SEI Stockholm Environment Institute

Consumption-based emissions: a new frontier for EU climate policy

SEI report
June 2024

Katarina Axelsson[1]
Jindan Gong[1]
César Dugast[2]
Fiona Lambe[1]
Pierre Maquet[2]
Timothy Suljada[1]

[1] Stockholm Environment Institute

[2] Carbone4

Published by

Stockholm Environment Institute
Linnégatan 87D 115 23 Stockholm, Sweden
Tel: +46 8 30 80 44
www.sei.org

Author contact

Katarina Axelsson
katarina.axelsson@sei.org

Editing

Tom Gill

Layout

Richard Clay

Graphics

Afina Zahra and Mia Shu

Cover photo

Loading cargo container ship © pidjoe / Getty

DOI: https://doi.org/10.51414/sei2024.025

Stockholm Environment Institute is an international non-profit research and policy organization that tackles environment and development challenges. We connect science and decision-making to develop solutions for a sustainable future for all. Our approach is highly collaborative: stakeholder involvement is at the heart of our efforts to build capacity, strengthen institutions, and equip partners for the long term. Our work spans climate, water, air, and land-use issues, and integrates evidence and perspectives on governance, the economy, gender and human health. Across our eight centres in Europe, Asia, Africa and the Americas, we engage with policy processes, development action and business practice throughout the world.

SEI Stockholm Environment Institute

Contents

Key messages

- Between 1990 and 2020, global CO_2 emissions increased by 63%, while emissions in the EU decreased by 29%. Yet this reduction doesn't capture the environmental footprint of the EU, which extends beyond its borders due to the import of emissions-intensive goods and services to satisfy EU demand.

- Since 2015, the EU has been a net importer of CO_2 emissions: the emissions associated with goods and services imported for EU consumption exceed emissions associated with its exports, signalling a growing adverse impact of EU consumption on other countries.

- More than 30% of the EU's imported emissions originate outside the EU, with the remainder traded within EU's borders. China was the largest exporter of emissions to the EU accounting for 8.5% of EU consumption-based emissions, followed by Russia (4.8 %), the United States and India (both 1.6 %).

- Projections point to a rise in environmental impacts of EU consumption up to 2030, highlighting the need for additional measures to align with global climate goals.

- To lower consumption-based emissions, we recommend:
  - setting binding targets at the EU-level
  - standardizing methods for CBEs accounting
  - setting mandatory reporting requirements on member states
  - strengthening existing EU legislation to better address CBEs
  - enhancing transparency in trade and value chains
  - fostering partnerships with trading partners committed to sustainable production practices, and
  - providing capacity-building support to developing countries to enhance their sustainable trade practices can help lower EU's consumption-based emissions.

Executive summary

Trade is a key building block of the EU, fostering job opportunities, economic growth, and enhanced welfare. At the same time, unsustainable trade and consumption patterns are one of the primary drivers behind the sustained high levels of greenhouse gas emissions at the global level (IPCC 2022). The EU has long prioritized mitigating territorial greenhouse gas emissions and most Member States have clear ambitions and targets in place. Consumption-based emissions (CBEs) are a significant challenge to the EU's efforts to combat climate change and a significant contributor to the region's overall carbon footprint. This report delves into the complexities of CBEs within the EU, focusing on the environmental impact of EU consumption. Through analysing the current state of CBEs and trade within and beyond the EU, assessing existing policy frameworks, and in-depth case studies of three member states, this report offers valuable insights and recommendations to enhance the EU's efforts to mitigate its CBEs.

Key findings

The EU can emerge as a global leader in climate action by addressing CBEs and setting an example for other nations to follow. Examples from our three case study countries demonstrate a strong commitment and engagement in addressing CBEs at member state level. The main barriers to addressing CBEs identified in the case studies include a lack of targets and standardized monitoring systems, the complexity of global supply chains, and a lack of political support and coordinated efforts among member states to tackle CBEs effectively through common policies and measures. Opportunities include leveraging the EU's influence to set common targets for CBEs at the EU level, driving international norms and standards, supporting member states as well as developing countries in transitioning to low-carbon practices, and in boosting demand for products produced with minimal environmental impact.

The report underscores the necessity for targeted policies and measures to address household CBEs, given their significant contribution to overall emissions in the EU and their role in emissions and environmental pressures globally. While recent and planned EU policies have increasingly targeted household CBEs through carbon pricing and emission restrictions on imports, the coverage of products and services remains limited. Furthermore, we suggest that current policy measures are overly focused on efficiency gains (a strategy often labelled as "improved consumption" in the discourse) and advocate for their expansion to encompass a broader array of policies and initiatives. These should include stronger sustainability measures aimed at transitioning to low-carbon consumption (labelled as "shift") or, ideally, reducing consumption altogether (labelled as "avoid").

The report provides 24 recommendations (see section 6) for advancing the EU's work to address CBEs, divided into five different categories. The most important of these recommendations are:

- Standardizing carbon accounting and setting binding targets.
- Designing policies and measures at the EU and member-state levels focused on promoting *strong sustainability* and consumption *sufficiency*, emphasizing not only shifts or efficiency gains in consumption but also the importance of consuming less overall.
- Fostering partnerships with trading partners committed to sustainability and supporting developing countries to enhance their environmental sustainability.
- Creating a space for EU member states to share best practices of monitoring efforts and national policy frameworks.
- Supporting research initiatives to improve data quality and coverage for additional indicators to monitor consumption-based impacts.

This report sheds light on the intricate relationship between consumption, trade, and emissions in the EU and underscores the critical role of the EU in leading the global fight against climate change. By prioritizing the reduction of CBEs and implementing targeted policies, the EU can harness the size of the single market to drive emissions reductions in trading partners while also maintaining the competitiveness of cleaner production processes within Europe. Overcoming barriers, seizing opportunities, and championing sustainable practices will enable the EU to position itself as a frontrunner in climate action, inspiring collective efforts towards a greener and more sustainable future for all. Setting targets for CBEs at the EU level in addition to targets for territorial emissions, is crucial for driving meaningful change and ensuring accountability in reducing emissions from consumption across all EU member states.

Abbreviations

CBAM	Carbon Border Adjustment Mechanism
CBEs	Consumption-based emissions
CGDD	French General Commission for Sustainable Development
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DCCC	Danish Council on Climate Change
DGEC	Directorate General for Energy and Climate
EAP	Environmental Action Plan
EE MRIO	Environmentally extended, multi-regional input-output
EEA	European Environment Agency
ENVI	European Parliamentary Committee on Environment, Public Health and Food Safety
EU	European Union
ETS	Emissions Trading System
FAO	Food and Agriculture Organization
GHG	Greenhouse gas
GVA	Gross value added
IEA	International Energy Agency
INSEE	French National Institute for Statistics and Economic Studies
IO	Input-output
JRC	Joint Research Centre
LEC	Energy and Climate Law
LTECV	Energy Transition Law for Green Growth
LULUCF	Land use, land-use change and forestry
MRIO	Multi-regional input-output model
MTE	Ministry of Ecological Transition
OFCE	Observatoire Français des Conjonctures Économiques
SDES	Statistical Data and Studies Department
SEI	Stockholm Environment Institute
SEPA	Swedish Environmental Protection Agency
SNBC	French national low-carbon strategy
SRIO	Single-region input-output

Acknowledgements

We extend our sincere gratitude to the individuals from Sweden, Denmark, and France, and those actively engaged at the EU level, who generously contributed their time, insights, and expertise to this project. While their contributions through interviews and sharing information are acknowledged anonymously in this report, their valuable input has played a big role in shaping the findings and recommendations presented here. We deeply appreciate their collaboration and commitment to advancing our collective understanding in this field.

We are also grateful to the European Climate Foundation for their generous support and funding, which made this project possible. Their commitment to advancing research in consumption-based emissions and trade has enabled us to conduct this important study. We are grateful for their partnership and dedication to fostering knowledge and innovation in support of work to address the global climate challenge.

1. Introduction

Trade is a key building block of the European Union (EU), fostering job opportunities, economic growth, and enhanced welfare. At the same time, unsustainable trade and consumption patterns are one of the primary drivers behind the sustained high levels of greenhouse gas emissions at a global level (IPCC 2022).

The EU has long prioritized mitigating territorial greenhouse gas emissions and most member states have clear ambitions and targets in place. A substantial portion of consumption in member states, however, relies on imported goods, resulting in greenhouse gas emissions generated outside EU borders. To effectively address climate change, these imported emissions must be reduced alongside territorial greenhouse gas emissions, which necessitates fundamental changes in household consumption patterns (e.g. IPCC, 2023; Köhler et al., 2019; Lorek & Vergragt, 2015) and trade policies, as well as well-designed policy responses to ensure that the transition is not only sustainable but also just and rapid (Newell et al. 2022).

Despite the EU's efforts, current projections indicate a rise in environmental impacts of EU consumption up to 2030, highlighting the need for additional measures to align with global climate goals (European Commission, 2022). Although proposed initiatives by the EU are an improvement on the business-as-usual approach, they fail to substantially diminish the impacts to levels essential for staying within planetary boundaries or meeting the global goal of keeping global warming below 1.5°C above pre-industrial levels. Hence, additional endeavours are imperative to prevent the shifting of environmental burdens from EU production and consumption to third countries (European Commission, 2022).

It is crucial to monitor consumption and production patterns within the EU to decouple environmental pressures from economic growth and advance towards a green economy (Eurostat, 2023c). Greenhouse gas emissions are among the most significant of many global environmental and social impacts exerted by EU consumption and production patterns. Initiatives such as the Carbon Border Adjustment Mechanism (CBAM) and Regulation on Deforestation-free products demonstrate the EU's commitment to regulating embodied emissions in products. While some member states have begun to track imported emissions, there remains a clear opportunity for European leadership in global climate action to address this often-overlooked aspect of global climate action.

1.1 This study

This report, funded by the European Climate Foundation, contributes knowledge about the scope of households' consumption-based emissions (CBEs) within the EU and identifies opportunities and barriers for mitigating these emissions.

Our aim is to better understand the potential to establish targets for CBEs, and strategies to reduce them, in the EU and among member states. We also aim to identify opportunities for EU policy to support member states' efforts to address CBEs while at the same time fostering shifts in household consumption behaviour and contribute to mitigating global greenhouse gas emissions.

The following three questions were used to guide our work:

1. What are the main hotspot consumption categories for households within the EU and selected member states, and who are the main trading partners within these consumption categories?
2. What are the opportunities and barriers for establishing consumption-based emissions targets and strategies in the EU and among member states to support a change in household consumption patterns?
3. What role could the EU play in supporting member states' efforts to ensure a reduction in greenhouse gas emissions from consumption?

The study employs a multi-method approach, including a review of primarily grey (but also academic) literature, policy documents, official statistics, and semi-structured interviews with experts from institutions at the EU level and three case study countries, namely Sweden, Denmark, and France. See Annex A for details about how these interviews were set up.

The report is structured as follows: Section 2 presents the current state of consumption-based emissions and trade within the EU. Section 3 assesses the EU's current policy landscape of relevance for mitigating the EU's CBEs. Section 4 provides a comprehensive overview of CBEs and trade in each case study country, as well as potential pathways for developing and implementing policy in each of the three case studies. Section 5 presents an analysis of our findings and Section 6 our conclusions and recommendations.

1.2 Scope and limitations

There are several different indicators used to estimate environmental impacts connected to our consumption. In this report, we focus on greenhouse gas emissions (CO_2 and CO_2 equivalent) which is the most established indicator (see Figure 1 for a definition) and for which several countries already have monitoring systems in place. Other indicators that are relevant (but outside the scope of this report) include: footprints for materials; water; land; energy; other emissions to air; chemicals; land-use change; biodiversity; and fisheries (see e.g. PRINCE, n.d.). Monitoring of developments across the Sustainable Development Goals (SDGs) is also regularly undertaken at the

EU level (see e.g. Eurostat, 2023c). Environmental footprinting is another indicator recently developed by the Joint Research Centre. For further details see section 2.5.1 .

This report focuses on policies and measures to address households' CBEs; hence it does not cover public consumption or other actors and actions classified as final consumption (see section 2.2.1). For a review of how the EU can mitigate climate impacts from public consumption and work to strengthen Green Public Procurement practices, see Nilsson Lewis et al. (2023).

Figure 1. Definitions

Territorial emissions

Territorial emissions refer to the greenhouse gas emissions produced within the geographical boundaries of a specific region, country, or territory. These emissions are generated from activities like burning fossil fuels for energy, industrial processes, transportation, and agriculture that occur within the territory. Territorial emissions are commonly used to assess a country's or region's direct contribution to climate change and are often reported in national greenhouse gas inventories.

Production-based emissions

Production-based emissions are generated from similar sources as territorial emissions, but also include greenhouse gas emissions of European economic actors outside European borders.

Consumption-based emissions

Consumption-based emissions (CBEs), also known as carbon footprints or emissions embodied in consumption, refer to the greenhouse gas emissions associated with the production of goods and services consumed by individuals, households, or entire nations, regardless of where in the world the production occurs. This includes emissions from the entire supply chain of goods and services, including production, transportation, and disposal. CBEs include both direct and indirect emissions. Direct emissions are typically covered in a country's territorial emissions (for instance, the direct emissions resulting from vehicle combustion). Indirect emissions are emissions that have occurred along the supply chain, for instance in the production of a car. When estimating a country's or region's CBEs, emissions associated with export are excluded because these are counted as the embedded emissions of the importing country, i.e. consumption-based emissions = production-based emissions + imported emissions – export.

2. Consumption-based emissions in the EU

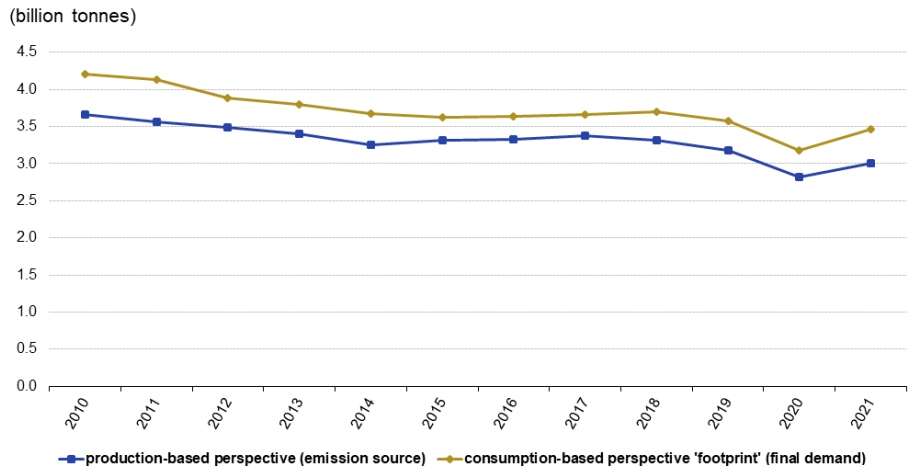
This section outlines features and trends in household consumption within the EU. It highlights some of the EU's most significant trading partners and the goods traded with them, and offers an overview of the available databases for monitoring consumption-based emissions (CBEs) in the EU.

It is important to note that a significant quantity of the consumption-based statistics available at the EU level only cover carbon dioxide (CO_2) emissions. According to the IPCC (2022), CO_2 emissions from fossil fuel combustion and industrial processes accounted for almost 70% of global anthropogenic greenhouse gas emissions in 2019.[1] Although CO_2 is the most prevalent greenhouse gas, focusing solely on CO_2 overlooks approximately 30% of greenhouse gas emissions. For instance, methane (CH_4) accounts for 22% of total greenhouse gas emissions, followed by nitrous oxide (N_2O) at 6% and fluorinated gases (i.e. HFCs, PFCs, SF6, NF3) at 3% (IPCC, 2022).

2.1 Characteristics of household consumption and trends in the EU

From 2010 to 2021, both the EU's total production-based and consumption-based CO_2emissions saw an 18% decrease (see Figure 1 for definitions) (Eurostat, 2024c). In 2021, consumption-based CO_2emissions (also known as the carbon footprint) were 15% higher than its production-based emissions. As illustrated in Figure 2, there was a noticeable decline in emissions during the Covid-19 pandemic, particularly in 2020 when strict lockdown measures were implemented in most economies. This decrease began to reverse as societies reopened in 2021.

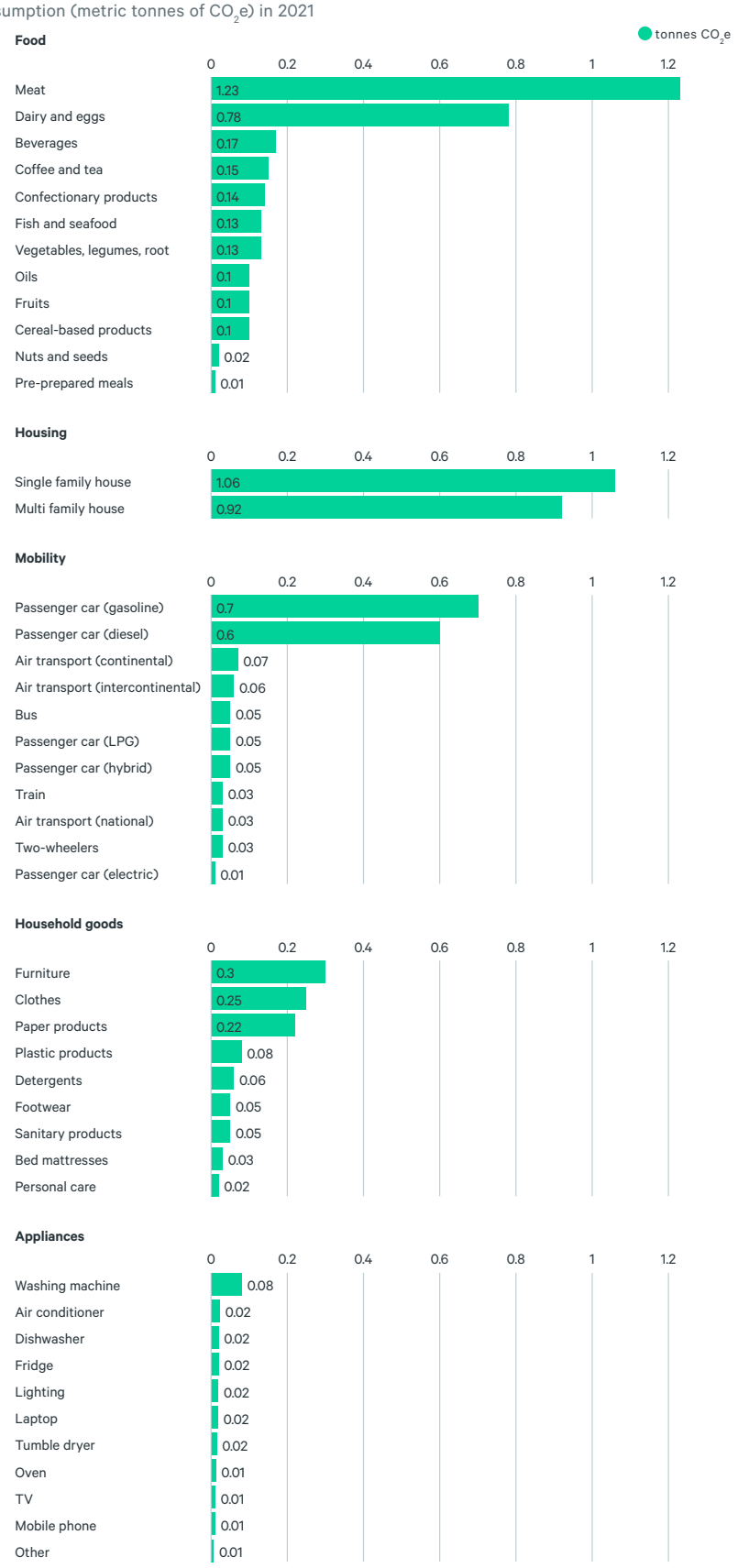
Figure 2. CO_2 emissions within the EU by perspective, 2010–2021



Source: Eurostat, 2024c

1 Excluding net CO_2 from land use, land-use change and forestry (CO_2-LULUCF) which would make up 13 percent of the total greenhouse gas emissions if that was included

Figure 3. Average consumption-based footprints per person within the EU and for different categories of consumption (metric tonnes of CO_2e) in 2021



Source: Adapted from European Commission (2023b)

On average, the European Commission estimated that, in 2021, CBEs from EU households were 8.01 metric tonnes of CO_2e per person (European Commission, 2023b), excluding public consumption and investments. In terms of different categories of consumption, food was the consumption category that generated the highest emissions per person on average (3.1 tonnes CO_2e); followed by housing (2 tonnes), mobility (1.7 tonnes), household goods (1.1 tonnes), and appliances (0.2 tonnes) (European Commission, 2023b). Figure 3 presents a detailed breakdown of average CBEs per person in the main categories of consumption.

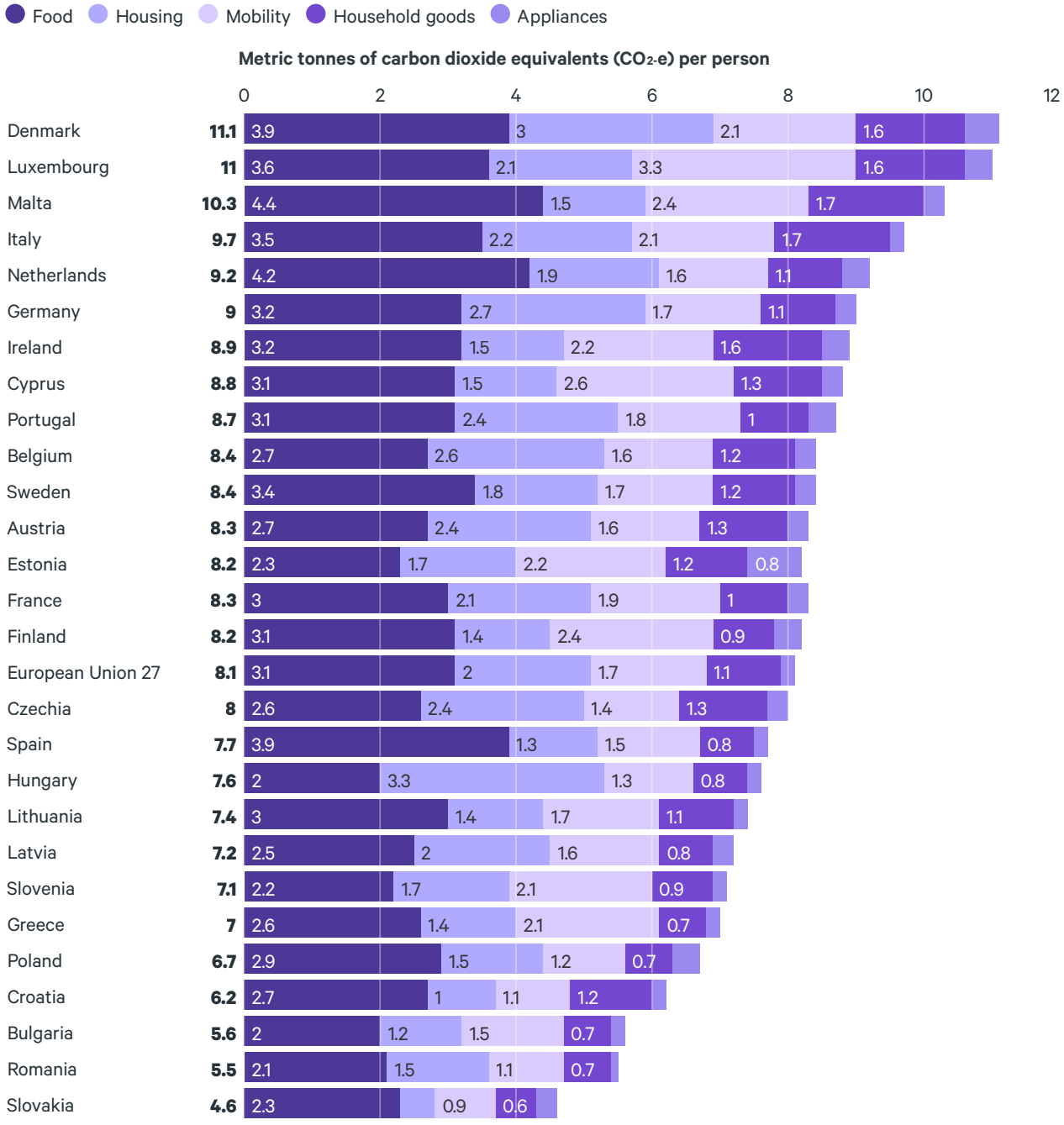
As illustrated by Figure 3, data from the European Commission (2023b) show that on average, meat and dairy products contribute the highest carbon footprint per person within the food category. Households living in separate houses use more energy than households living in multi-family homes, and for the category of mobility, passenger cars running on gasoline and diesel generate the highest carbon footprint in total. In the category of household goods, furniture, clothes, and paper products are the sub-categories that generate the highest carbon footprint on average. In the appliances category, households' consumption of washing machines generated the most emissions, followed by air conditioning products and other white goods.

2.2 Differences in consumption-based emissions between member states

The European Commission (2023b) estimated households' CBEs for every member state and per main category of consumption. In 2021, the average footprint for the EU 27 was 8.0 metric tonnes CO_2e per person, but ranged from 11 tonnes CO_2e per person in Denmark and Luxembourg to 4.6 tonnes CO_2e per person in Slovakia (see Figure 5).

Food represents the category that is responsible for the largest share of household consumption (38%), followed by *housing* (25%), *transport* (21%), *household goods* (13%) and then *appliances* (3%) (excluding public consumption and investments, see below). *Food* shows the lowest variation among member states, followed by *household goods* and then **mobility**. Appliances is the category with the largest variation between member states (European Commission, 2023b).

Figure 4. Average carbon footprint for each EU member state in 2021, overall and per category of household consumption

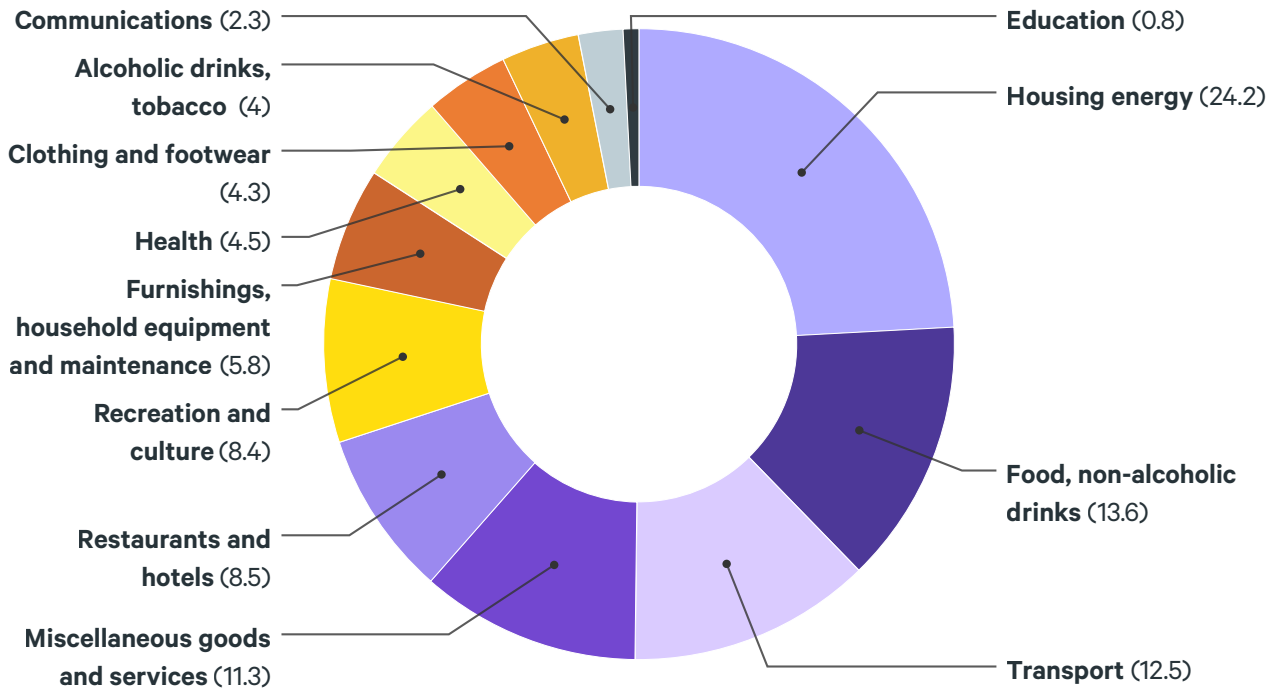


Source: European Commission, 2023b

Consumption trends since 2022

The European Commission has not yet published any environmental data for 2022. While waiting for that data to be published, data from the national accounts provided by Eurostat can provide interesting insights into how consumption patterns within the EU have developed after 2021 (see Figure 2 for the trend before 2022). It shows us that while the Covid-19 pandemic brought significant economic consequences, evident in national accounts projections for 2020 as well as 2021, by 2022, household expenditure rebounded to surpass pre-pandemic levels within nearly every consumption category (Eurostat, 2023b). Compared to 2021, household consumption in the EU surged by almost 5% in 2022, with the category of *restaurants and hotels* leading the rebound at almost 35%. Other categories like *recreation and culture*, *clothing and footwear*, and *transport* also saw increases. Against 2019, *communications* had the highest growth in 2022 with almost 12% increase. And despite an overall recovery, *transport*, *restaurants and hotels*, and *education* still lagged behind 2019 levels (Eurostat, 2023b). Figure 4 illustrates the significance of different categories of consumption in households' expenditures in 2022.

Figure 5. Average shares of total consumption by consumption category in EU household expenditure in 2022, in percentages.



Source: Eurostat, 2023b

Public consumption and investments

In all member states, citizens also rely on public consumption for their welfare (e.g. schools, hospitals, rescue services, roads). Public procurement accounts for around 14% of the EU's gross domestic product (GDP) (European Commission, 2023a). In national accounts, households and governments are both classified as final consumers

along with a small share of NPISH[2] (UNSTATS, 2009). Gross capital formation (i.e. investment) is another important share of consumption in the national accounts, and covers, for example, housing, machinery, and luxury goods that are used repeatedly or continuously over several years (UNSTATS, 2009) and which are therefore problematic to endogenize as either household or government consumption. Hence, to estimate a country's full CBEs, the consumption associated with households', governments and investments need to be included.

There are, however, no official statistics available about the greenhouse gas emissions associated with public consumption or investments at the EU level. Preliminary findings from the European Topic Centre on Circular Economy and Resource Use suggest that in 2021, households generated the bulk of the EU's total consumption footprint, at 65%. Governments generated 11%, and investments 20%. An additional 1% was associated with NPISH and changes in inventories accounted for 4% (Christis et al., Forthcoming). These findings align with national-level estimates presented in our case studies (see section 4). Hence, when evaluating the greenhouse gas emissions of household consumption at the EU level, it is important to note that public consumption and investments, which play a vital role in sustaining EU welfare systems , are not factored in.

2.3 Actors involved in monitoring consumption-based impacts at the EU-level

At the EU-level, consumption-based environmental impacts are monitored by different actors and institutions and for slightly different purposes. The three central institutions when it comes to monitoring statistics related to consumption-based estimates and trade are Eurostat, the European Environment Agency, and the Joint Research Centre.

Eurostat is the statistical office of the EU and is as such responsible for publishing Europe-wide statistics and indicators that enable comparisons between countries and regions. Their work focuses on an environmentally extended, multi-regional world input-output (EE MRIO) model. See Figure 6. The indicator used to express consumption-based impacts is carbon dioxide (CO_2).

The European Environment Agency (EEA) is an agency of the EU with a focus on providing data and assessments related to environment and sustainability in Europe.

The Joint Research Centre (JRC) is the European Commission's science and knowledge section. It is tasked to provide independent scientific advisory services that support EU policy.

In addition to these three actors, the Organisation for Economic Co-operation and Development (OECD) has its own multi-regional input-output model. Since the 2000s,

2 NPISH stands for non-profit institutions serving households. NPISH are private, non-market producers which are separate legal entities in the national accounts. NPISH provide goods or services to households for free or at prices that are not economically significant, and include e.g. religious societies, sports and other clubs, trade unions, and political parties.

the organization has worked to estimate final-demand CO_2 emissions for its member countries, as well as for certain partner countries. The OECD model is broken down into 34 economic sectors and includes fossil CO_2 only (OECD, n.d.).

Many of the models used by these organizations are not able to cover the full impact of citizen consumption. Categories that are regularly not included for example are:

- long-range air travel, where most models only include domestic air travel or so-called bunker fuels
- direct imports from household purchases over the internet
- investments in capital goods (e.g. building a house) and luxury items.

The models are often also not able to cover the full range of greenhouse gases and only cover CO_2 (see e.g. Schulz et al., 2024; Steinegger, 2019; Swedish Environmental Protection Agency, 2023c; UN Stats, 2018).

Figure 6. Methods to estimate consumption-based emissions

To estimate consumption-based emissions (CBEs) for whole economies, the most common approach is to apply an environmentally extended multi-regional input-output model. This is a quantitative economic model that can reflect interactions between different economic sectors within a national economy or between different regions of the world. These statistical data are then combined with climate data per industry for domestically produced and imported products. Emissions caused by travel and transport in other countries are also included in the calculations. FIGARO and EXIOBASE, are two of the most common databases used for estimating consumption-based emissions within the EU.

FIGARO, or Full International and Global Accounts for Research in input-Output Analysis, was launched by Eurostat in 2015, and is the result of a collaboration between Eurostat and the Joint Research Centre of the European Commission. FIGARO compiles EU inter-country supply, use, and input-output tables (Eurostat, 2021), and provides a unique tool for analysing the socioeconomic and environmental impacts of globalization. It builds on data from national accounts, business, trade, and jobs for all EU member states, the UK, the US, and 17 other main EU trading partners. It is divided into 64 products and production activities (i.e. industries), as well as five final demand categories. The FIGARO data can be used to study trade effects on value chains, environmental footprints, competitiveness, growth, productivity, and employment at various geographical scales. FIGARO aspires to be EU's reference tool for policymakers and has produced annual data since 2021. It is currently able to provide time series data from 2010 to 2021 (Eurostat, n.d.). FIGARO builds on the European statistical classification of economic activities and the so-called NACE (Nomenclature of Economic Activities) structure, which includes 64 industrial categories.

Figure 6 (continued)

As with other similar databases, FIGARO is only able to map carbon dioxide emissions (CO_2) and no other types of greenhouse gas emissions.

EXIOBASE is a global multi-regional input-output (MRIO) database that provides detailed information on economic activities by country and the associated environmental impacts across different regions and sectors. It can be used to analyse the environmental footprint of consumption for a large number of countries, and to understand how economies are connected and the environmental consequences of these connections (Exiobase, 2024). EXIOBASE can estimate emissions of several greenhouse gases (i.e. CO2equivalents). It also provides estimates of other consumption-based impacts expressed through indicators such as land use, water use, mineral and energy flows, and indicators on economic and social flows by industry.

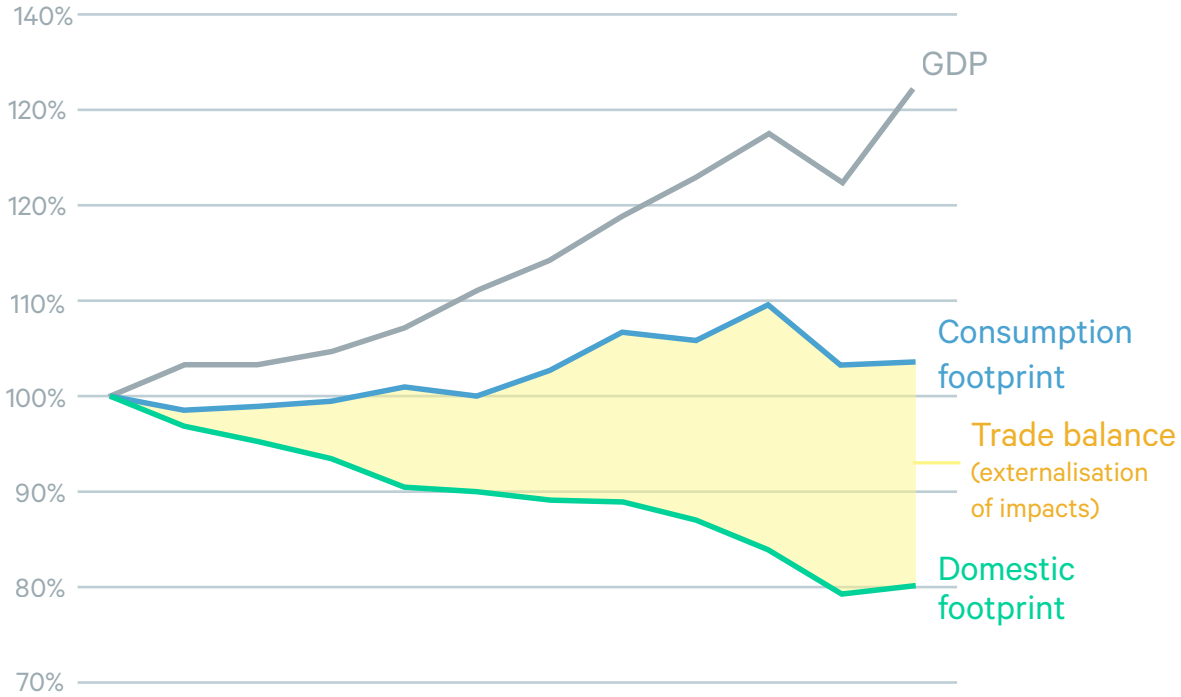
The consortium behind EXIOBASE consists of researchers and institutions from the Norwegian University of Science and Technology (NTNU), Netherlands Organisation for Applied Scientific Research (TNO), Swiss Federal Institute for Environmental Science and Technology (SERI), Wageningen University, and 2.-0 LCA Consultants (Exiobase, 2024). The advantage of EXIOBASE is that it offers numerous environmental extensions. The disadvantage is that it Is set up as part of a research project and that its future funding Is uncertain at this point.

The Consumption Footprint Indicator

Carbon footprinting is of course not the only environmental indicator that is important for understanding the environmental impacts of EU consumption and lifestyles. The JRC has developed a novel method that combines several different indicators into one single weighted score for assessing the environmental impact of EU consumption, which they refer to as the Consumption Footprint. The indicator aggregates economic input and output accounts across 16 impact categories (e.g. climate change, ecotoxicity, land-use related impacts, and water-use related impacts) and weighs them by importance and combining them into a single environmental footprint score that is also compares them against the planetary boundaries framework (Joint Research Centre, 2022; Sala et al., 2020; Sanye & Sala, 2023).

Sanye and Sala (2023) found that between 2010 and 2018, domestic environmental impacts in the EU 27 decreased by 12%, while GDP increased by 23%, indicating absolute decoupling. However, when trade is considered, the relative decoupling is more limited, with a 6% increase in the consumption footprint (see Figure 7). Additionally, they stress that certain impacts like biodiversity loss and overexploitation remain unaccounted for, emphasizing the need for their inclusion in future assessments for a more comprehensive understanding of decoupling trends.

Figure 7. Decoupling of environmental impacts from economic growth, 2010–2021, shown by the JRC's Consumption Footprint and Domestic Footprint indicators.



Source: Adapted from Sanye Mengual and Sala (2023)

2.4 Trade and the EU in the global context

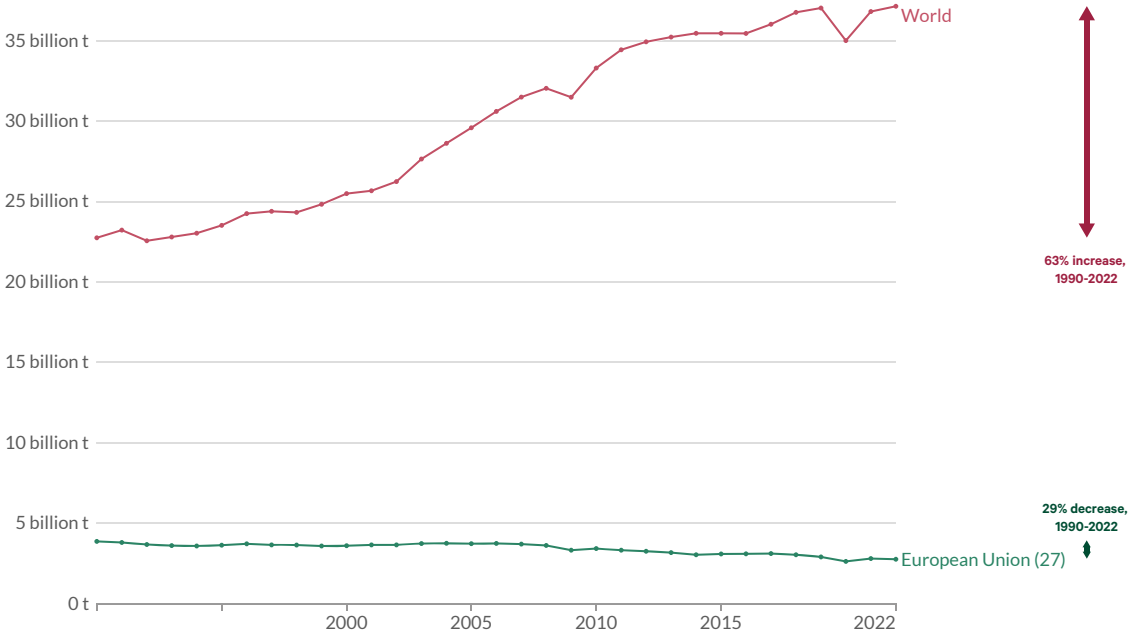
Between 1990 and 2020, global CO_2 emissions increased by 63%, while emissions in the EU decreased by 29% (see Figure 8) (Global Carbon Project, 2024). Yet this reduction doesn't capture the environmental footprint of the EU, which extends beyond its borders due to the import of emissions-intensive goods and services (note that this section only covers CO_2 emissions, not CO_2e).

In 2021, the EU's total consumption-based CO_2 emissions were estimated at 3.5 billion metric tonnes, corresponding to about 9% of global CO_2 emissions (37.9 billion tonnes), which is disproportionate to its 5.7% share of the world population (Eurostat, 2024c).

Since 2015, the EU has been a net importer of CO_2 emissions. This means that the emissions associated with goods and services imported for EU consumption exceed emissions associated with its exports. This so-called negative spillover in CO_2 imports signals a growing adverse impact of EU consumption on other nations (Eurostat, 2022). There are however also positive spillovers associated with EU consumption, which can be measured by the net trade balance of the so-called gross value added (GVA) (Eurostat, 2022). Since 2015, the net balance between GVA from EU imports and exports has grown. However, EU consumption continues to influence environmental conditions worldwide, with some effects intensifying, notably increased CO_2 emissions, as well as cropland footprints (Eurostat, 2022).

Figure 8. Global and EU greenhouse gas emissions, 1990–2022

Carbon dioxide (CO_2) emissions from fossil fuels and industry[1]. Land-use change is not included.



Source: Global Carbon Budget (2023), with major processing by Our World in Data (Global Carbon Project, 2024)

Key import and export countries

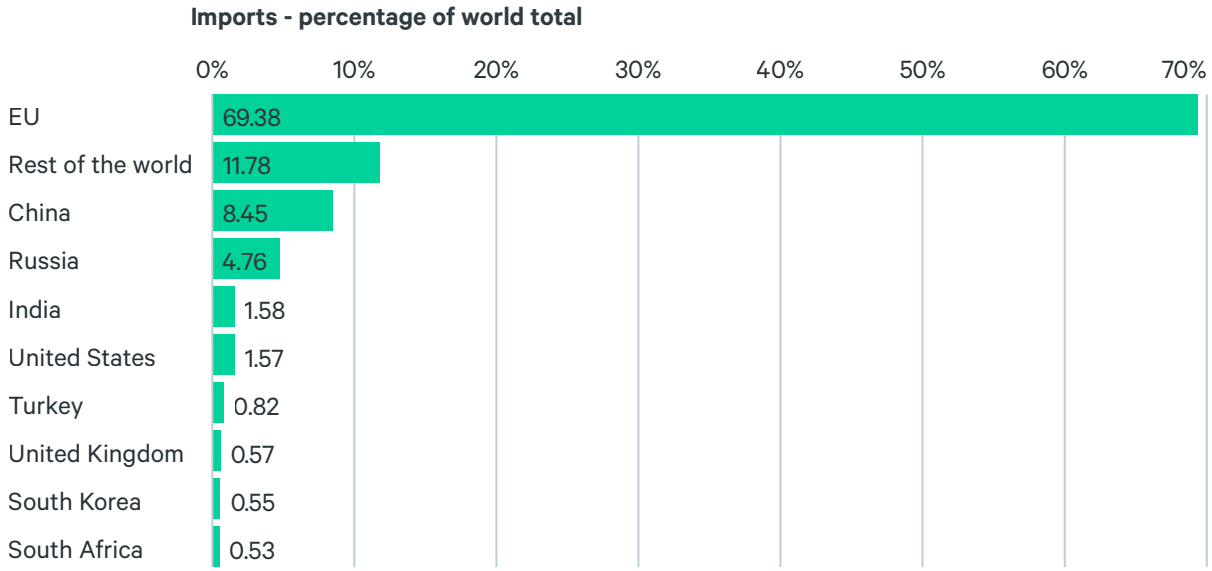
Imports

Figure 9 presents the 2021 statistics on countries from which EU member states imported emissions in goods and services in 2021 . About 69% of the EU's consumption-based CO_2 emissions were generated within the EU and illustrate the import from across other EU member states. Imports from other G20 countries generated 21%, and the remainder – about 9% – originated from non-EU and non-G20 countries. Looking at individual countries, China was the largest exporter of greenhouse gas emissions embedded in goods to the EU (8.5%), followed by Russia (4.8 %), the US and India (both 1.6 %) (Eurostat, 2024c).

Detailed public data about the composition of the imports from different partners are limited. There is no detailed data available about the total emissions or the emission intensities connected to the imports from different countries. Here, we use examples of the type of data available from China, Russia, the US and India as illustrative examples.

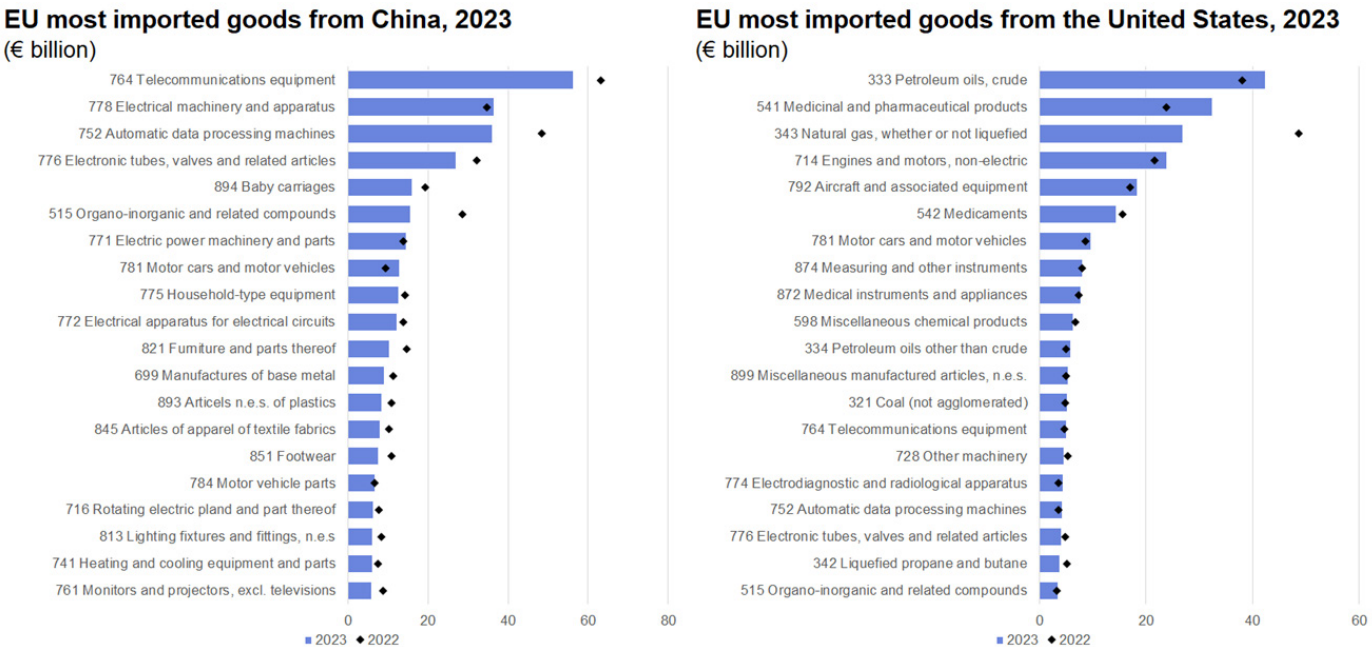
Imports from China comprise many different consumption categories. Figure 10 illustrates the top 20 types of goods imported from China into the EU in 2023 (making up around 60% of the total imports from China). Telecommunication equipment is by far the most imported type of goods, followed by other kinds of machinery and electronics. Overall, electronics, machinery and vehicles are the most prominent categories of goods imported from China, but the list also includes products such as baby carriages (the fifth most imported), furniture, textiles and footwear (Eurostat, 2024a).

Figure 9. The 10 regions or countries most responsible for greenhouse gas emissions resulting from EU imports in 2021, as a percentage of world total



Source: Eurostat, 2024c

Figure 10. Top 20 most imported goods into the EU from China and the US in 2023, in billions of Euros



Source: Eurostat, 2024a, 2024d

Looking at Russia, imports in 2022 were mainly related to energy (87%) in the form of petroleum oils, gas and coal. In 2023 (February to December), the value of EU imports from Russia fell by 82% (Eurostat, 2024b) following Russia's invasion of Ukraine and subsequent bans on Russian oil and gas.

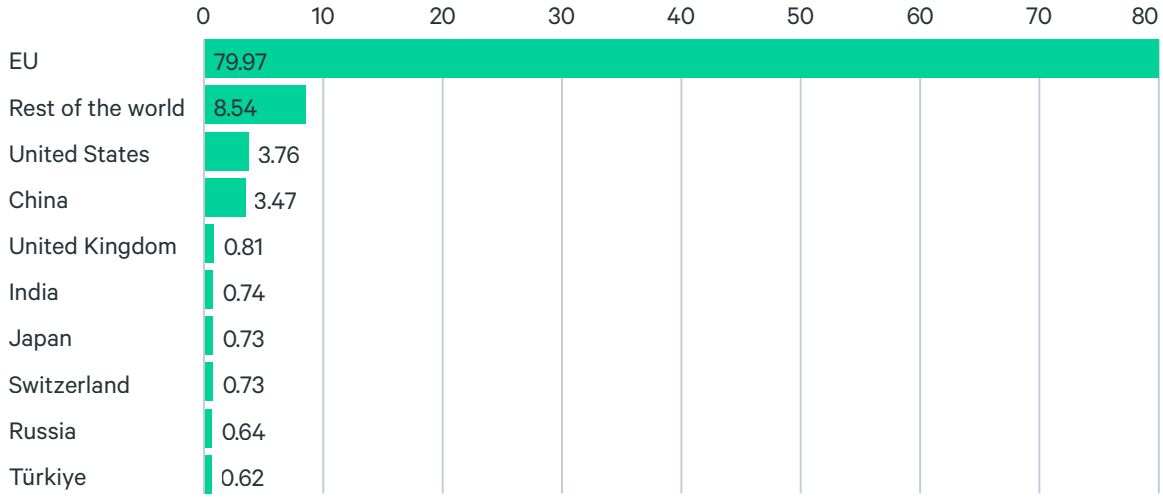
In the case of imports from the US, the country partially filled the gap left by Russia as a source of energy imports to the EU. As a result, in 2023 oil and natural gas became the top and third most imported products from the US, respectively, with medical and pharmaceutical products ranking second (Eurostat, 2024d). Other common categories of goods imported from the US include different types of machinery (see Figure 10).

In the case of India, pearls and semi-precious stones, petroleum oils, apparel and footwear stood out as important import categories in the same year (2023).

Exports

The EU's exported greenhouse gas emissions are deducted when calculating CBEs, as described in Figure 2. We present EU exports here to reflect the role of the EU in global trade and associated greenhouse gas emissions. Most greenhouse gas emissions embedded in exports from EU member states are imported by other member states. Outside the EU, the US was the individual country that received the highest volume of emissions embedded in EU exports, followed by China, then the UK as, shown in Figure 11 (Eurostat, 2024c).

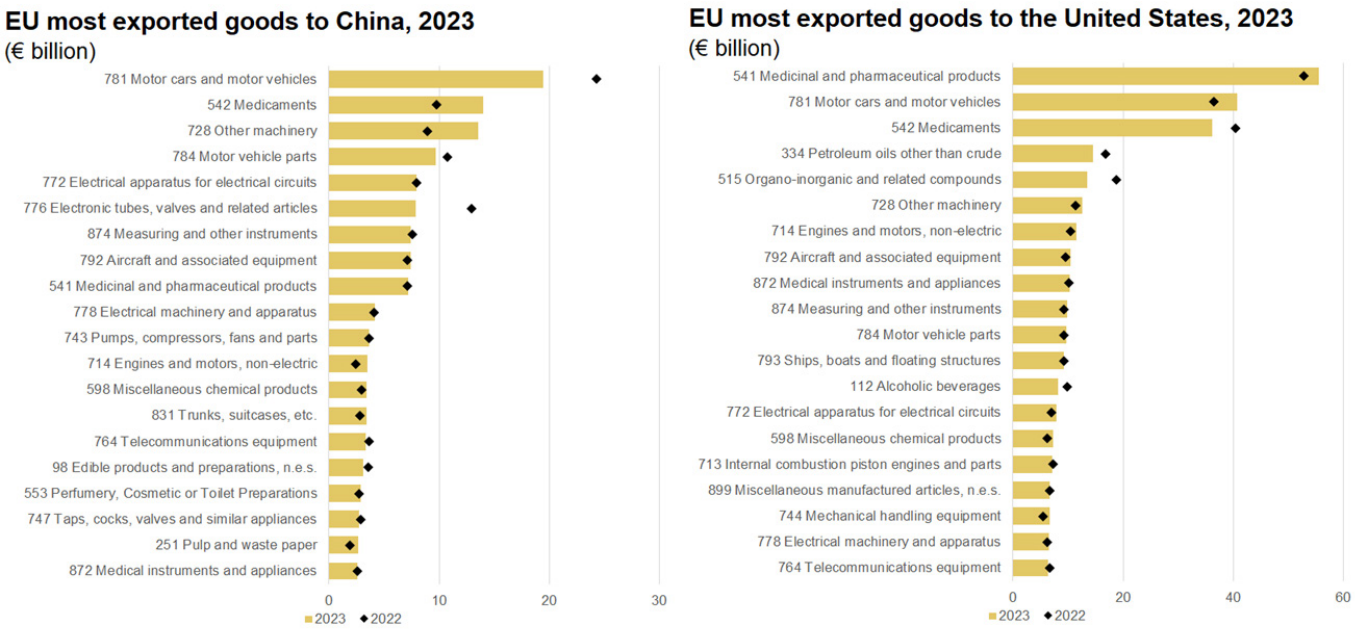
Figure 11. The 10 regions or countries to which the majority of greenhouse gas emissions are attributed due to EU exports in 2021, as percentage of world total



Source: Eurostat, 2024c

Using China and the US again as examples (see Figure 12), we find that *motor cars and vehicles* was the most important category of goods exported to China in 2023, followed by *medicaments* and then *other machinery*. In exports to the US, we find similar categories among the top three, with *medicinal and pharmaceutical products* at the top, followed by *motor cars and vehicles* and then *medicaments*.

Figure 12. Most exported categories of goods from China and the US to the EU in 2023, in billions of Euros

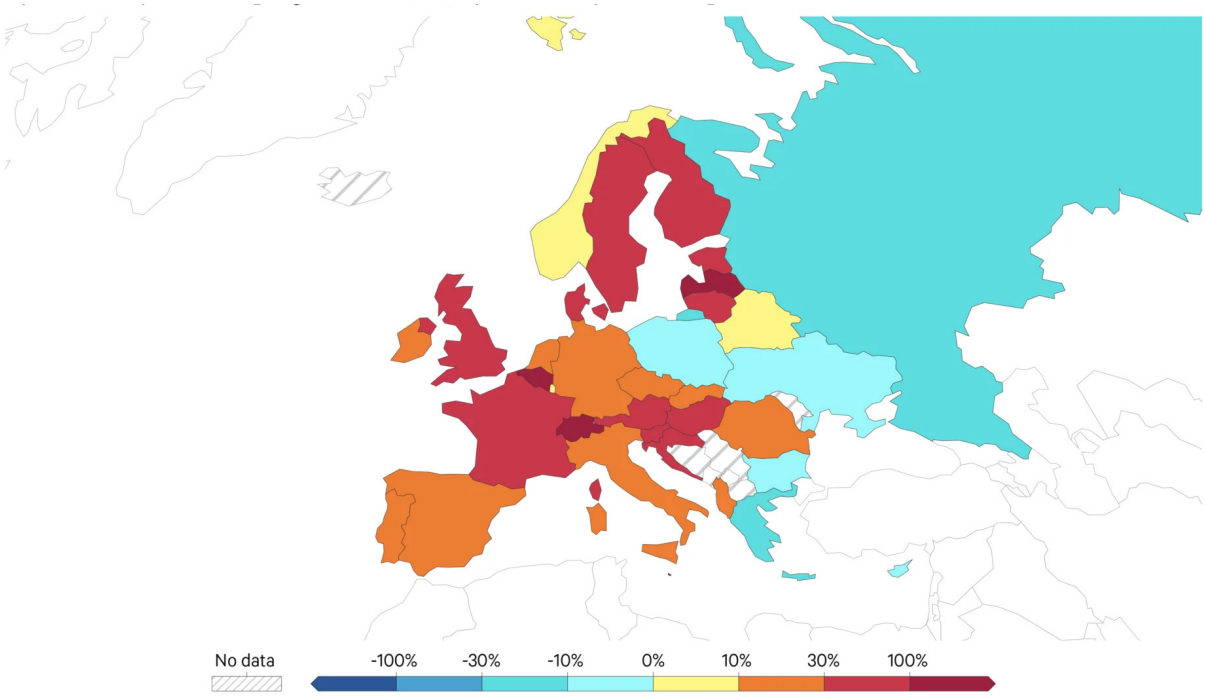


Source: Eurostat, 2024a, 2024d

Variation in imported emissions across member states

The average CO_2 emissions embedded in trade for the EU27 was 8% in 2021 (see Figure 1). As shown in Figure 13, the range differs substantially, with Malta at the top with over 500% of their emissions embedded in trade, followed by Latvia and Belgium at around 110%. This means that emissions embedded in these countries' imports are greater than the emissions embedded in their exports. As a net exporter, Greece is at the other end of the scale with -12% embedded in trade, followed by Bulgaria and Poland, both -4%, meaning that the carbon footprint associated with these countries' exports is larger than the carbon footprint of their imports (Global Carbon Project, 2023).

Figure 13. Share of CO_2 emissions embedded in trade among the EU 27 in 2021. Positive values (red) represent net importers of CO_2. Negative values (blue) represent net exporters of CO_2



Source: Global carbon budget, 2023

2.5 Findings from our interviews on methods

In total we undertook five interviews to inform our understanding of monitoring practices at the EU level. From these interviews, we can conclude that EU institutions use differing methods to measure consumption-based impacts and that they have different merits and limitations and can also meet different needs and audiences. Several interviewees expressed a desire to have a standard, centralized approach to account for CBEs in the EU to make data more consistent and available and to support target-setting and policymaking, both at member state and EU level.

Whether or not a standard approach is adopted, several interviewees reported that better communication of the methods is needed to better support policymakers and stakeholders to interpret consumption-based data.

Firstly, according to one interviewee, the methods themselves can be hard to grasp. For example, some may struggle to understand at first sight how 155 product categories could represent overall consumption and how these can be used as proxies to scale up to the entire basket of products.

Secondly, the narratives presented by consumption-based and territorial emissions are contrasting in some sectors, which could be a source of confusion to a non-technical audience. For example, CBEs from EU food consumption are clearly increasing, but this contrasts with the more commonly presented data on emissions from EU-based agriculture only. There is a perception that EU agriculture policy, including the Common

Agricultural Policy (CAP), serves the EU well and there seems to be less understanding that the demand for products must be met from imports.

Another interviewee pointed out that limitations in some data sets mean it is more difficult to make detailed comparisons of consumption-based and territorial emissions. One example is the FIGARO database, which only provides consumption-based estimates for CO_2 rather than a broader range of greenhouse gases (CO_2e) as used by EXIOBASE and which is used by an increasing number of member states. However, according to one interviewee, FIGARO will soon be updated to include other pollutants.

3. Addressing consumption-based emissions within the EU

In this section, we present our work to outline the framework of EU policies and other measures that can have an impact on the EU's consumption-based emissions. It's important to acknowledge that this mapping is not exhaustive, and that we may have overlooked some relevant policies and measures. The full mapping can be found in Annex B.

3.1 Current policy framework from EU policy mapping

As in many other parts of the world, efforts to reduce greenhouse gas emissions within the EU and its member states have traditionally focused on levying costs of emissions on producers alongside product energy efficiency measures (Grubb et al., 2020). While a "polluter pays" approach affects consumers indirectly, as higher prices are passed on to them from producers, it rarely targets specific consumption categories and the behavioural shifts required for deep decarbonization (Morfeldt et al., 2023).

In recent years, the EU policy framework for reducing greenhouse gas emissions has broadened from regulating producers, such as manufacturers, refiners and miners, to increasingly addressing consumption by targeting retailers and household-related emissions by final consumers. More recently, the policy scope has also reached beyond EU borders by requiring importers of goods and services to monitor and compensate for social and environmental impacts in the supply chain.

The environmental pressures associated with EU consumption, both within the EU and abroad, have been increasingly recognized in strategy documents since the European Green Deal was unveiled in December 2019. The impact of EU consumption has also become a more prominent driver of policy, as shown by carbon and material footprints being cited in high-level guiding strategies such as the Eighth Environmental Action Plan (8th EAP), and strategies released by the European Commission on thematic areas, including circular economy, biodiversity, food systems and trade. These strategies are outlined below.

Current EU strategies

The 8th Environmental Action Plan (EAP), adopted on 6 April 2022, is a central guiding strategy that cites reducing material and consumption footprints among the enabling conditions to reach its objective, which is that by 2050, "people live well, within the planetary boundaries in a well-being economy where nothing is wasted, growth is regenerative, climate neutrality in the Union has been achieved and inequalities have been significantly reduced" (Decision (EU) 2022/591, 2022). It states in Article 3(s) that "significantly decreasing the Union's material and consumption footprints to bring them into planetary boundaries as soon as possible, including through the introduction of Union 2030 reduction targets, as appropriate" is required for the Commission, member

states, regional and local authorities and stakeholders to meet the priority objective of the 8th EAP (Decision (EU) 2022/591, 2022).

Table 1 sets out the consumption-oriented strategies identified in this study. Among these, only the 8th EAP was adopted based on a decision by the European Commission, Council and Parliament, as well as European Economic and Social Committee (EESC) and the European Committee of the Regions (CoR). This means that the 8th EAP is not limited to the five-year Commission mandate; rather it applies until 2030. The other identified strategies, which are thematic in nature, are communications adopted by the Commission and could be changed with the Commission mandate.

Table 1. Identified consumption-oriented EU strategies adopted by 2024

Policy name	Policy type	EU implementation stage/status	Formal adoption date	Main consumption categories targeted	Responsible to implement	Affected sectors
8th Environment Action Programme	Decision	Adopted	6 April 2022	All	Government	Industry
New Circular Economy Action Plan	Communication	Commission adopted	11 March 2020	All	Government	Agriculture
Farm to Fork Strategy	Communication	Commission adopted	20 May 2020	Food	Government	
Biodiversity Strategy for 2030	Communication	Commission adopted	20 May 2020	All	Government	All sectors
The power of trade partnerships: together for green and just economic growth	Communication	Commission adopted	22 June 2022	All	Government	Trade
Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society	Communication	Commission adopted	6 February 2024	All	Government	All sectors

In addition to EAP, there are also several thematic strategies adopted by the Commission that are relevant for addressing consumption-based emissions. This includes the Circular Economy Action Plan (COM/2020/98 final, 2020); the food supply chain in the Biodiversity Strategy for 2030 (COM/2020/380 final, 2020); and the Farm to Fork Strategy (COM/2020/381 final, 2020) (see Table 1). While these strategies and plans do not explicitly recognise CBEs, they refer to monitoring material, carbon and consumption footprints associated with products placed on the EU market.

The EU also uses bilateral trade agreements to advance its objective of making supply chains more sustainable. The European Commission communication, The Power of Trade Partnerships: Together for Green and Just Economic Growth (COM(2022) 409 final, 2022) sets out binding requirements for chapters on trade and sustainability in all new bilateral trade agreements. The EU has since used this mechanism with trading partners to ratify conventions on climate change and forced labour, among other sustainability requirements (Blot, 2023). Indirectly, this could have the effect of reducing production emissions in countries exporting products to the EU.

The EU has set a binding goal for climate neutrality by mid-century, and mid-term targets under the EU Climate Law , which is focused on territorial greenhouse gases and does not explicitly consider CBEs or imported emissions (European Commission, 2021). In line with the EU Climate Law, on 6 February 2024 the Commission presented options for a 2040 emissions reduction target, also based on territorial emissions (COM(2024) 63 final, 2024).

Current EU policy measures

We identified 10 EU policy measures that are relevant for CBEs and that have been adopted or are expected to be adopted, covering the period 2009 to 2024 (see Table 2).

The earliest consumption-oriented policies, adopted between 2008 and 2018, focused on waste management, energy efficiency, and public procurement. These placed energy efficiency requirements on manufacturers and importers of energy-consuming goods (Directive 2009/125/EC, 2009). A voluntary scheme for labelling products according to their environmental impact for consumer information was also established (Regulation (EC) No 66/2010, 2009).

Green public procurement has been another EU policy focus for the public sector, and in 2014, rules were established for public procurement above certain thresholds, including provisions for life-cycle costing such as the cost of greenhouse gas emissions (Directive 2014/24/EU, 2024).

Table 2. Identified consumption-oriented EU policy measures, adopted or expected to be adopted in 2024

Policy name	Policy type	EU implementation stage/status	Formal adoption date	Main consumption categories targeted	Responsible to implement	Affected sectors
Eco-design requirements for energy-related products 2009/125/EC	Directive	Adopted, to be repealed	21 October2009	Appliances	Manufacturer, importer	Consumer
Community ecolabel scheme (EU EcoLabel) regulation 66/2010	Regulation	Adopted	25 November 2009	Appliances	Manufacturer, importer	Consumer
EU public procurement directive 2014/24/EU	Directive	Adopted	26 February 2014	Public consumption	Government	Industry
Revised directive on waste (EU) 2018/851	Directive	Adopted	30 May 18	Household goods, appliances, food	Government	Industry
Carbon Border Adjustment Mechanism	Regulation	Adopted	10 May 2023	Investments	Importer	Trade, Industry
Emissions Trading System (ETS) and revision of the ETS for road transport and buildings (ETS2)	Directive	Adopted	10 May 2023	Housing, Mobility	Retailer	Consumer
Deforestation Regulation (EU) 2023/1115	Regulation	Adopted	31 May 2023	Investments	Importer, traders	Agriculture, Forestry
Energy Efficiency Directive (EU/2023/1791)	Directive	Adopted	13 September 2023	Housing, public consumption	Government, Wholesaler, retailer	Industry, Consumer
Empowering consumers for the green transition (EU) 2024/825	Directive	Provisional agreement	Expected 2024	Household goods	Manufacturer, retailer, trader	Consumer
EcoDesign for Sustainable Products Regulation (ESPR)	Regulation	Provisional agreement	Expected 2024	Household goods, appliances	Manufacturer, Importer, distributor	Industry, Consumer

Most recently, further policy measures relevant for CBEs have been proposed and adopted under the banner of the European Green Deal. In 2023, four were adopted and provisional agreements have been reached on two further measures with adoption expected in 2024. The four adopted measures are:

1. The Carbon Border Adjustment Mechanism (CBAM) requires importers to report and pay the shortfall in carbon costs associated with production of certain industrial products imported to the EU single market such as electricity, cement, aluminium and fertilizers (Regulation (EU) 2023/956, 2023).

2. The Deforestation Regulation requires importers of cattle, cocoa, coffee, oil palm, rubber, soya and wood to ensure that the supply chain does not include embodied emissions associated with deforestation or forest degradation (Regulation (EU) 2023/1115, 2023).

3. The Emissions Trading System for Road Transport and Buildings (ETS2) establishes a separate emissions trading system for retailers of fuels such as gas for heating and cooking and petrol or diesel for vehicles based on their carbon content (Directive (EU) 2023/959, 2023). This places a carbon price on new household consumption categories, adding to carbon pricing already in place for electricity and district heating (Strambo et al., 2022).

4. The Energy Efficiency Directive repeals the previous directive, laying down rules for member states to require retailers, wholesalers and public agencies to implement energy efficiency, raise public awareness and meet minimum contributions towards EU greenhouse gas emissions targets by 2030 (Directive (EU) 2023/1791, 2023).

A trend can be observed in the focus of these policies, away from predominantly incentive structures for government and industry sectors to more coercive policy measures that apply to a broader range of sectors such as retail, trade, and consumers directly. Of the identified consumption-oriented policies adopted or under provisional agreement in 2023, importers and retailers have the main responsibility to implement three of seven measures, manufacturers are primarily responsible for two of seven, and government is responsible for the remaining two. Of the four identified consumption-oriented policies adopted prior to 2023, two were implemented by manufacturers and two by government.

Provisional agreements following inter-institutional negotiations have been reached on the following two policy files, which will likely see them adopted after endorsement by the European Parliament and European Council in the spring of 2024:

5. The EcoDesign for Sustainable Products Regulation sets requirements for specific product groups placed on the EU market such as environmental and carbon footprint benchmarks and product circularity metrics, including durability, reusability, reparability, recyclability and recycled content. The regulation expands existing requirements for energy and resource efficiency of products currently contained in the directive on eco-design requirements for energy-related products, which will be repealed and replaced by the EcoDesign Regulation (Directive 2009/125/EC, 2009). It applies to all products placed on the market or put into

service, with a few exceptions such as food, feed, medicinal products, veterinary medicinal products and living plants (Procedure EU 2022/0095/COD, 2022). This information will be verified by manufacturers, importers and distributors along the product's value chain and will have a unique product identifier as part of a new Digital Product Passport. Further delegated acts adopted by the European Commission will specify product requirements and indicators.

6. The directive on empowering consumers for the green transition amends existing consumer protection directives to require manufacturers and retailers to improve and make more robust consumer information on durability, repairability and environmental performance of products placed on the EU market (Procedure EU 2022/0092/COD, 2022).

3.2 Proposed policy measures and initiatives

A further 10 consumption-oriented EU policy measures under the banner of the European Green Deal are currently being considered by the European Parliament and Council. These are at various stages of implementation, as shown in Table 4.

The legislative package includes policy measures to increase the circularity of products and reduce product and packaging waste and associated greenhouse gas emissions. There are proposed new standards for product longevity and repairability in the Right to Repair Directive; textile and food waste through recycling and sustainable waste management is being addressed in the Waste Framework Directive; and mandates to reduce packaging materials and increase recycling are laid out in the Packaging and Packaging Waste Directive.

There are new reporting requirements for industry to increase transparency on environmental and social impacts linked to corporate operations, supply chains and the way green activities are communicated. To avoid greenwashing, the Green Claims Directive includes requirements for validating the environmental claims made by companies marketing their products or services. And the Corporate Sustainability Due Diligence Directive requires large companies operating in the EU (that meet certain conditions on numbers of employees and turnover) to identify, prevent, mitigate and account for their adverse human rights and environmental impacts. The latter received a provisional agreement on 14 December 2023, but is still the subject of negotiation.

The Fit for 55 package is a comprehensive set of proposals intended to revise and update EU legislation, as well as introduce new initiatives, to align EU policies with the climate targets established by the Council and the European Parliament. This package seeks to create a coherent and balanced framework to help the EU meet its climate objectives and includes proposals to: reorient energy security away from dependence on Russian exports; increase renewable energy and energy efficiency targets under the REPowerEU Directive; increase energy performance standards for buildings in the Energy Performance of Buildings Directive; secure the supply and increased recycling of essential materials for a green and digital economy under the Critical Raw Materials Act; and set minimum taxation levels for energy products in the Energy Taxation Directive.

Table 4 Identified consumption-oriented EU policy measures proposed and under consideration by EU institutions in 2024

Policy name	Policy type	EU implementation stage/status	Main consumption categories targeted	Responsible to implement	Affected sectors
Corporate Sustainability Due Diligence	Directive	Provisional agreement	Investments	Government, companies (large)	Industry
Energy performance of buildings (EU) 2024/1275	Directive	Awaiting Parliament Position	Housing, public consumption	Government	Industry
Common rules promoting the repair of goods (Right to Repair)	Directive	Awaiting Council Position	Household goods, appliances	Government, Manufacturer, Retailer, Importer, Distributor	Repairer, Consumer
Waste Framework Directive: textiles and food waste	Directive	Awaiting Council Position	Household goods, food	Government, Manufacturer, Retailer, Consumer	Industry, Consumer
Substantiation and communication of explicit environmental claims (Green Claims Directive)	Directive	Awaiting Council Position	Household goods, food	Government, Trader	Industry, Consumer
REPowerEU – Renewable Energy, Energy Performance of Buildings and Energy Efficiency Directives: amendments	Directive	Awaiting Council Position	Housing, public consumption	Government	Industry
Packaging and packaging waste	Regulation	Awaiting Council Position	Household goods, food	Manufacturer, Importers, distributors	Industry
Critical Raw Materials Act	Regulation	Awaiting Council Position	Investments, public consumption	Government	Industry
Energy Taxation Directive	Directive	Commission Adopted		Government	Industry

3.3 Practitioners' view on challenges and opportunities for the EU policy agenda

This section reviews the status of targets and policy measures to address CBEs within the EU, as well as challenges and opportunities for monitoring them. It draws on an analysis of the findings from interviews with eight experts from organizations with responsibilities related to CBEs in the EU (see Annex A).

Monitoring consumption-based emissions

The range of consumption-based indicators tracked by EU agencies provides a foundation for monitoring that can be refined and broadened in scope. As discussed in Section 2.5, interviewees emphasized that the different methodological approaches for monitoring CBEs could be used to reinforce robustness. However, they remain difficult to grasp for policymakers and citizens alike.

Nevertheless, several interviewees indicated that there is clear demand for indicators on CBEs for policymaking. They pointed to evidence in the European Green Deal communication by the Commission, which references transboundary effects from European consumption. This narrative is also featured in EU strategies and action plans on circular economy, biodiversity, food and trade as identified in Section 3.1.

Targets for consumption-based emissions

Targets for CBEs have not been explicitly set by the EU beyond the statement in the 8th EAP on "significantly decreasing the Union's material and consumption footprints", which also floats the possibility of "the introduction of Union 2030 reduction targets, as appropriate". No thematic strategy or EU communications have taken up targets for CBEs, including in the legally binding mid-century climate neutrality goal and the associated mid-term targets for 2030 and the Commission's recently adopted options for 2040 targets.

A number of interviewees recognized that the EU's territorial approach to target-setting for reducing greenhouse gas emissions is legitimate, given it aligns with standards set out in the IPCC and UNFCCC, such as Nationally Determined Contributions. However, they also pointed out that a territorial focus alone means that the impact of traded emissions globally is a blind spot that should be recognized to provide a full picture of EU emissions and their impact. A comprehensive approach bringing together territorial and consumption-based accounting would provide a fuller evidence base for policy development to target and reduce emissions, whatever their source.

While explicit consumption-based targets are lacking, interviewees have highlighted the importance of the qualitative phrase in the 8th EAP on "significantly decreasing the Union's material and consumption footprints" (see Section 3.1). This presents an opportunity for a wider discussion of CBEs and for EU institutions and agencies to consider the issue in the context of target-setting and policymaking. One interviewee considered the 8th EAP as the clearest mandate for EU institutions to work to reduce consumption footprints. Another interviewee suggested that this qualitative target, combined with binding targets, could help to develop EU strategies and policies that could address emissions that occur beyond EU borders.

The European Parliament has been the most active of the EU institutions on CBEs. Members of the European Parliamentary Committee on Environment, Public Health and Food Safety (ENVI) called for "science-based binding 2030 EU targets for materials use and consumption footprint, covering the whole lifecycle of each product category placed on the EU market" (European Parliament, 2021). ENVI's call was put forward in its report on the new Circular Economy Action Plan, which includes a monitoring framework with indicators but stops short of targets (European Commission, 2020). The European Parliament also hosted the Beyond Growth Conference on 15 to 17 May 2023, which addressed EU consumption footprints, including through a companion study produced by the European Parliamentary Research Service prior to the conference (Jensen, 2023).

Several interviewees raised the question of how robust indicator data needed to be to be able to inform binding targets. This question centres on the levels of uncertainty in the use of modelled emissions instead of measurements, and the levels of error on which policymakers would be willing to base binding targets. One interviewee identified a more disaggregated version of FIGARO, covering 64 industries and 64 products, developed in a research project that if scaled up could provide more acceptable data on which to set targets for member states and the EU as a whole.

Policies to address consumption-based emissions

EU policies addressing consumption – both adopted and proposed – have increased the coverage and scope of emissions generated by EU households, whether these are produced within the territory of member states or are embodied in imported products and services. Our interviews highlight the significance of these policy shifts (and point to potential gaps), which could more comprehensively address CBEs.

One interviewee pointed out that to fully capture the impact of EU consumption the EU needs to set standards for goods that come into the EU market, and that this is a potential game-changer because it requires companies outside to come up to EU standards. One interviewee emphasized that using EU policy to reduce emissions produced beyond EU borders was an effort to apply the "leaving no one behind" principle to countries outside EU, ensuring that the green transition does not come at the cost of others.

The adoption of CBAM and the provisional agreement of the EcoDesign Regulation are the clearest examples of the EU seeking to apply the same standards to products manufactured within and outside the bloc.

The focus of CBAM on industrial products means that it is one step removed from household consumption, so its effect would potentially be felt only through prices passed on by businesses. However, one interviewee pointed out that this impact could become more pronounced if its scope is expanded from the current set of industrial product categories or the scope of emissions was widened to capture indirect emissions for additional product categories.

The EcoDesign Regulation is most significant for household emissions embodied in products because it expands current regulation from energy-using products to almost all products (with a few exceptions) and will apply equally to imported products and EU-manufactured products. The specific standards will be set by forthcoming delegated acts, which will be the true test of the direct impact on household emissions.

One interviewee stated that the revision of the EU Emissions Trading System for buildings, road transport and additional sectors (known as ETS2), with its direct focus on the carbon content of fuels used by households, is the consumption-oriented measure with the most significant impact. ETS2 is due to become operational in 2027. The carbon price will be determined by the market, and this will be the true test of its impact on households and their consumption. The policy does not set a floor price for carbon, but measures can be activated to address excessive carbon price increases if the price exceeds EUR 45 (at 2020 prices) during its first three years of operation (European Commission, 2024). There is also a provision for delaying the operational start of ETS2 to 2028, should there be exceptionally high oil or gas prices (European Commission, 2024). These provisions are designed to ensure a smooth start to the new ETS2 for consumers, who would otherwise be exposed directly to the carbon price, though the impact is likely to be less for some member states with existing carbon taxation, such as Sweden, than in countries that do not (Strambo et al., 2022).

One interviewee also stated that the proposed revision to the Energy Taxation Directive could be a very significant policy, but it has not yet reached agreement in the European Council nor the European Parliament. According to the interviewee, it would be significant for household consumption and emissions in many member states because it would mandate minimum energy taxation levels based on the carbon content of fuels instead of volume of fuels, as in the current Directive from 2003 (Karaboytcheva, 2022). Because the Energy Taxation Directive is about taxation, which is a competency of member states, it requires unanimity in the European Council after consultation with the European Parliament and the European Economic and Social Committee (Karaboytcheva, 2022). At the time of writing, the procedure was under discussion in the European Council and Parliament.

One interviewee highlighted that additional EU measures could be introduced to address the emissions intensity of imported raw materials. According to a 2021 EEA report, imports of non-energy, non-agriculture material, such as copper, iron, gold, limestone, aluminium, timber, chemicals and fertilizer, account for around 18% of greenhouse gas emissions associated with EU consumption (Nelen & Bakas, 2021). Among these sectors, CBAM covers aluminium, iron, chemicals and fertilizer, but even within these sectors, not all emissions associated with extraction and processing would be covered. The Critical Raw Materials Act emphasizes sustainable supply and circularity to reduce demand, but for sourcing requirements it refers only to the EU principles for sustainable raw materials. The EEA report suggests that standards could be introduced to set limits of embedded emissions in raw materials that are imported to the EU market, which could be further encouraged by procurement procedures (Nelen & Bakas, 2021).

In addition to policies, one interviewee identified bilateral trade agreements with the EU as a potential vehicle for addressing CBEs. As stated in Section 3.1, the trade and sustainable development chapters required in EU bilateral trade agreements could include areas of technical and financial cooperation for reducing the emissions intensity of sectors that are relevant to trade with the EU, such as raw material extraction or product manufacturing.

4. Case study descriptions

This section provides an overview of the current strategies employed by Sweden, Denmark, and France for addressing consumption-based emissions (CBEs). We selected these three countries because they have already taken several initiatives for mitigating CBEs that other member states could learn from. In these case studies, we aim to elucidate the governance frameworks, key policies and actors, and trade patterns that are shaping how each country manages CBEs. By understanding the approaches these countries are taking to mitigate the environmental impact of consumption, as well as the opportunities and barriers to doing so, we can gain valuable insights into effective strategies and identify opportunities for improvements at both national and EU levels. In each case also incorporated the results from the interviews with practitioners at the member state level.

4.1 Case study 1: Sweden

In 2017, Sweden adopted a new climate political framework. The framework sets the target for Sweden's territorial emissions to reach net-zero greenhouse gas emissions by 2045 (Swedish Government, 2017). The framework includes a climate law stating that every government in office will be responsible for working towards the climate targets that have been adopted by the Swedish Parliament. Furthermore, the framework has instituted a politically independent climate policy council that is tasked to review Sweden's climate politics.

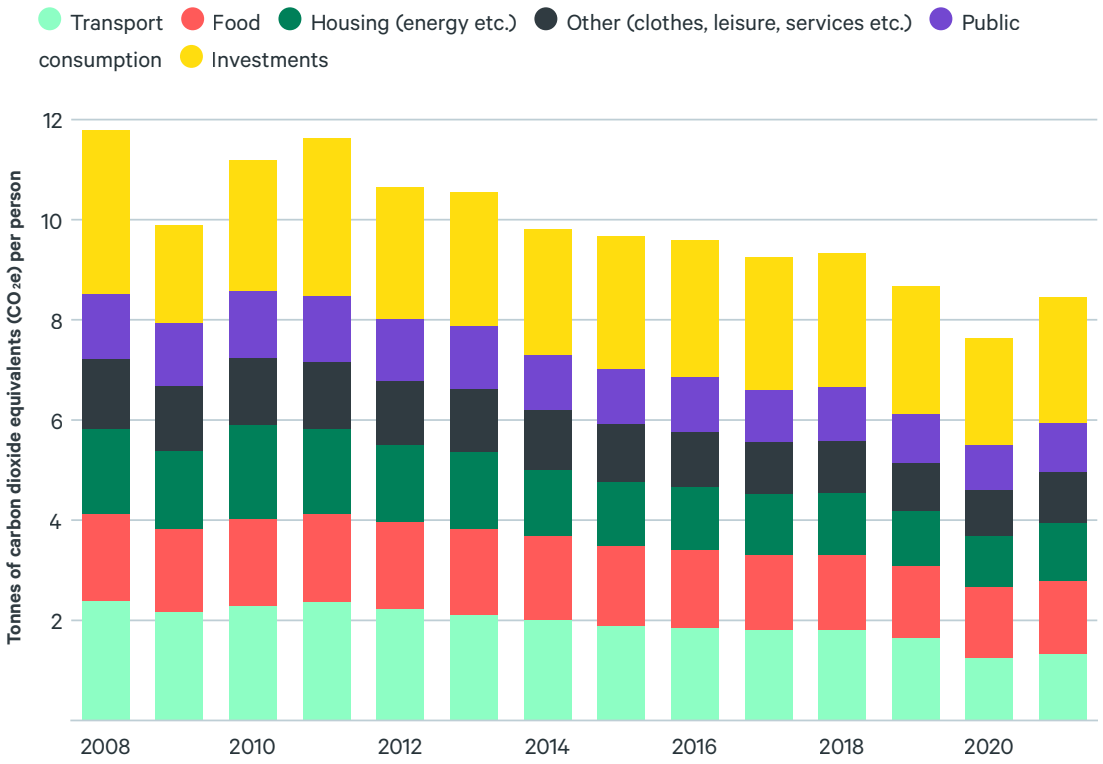
Sweden's territorial greenhouse gas emissions had decreased by close to 40% over the period 1990 to 2022 (Swedish Environmental Protection Agency, 2024b). During this period, almost all sectors had decreased their emissions, with heating emissions showing the largest decrease of just over 90%, followed by emissions from waste, with an almost 80% decrease. Two sectors – product use and international transportation – have increased their emissions over the same period, with an increase of around 130%.

Consumption-based emissions statistics

Categories of consumption

In Sweden, households account for approximately 60% of Sweden's consumption-based emissions (CBEs). Emissions from the public sector and its investments, housing, machinery, and luxury goods (see section 2.1), make up the remaining 40% (Swedish Environmental Protection Agency, 2023c) (Figure 14). In 2021, the Swedish Environmental Protection Agency (SEPA) estimated the average climate footprint of Swedish households at just under 5 metric tonnes of CO_2e per person, or almost 8.5 tonnes if the emissions linked to the public sector and investments are included.

Figure 14. Sweden's consumption-based emissions 2008–2021, per person and per main category of consumption

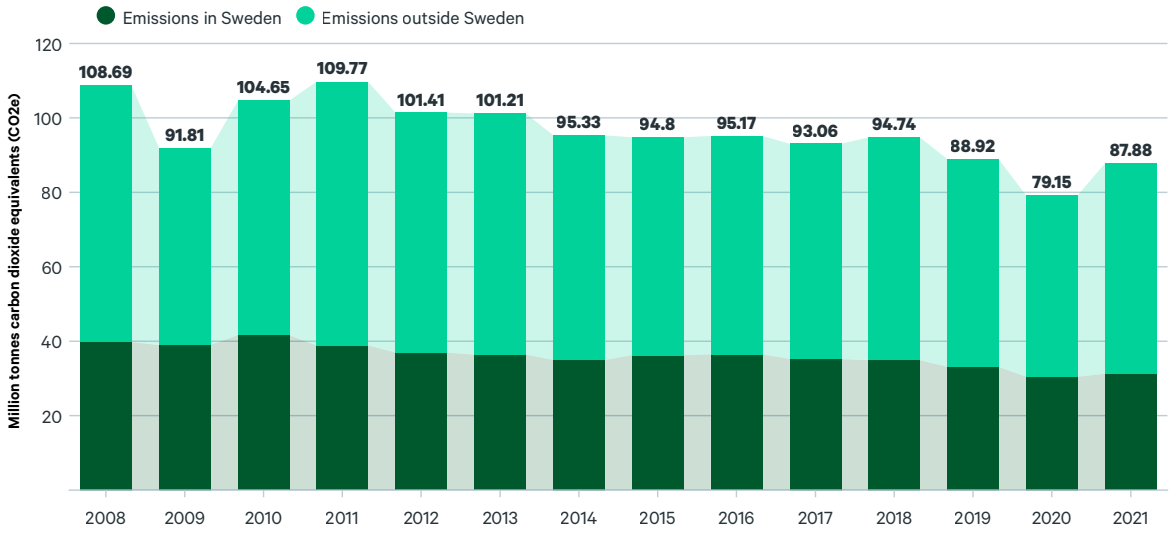


Source: Swedish Environmental Protection Agency, 2023c

Since 2008, Sweden's CBEs have decreased by almost 30%. Emissions related to transport have decreased the most (45%), followed by housing (30%) and then other consumption (27%). This is largely connected to an increased use of biofuels, more efficient vehicles, and a growing share of electric vehicles, plus an increasing share of renewable energy sources for house heating, plus efficiency gains in production energy and methods worldwide (Klimatpolitiska rådet, 2022; Statistics Sweden, 2023c; Swedish Environmental Protection Agency, 2023a, 2024a).

It is important to note, however, that the official statistics do not include all categories of household consumption. Related to long-range air travel, only the climate impact associated with the so-called "bunker fuels" used to fuel up the aircraft at the Swedish airports is included (i.e. and not the full impact if a person continues travelling to another country after transit). Examples of other types of consumption that are not included are direct imports through household purchases over the internet; financial investments (e.g. stocks); and physical investments in, for instance, a new home. While the latter is included in the *investments* category, which is a share of the total consumption in the national accounts (see section 2.2.1), it is currently not possible to separate households' share of the investment component from the published official statistics.

Figure 15. Sweden's consumption-based emissions 2008–2021, in Sweden and in other countries

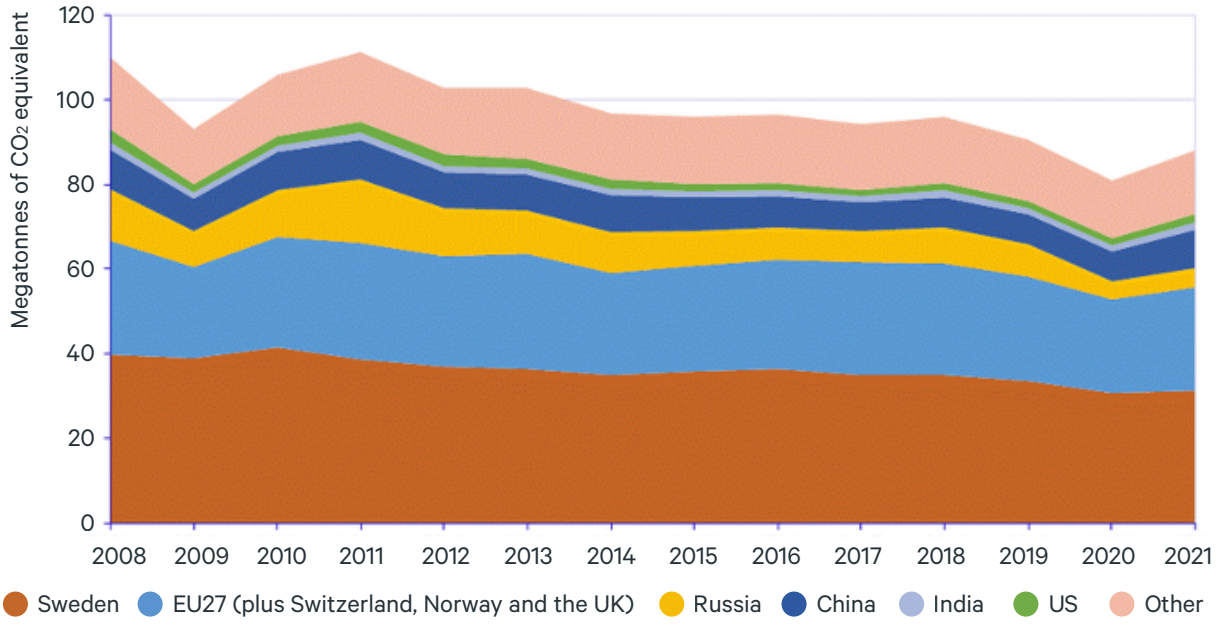


Source: Swedish Environmental Protection Agency, 2023b

Trade patterns

Around 60% of Sweden's total CBEs are embedded in products imported from other countries for final consumption in Sweden (Figure 15). During the period 2008–2021, Sweden's territorial emissions decreased by around 30%, whereas imported emissions decreased by almost 25% (Swedish Environmental Protection Agency, 2023b).Sweden's CBEs in any given year are influenced by the type of products imported, as well as the countries from which these products are imported, because emission intensity for different products varies from country to country. Figure 16 visualizes how Sweden's CBEs fluctuate depending on the country of origin of the products imported to Sweden.

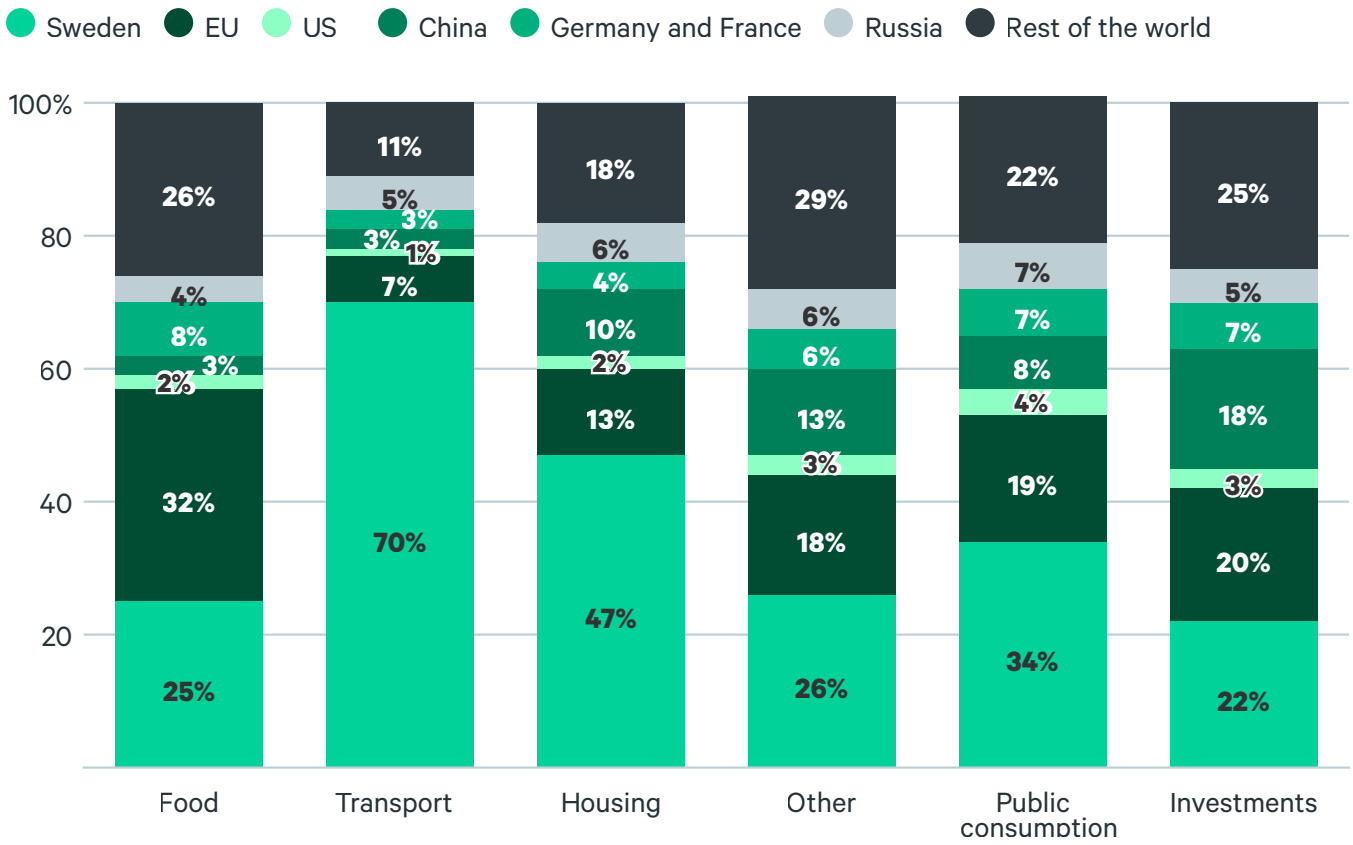
Figure 16. Sweden's consumption-based emissions from 2008–2021, showing the countries of origin of products consumed.



Source: Statistics Sweden, 2023.

Looking at types of imported products connected to household consumption, electronics is Sweden's third largest product type, with 16% being imported. Food and drink make up 11%, vehicles 6% and textiles 4.5% of the total imports, in monetary value (Statistics Sweden, 2024c). Figure 17 shows the share of imported emissions connected to different main categories of consumption.

Figure 17. Share of imported emissions connected to major categories of consumption in 2021 The first four bars – food, transport, housing and other – relate to household consumption.



Source: Statistics Sweden, 2024d (authors' compilation).

Looking at the emissions from household consumption in 2021, the largest shares of imported emissions were noted both for *food* and for consumption of *other* goods (e.g. clothing, electronics, pets, gardening), both at 75%. *Housing* (which also includes furniture, interior decoration, and minor renovation work) had the second largest share, at 53%. The smallest share was for transportation (30%), where the largest portion consists of direct emissions from driving cars. As the proportion of electric cars increases, an increase in the share of imported emissions can be expected (due to reduced direct emissions within Sweden's borders). As mentioned above, the full emissions connected to international flights are not included in the public statistics. If they were, the share of imported emissions from transportation would increase significantly. In terms of non-household consumption, the share of imported emissions is very high for investment-related consumption (78%), as well as public sector consumption (66%).

Important trade partners

Europe is the most important import region for Sweden, with close to 85% of the country's total imports (of which 80% come from within the EU). Another 10% of Sweden's imports come from Asia, and 5% from America. Africa and Oceania account for less than 1% each (Statistics Sweden, 2024a).

Since the mid-1980s, Sweden has exported goods and services worth more than its imports, meaning that Sweden has a positive trade balance. In 2022 and in monetary values, Norway was the largest exporting country into Sweden, followed by Germany and then the USA. Looking at the imports, Germany was the most important country, followed by Norway and then the Netherlands (Statistics Sweden, 2023a, 2023b). See Table 5.

Table 5. Sweden's most important export and import countries in 2022, in billions of SEK.

Export country	Billion SEK	Import country	Billion SEK
Norway	216	Germany	313
Germany	203	Norway	252
US	184	Netherlands	217
Denmark	149	Denmark	130
Finland	147	China	121
UK	110	Finland	94
Netherlands	96	Belgium	92
Poland	80	Poland	88
France	80	UK	84
Belgium	74	US	75

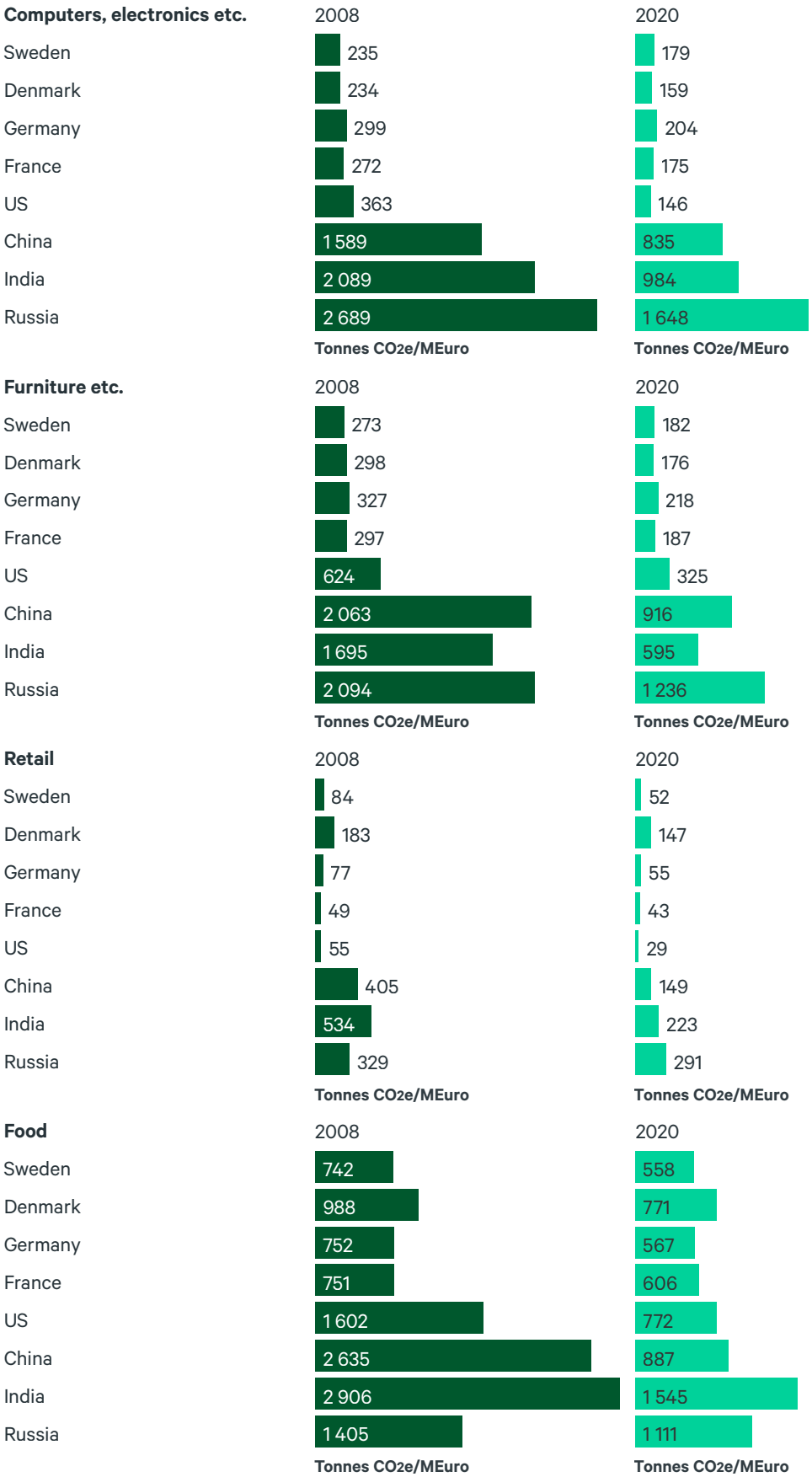
Source: Statistics Sweden, 2023a, 2023b

Emissions embedded in imports

Statistics Sweden also monitors the annual emissions' intensities associated with imports from different countries and a large number of sectors of consumption. Figure 18 includes four examples. As visualized here, the emission intensity has improved across the board since 2008.

Looking at Figure 18, it is clear that Swedish production has a comparatively low emission intensity in all these four categories of consumption used as examples here, and that European trade partners have a substantially lower emission intensity than countries such as China, India and Russia.

Figure 18. Emission intensity in 2008 and 2020 in different countries and connected to different categories of consumption.



Governance and high-level policy frameworks, targets and main actors

In this section we describe the frameworks and targets guiding Sweden's environmental work (both territorial and consumption-based), plus the main actors involved in the work to address and monitor Sweden's consumption-based impacts.

Sweden's environmental objectives system

Twenty-five years ago (in 1999), Sweden adopted the so-called Generational Goal, which says that the overarching goal of Sweden's environmental work is:

> *"To hand over to the next generation "a society in which the major environmental problems in Sweden have been solved, without causing increased environmental and health problems outside Sweden's borders." (Swedish Environmental Protection Agency, n.d.d).*

This goal recognizes that the way people live and consume in Sweden risks having a negative impact on other countries where goods are being produced to satisfy Swedish demands, and that solving environmental problems in Sweden should not come at a cost for other countries by for instance outsourcing environmental and health problems that otherwise might have occurred from production in Sweden. The goal has seven sub-targets, one of which says: "Patterns of consumption of goods and services cause the least possible problems for the environment and human health." (Swedish Environmental Protection Agency, n.d.d).

The goal guides Sweden's environmental objectives system, which function as the overarching framework for Sweden's environmental work. It consists of 16 environmental quality objectives, with defined milestones and targets and main actors responsible for different parts of the work (Swedish Environmental Protection Agency, n.d.c).

Targets for territorial emissions

Sweden has set the goal of achieving net-zero greenhouse gas emissions by 2045, followed by a transition to negative emissions thereafter. This means that Sweden's territorial greenhouse gas emissions must be at least 85% lower in 2045 than emissions in 1990 (not including emissions and uptake from LULUCF – i.e. land use, land-use change, and forestry). The remaining 15% reduction to zero after 2045 can be achieved through so-called supplementary measures, such as absorption of carbon dioxide in forests and soil; emission reductions outside Sweden's borders; and separation and storage of carbon dioxide (so-called bio-CCS) (Swedish Government, 2017).

Furthermore, Sweden's emissions in the sectors that are covered by the EU's effort-sharing regulation (ESR) (Swedish Environmental Protection Agency, 2023d) should be at least 63% lower by 2030 compared to 1990, and at least 75% lower by 2040. This covers emissions from transport, work machinery, small industrial and energy facilities, housing and agriculture. These emissions are not included in the EU's emissions trading system (ETS), which includes most emissions from industry, electricity,

district heating, and flights taking off and landing within the European Economic Area. Supplementary measures may be used to meet a maximum of 8% and 2%. respectively, of the emission reduction targets in 2030 and 2040. Emissions from domestic transport must be reduced by at least 70% by 2030, compared to 2010. This excludes domestic aviation which is covered by the EU's ETS (Swedish Government, 2017).

Targets for consumption-based emissions

Sweden does not have a national target to reduce its CBEs. However, in 2020 the government initiated a parliamentary committee to investigate opportunities to establish a consumption-based target and propose an overall strategy for how Sweden could work to reduce the climate impact from consumption, with the ambition to achieve sustainable consumption in a cost-effective and socially just manner. When the committee put forward its proposal, it recommended that Sweden should establish a target for CBEs formulated as net-zero emissions by 2045, mirroring the territorial emissions target (Sveriges globala klimatavtryck, 2022).

Following a broad review, however, the proposal was shelved by the new government that took office in the autumn of 2022, even though the committee initially had broad support from all political parties. But two of the investigation's sub-proposals were taken forward: to explore how public procurement can establish more stringent climate requirements, and to identify the climate benefits associated with Swedish exports (see above).

While there is no national target related to Sweden's consumption-based emissions, the country does have several other targets relating to different sectors of consumption. These include a decrease of emissions from domestic transport by 70% by 2030 compared to 2010; a maximum level of energy consumption per building; and that by 2020 at least 50% of the food waste from households, public kitchens and restaurants are sorted, composted and/or digested for circularity. Further, measures taken to establish consumption-based targets at the local level could indicate strong support for instituting consumption-based measures at the national level, where it has been found that a significant share of the Swedish municipalities already have some kind of consumption-based target in place (Axelsson et al., 2023).

Main actors

Key actors directly involved in the work to address and monitor Sweden's consumption-based impacts are the Swedish Environmental Protection Agency (SEPA), Statistics Sweden, and the Swedish Consumer Agency.

The SEPA coordinates work on Sweden's environmental objectives and is responsible for seven of the sixteen environmental quality objectives within the environmental objective system (Swedish Environmental Protection Agency, n.d.c). The SEPA also drives and coordinates environmental efforts in Sweden, often in collaboration with other stakeholders. They are responsible for monitoring indicators for goals linked to limited climate impact, such as global mean temperature, climate-affecting emissions, and CBEs in Sweden and other countries (Statens Offentliga Utredningar, 2022). The SEPA is also Sweden's focal point for the One Planet Network, which drives implementation of SDG12 on sustainable consumption and production under Agenda 2030 (Swedish Environmental Protection Agency, n.d.b).

Statistics Sweden (SCB) is the public agency mandated to develop, produce, and disseminate Sweden's official statistics. They also coordinate the system for official statistics in Sweden. Within this framework, SCB is responsible for producing consumption-based statistics, including climate impact data, which have been part of Sweden's official statistics since 2019.

Alongside other authorities, the Swedish Consumer Agency works to achieve the Swedish goal for consumer policy, which aims to establish well-functioning consumer markets that are environmentally, socially, and economically sustainable (Swedish Consumer Agency, 2022).

Enablers: policies and measures to address consumption-based emissions

In addition to the overarching policies and targets mentioned under 4.1.2, this section will outline some of the policies and measures implemented at the sectoral level.

In 2016, the Government of Sweden launched the Strategy for Sustainable Consumption (Government Offices of Sweden, 2016). The strategy focused on seven different areas covering environmental issues as well as issues connected to social sustainability. The ambition was to increase knowledge in society about sustainable consumption, stimulate sustainable consumption patterns, and encourage more efficient use of resources.

The work included establishing a forum for sustainable consumption that was led by the Swedish Consumer Agency (between 2017 to 2020). Among other things, the forum aimed to gather actors working with sustainable consumption; work to improve school curriculums; establish a committee on the sharing economy; and introduce new reporting requirements for large companies (see Table 6). According to one interviewee, the action plan developed to support the strategy is not maintained by the new government, but several important measures have been put in place since its launch, as illustrated in Table 6.

Table 6. Examples of measures implemented within the framework of the Government of Sweden's strategy for sustainable consumption

Establishment of a forum for sustainable consumption (between 2017-2020).	Improve the education curriculum about the environmental impact of consumption
Assignment to the Consumer Agency to promote environmentally conscious consumption	Support for municipalities' work on sustainable cities and urban public transport
Establishment of an investigation into the sharing economy	Development of a national cycling strategy
Establishment of a delegation on the circular economy	Implementation of a bonus-malus system for road transport*
Reduced VAT from 25% to 6% for repair of bikes, shoes, leather goods, clothing, and household textiles*	Development of a system for aviation tax*
Tax deduction for repair and maintenance of home appliances	Introduction of an e-bike subsidy for individuals
Proposal prepared for a home-charging subsidy	System for environmental information requirements on fuels
Introduction of a tax deduction system for micro-production of renewable electricity	Action plan within the framework of the Food Strategy
Increased budget for investment support for solar cells	Support for local climate investments

Source: Statens Offentliga Utredningar, 2022 *See below for further details on these.

The Government of Sweden publishes a climate action plan each term, outlining its work on climate issues for the next four years. In December 2023, the government published its latest action plan, which stressed the imperative of achieving a fair transition. Regarding consumption, the plan underscored the significance of addressing CBEs, while acknowledging that further research is needed to understand the necessary policies and measures (Swedish Government, 2023b).

In addition to the measures listed in Table 6, Sweden has several policies and measures in place that target territorial emissions as well as CBEs, either directly or indirectly. The remainder of this section presents selected examples connected to four categories of consumption: *transport*, *food*, *housing*, and *other consumption*.

Transport

Sweden has several policy measures in place to encourage sustainable transportation and travel. For instance, there is a differentiated vehicle tax based on factors such as vehicle weight, fuel type, and carbon dioxide emissions. This aims to promote more environmentally friendly vehicles and reduce the use of fossil fuels (Swedish Transport Agency, 2023). As mentioned in Table 6, the work on the government's strategy for sustainable consumption involved developing an air travel tax, which has been in place since 2018. As of 2024, the tax ranges between EUR 6.5 and 43 per passenger, depending on the flight destination (Swedish Tax Agency, 2024).

Investments in public transport are often motivated by making it more attractive and accessible to commute by public transport. This includes the expansion of tramways, bus lines, and train networks. Similarly, improvements to bicycle paths and infrastructure are also made to encourage more people to cycle instead of drive cars, reducing both congestion and environmental impact. Larger cities such as Stockholm and Gothenburg have vehicle congestion taxes to reduce congestion and improve air quality (Swedish Transport Agency, 2024).

The government has recently taken a couple of measures that run counter to mitigating transport-related emissions. In 2022, it discontinued the bonus system (see Table 6) given to new cars with low emissions during its first three years. The so-called reduction obligation that was introduced in 2018 to increase the blending of biofuels in gasoline and diesel was put on hold by a new decision in 2023 (Swedish Government, 2023d). In the same year, the Government also decided to lower the price of diesel and petrol to support Swedish households during a period of high inflation and high energy prices (Swedish Government, 2023c), something that is expected to work against a decrease in vehicle fuel consumption.

Food

The overarching goal of Sweden's food strategy is a competitive food supply chain, where total food production increases while also achieving relevant national environmental goals. It also aims to foster growth, employment, and contribute to sustainable development throughout the country. Other goals are to contribute to greater food self-sufficiency, and decrease vulnerability in food supply chains (Swedish Parliament, 2017). Furthermore, the strategy contains measures aimed at reducing the climate impact associated with Swedish food consumption, such as reducing food

waste and increasing biological treatment of source-separated food waste, which both contribute to increased resource efficiency and reduced environmental impact (Government Offices of Sweden, 2019). To address this, Sweden has developed a national action plan for reduced food waste. This includes a wide range of activities, such as measures to encourage changes in consumer behaviour, and proposes a number of different targets, such as reducing total food waste by at least 20% per person from 2020 to 2025, and ensuring that by 2023 at least 75% of total food waste is sorted and treated biologically to recover plant nutrients and biogas (Sveriges Miljömål, 2023).

Since 2023, Sweden has been implementing the new Nordic Dietary Recommendations, which encompass health, environment, and climate. The recommendations set out dietary guidelines aimed at maintaining optimal health while at the same time addressing environmental and climate concerns. The new recommendations do not, however, involve any significant changes to the former Swedish guidelines. Sweden started integrating environmental considerations into its dietary guidelines as early as 2015, and Sweden is understood to be the first country in the world to do so (Swedish Food Agency, 2023a, 2023b).

Housing

Sweden has several policy measures to promote sustainable housing. These include regulations within the Planning and Building Act (PBL) that ensure sustainable development and environmental considerations are part of the physical planning and the construction process. There are also a number of economic measures to promote sustainable housing, including support for environmental improvements in single-family homes, such as grants or tax incentives for the installation of several different energy efficiency measures (Swedish National Board of Housing, Building and Planning, 2024). There are public information measures, such as energy and climate advice for individuals on energy-efficient measures for their homes, and energy performance certificates provide property owners with information on the building's energy performance and recommendations for energy efficiency. These public information policies aim to increase awareness and knowledge of sustainable alternatives and promote behavioural changes to reduce energy consumption and encourage sustainable housing (Swedish National Board of Housing, Building and Planning, 2023).

Consumption of other goods and services

Sweden has no specific national targets or policies related to consumption of other goods, such as textiles or electronics (Swedish Environmental Protection Agency, 2023e, n.d.a), other than those developed under the EU (see Table 1, Table 2 and Table 4 in section 3). Thus, when it comes to promoting more sustainable consumption of various goods, Sweden implements the EU directive on energy labelling for different products, aimed at increasing consumer awareness of products' energy performance (e.g. appliances, lamps, vacuum cleaners, TVs, tires).

To empower consumers to make sustainable choices, the Swedish Consumer Agency has launched the web portal "Hello Consumer" [Hallå Konsument], which has several pages dedicated to environment and sustainability to support households that want to make informed choices (Swedish Consumer Agency, n.d.).

To encourage people to repair goods rather than buying new ones, in 2017 the government decided to reduce VAT from 25% to 6% on the repair of bikes, shoes, leather goods, clothing, and household textiles. However, the government that took office in 2022 increased the VAT to 12% in April 2023, citing the importance of tax revenue to the national economy (Swedish Government, 2023a).

In 2020, the government put forward a strategy for the transition to a circular economy to contribute to achieving national and international environmental and climate goals, as well as the global goals of Agenda 2030. The strategy identifies four focus areas that are central to achieving this vision, two of which include: sustainable production and product design; and sustainable ways of consuming and using materials, products, and services (Swedish Government, 2020). The strategy was complemented with a detailed action plan in 2021 (Swedish Government, 2021).

Since 2022, Sweden has implemented a new consumer purchase law aimed at supporting consumer rights and enhancing product sustainability. This law extends the period during which the producer is responsible for correcting any product faults that arise.

Monitoring and follow-up

Based on the Swedish Climate Law, the Climate Policy Council is tasked to evaluate whether developments in relevant policy areas contribute to or hinder achieving Sweden's climate goals. The council is expected to focus on the effects of enacted and proposed policy instruments from a broad societal perspective and identify areas where additional measures are needed to achieve climate goals. It is also expected to analyse how climate goals can be achieved cost-effectively, both in the short and long term. The Climate Policy Council, however, has no specific assignment related to CBEs.

Statistics Sweden (SCB) is responsible for monitoring CBEs at the national level. In collaboration with the Swedish Environmental Protection Agency, SCB began publishing data on Sweden's CBEs on an annual basis about twelve years ago (according to one interviewee, see section 4.1.6). Monitoring of Sweden's CBEs is one of the key indicators for Sweden's Generational Goal (see section 4.1.2.1).

Until 2017, Sweden used a single-regional model for calculating emissions connected to Sweden's CBEs, in which the emissions from imports were reweighted with international emissions data per country (Steinbach et al., 2018). The model was last updated in 2018, building on the results from the research programme PRINCE (Policy Relevant Indicators for Consumption and Environment) that put forward a new model for monitoring a number of different consumption-based environmental pressures resulting from Swedish consumption (Swedish Environmental Protection Agency, 2022). The PRINCE model builds on data from the EXIOBASE project (see section 2.5) which has developed a model that expresses data through so-called Multi-Regional Environmentally Extended Supply-Use Table and an Input-Output Table (for more information see Exiobase, 2024) .

Currently, the SEPA only publishes greenhouse gas emissions (CO_2e) as an indicator for Sweden's consumption-based impacts. Further efforts are required before other indicators can be used with equivalent certainty. Sweden is currently also working to analyse how these data compare with data from Figaro.

In 2023, the government commissioned SCB to develop statistics on the climate benefit of Swedish exports, including developing a measure of the climate footprint of exported products compared to other equivalent foreign products (see Figure 18). SCB was tasked to develop an enhanced measure of the climate footprint of Swedish products intended for domestic consumption, and to propose a method for monitoring statistics on the effect of exports on global emissions. SCB was also assigned to promote the further development of an official global environmental economic database for CBEs and exports as part of its international work (Statistics Sweden, 2024b)

Relevant networks and initiatives

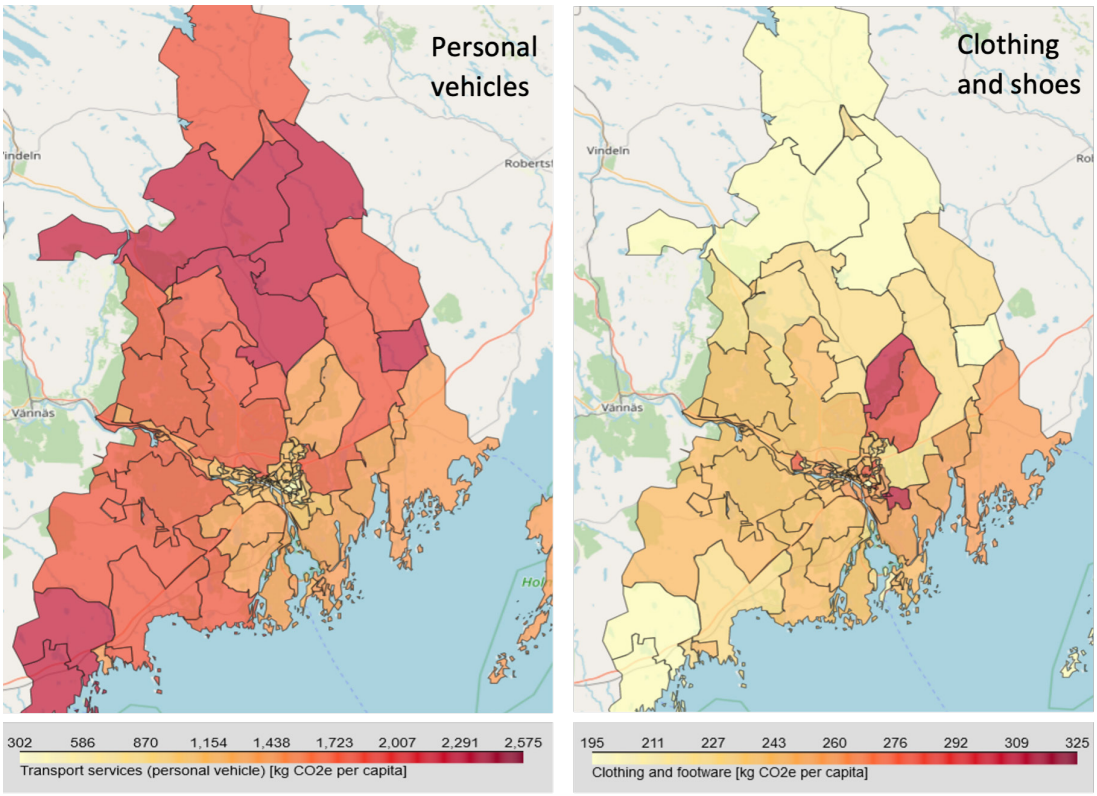
Sweden has several networks and larger research initiatives that support the sustainable consumption agenda. Klimatkommunerna is a network for municipalities and regions actively engaged in local climate work. It was established in 2003 and has more than 40 members (covering about 50% of Sweden's total population). The overarching aim of the network is to reduce greenhouse gas emissions in Sweden through knowledge exchange, advocacy, and disseminating best practice. It promotes a range of actions, including developing statistics on the climate impact of consumption at the local level; removing environmentally harmful subsidies; and developing a system for green taxes to ensure that services and products bear their own climate costs. Kilmatkommunerna also supports a consumption tax on foods that have a significant climate impact. Furthermore, it argues that focus should shift from the proportion of waste collected to the proportion that is recycled, and that measures should be introduced to increase the profitability of reuse, recycling, and repair to extend the lifespan of products (Klimatkommunerna, 2023).

Ekokommunerna is a network of "eco municipalities", consisting of 90 municipalities and two regions. It is not as active as Klimatkommunerna in driving the sustainable consumption agenda, but works to influence sustainability policies and drive local actions for nature-based, equitable, circular, and sustainable development with low emissions. They are part of the global Local Governments for Sustainability network (ICLEI) , which comprises more than 2500 municipalities and regions engaged in sustainable urban development (Sveriges ekokommuner, n.d.).

Other efforts to address Sweden's CBEs include work by Stockholm Environment Institute (SEI), which has developed an innovative model and tool that downscales national CBEs to the local and postcode level. The Consumption Compass tool (Stockholm Environment Institute, 2022) is available at no cost and is being used by a large number of Swedish municipalities who want to understand how households' consumption footprint in their own municipalities compares with others, or with the national average, to help design better policies and measures for the local context (Figure 19). Examples of how municipalities work with the tool's data include integrating it as part of action plans or roadmaps to address sustainability and CBEs

(City of Gothenburg, 2023; Energiintelligent Dalarna, 2023), and local climate and energy plans (Municipality of Tierp, 2023).

Figure 19. Examples from the Consumption Compass tool (Stockholm Environment Institute, 2022), illustrating differences in households' climate footprint associated with car travel and consumption of clothing between postcodes in Umea municipality.



In response to public calls for proposals, research projects on sustainable consumption have been funded in Sweden for many years. For example, between 2018 and 2025, Mistra Sustainable Consumption funded a large research program (almost EUR 10 million) which aims to catalyse a shift towards more sustainable consumption patterns in Sweden. Its objective is to foster transformation by deepening our understanding of how sustainable consumption practices, currently adopted by a minority, can be scaled up and mainstreamed. The program places particular emphasis on the domains of food, leisure and interior design, and alongside research outputs has put forward a range of proposals for different measures to mitigate consumption-based impacts (MISTRA Sustainable Consumption, n.d.).

Practitioners view on challenges, opportunities for acceleration and monitoring

A total of eight interviews with practitioners were conducted to inform the Swedish case study. This section draws on the findings from these interviews about opportunities and barriers to accelerate action to curb Sweden's CBEs, as well as a section on interviewees' perspectives on targets and monitoring practices for

addressing CBEs within the EU. Table 12 in Section 5 provides an overview of the opportunities and barriers identified by practitioners in all three case study countries.

Opportunities to address consumption-based emissions

Interviewees highlighted several opportunities for the EU to monitor CBEs more broadly. One suggested that CBEs will become increasingly important in the future as countries worldwide grapple with the challenges of mitigating climate change, and emphasized the advantage of being early movers in the area because this would position the EU favourably in the global market. A large share of future global emissions is expected to originate from countries such as Brazil, Russia, India, China and South Africa. Given that the EU and the US have already made strides in reducing their emissions, attention must now turn towards supporting developing and emerging economies in transitioning their economies towards low-carbon practices. The interviewee stressed the importance of demanding products produced without carbon emissions as part of this transformative process.

Interviewees also suggested that driving the agenda on CBEs at the EU level holds a lot of potential because the topic of consumption-based impacts is often politically sensitive at member state level. One interviewee with experience of collaboration between Nordic countries suggested that such inter-country collaboration can facilitate discussion on sensitive topics without fear of being heavily criticized at the national level. Opportunities were also identified for the EU to lead by example through measures like banning ads on fossil fuel-intensive products, which could be considered a sensitive measure if only implemented at the member states level.

Interviewees highlighted several opportunities for addressing households' CBEs more broadly within the EU and among member states. Leveraging stronger existing initiatives, such as the EU Climate Law and Fit for 55, could provide a progressive framework for addressing CBEs. Additionally, the Eco-design directive and Carbon Border Adjustment Mechanism (CBAM) were identified as potential tools, although there were calls for CBAM to be broader in scope. One interviewee suggested integrating sustainable consumption more strongly into the EU Commission s global policy work, presenting an opportunity for global impact.

Moreover, interviewees emphasized the importance of working more actively at the EU level to address behaviour change by raising awareness about the role of individuals in contributing to mitigating global emission levels. Initiatives to incorporate climate impact into nutrition recommendations and addressing food waste were seen as areas for improvement at the EU level, and where there could be a lot to learn from Nordic countries.

With regards to national measures, subsidizing environmentally friendly options was suggested as an important means to encourage the consumption of climate-smarter products. One interviewee also highlighted the potential of reducing VAT on products that are considered climate friendly. Several interviewees emphasized the potential of the sharing and the circular economy as well as stimulating the second-hand market.

Barriers to addressing consumption-based emissions

Interviewees also discussed several barriers to addressing CBEs. Political priorities and limitations were highlighted as a significant barrier among several interviewees, especially at the member state level. Another barrier mentioned was the broad scope of sustainable consumption, which poses challenges for its integration into various sectors.

The challenges associated with addressing the behaviour change needed for altering consumption patterns were also highlighted. One interviewee suggested that society has put too much responsibility on the consumer to change consumption behaviour and that there is a need for stronger policymaking to guide change in consumption behaviours. To this end, several interviewees proposed removing subsidies for environmentally harmful consumption as a means to transition consumers to more environmentally conscious consumption habits. Reflecting on the regulatory landscape, one interviewee noted the differences between treatment of health, social and environmental issues, where some items are illegal and banned outright (such as heroin, prostitution), while others are subject to restrictions (like alcohol, cigarettes), or varying VAT rates. Similarly, there is a need to make it more difficult to access environmentally harmful products, promoting a shift towards more sustainable consumption practices.

Overall, the interviewees expressed a strong recognition of the complexity involved in addressing CBEs and emphasized the need for multifaceted approaches to overcome these barriers. Several also identified communication as a barrier and stressed the need for more effective communication methods to engage stakeholders across society.

Targets and monitoring practices

Interviewees expressed strong support for establishing mandatory monitoring and reporting within the EU on member states' CBEs, and that this should be used as part of annual reporting. Some interviewees also suggested that there may not be a need for member states to report on this themselves if Eurostat is already using FIGARO for this for the EU as a whole. The significance of monitoring CBEs at the EU level was also underscored by several interviewees because of its value for demonstrating progress to the public and policymakers, fostering transparency and accountability, and encouraging sustainable consumption practices. Furthermore, interviewees proposed framing CBEs as a complement to territorial emissions to achieve the 1.5° climate goal, emphasizing the need for broader communication and acceptance.

Interviewees were also very supportive of setting targets for CBEs at both national and EU levels. To this end, the EU's Climate Law and the Fit for 55 package were referred to as catalysts for action. Suggestions were also made to set overarching targets as well as sub-targets, with allocated funding for follow-up. Overall, interviewees thought that both monitoring and target setting at the EU level would be more effective than member states pursuing this task independently. This is because many member states lack the competence and tools, and political will, and that policies and measures established at the EU level would create a level-playing field for all. Several of the interviewees suggested that despite the complexity of the task, the EU would be in

a good position to develop a sophisticated and fair system for monitoring emissions, especially with support from the standardized methods established by the UN.

A couple of the interviewees also highlighted the importance of using high-quality multi-regional input-output (MRIO) models to provide real data for the task of monitoring CBEs. While recognizing the imperfections of existing models, such as EXIOBASE and Figaro, interviewees agreed that setting targets first could be a pragmatic approach, with monitoring practices to follow, expecting them to get more sophisticated over time. One interviewee suggested that the broad interest expressed by countries such as the UK, the Netherlands, and Denmark in Sweden's monitoring model, presents an opportunity for broad international collaboration and further strengthening and standardization of monitoring practices.

By setting standards for monitoring CBE, one interviewee also suggested that the EU would enhance its attractiveness for imports, particularly from countries with already lower emissions associated with production. This proactive approach would not only benefit the EU economically but also strategically, as it could strengthen the EU's negotiating position within the UN and reinforce its role as a global leader in sustainability.

Concerning the current work within Sweden to also estimate the climate benefits associated with Swedish exports (see section 4.1.4), those interviewees who reflected on this work suggested that this was an effective way to get all the parties on board. One suggested that it could serve as an opportunity to align export-related emissions with existing efforts, offering a comprehensive view of emissions throughout the value chain. However, all stressed the importance of ensuring that this does not detract from the focus on the imperative to mitigate CBEs.

4.2 Case study 2: Denmark

Enshrined in the Danish Climate Act, Denmark has a national climate target of reaching climate neutrality by 2050 (Danish Council on Climate Change, 2023a). This includes interim targets of reaching 50–54% greenhouse gas reductions by 2025, and 70% greenhouse gas reductions by 2030, compared to 1990 levels. It should be noted that the Danish climate targets do not cover emissions that occur outside of Danish borders (Danish Council on Climate Change, 2022) and that the climate targets are to be revised every five years (Climate Act, 2020). As of 2022, Denmark's efforts left an estimated emissions gap of around 2.4–5.5 million metric tonnes of CO_2e to meeting the 2025 target, and a 10.1 million ton CO_2e gap from the 2030 target (Danish Energy Agency, 2022). For Denmark to close the gaps and fulfil its EU obligations, further measures are needed. Figure 5 shows that in 2021, Denmark had the highest per capita consumption-based climate footprint of all EU countries (European Commission, 2023b). Thus, measures to reduce Denmark's greenhouse gas emissions should pay particular attention to the area of consumption-based emissions (CBE).

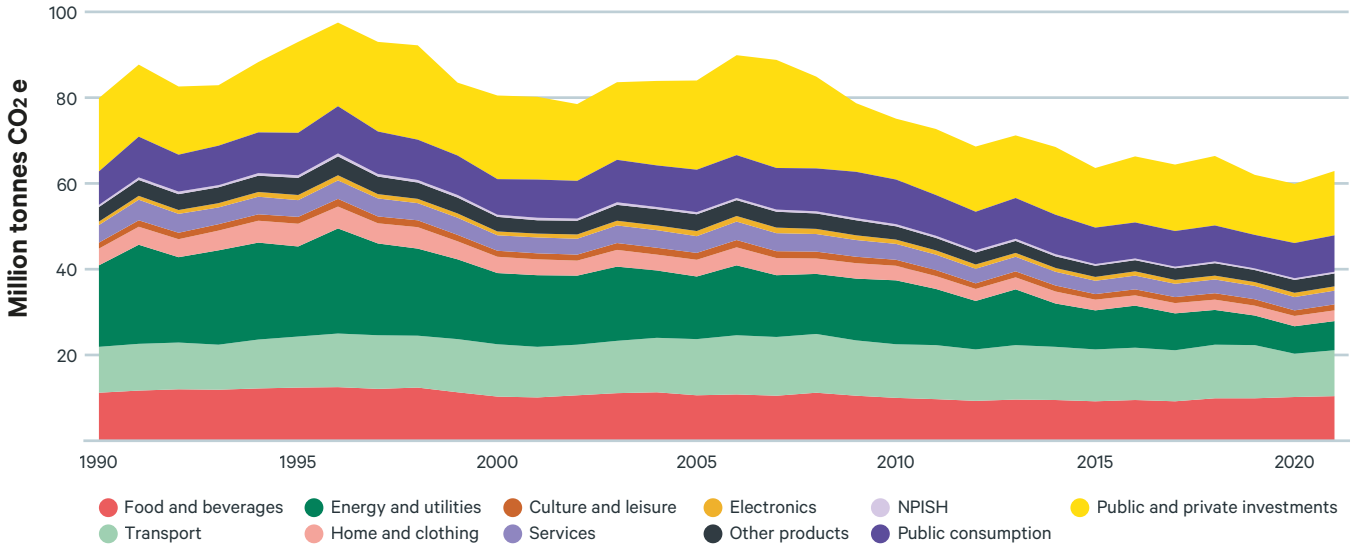
Consumption-based emissions statistics

Categories of consumption

In 2021, Denmark's CBEs amounted to 63 million tonnes CO_2e (Danish Energy Agency, 2023d). This figure includes Danish land use-related emissions and emissions from international transport, but excludes emissions from land use change and forestry (Danish Energy Agency, 2023b). Emissions from international transport include both Danish and foreign aircrafts that arrive at and depart from Danish airports and ships bunkering in Denmark, as well as the refuelling and bunkering abroad of Danish operated aircrafts and ships that have a connection to the Danish economy (Danish Energy Agency, 2023a).

Denmark's CBEs were roughly 40% higher than its territorial emissions (Danish Council on Climate Change, 2023a). As seen in Figure 20, Danish CBEs have decreased over time, by about 17 million tonnes of CO_2e between 1990 and 2021.

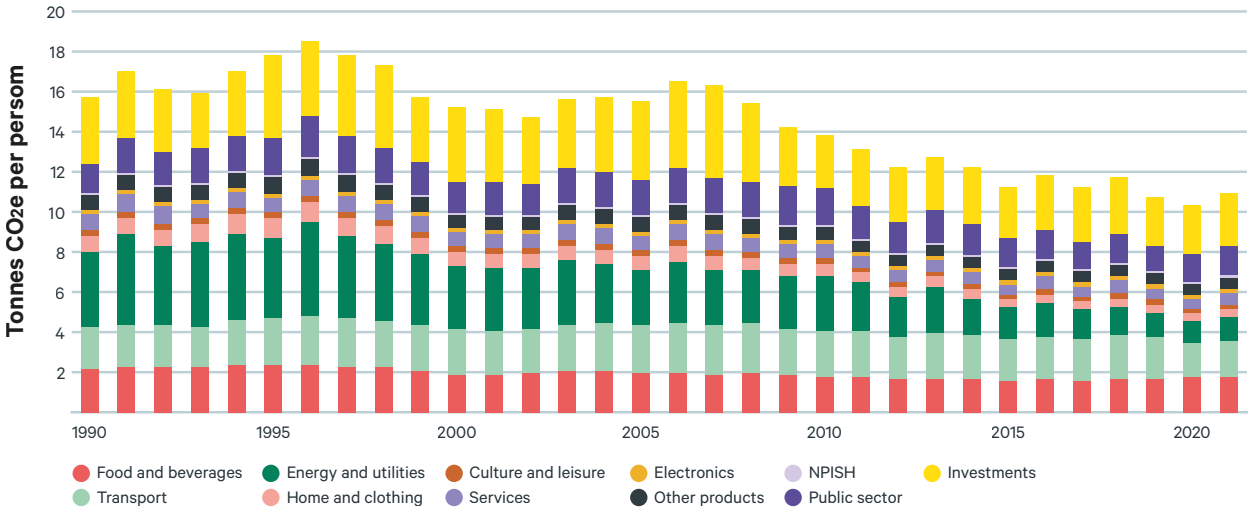
Figure 20. Denmark's consumption-based emissions by consumption categories, 1990–2021.



Source: Adapted from (Danish Energy Agency, 2023b).
Note: NPISH refers to non-profit institutions serving households.

Denmark's CBEs corresponded to about 11 tonnes of CO_2e per capita in 2021 (Danish Energy Agency, 2023d). Broadly in line with the total numbers, Denmark's per capita CBEs have decreased between 1990 and 2021, by about 4.8 tonnes of CO_2e per person, despite a population increase of around 705 000 in the same period (Statistics Denmark, 2024). These reductions are mainly linked to the categories of *Energy and utilities* (69% reduction), *Home and clothing* (43% reduction), *NPISH* (33%), and *Services* (31%), as shown in Figure 21.

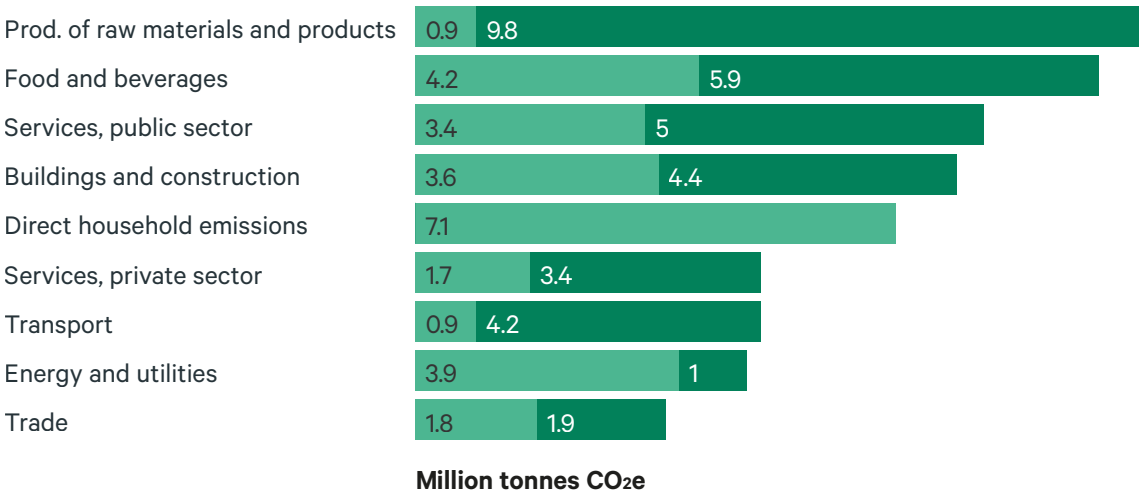
Figure 21. Denmark's per person consumption-based emissions by consumption category, 1990–2021.



Source: Adapted from Danish Energy Agency, 2023b; Statistics Denmark, 2024

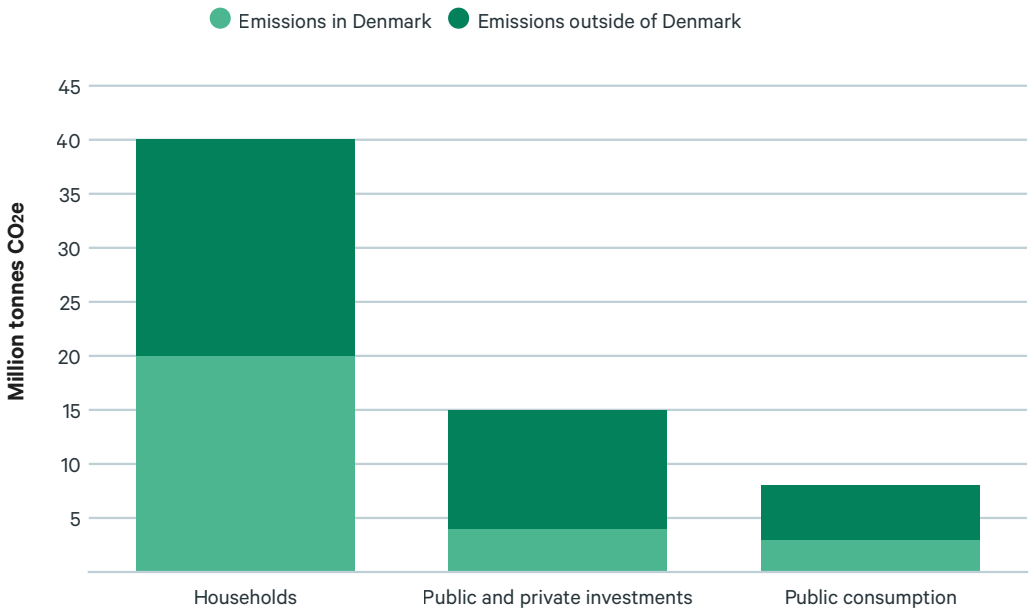
Broken down by industry groups, the 2021 Danish CBEs *are* mainly linked to the production of raw materials and products, and food and beverages, representing 17% and 16%, respectively. Out of the emissions embedded in production of raw materials and products, the pharmaceuticals, metals manufacturing and clothing industries stood out as significant contributors (Danish Energy Agency, 2023d). The industrial group breakdown is shown in Figure 22, which shows that a significant amount of CBEs occurred outside of Danish borders. These emissions were most prominent in the industry categories: *Production of raw materials and products* (91% emissions occurring abroad), *Transport* (83% emissions occurring abroad), and *Private sector services* (66% emissions occurring abroad).

Figure 22. Danish consumption-based emissions broken down by industry group in 2021.



Adapted from Danish Energy Agency, 2023b

Figure 23. Danish consumption-based emissions in 2021, broken down by emissions that occur within Denmark and abroad.

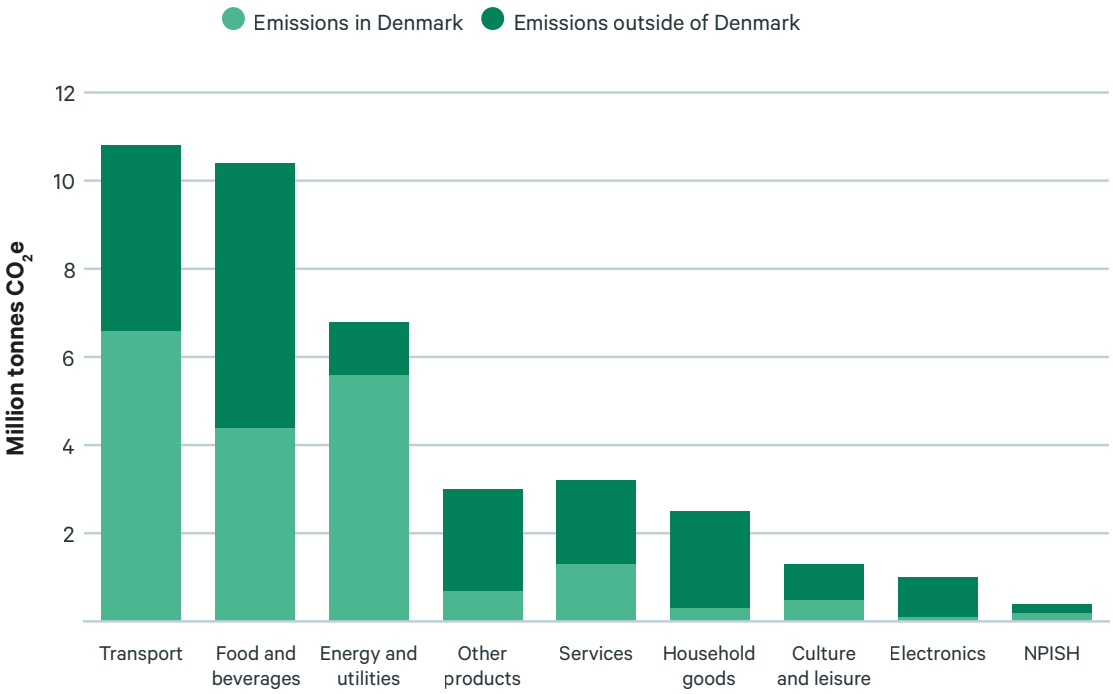


Adapted from Danish Energy Agency, 2023b

Out of Denmark's total CBEs in 2021, around 63% of the emissions can be linked to household consumption, around 24% to public and private investments, and around 13% to consumption by public bodies (Danish Energy Agency, 2023d). All three of these end-consumer categories had a high share of emissions occurring outside of Denmark, as shown in Figure 23.

In 2021, the largest contributions to Danish households' CBEs could be linked to the households' consumption of transport (17%), and food and beverages (16%). Danish households' foreign emissions were mainly embedded in consumption of household goods (87%), which includes *Clothing* and *Electronics*, as shown in Figure 24. *Energy and utilities*, and *Transport* had the highest shares of household CBEs that occurred within Denmark, at 86% and 61%, respectively.

Figure 24. Danish households' consumption-based emissions by consumption category in 2021.



Source: Adapted from Danish Energy Agency, 2023d
Note: NPISH stands for non-profit institutions serving households.

As seen in Figure 21, three consumption areas have made significant contributions to Danish household CBEs since the 1990s: *Transport*, *Food and beverages*, and *Energy and utilities* (Danish Energy Agency, 2023b).

General trends in Danish household consumption in these areas can be seen by looking at the key indicators for these areas over time. Danish household consumption of emission-intensive passenger transport, such as air and car travel, has increased in recent years, except for in 2020, which can be explained by the Covid-19 lockdown (Danish Energy Agency, 2023d). While low-emission passenger vehicles are taking over larger shares of new vehicle registrations (Danish Energy Agency, 2023d), the majority of the transport fleet remains fossil fuelled (Statistics Denmark, 2023).

Looking at Danish households' consumption of food and beverages, there has been a slight reduction in meat consumption of 2 kg per person over the past decade (Danish Energy Agency, 2023d). This reduction is paired with a shift in consumption from pork to poultry (Danish Energy Agency, 2023d), which is less emission-intensive (Van Rysselberge & Röös, 2021).

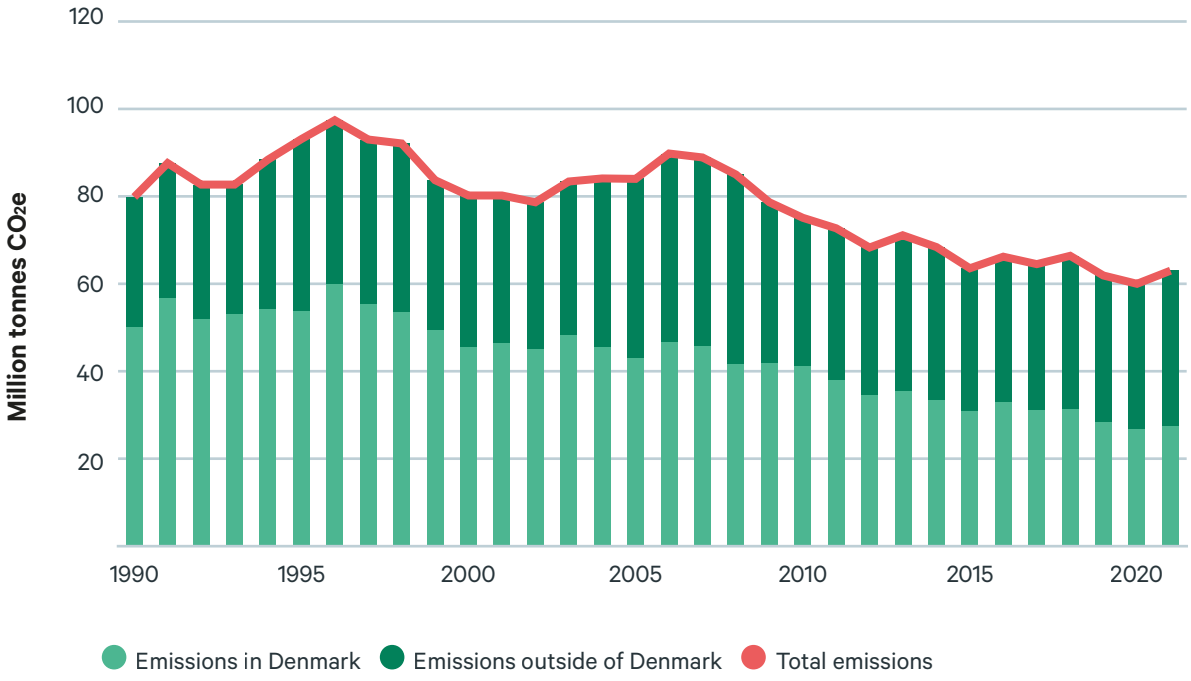
For energy and utilities, there has been a consistent increased share of renewable energy in Danish households' energy and utility consumption since 1990, mainly through an increased use of solid biofuels (Danish Energy Agency, 2023d). Moreover, Denmark's per household energy consumption fell by around 24% between 1990 and 2022 (Danish Energy Agency, 2023e). This decrease can mainly be attributed to efficiency improvements, such as a shift to district heating and heat pumps, stricter

building regulations, as well as more efficient electronic appliances (Danish Energy Agency, 2023e). It is worth noting that these efficiency improvements are paired with increasing sizes of areas to be heated, and an increased number of electrical appliances per household, leaving Danish households' total energy consumption in 2021 0.8% higher than in 1990 (Danish Energy Agency, 2023e).

Trade patterns

As stated above, foreign emissions are a prominent part of Denmark's CBEs. The graph below provides an overview of the share of foreign emissions in Denmark's CBEs between 1990 and 2021. Within this period, the decrease in CBEs was mainly achieved by reduced territorial emissions of about 45%, while the CBEs that occur outside of Denmark increased by roughly 20%.

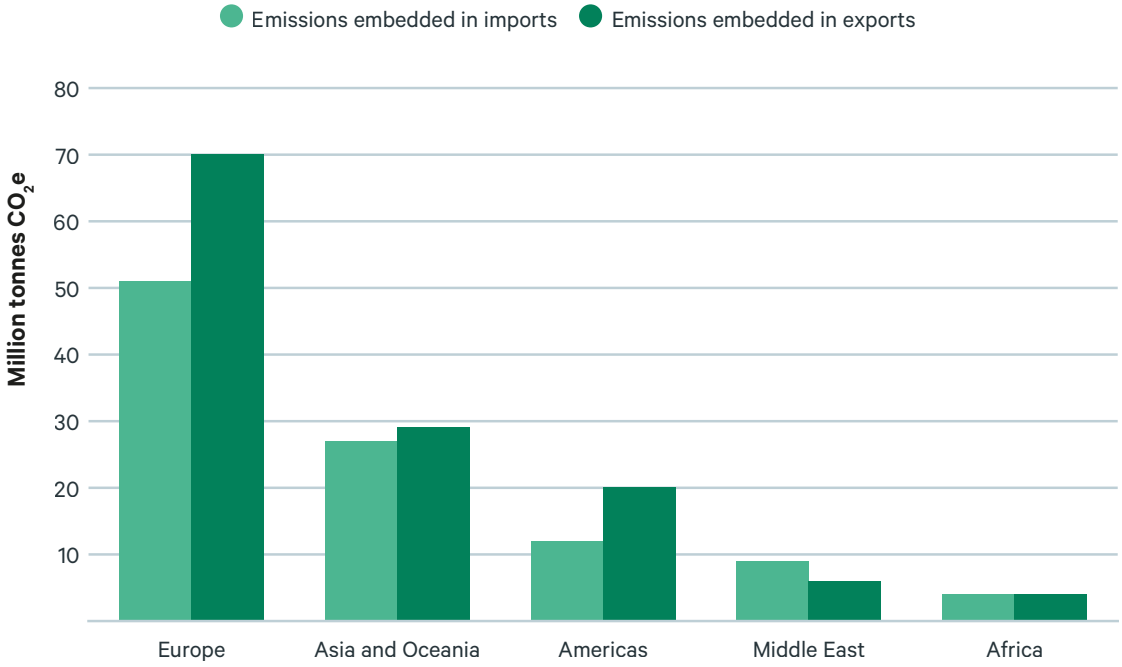
Figure 25. Consumption-based emissions occurring inside and outside of Denmark, 1990-2021.



Source: Adapted from Danish Energy Agency, 2023d

Denmark trades heavily with the rest of the world. In 2021, 56% of Denmark's CBEs occurred abroad, mainly in China and Germany, where the emissions accounted for 7% and 5.5% of Denmark's CBEs, respectively (Danish Energy Agency, 2023d). Its major regional trading partners are Europe, Asia, and North America, and the countries it trades most with are Germany, the US, and China (Danish Energy Agency, 2023d). An overview of Denmark's most important trading regions in is presented in Figure 26.

Figure 26. Danish consumption-based emissions embedded in Danish imports and exports by region in 2021.

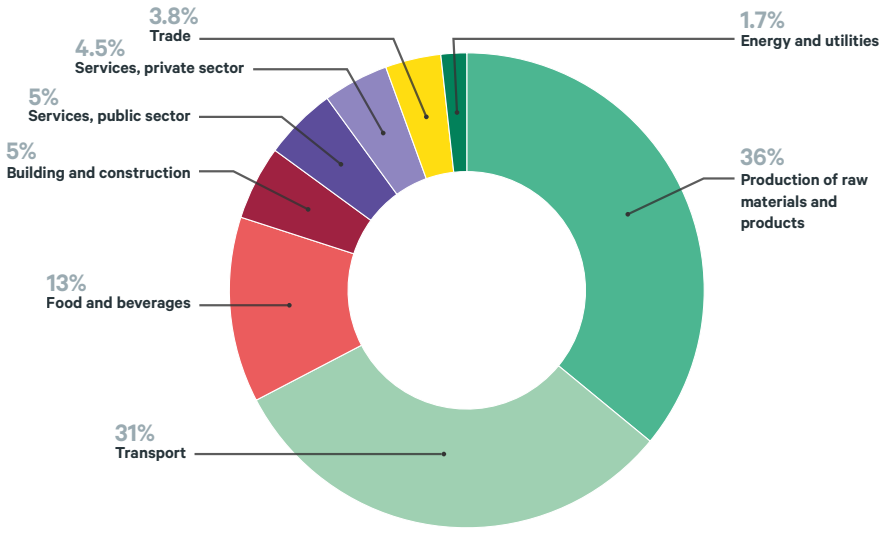


Source: Adapted from Danish Energy Agency, 2023d.

Danish imports

Emissions associated with Danish imports include the embedded emissions of imported goods and services until they enter Denmark. In 2021, the emissions embedded in Danish imports amounted to 103 million tonnes of CO_2e, and mainly involved imports of raw materials and products related to oil refinery, pharmaceuticals and clothing (together accounting for 36% of import-related emissions), as well as foreign transport services, such as shipping, and fuels from abroad (accounting for 31% of import-related emissions). Figure 27 presents an overview of the emissions embedded in imports for each industry sector group. In terms of CO_2e emissions, major import trade partners are Germany, particularly its shipping industry, and China, mainly due to the electricity used in the production of Danish imports from China, and its metal manufacturing sector (Danish Energy Agency, 2023d). Import-related emissions from Germany and China amounted to 12 and 11 million ton of CO_2e, respectively (Danish Energy Agency, 2023d).

Figure 27. Emissions embedded in Danish imports in 2021, broken down by industry group.

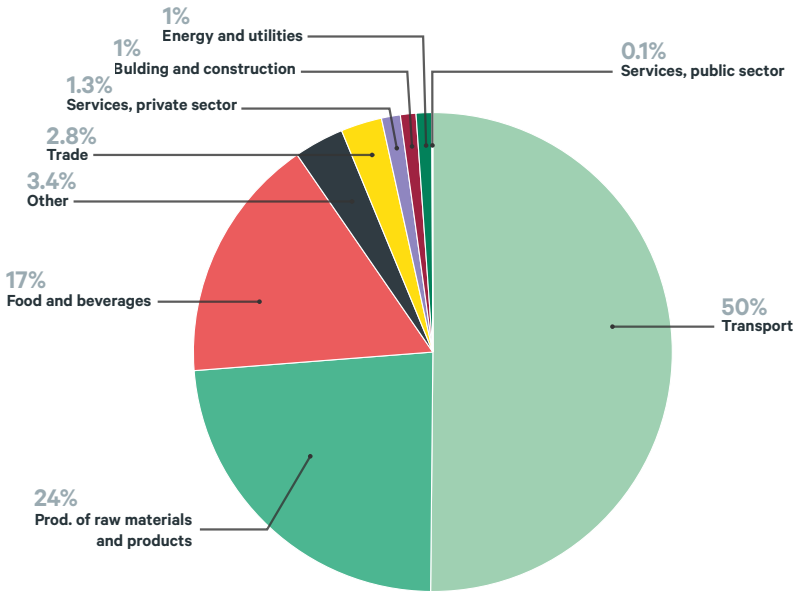


Source: Adapted from Danish Energy Agency, 2023c

Danish exports

Emissions associated with Danish exports involve the emissions from the value chain of exported goods until they pass from Danish hands. The total amount of emissions from Danish exports amounted to 129 million ton CO_2e in 2021 (Danish Energy Agency, 2023d). The Danish transport industry, mainly shipping, accounted for the majority of the exported emissions, as seen in Figure 28 (Danish Energy Agency, 2023d). On a country-level, the US and Germany were the two largest export markets for Denmark in 2021 (Danish Energy Agency, 2023d). Emissions embedded in exports to these countries amounted to 14 and 13 million tonnes of CO_2e in 2021, respectively (Danish Energy Agency, 2023d). The emissions were mainly embedded in shipping, and the food and pharmaceutical industries (Danish Energy Agency, 2023d). By region, Europe, then Asia, were the main recipients of Danish first stage exports (Danish Energy Agency, 2023d).

Figure 28. Emissions embedded in Danish exports in 2021, broken down by industry group. Adapted from (Danish Energy Agency, n.d.).



Source: Adapted from Danish Energy Agency, n.d.

This section reveals that there is a strong overlap between Danish imports and exports of goods, particularly within the *Transport* and *Production of raw materials and products* sectors. In total, around 65% of emissions related to imported goods in 2021 were further exported (Danish Energy Agency, 2023d). Foreign emissions embedded in Danish exports are most prominent in the transport, and raw materials and products.

Governance and high-level policy frameworks, targets and main actors

Denmark has stated ambitions to be a pioneer in its global climate effort to lead a fair transition to sustainable societies around the world (Danish Government, 2020). In legislation, Denmark has legally binding climate targets that are set with the ambition to make Denmark "a leading nation in the international climate effort, a nation that can inspire and influence the rest of the world" (Climate Act, 2020). As set out in the Danish Climate Act, Danish climate efforts must adhere to specific guiding principles, including that Danish measures must not simply move all greenhouse gas emissions outside Denmark's borders (Climate Act, 2020).

The Danish Climate Act also mandates continuous revisions of the Danish climate targets, where new, more ambitious national climate targets must be set every five years for the coming 10-year periods (Climate Act, 2020). In 2022, the Danish government stated a new target of 110% reduction in greenhouse gas emissions by 2050, compared to 1990 levels, and set the ambition of a reduction target for 2035 (Danish Government, 2022). These increased climate ambitions are yet to be adopted by the Danish Climate Act because the revision of legally binding climate targets

will take place in 2025 (International Energy Agency, 2023). The Danish Government has identified carbon capture, utilization and storage (CCUS), together with biochar, and bioenergy with CCS, as key technologies for advancing from the 2050 climate neutrality target to achieving net negative emissions by 2050 (International Energy Agency, 2023). Such technologies are deemed particularly important because Danish forests are expected to lose their role as carbon sinks (International Energy Agency, 2023).

Although there is currently no national target for CBEs in Denmark, the economic implications of setting such a target is currently under review by the Danish government (Danish Government, 2022). As stated in its 2022 climate program, the Danish government has further initiated a project to harmonize calculation methods and data sources for calculating CBEs, creating a common national starting point (Danish Ministry of Climate, Energy, and Utilities, 2022). Additionally, the Danish Council on Climate Change (DCCC) has made recommendations to the Danish Government to implement indicative reduction benchmarks for CBEs (see below).

Important actors in tackling Danish CBEs include the Danish Ministry of Climate, Energy and Utilities, the Danish Energy Agency, the DCCC and the Danish Environmental Protection Agency. The Danish Ministry of Climate, Energy and Utilities consists of several government agencies, including the Danish Energy Agency, and independent bodies such as the DCCC are responsible for developing of domestic climate and energy policies, the coordination and implementation of international agreements and EU regulations, and the setting of national climate targets (Climate Act, 2020; State of the Green, n.d.). Apart from providing expert advice to the Ministry of Climate, Energy and Utilities, the Danish Energy Agency has main responsibility for monitoring progress on Denmark's global climate impact that is not covered by Denmark's territorial climate targets (Danish Energy Agency, 2021). The DCCC is an independent body of experts established under the Danish Climate Act (Climate Act, 2020; Danish Council on Climate Change, 2023b). Its responsibilities include assisting the Ministry for Climate, Energy and Utilities in setting national climate targets and making recommendations to the ministry on cost-effective policies to advance climate efforts in relation to welfare and development (Climate Act, 2020; Danish Council on Climate Change, 2023b). The Danish Environmental Protection Agency is mainly active in national monitoring of environmental impacts, supporting Danish businesses for greener production, and providing environmental knowledge to Danish citizens to help them make informed choices in their everyday lives (Danish Environmental Protection Agency, n.d.).

Enablers: policy measures and initiatives to address consumption-based emissions

In addition to the overarching policies and targets mentioned above, this section outlines a selection of policies and measures implemented at the sectoral level

In 2021, Denmark adopted a national action plan to implement the 2030 Agenda, particularly targeting SDG 12 on responsible consumption and production, and SDG 13 on climate action (Danish Ministry of Finance, 2023). These areas remain as key challenges in Denmark's implementation of the 2030 Agenda (Danish Ministry of Finance, 2023). The Danish 2023 National Reforms Programme summarizes a number of initiatives related to SDG 12, including:

- Agreement on the EU's New Circular Economy Action plan
- Adoption of a Danish action plan for circular economy for 2020-2032
- Follow-up agreement on a climate plan for a green waste sector and circular economy from 2022
- Plans on a plastic action plan (Danish Ministry of Finance, 2023).

Moreover, the Danish government's 2022 climate program sets out several initiatives taken to promote more climate-friendly behaviour among citizens. These include efforts to educate citizens by integrating teaching materials for healthy and climate-friendly foods into education, and financial support for a knowledge portal on global goals and education on sustainable development and choices (Danish Ministry of Climate, Energy, and Utilities, 2022). Initiatives to guide consumers include strengthened legislation to combat greenwashing, climate-friendly dietary guidelines, and the development of climate labels for food (Danish Ministry of Climate, Energy, and Utilities, 2022). Lastly, there are initiatives that target citizen engagement in climate policy developments, particularly to engage youth in the climate debate (Danish Ministry of Climate, Energy, and Utilities, 2022). It is worth noting that the 2022 climate programme also includes initiatives to encourage climate-friendly behaviour in companies and public procurement. These include developing tools and guidance for companies in working for a responsible green transition, and policies for green public procurement for government flights and climate-friendly food (Danish Ministry of Climate, Energy, and Utilities, 2022).

Denmark also has policies in place that, while not explicitly targeted at CBEs, will have impacts on Danes' consumption. Below, we group examples of such policies into the four largest consumption-categories: *transport*, *food, housing,* and *other consumption*.

Transport

Since 2021, Danish registered vehicles have been subject to different types of taxes to promote sustainable transportation. For private vehicles, these include a green vehicle tax, taxes promoting vehicle fuel efficiency, a CO_2 vehicle tax, and taxes promoting the use of low-emission vehicles (Danish Motor Vehicle Agency, 2024).

In November 2023, the Danish government presented a proposal for the transition to green aviation. This includes a proposed passenger tax on air travel of an average of DKK 100 per trip in 2030, to be gradually introduced from 2025 (Danish Government, 2023). The tax is proposed to be differentiated based on flight distance, and a share of the proceeds must be channelled back to the aviation industry to further accelerate green aviation (Danish Government, 2023). The government has also presented its ambitions to achieve completely "green" domestic aviation by 2030. However, the DCCC, an independent body responsible for making annual recommendations to the Ministry of Climate, Energy and Utilities (Climate Act, 2020), has recommended that the proposed tax levels should increase to be on par with those in neighbouring countries, which range between DKK 150–720 (Danish Council on Climate Change, 2023a).

Additionally, in its 2022 government platform, the Danish government stated ambitions to investigate increasing the targets for light-duty electric vehicles and to further promote the conversion to a zero-emission heavy-duty vehicle fleet (Danish Government, 2022).

Food

In January 2021, the Danish Ministry of Food, Agriculture and Fisheries published updated official dietary guidelines for a healthy diet, revised to promote climate-friendly diets. The recommendations promote the consumption of fruits, vegetables and legumes because of their lower climate footprint, and reduced meat consumption (Ministry of Food, Agriculture and Fisheries of Denmark, n.d., 2020).

Moreover, in April 2023 the Danish Veterinary and Food Administration issued recommendations for future climate labelling of food, including state-controlled climate labelling that ranks foods in relation to their climate footprint, as well as a publicly accessible database on the climate footprint of food (Fødevarestyrelsen, 2023).

Housing

Policies related to sustainable housing include efforts for more sustainable and climate-friendly heating. These efforts include a boiler scrapping scheme for those households that cannot be connected to a district heating network to switch from oil and natural gas boilers to heat pumps through a subscription-service (Danish Energy Agency, 2020a). There are also subsidies for households to convert their heat supply systems from boilers or electric heating to heat pumps, and to make renovations for more energy efficient homes (Danish Energy Agency, 2020b).

Consumption of other goods and services

Denmark's action plan for circular economy 2020–2032 mandates separate collection of ten types of household waste, following a national sorting criteria, to ensure proper waste management and increased recycling (European Environment Agency, 2022). This includes recyclable household waste, such as cardboard, metal and glass, as well as food, residual waste and textiles. A deadline for municipalities to roll out nearby and separate collection of households' clothing and textile waste has been set to July 2023, in a follow-up agreement on the Climate Plan for a green waste sector and circular economy (State of the Green, 2022).

Moreover, in the context of the EU Waste Framework Directive 2008/98/EC, and the Packaging Waste Directive (94/62/EC as amended by Directive (EU) 2018/852), Denmark has targets in place for packaging waste and recycling for 2025 and 2030 (European Environment Agency, 2022). As these targets are unlikely to be met for plastics, Denmark has dedicated targets on recycling of plastic waste from households, and policies banning the marketing of specific disposable plastic products (European Environment Agency, 2022).

Recommendations from the Danish Council on Climate Change

In its 2023 status report on Denmark's national climate goals and international obligations, the DCCC highlights the value of implementing indicative benchmarks on how much Danish CBEs must be reduced by, for example 2030, or at the latest 2050 (Danish Council on Climate Change, 2023a). It suggests that such benchmarks should target consumption and exports separately, and be complementary to the existing territorial climate targets (Danish Council on Climate Change, 2023a).

Additionally, the DCCC views the updated national dietary guidelines as sufficient benchmarks for what a Danish climate-friendly diet should look like by 2030, potentially leading to reductions in CBEs of between 2.6 and 3.9 million ton CO_2e annually, and significant health gains for Danes (Danish Council on Climate Change, 2023a). Similarly, an OECD working paper on Denmark's accelerated transition to net zero has identified potential for reducing Denmark's global climate impact by up to 3 gigatonnes CO_2e by 2030 by changing food consumption patterns (Barker et al., 2022). One example of such a change involves shifting the intake of animal protein to plant-based proteins, which could bring health benefits as well (Barker et al., 2022). The DCCC also proposed food consumption taxes that reflect the climate impact of food products, paired with greenhouse gas-based taxes on agricultural production, as measures to drive shifts to climate-friendly diets (Danish Council on Climate Change, 2023a).

Moreover, the DCCC suggests that the regressive effects of economic instruments, such as taxes on food products, could be addressed by channelling back the tax revenues to low-income households through "green cheques", or other means (Danish Council on Climate Change, 2023a).

While the DCCC deem indicative benchmarks for reduction of CBEs as a useful means to guide Danish climate policy, it has also identified three barriers to implementation. These include: methodological challenges with monitoring CBEs; a lack of influence over emissions from the countries that produce Danish imports; and the high administrative costs of implementing economic instruments, such as a consumption tax on food (Danish Council on Climate Change, 2023a).

Monitoring and follow-up

Based on the Danish Climate Act, the Danish Energy Agency has for the past three years published official assessments of Denmark's global impact, in terms of how CO_2e emissions outside Denmark are affected by Danish consumers, businesses and authorities (Danish Energy Agency, 2021).

The Danish Energy Agency has used the same calculation method in all its reports. The data is prepared in collaboration between Statistics Denmark and the Danish Energy Agency (Danish Energy Agency, 2023b). Monitoring follows a top-down approach, building on a simplified SNAC- model (Danish Energy Agency, 2023b). The emissions from Danish production are calculated based on data from Statistics Denmark, where official Danish input-output tables are combined with Danish emission accounts. The emissions linked to Danish production are then complemented with the emissions from Danish imports that are calculated through a combination of the official input-output tables, foreign trade statistics from Statistics Denmark, and the monetary version of the EE-MRIO database EXIOBASE (Danish Energy Agency, 2023b). In other words, the data from Statistics Denmark is combined with data from EXIOBASE in a so-called coupled model. Data on Danish land use-related emissions from the Danish Environmental and Energy Centre at Aarhus University are added as a final component of the Danish accounting of CBEs (Danish Energy Agency, 2023b).

The Danish Global Climate Impact reports are further subject to public consultations on assumptions and other aspects, as stipulated by the Danish Climate Act (Danish Energy Agency, 2023d). The purpose of the reports is to provide a picture of the Danish positive and negative global climate impact, monitor the developments of Denmark's global climate action efforts, and support decision-making (Danish Energy Agency, 2021).

According to Statistics Denmark (2021), the experimental statistics are mainly used by the Danish Energy Agency for their annual reporting, but additional interest in the statistics and the model has also been shown by analysts in the central administration, trade associations, municipalities, and research institutions.

Relevant networks and initiatives

In the expert interviews, the City of Copenhagen was highlighted as a progressive example of work on tackling Danish CBEs. The municipality is currently developing their next climate plan, which will include scope 1, 2, and 3 emissions, and aims to reduce citizens' CBEs by half by 2035 (Copenhagen Municipality, 2021). Copenhagen's climate plan is developed with the involvement of the Copenhagen Citizens' Assembly (the Klimatborgertinget) through a number of gatherings where the assembly can provide recommendations on how a good life for Copenhageners can be ensured, while their CBEs are reduced (Climate Citizens' Assembly of Copenhagen, n.d.). Copenhagen is also a member in the C40 Cities network, a global network of cities that aim to develop and deliver on Paris compatible climate action plans with the goal of halving their collective emissions by 2030 in a resilient and equitable way (C40 Cities, 2023).

Moreover, all but two Danish municipalities are part of the DK2020 network, a project that supports municipalities in developing "Paris compatible" climate action plans (Holmbo Lind & Hansen, 2023). Consumption-based and societal emissions will be in focus in the next iteration of the DK2020 project (Sanderson et al., 2024).

Other efforts to monitor Denmark's CBEs include those by the think tank CONCITO that, while using a different methodology, arrived at similar results as the Danish Energy Agency (Minter et al., 2023).

Practitioners' views on challenges, opportunities for acceleration and monitoring

A total of eight interviews with practitioners and researchers were conducted to inform the Danish case study. This section draws on the findings from these interviews about opportunities and barriers to curbing Danish CBEs, as well as a section on interviewees' perspectives on targets and monitoring practices for addressing CBEs within the EU. Table 12 in section 5 provides an overview of the opportunities and barriers identified by practitioners in all three case study countries.

Opportunities to address consumption-based emissions

Overall, the interviewees deem that there is a good institutional set-up in Denmark for monitoring CBEs and for including them in official statistics. There is also broad agreement among the interviewees that the EU is the appropriate level to make progress on CBEs and to push member states to act. It is seen by interviewees as an opportunity to overcome the inertia of individual countries each waiting for others to act, as well as the domestic political barriers to action. Some interviewees consider that EU regulations are necessary in order to reduce emissions in carbon intensive sectors. EU-level regulations on specific sectors could provide guidance to member states on where to direct their regulatory efforts, because it would be challenging for individual nations to regulate everything linked to consumption. According to one interviewee, an EU-level target for CBEs would further present an opportunity for policies in areas that are currently not addressed or are prone to carbon leakage.

The agricultural sector was pointed to by several interviewees as an important focus area that could benefit from more efficient management at the EU-level. Interviewees suggested that addressing taxation on agriculture at the EU-level could help mitigate carbon leakage. EU-level targets could also help to develop policy to mitigate outsourcing of emissions. Some interviewees also noted that having an EU-level target on CBEs could help with addressing emissions from agriculture, because the Common Agricultural Policy is already in place and many member states are currently grappling with how to reduce emissions from agriculture. Most interviewees stress the importance of implementing policies for agriculture on both the production and consumption sides.

The interviewees further identified relevant EU level policies and initiatives that align with tackling CBEs, including the EU EcoDesign Directive and the broader

recommendation on the use of Environmental Footprint methods proposed by the European Commission. One interviewee suggested that the CBAM could be expanded to cover more areas related to CBEs, such as food products. Another highlighted the potential to incorporate CBEs more prominently in the European Green Deal.

Interviewees also foresee learning opportunities between countries. According to one, informal networks, and alliances for learning already exist and could be formalized. Another interviewee suggested that partnerships and agreements between countries, such as trade agreements or an offsetting scheme for global aviation emissions, could be more effective in achieving targets for CBEs than policy measures targeted at domestic consumers.

Another important theme is local level action. Several interviewees highlighted the importance of municipal level initiatives for increasing public participation and changing behaviour, and also suggested that more use could be made of the national level reporting on CBEs to inform and influence public opinion. Our interviews indicate that there are contrasting views on how the Danish Energy Agency's annual reporting is currently used: some interviewees say that it is used a lot and very valuable for civil society and the private sector, while others say it is not used enough by government, despite a general interest for information on CBEs in the media and wider society. This suggests there is room to more effectively inform and influence the public without additional monitoring efforts.

Interviewees said that in Denmark economic instruments were one of the most important means to get people to shift their behaviour and tackle CBEs. One interviewee emphasized that such instruments should be used in a way that does not disadvantage the poorest consumers. Another interviewee gave the example of instruments that make greener choices – such as choosing train over air travel – more affordable. Given the relatively high level of awareness among Danish consumers about the need for behavioural change, the interviewees also said that it is important to promote a different vision of what a "good life" is, linked to the idea of sufficiency (working less, spending less), and how this could contribute to enhanced welfare.

Barriers to addressing consumption-based emissions

In general, interviewees from the Danish case study called for more progress to address CBEs, emphasizing the need for the Danish government to take the lead. Many interviewees highlight the need for actions and prioritization of CBEs at the national level, citing current ambitions as lagging behind the rest of society. The interviews indicate that progress seems to be stuck at the national level mainly for political reasons: it is seen as politically sensitive to encroach on people's private spheres, and there is fear that a national level target for CBEs could damage local industry. As one interviewee put it, *"It [measures targeting consumption-based emissions] is politically not saleable"*.

Despite examples of best practices at a local level, the interview findings indicate that local level actors lack the agency required to make changes, and that local-level efforts may not necessarily translate to a higher level. The interview findings further highlight

the lack of international standards for measuring and monitoring CBEs as a barrier for establishing formal networks and partnerships between countries.

Targets and monitoring practices

As part of the Danish government's efforts to investigate the economic implications of setting a target for CBEs, research will be conducted to establish the projected impact on trade and industry. The interviewees, however, find it unlikely that this research will be concluded before the next national election in three years' time.

One interviewee further stressed that targets on CBEs should be considered as complementary to territorial climate targets. They emphasized that a focus on only one risks diluting the importance of the other, while both are important for reducing Denmark's global climate impact.

The interviewees were generally positive about implementing CBEs targets at an EU-level. According to the interview findings, setting an EU-level target is an opportunity to create a level playing field for all member states and to mitigate border tax problems. The interviewees suggest that establishing standardized monitoring in the EU could be the first step to setting a target for CBEs and allow for comparisons to be made between member states. One interviewee suggested that EU-level monitoring would be particularly useful for Denmark, considering the country's high level of export-related emissions, of which a high share goes to European countries. They reasoned that if all member states are subject to policies that target CBEs, Denmark would be incentivized to address their exports. Other interviewees suggest that a supranational actor is needed to lead the standardized monitoring, by developing guidelines on what data to use and what to include.

The interview findings indicate that there are challenges when it comes to standardized monitoring at the EU-level, mostly related to data availability. According to interviewees, EXIOBASE, while comprehensive, has drawbacks because some parts are outdated and the database relies on research funding. Meanwhile, the Figaro database, also used at the EU-level, is updated more frequently but is missing data for many sectors and countries. Some interviewees noted that the EU EcoDesign Directive and the expanded regulation succeeding it will require greater EU data collection, which could also enhance data availability for monitoring CBEs. Some interviewees suggested that challenges around monitoring are sometimes used as reasons not to act on CBEs. However, as one interviewee said, "You can't wait for the perfect data to begin to address the climate problem."

Some interviewees suggested that alternative ways of measuring would add value to addressing CBEs. These could include measuring activities, mass or other physical units rather than the spend-base methodology currently used by the Danish Energy Agency and in other MRIO-models. Alternative targets, such as on reducing miles driven or reducing food waste, were also proposed by one interviewee.

4.3 Case study 3: France

In 2019, France adopted the Energy and Climate Law which introduced legally binding climate targets for achieving carbon neutrality by 2050 compared to 1990 levels, and reducing greenhouse gas emission by 40% by 2030 compared to 1990 (General Commission for Sustainable Development, 2023). The 2030 interim target is to be revised according to the European Climate Law, under which the EU is committed to reduce net greenhouse gas emissions by at least 55% by 2030 (General Commission for Sustainable Development, 2023).

In 2015, France outlined a legally binding roadmap to steer its climate policy to achieve these targets: the French National Low Carbon Strategy (SNBC for Stratégie Nationale Bas-Carbone), which is subject to a complete revision every five years (Ministry for the Ecological and Solidary Transition, 2020). The current version is the second iteration of the strategy (SNBC-2), issued by a decree in 2020 with guidelines for implementing the low-carbon transition in all sectors of activity and short- and medium-term carbon budgets, targeting emission reductions in the periods of 2019–2023, 2024–2028, and 2029–2033 (Ministry for the Ecological and Solidary Transition, 2020). The third version (SNBC-3) is scheduled for late 2024.

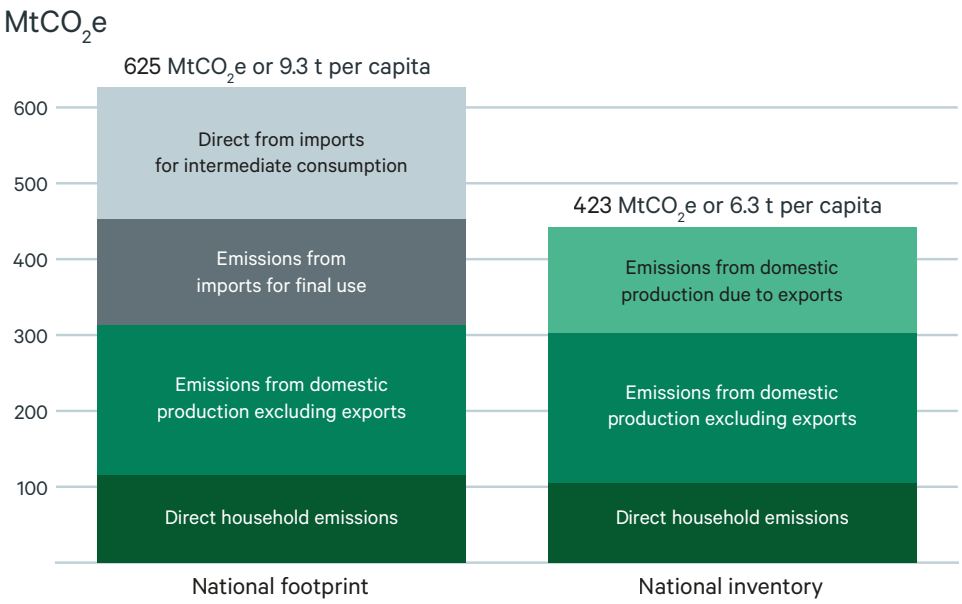
So far, France's estimated annual territorial emissions between 2019-2022, excluding LULUCF, are 3% below that indicative annual carbon budget (General Commission for Sustainable Development, 2023). The estimated annual territorial emissions for 2019–2022 including LULUCF, however, exceeds the carbon budget by 2% (General Commission for Sustainable Development, 2023).

Consumption-based emissions statistics

Categories of consumption

In 2019, France's consumption-based emissions (CBEs), including emissions linked to international transport, were estimated at 625 Mt CO_2e, corresponding to 9.3 metric ton CO_2e per person (SDES, 2023b). The national inventory, or territorial emissions, was estimated at 423 MtCO_2 for the same year, meaning that France's CBEs were 48% higher than the national inventory in 2019 (SDES, 2023b). A breakdown of the 2019 CBEs and territorial emissions is presented in Figure 29.

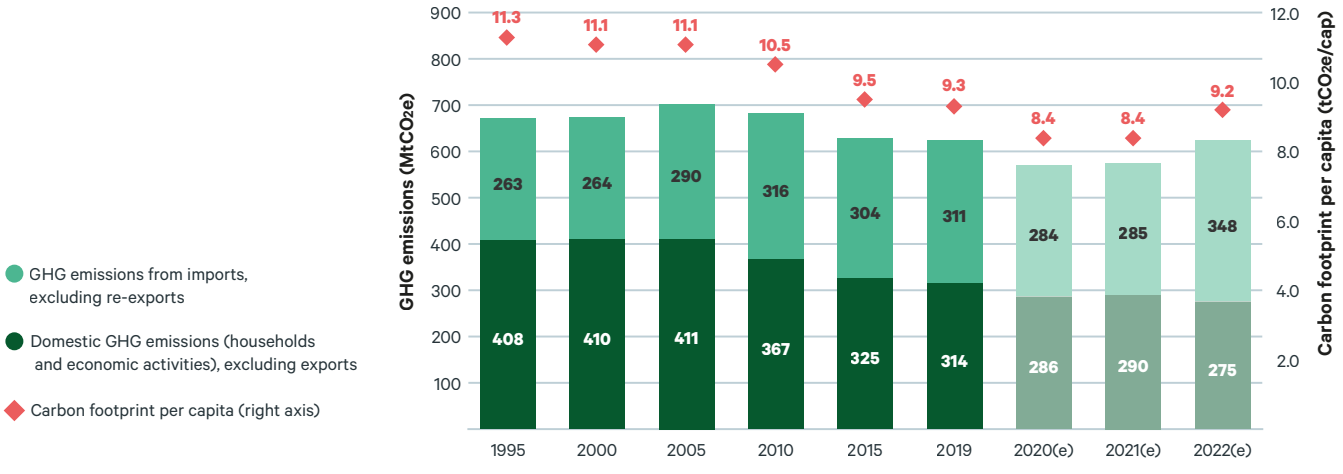
Figure 29. Comparison between France's consumption-based emissions and national inventory in 2019



Source: SDES, 2023b

Developments in France's CBEs since 1995 are presented in Figure 30. Estimates point to a total of 623 Mt CO_2e being emitted in 2022, which represents a 0.3% decrease since 2019. Compared to 1995, the estimated 2022 CBEs have decreased by 7%. The carbon footprint per person, estimated at 9.2 metric ton of CO_2e per person in 2022, is 19% lower than in 1995. The overall reduction in the footprint is the result of two contradictory trends over the 1995–2022 period: on the one hand, a 33% reduction in domestic emissions, and on the other, a 32% increase in imported emissions (SDES, 2023b).

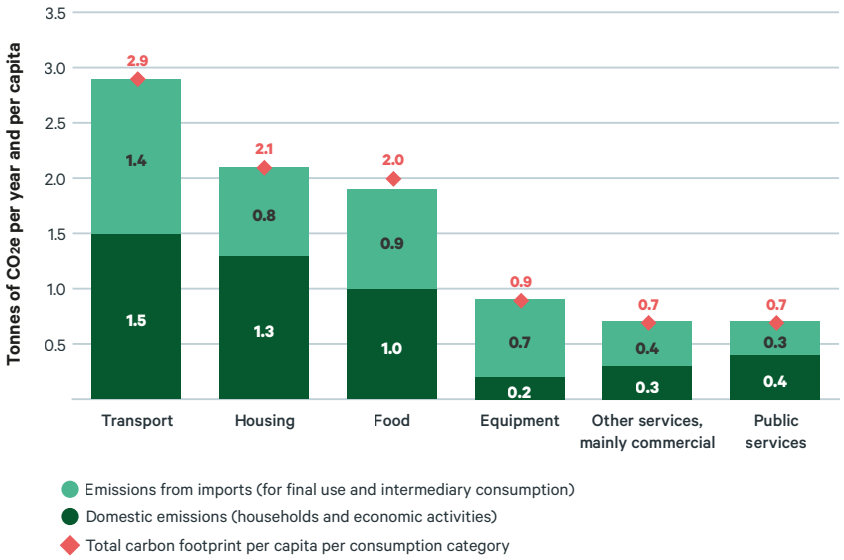
Figure 30. Evolution of France's carbon footprint between 1995 and 2022.



Note: For 2020, 2021 and 2022, "e" stands for "estimated" (SDES, 2023b).

As shown in Figure 31, around 85% of France's CBEs were linked to household consumption in 2019. Household consumption of *transport* (32%), *housing* (22%) and *food* (21%) were the biggest contributors to the CBEs in 2019, followed by household consumption of *equipment* (10%), *other services* (*mainly commercial*) (8%), and *public services* (8%). Imported emissions were predominant for the *equipment* category (electrical appliances and capital goods) and *other services* (e.g. clothes, decoration, chemical cleaning products, leisure, banking services), and accounted for almost half of emissions from *transport*, *food*, and *public services* in 2019 (SDES, 2023b).

Figure 31. Breakdown of France's carbon footprint per person by consumption category in 2019



Source: SDES, 2023b

Note: Aggregation by consumption category is based on results obtained for all NAF nomenclature categories.

Trade patterns

As shown in Figure 30, around half of France's total CBEs in 2019 were associated with imports (311 Mt CO_2e). The other half of the carbon footprint corresponds to domestic emissions (related to households and economic activities, excluding exports). Emissions linked to exports accounted for 28% of the national inventory in 2019. It should be noted that the SNBC currently includes a strategy for reducing exported emissions through its carbon budgets (High Council on Climate, 2020). A corresponding quantified target for reducing imported emissions is, however, currently not included in the strategy (High Council on Climate, 2020).

The OECD inter-country input-output database shows that France had a trade deficit of around 121 million tonnes CO_2 in 2015 (Cezar & Polge, 2020). This balance indicates that, in terms of CO_2 emissions, France consumes more than it produces. France's most important trade flows in terms of CO_2 emissions in 2015 are presented in Table 8.

Table 8. France's CO_2 trade flows in million tonnes of CO_2 in 2015 with selected countries

	Imports	Exports	Deficit
China	40	8	-32
Germany	24	14	-10
US	14	10	-4
Italy	12	8	-4
Europe (incl. Germany and Italy)	73	46	-27

Source: Cezar & Polge, 2020.

The French CO_2 trade deficit can be attributed to a monetary trade deficit, but can also be attributed to the sectoral structure of trade flows (Cezar & Polge, 2020). The latter stands out in the case of French trade with Kazakhstan and Russia, which rank third and fourth place in terms of French CO_2 trade deficits, at -10 million tonnes CO_2 and -9 million tonnes CO_2, respectively (Cezar & Polge, 2020). French imports from these two countries are dominated by raw materials and hydrocarbons. French exports, on the other hand, are often measured as the added value of products, usually originated from services that generally have less emissions (Cezar & Polge, 2020).

China stands out in the French CO_2 trade balance, contributing to the largest share of France's imported emissions, the largest trade deficit and one of the third largest recipients of emissions from French exports. Moreover, in 2015, France had CO_2 trade surpluses with the UK, Switzerland, Colombia, Sweden and Argentina. However, the balance between France and the latter three countries were close to zero (Cezar & Polge, 2020). Spain and the UK are other important countries to French trade in terms of CO_2 emissions. Spain contributed to 5% of the emissions embedded in French imports in 2015, and the UK received 7% of the emissions embedded in French exports in 2015 (Cezar & Polge, 2020).

More generally, Europe as a region accounted for the highest shares of imported and exported CO_2 emissions in 2015 (Table 8), when around 31% of the emissions embedded in France's imports originated from Europe (Cezar & Polge, 2020).

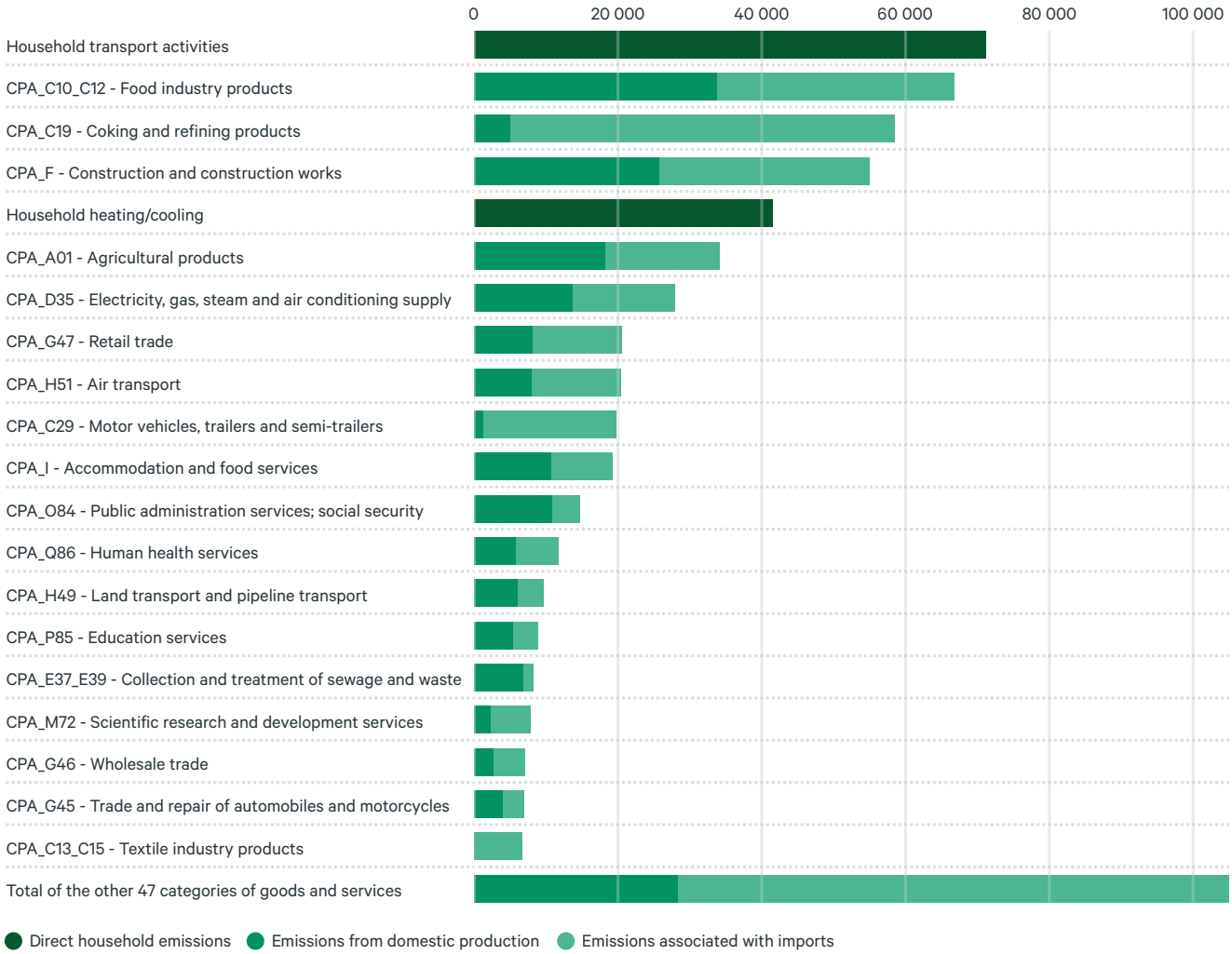
Emissions embedded in French exports can mainly be linked to transport equipment, basic materials, and transport storage sectors. Together, these sectors accounted for more than 30% of France's exported emissions in 2015 (Cezar & Polge, 2020). Other relevant sectors include chemicals and pharmaceuticals (around 8% of the exported emissions in 2015) and agriculture and mining (around 5% of exported emissions in 2015) (Cezar & Polge, 2020).

In 2015, around 45% of France's exported emissions originated outside of France (Cezar & Polge, 2020). China and Germany were the main contributors to foreign emissions in French exports in 2015, accounting for 8.5% and 4.5% of the emissions embedded in French exports, respectively (Cezar & Polge, 2020). The imported emissions from these countries can largely be sourced to the energy and basic metals sectors in both countries (Cezar & Polge, 2020). In the case of China, emissions from the energy sector refers to the energy being used to produce Chinese exports, while the basic metals sector is linked to directly exported products (Cezar & Polge, 2020).

Emissions embedded in imports

Breaking down France's carbon footprint by consumption item, as in Figure 32, highlights France's large dependence on imported goods and emissions. While French households' consumption of transport is the biggest contributor to the carbon footprint, all these emissions occur within France (blue and orange in Figure 32) and are therefore not a matter of imported emissions (shown in grey). Meanwhile, emissions related to construction work, the fourth biggest contributor to the national carbon footprint, includes more than 50% imported emissions.

Figure 32. Breakdown of the French 2019 carbon footprint by product, in kilotonnes of CO_2equivalent



Source: SDES, 2022a

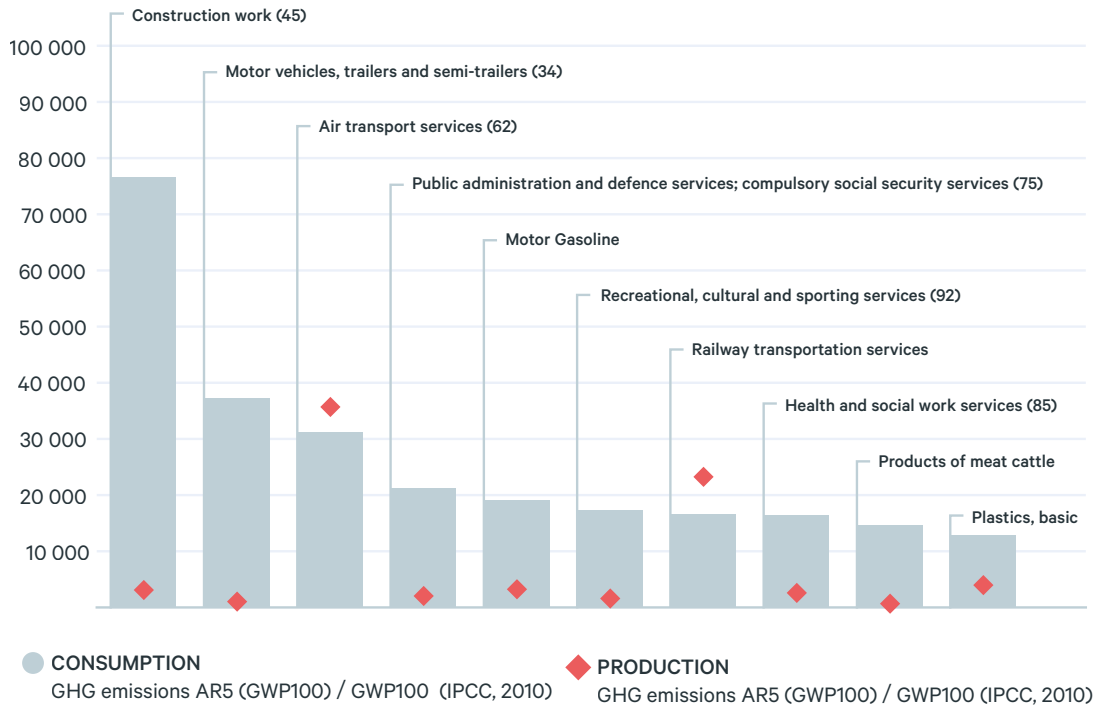
A review of the carbon intensity of the 20 most CO_2-intensive products per Euro of domestic final demand value added[3] in 2014 shows that the carbon intensities of products produced in France is generally lower than imported products (SDES, 2022a).

3 Domestic final demand "corresponds to the consumption of goods and services by households, public administrations, non-profit institutions serving households and investments", excluding exports (SDES, 2022a) (SNBC 2).

This is largely due to the relatively low carbon intensity of electricity production in France and the importance of services in the French economy, where almost 80% of jobs are connected to the services sector, compared to just over 2% in the primary sector and 18% in the secondary sector (SDES, 2022b). Analysis by the Ministry of Ecological and Solidary Transition (2020) has suggested that the relocation of activities from abroad to France is a lever for reducing the French carbon footprint. While it would lead to an increase in domestic emissions from more activities occurring on French territory, these would be at a lower emissions intensity.

Figure 33 shows production and consumption emissions for the 10 products with the highest consumption emissions in France in 2022 figures from EXIOBASE for the year 2022 (representing 46% of total consumption-related emissions in France). These 10 categories include both final and intermediate sectors. For example, the construction sector relies heavily on the sourcing of raw materials, machinery and services from abroad. This accounts for a very high volume of CBEs compared with production-based emissions, which take place in France. The same phenomenon can be seen in other categories such as motor vehicle manufacturing and service activities. The volume of CBEs is particularly high in sectors that use a lot of raw materials.

Figure 33. Production and consumption emissions for the 10 products with the highest consumption emissions in France in 2022, kt CO_2e



Source: EXIOBASE

Governance and high-level policy frameworks, targets and main actors

Apart from the climate targets enshrined in their Energy and Climate Law, France has several legal frameworks addressing CBEs, including national low-carbon strategies and a Climate and Resilience Law. This section will give an overview of these frameworks.

France's National Low-Carbon Strategy version 2 (SNBC-2)

Introduced by the Energy Transition Law for Green Growth (LTECV), the SNBC is France's roadmap for fighting climate change. The second version of this strategy (SNBC-2) has two main objectives: to achieve carbon neutrality by 2050, and to reduce the carbon footprint of French consumption (Ministry for the Ecological and Solidary Transition, 2020). Without going so far as to determine proper carbon footprint targets for the country, the SNBC-2 incorporates the notion of France's carbon footprint as a "transversal orientation". This involves reducing emissions linked to French consumption of domestically produced and imported goods and services, including international transport (Ministry for the Ecological and Solidary Transition, 2020). The outlined strategy consists of two levers:

Promoting global climate ambitions, particularly those of France's trading partners, to encourage them to reduce their domestic emissions. The SNBC-2 considers that instruments such as carbon markets or carbon taxes are particularly interesting for this purpose.

Favouring domestic production if it emits less, and preventing the risks of carbon leakage that may occur when production facilities relocate to regions with less stringent climate regulations.

The strategy is further broken down into three guidelines, as illustrated in Table 9.

Table 9. Guidelines for France's National Low-Carbon Strategy (SNBC).

EC1. Better control of the carbon content of imported products	EC2. Encourage all economic players to better manage their carbon footprint	EC3. Encourage citizens to better manage their carbon footprint
Advance carbon pricing worldwide. Promote Europe's border pricing mechanism (CBAM). Use EU trade agreements to encourage partner countries to adopt ambitious climate policies. Impose the same eco-design constraints on imported products as on goods produced in the EU.	Take scope 3 into account in companies' greenhouse gas emissions assessments. Systematically communicate the carbon content of products and services sold (environmental labelling). Develop the use of carbon footprint calculation tools by all stakeholders. (companies, consumers) Harmonize calculation methods.	Regulate advertising. Promote individual footprint calculators and support citizens in their own low-carbon transition. At individual level, several footprint calculators already exist (e.g. Nos Gestes Climat, MyCO$_2$), and a project to harmonize their calculation methods is under way under the aegis of the Directorate General for Energy and Climate (DGEC).

Finally, the SNBC-2 provides for three categories of monitoring indicators: two relating to the EC-1 and EC-2 guidelines, and one relating to results. The SNBC-2 does not provide monitoring indicators for EC-3 . The monitoring indicators for each guideline are presented in Table 10.

Table 10. Monitoring indicators related to the carbon-footprint orientation of the SNBC-2 for guideline EC-1-EC-3

EC-1 orientation indicators	EC-2 orientation indicators	EC-3 orientation indicators	Performance indicators
• Emissions associated with imports • Share of global emissions covered by a carbon price • Greenhouse gas emissions trends of France's main trading partners or mitigation targets of France's main trading partners (national contributions to the UNFCCC – NDC)	Number of greenhouse gas emission reports including scope 3	No orientation for EC-3	• France's carbon footprint • Territorial greenhouse gas emissions

Source: Ministry for the Ecological and Solidary Transition, 2020

The levers of the SNBC-2 echo the recommendations by the High Council of Climate (HCC – see "main actors", below). However, the SNBC-2 is merely a normative document and has no value in terms of law enforcement. Each guideline may not have a corresponding law that enforces its implementation.

France's National Low-Carbon Strategy version 3 (SNBC-3)

The Energy and Climate Law (LEC) from 2019 provides the legal framework for France's energy and climate policies. With the LEC, France has put in place an indicative cap on France's carbon footprint from 2022, as well as for international transport (Law No 2019-1147, 2019). The third version of France's National Low-Carbon Strategy (SNBC-3) complements the LEC by offering a more detailed roadmap and specific strategies to achieve the objectives outlined in the law. The SNBC-3, whose public consultation is scheduled for the end of 2024, will include indicative carbon footprint reduction caps over consecutive five-year periods starting from the period 2019–2023 (as specified in article 222-1 B of the Environment Code), in addition to territorial emission reduction targets.

Climate and Resilience Law

In 2021, France adopted a Climate and Resilience Law, aimed at their 2030 climate target of reducing greenhouse gas emissions by 40% (Jousseaume, 2022). The law is structured to reflect proposals from the Citizens' Climate Convention, established after the "yellow vests protests"[4] and mandated to propose measures to achieve the 2030 climate target (Vie publique, 2020, 2021). It contains decrees centred around consumption patterns and diet, production and work models, travel, housing and land artificialization, and criminal sanctions of ecocide (Vie publique, 2021). It should be

4 The Yellow Vests Protests, or Yellow Jackets Protests, are a series of grassroots, weekly protests in France that began on 17 November 2018. The movement was initially motivated by rising crude oil and fuel prices, high costs of living, and economic inequality.

noted that the Climate and Resilience Law further states a commitment to the EU target of greenhouse gas emission reductions of 55% by 2030 (Vie publique, 2021).

Main actors

The Directorate General for Energy and Climate (DGEC), the administration responsible for the SNBCs, is also monitoring and using the work done by Statistical Data and Studies Department (SDES), because it is closely linked to that of the SNBC. In addition, a dedicated working group now exists within the DGEC to model France's carbon footprint and define targets for the SNBC.

The SDES is attached to the French General Commission for Sustainable Development (CGDD) and is mandated by law to offer statistical services to several French ministries, including the ministries for environment, energy, housing and transport (SDES, n.d.). It further acts as the French national statistical authority in correspondence with the European statistical system Eurostat, and other international organizations (SDES, n.d.).

The High Council of Climate (HCC) is an independent body of experts that was established by a decree in 2019. Its members are chosen for their expertise in the fields of climate science, economics, agronomy and energy transition. They are tasked with issuing advice and recommendations to the French Government on the delivery of public measures and policies aimed at reducing France's greenhouse gas emissions. It is also responsible for annually reporting on France's emission reduction progress, the coherence between national policies and the national climate targets, SNBCs and international pledges, as well as issuing recommendations on policies to achieve France's climate targets (High Council on Climate, n.d.).

Citepa (Technical Reference Centre for Air Pollution and Climate Change) is responsible for compiling and analysing data related to air pollution and greenhouse gas emissions in France. It provides expertise, research, and data to support environmental policies and decision-making (Citepa, 2024). The organization works closely with the CGDD and the SDES within the Ministry of Ecological Transition (MTE) to gather and disseminate accurate information on emissions, monitor environmental trends, and assess the effectiveness of environmental policies.

Enablers: policy measures and initiatives to address consumption-based emissions

In addition to the overarching policies and targets mentioned above, this section outlines some of the policies and measures implemented at the sectoral level.

At the French national level, the Climate and Resilience law has introduced a number of policies to reduce the French domestic emissions. A few of them also aim directly at reducing imported emissions. Some of the existing policies are detailed in the following sections.

Transport

On passenger road transport, the *Code des transports* has been revised to promote the development of park-and-ride schemes (Ministry for the Ecological Transition, 2021). The Climate and Resilience Law further introduces low transport emission zones to urban areas with more than 150 000 inhabitants (Ministry for the Ecological Transition, 2021). Moreover, under the Climate and Resilience Law, domestic flights for which a corresponding train journey would take less than 2.5 hours were prohibited as of May 2023 (Euronews, 2023; Ministry for the Ecological Transition, 2021).

Food

On food, the Climate and Resilience Law mandates public and private schools to serve a vegetarian option at least once per week (National Research Institute for Agriculture, Food and Environment, 2023). Moreover, by 2025, both public and private catering firms will be obliged to offer 50% of food products with a sustainability or quality certification, of which 20% must be organic (Ministry for the Ecological Transition, 2021).

Housing

Commencing in 2025, the Climate and Resilience Law mandates that landlords cannot raise rents unless they undertake the necessary energy renovation work. Specifically, it prohibits the rental of housing units with an energy performance rating of class G. Furthermore, the rental of units with performance ratings of classes F and G will be prohibited starting from 2028, unless renovated (Law No. 2021-1104, 2021). There is a "MaPrimeRénov'" state aid for households to carry out home renovations to improve their energy performance (Ministry of the Economy, Finance and Industrial and Digital Sovereignty, 2024).

Consumption of goods and services

In 2024, the French parliament approved a bill on introducing a penalty on fast-fashion clothing articles by 2030, together with a ban on advertisements of fast-fashion companies, to offset their environmental impact (Vie publique, 2024). Under the French law on anti-waste for a circular economy, adopted in 2020, repair bonuses are further offered for electrical and electronic devices (Directorate for Legal and Administrative Information, n.d.).

Recommendations by the High-Council on Climate (HCC)

In October 2020, the HCC published the report Tackling France's Carbon Footprint in an effort to bring France's carbon footprint to the attention of the French government. The report provides an overview of emissions associated with France's international trade and a carbon footprint analysis in support of a strategy for reducing France's carbon footprint. The HCC proposes to establish a carbon footprint reduction trajectory, in line with the commitments to carbon neutrality by 2050. This trajectory involves reducing the French carbon footprint by 37% by 2030, and by 80% by 2050 compared to 2005 (High Council on Climate, 2020). For imported emissions, the proposed trajectory involves a reduction target of 27% by 2030, and a 65% reduction by 2050 compared with 2005, taking all greenhouse gases into account (High Council on Climate, 2020). It should be noted, however, that these targets were estimated in 2020 when the latest carbon footprint methodological revisions had not yet been carried out. See Table 11.

Table 11. the HCC's recommended trajectory for France's carbon footprint , compatible with limiting global warming to 1.5°C

	Emissions (metric tonnes of CO_2e per capita)			Reduction compared with 2005	
	2005	2030	2050	2030	2050
Imported emissions	5.0	3.7	1.8	-27%	-65%
Territorial emissions, excluding exports	6.3	3.4	0.6	-46%	-91%
Carbon footprint	11.3	7.1	2.3	-37%	-79%

Source: High Council on Climate, 2020

In its report, the HCC further recommends four levers for taking direct action on France's carbon footprint.

The first lever involves adapting industrial strategies in France. This means adapting production methods while avoiding the risks of massive relocation, because a large proportion of France's imported emissions come from the import of goods and services by French companies (High Council on Climate, 2020). Here, the role of individual and collective action by companies is highlighted. Economic players must control their direct and indirect emissions (scopes 1, 2 and 3), both individually and collectively, in co-construction within their sectors (High Council on Climate, 2020). Environmental labelling of consumer products is one way of changing production methods by redirecting demand towards less carbon-intensive solutions (High Council on Climate, 2020).

The second lever highlighted by the HCC is the communication to households of the climate footprint of the products they consume. Emissions linked to household consumption account for a significant proportion of France's carbon footprint. However, households are not sufficiently informed about the emissions contained in the goods and services they buy. The introduction of a carbon score, for example, would make it possible to inform consumers about the impact of products on the climate. However, individual actions by households cannot replace structural action by society as a whole (High Council on Climate, 2020).

The third lever is to promote measures to reduce imported emissions at the EU level. To this end, the HCC promoted two avenues. The first, CBAM, is already in place, which gives a price signal for goods imported by the EU. The second is to transform trade agreements to make them compatible with climate goals (High Council on Climate, 2020). For example, all new free-trade agreements could be accompanied with an assessment of their climate impacts (and in particular on imported deforestation), or even a requirement for the trade partner to adopt a significant commitment to reduce its greenhouse gas emissions. EU free-trade agreements could then be transformed into tools of climate diplomacy (High Council on Climate, 2020).

The fourth and final lever for reducing France's footprint suggested by the HCC is to direct France's international cooperation towards strengthening its commitments under the Paris Agreement. As countries' current commitments are insufficient to limit

temperature rises to 1.5°C or 2°C, France needs to play its part, through diplomatic channels, in raising the ambitions of other countries. In particular, the French development agency can play a major role in this (High Council on Climate, 2020).

Monitoring and follow-up

Calculating France's carbon footprint is essential to France's climate strategy, as it complements the national inventory data from Citepa (Citepa, 2024). The carbon footprint calculation enables a broader assessment of the impact of French consumption on climate, particularly through imported emissions.

Since 2013, France's carbon footprint has been calculated by the Statistical Data and Studies Department (SDES) for France's Ministry of Ecological Transition (MTE). Annual reporting of the carbon footprint has been done since 2018. This work does not respond to a governmental request: it is a self-referral. The SDES now works closely with the French National Institute for Statistics and Economic Studies (INSEE) to facilitate data transmission and calculation quality (Insee, 2024). A dedicated position has existed at INSEE for this purpose for one year. The aim is to produce joint analyses between SDES and INSEE.

The SDES carbon footprint calculation methodology is based on the combination of two types of data sets: symmetrical input-output tables from the national accounts, supplied by INSEE, and Environmental accounts of greenhouse gas emissions broken down by branch of activity, according to the French nomenclature of economic activities (NAF) (SDES, 2023a). The environmental accounts are supplied by the Citepa, through its air emission accounts AEA.

This methodology has been enriched over the years. Following the 2020 HCC report on Tackling France's carbon footprint, a technical working group made up of various experts, including the French General Commission for Sustainable Development, the General Directorate for Energy and Climate, HCC and Carbone 4, made an assessment of the carbon footprint calculation methodology, examining the potential to base the input-output calculations on a multi-regional input-output model (MRIO) instead of the current single-region input-output (SRIO) table (SDES, 2023a). While a switch to MRIO was not deemed feasible at the time, a significant methodological improvement was nevertheless incorporated by the SDES (SDES, 2023a). This improvement allowed for a more precise estimation of the greenhouse gas intensities of these products from extractive activities according to the country of extraction, and corrections of price effects linked to the volatility of crude oil prices (SDES, 2023a).

The most recent calculations made by the SDES adjusted the greenhouse gas emission intensities of exporting countries according to their economic and technical characteristics (e.g. carbon content of electricity, greenhouse gas emission intensity of value added in the various sectors). Carbon intensities of non-EU countries were adjusted by using data from the International Energy Agency (IEA) and the Food and Agriculture Organization (FAO). Imports from the EU have been estimated using an input-output table provided by Eurostat.

France's carbon footprint has thus been calculated for 1995, 2000, 2005 and for all years between 2010 and 2019. For the last three years (2020, 2021 and 2022), the IO tables required for the calculation are not yet available. An estimate has therefore been made until all the data are available. At this stage, only three gases are included in the carbon footprint result (CO_2, CH_4 and N_2O). Eventually, it is planned to include fluorinated gases and emissions from land use, land-use change and forestry (LULUCF).

It should be noted that, although ruled out in the assessment made in 2021, the switch from an SRIO to an MRIO using the FIGARO database is under way and should see the light of day in 2024. The calculations forward will therefore be based directly on a multilateral approach, using a global loop model. MRIO models consist of a set of IO tables (as many as there are countries or groups of countries under consideration) linked together by harmonized international trade statistics, describing foreign trade between the different countries or groups of countries under consideration.

Relevant networks and initiatives

In 2020, a report was published as part of a research agreement between the French Observatory of Economic cycles (Observatoire Français des Conjonctures Économiques, OFCE) and the HCC, on the contribution of imported emissions to France's carbon footprint (Malliet, 2020b). This document explores the relationship between the private final consumption of French households and the French carbon footprint. It underlines the disassociation between emissions linked to production and consumption, by highlighting the differences between the results provided by using different existing databases.

The report shows that results of using the EXIOBASE 3 database differ from the SDES's results for the year 2022 (Malliet, 2020b). On the same scope as the SDES, of only accounting for CO_2, CH_4 and N_2O, the EXIOBASE-based carbon footprint is estimated at 614 $MtCO_2e$ for 2022, whereas it is 623 $MtCO_2e$ according to the SDES 2022 estimate (Malliet, 2020a). The differences between EXIOBASE and SDES stems from the economic IO-tables on which the calculations are based. There are also different approaches to calculate and harmonize international trade and estimate environmental impacts.

There are also other initiatives on different "microeconomic" carbon footprint calculation tools designed for the public, using different methodologies. Public initiatives, such as ADEME focus mainly on national estimates, using figures produced by SDES (ADEME, 2024). Apart from ADEME, there are also private initiatives, such as the $MyCO_2$ initiative by Carbone 4 (Carbone 4, 2023) or the Good Planet Foundation (GoodPlanet Foundation, 2024).

Practitioners' views on challenges, opportunities for acceleration and monitoring

Four interviews with practitioners were conducted to inform the French case study on CBEs. Insights from the interviews are detailed in the following sections, highlighting the opportunities for and barriers to curbing CBEs in France, together with the

interviewees' views on targets and monitoring practices. Table 12 in Section 5 provides an overview of the opportunities and barriers identified by practitioners in all three case study countries, facilitating comparison.

Opportunities to address consumption-based emissions

The interviewees highlighted the power of regulations and standards to reduce emissions, in addition to market mechanisms, such as taxes and quotas. For example, the European I (Corporate Average Fuel Economy) standard has made it possible to reduce the average carbon intensity of new vehicles by 20% from 2021. This standard has the advantage of directly modifying supply, and indirectly influencing consumer demand. France's Climate and Resilience Act, which bans the leasing of heating systems, is another example of effective regulation, but it needs to be backed up by appropriate financial support.

The interviewees highlighted other potential measures to take. These include targeted advertising, such as bans on certain product categories, eco-conditionality of advertising, or the narratives conveyed (for example banning a car advert if the images do not show a carpooling situation, as one of the interviewees suggested). Current environmental labelling policies were also seen as key by some respondents, although these consumer information measures are potentially too lax.

In France, reindustrialization (i.e. the relocation of industrial capacities into France) also appears to be a solution to the interviewees – although not the only one – to reduce import-related emissions. Programs such as France Relance[5] and France 2030[6] were raised as two examples of policies being implemented in this direction.

Our interviews suggested that the involvement of European bodies is a crucial factor in making the calculations of CBEs more widespread and standardized. This would also make it possible to set carbon footprint reduction targets on this scale. Moreover, at the European level, the introduction of CBAM and EU-ETS appears to the interviewees to be a first step towards taking better account of environmental impacts of French consumption. Their impact will have to be assessed in the long term, once CBAM is extended to more product categories, such as semi-finished or finished products.

Barriers to addressing consumption-based emissions

One interviewee also raised the risk of certain policies aimed at changing consumer behaviour of being perceived by the public as anxiety-provoking and moralistic. To limit the risk of fracturing the population, the interviewee suggests that policies aimed at transforming supply could be favoured. Nevertheless, the interviewee also recognized

5 The economic recovery plan for France from 2020–2022 (or France Relance) is a program implemented by the French government to revive the French economy following the Covid-19 pandemic.

6 France 2030 is a future investment plan of EUR 54 billion over five years, announced by the President of the Republic, Emmanuel Macron, on October 12, 2021, at the Elysée. The goal is to catch up on France's lag in certain industrial sectors, invest in sustainable development, and commit France to the mastery of common spaces (digital, outer space, ocean depths).

the importance of direct incentives to limit consumption of certain greenhouse gas-intensive products, such as flights, telephones or televisions.

One interviewee mentioned a challenge related to how monitoring is communicated. The release of the latest carbon footprint figures is eagerly awaited, but also the most uncertain. Another interviewee stated that international, and especially European, cooperation is key for effective monitoring. At this stage, however, it appears to the interviewee to be underdeveloped. The interviewees stress that initiatives must emerge to ensure that EU member states take better account of their carbon footprints. What is more, it was suggested that closer collaboration and sharing of data between countries would enable a refinement of the carbon footprint calculations. One interviewee suggested establishing a European-level framework for calculating carbon footprints, possibly involving existing agencies (e.g. Eurostat, EEA) or creating a new one. Another interviewee pointed out the complexities of individual efforts due to the interconnected nature of carbon data, suggesting that pooling resources is essential, although progress on this at the EU level is slow. Additionally, the importance of the European Commission in enhancing climate and energy reporting was noted by another interviewee, with a call for more standardized methods in measuring and reporting carbon footprints.

Targets and monitoring practices

During the interviews, various strengths of the French approach for calculating CBEs were highlighted. One of the strengths is that it is a simple method to start with, which has enabled regular calculations to be made since the early 2010s. Additionally, as indicated above, there are several working groups and private and public initiatives in France focused on carbon footprints. Two interviewees praised the existence of these working groups, as they contribute to enhancing the quality of the calculations made, by providing varying points of view and enabling frequent methodological evolutions. Furthermore, the existence of simulators for calculating individual (“microeconomic”) carbon footprints has made it possible to raise public awareness of these issues and foster the emergence of a public-private expertise in France. What is more, these simulators are often easy to use and free of charge. More generally, the availability of external expertise, independent of the Ministry, is an asset for improving carbon footprint calculations. Finally, France is likely to be the first European country to integrate the MRIO FIGARO (by 2024) into the calculation of its national carbon footprint.

The interviewees raised several recommendations and challenges related to the monitoring of CBEs. Relying on European work on the FIGARO, MRIO is deemed essential to ensure consistency in member states’ methods because the FIGARO model is based on national data. At least two of the interviewees mentioned that the imminent use of FIGARO to calculate France’s carbon footprint will enable numerous improvements. For example, it will be possible to map supplies right up the processing chain, and thus trace the origins of the raw materials used. The interviewees perceive this as an opportunity to provide a more accurate picture of the import dependency of certain sectors. EXIOBASE is seen by the interviewees as an interesting tool for assessing carbon footprints, but for research purposes rather than statistical calculations. The interviewees emphasize that the EXIOBASE model is more exhaustive and complete, but it is built on numerous estimates, and depends on research funding

whose sustainability is unknown, unlike FIGARO which is financially supported by the EU. This instability is considered insufficient by the interviewees to regularly and accurately update a country's carbon footprint.

The interviewees further highlight the importance of harmonizing the calculation methods used by individual carbon footprint simulators, using the microeconomic approach, both with each other and with the macroeconomic calculations carried out by SDES. Although these two types of calculations are quite different, it seems essential for the interviewees to harmonize them for reasons of communication and rigour. One interviewee also pointed to the vocabulary being confusing because the term "carbon footprint" is used both for the microeconomic and the macroeconomic approaches.

Other calculation improvements were suggested during the interviews. First is the inclusion of fluorinated gases in the carbon footprint calculations. They are currently included in Citepa's national inventory data, but the data provided by the IEA and the FAO for foreign countries does not include it. The second improvement suggested by the interviewees is the inclusion of emissions from imported deforestation, which are currently not accounted for. Global accounting on this subject still seems inadequate, but working groups are already looking into this issue with a view to integrate it in the future. The third suggestion proposed by the interviewees involves breaking down the carbon footprint by income or lifestyle. This is seen as a useful indicator to guide public policy according to the interviewees. Initial research has already been carried out by OFCE (Malliet, 2020b) and the interviewees see a possibility to implement this indicator in the national carbon footprint in the future, by using surveys for example. Lastly, the interviewees suggest integrating new modules into the FIGARO model, such as EXIOBASE extensions, as it would allow the inclusion of multiple greenhouse gas emissions and in time possibly also other indicators.

5. Comparative analysis of case studies: unveiling patterns and insights

In the following sections, we analyse and compare the findings from the three case studies around the following themes: targets and statistics on households' consumption-based emissions (CBEs), governance and high-level policy frameworks, enablers, monitoring and follow-up, relevant networks and initiatives, and challenges and opportunities perceived by the interviewees. We also reflect briefly on our findings from the sections on CBEs and policy frameworks within the EU as a whole.

5.1 Key consumption-based emissions trends, opportunities and barriers within the EU

Findings clearly show that the environmental impact of the EU extends beyond its borders and highlights the importance of considering CBEs in addition to territorial emissions when assessing EU households overall environmental footprint. Also, the fact that the levels of emissions vary across different consumption categories and member states sheds light on the importance of analysing consumption hotspots and trade dynamics. Average household CBEs varied across member states and ranges from 11 tonnes CO_2e per capita (Denmark) to 4,6 (Slovakia) in 2021. Findings also point out the substantial difference in the levels of CO_2 emissions embedded in trade across EU countries with some having negative and other positive trade balances. These variations highlight diverse consumption patterns and socio-economic situations as well as trade dynamics among EU member states, underscoring the importance of understanding and addressing these differences in developing targeted policies and strategies to reduce CBEs across the EU.

Hotspot consumption categories appear similar across most member states, with food consumption on average generating the highest CO_2e emissions per capita; followed by housing and then mobility. Food is also the category that shows the lowest variation among member states in terms of emissions per capita, while appliances is the category with the largest variation.

These variations in both per capita emission levels across consumption categories and member states underscore the importance of understanding the specific drivers of emissions in different sectors and regions. Based on an understanding of variations, policymakers can tailor interventions and strategies to address the unique challenges and opportunities related to CBEs in each member state, ultimately contributing to more targeted and effective emission reduction efforts across the EU.

Barriers to a better understanding and for establishing more comprehensive policy measures involve a lack of standardization in the methods used to measure consumption-based impacts within EU institutions, leading to inconsistencies in data availability and interpretation. Some databases, such as the FIGARO database, currently have limitations in providing comprehensive estimates for a broader range of greenhouse gases, making detailed comparisons between consumption-based and

territorial emissions more difficult. The complexity of methods used to measure CBEs and the contrasting narratives between consumption-based and territorial emissions can pose challenges for policymakers and stakeholders in interpreting the data effectively.

There are however promising opportunities to establish a standard, centralized approach to CBEs accounting in the EU, which could improve consistency of data availability and support target-setting and policymaking at both the member state and EU levels. Overall, the results underscore the significance of monitoring CBEs in the EU and the potential for more informed decision-making through enhanced data analysis and communication strategies.

Policymakers and stakeholders could benefit from a concise overview and comparison of the different methods and data to better understand how CBEs data can effectively inform policy. Updates to databases like FIGARO to include a broader range of pollutants would enhance the accuracy and comprehensiveness of CBEs estimates, facilitating more robust analyses and decision-making processes.

To address EU consumption hotspots, it is essential to analyse data on the EU's imports and exports of greenhouse gases. Focusing on trade with countries or regions from which the EU imports the highest volume of emissions embedded in goods and services can reveal key trading partners with significant environmental impacts. Current limitations in public statistics hinder the assessment of consumption categories or products from smaller trading partners. By delving deeper into these aspects, we can gain valuable insights into EU consumption hotspots and trade dynamics related to CBEs and deploy this knowledge to encourage trade partners to reduce greenhouse gas emissions associated with their exports.

5.2 Consumption-based targets and statistics in the three case studies

National targets for consumption-based emissions

None of the case study countries have targets in place for household CBEs. Nevertheless, they have all expressed intentions to enact such targets. The level of progress in setting targets for CBEs varies between the countries, as indicated by their respective commitments. Similarly, no quantitative targets exist at the EU level and while the European Parliament has tabled a report recommending such targets, the policymaking process requires all European institutions to agree to put forward a binding proposal on member states.

So far, France stands out with the most ambitious commitments. Under its 2019 Energy and Climate Law, France aims to outline a reduction trajectory for its carbon footprint, incorporating indicative carbon budgets for each five-year period within their third national low-carbon strategy. The Denmark is reviewing the economic implications of setting a consumption-based target. Meanwhile, the Danish Climate Act states that efforts to reduce Danish emissions must avoid outsourcing of emissions, which establishes a good institutional set-up for consumption-based targets. The DCCC

has further recommended to the Danish government that indicative benchmarks for reducing CBEs are important for guiding Danish climate policy. Sweden had, until a change in Government in 2022, considered a proposal to establish a target for CBEs. While the proposal previously had broad political support, all but two elements have been shelved. Ongoing investigations are limited to more stringent climate requirements on Swedish public procurement, and the climate benefits of Swedish exports.

There are differing perspectives on the need for robust data in setting targets for CBEs, identified in both the EU and the case study sections. On one hand, there is a recognized need for sound data systems and sources, while on the other, target-setting is suggested to provide incentives and investment necessary to develop data systems. As our case studies show (see section 4), an increasing number of municipalities in Europe have established sub-national targets for CBEs, demonstrating a will to take action to address CBEs. Alongside the process of improving methods and quality of the data, EU institutions, agencies and policymakers could learn from the experience of municipalities by drawing on well-established practices for dealing with uncertainty in the modelling projections that underpin long-term target-setting for territorial emissions in the EU and member states.

National statistics on consumption-based emissions

As each case study country uses different methodologies for calculating CBEs, the reported results are not fully comparable. Instead, this analysis examines the development of each case study country's CBEs over time. It also considers emission-intensive consumption categories and sectors, and important trading partners as indicators in the comparisons.

In all three case study countries, CBEs have reduced over time. But these reductions mask a general trend where domestic emissions have been gradually outsourced, resulting in a pattern of reduced domestic emissions and increased imported emissions over time. These developments indicate that, while each country has made progress on reducing their CBEs, there is a need for strengthened efforts to target CBEs that occur abroad. The expert interviewees also cite risks of one-sided progress on either territorial emissions or CBEs if emissions are not addressed comprehensively through, for example, a balanced focus on both CBEs and territorial emission targets.

Households' share of total consumption-based emissions

Household consumption makes up the majority share of the CBEs in all case study countries. These shares range approximately 85% in France, 63% in Denmark, and 60% in Sweden. *Transport, Food,* and *Housing* were the most emissions-intensive consumption categories among households in France and Sweden in the most recent statistics. For the case of Denmark, *Energy and utilities* was the third most emission-intensive category, after *Transport*, and *Food and beverages*. The overlap between the countries' hotspot consumption categories offers potential for the countries to collaborate and learn from each other when it comes to implementing national policies to curb CBEs. These overlaps also indicate a potential for addressing CBEs at a higher institutional level, such as the EU.

Looking at the shares of domestic and foreign emissions within household consumption offers a different perspective on the hotspots with the most emissions-intensive consumption categories. While housing constitutes a significant portion of French households' CBEs, it is primarily associated with domestic emissions. In terms of French CBEs occurring abroad, the categories of *Equipment (including appliances and clothes)* and *Commercial services* are the most emission intensive. The most recent Danish statistics show that the categories of *Household goods (including clothing)* and *Electronics* have the highest shares of emissions occurring abroad. Meanwhile, the categories where foreign emissions are dominant make relatively small contributions to the Danish households' overall CBEs, as is the case for France. In Sweden, the categories of *Food*, and *Others (including clothing and electronics)* have the highest share of foreign emissions. This distribution of emissions occurring domestically and abroad indicates that measures to reduce imported CBEs should not necessarily target the consumption categories with the overall highest emissions but should also consider the extent to which the categories depend on foreign emissions.

Trade

All case study countries are highly dependent on trade to satisfy their consumption demands. Out of the three countries, Sweden has the highest shares of CBEs embedded in imported products (60%), followed by Denmark (56%), and France (50%). While China stands out as an important import country for France and Denmark, Europe as a region was the main source of imports for all three case-study countries. In 2015, around 31% of the French emissions embedded in the import of goods and services originated from Europe. Out of the 2021 Danish CBEsol, 50% of emissions embedded in imports came from Europe (Danish Energy Agency, 2023d). Granular statistics on imports of Swedish imports and exports of goods and services are presented in monetary terms. These indicate that European countries formed the four main import partners of Sweden in 2022: Germany, Norway, the Netherlands, and Denmark. Concerning CBEs reduction benchmarks, member states have limited influence over production processes in exporting countries, something the Danish DCCC identified as a barrier. The significant proportion of imported emissions originating in Europe could, however, be an opportunity for EU-level actions to address this obstacle.

Sweden recently began monitoring the CO_2e emissions connected to country of origin for a wide range of product categories. In general, though, countries' national statistics on CBEs currently do not show details on the source country for each imported product category, it is therefore not possible to establish the main trading partners linked to household consumption categories. At the EU-wide level, China, Bangladesh and Turkey are the main suppliers of clothing products to the EU in monetary terms in 2019 (Eurostat, 2020). China, Taiwan and Vietnam were the EU's main suppliers of *electronics and telecommunications* products in 2022 (Eurostat, 2023a). However, to properly address CBEs, there is a need to address the lack of granular data on imported emissions on a product level.

When it comes to total emissions associated with exports, Denmark stands out: in 2021, its export-related emissions were almost twice the level of its CBEs. In the case of Sweden, exports corresponded to around 83% of Sweden's overall CBEs in 2021; and in France, emissions embedded in exports in 2019 made up around 20% of overall

CBEs. The case study countries' major trade partners for exports are concentrated in Europe. European countries received around 54% of the emissions embodied in the export of goods and services from Denmark in 2021, and around 40% of the embodied emissions from exported French goods and services in 2015. For Sweden, nine out of the ten largest recipients of Swedish exports, in monetary terms, were in Europe. On a country level, the US is an important trade partner outside of Europe, being the largest recipient of emissions embedded in exported goods and service from Denmark in 2021, and the second largest for France in 2015. For Sweden, the US was the third largest export country in 2022 in monetary terms.

Because a large share of the case study countries' imports and exports of goods and services take place in Europe, stronger European collaboration could be effective in curbing trade-related CBEs.

5.3 Governance: strategic and legal frameworks at the national level

As members of the European Union, Sweden, Denmark, and France are obligated to meet specific climate goals set out in the European Climate Law for the years 2030 and 2050. Each country has its own legally mandated national targets for reducing emissions within its borders. Sweden aims to achieve net-zero emissions by 2045; Denmark and France by 2050. They all also have intermediate goals for reducing greenhouse gas emissions by 2030 compared to 1990 levels. France's 2030 target will be adjusted according to the new EU Fit for 55 package. Sweden has also established specific objectives for sectors such as domestic transport, energy use in buildings, and food waste, though these are not legally binding.

National strategies and frameworks addressing CBEs vary in their presence and scope among the case study countries, either directly or indirectly. France has the most direct aspirations through its second revision of its national low-carbon strategy, the 2020 SNBC-2, which states an aim to reduce French people's overall carbon footprint. The 2020 SNBC-2 guidelines cover the carbon content of imports, and the carbon footprint of all economic actors. The strategy further emphasizes the importance of a just transition, by promoting targeted support to reduce inequalities (Ministry for the Ecological and Solidary Transition, 2020). France has further a Climate and Resilience Law, which includes several policies relevant for reducing CBEs. The Swedish Government's climate action plan also emphasizes the need to ensure a just transition. Previously, Sweden had a national strategy for sustainable consumption, launched in 2016, which included measures to drive changes in consumption behaviour. While the strategy is no longer active, several measures have been implemented. Danish initiatives aimed at reducing CBEs are primarily oriented towards Denmark's contributions to the Agenda 2030, specifically SDG 12 on responsible consumption and production, through national strategies on circular economy, a greener waste sector, and public procurement.

5.4 Enablers: policies and measures in place to ensure the fulfilment of targets at the national level

While none of the case study countries has targets for CBEs, they all have policies that are relevant for reducing households' CBEs. The listed examples in each case study section, on policies relevant for households' consumption of *transport, food, housing*, and *other goods and services* are non-exhaustive. Several of the French policies can be found under the French Climate and Resilience Law. Because the law is structured to reflect proposals by the French Citizen's Convention for Climate, its proposed policies can be assumed to have broad public support. For the case of Sweden, the newly appointed government implemented measures that counteract previous efforts to decrease the use of fossil fuels in transport. These decisions reflect considerations of public legitimacy and the belief that the transition should not impose unreasonable costs for individuals and businesses (Swedish Government, 2023b). These national policy developments highlight the importance of considering public acceptance and social equity when introducing measures targeting CBEs. Compared to Sweden and France, Denmark has fewer measures in place targeting the consumption of goods and services.

All three case study countries have similar institutional frameworks linked to their efforts to address CBEs. The responsibility for statistics and technical or policy-oriented tasks is distributed among various agencies. Additionally, each country has established climate councils, which offer independent advice and evaluate the government's actions in mitigating climate impact. Climate councils in France and Denmark propose strategies for curbing each country's CBEs. In France, these take the form of ensuring that the reduction of imported emissions, territorial emissions and the French carbon footprint follow a pathway consistent with limiting global warming to 1.5°C. Similarly in Denmark, the DCCC has proposed that the Danish government implement indicative benchmarks for reducing CBEs, and a series of concrete policies to reduce emissions mainly from Danish food consumption. The DCCC have, however, not undertaken any analysis to determine what the specific benchmarks should be. In Sweden, the Climate Policy Council's annual reports have consistently highlighted CBEs and the need for policies targeting behavioural change to address the consumption impact of goods and services (Swedish Climate Policy Council, 2024).

5.5 Monitoring practices at the national level

In all three case study countries, CBEs are monitored annually by different government agencies. Monitoring has been carried out in Sweden for the longest, around 12 years, closely followed by France, 11 years. Denmark has the shortest history of monitoring, starting just three years ago, following the requirements in the Danish Climate Act, adopted in 2019. Denmark is alone among the case study countries in requiring reporting on the country's global climate impact by law.

The monitoring is done by each country's central statistical authority in collaboration with other government institutions. The methods used to calculate the CBEs vary between the case study countries. Sweden and Denmark follow a similar approach,

using a top down MRIO model to link national statistics with the EXIOBASE database. However, minor differences exist in what the models include. For example, emissions from land use activities are included in the Danish statistics but not in the Swedish or the French. France's current method for calculating CBEs, using SRIO-based model, is less complex, where the emission-intensities of imported goods and services are adjusted using data from the IEA and FAO. France's current methods do not include the fluorinated gases, which the Swedish and the Danish models do. France intends to update their methodology to a FIGARO-based MRIO approach from 2024 onwards. Moreover, the governmental agencies in all three case study countries are developing enhanced methods for calculating their CBEs.

The methodological differences indicate that a more internationally harmonized approach for calculating CBEs could foster collaborative learning and facilitate higher institutional-level strategies for addressing CBEs including more comprehensive monitoring, comparisons between member states, and establishing benchmarks or targets.

There appears also to be a demand for data centralization and monitoring at the EU level. Through our case studies, we have identified an opportunity for enhanced central monitoring approaches by EU agencies to improve the consistency of available data for reporting CBEs across the bloc, and to support target-setting and policymaking, both at member state and EU levels. There remain different perspectives on the most suitable methods. Further action on a regional approach would require a deliberative process to identify the relative merits and the differing purposes and audiences for the methods, including FIGARO, MRIO modelling or bottom-up life-cycle accounting.

In addition to each case study countries' own monitoring efforts, various non-government initiatives also calculate CBEs using different methods. Some of these initiatives and networks have made significant progress in setting targets and promoting policies to address CBEs. This shows there is a robust knowledge base to draw from to further expand and enhance models. International collaboration could also be key to accelerating overall efforts to reduce CBEs.

5.6 Practitioners' views on challenges and opportunities in the three case studies

Findings from the expert interviews shed light on the common and distinct challenges that each case study country faces in addressing CBEs. They further provide insights on the opportunities to address the challenges at both national and EU-levels. The interview insights are presented below, structured after the themes of behavioural change and political will, national and international collaboration, leveraging existing EU initiatives, and targets and monitoring.

Table 12. Overview of interviewees' perceptions of opportunities (+) and challenges (-) for accelerating the transition to sustainable consumption in identified areas.

Sweden	Denmark	France
EU level monitoring		
+ Positions EU favourably on the global market + Drives transition at the global level + Builds on standardized methods + Demonstrates progress to the public and policymakers + Fosters transparency and accountability + Encourages sustainable consumption practices + Supports communication and acceptance + International collaboration – High-quality MRIO needed – Current monitoring limited to CO_2 emissions – Limited data availability – Limited data on supply-chain impacts	+ Improved data access with new EU directives + Useful for Denmark with high share of exported emissions – Lack of data availability – Lack of standardized monitoring methods	+ Harmonize methodologies + Strong role for the EC to propose new indicators – Lack of methodology harmonization – No breakdown of CBEs by income or lifestyle – Monitoring using Figaro limited to CO_2 emissions – Lengthy process to get monitoring standardization
EU level targets		
+ Advance policies and measures that address CBE + More efficient because of political sensitivities at MS level + Mandatory to report on CBEs and address in policy + Achieve the 1.5-degree target – Politics – Lack of standardized monitoring methods	+ Creates a level playing field for all member states + Facilitates policy developments + Incentivizes member states to act – Lack of monitoring standards	+ Set indicative targets before mandatory targets + Frequent measurement and monitoring at an EU-level – Currently no targets – Challenges in targeting CBEs from non-EU imports
EU level policy measures and regulations		
+ Subsidize environmentally friendly options + Reduce VAT for climate-friendly products + Help drive CBEs agenda at member state level + Opportunities for global impact + Use as inspiration for framing: Climate Law, Fit for 55, deforestation legislation + Make it more difficult to access environmentally harmful products + Lead by example by e.g. regulating advertising – Gaps in addressing behaviour change – Current subsidies for environmentally harmful consumption – Broad nature of SC challenge policy integration – Challenging to engage stakeholders across society	+ Leverage EU EcoDesign Directive, proposed use of Product Environmental Footprint methods , CBAM + Leverage EU Green Deal + Incentivizes member states to act + Incentivizes Denmark to address exported emissions + Offers guidance on where to direct efforts + Motivates actions targeting carbon-intensive sectors + Motivates actions in areas subject to taxation challenges and carbon leakage + Motivates actions in areas currently not addressed – Lack of available data is used as an excuse for inaction	+ Progress made via current regulations and standards: EU Corporate Average Fuel Economy (CAFE), CBAM, ETS + Targeted advertising and eco-conditionality of advertising – Addressing consumer behaviour perceived as anxiety-provoking and moralistic. – Limited coordination between EC, Eurostat, EEA and member states on the calculation of CBEs – Length of process to come up with new legislation.

Behavioural change and political will

A common theme raised in the expert interviews was challenges related to the behavioural change that is needed for addressing CBEs. Enforcing a shift to sustainable consumption practices is considered politically sensitive because such policies may be pervasively perceived as moralizing or intruding on peoples' private spheres. The Swedish interviewees pointed to the increased cost of living resulting from inflation and the energy crisis as a barrier, because households are less able to cope with the costs involved in some sustainable consumption choices, such as shifting to electric vehicles. In the Danish and Swedish case studies, interviewees highlight a lack of political will and agency as additional barriers for addressing CBEs. This could also be linked to a perception that it is considered politically sensitive to intervene in people's consumption patterns. One Swedish interviewee proposed that action on this at the EU level would be a more feasible approach for driving action in this area.

Interviewees from all case study countries suggest that education and awareness-raising are needed to facilitate shifts to more sustainable consumption, and to get more people on board without encroaching on people's private spheres. Environmental labelling and dietary guidelines were mentioned in the interviews as two examples of such efforts. However, such measures were not considered sufficient to ensure a shift in households' behaviour. Another effort, as mentioned by a Danish interviewee, was to raise public awareness about sufficiency and its link to improved well-being.

It appears that opportunities for addressing CBEs identified by Danish interviewees generally centre around a trust in people's willingness to change. Such approaches rely on broad public awareness of the need for behavioural change, with interviewees highlighting the potential for public education, particularly aimed at encouraging people to rethink their lifestyle aspirations. It should be noted that the context for the opportunities identified in the Danish case is one of relatively high public awareness and acceptance of the need to change behaviour, as demonstrated by a national survey, according to one interviewee.

The French interviewees, on the other hand, seem to have a more pragmatic view on ways to change individuals' consumption patterns. Suggestions focus on the supply side, using regulations and standards to modify the supply of goods and services as a way of indirectly influencing the consumer demand. Other suggestions included selective advertising or requirements promoting sustainable use of products.

The Swedish interviewees lie somewhere in between, recognizing that a multifaceted approach is needed. Some interviewees propose that greater awareness about how individuals can contribute to the global picture can have a behavioural impact. Others suggest that too much responsibility is put on consumers, and that changes in consumption behaviour needs to be guided by stronger policymaking. Regulation of advertising was suggested as an approach by Swedish and French interviewees. However, Swedish interviewees considered regulated advertising, such as banning ads on fossil-fuel intensive products, as too potentially sensitive to implement at the national level. Again, having the EU lead by example was seen as an opportunity to overcome such sensitivities.

Interviewees from all case study countries raise the importance of economic instruments, such as taxes, pricing and subsidies, for curbing CBEs. The Danish and French interviewees further emphasize the need to apply such instruments carefully, to not harm the poorest.

Trade, and national and international collaboration

Interviewees from all case study countries emphasize the importance of collaborative efforts to curb CBEs. There was broad agreement among the interviewees that the EU is the most effective level on which to make progress on CBEs. Danish interviewees, in particular, call attention to top-down measures to push member states to act, especially when it comes to tackling carbon-intensive sectors or emissions that currently are not covered by climate policies. Pushing CBEs higher up on the EU agenda could enable greater progress on addressing emissions embedded in imports and exports, considering that the bulk of case study countries' trade mainly takes place within the EU.

Working at the EU-level could also be key for addressing the trade aspects of CBEs. For example, one Swedish interviewee suggested that the EU could play a key role by demanding products produced without carbon emissions as a means to support other regions in transitioning their economies. This kind of demand could also enhance the EU's attractiveness as a trade partner for countries with low emissions in their production. Another Swedish interviewee suggests that it will be of strategic importance to produce, export and import goods and services produced at low or zero emissions, which is why sophisticated monitoring methods should be of interest for the EU.

In a Nordic context, the interviewees see potential to leverage existing networks to facilitate discussion and share insights. The strong interest in Sweden's calculation models for CBEs presents an opportunity for collaboration and standardized monitoring practices. In general, a stronger collaboration between countries could foster the development of more sophisticated calculation methods. One Swedish interviewee saw an opportunity to advance the sustainable consumption agenda at the Nordic level, for similar reasons to working at the EU level – so that individual countries can avoid sole responsibility for proposed initiatives and so overcome domestic political sensitivities.

Interviewees from all case study countries recognized the value of the multiple initiatives for calculating and addressing CBEs. This includes providing inspiration and positive examples, raising public awareness, driving action at the local level, and fostering expertise around monitoring methods. Collaboration and harmonization between official national monitoring and other initiatives, are deemed crucial for an effective change by the interviewees. Moreover, according to interviewees, aligning existing efforts with research presents an opportunity for better understanding how the emissions from goods and services are generated throughout their value chains.

Targets and monitoring

Interviewees from all case study countries consider EU-level efforts crucial to making progress on CBEs. While both EU-level targets and standardized monitoring are seen as key for progress at the EU-level, there were different views on the order in which these should be implemented: if a target fosters standardized monitoring that will be refined over time, or if standardized monitoring is the first step to setting a target. Several interviewees also pointed to the need to take a balanced approach for targets on CBEs (i.e. addressing both imports and exports): CBEs targets should be considered complimentary to targets for territorial emissions and could be set at both the national and EU-level, while overarching targets could be complemented by sub-targets.

Interviewees considered monitoring CBEs at the EU level to be important for bringing transparency and accountability. There was broad agreement on the importance of MRIO models for monitoring CBEs. However, as reflected in the current methods used to calculate CBEs in the case study countries, there is no clear choice on what database should be used. The French respondents prefer using FIGARO, because of its robustness in terms of funding and updates – a strength also recognized by Swedish and Danish interviewees. EXIOBASE, on the other hand, is considered more comprehensive, but it contains many estimates, and some data seems to be outdated. With the updates planned for FIGARO, as pointed out by one interviewee, it could be perceived as equally comprehensive. While several interviewees recognized the complexity of developing a sophisticated system for monitoring CBEs, the EU was deemed to be the right actor to undertake the task. Some interviewees also emphasized the importance of harmonization and consistency of monitoring methods within the EU.

Moreover, two Danish interviewees proposed measuring CBEs by sector, rather than overall greenhouse gas emissions, or using alternative measures to monitor progress on sustainable consumption, such as miles driven by vehicles or other activities. Regardless, standardized reporting necessitates official guidelines on what data to use and what to include. One Swedish interviewee suggested that the official guidelines should be developed in parallel with building expertise around the monitoring.

Leveraging existing EU initiatives

To reduce emissions from consumption, three types of sustainability strategies are often discussed: *improve, shift* and *avoid* (see e.g. Akenji et al., 2021; Berg, 2011; Koide et al., 2021). *Improve* typically refers to improving production processes to mitigate less greenhouse gases. *Shift* refers to changing consumption practices by for instance switching from meat to fish or to an electric vehicle instead of a fossil fuel-driven car. Finally, *avoid* points to profound changes in consumption behaviour by, for instance, vacationing at home instead of flying abroad for vacation. These strategies differ in that they address different aspects of sustainability, where they are often also considered as either *weak* or *strong sustainability* (Lorek & Fuchs, 2019). Strategies focusing on improving production processes or shifting consumption patterns can be seen as strategies for *weak sustainability*, while strategies aimed at reducing

overall consumption and emphasizing profound lifestyle changes represent *strong sustainability* (Fuchs et al., 2021; Lorek & Fuchs, 2019; Spangenberg & Lorek, 2019). It is vital that both of these strategies are considered in designing effective pathways towards a low-carbon and just society.

From our review of the current policy landscape at the EU level for addressing consumption-based emissions, we observed a shift from primarily incentivizing government and industry sectors towards employing coercive policy measures applicable to a wider array of sectors, including retail and trade, as well as consumers directly. Where policies have directly targeted consumers and household-related emissions, our mapping shows that measures have historically been focused on less coercive consumer information measures (*weak sustainability*) such as energy efficiency labelling. There is also a large focus on sustainable waste management and measures to support an increase in the circularity of products, as well as standards connected to product longevity and repairability. Nevertheless, the main emphasis remains on policies aimed at enhancing production practices (i.e. *improved* or *weak sustainability*), rather than adequately addressing the imperative to shift and ultimately avoid household consumption (i.e. *strong sustainability*). Policies also need to ensure that green choices are more affordable. For example, currently it is often more expensive to take the train than to fly. Affordability will be critical for encouraging households to shift consumption practices.

Policy measures under the European Green Deal address consumption and consumers more directly, with pricing and standards that restrict the availability of products on the EU market with a higher carbon footprint, and this could still significantly contribute to mitigating household CBEs. Of the consumption-oriented policies identified in the EU policy mapping (see Section 3.1), two directly affect household consumption.

Firstly, the new Emissions Trading System for road transport and buildings will mean consumers are exposed to the price of carbon associated with fuels to drive vehicles and for heating or cooking in the home. The price signal to consumers and whether it will be sufficient to change consumer behaviour will remain uncertain until the scheme becomes operational in 2027 and trading in the market commences.

Secondly, the EcoDesign Regulation, currently provisionally agreed by EU institutions, will set requirements such as carbon footprint benchmarks for products placed on the EU single market. The unique product identifier contained in the Digital Product Passport will provide an unprecedented level of information on supply chains to ensure requirements are met and facilitate informed decisions by businesses and consumers. If adopted as agreed by the European Parliament and Council, the product groups and the requirements they must meet will be set out in delegated acts proposed by the Commission. This leaves a wide scope and some uncertainty about the stringency of requirements that will be applied, such as carbon footprints.

More stringent EU and member state policies such as carbon pricing and standards on carbon footprints require careful design and consideration of potential negative impacts on society. In Sweden, for example, an estimated 40% of the population are likely to struggle to cope with decarbonization policy in the transport and food sector, due to limited income, high dependence on cars, lack of access to public transport,

and long distances to public services (Dawkins et al., 2023). These policies need to be accompanied by EU and member state efforts to take account of the fact that different segments of the population have different abilities to cope with change (Dawkins et al., 2023). Research indicates that addressing risks to vulnerable groups in society and ensuring all groups have access to low-carbon goods and services requires comprehensive adaptive support. Adaptive support combines financial support and effective planning to diversify economies, alongside other strategies aimed at addressing non-financial impacts of the transition, such as community-level public investment in economic and non-economic infrastructure (Green & Gambhir, 2019; Strambo et al., 2022).

Despite some positive developments, such as those linked to the European Green Deal, there is still a lack of measures that address strong sustainability and support EU households to shift and avoid (see e.g. Akenji et al., 2021; Koide et al., 2021; Lorek & Fuchs, 2019).

In terms of the EU's role in driving the agenda on CBEs, we found that, overall, interviewees in all three case studies agreed there was a solid case for working with CBEs at the EU level. In particular, they referred to the established institutional frameworks for addressing CBEs at the EU level, encompassing both institutional structures and policy measures, even if the perception was that these are not yet adequate for mitigating CBEs in the EU. Moreover, the interviewees broadly see an opportunity to leverage existing initiatives to develop a more progressive framework for addressing CBEs under the European Green Deal, such as the EU Climate Law, the Fit for 55-package, CBAM, the EcoDesign Regulation, the CAP, as well as the global policy on Sustainable Consumption and Production.

Generally, several interviewees suggest that EU-level regulations could offer guidance to the member states on directing their efforts, given the broad scope of consumption. Additionally, an EU-level target, was suggested to provide an opportunity to implement policies in areas currently overlooked or prone to carbon leakage, such as the agricultural sector.

Of the consumption-oriented policy measures identified by interviewees, CBAM was most often identified as the EU measure with the potential to be further expanded. For now, it applies to imports of industrial products and ensure that the carbon price of imported industrial products is matches that of domestic production. CBAM does not apply directly to consumer goods and services (except for electricity), but the CBAM Regulation will be reviewed at the end of the transitional period in 2026 and could be expanded to other sectors and a wider application of associated indirect emissions. A broader application of CBAM would ensure that goods on the EU market are more uniformly exposed to the EU ETS carbon price, which should guide the market towards suppliers with lower emissions intensity.

6. Conclusions and recommendations

Mitigating greenhouse gas emissions is a global effort in which the EU has a crucial role to play in pursuing climate goals. The EU has been a leader in establishing ambitious climate targets and policy frameworks, but its consumption patterns continue to put pressure on the global carbon budget, particularly through its import of emissions embedded in goods and services. There is a unique opportunity for the EU to drive global climate action by advancing its efforts to address its consumption-based emissions (CBEs).

The EU could build on and address gaps in existing consumption-oriented policy measures to more effectively address households' consumption behaviour, in particular by working more with measures that emphasize the need to shift or avoid consumption as a complement to the current focus on efficiency measures in production. There is scope for recently adopted policy measures that apply carbon pricing and carbon footprint requirements to cover additional sectors, products, and services. More uniformly applied pricing and standards could drive behaviour change but would also require oversight of – and policy responses to – the potential impacts on vulnerable groups.

The EU has extensive trade connections both within and beyond Europe. With its large single market, the EU plays an important role in enacting production requirements to reduce emissions traded across and within its borders. Additionally, as awareness within the EU grows about the imperative to mitigate global emissions and take responsibility for CBEs, there is a need to closely monitor the embedded impacts in the EU's imports and impose requirements on exporting countries to reduce their production-related emissions. Furthermore, the EU must be mindful of that developing countries need support to transition to low-emission production methods. Thus, by adopting a more ambitious legislative framework for CBEs, the EU can not only reaffirm its commitment to the climate goals but also set an example for other nations to follow.

Tackling climate change on a global scale requires collaborative efforts. By assuming a leadership role, the EU can inspire other nations to adopt more stringent measures and accelerate the transition to a low-carbon economy. This is a major opportunity for the EU to shape international norms and standards, driving a collective response to the climate crisis.

Findings from the interviews suggest that the respondents expressed overall support for implementing targets for CBEs at the EU level. They highlighted that such targets could incentivize member states to act, ensure fairness and a level playing field among member states, and address taxation challenges at borders. Additionally, interviewees proposed that setting up standardized monitoring within the EU could serve as an initial phase in setting a CBEs target, creating transparency and facilitating comparisons between member states. At the same time, they emphasize that lacking data robustness should not be used as an excuse to impede action on and setting targets for consumption-based emissions.

In conclusion, not only is it imperative for the EU to boost its domestic efforts in lowering emissions, but it is also a key moment for it to drive change and leverage its influence on the global stage. By seizing this chance, the EU can position itself as a global leader in the fight against climate change, fostering a collective commitment to building a sustainable and resilient future for the entire planet.

6.1 Recommendations

Below, we set out 24 recommendations for what we consider to be essential steps for boosting EU and member state efforts to mitigate consumption-based emissions, and to position the EU as a frontrunner in the fight against climate change, driving a collective commitment to building a sustainable and resilient future for the entire planet.

Our recommendations aim to leverage identified opportunities and address identified barriers to scale up EU ambition on CBEs. The EU is the primary target for these recommendations; however, we also indicate where responsibility would be shared between the EU and member states in cases where policy competences overlap.

1. **Standardization efforts, data enhancement and targets**

- Establish a standardized approach to consumption-based emissions accounting across member states and EU institutions. This can ensure consistency in data collection and reporting and enable comparison to better track progress.
- Set mandatory annual reporting requirements for CBEs on member states to EU institutions, complementing existing reporting obligations.
- Establish short and long-term EU targets for consumption-based emissions, complementary to targets on territorial emissions.
- Invest in databases such as FIGARO to ensure that they provide robust, rigorous, and regularly updated data that allow a standardized approach to monitoring CBEs, and also include a broad range of indicators beyond CO_2 to support comprehensive consumption-based estimates.
- Build on the strongest features of the FIGARO and EXIOBASE databases and invest in a comprehensive database on imported and exported emissions linked to household consumption that discloses detailed statistics on traded products, country of origin, and associated environmental impacts.

2. **Policy frameworks**

- Design EU and member state policies and measures focused on promoting *strong sustainability* and consumption *sufficiency*, emphasizing not only shifts or efficiency gains in consumption but also the importance of consuming less overall.

- Complement existing EU and member state policy measures that target household consumption and associated impacts with more uniform carbon pricing and standards that restrict carbon footprints in products and services placed on the market. In doing so, consumption hotspots such as food, housing, and mobility should be prioritized.

- Adopt the EcoDesign Regulation (provisional agreement at the time of writing), and also put forward delegated acts specifying a wider range of product groups and requirements for them, such as limits on carbon footprints, based on science-based benchmarks.

- Consider expanding existing policies such as the Carbon Border Adjustment Mechanism to include more product groups and a wider range of indirect emissions so that the environmental costs of imported goods are appropriately priced based on their carbon footprint.

- Monitor the implementation of the ETS2 for road transport and buildings and its effects on household behaviour and fuel consumption, and consider adjusting it to maintain a meaningful carbon price and ensure that the Social Climate Fund is targeted to protect vulnerable groups.

- Monitor and expand EU and member state schemes such as the EU Social Climate Fund to protect vulnerable groups exposed to increased prices arising from consumption-oriented policies. For these schemes to contribute to policy acceptance and legitimacy, they must be well-targeted, sufficiently resourced and be complemented by wider programs to ensure all groups in society have access to low-carbon goods and services.

- Establish a focal point for CBEs in the European Commission, such as a Directorate-General responsible for guiding policy and action on CBEs across EU institutions and towards member states.

3. **Sustainable trade, transparency and development cooperation**

- Leverage the EU's global influence to drive international norms and standards by advocating for global initiatives that promote transparency in supply chains, encourage sustainable production methods, and hold exporting countries accountable for their environmental impacts.

- Foster partnerships with trading partners committed to sustainable production practices and low-carbon technologies to reduce the carbon intensity of imported goods.

- Enhance transparency of trade-flow data with EU trading partners to track the environmental and other impacts of imported goods and services to better target consumption hotspots such as food, housing and mobility.

- Engage EU trading partners to support the implementation of mechanisms for disclosing the carbon footprint of products and services placed on the EU market, as is required for CBAM registries and the forthcoming Digital Product Passport, to enable consumers and businesses to make informed purchasing decisions based on sustainable consumption practices.

- Encourage trading partners to adopt carbon pricing policies in line with the EU to create a level playing field and incentivize emission reductions throughout supply chains.

- Develop the Trade and Sustainable Development chapters of EU trade agreements, providing technical and financial support to address emissions associated with exports to the EU, especially those contributing to EU consumption hotspots.

- Provide capacity-building support to member states as well as developing countries to enhance their sustainable production practices and monitoring capabilities and promote sustainable trade practices that align with EU goals to reduce emissions.

4. **Communication**

- Create a space for member states to learn, share best practices and improve knowledge and capacity for monitoring CBEs and improving national policy frameworks.

- Develop clear and accessible communication to elucidate the climate impact associated with consumption, including transparent explanations of monitoring methods and data interpretations tailored for policymakers, businesses, and the public. Additionally, actively engage stakeholders in the development of these communication initiatives to ensure relevance and effectiveness.

5. **Research and innovation**

- Support research initiatives on improving data quality, and extend data coverage for new indicators to monitor consumption-based impacts on hotspot consumption categories, such as air travel and investments.

- Encourage research and innovation in monitoring practices, including the development of advanced tools and technologies for data collection, analysis, and visualization.

- Foster collaboration between research institutions, government agencies, and industry partners to drive continuous improvement in monitoring practices and data accuracy.

References

ADEME. (2024). ADEME, the French Agency for Ecological Transition. The French Agency for Ecological Transition. https://www.ademe.fr/en/frontpage/

Akenji, L., Bengtsson, M., Toivio, V., Lettenmeier, M., Fawcett, T., Parag, Y., Saheb, Y., Coote, A., Spangenberg, J. H., Capstick, S., Gore, T., Coscieme, L., Wackernagel, M., & Kenner, D. (2021). 1.5-Degree Lifestyles: Towards A Fair Consumption Space for All. Hot or Cool Institute. https://ora.ox.ac.uk/objects/uuid:8e70adb3-1366-4b17-b0eb-aa45f1ee72c1/files/sqf85nc57p

Axelsson, K., André, K., Dawkins, E., Swartling, Å. G., & Xylia, M. (2023). Transitioning towards sustainable consumption at the Swedish local governance level. Frontiers in Sustainability. https://doi.org/10.3389/frsus.2023.1196373

Barker, A., Blake, H., D'Arcangelo, F. M., & Lenain, P. (2022). Towards net zero emissions in Denmark. OECD. https://doi.org/10.1787/5b40df8f-en

Berg, A. (2011). Not Roadmaps but Toolboxes: Analysing Pioneering National Programmes for Sustainable Consumption and Production. Journal of Consumer Policy, 34(1), 9–23. https://doi.org/10.1007/s10603-010-9129-2

Blot, E. (2023). Leveraging free trade agreements for sustainability. Institute for European Environmental Policy.

C40 Cities. (2023). C40 Cities Annual Report 2022. C40 Cities. https://www.c40.org/wp-content/uploads/2023/03/C40-Cities-Annual-Report-2022_Published-Online-31-Mar-2023.pdf

Carbone 4. (2023). MyCO2. https://www.myco2.fr/

Cezar, R., & Polge, T. (2020). CO2 emissions in French international trade (229/4). Banque de France Bulletin. https://www.banque-france.fr/en/publications-and-statistics/publications/CO2emissions-french-international-trade

Christis, M., Nuss, P., Nicolau, M., & Günther, J. (Forthcoming). Drivers of consumption and sustainable consumption levels. ETC-CE Report XX/2024. https://www.eionet.europa.eu/etcs/etc-ce/products

Citepa. (2024). Citepa—Guider l'action Air & Climat. Citepa. https://www.citepa.org/en/about/

City of Gothenburg. (2023). Strategi Leva hållbart—Sammanfattningsrapport 2023.

Climate Act, File no. 2019-2855 (2020). https://en.kefm.dk/Media/1/B/Climate%20Act_Denmark%20-%20WEBTILG%C3%86NGELIG-A.pdf

Climate Citizens' Assembly of Copenhagen. (n.d.). Sådan laver vi et Klimaborgerting | Københavns Kommune. Retrieved 12 March 2024, from https://klimaborgerting.kk.dk/klimaborgertinget

COM/2020/98 final. (2020). COMMUNICATION. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

COM/2020/380 final. (2020). COM/2020/380. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380

COM/2020/381 final. (2020). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381

COM(2022) 409 final. (2022). COM(2022) 409 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0409

COM(2024) 63 final. (2024). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2024%3A63%3AFIN

Copenhagen Municipality. (2021). A new climate plan 2035 | Copenhagen Municipality's website. https://www.kk.dk/dagsordener-og-referater/Borgerrepr%C3%A6sentationen/m%C3%B8de-23092021/referat/punkt-18

Danish Council on Climate Change. (2022). Denmarks Climate Targets—Evaluating the current targets and upcoming revision of the targets in a global perspective [Policy brief]. Danish Council on Climate Change. https://klimaraadet.dk/sites/default/files/node/field_files/Denmarks%20Climate%20Targets%20-%20English%20policy%20brief.pdf

Danish Council on Climate Change. (2023a). Statusrapport 2023—Danmarks nationale klimamål og internationale forpligtelser. Danish Council on Climate Change. https://klimaraadet.dk/da/rapport/statusrapport-2023

Danish Council on Climate Change. (2023b, November 28). About the Danish Council on Climate Change | Klimarådet. https://klimaraadet.dk/en/about-danish-council-climate-change

Danish Energy Agency. (n.d.). Danmarks globale klimapåvirkning—Global afrapportering (GA23): Klimaaftrykket af eksport—Baggrundsnotat nr. 5 [Background memorandum]. Danish Energy Agency. Retrieved 20 March 2024, from https://ens.dk/sites/ens.dk/files/Basisfremskrivning/5._baggrundsnotat_-_klimaaftrykket_af_eksport.pdf

Danish Energy Agency. (2020a). How to be climate-friendly—Subscribe to a heat pump and scrap your old boiler. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Varme/04_ens_faktaark.pdf

Danish Energy Agency. (2020b, October 14). Bygningspuljen – opsplittes i to puljer. Energistyrelsen. https://ens.dk/service/tilskuds-stoetteordninger/bygningspuljen

Danish Energy Agency. (2021). Global Report 2021. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Basisfremskrivning/ga21_master_english_version_.pdf

Danish Energy Agency. (2022). Denmark's Climate Status and Outlook 2022. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Forskning_og_udvikling/cso22_-_english_translation_of_kf22_hovedrapport.pdf

Danish Energy Agency. (2023a). Danmarks globale klimapåvirkning—Global afrapportering 2023 (GA23): International transport—Baggrundsnotat nr. 12 [Background memorandum]. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Basisfremskrivning/12._baggrundsnotat_-_international_transport.pdf

Danish Energy Agency. (2023b). Danmarks Globale Klimapåvirkning—Global Afrapportering 2023 (GA23): Klimaaftrykket af forbrug—Baggrundsnotat nr. 1 [Background memorandum]. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Analyser/1._baggrundsnotat_-_klimaaftrykket_af_forbrug.pdf

Danish Energy Agency. (2023c). Danmarks globale klimapåvirkning—Global afrapportering 2023 (GA23): Klimaaftrykket af import—Baggrundsnotat nr. 4 [Background memorandum]. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Basisfremskrivning/4._baggrundsnotat_-_klimaaftrykket_af_import.pdf

Danish Energy Agency. (2023d). Denmark's Global Climate Impact—Global report. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/EnergiKlimapolitik/final_denmarks_global_climate_impact_-_global_report_2023.pdf

Danish Energy Agency. (2023e). Energy Statistics 2022. Danish Energy Agency. https://ens.dk/sites/ens.dk/files/Statistik/energy_statistic_2022.pdf

Danish Environmental Protection Agency. (n.d.). Miljøstyrelsens opgaver. Miljøstyrelsen. Retrieved 12 March 2024, from https://mst.dk/om-miljoestyrelsen/hvad-laver-miljoestyrelsen/maal-resultater-og-aarsrapporter/miljoestyrelsens-opgaver

Danish Government. (2020). A Green and Sustainable World: The Danish Government's long-term strategy for global climate action. https://www.regeringen.dk/media/10084/a_green_and_sustainable_world.pdf

Danish Government. (2022). Ansvar for Danmark—Det politiske grundlag for Danmarks regering (2022/23:02). Statsministeriet. https://fm.dk/media/26729/ansvar-for-danmark_det-politiske-grundlag-for-danmarks-regering_december-2022.pdf

Danish Government. (2023). Vejen til grøn luftfart—Udspil om grøn luftfart. Skatteministeriet.

Danish Ministry of Climate, Energy, and Utilities. (2022). Klimaprogram 2022 (2021/22:22). Klima-, Energi- og Forsyningsministeriet. https://kefm.dk/Media/637995217763659018/Klimaprogram%202022.pdf

Danish Ministry of Finance. (2023). Denmarks National Reform Programme 2023. Danish Ministry of Finance. https://commission.europa.eu/system/files/2023-05/2023-Denmark-NRP_en.pdf

Danish Motor Vehicle Agency. (2024, February 29). Periodic taxes. The Motor Vehicle Agency (Motorstyrelsen) | Motorst.Dk; The Motor Vehicle Agency (Motorstyrelsen) | motorst.dk. https://motorst.dk/en-us/individuals/vehicle-taxes/periodic-taxes

Dawkins, E., Strambo, C., Xylia, M., Grah, R., Gong, J., Axelsson, K., & Maltais, A. (2023). Who is most at risk of losing out from low-carbon transition in the food and transport sectors in Sweden? Equity considerations from a consumption perspective. Energy Research & Social Science, 95, 102881. https://doi.org/10.1016/j.erss.2022.102881

Decision (EU) 2022/591, 114 OJ L (2022). http://data.europa.eu/eli/dec/2022/591/oj/eng

Directive 2009/125/EC, CONSIL, EP, 285 OJ L (2009). http://data.europa.eu/eli/dir/2009/125/oj/eng

Directive 2014/24/EU (2024). http://data.europa.eu/eli/dir/2014/24/2024-01-01/eng

Directive (EU) 2023/1791, EP, CONSIL, 231 OJ L (2023). http://data.europa.eu/eli/dir/2023/1791/oj/eng

Directive (EU) 2023/959, EP, CONSIL, 130 OJ L (2023). http://data.europa.eu/eli/dir/2023/959/oj/eng

Directorate for Legal and Administrative Information. (n.d.). Anti-Waste Circular Economy Act: Measures in Place and Coming. Retrieved 25 March 2024, from https://www.service-public.fr/particuliers/actualites/A16390?lang=en

Energiintelligent Dalarna. (2023). Färdplan för Klimatsmart konsumtion. https://www.energiintelligent.se/konsumtion/

Euronews. (2023). Short-haul flights are now banned in France thanks to new law. Euronews. https://www.euronews.com/green/2022/12/02/is-france-banning-private-jets-everything-we-know-from-a-week-of-green-transport-proposals

European, C. J. R. C. (2022, December 6). Zero Pollution Outlook 2022. JRC Publications Repository. https://doi.org/10.2760/39491

European Commission. (2020, March 10). Communication on the new EU Circular Economy Action Plan. https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

European Commission. (2021). Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999. https://eur-lex.europa.eu/eli/reg/2021/1119/oj

European Commission. (2023a). Access to public procurement. https://single-market-scoreboard.ec.europa.eu/business-framework-conditions/public-procurement_en

European Commission. (2023b). Consumption Footprint Platform | EPLCA [dataset]. https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

European Commission. (2024). ETS 2: Buildings, road transport and additional sectors - European Commission. https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/ets-2-buildings-road-transport-and-additional-sectors_en

European Environment Agency. (2022). Early warning assessment related to the 2025 targets for municipal waste and packaging waste—Country profile Denmark [File]. European Environment Agency. https://www.eea.europa.eu/publications/many-eu-member-states/denmark/view

European Parliament. (2021, January 27). MEPs call for binding 2030 targets for materials use and consumption footprint | News | European Parliament. https://www.europarl.europa.eu/news/en/press-room/20210122IPR96214/meps-call-for-binding-2030-targets-for-materials-use-and-consumption-footprint

Eurostat. (2020). Where do our clothes come from? https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20200424-1

Eurostat. (2021). FIGARO - integrated global accounts for economic modelling. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20210526-1

Eurostat. (2022). Estimating spillover effects of EU consumption. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Estimating_spillover_effects_of_EU_consumption

Eurostat. (2023a). EU trade in high-tech products up in 2022. https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20230510-2

Eurostat. (2023b). Household consumption by purpose. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Household_consumption_by_purpose

Eurostat. (2023c). Sustainable development in the European Union: Monitoring report on progress towards the SDGs in an EU context : 2023 edition. Publications Office. https://doi.org/10.2785/403194

Eurostat. (2024a). China-EU - international trade in goods statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=China-EU_-_international_trade_in_goods_statistics

Eurostat. (2024b). EU trade with Russia—Latest developments. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_trade_with_Russia_-_latest_developments

Eurostat. (2024c). Greenhouse gas emission statistics—Carbon footprints. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Greenhouse_gas_emission_statistics_-_carbon_footprints

Eurostat. (2024d). USA-EU - international trade in goods statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=USA-EU_-_international_trade_in_goods_statistics

Eurostat. (n.d.). National supply, use and input-output tables [dataset]. https://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/information-data#figaro

Exiobase. (2024). Exiobase—Home. https://www.exiobase.eu/

Fødevarestyrelsen. (2023). Udvikling af et klimamærke til fødevarer—Anbefalinger fra Arbejdsgruppen. Fødevarestyrelsen. https://foedevarestyrelsen.dk/Media/638207095580381128/Klimam%C3%A6rke_anbefalinger%20fra%20arbejdsgruppen_27.%20april%202023.pdf

Fuchs, D., Sahakian, M., Gumbert, T., Di Giulio, A., Maniates, M., Lorek, S., & Graf, A. (2021). Consumption Corridors: Living a Good Life within Sustainable Limits. https://doi.org/10.4324/9780367748746

General Commission for Sustainable Development. (2023). French policies to tackle climate change. Climate Change Observations 2023. https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-du-climat-2023/en/19-french-policies-to-tackle-climate.php

Global Carbon Project. (2023). Share of CO2 emissions embedded in trade, Global Carbon Budget with major processing by Our World in Data. Our World in Data. https://ourworldindata.org/grapher/share-CO2embedded-in-trade

Global Carbon Project. (2024, January 22). Annual CO2 emissions, Global Carbon Budget (2023) with major processing by Our World in Data. Our World in Data. https://ourworldindata.org/CO2emissions

GoodPlanet Foundation. (2024). GoodPlanet Foundation—Taking Action Builds Happiness. Fondation GoodPlanet. https://www.goodplanet.org/en/

Government Offices of Sweden. (2016). Strategi för hållbar konsumtion (Fi 2016:6). https://www.regeringen.se/4a7e12/globalassets/regeringen/dokument/finansdepartementet/pdf/2016/strategi-for-hallbar-konsumtion/strategi-for-hallbar-konsumtion--tillganglighetsanpassad.pdf

Government Offices of Sweden, R. och. (2019). Regeringens handlingsplan del 2: En livsmedelsstrategi för Sverige – fler jobb och hållbar tillväxt i hela landet [Text]. Regeringen och Regeringskansliet. https://www.regeringen.se/informationsmaterial/2019/12/regeringens-handlingsplan-del-2-en-livsmedelsstrategi-for-sverige--fler-jobb-och-hallbar-tillvaxt-i-hela-landet/

Green, F., & Gambhir, A. (2019). Transitional assistance policies for just, equitable and smooth low-carbon transitions: Who, what and how? Climate Policy, 0(0), 1–20. https://doi.org/10.1080/14693062.2019.1657379

Grubb, M., Crawford-Brown, D., Neuhoff, K., Schanes, K., Hawkins, S., & Poncia, A. (2020). Consumption-oriented policy instruments for fostering greenhouse gas mitigation. Climate Policy, 20(sup1), S58–S73. https://doi.org/10.1080/14693062.2020.1730151

High Council on Climate. (n.d.). About—High Council on Climate. High Council on Climate. Retrieved 25 March 2024, from https://www.hautconseilclimat.fr/en/about/

High Council on Climate. (2020). Maîtriser L'empreinte Carbone de la France. High Council on Climate. https://www.hautconseilclimat.fr/wp-content/uploads/2020/10/hcc_rapport_maitriser-lempreinte-carbone-de-la-france-1.pdf

Holmbo Lind, M., & Hansen, K. E. E. (2023). SUMMARY: Adaptation approaches in Danish municipalities climate action plans. CONCITO. https://www.realdania.org/publications/in-english/summary-adaptation-approaches-in-danish-municipalities-climate-action-plans

Insee. (2024). National Institute of Statistics and Economic Studies, Energy, Housing, Transport and the Environment. https://www.insee.fr/en/information/2412664

International Energy Agency. (2023). Denmark 2023: Energy Policy Review. OECD. https://doi.org/10.1787/755105d6-en

IPCC. (2022). Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926.001.

IPCC. (2023). IPCC Sixth assessment report (AR6) Climate Change 2023—Synthesis report. https://www.ipcc.ch/site/assets/uploads/2023/03/Doc5_Adopted_AR6_SYR_Longer_Report.pdf

Jensen, L. (2023, April). Beyond growth: Pathways towards sustainable prosperity in the EU | Think Tank | European Parliament. https://www.europarl.europa.eu/thinktank/en/document/EPRS_STU(2023)747108

Joint Research Centre. (2022, December 6). Zero Pollution Outlook 2022, European Commission. JRC Publications Repository. https://doi.org/10.2760/39491

Jousseaume, M. (2022). The French Climate and Resilience Law. Centre de Politique Européenne. https://www.cep.eu/fileadmin/user_upload/cep.eu/Studien/cepInput_Franzoesisches_Klima-_und_Resilienzgesetz/cepInput_The_French_Climate_and_Resilience_Law.pdf

Karaboytcheva, M. K. (2022). Revision of the Energy Taxation Directive: Fit for 55 package.

Klimatkommunerna. (2023). Vad vi vill—Konsumtion. Klimatkommunerna. https://klimatkommunerna.se/vad-vi-vill/undersida-vad-vi-vill/

Klimatpolitiska rådet. (2022). Klimatpolitiska rådets rapport 2022 (Årsrapport 2022 Rapport nr 5). https://www.klimatpolitiskaradet.se/wp-content/uploads/2022/03/klimatpolitiskaradetrapport2022.pdf

Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeekin, A., Mühlemeier, M. S., … Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. Environmental Innovation and Societal Transitions, 31, 1–32. https://doi.org/10.1016/j.eist.2019.01.004

Koide, R., Lettenmeier, M., Akenji, L., Toivio, V., Amellina, A., Khodke, A., Watabe, A., & Kojima, S. (2021). Lifestyle carbon footprints and changes in lifestyles to limit global warming to 1.5 °C, and ways forward for related research. Sustainability Science, 16(6), 2087–2099. https://doi.org/10.1007/s11625-021-01018-6

Law No 2019-1147, Pub. L. No. Decision No. 2019-791, Bill No. 1908; Letter of amendment No. 2032; (2019). https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000039355955

Law No. 2021-1104, Pub. L. No. 2021–1104 (2021). https://cdn.climatepolicyradar.org/navigator/FRA/2021/law-no-2021-1104-on-the-fight-on-climate-change-and-resilience_8dbd167d2f57c735d66d5e4c2dcfa821.pdf

Lorek, S., & Fuchs, D. (2019). Why only strong sustainable consumption governance will make a difference. A Research Agenda for Sustainable Consumption Governance. https://www.elgaronline.com/view/edcoll/9781788117807/9781788117807.00010.xml

Lorek, S., & Vergragt, P., J. (2015). Sustainable consumption as a systemic challenge: Inter- and transdisciplinary research and research questions. In L. A. Reisch & J. Thøgersen (Eds.), Handbook of Research on Sustainable Consumption (Vol. 2015). Edward Elgar Publishing Ltd. https://www.elgaronline.com/view/edcoll/9781783471263/9781783471263.xml

Malliet, P. (2020a). La contribution des émissions importées à l'empreinte carbone de la France. OFCE. https://www.ofce.sciences-po.fr/pdf-articles/actu/Rapport-OFCE-HCC-2020.pdf

Malliet, P. (2020b). La contribution des émissions importées á l'empreinte carbone de la France, Observatoire français des conjonctures économiques (OFCE), SciencesPo. https://www.ofce.sciences-po.fr/pdf-articles/actu/Rapport-OFCE-HCC-2020.pdf

Ministry for the Ecological and Solidary Transition. (2020). National low carbon strategy—The ecological and inclusive transition towards carbon neutrality. Ministry for an Ecological and Inclusive Transition. https://www.ecologie.gouv.fr/sites/default/files/en_SNBC-2_complete.pdf

Ministry for the Ecological Transition. (2021). Press kit—Presentation of the bill to the Council of Ministers. Ministry for the Ecological Transition. https://www.ecologie.gouv.fr/sites/default/files/2021.02_FrenchClimateLaw_PressKit.pdf

Ministry of Food, Agriculture and Fisheries of Denmark. (n.d.). The Danish Official Dietary Guidelines. Ministry of Food, Agriculture and Fisheries of Denmark. Retrieved 12 March 2024, from https://en.fvm.dk/focus-on/the-danish-official-dietary-guidelines

Ministry of Food, Agriculture and Fisheries of Denmark. (2020). De officielle kostråd—Godt for sundhed og klima (2020006). Ministry of Food, Agriculture and Fisheries of Denmark. https://foedevarestyrelsen.dk/Media/638192163966924935/ONLINE_Kostraad_pjece,%20to%20sider%20pr%20ark.pdf

Ministry of the Economy, Finance and Industrial and Digital Sovereignty. (2024). MaPrimeRénov': La prime pour la rénovation énergétique. https://www.economie.gouv.fr/particuliers/prime-renovation-energetique

Minter, M., Jensen, C. L., & Chrintz, T. (2023). Danmarks globale forbrugsudledninger. CONCITO. https://concito.dk/files/media/document/Danmarks%20globale%20forbrugsudledninger.pdf

MISTRA Sustainable Consumption. (n.d.). Sweden's largest research program on sustainable consumption. MISTRA Sustainable Consumption. https://www.sustainableconsumption.se/en/start-eng/

Morfeldt, J., Larsson, J., Andersson, D., Johansson, D. J. A., Rootzén, J., Hult, C., & Karlsson, I. (2023). Emission pathways and mitigation options for achieving consumption-based climate targets in Sweden. Communications Earth & Environment, 4(1), Article 1. https://doi.org/10.1038/s43247-023-01012-z

Municipality of Tierp. (2023). Klimat- och energiprogram för Tierps kommun (KF 2023/823). https://www.tierp.se/download/18.219c09301768e745e724cb0e/1704189074688/Klimat-%20och%20energiprogram%20f%C3%B6r%20Tierps%20kommun.pdf

National Research Institute for Agriculture, Food and Environment. (2023). Transforming food systems worldwide with school meals. INRAE Institutionnel. https://www.inrae.fr/en/news/transforming-food-systems-worldwide-school-meals

Nelen, D., & Bakas, I. (2021, August 30). Improving the climate impact of raw material sourcing—European Environment Agency [Publication]. https://www.eea.europa.eu/publications/improving-the-climate-impact-of

Nilsson Lewis, A. N., Kaaret, K., Torres, E., Piirsalu, E., & Axelsson, K. (2023). Green public procurement: A key to decarbonizing construction and road transport in the EU. https://www.sei.org/publications/green-public-procurement-eu/

OECD. (n.d.). Input-Output Tables (IOTs). https://www.oecd.org/sti/ind/input-outputtables.htm

PRINCE. (n.d.). The PRINCE project. https://www.prince-project.se/

Procedure EU 2022/0092/COD. (2022). EUR-Lex—2022_92—EN - EUR-Lex. COM (2022) 143: Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL Amending Directives 2005/29/EC and 2011/83/EU as Regards Empowering Consumers for the Green Transition through Better Protection against Unfair Practices and Better Information. https://eur-lex.europa.eu/procedure/EN/2022_92

Procedure EU 2022/0095/COD. (2022). EUR-Lex—2022_95—EN - EUR-Lex. COM (2022) 142: Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL Establishing a Framework for Setting Ecodesign Requirements for Sustainable Products and Repealing Directive 2009/125/EC. https://eur-lex.europa.eu/procedure/EN/2022_95

Regulation (EC) No 66/2010, 027 OJ L (2009). http://data.europa.eu/eli/reg/2010/66/oj/eng

Regulation (EU) 2023/956, 130 OJ L (2023). http://data.europa.eu/eli/reg/2023/956/oj/eng

Regulation (EU) 2023/1115, 150 OJ L (2023). http://data.europa.eu/eli/reg/2023/1115/oj/eng

Sala, S., Crenna, E., Secchi, M., & Sanyé-Mengual, E. (2020). Environmental sustainability of European production and consumption assessed against planetary boundaries. Journal of Environmental Management, 269, 110686. https://doi.org/10.1016/j.jenvman.2020.110686

Sanderson, H., Hildén, M., Saikku, L., Axelsson, K., Pedersen, A. B., & Aamaas, B. (2024). Consumption-based emission inventories in Nordic municipalities—A quest to develop support for local climate action. Frontiers in Climate, 5. https://www.frontiersin.org/articles/10.3389/fclim.2023.1294296

Sanye, M. E., & Sala, S. (2023, February 23). Consumption Footprint and Domestic Footprint: Assessing the environmental impacts of EU consumption and production. JRC Publications Repository. https://doi.org/10.2760/218540

Schulz, A., Magdolen, M., Chlond, B., Kuhnimhof, T., & Köhler, K. (2024). Identifying and understanding long-distance travel demand by combining official transport statistics and survey data. Transportation Research Procedia, 76, 458–469. https://doi.org/10.1016/j.trpro.2023.12.068

SDES. (n.d.). Who are we? | Data and statistical studies. Retrieved 2 May 2024, from https://www.statistiques.developpement-durable.gouv.fr/qui-sommes-nous

SDES. (2022a). L'empreinte carbone de la France de 1995 à 2021. Données et études statistiques pour le changement climatique, l'énergie, l'environnement, le logement, et les transports. https://www.statistiques.developpement-durable.gouv.fr/lempreinte-carbone-de-la-france-de-1995-2021

SDES. (2023a). Méthodologie de calcul de l'empreinte carbone de la France. Minstry for the Energy Transition. https://www.statistiques.developpement-durable.gouv.fr/sites/default/files/2023-10/m%C3%A9thodologie_empreinte_carbone_octobre2023.pdf

SDES, C. général au développement. (2022b). Quels sont les grands secteurs de production? French Government, Ministry of the Energy Transition. https://datawrapper.dwcdn.net/SsVTE/2/

SDES, C. général au développement. (2023b). Carbon footprint and territorial emissions, French Government, Ministry of the Energy Transition. Climate Change Observations 2023. https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-du-climat-2023/en/16-carbon-footprint-and-territorial-emissions.php

Spangenberg, J. H., & Lorek, S. (2019). Sufficiency and consumer behaviour: From theory to policy. Energy Policy, 129, 1070–1079. https://doi.org/10.1016/j.enpol.2019.03.013

State of the Green. (n.d.). Danish Ministry of Climate, Energy and Utilities. State of Green. Retrieved 12 March 2024, from https://stateofgreen.com/en/solution-providers/danish-ministry-of-energy-utilities-and-climate/

State of the Green. (2022). Denmark is one step closer to a climate-neutral waste sector. State of Green. https://stateofgreen.com/en/news/denmark-is-one-step-closer-to-a-climate-neutral-waste-sector/

Statens Offentliga Utredningar. (2022). Sveriges globala klimatavtryck (SOU 2022:15). https://www.regeringen.se/495acd/contentassets/4a8366fdf6d84c2f929ab6e4a216e23f/sveriges-globala-klimatavtryck-sou-202215.pdf

Statistics Denmark. (2021). Statistikdokumentation for Klimaaftryk (eksperimentel statistik) 2021. Statistics Denmark. https://www.dst.dk/Site/Dst/SingleFiles/GetArchiveFile.aspx?fi=1432111100953&fo=0&ext=kvaldel

Statistics Denmark. (2023). Bestanden af transportmidler. Bestanden af transportmidler. https://www.dst.dk/da/Statistik/emner/transport/transportmidler/bestanden-af-transportmidler

Statistics Denmark. (2024). Population figures. https://www.dst.dk/en/Statistik/emner/borgere/befolkning/befolkningstal

Statistics Sweden. (2023a). Sveriges export. Statistiska Centralbyrån. https://www.scb.se/hitta-statistik/sverige-i-siffror/samhallets-ekonomi/sveriges-export/

Statistics Sweden. (2023b). Sveriges import. Statistiska Centralbyrån. https://www.scb.se/hitta-statistik/sverige-i-siffror/samhallets-ekonomi/sveriges-import/

Statistics Sweden. (2023c). Tredubbling av elbilar på två år. Statistikmyndigheten SCB. https://www.scb.se/hitta-statistik/redaktionellt/tredubbling-av-elbilar-pa-tva-ar2/

Statistics Sweden. (2024a). Export och import fördelade på världsdelar. Statistiska Centralbyrån. https://www.scb.se/hitta-statistik/statistik-efter-amne/handel-med-varor-och-tjanster/utrikeshandel/utrikeshandel-med-varor/pong/tabell-och-diagram/export-och-import-fordelade-pa-varldsdelar/

Statistics Sweden. (2024b). Exportens klimateffekter (Regeringsuppdrag Dnr 2024/0286). https://www.scb.se/contentassets/3876871f6b2f4d3fa2e3c00d1a6e5321/mi1301_2008a01_br_mi71br2402.pdf

Statistics Sweden. (2024c). Import för viktiga varuområden enligt SITC. Statistiska Centralbyrån. https://www.scb.se/hitta-statistik/statistik-efter-amne/handel-med-varor-och-tjanster/utrikeshandel/utrikeshandel-med-varor/pong/tabell-och-diagram/import-for-viktiga-varuomraden-enligt-sitc/

Statistics Sweden. (2024d). Miljöpåverkan från hushållens konsumtion efter ändamål COICOP och ämne. År 2008—2021 [dataset]. https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__MI__MI1301__MI1301F/MI1301MPCOICOPN/

Steinbach, F. N., Palm, V., Finnveden, G., Persson, L., Berglund, M., Björk, I., Fauré, E., & Trimmer, C. (2018). Miljöpåverkan från svensk konsumtion—Nya indikatorer för uppföljning (6842). https://www.naturvardsverket.se/globalassets/media/publikationer-pdf/6800/978-91-620-6842-4.pdf

Steinegger, T. (2019). Investigating the Environmental Footprint of Swedish Household Consumption. Royal Institute of Technology.

Stockholm Environment Institute. (2022). The Consumption Compass. SEI. https://www.sei.org/tools/konsumtionskompassen/

Strambo, C., Xylia, M., Dawkins, E., & Suljada, T. (2022). The impact of the EU Emissions Trading System on households: How can the Social Climate Fund support a just transition? https://doi.org/10.51414/sei2022.024

Sveriges ekokommuner. (n.d.). Om SEKOM. Sveriges Ekokommuner. https://www.sekom.se/om-sekom/

Sveriges globala klimatavtryck, Pub. L. No. SOU 2022:15 (2022). https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2022/04/sou-202215/

Sveriges Miljömål. (2023). Ökad utsortering och biologisk behandling av matavfall—Sveriges miljömål. https://www.sverigesmiljomal.se/etappmalen/okad-utsortering-och-biologisk-behandling-av-matavfall/

Swedish Climate Policy Council. (2024). Klimatpolitiska rådets rapport 2024 (7). Swedish Climate Policy Council. https://www.klimatpolitiskaradet.se/wp-content/uploads/2024/04/klimatpolitiskaradetsrapport2024.pdf

Swedish Consumer Agency. (2022). Uppdrag och mål. Konsumentverket. https://www.konsumentverket.se/om-konsumentverket/var-verksamhet/uppdrag-och-mal/

Swedish Consumer Agency. (n.d.). Miljö och hållbarhet | Konsumentverket. Hallå konsument. https://www.hallakonsument.se/omrade/miljo-och-hallbarhet/

Swedish Environmental Protection Agency. (2022). Svensk konsumtions miljöpåverkan (PRINCE). https://www.naturvardsverket.se/om-miljoarbetet/forskning/miljoforskning/forskningssatsningar-samhalle/svensk-konsumtions-miljopaverkan-prince/

Swedish Environmental Protection Agency. (2023a). Inrikes transporter, utsläpp av växthusgaser. https://www.naturvardsverket.se/data-och-statistik/klimat/vaxthusgaser-utslapp-fran-inrikes-transporter/

Swedish Environmental Protection Agency. (2023b). Konsumtionsbaserade utsläpp av växthusgaser i Sverige och andra länder. https://www.naturvardsverket.se/data-och-statistik/konsumtion/vaxthusgaser-konsumtionsbaserade-utslapp-i-sverige-och-andra-lander/

Swedish Environmental Protection Agency. (2023c). Konsumtionsbaserade växthusgasutsläpp per person och år. https://www.naturvardsverket.se/data-och-statistik/konsumtion/vaxthusgaser-konsumtionsbaserade-utslapp-per-person/

Swedish Environmental Protection Agency. (2023d). Sveriges del av EU:s klimatmål. https://www.naturvardsverket.se/amnesomraden/klimatomstallningen/sveriges-klimatarbete/sveriges-del-av-eus-klimatmal/

Swedish Environmental Protection Agency. (2023e). Textil. https://www.naturvardsverket.se/amnesomraden/textil/

Swedish Environmental Protection Agency. (2024a). Egen uppvärmning av bostäder och lokaler, utsläpp av växthusgaser. https://www.naturvardsverket.se/data-och-statistik/klimat/vaxthusgaser-utslapp-fran-egen-uppvarmning-av-bostader-och-lokaler/

Swedish Environmental Protection Agency. (2024b). Sveriges utsläpp och upptag av växthusgaser. https://www.naturvardsverket.se/data-och-statistik/klimat/sveriges-utslapp-och-upptag-av-vaxthusgaser/

Swedish Environmental Protection Agency. (n.d.a). Elavfall. https://www.naturvardsverket.se/amnesomraden/avfall/avfallslag/elavfall/

Swedish Environmental Protection Agency. (n.d.b). One Planet Network – globalt partnerskap för hållbar konsumtion och produktion. https://www.naturvardsverket.se/om-miljoarbetet/internationellt-miljoarbete/multilateralt-miljosamarbete/one-planet-network/

Swedish Environmental Protection Agency. (n.d.c). Swedish environmental objectives. https://www.naturvardsverket.se/en/om-miljoarbetet/swedish-environmental-objectives/

Swedish Environmental Protection Agency. (n.d.d). The generational goal. https://www.naturvardsverket.se/en/om-miljoarbetet/swedish-environmental-objectives/the-generational-goal/

Swedish Food Agency. (2023a). Idag lanseras nya nordiska näringsrekommendationer. https://www.livsmedelsverket.se/om-oss/press/nyheter/pressmeddelanden/idag-lanseras-nya-nordiska-naringsrekommendationer

Swedish Food Agency. (2023b). Näringsrekommendationer. https://www.livsmedelsverket.se/matvanor-halsa--miljo/kostrad/naringsrekommendationer

Swedish Government. (2017, June 12). Det klimatpolitiska ramverket [Text]. Regeringskansliet; Regeringen och Regeringskansliet. https://www.regeringen.se/artiklar/2017/06/det-klimatpolitiska-ramverket/

Swedish Government. (2020). Cirkulär ekonomi – strategi för omställningen i Sverige, Miljödepartementet. https://www.regeringen.se/globalassets/regeringen/bilder/klimat--och-naringslivsdepartementet/klimat-och-miljo/cirkular-ekonomi---strategi-for-omstallningen-i-sverige/

Swedish Government. (2021). Cirkulär ekonomi – Handlingsplan för omställning av Sverige. https://www.regeringen.se/contentassets/4875dd887fd34edabd8c1d928a04f7ba/cirkular-ekonomi-handlingsplan-for-omstallning-av-sverige.pdf

Swedish Government. (2023a). Höjd mervärdesskatt på vissa reparationer, Department of Finance (Fi2022/02895).

Swedish Government. (2023b). Regeringens klimathandlingsplan – hela vägen till nettonoll. https://www.regeringen.se/contentassets/990c26a040184c46acc66f89af34437f/232405900webb.pdf

Swedish Government. (2023c, September 7). Sänkt skatt på bensin och diesel och förstärkt skattenedsättning för jordbruksdiesel även under 2024 [Text]. Regeringskansliet; Regeringen och Regeringskansliet. https://www.regeringen.se/pressmeddelanden/2023/09/sankt-skatt-pa-bensin-och-diesel-och-forstarkt-skattenedsattning-for-jordbruksdiesel-aven-under-2024/

Swedish Government, R. och. (2023d, July 3). Sänkning av reduktionsplikten för bensin och diesel [Text]. Regeringskansliet; Regeringen och Regeringskansliet. https://www.regeringen.se/rattsliga-dokument/departementsserien-och-promemorior/2023/07/sankning-av-reduktionsplikten-for-bensin-och-diesel/

Swedish National Board of Housing, Building and Planning. (2023, May 10). Ska din byggnad ha en energideklaration? Boverket. https://www.boverket.se/sv/energideklaration/energideklaration/

Swedish National Board of Housing, Building and Planning. (2024, January 26). Bidrag för energieffektivisering i småhus. Boverket. https://www.boverket.se/sv/bidrag--garantier/bidrag-for-energieffektivisering-i-smahus/

Swedish Parliament. (2017). En livsmedelsstrategi för Sverige—Fler jobb och hållbar tillväxt i hela landet (Proposition 2016/17:104). https://www.riksdagen.se/sv/dokument-och-lagar/dokument/proposition/en-livsmedelsstrategi-for-sverige-fler-jobb-och_h403104/

Swedish Tax Agency, S. (2024). Flygskatt – Skatt på flygresor [Text]. https://skatteverket.se/foretag/skatterochavdrag/punktskatter/flygskatt.4.41f1c61d16193087d7f1239.html

Swedish Transport Agency. (2023). Fordonsskatt beräknas utifrån vikt eller koldioxidutsläpp—Transportstyrelsen. https://www.transportstyrelsen.se/sv/vagtrafik/fordon/Fordonsskatt/sa-beraknas-fordonsskatten/

Swedish Transport Agency. (2024). Trängselskatt. https://www.transportstyrelsen.se/sv/vagtrafik/Trangselskatt/

UN Stats. (2018). Classification of Individual Consumption According to Purpose (COICOP) 2018 (ST/ESA/STAT/SER.M/99). Department of Economic and Social Affairs Statistics Division. https://unstats.un.org/unsd/classifications/unsdclassifications/COICOP_2018_-_pre-edited_white_cover_version_-_2018-12-26.pdf

UNSTATS. (2009). System of National Accounts 2008, European Commission, International Monetary Fund, OECD, United Nations, World Bank. https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf

Van Rysselberge, P., & Röös, E. (2021). Carbon footprint of meat, egg, cheese and plant-based protein sources – compilation of data and discussion of assessing the climate impact in the WWF Swedish Meat Guide (117). Swedish University of Agricultural Sciences, NL Faculty/ Department of Energy and Technology. https://media.wwf.se/uploads/2021/11/carbon-footprint-of-meat-egg-cheese-and-plant-based-protein-sources_slu-v11.pdf

Vie publique. (2020, June 30). Convention citoyenne climat: Les réponses du président de la République | vie-publique.fr. http://www.vie-publique.fr/en-bref/274866-convention-citoyenne-climat-les-reponses-du-president-de-la-republique

Vie publique. (2021). Loi 22 août 2021 Climat et résilience convention citoyenne climat | vie-publique.fr. http://www.vie-publique.fr/loi/278460-loi-22-aout-2021-climat-et-resilience-convention-citoyenne-climat

Vie publique. (2024). Proposition de loi fast fashion impact environnemental mode jetable | vie-publique.fr. http://www.vie-publique.fr/loi/293332-proposition-de-loi-fast-fashion-impact-environnemental-mode-jetable

Annex A

Interview set-up

A fundamental part of the project involved conducting semi-structured interviews with a diverse range of stakeholders at both the EU and member state levels in our three case study countries: Sweden, Denmark, and France. These interviews were conducted with policymakers, experts, and researchers and sought to capture perspectives from interviewees' expertise rather than as representatives of their organizations.

The interviews aimed to gain insights into perceived opportunities and barriers related to addressing consumption-based emissions (CBE) at both EU and national level as well as explore approaches for tackling them, including statistical methodologies, targets, strategies, and mitigation measures. The interviews also sought to capture interviewees' perspectives on the role of the EU in addressing CBE and the available measures to support existing initiatives at the MS level.

This Annex outlines how these interviews were set up.

Following SEI's ethics guidance, an ethics plan, including an interview protocol was developed, reviewed, and approved by SEI's ethics committee. Before the interviews, each participant was provided with an information sheet outlining the project's objectives, planned activities, expected outputs, and details on data collection and management. Participants were also informed about the key topics to be discussed, their confidentiality rights, their ability to decline to answer questions or withdraw from the interview at any time without repercussion, and the purposes for which the data would be used and how their data would be managed and stored. Participants were given the option to retract their responses and data up until January 31, 2024, the planned cutoff date for finalizing the project publication.

Furthermore, participants were asked to provide (sign) prior informed consent before proceeding with the interview.

Interviews were conducted between October 2023 and January 2024, using an online platform (Teams) and typically lasted for approximately 60 minutes. Sessions were recorded and notes taken during the interview. In most cases, two researchers from SEI participated, with one serving as the interviewer and the other one assisting with notetaking and posing clarifying questions as needed. In some instances, interviews were conducted by a single SEI researcher, with the recording used for subsequent note-taking purposes. In one of the interviews, two representatives of the organization interviewed participated the interview; and in two other interviews, three representatives participated.

At the outset of the interview, participants were reminded that their participation was voluntary, and that they had the right to decline answering any questions during the interview. They were informed that all data collected would be anonymized and stored securely at Microsoft Teams at Stockholm Environment Institute HQ in Sweden for up to two years, after which it would be deleted. Also, that access to the stored data

was restricted to SEI researchers involved in the project and would not be shared with third parties. Participants were also informed that they would be given the opportunity to provide feedback and correct any inaccuracies on a draft report related to their respective case studies, should the interviewee want the opportunity to share feedback and correct eventual inaccuracies.

In total 28 interviews were undertaken. Table 1 below lists the names of the organisations interviewed for each MS and at the EU-level.

Table 1. List of organizations interviewed for each case study

EU-level	Sweden	Denmark	France
1. European Commission DG ENV 2. European Environment Agency (EEA) 3. Expert and consultant –Systemiq 4. European Commission – JRC 5. European Commission – Eurostat 6. European Commission – Eurostat 7. European Commission – Eurostat 8. Research organisation - BC3	1. The Swedish Environmental Protection Agency (1:3) 2. The Swedish Environmental Protection Agency (2:3) 3. The Swedish Environmental Protection Agency (3:3) 4. A representative from the Climate municipalities network 5. Statistics Sweden 6. A Swedish parliamentarian 7. The Swedish Consumer Agency 8. Expert and consultant	1. Research organisation and consultant – Concito 2. The Danish Energy Agency 3. Aarhus University (1:2) 4. Aarhus University (2:2) 5. Danish Ministry of Climate, Energy and Utilities 6. Climate officer from one Danish municipality 7. Chalmers University (in Sweden)* 8. Royal Institute of Technology (KTH) (in Sweden)*	1. Haut conseil pour le climat (HCC - High Council for Climate) 2. Institut national de la statistique et des études économiques (INSEE - National Institute of Statistics and Economic Studies) 3. Commissariat général au développement durable (CGDD – General Commission for Sustainable Development) 4. Direction générale de l'énergie et du climat (DGEC – Directorate General for Energy and Climate)

*Two people from Swedish universities were interviewed for the Danish case study in light of their role in a Nordic project on consumption-based emissions.

Interview questions

The semi-structured interview questions were adjusted for each interviewee, depending on whether they were providing insights on a specific case study or the broader context of the EU. Additionally, the nature of the interviewee's role influenced the focus of the questions. For example, policymakers, researchers, and statisticians were approached with distinct lines of inquiry. The list of questions in Table 2 outlines the questions intended to guide the interviews, from which we adapted and refined the specific wording to suit the diverse profiles of interviewees.

Table 2. List of interview questions used as a guidance for the semi-structured interviews.

A. Opening questions	Name
	Organization
	Type of actor (Commission, MEP, NGO, public official, official statistician, researcher, other)
	Your role
	Would you say that your country/party/WG/project/initiative (or the EU) currently considers and works to address sustainable consumption? If so, please describe.
	What do you consider are some of the key areas to prioritize in the work to address consumption-based emissions?
B. Policy measures	Can you give a few examples of policies or measures that your country/the EU currently has in place (or under way) to address consumption-based emissions?
	Can you give a few examples of which types of policies or measures you think would be required (or most effective) for mitigating consumption-based emissions within the EU or your country?
	Learning potential: Anything in particular that has worked particularly well in your country (or within the EU) that you want to suggest that other countries/rest of the EU can learn from or vice versa – that your country/the EU can learn from other countries/the EU?
	Do you have any reflections on measures to support public awareness - what is needed for households/citizens to change their consumption patterns?
	Do you have any thoughts on barriers to changes in households' consumption practices?
C. Institutions	Institutions/actors and their role. From your work, what is your impression with regard to which actors/organizations are most active in driving the consumption-based emissions agenda in the EU/your country? And what are their respective roles?
	Do you have any thoughts on what is required to support the progressive work demonstrated at the local level in the best way (i.e. municipalities and cities)?
D. Targets	Targets present/underway? MS: Does your country have a target at the national or sub-national levels that aims to mitigate consumption-based emissions (CBEs) - or is a process under way to establish that? EU person: Do you know of any member state that has or is under way to establish that and if so, are you aware of how the dialogue connected to that has been? If no target at the national level, are you aware of CBEs targets for specific sectors (food, transport etc.)?
E. Monitoring & statistics	Monitoring practices: Does your country currently monitor its consumption-based emissions (as a whole or for different sectors)? a. If yes, who is responsible for doing that? For statisticians only: c. how is the monitoring set up? Does it cover e.g. COICOP categories? d. which indicators does the monitoring cover and when did the monitoring start (which year)?
	How is the statistics developed communicated and used?
	Methodology and databases for statistician/modeler only: Can you briefly describe the methodology used for the monitoring and name the relevant models and databases used? Is the country using a multi-regional input-output model or something else? Which global database is used? And is it building on the EXIOBASE database or some other database?
	View on consumption-based emissions target and/or monitoring at EU level. a) What are your thoughts on the opportunities for instituting consumption-based targets and regular monitoring as part of MS/EU official statistics? b) What effect do you think this would have? c) If perceived as difficult, what do you suggest are the main barriers?
	Opp for linking data to other reporting mechanisms. If MS started reporting on their CBEs statistics, do you see any opportunities for linking such statistics to other datasets and reporting systems already established at the EU level - and if so which?
	Standardized monitoring practices? a) How do you perceive the opportunities for establishing standardized monitoring of consumption-based emissions across the EU? (Do you have any ideas or reflections about what kind of processes, or approaches would be needed to establish a harmonization of methods?) b) What would be some of the main barriers?
	Motivations for monitoring and reporting on consumption-based emissions. What would you want to suggest would be the main motivations for monitoring and reporting on CBE, both within your country and at the level of the EU? If EU person: What would you want to suggest would be the main motivations for MS to report on their consumption-based emissions for the EU?
F. EU Policy	What do you suggest could be some of the opportunities for linking policies to address consumption-based emissions to existing policies/measures at the EU level?
G. Trade	Important trade regions/countries. Do you know from which countries or regions your country/the EU imports significant products? (imported greenhouse gas emissions)
	Monitoring exports. Do you know if your country/the EU currently monitors the proportion of its territorial emissions that are exported and the associated emissions generated? Is there any discussion in your country/the EU about offsetting imported CBE with exported territorial emissions (i.e. on whether to offset or compensate imported emissions with low emissions exported products?)
H. Needs	Needs for stepping up. What do you suggest is needed for your country/the EU to be able to step up its ambition and work to address consumption-based emissions more effectively? (Possible prompts: political support, competence, tools, data, legislation, global agreements, and processes such as the Paris Agreement or Agenda 2030?).
I. Recommendations	Would you have any ideas for strong arguments or recommendations for how to bring this forward at the EU level that you think would be useful for our audience? What do you think could be the strongest arguments that we could take with us for why and how consumption-based emissions within the EU should be targeted more strongly?
J. Addition	Anything to add?

Annex B

Policy matrix

Policy name	Policy type	EU implementation stage/status	Formal adoption date	New or revised instrument	Responsible to implement	Consumption category targeted	Affected sector
New Circular Economy Action Plan	Communication	Commission adopted	11-Mar-20	New	Government	All	Industry
Farm to Fork strategy	Communication	Commission adopted	20-May-20	New	Government	Food	Agriculture
Biodiversity strategy for 2030	Communication	Commission adopted	20-May-20	New	Government	All	
The power of trade partnerships: together for green and just economic growth	Communication	Adopted	22-Jun-22	New	Government	All	Trade
Securing our future Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society	Communication	Commission adopted	06-Feb-24	New	Government	All	All sectors
8th Environment Action Programme	Decision	Adopted	06-Apr-22	New	Government	All	All sectors
Amended directive on waste (EU) 2018/851	Directive	Adopted	30-May-18	Revised	Government	Household goods, Appliances, food	Industry
Ecodesign requirements for energy-related products	Directive	Adopted, to be repealed	21-Oct-09	Revised	Manufacturer, Importer	Appliances	Consumer
EU Public Procurement Directive	Directive	Adopted	26-Feb-14	New	Government	Industry	
Emissions Trading System and ETS for road transport and buildings (Revision of the Emissions Trading System)	Directive	Adopted	10-May-23	Revised	Retailer	Housing	Consumer
Empowering Consumers for the Green Transition	Directive	Provisional agreement	Provisional agreement	New	Manufacturer, Retailer, trader	Household goods	Consumer
Corporate Sustainability Due Diligence	Directive	Provisional agreement	Provisional agreement	New	Government, Companies	Investments	Industry
Energy performance of buildings	Directive	Provisional agreement	Legislative procedure underway	Revised	Government	Housing, Public consumption	Industry
Common rules promoting the repair of goods (Right to Repair)	Directive	Awaiting Council Position	Legislative procedure underway	New	Government, Manufacturer, Retailer, Importer, Distributor	Household goods, Appliances	Repairer, Consumer
Waste Framework Directive: textiles and food waste	Directive	Awaiting Council Position	Legislative procedure underway	Revised	Government, Manufacturer, Retailer, Consumer	Household goods, Food	Industry, Consumer
Substantiation and communication of explicit environmental claims (Green Claims Directive)	Directive	Awaiting Council Position	Legislative procedure underway	New	Government, Trader	Household goods, Food	Industry, Consumer
Energy Efficiency Directive	Directive	Adopted	13-Sep-23	Revised	Government, Wholesaler, retailer	Housing, Public consumption	Industry, Consumer

Policy name	Policy type	EU implementation stage/status	Formal adoption date	New or revised instrument	Responsible to implement	Consumption category targeted	Affected sector
REPowerEU - Renewable Energy, Energy Performance of Buildings and Energy Efficiency Directives: amendments	Directive	Awaiting Council Position	Legislative procedure underway	Revised	Government	Housing, Public consumption	Industry
Energy Taxation Directive	Directive	Commission adopted	Legislative procedure underway	Revised	Government	All	Industry
Community Ecolabel scheme (EU EcoLabel) Regulation	Regulation	Adopted	25-Nov-09	New	Manufacturer, Importer	Appliances	Consumer
Carbon Border Adjustment Mechanism	Regulation	Adopted	10-May-23	New	Importer	Investments	Trade, Industry
EcoDesign for Sustainable Products Regulation	Regulation	Provisional agreement	Provisional agreement	New	Manufacturer, Importer, distributor	Household goods, Appliances	Industry, Consumer
Deforestation Regulation	Regulation	Adopted	31-May-23	New	Importer, Traders	Investments, Public consumption	Agriculture, Forestry
Packaging and Packaging Waste	Regulation	Awaiting Council Position	Legislative procedure underway	New	Manufacturer, Importers, distributors	Household goods, Food	Industry
Critical Raw Materials Act	Regulation	Awaiting Council Position	Legislative procedure underway	New	Government	Investments, Public consumption	Industry

Visit us

SEI Headquarters

Linnégatan 87D
Box 24218
104 51 Stockholm Sweden
Tel: +46 8 30 80 44
info@sei.org

Måns Nilsson
Executive Director

SEI Africa

World Agroforestry Centre
United Nations Avenue Gigiri
P.O. Box 30677 Nairobi 00100 Kenya
Tel: +254 20 722 4886
info-Africa@sei.org

Philip Osano
Centre Director

SEI Asia

Chulalongkorn University
Henri Dunant Road Pathumwan
Bangkok 10330 Thailand
Tel: +66 2 251 4415
info-Asia@sei.org

Niall O'Connor
Centre Director

SEI Latin America

Calle 71 # 11–10
Oficina 801
Bogotá Colombia
Tel: +57 1 6355319
info-LatinAmerica@sei.org

David Purkey
Centre Director

SEI Oxford

Oxford Eco Centre
Roger House Osney Mead
Oxford OX2 0ES UK
Tel: +44 1865 42 6316
info-Oxford@sei.org

Ruth Butterfield
Centre Director

SEI Tallinn

Arsenal Centre
Erika 14
10416 Tallinn Estonia
Tel: +372 6276 100
info-Tallinn@sei.org

Lauri Tammiste
Centre Director

SEI York

University of York
Heslington
York YO10 5NG UK
Tel: +44 1904 32 2897
info-York@sei.org

Sarah West
Centre Director

SEI US Main Office

11 Curtis Avenue
Somerville MA 02144-1224 USA
Tel: +1 617 627 3786
info-US@sei.org

Ed Carr
Centre Director

SEI US Davis Office

501 Second Street
Davis CA 95616 USA
Tel: +1 530 753 3035

SEI US Seattle Office

1326 Fifth Avenue #640
Seattle WA 98101 USA
Tel: +1 206 547 4000

SEI Stockholm Environment Institute

sei.org
@SEIresearch @SEIclimate