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Energy consumption decomposition analysis on EU-27 and EU-27 members

2023 edition

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1 Introduction

For several decades now, the importance of energy efficiency has been well understood, both in the context of clean energy transition, and for its benefits to national economies in general. This has evolved to such an extent that after being labelled for some time as the 'hidden fuel', it is now more commonly referred to as the 'first fuel' (IEA, 2019), thus showing its prime role in the current energy efficiency debate. Another sign that energy efficiency is recognised in the political agenda is its presence in the United Nations' 7th Sustainable Development Goals (SDG7). This states that 'by 2030, double the global rate of improvement in energy efficiency' (UN, 2021).

In the European Union, energy efficiency improvement was one of three 20% targets that should be reached by 2020 (Energy Efficiency Directive 2012/27/EU). The target has since been updated to 32.5% by 2030, compared to projections of expected energy use (Energy Efficiency Directive 2018/2002).

If these ambitious goals are to be implemented effectively, actions need to be carefully planned and monitored. National administrations, academics, researchers, international organisations, and other stakeholders will need gain a solid understanding of what drives energy consumption.

Decomposition analyses have been widely used for many decades. The objective of the decomposition analysis is to separate the respective impact of different drivers on the total energy demand.

Various calculation methods can be used, but the Logarithmic Mean Divisia Index (LMDI) method is becoming the benchmark as it offers several interesting mathematical properties and allows transparent analysis of the result, thanks to the absence of a residual term. This method was therefore chosen for the energy consumption decomposition analysis.

The result consists in a series of coefficients which represent the estimated effect of each component of the initial equation on the overall energy consumption between different periods covered in the dataset. These coefficients can then be used to carry out various analyses, thanks to the possibility of separating out different aspects of scenarios, and they can also be presented in graphical form.

For the purposes of this publication, data from all EU-27 countries were treated, as well as the EU-27 aggregate, for all years since 2010. In the first section, the methodology used for the decomposition analysis is described and the different data limitations, both in terms of coverage and other issues, are discussed. The methodology is then applied in order to decompose the energy consumption for each EU-27 Member State and for the European Union as a whole, for the following sector of activities:

- Final energy consumption of the industry(1) sector (manufacturing industries and construction sector) based on value added;
- The final energy consumption for the whole economy (industry above, plus agriculture(2) and services) based on employment;
- The residential sector;
- The transport sector based on traffic.

(1) Industry defined by 'Annual Questionnaires & Reporting Instructions' from Eurostat. It includes the mining and quarrying sector, the manufacturing sector, the construction sector but excludes the electricity, gas, steam and air conditioning supply sector as well as the water supply; sewerage, waste management and remediation activities sector. See the Detailed information on the methodology used and the different sector of activities are available in the description of the methodology.

(2) Agriculture includes agriculture, forestry and fishing.

2

Decomposition methodology

2.1 General principle

The objective of the Indexed Decomposition Analysis (IDA) is to evaluate the respective share of different effects on the variation of a total quantity, in this case the energy consumption of a sector of the economy. These effects are commonly related to:

- the activity level of the sector (A);
- the energy intensity (I_i) of each subsector, i.e. the ratio of the energy use to the output of the subsector;
- the respective weights of these subsectors in the total (S_i).

Additional effects can also be included when they are assumed to have an impact on the overall quantity to decompose. To perform the decomposition, the starting point is to establish an identity, where the energy consumption of a sector (E) is expressed as a product of each element whose impact are to be quantified. In practice, the decomposition identity is usually expressed as follows:

$$E = \sum_i E_i = \sum_i A \times \frac{A_i}{A} \times \frac{E_i}{A_i} = A \times \sum_i S_i \times I_i$$

Where:

E_i : Energy consumption of subsector i

A_i : Activity level of subsector i

$S_i = \frac{A_i}{A}$: Share of energy consumption of sector i

$I_i = \frac{E_i}{A_i}$: Energy intensity of subsector i

The IDA allows the respective contribution (measured in terms of energy consumption) of each of these driving factors to be determined. This can be expressed either additively (notation) or multiplicatively (notation Δ , as is shown below:

$$\Delta E = E_t - E_0 = \Delta E_{ACT} + \Delta E_{STR} + \Delta E_{INT} + \Delta E_{RES}$$

$$DE = \frac{E_t}{E_0} = DE_{ACT} \times DE_{STR} \times DE_{INT} \times DE_{RES}$$

- The additive form decomposes the difference between two points in time, while the multiplicative form decomposes the ratio of change with respect to the base year.
- The activity effect (E_{ACT}) accounts for changes in energy consumption due to the change in the economic activity of the sector: the activity effect is positive (i.e. the energy consumption increases) if the overall activity increases.
- The structural effect (E_{STR}) accounts for changes in energy consumption that are due to the change in the relative importance of more or less energy-intensive sectors. The structural effect is positive if the share of energy-intensive sectors grows.
- The intensity effect (E_{INT}) is represented by the ratio $\frac{E_i}{A_i}$. It accounts for changes in total energy consumption due to technology advancements, efficiency improvements, policy, and other effects. The intensity effect is negative if there is a drop in energy intensity.
- The residual effect (E_{RES}) is an undesirable output from an imperfect decomposition, which occurs with some of the mathematical methods.

Decomposition is commonly calculated on a yearly base. In the case here, this would mean the first year of the period is marked as 0 and the last year as T. However, it could also be conducted on a shorter period if the corresponding data are available. For the present calculation, two approaches are possible:

- Chaining decomposition uses annual time-series data, and decomposition is made on changes between consecutive years. The results for each effect are then 'chained' to generate a time series.
- Meanwhile, non-chaining decomposition is conducted using data for only the first and last year of the period, without calculating it for the intermediate years.

2.2 Choice of the calculation method

The objective of this publication is to provide a decomposition of energy consumption by sector for all European countries, based on European data publicly available.

After a review of possible methodologies, the LMDI presented the most advantages: firstly, because it enables changes in energy use to be decomposed into separate determinant effects, and secondly, because it presents interesting mathematical properties (including perfect decomposition). Additionally, the literature (Liu, 2006) highlights that the importance of the levels of disaggregation and data quality on results are more important than the decomposition methods themselves.

To support the selection, existing decomposition analysis works on European countries were also reviewed. Among the three examples reviewed, both the JRC (JRC, 2017) and IEA (IEA, 2020) rely on the LMDI methodology to perform the decomposition. The ODYSSEE database (Enerdata, 2015) uses a variety of custom-made decomposition methods for greater flexibility. However, this results in imperfect decomposition, causing difficulties with the interpretation. In terms of data sources, the IEA and ODYSSEE both mainly rely on their internal data collection for their work, while the JRC mainly uses Eurostat data.

2.3 Choice of the data sources

Conducting decomposition analysis requires information on activity and energy consumption at the sub-sectoral, mode, or end-use level. The availability of this information is the key element that will determine the breakdown that can be applied to each sector, and consequently, it will also impact the choice of the method for the calculation.

- All the data used in the decompositions were sourced from Eurostat databases. This presents several advantages, namely:
- It is simple to reproduce the results obtained, since the calculation methodology is also available.
- It highlights the work of statisticians in national administrations, by proposing a new way to use their data.
- It also enables potential data issues to be identified, such as lack of disaggregation or unstable time series, which can help administrations to focus their efforts on particularly important areas.
- Finally, by applying the exact same methodology to all European countries covered, a transparent comparison is possible, hopefully bringing interesting insights on the energy consumption analysis of each country.

Nevertheless, the existence of missing data represents a significant limitation of LMDI applications.

2.4 LMDI application by sector

2.4.1 Total economy final energy decomposition based on employment

CALCULATION

In order to get as broad a picture as possible, applying the decomposition analysis on the overall economy, i.e. including industry, agriculture and service sectors can be of great interest. Through this, the effect of the shift between the sectors can be quantified, such as the transition from an industrial to a service-based economy. However, the challenge here can be defining a common activity indicator. The gross value added used for the decomposition of the industry subsector is not so relevant to assess the level of activity in other sectors. For example, agricultural production depends very much on the weather. To some degree, other variables impact the turnover in the service sector, (e.g. tech companies with very high value added). As a proposal, a decomposition based on the number of employees is suggested, based on the following identity:

$$E_{economy} = \sum_i E_i = \sum_i N_{emp} * \frac{N_{emp_i}}{N_{emp}} * \frac{E_i}{N_{emp_i}}$$

Where:

i represents the different sectors of the economy.

$E_{economy}$: Total energy consumption in the overall economy (see next section for coverage). It is measured in Terajoule (TJ).

E_i: Energy consumption of the sector i.

N_{emp}: Number of employees in total It is measured in thousands of employees.

N_{emp_i}: Number of employees in the sector i.

EFFECTS

In this decomposition, the activity effect stems from the variation in the total number of employees. The increase in the total number of employees over time should be linked to a larger economy size, and result in a positive effect (i.e. increasing) on energy consumption.

The intensity effect at sub-sectoral level is expressed by the energy consumption per employee in each subsector. An increase in the ratio results in a positive effect on the overall energy consumption.

The structural effect stems from the variation of the weight of each subsector in the total employment. If shares of the more energy-intensive industries increase, then the level of activity in these sectors may be increasing and the overall energy consumption would also increase.

DATA SOURCES

With the available data on energy and employment, the decomposition was performed for the following five sectors, namely:

- Agriculture, forestry, and fishing
- Manufacturing industries
- Construction industries
- Other industries
- Commercial and public service

These data were obtained from Eurostat's dataset 'Employment by A*10 industry breakdowns' (nama_10_a10_e). The mapping between the Statistical classification of economic activities (NACE Rev. 2) and the sectors used in the dataset 'complete energy balance' is provided in the annex 02.

2.4.2 Industry final energy decomposition based on added value

CALCULATION

This is the most commonly used decomposition analysis proposed for energy consumption in the industry sector, and it can be found in a number of publications on the topic (JRC, 2017) (IEA, 2020). It relies on the following identity:

$$E_{industry} = \sum_i E_i = GVA_{industry} \sum_i \times \frac{GVA_i}{GVA_{industry}} \times \frac{E_i}{GVA_i}$$

Where:

$E_{industry}$: Total energy consumption in the overall sector. It is measured in terajoules (TJ).

E_i: Energy consumption of the subsector i.

$GVA_{industry}$: Gross value added in the overall industry sector in our decomposition it is measured in million euro (2015) at chain-linked volumes (2015).

GVA_i: Gross value added in the industry subsector i.

EFFECTS

The activity effect stems from the variation of the total GVA of the industry sector. An increase in the total GVA over time would have a positive effect (i.e. increasing) on the energy consumption.

The Intensity effect at subsector level is expressed by the ratio of energy consumption over the GVA of the subsector. An increase in the ratio results in a positive effect on overall energy consumption (which can be understood as a higher energy consumption per unit of sectoral output).

The structural effect stems from the weight variation of each subsector's output, expressed as the GVA share. If the shares of the more energy-intensive industries increase, then the overall energy consumption also increases.

DATA SOURCES

The list of subsectors that could be treated separately corresponds to those mappable between the energy consumption and economic data. Mapping of industry sectors between the Eurostat datasets 'Complete energy balances' (*nrg_bal_c*) and 'National accounts aggregates by industry (up to NACE A*64)' (*nama_10_a64*) is provided in annex 01. The decomposition was made for the following 13 industry subsectors:

- Construction
- Mining and quarrying
- Food, beverages, and tobacco
- Textile and leather
- Wood and wood products
- Paper, pulp, and printing
- Coke and refined petroleum products
- Chemical and petrochemical
- Non-metallic minerals
- Basic metals
- Machinery
- Transport equipment
- Other manufacturing

2.4.3 Residential energy decomposition by end use

CALCULATION

Different decompositions have been proposed in the literature on the residential sector. Based on available data obtained from various Eurostat datasets, the proposed identity for the residential sector decomposition analysis is the following:

$$E_{residential} = Pop * \frac{Dwelling}{Pop} * \frac{E^{corrected}_{residential}}{Dwelling} * \frac{E_{residential}}{E^{corrected}_{residential}}$$

Where:

Pop: Total population.

$\frac{Dwelling}{Pop}$: Reciprocate of the average household size (in capita per dwelling).

$E_{residential}$: Total energy consumption in the overall residential sector

$$E^{corrected}_{residential} = E^{corrected}_{space\ heating} + E^{corrected}_{space\ cooling} + E_{water\ heating} + E_{cooking} + E_{light\ and\ appliances} + E_{other}$$

$E^{corrected}_{space\ heating} = \frac{E_{space\ heating}}{HDD_{norm}}$: Corrected energy consumption for space heating

$E^{corrected}_{space\ cooling} = \frac{E_{space\ cooling}}{CDD_{norm}}$: Corrected energy consumption for space cooling

$E_{water\ heating}$: Energy consumption for water heating

$E_{cooking}$: Energy consumption for cooking

$E_{light\ and\ appliances}$: Energy consumption for light and electrical appliances

E_{other}: Other residential energy consumption

$HDD_{norm} = \frac{HDD_{year}}{HDD_{average}}$: Normalised heating degree days of the year over the average (entire time series)

$CDD_{norm} = \frac{CDD_{year}}{CDD_{average}}$: Normalised cooling degree days of the year over the average (entire time series)

EFFECTS

The first effect evident here is demographic: an increase in overall population would result in an increase in residential sector energy consumption.

The second effect corresponds to the reversed household occupancy: as less people are living in a single household, energy consumption is assumed to increase, since a higher number of households would be required to host the same number of inhabitants.

The third effect considered in the decomposition is the temperature-corrected energy consumption per dwelling.

It is important to note here that some significant simplifications or assumptions were made to allow calculation based on the available data:

- The number of dwellings is not the most appropriate indicator for heating consumption. The dwelling surface would be a better choice, the reason being that the average surface per household may change over the period.
- The number of appliances per dwelling would be a better activity indicator for appliance consumption.

Finally, the fourth effect corresponds to weather correction. This calculation is based on the actual energy consumption in the residential sector over the climate-corrected energy consumption.

DATA SOURCES

The end-use data were extracted from Eurostat's disaggregated final energy consumption in households dataset (nrg_d_hhq). When disaggregated data were not available, the total energy consumption in the residential sector was obtained from Eurostat's complete energy balance (nrg_bal_c).

The population data were extracted from the Eurostat demographic balance dataset (demo_gind).

The average household size was obtained from the Eurostat EU-SILC survey (ilc_lvph01). The figures are within two and three persons per household on average for all European countries.

Both the heating degree days (HDD) and cooling degree days (CDD) were obtained from the Eurostat heating and cooling degree days dataset (nrg_chdd_a).

In many cases the breakdown in end-use energy consumption data only starts in 2015. In the case of colder countries, energy consumption for space cooling use is often not reported at (see annex 04 for further details)

2.4.4 Transport energy decomposition based on traffic

CALCULATION

Transport usually comprises two distinct purposes: passenger transport and freight transport. They are each subdivided into different modes, e.g. road, air, waterways, and rail, which can then be again subdivided e.g. by type of vehicle.

At the current level of Eurostat's disaggregation of energy data, the only breakdown for energy consumption available in transport is a split-by-mode: road, water (national) and air (national). International air and maritime transport are also available separately, due to their different transport in GHG emissions accounting.

Decomposition of transport by purpose, mode and vehicle type is already available in Eurostat's dataset, but it cannot be fully used without further information on energy consumption. It is reported in three different units, depending on the purpose: passenger-kilometre (for passenger transport), ton-kilometre (for freight transport) and vehicle-kilometre (for both).

Consequently, the only decomposition identity that can be proposed currently is:

$$E_{transport} = VKM * \sum_i \frac{VKM_i}{VKM} * \frac{E_i}{VKM_i}$$

Where:

VKM: total number of vehicle-kilometres

VKM_i: Vehicle-kilometre per mode

E_i: Energy consumption per transport mode

For energy statistics, the decomposition based on vehicle-kilometres was the only one that seemed feasible at the current level of detail. Hopefully, it will soon be replaced when data broken down by purpose become available. It is important to note here the main limitations of this decomposition:

Firstly, air is excluded because no domestic traffic-only dataset was identified. Likewise, water transport traffic (VKM) only covers inland waterways, and not maritime transport since this information could not be retrieved.

Secondly, and more importantly, the decomposition by vehicle-kilometres cannot carry out an in-depth analysis of the structural change, as the results can be complex to interpret:

- Consumption per VKM varies completely from one type of vehicle to the next.
- Also, the purpose of transport being to move goods or passenger, not the vehicle themselves, the $\frac{E_i}{VKM_i}$ is not the most relevant to represent the intensity effect.

EFFECTS

In this decomposition, the activity effect is represented by the total traffic, or VKM. An increase in total traffic would result in a higher energy consumption.

The intensity effect is represented by the energy per vehicle-kilometre. An increase in the energy consumption per unit of VKM would result in a higher overall energy consumption of the sector.

The structural effect represents the variation of the respective weight of each of the transport mode within the total traffic. An increase in the share of higher consumption sectors would result in a higher energy consumption.

DATA SOURCES

The total energy consumption by mode was obtained from Eurostat's complete energy balance dataset (nrg_bal_c).

Transport traffic data were obtained from Eurostat's transport statistics (road, railway and inland waterways). These three modes of transport are available in these datasets: 'Motor vehicle movements on national territory' (road_tf_vehmov), 'Train movements' (rail_tf_trainmv), 'Vessel traffic' (iww_tf_vetf). Air traffic transport is currently not available in Eurostat's database.

As explained previously, road and rail traffic (VKM) and energy consumption include both transport of goods and passengers.

Water traffic only includes transport of goods on inland waterways, while energy consumption also covers maritime transport of passenger and goods. It is assumed that inland waterways represent most types of inland water transport. Additionally, the inland waterway dataset appears to be very incomplete, hence the decomposition could only be performed for a limited number of countries.

These differences in coverage may be of secondary importance given the decomposition chosen, since road traffic often covers almost all of the total transport, and most of the sector's energy consumption.

The mapping between Eurostat datasets 'Complete energy balances' (nrg_bal_c) and the transport traffic datasets (road_tf_vehmov, rail_tf_trainmv, iww_tf_vetf) are presented in the annex 03.

2.5 Data limitations

As previously described in part 2.3, the existence of missing data represents a significant limitation of LMDI applications (as it would for any other decomposition methods). In order to be able to perform the calculation, data on both energy consumption and activity data is required. As a consequence, sectors and subsectors for which any of these two data were unavailable had to be excluded from the analysis, resulting in an analysis performed on a subset of the total sector. This situation has particularly affected some smaller countries where sectors included a small number of actors, resulting in confidentiality issues.

2.5.1 Missing final energy consumption and GVA data in manufacturing industries and construction

As explained previously, performing the decomposition of energy consumption requires access to the data on both energy consumption by subsector, and the activity, for which in the case of the industry is represented by the gross value added. For most countries up until 2020, the data for all subsectors were available. However, at the time of the extraction, a certain number of countries had incomplete GVA data for 2021, and as a result some of the decompositions were performed on the period 2011-2020.

It should be noted that in table 1 and similar ones that follow, a subsector is counted as missing if either the energy consumption is reported and not the activity, or vice-versa. In this specific example, the two countries showing a high number of subsectors missing across the entire time series appear to both be quite small. It is therefore likely that the energy consumption was too small to appear in the unit of reporting, explaining the apparent lack of coverage. Additionally, it is important to point out that data quality is not part of this analysis.

TABLE 1

Missing subsectors in the manufacturing industry of the EU-27 countries

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AT	0	0	0	0	0	0	0	0	0	0	0
BE	0	0	0	0	0	0	0	0	0	0	6
BG	0	0	0	0	0	0	0	0	0	0	0
CY	0	0	0	0	0	0	0	0	0	0	11
CZ	0	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	11
DK	0	0	0	0	0	0	0	0	0	0	0
EE	1	1	1	1	1	1	1	1	1	1	1
EL	0	0	0	0	0	0	0	0	0	0	0
ES	0	0	0	0	0	0	0	0	0	0	11
FI	0	0	0	0	0	0	0	0	0	0	0
FR	0	0	0	0	0	0	0	0	0	0	6
HR	0	0	0	0	0	0	0	0	0	0	0
HU	0	0	0	0	0	0	0	0	0	0	0
IE	1	1	1	1	3	3	3	3	3	3	3
IT	0	0	0	0	0	0	0	0	0	0	6
LT	1	1	1	1	1	1	1	1	1	1	11
LU	8	8	8	8	8	8	8	8	8	8	8
LV	1	0	1	1	1	1	1	1	1	1	10
MT	6	6	6	6	5	5	4	4	3	3	3
NL	0	0	0	0	0	0	0	0	0	0	0
PL	0	0	0	0	0	0	0	0	0	0	11
PT	0	0	0	0	0	0	0	0	0	0	11
RO	0	0	0	0	0	0	0	0	0	0	0
SE	1	1	1	1	1	1	1	1	1	1	11
SI	1	1	1	1	1	1	1	1	1	1	1
SK	0	0	0	0	0	0	0	0	0	0	0

Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64).

2.5.2 Missing disaggregated energy consumption data in the residential sector

For the residential sector decomposition, the energy consumption data disaggregated by end uses were often available only from 2015 onwards, which mainly impacted the climate correction in the analysis. For these countries, the correction was only applied on the available years.

TABLE 2

Missing end-use in the residential sector of the EU-27 countries

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AT	0	0	0	0	0	0	0	0	0	0	0
BE	6	6	6	6	6	0	0	0	0	0	0
BG	1	1	1	1	1	1	1	1	1	1	1
CY	6	6	6	6	6	6	6	0	0	0	0
CZ	6	6	6	6	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	0
DK	6	6	6	6	1	1	1	1	1	1	1
EE	2	2	2	2	2	2	2	2	2	2	2
EL	6	6	1	6	1	1	1	1	1	1	1
ES	0	0	0	0	0	0	0	0	0	0	0
FI	6	6	6	6	0	0	0	0	0	0	0
FR	1	1	1	1	1	1	1	1	1	1	1
HR	1	1	1	1	1	1	1	1	1	1	1
HU	6	6	6	6	1	1	1	1	1	1	1
IE	6	6	6	6	1	1	1	1	1	1	1
IT	6	6	6	6	0	0	0	0	0	0	0
LT	6	6	6	6	6	6	2	2	2	2	2
LU	1	1	1	1	1	1	1	1	1	1	1
LV	1	1	1	1	1	1	1	1	1	1	1
MT	6	6	6	6	0	0	0	0	0	0	0
NL	0	0	0	0	0	0	0	0	0	0	0
PL	6	6	6	6	2	2	2	2	2	2	2
PT	0	1	0	1	1	1	1	0	0	1	1
RO	6	6	6	6	1	1	1	1	1	1	1
SE	6	6	6	6	1	1	1	1	1	1	1
SI	1	1	1	1	1	1	1	1	1	1	1
SK	6	6	6	6	0	0	0	0	0	0	0

Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a).

2.5.3 Missing energy consumption and traffic data in the transport sector

Traffic information is missing for at least one mode of transport in most countries, meaning that in many cases, energy consumption is reported but not the corresponding traffic information (in VKM). Moreover, several gaps appear in the time series, making it often complicated to find a pair of years with relatively complete information.

TABLE 3

Missing transport modes in the transport sector of the EU-27 countries

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AT	1	1	1	1	1	1	1	2	2	2	2
BE	2	3	1	2	2	3	2	2	2	2	2
BG	0	0	0	0	0	0	0	0	0	0	1
CY	0	1	1	1	1	1	2	2	2	2	2
CZ	0	0	0	0	0	0	0	0	0	0	0
DE	3	3	1	1	1	1	1	1	1	1	1
DK	2	2	1	1	1	1	1	1	2	1	1
EE	2	2	1	1	1	1	1	1	1	1	1
EL	2	2	2	2	2	2	2	3	3	3	3
ES	1	1	1	1	1	1	1	1	1	1	1
FI	1	2	1	1	1	1	1	1	1	1	2
FR	2	1	2	2	2	2	2	2	2	2	2
HR	1	1	1	1	1	1	1	1	1	1	1
HU	2	1	0	0	1	1	1	2	1	1	1
IE	2	2	1	1	1	1	1	1	1	1	1
IT	2	1	1	1	1	1	1	1	1	1	1
LT	1	2	1	1	1	1	1	1	1	1	1
LU	1	2	2	2	1	2	2	2	2	3	2
LV	1	1	1	1	1	1	1	1	1	1	1
MT	2	2	1	1	1	1	1	1	1	1	1
NL	1	3	2	2	2	2	2	2	2	2	2
PL	1	1	1	1	1	2	2	3	3	3	3
PT	2	2	2	2	2	2	2	2	2	2	2
RO	0	0	0	0	0	0	0	0	1	1	1
SE	2	2	1	1	1	1	1	1	1	1	1
SI	1	1	1	1	0	0	0	0	0	0	0
SK	0	0	0	0	0	0	0	0	0	0	0

Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf).

2.5.4 Other data issues

Although an effort was made to stay as close as possible to the original data, in some instances corrections had to be applied in order to make the calculations possible, and to avoid making the comparison among countries unreadable due to some figures that were obviously out of the range.

This was the case notably with the GVA in the coke and refined petroleum products sector, where for Austria, the figure had to be multiplied once by 10 (2013) and once by a 100 (2014) to be in line with the rest of the time series. In the same sector, negative GVA was often reported and had to be corrected to be positive. This was the case for Spain (2020), Sweden (2020), Italy (2014 and 2020), Portugal (2020), Latvia (2020) and Bulgaria (2014 and 2020). It also happened for the basic metals sector in Latvia (2013 and 2014).

Another correction was applied to the road traffic data for Bulgaria, where the 2010 figure had to be manually entered because the reported one was out of range.

2.5.5 Limitations of the analysis

The first and main limitation of the index decomposition analysis methodology is that the results obtained have to be understood under the prism of the initial equation that was decomposed. In particular, the metric chosen for the activity is of primary importance. For instance, the GVA used in the decomposition of the manufacturing industry is a good indicator of how dynamic the different sectors are, but it does not separate the effects of potential external factors, such as variability in the prices of goods produced. Likewise, the employment data used in the decomposition of the whole economy can reflect the shift between the sectors, but for the agriculture sector, for example, a lower workforce is usually related to a higher level of mechanisation. Finally, and although there was no simple alternative data available within the sources covered, the traffic data used in the transport decomposition are not a very good indicator, as they aggregate together traffic with multiple purposes (goods and passengers) and therefore do not allow the impact of the shift in transport between these purposes to be assessed.

The second limitation is in the impact of data coverage. Indeed, in order to apply the decomposition, the energy consumption and activity data for every subsector has to be available, otherwise neither the subsectoral intensity can be calculated, and nor the structural effect (which reflects shifts between these subsectors). Therefore, for many countries, only a selection of subsectors could be included in the decomposition, to avoid sectors with missing value added. In other instances, the period covered by the decomposition had to be restricted to a range of years for which sufficient disaggregated data were available.

The availability of disaggregated information had large effect on the decomposition of energy consumption in households, as it is required to calculate the temperature correction, and the analysis highlighted the major impact that the weather has in the consumption of this sector.

Another caveat of the decomposition lies in its sensitivity to data quality. For instance, a very high variability in the calculated intensity can be observed for transport. This could partly be explained by the effect of the aggregation of different types of transport together, but in some cases, this could also reflect data quality issues and sometimes differences in definition for traffic information between countries.

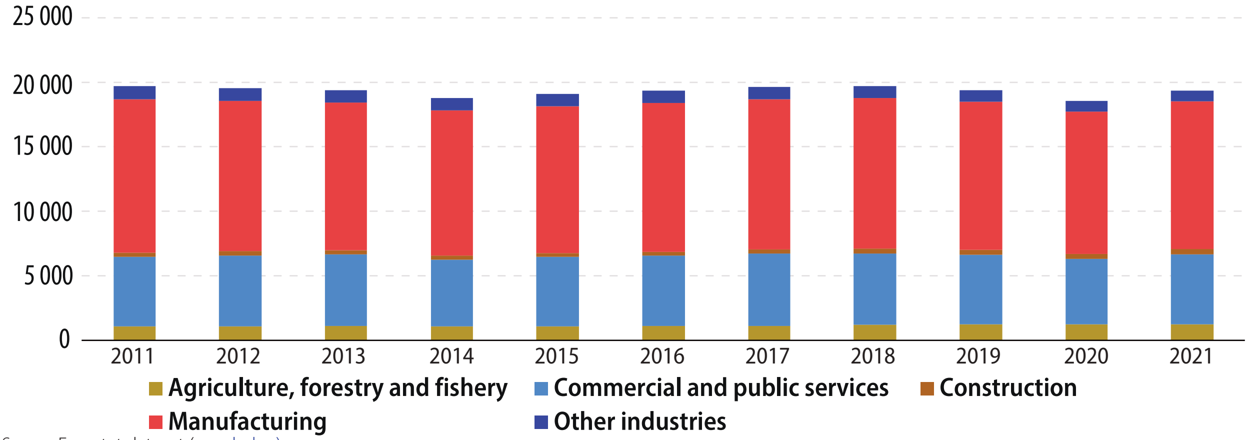
EU-27

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

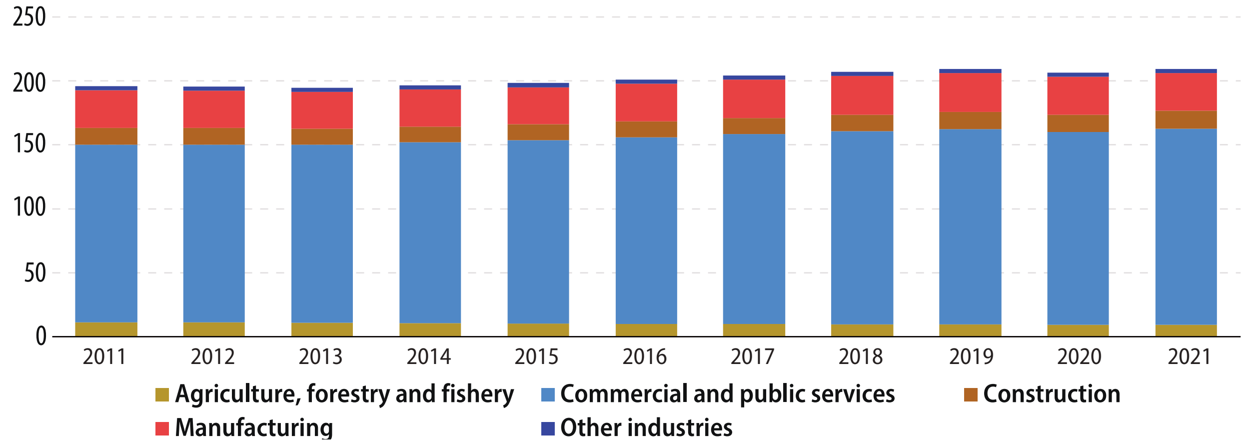


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

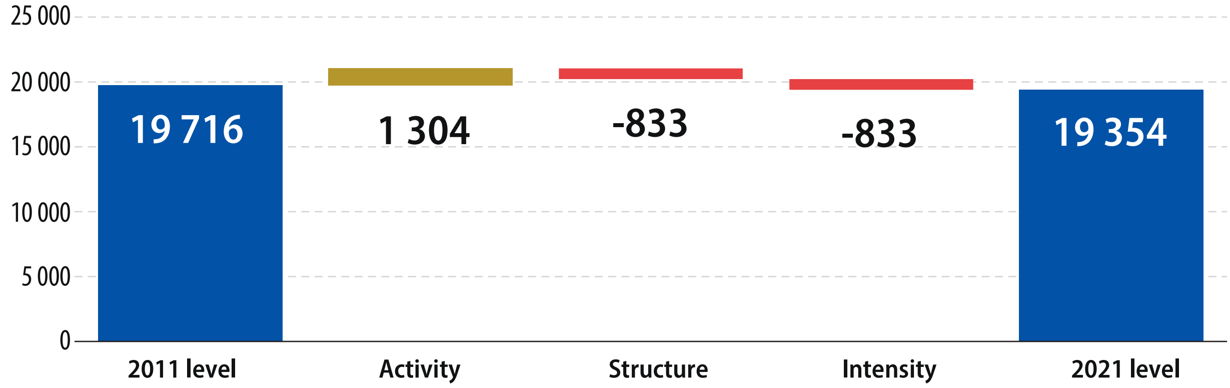


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

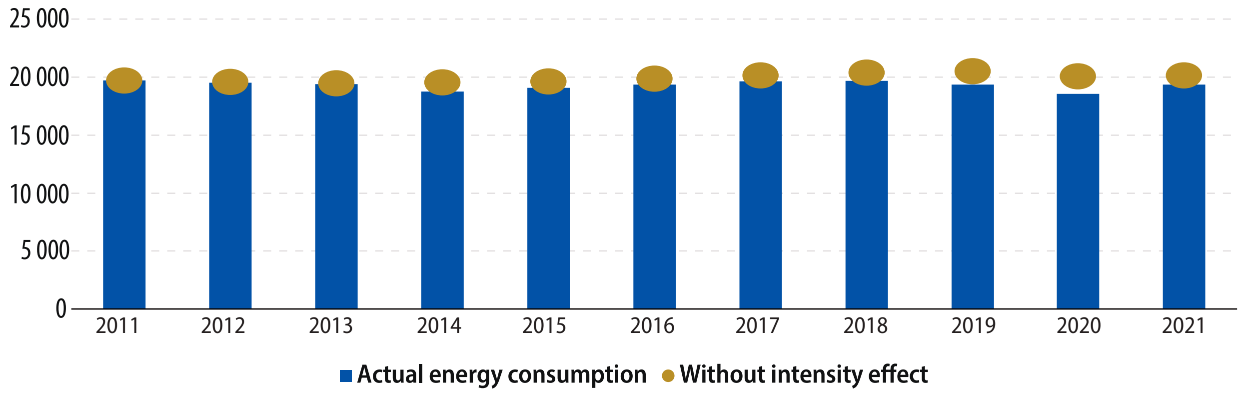


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

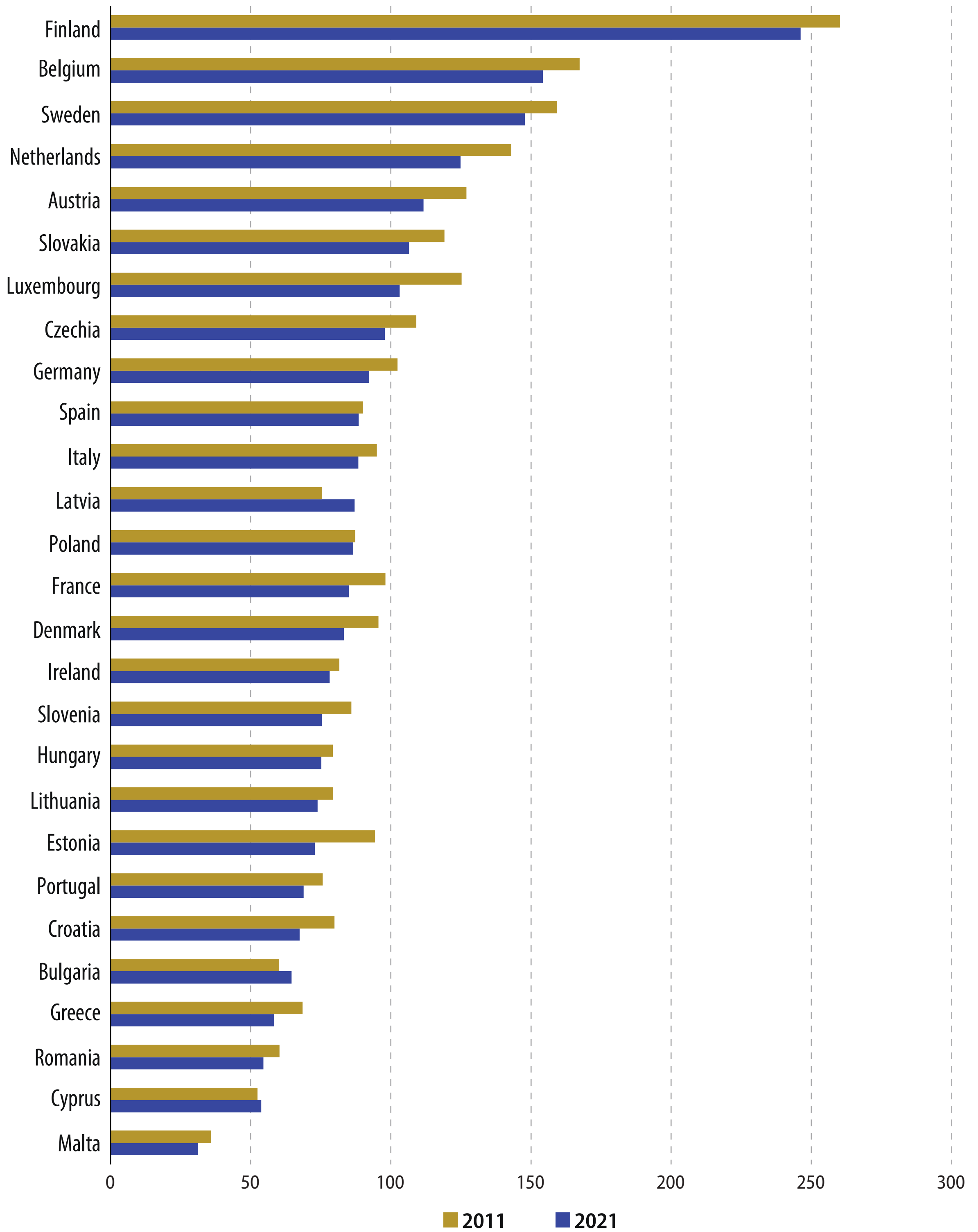
The final energy consumption of the different sectors of the whole economy remained within 18 555 PJ and 19 716 PJ over the studied period. Meanwhile, the active population steadily increased from 196 million in 2011 to 209 million in 2021, despite a small drop to 206 million in 2020. Over this period, the increase in activity (measured in terms of employees) brought energy consumption up by about 1 304 PJ. Meanwhile, the structural change had a strong decreasing effect on the energy consumption of about 833 PJ, mostly due to the increasing share of the commercial and public services sector (from 74 % to 73 % of the active population). The increase in energy consumption per employee had the exact same decreasing effect causing the energy consumption to go down by about 833 PJ. Without this decrease, energy consumption would have been 4 % higher in 2021.

The comparison among EU countries shows again very large variations in energy consumption per employee, ranging from just above 31 TJ per thousand employees in Malta in 2021 to 246 TJ per thousand employees in Finland the same year. All the EU-27 countries show a decrease in energy consumption per employee between 2011 and 2021, except for Latvia, Bulgaria and Cyprus.

FIGURE 5

Energy consumption per employee of European countries, 2011-2021

(TJ / Thousand employee)



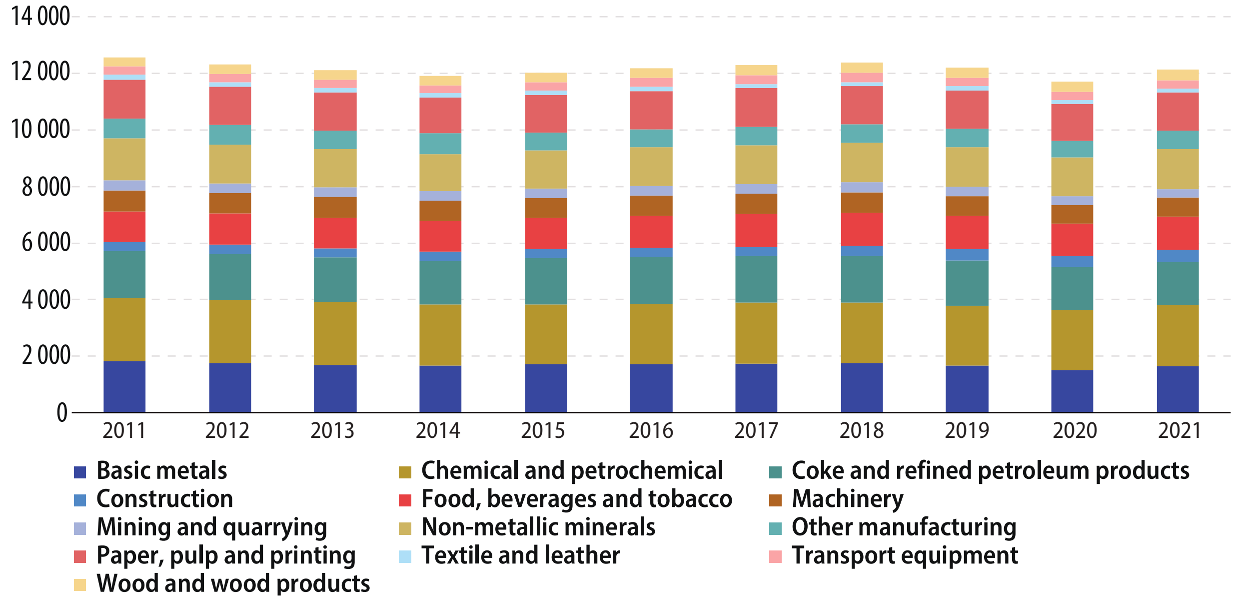
Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

Industry

FIGURE 6

Industry energy consumption by subsector, 2011-2021

(In PJ)

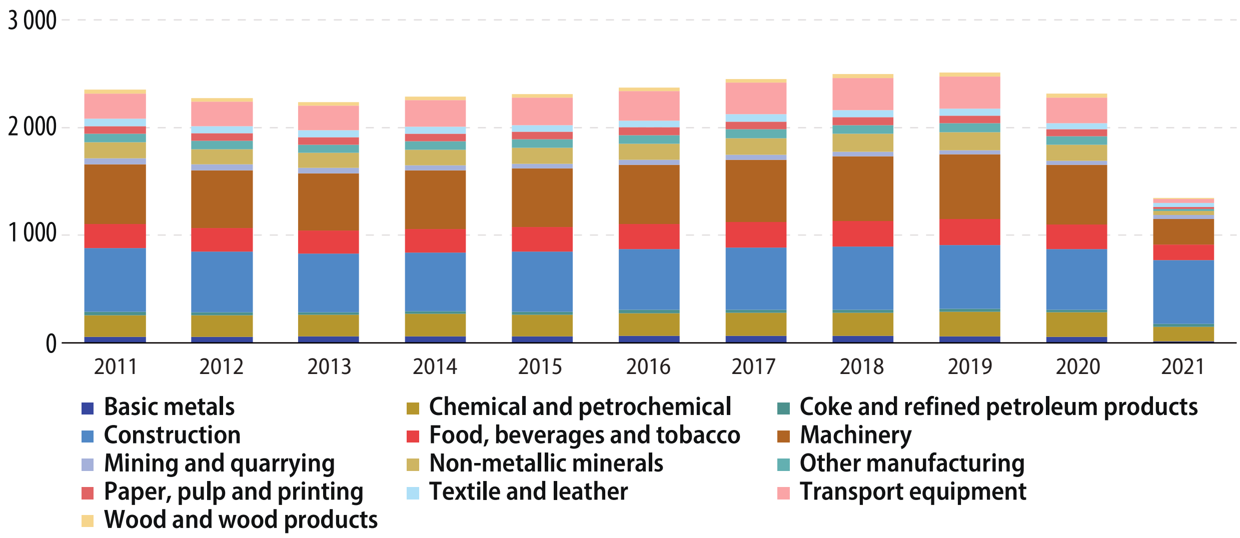


Source: Eurostat dataset (nrg_bal_c)

FIGURE 7

Industry GVA by subsector, 2011-2021

(In EUR billions)

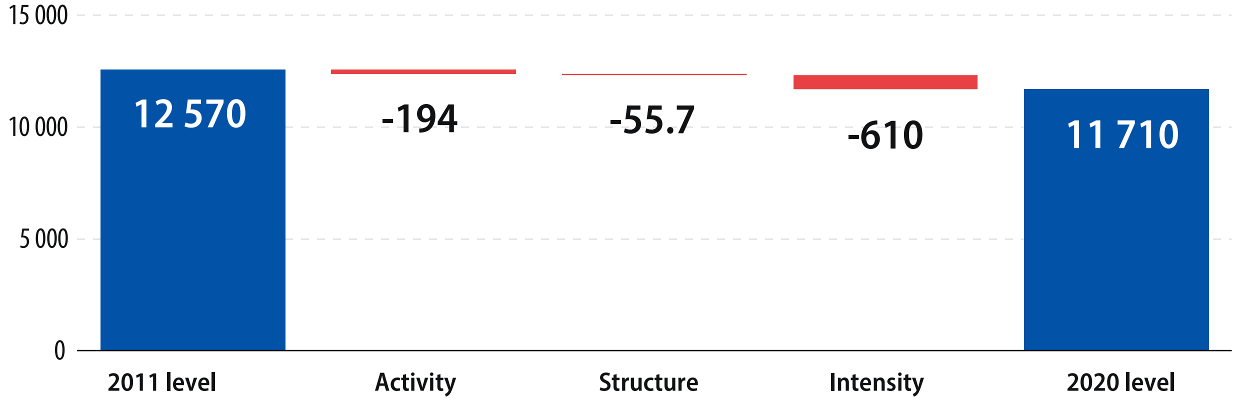


Source: Eurostat dataset (nama_10_a64)

FIGURE 8

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

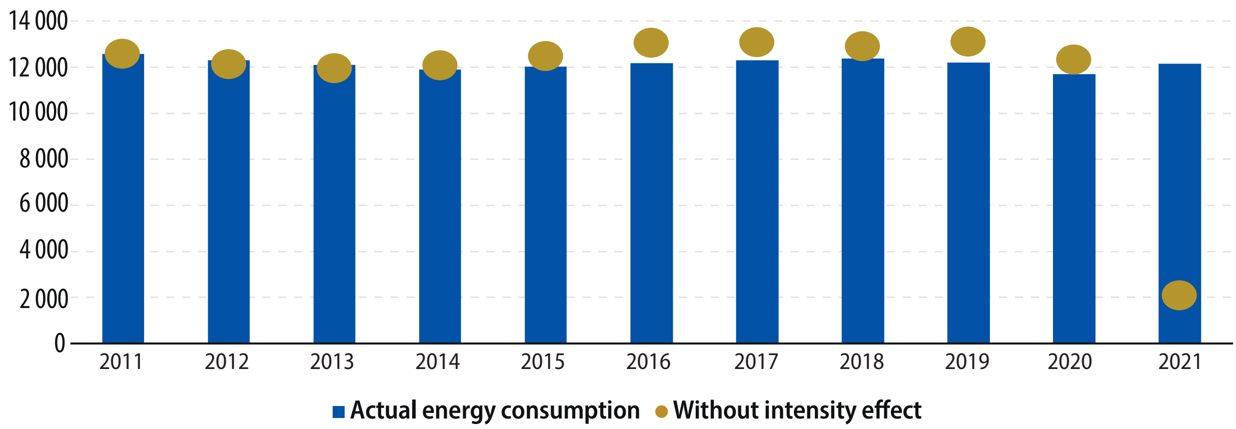


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 9

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

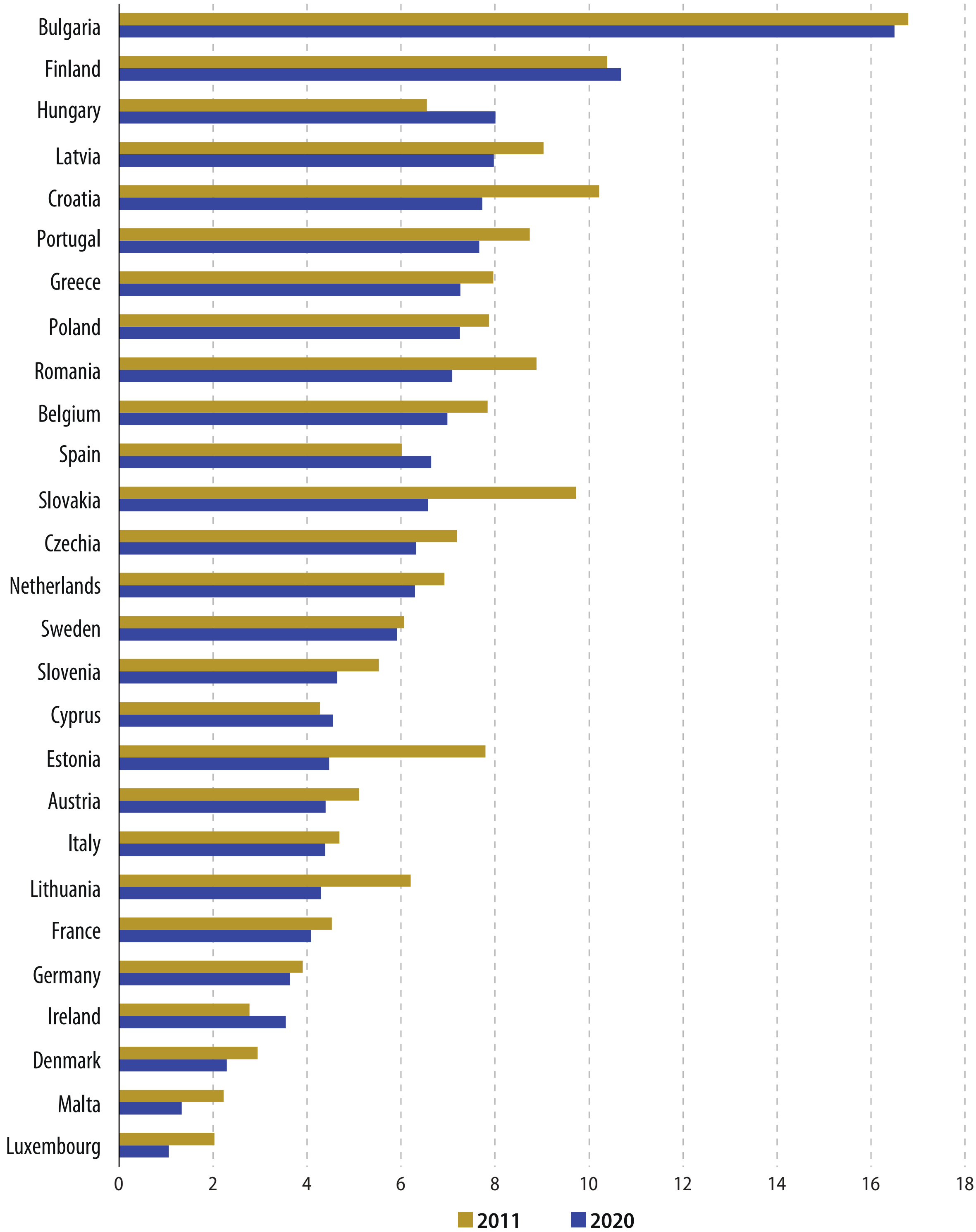
The energy consumption in EU-27 manufacturing industry sector remained very stable over the studied period, with consumption growing from 11 909 PJ in 2019 to 12 570 PJ in 2019, then dropping to 11 710 PJ in 2020 before bouncing back to 12 145 PJ in 2021. The corresponding total gross value added decreased from 2 353 billion EUR in 2011 to 2 236 billion EUR in 2013, then grew to reach 2 510 billion EUR in 2019, before dropping in 2020 to 2 315 billion EUR. The GVA data for 2021 was incomplete for many countries at the time of the extraction, therefore the decomposition was performed over the period 2011-2020. Between these two years, the decrease in activity drove down energy consumption by about 194 PJ. In addition, the structural changes in the industry caused a further decrease of about 55 PJ of consumption. Finally, the most significant driver was the decrease in energy intensity, which brought down consumption by about 610 PJ. Without this reduction, the total energy consumption in the EU manufacturing industry sector could have been 5 % higher in 2020.

The comparison among EU countries shows a very large variation in energy intensities, ranging from only 1 TJ / Million Euro in Luxembourg in 2020 to more than 16 TJ / Million Euro in Bulgaria the same year. Most countries showed a drop in energy intensity between 2011 and 2020.

FIGURE 10

Energy intensity in manufacturing industry of European countries, 2011-2020

(TJ / million EUR)



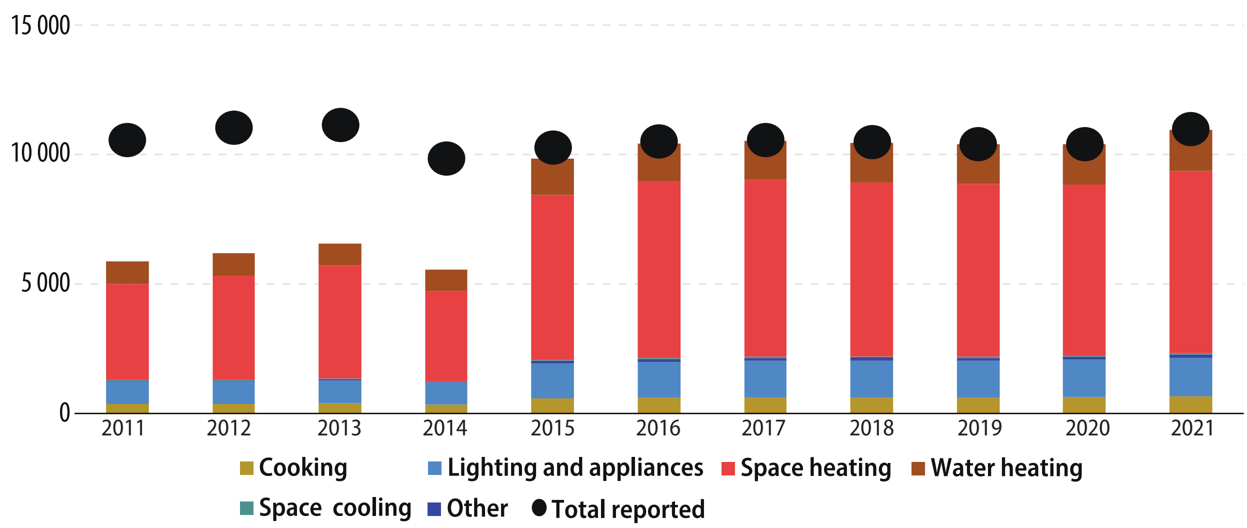
Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

Residential

FIGURE 11

Residential energy consumption by end-use, 2011-2021

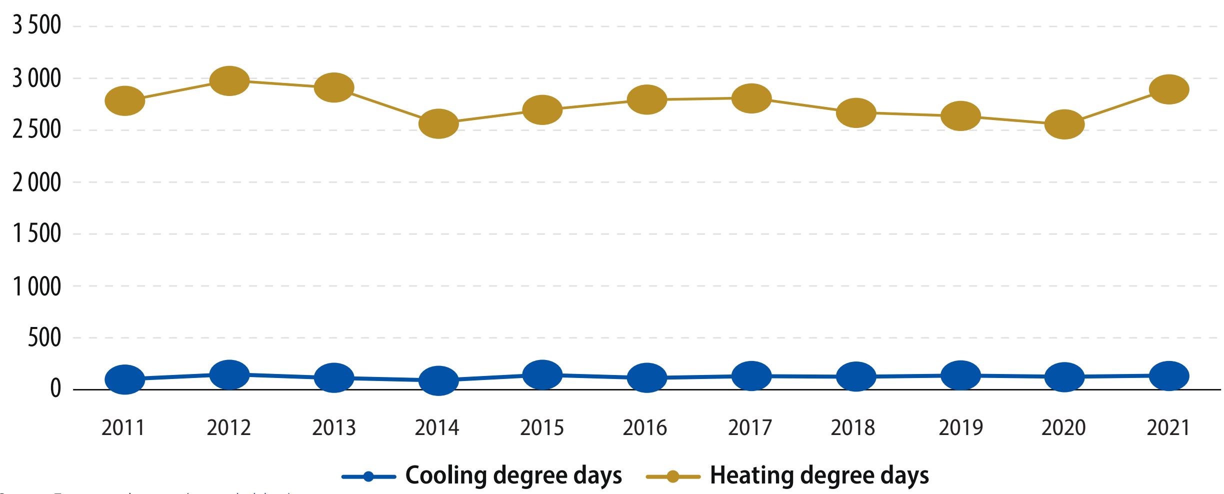
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq))

FIGURE 12

Heating and cooling degree days, 2011-2021

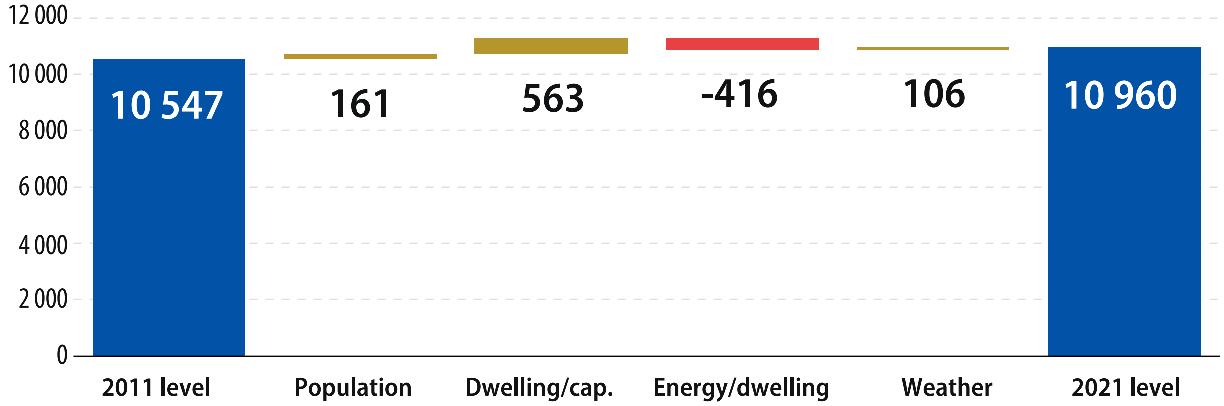


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 14

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

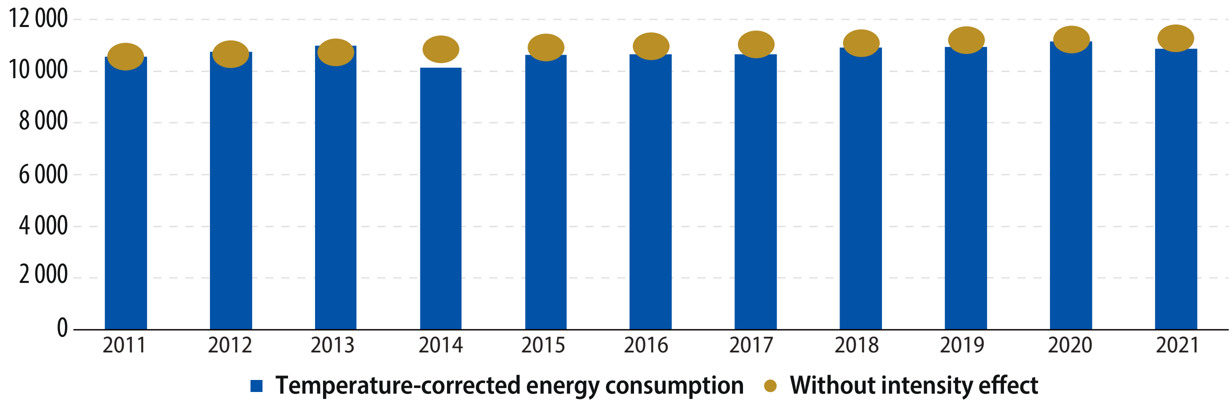


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 15

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

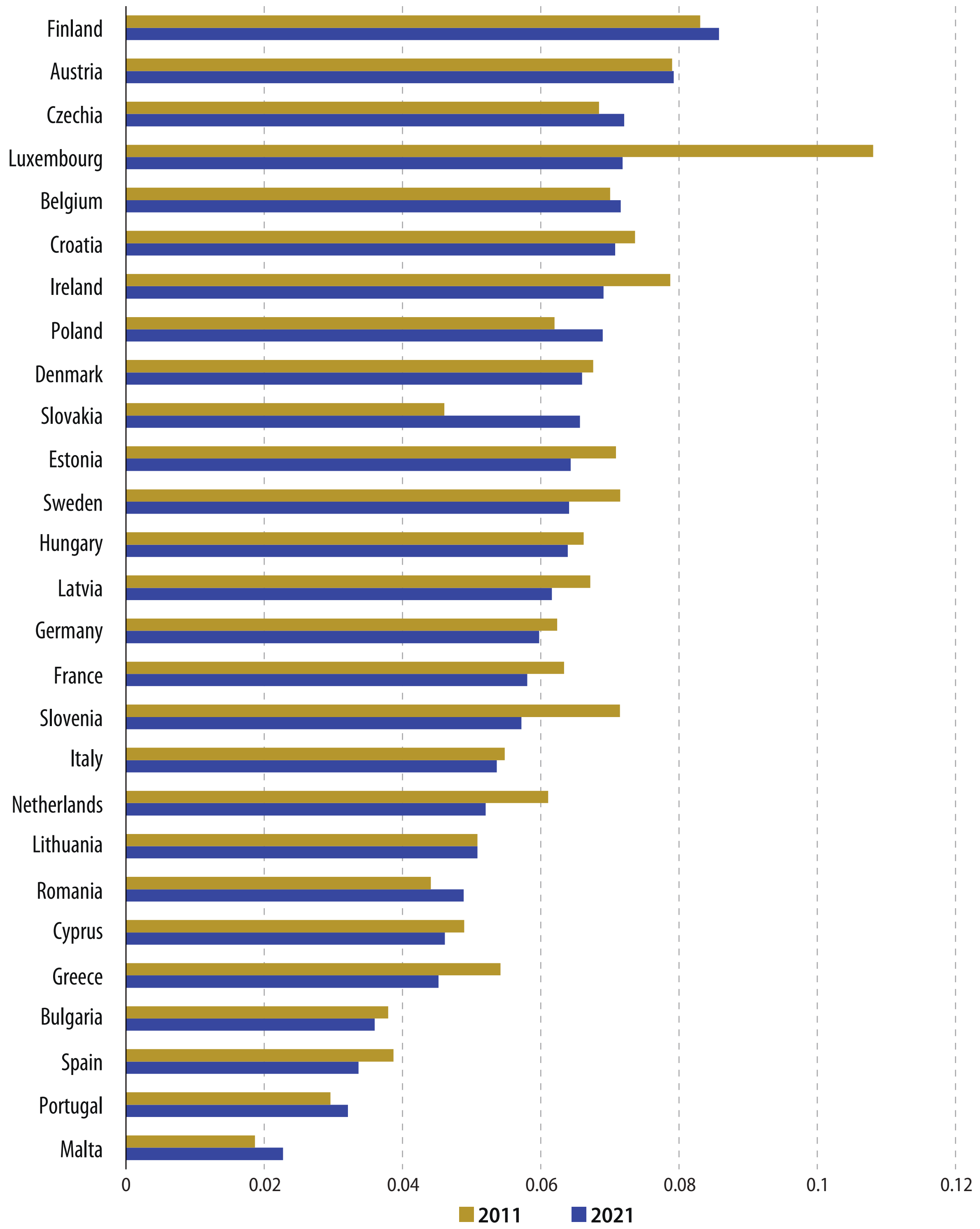
The energy consumption in the residential sector of EU-27 oscillated within 9 824 PJ and 11 141 PJ over the studied period. During this period, the small increase in population can be estimated to have caused an increase of only about 161 PJ, while the decrease in dwelling occupancy had the most significant effect, causing an increase of about 563 PJ. With a slight increase in heating degree days between the two years, the weather had a further increasing effect of about 106 PJ. The drop in energy consumption per dwelling caused a significant drop of almost 416 PJ. Without this drop, the energy consumption in the residential sector would have been 4 % higher in 2021.

The energy consumption per dwelling varies widely between countries, from around 20 GJ per dwelling in Malta in 2021 to above 80 GJ in Finland that same year. As could be expected, countries with warmer weather tend to have lower energy consumption per dwelling, while colder countries tend to show higher consumption. No clear trend can be seen between the two years, but it must be noted that the climate effect could only be calculated properly when countries' disaggregated energy consumption was available in 2011 and in 2021, which was not the case for many countries.

FIGURE 16

Energy consumption per household in European countries, 2011-2021

(In TJ)



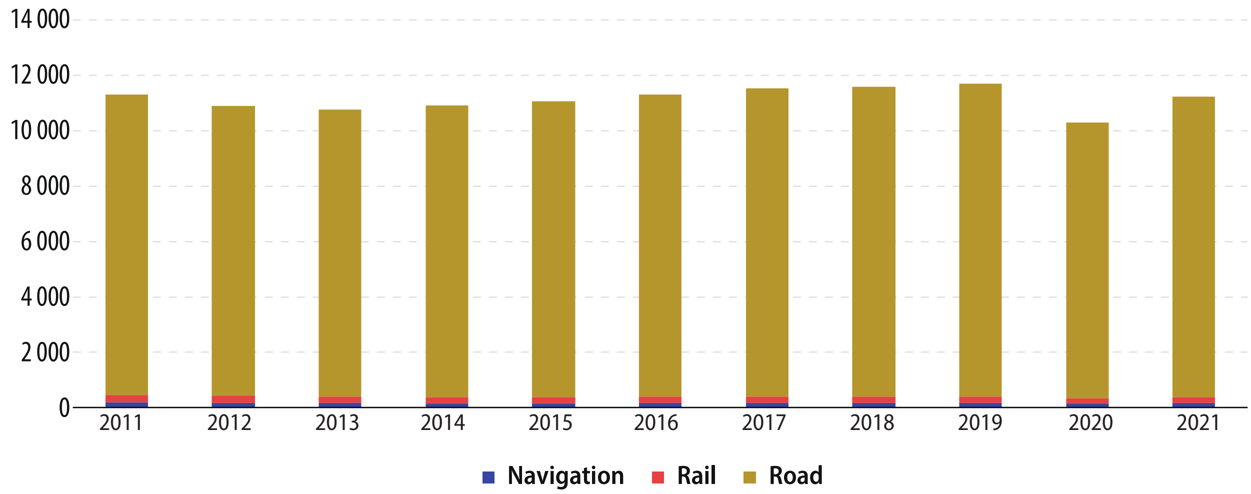
Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

Transport

FIGURE 17

Transport energy consumption by mode, 2011-2021

(In PJ)

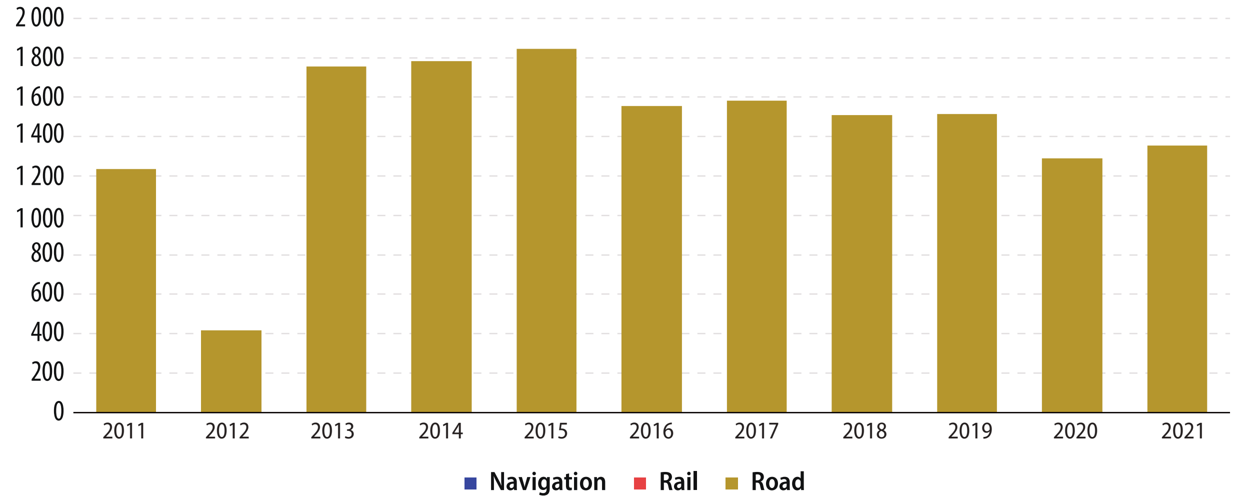


Source: Eurostat dataset (nrg_bal_c)

FIGURE 18

Transport traffic by mode, 2011-2021

(In billion VKM)

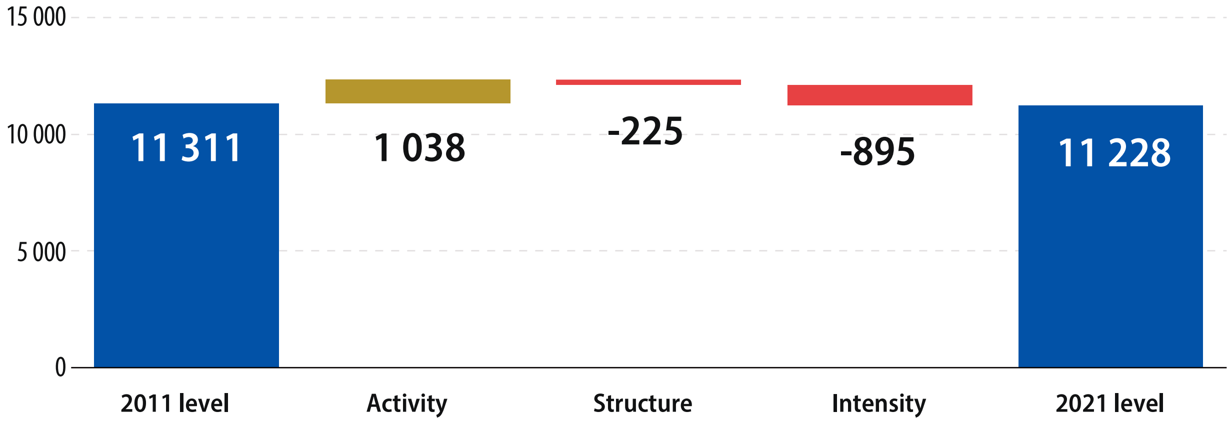


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 19

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

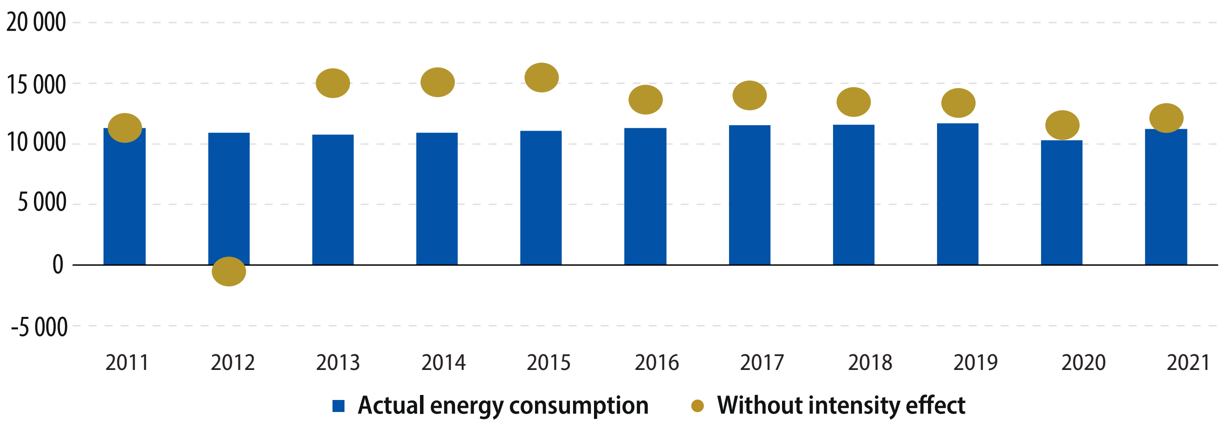


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 20

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

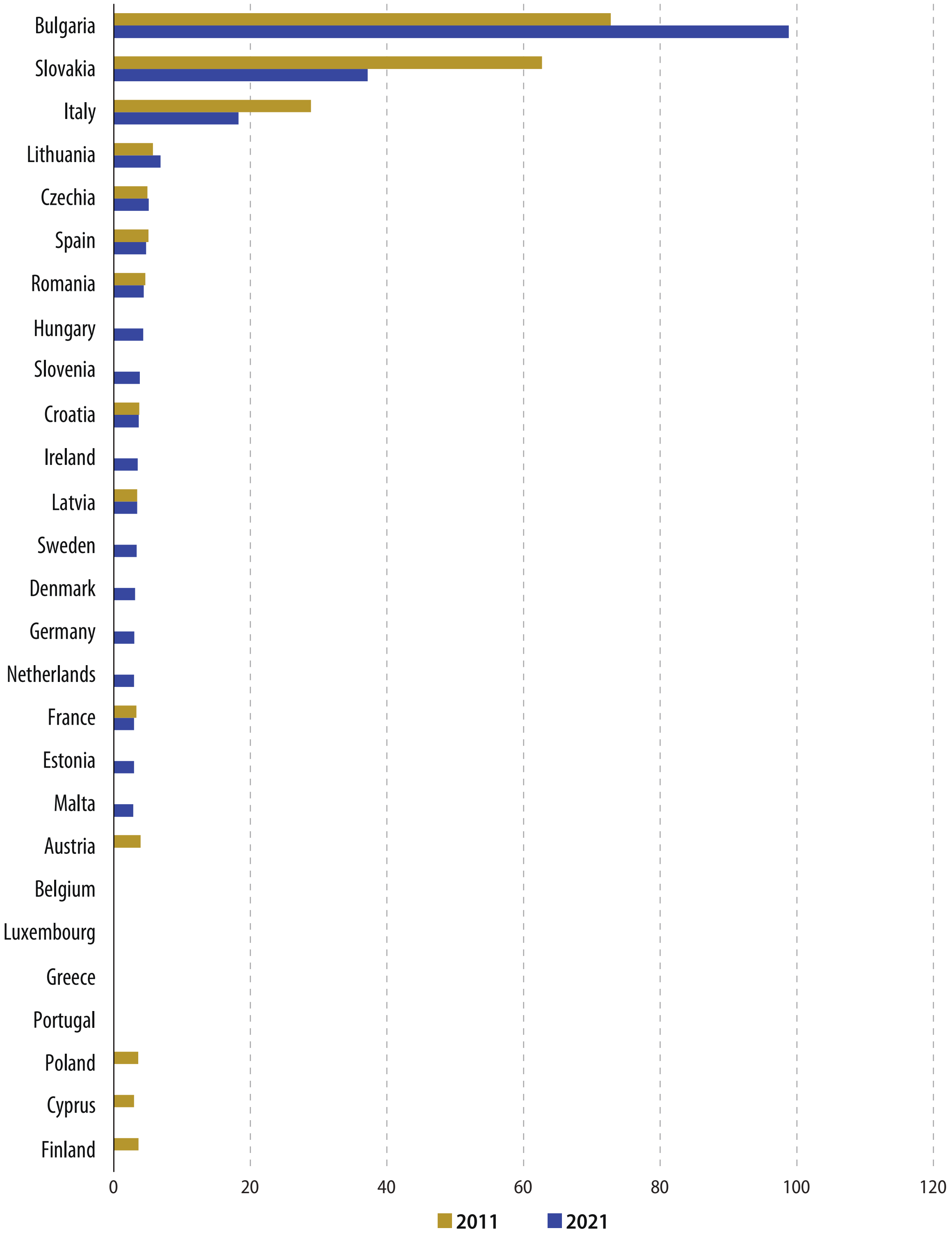
After a first decrease, from 11 311 PJ in 2010 to 10 774 PJ in 2013, the energy consumption in the EU-27 transport sector grew steadily to 11 692 PJ in 2019, before dropping to 10 304 PJ in 2020, and it was still only 11 228 PJ in 2021. Most of the energy consumption was due to road transport. Road traffic grew from 1 234 billion VKM in 2011 to 1 840 billion VKM in 2015, despite a significant drop in 2012, probably due to incomplete data, and it decreased to reach 1 352 billion VKM in 2021. Between 2011 and 2021, the small increase in traffic caused a bump in energy consumption of about 1 038 PJ, which was offset by the decrease in energy intensity, causing a decrease of about 895 PJ and to a lesser extent by a change in the share of the different modes, causing a drop of 225 PJ.

Some clear reporting issues can be identified for road transport data for many countries. Some issues might be due to incomplete traffic information, which would result in very high consumption per vehicle-kilometre. Rail transport data were also often missing, but the intensity was within the same order of magnitude. Navigation traffic was too seldom reported to draw any conclusions. Finally, for all types of transport, the absence of information between freight and passenger transport is also one of the main causes of variability between countries.

FIGURE 21

Energy intensity of road transport in European countries, 2011-2021

(TJ / Million VKM)

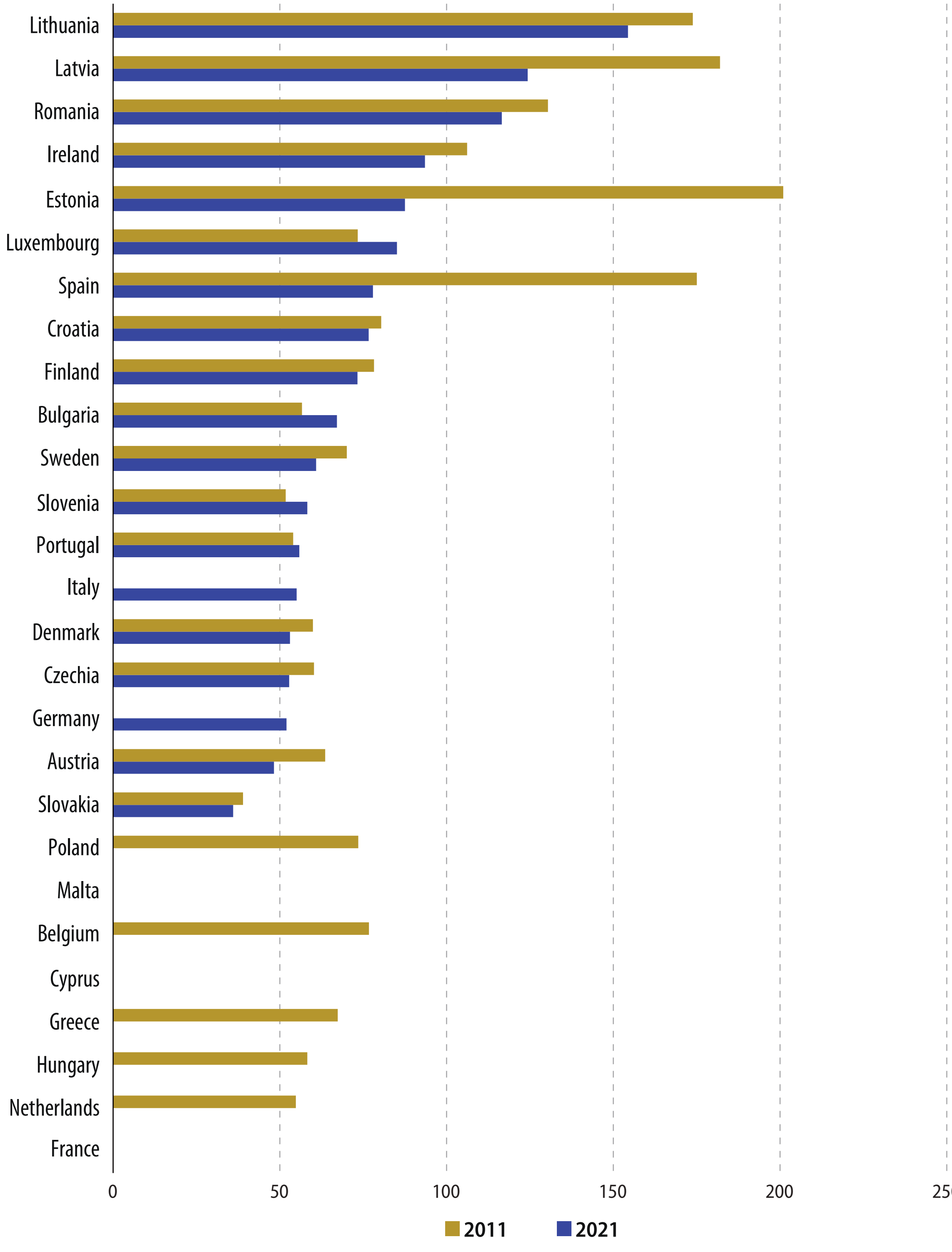


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 22

Energy intensity of rail transport in European countries, 2011-2021

(TJ / Million VKM)

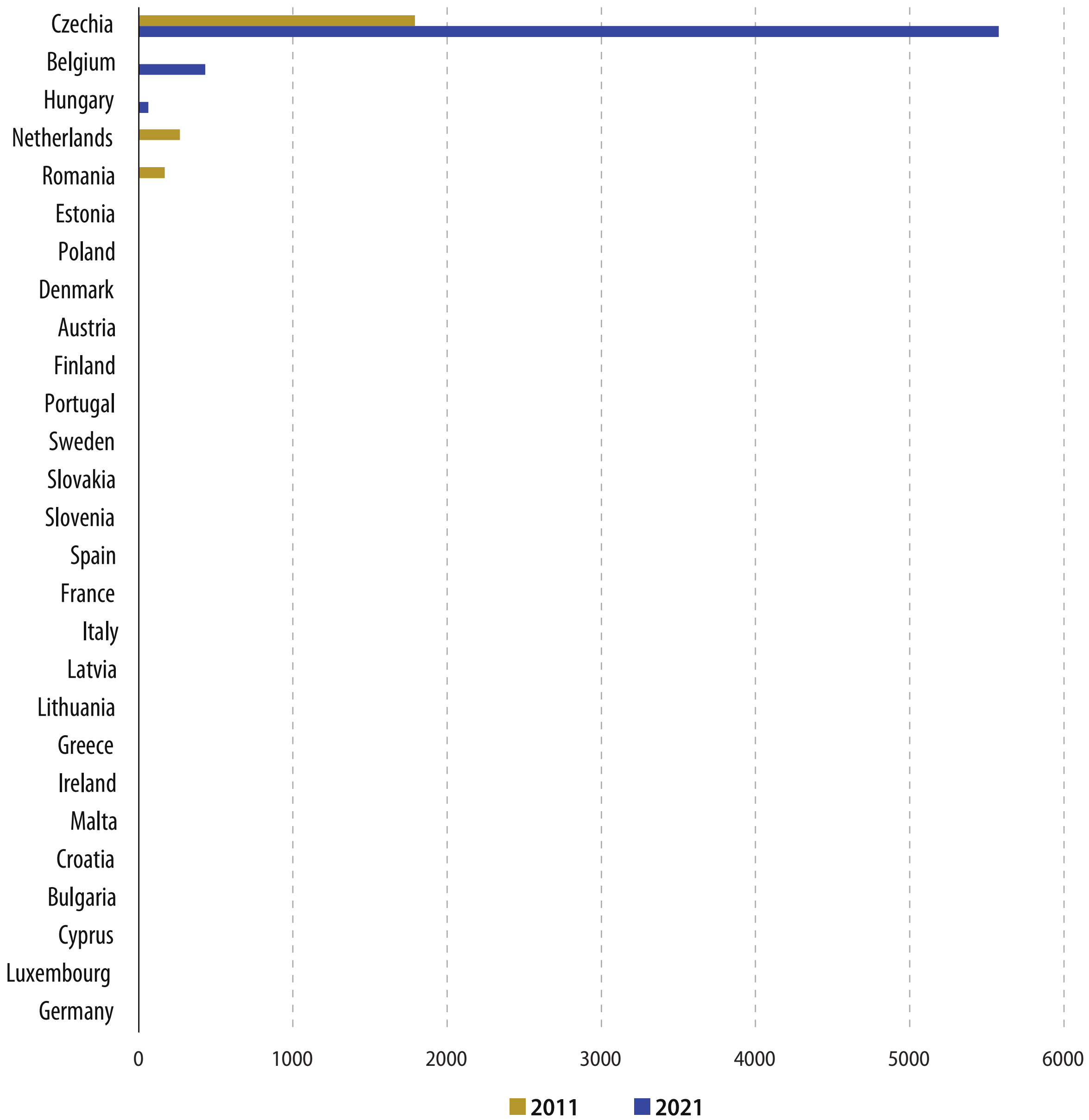


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 23

Energy intensity of navigation transport in European countries, 2011-2021

(TJ / Million VKM)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

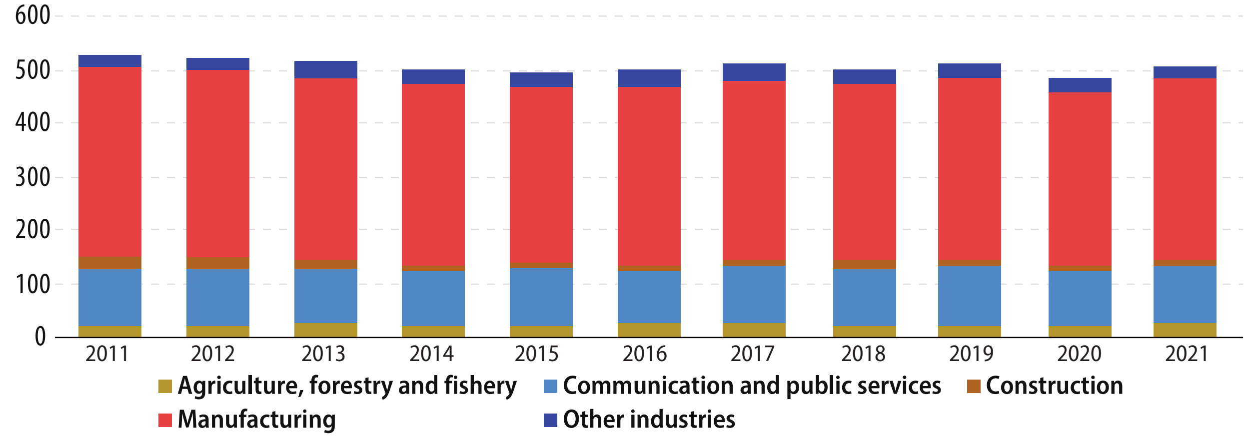
Austria

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

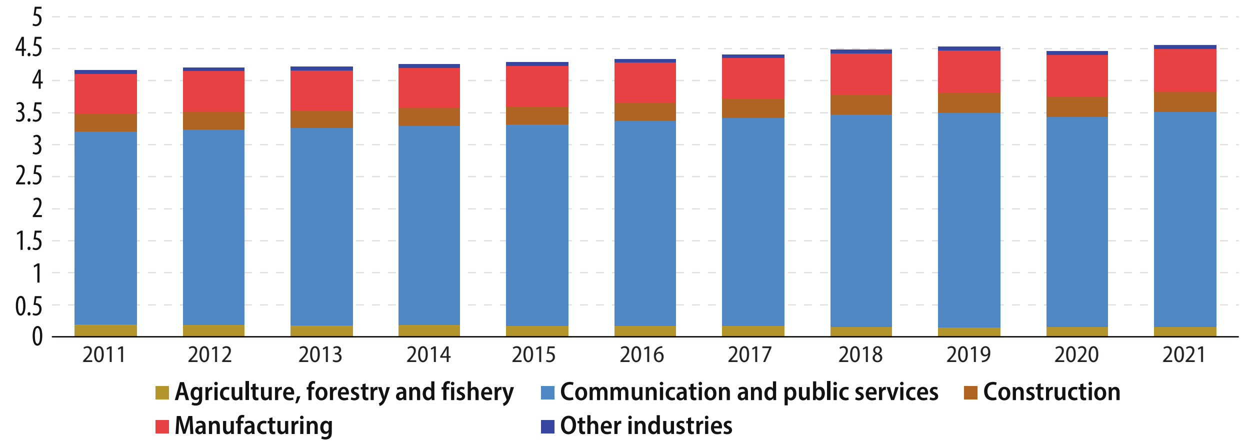


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

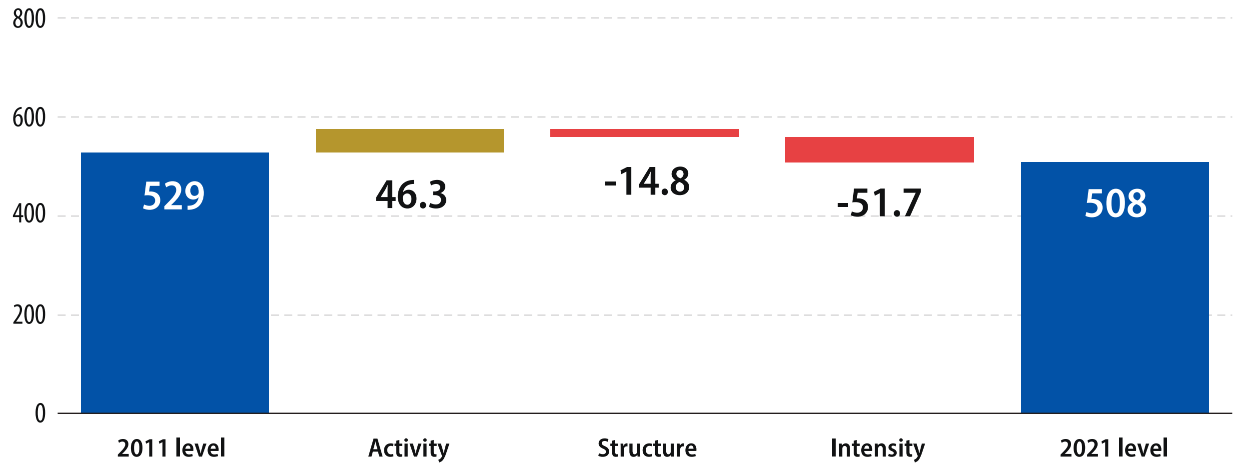


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

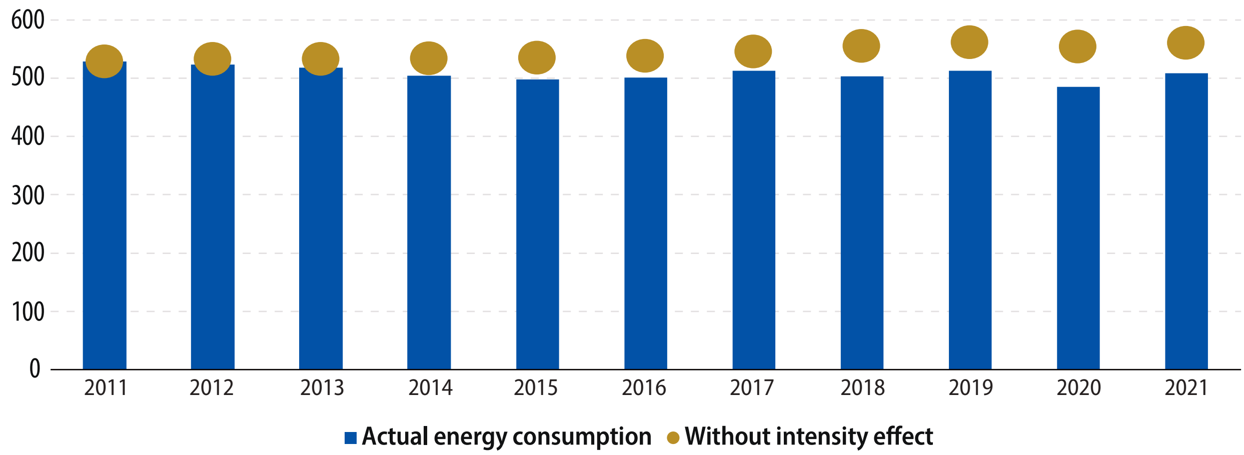


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

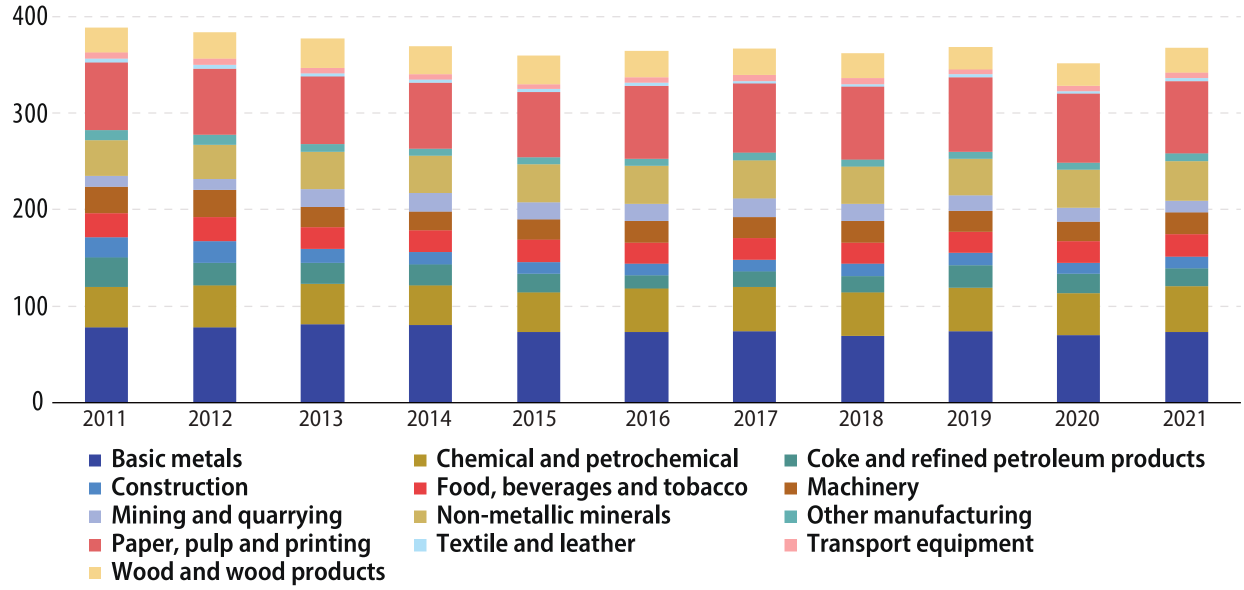
The final energy consumption of the different sectors of the whole economy slightly increased between 2011 and 2019 from 529 PJ to 512 PJ, then it dropped to 485 J in 2020, before coming back to 508 PJ in 2021. Similarly, the active population steadily increased from 55.5 million in 2011 to 58.1 million in 2019, then dropped to 57.7 million in 2020, then reached its highest level at 58.3 million in 2021. Over this period, the increase in activity (measured in terms of employees) brought up the energy consumption by about 46 PJ. Meanwhile, the structural change brought slightly down the energy consumption by about 15 PJ, mostly due to the increasing share of the commercial and public services sector (from 72 to 81% of the active population). The most significant change was due to a decrease in intensity, which caused the energy consumption to decrease by about 52 PJ. Without this decrease in energy consumption per employee, energy consumption would have reached 560 PJ in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

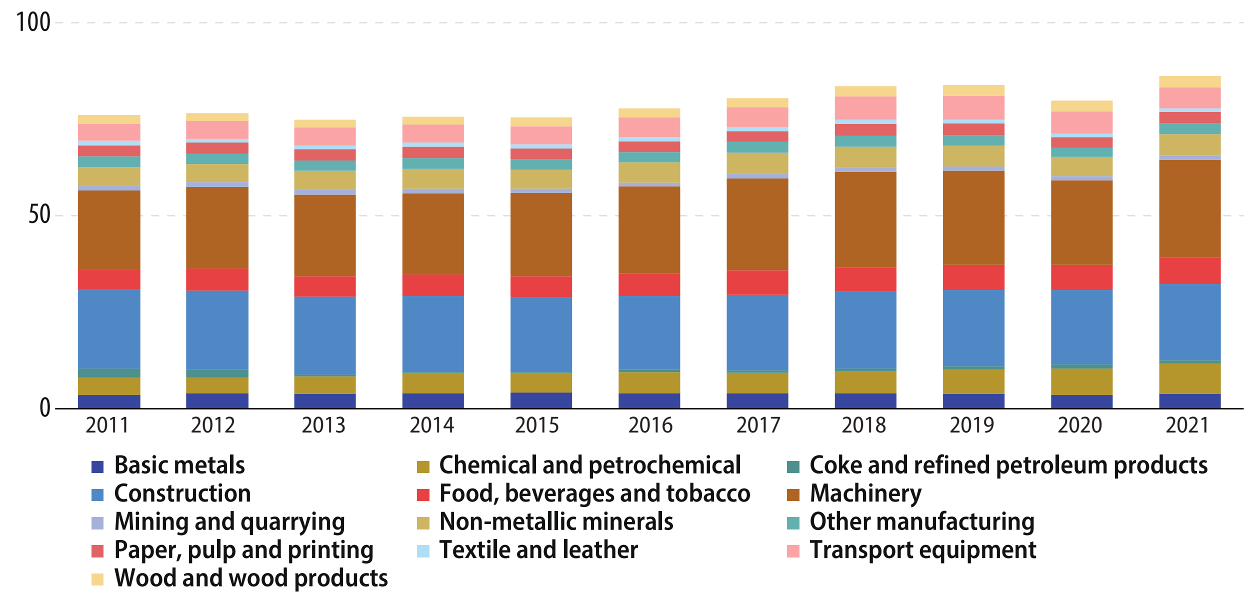


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

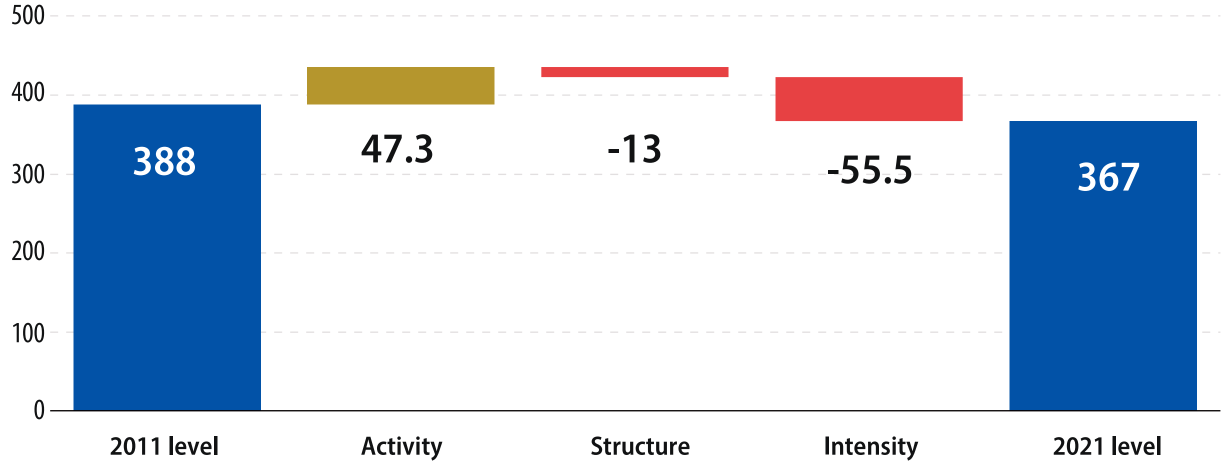


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

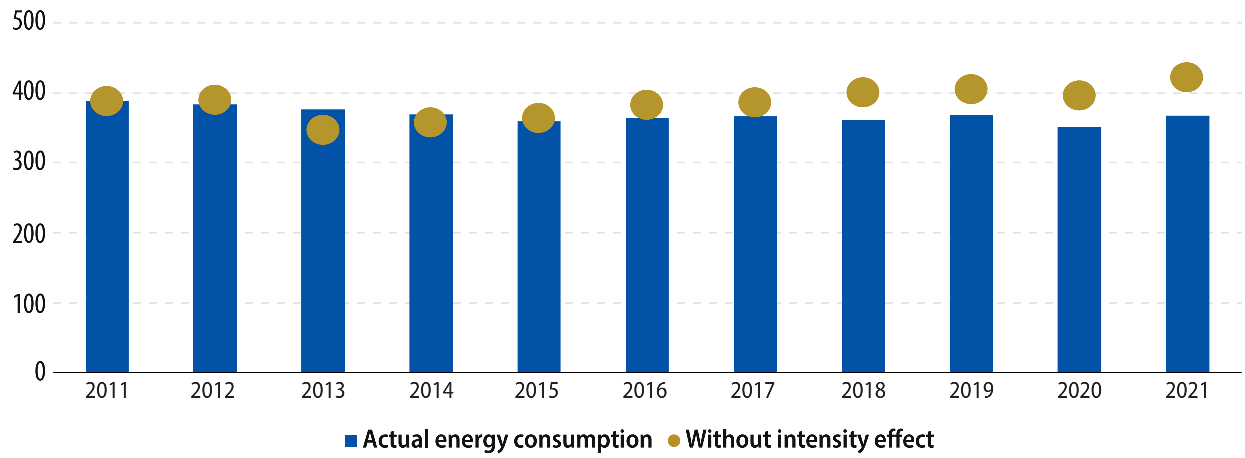


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

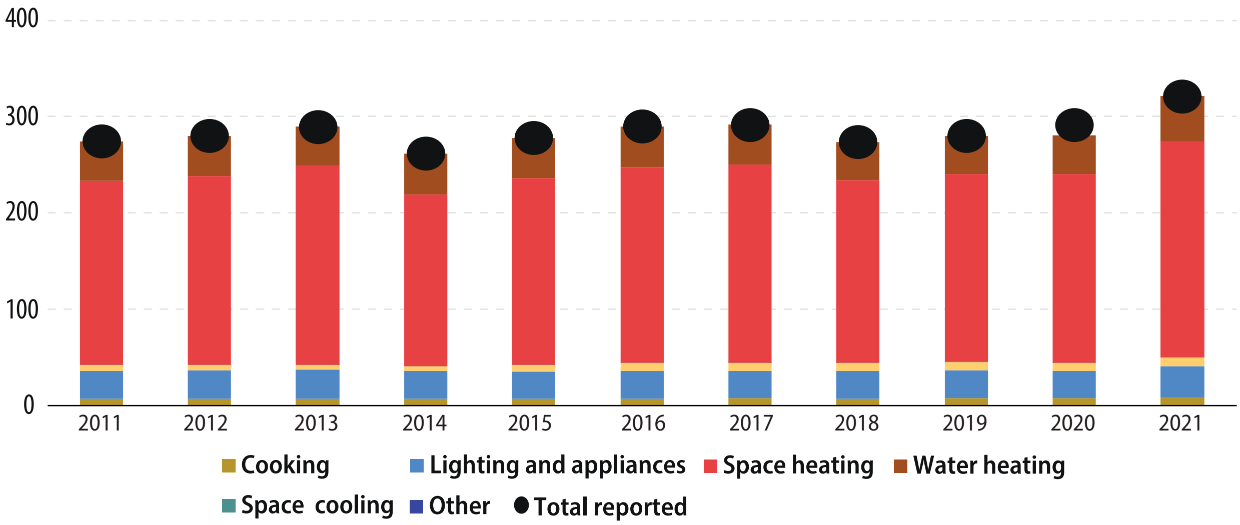
Austria's energy consumption in its manufacturing industry sector decreased from 388 PJ in 2011 to 351 PJ in 2020, then climbing back to 367 PJ in 2021. The corresponding total gross value added increased from 76 billion EUR in 2011 to 84 billion EUR in 2019, and then decreased in 2020 below 80 billion EUR, before bouncing back to its highest level in 2021 at 86 billion EUR. Between 2011 and 2021, the increase in activity brought up the consumption of energy by about 47 PJ. Meanwhile, the structural changes in the economy caused a decrease of about 13 PJ of consumption, partly due to a lower share of the construction sector (from 27 to 23% between these two years). Finally, the most significant variation was due to a decrease in energy intensity, which brought down the consumption by about 55 PJ. Without this reduction, the total energy consumption in the industry sector would have been close to 15% higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

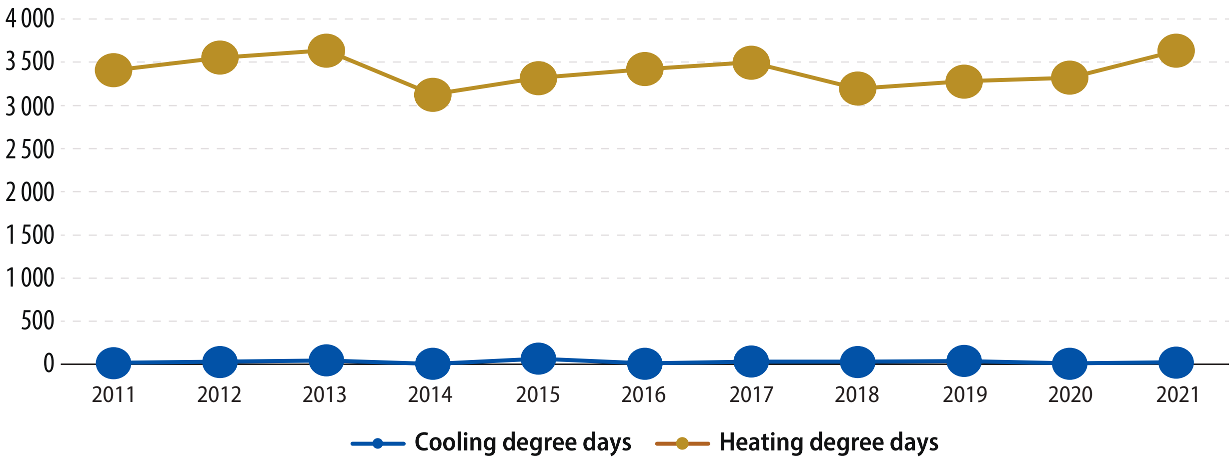
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

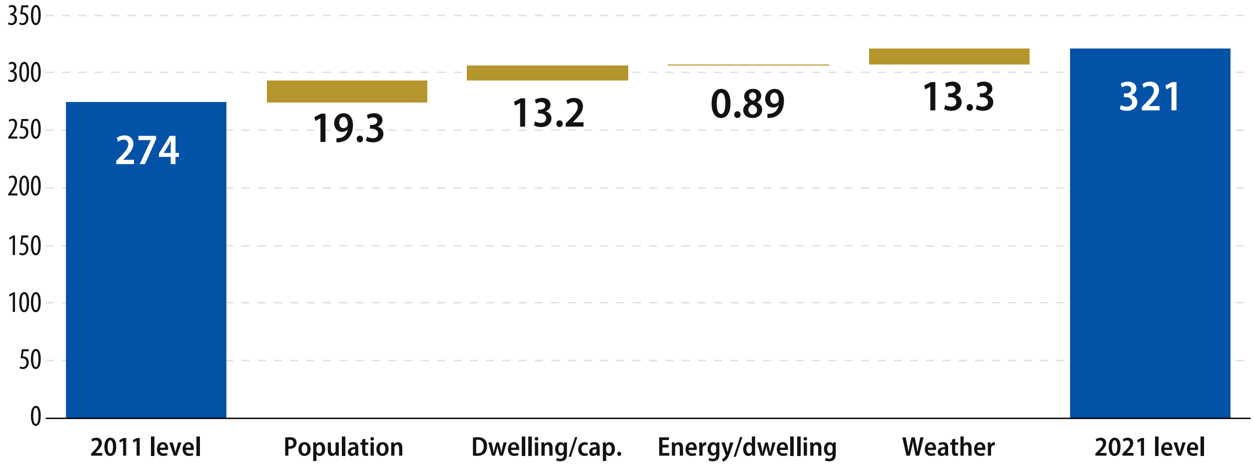


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

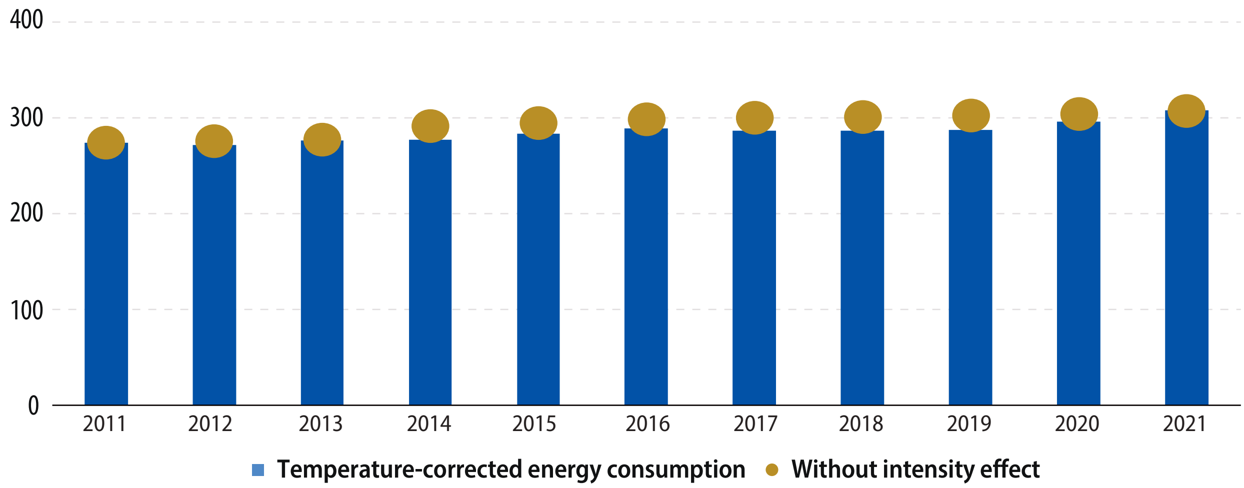


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

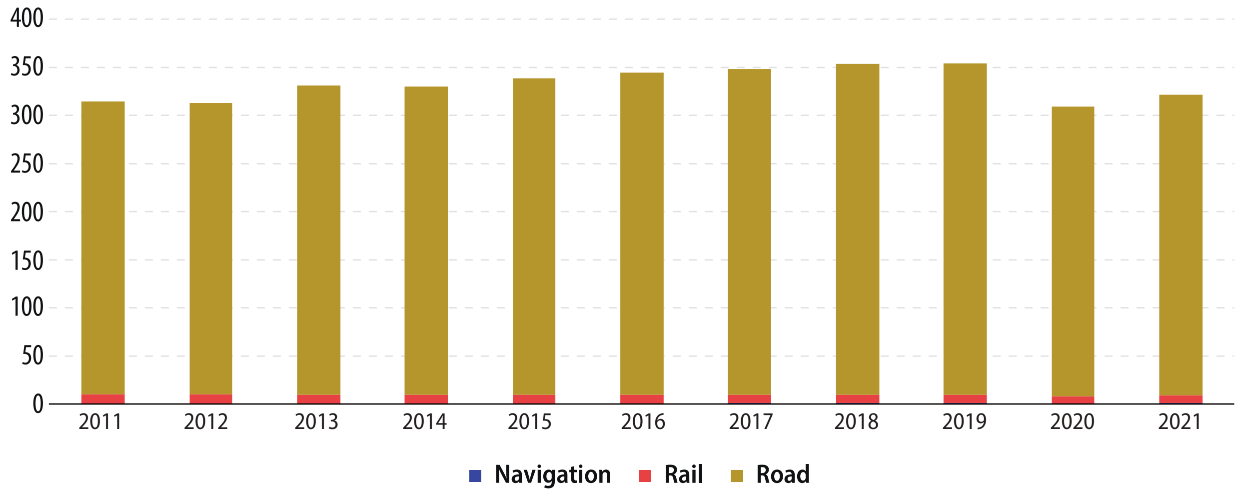
The energy consumption in the Austrian residential sector increased from 274 PJ in 2011 to 321 PJ in 2021. During this period, the increase in population can be estimated to have caused an increase of about 19 PJ, and the decrease in dwelling occupancy had an additional increasing effect of about 13 PJ. With a slight increase in heating degree days between the two years, the weather had a further increasing effect of about 13 PJ, while the energy consumption per dwelling remained very stable and had almost no effect on the overall consumption.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

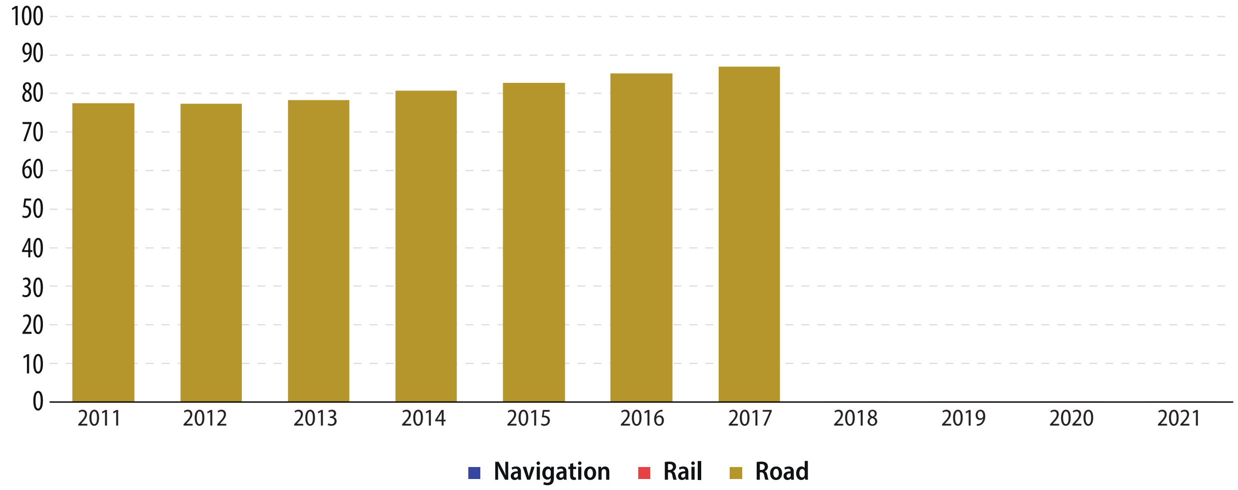


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

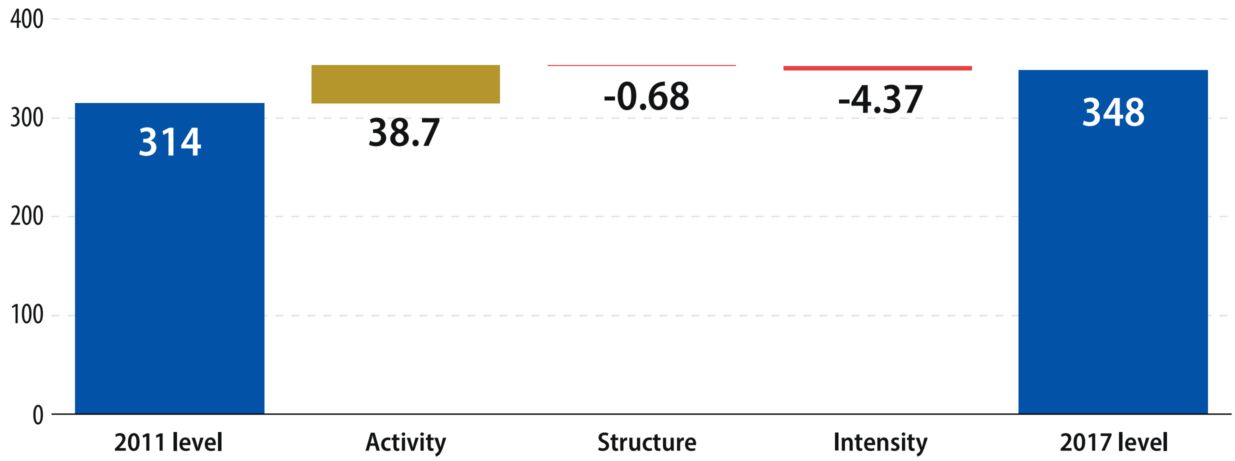


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

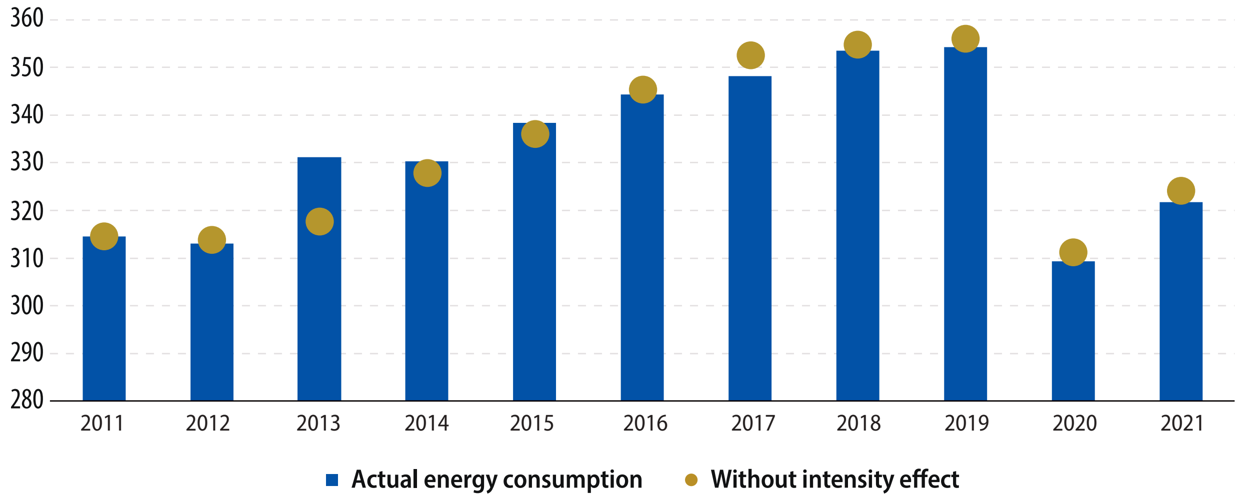


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Austrian transport sector grew steadily from 314 PJ in 2011 to 354 PJ in 2019, before dropping to 309 PJ in 2020, and it was still only 322 PJ in 2021. Most of the energy consumption was due to road transport. The traffic grew from 77.4 billion VKM in 2011 to 87.0 billion VKM in 2017, and road traffic information was not available in later years, therefore the decomposition was performed on the period 2011 to 2017. Between these two years, the increase in traffic caused an increase in energy consumption of about 39 PJ, which was only slightly offset by the decrease in energy intensity, causing a reduction of about 4 PJ. With the absence of variation in the share of the different transport modes, the structural effect was not noticeable.

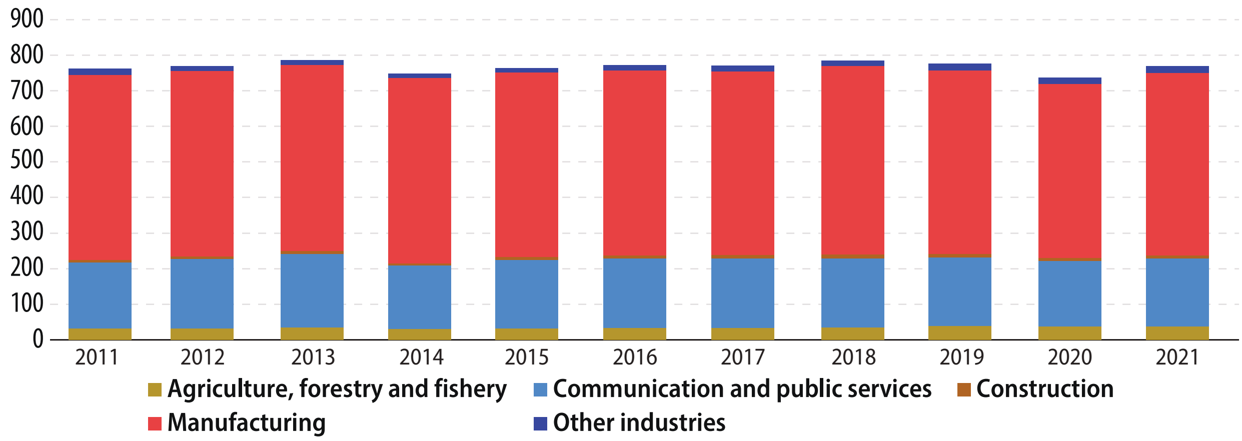
Belgium

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

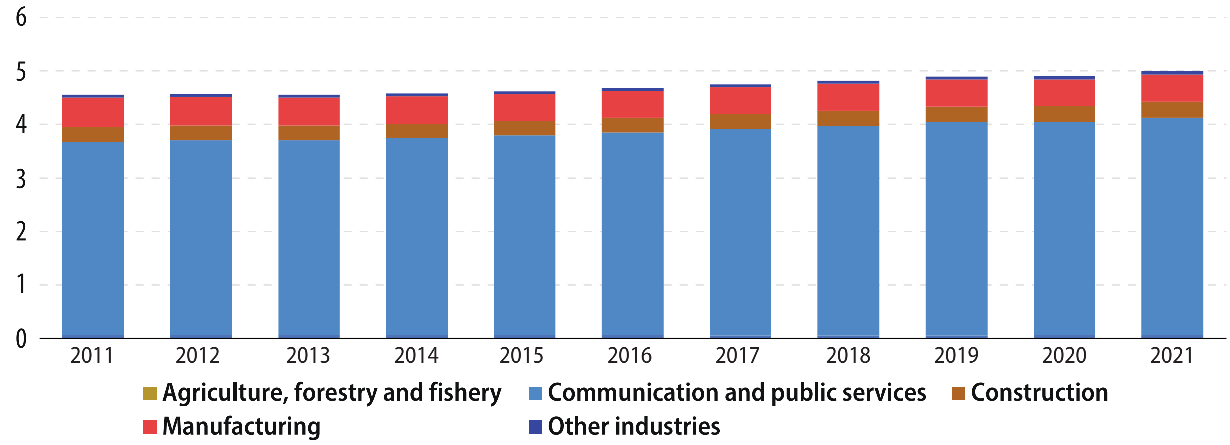


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

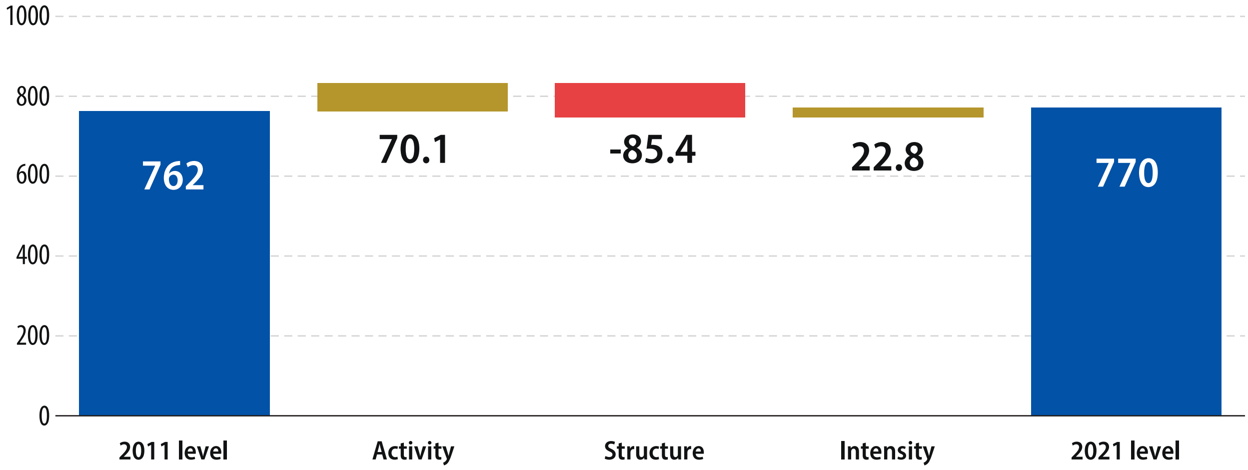


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

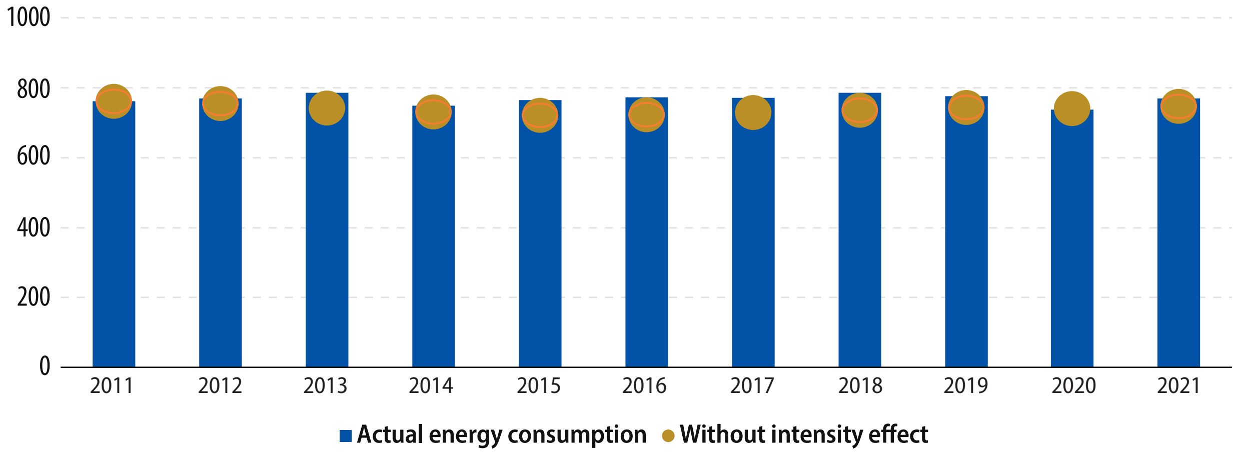


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

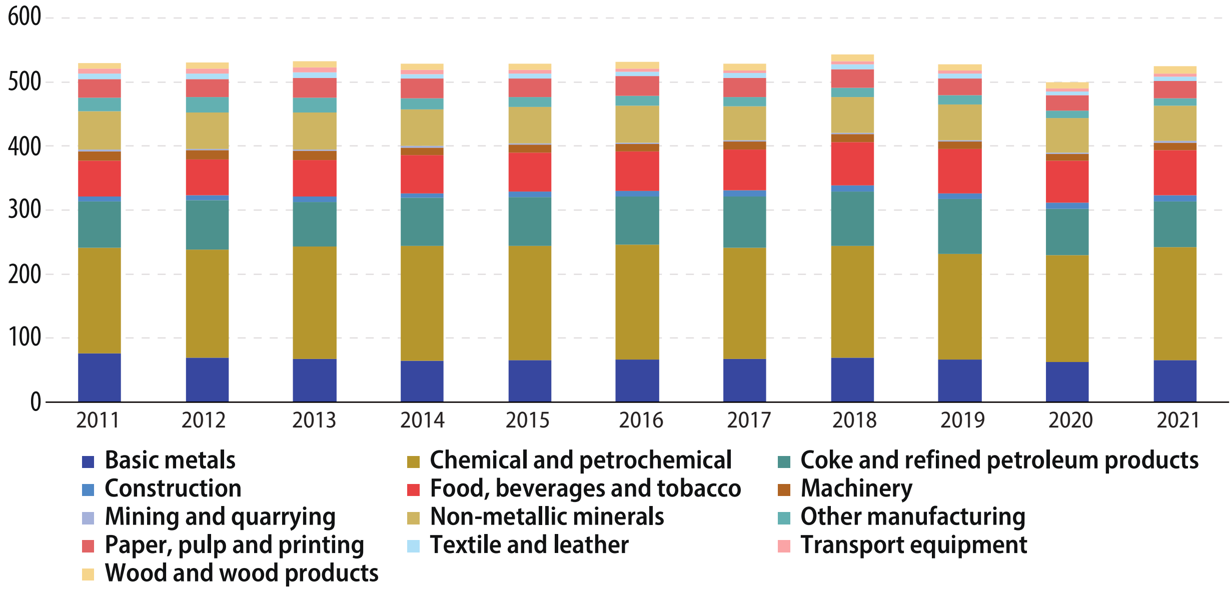
The final energy consumption of the different sectors of the Belgian economy slightly increased between 2011 and 2019 from 762 PJ to 776 PJ, then it dropped to 737 J in 2020, before coming back to 770 PJ in 2021. Meanwhile, the active population steadily increased from 4.6 million in 2011 to 5.0 million in 2021. From 2011 to 2021, the increase in activity (measured in terms of employee) brought energy consumption up by about 70 PJ, and the increase in intensity (measured as energy consumption per employee) brought the energy consumption further up by about 23 PJ. The most significant driver however was the changes in the structure of the economy, which caused a drop in energy consumption of about 85 PJ and is mostly related to the decrease in the share of the manufacturing sector (from 68 % to 66 % of the active population between the two years).

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

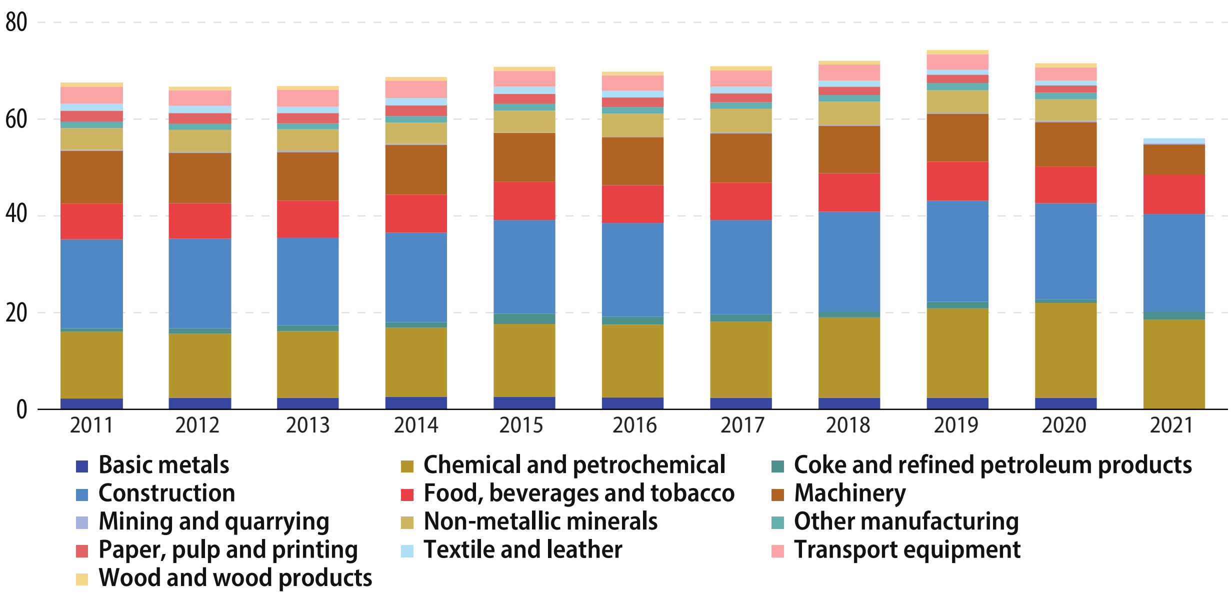


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

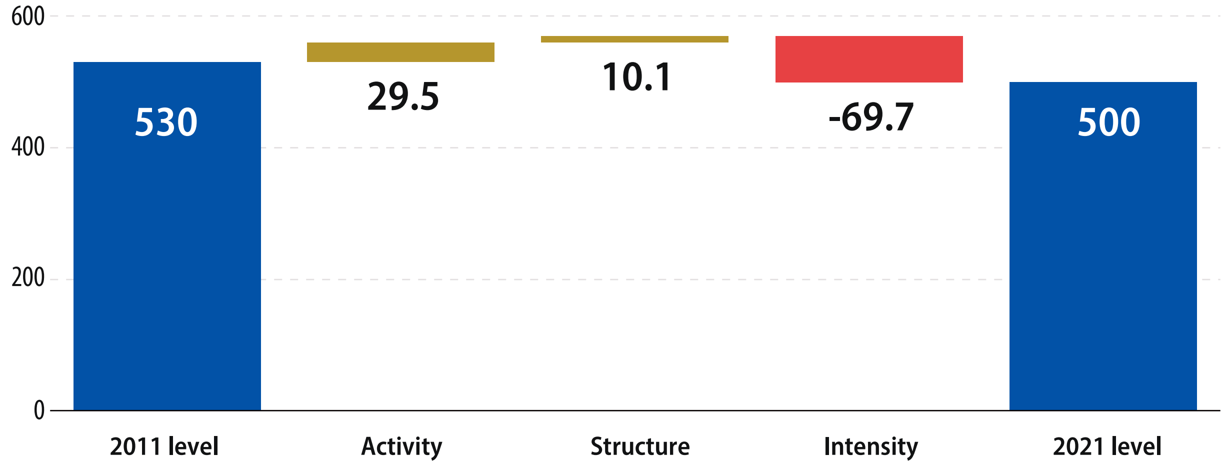


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

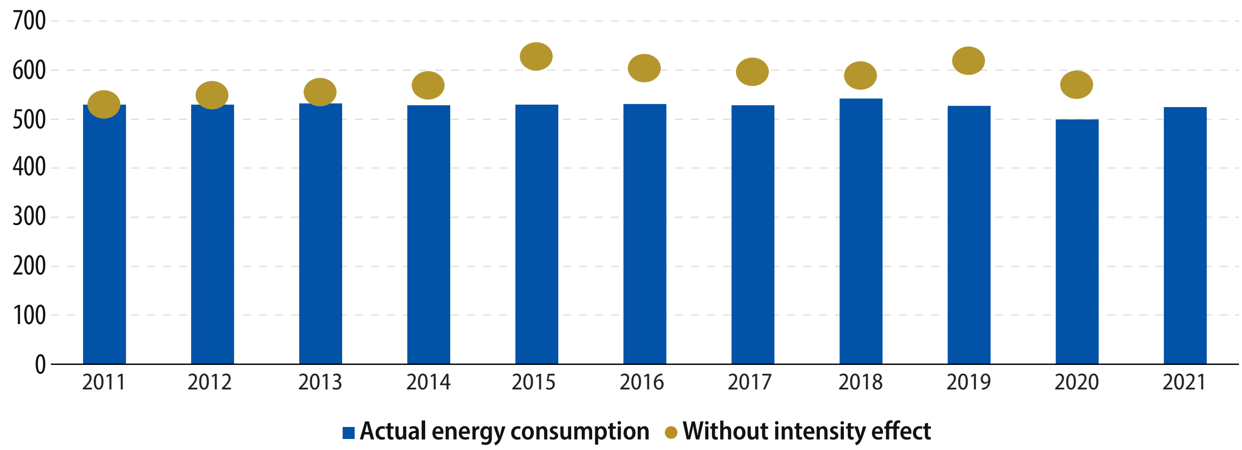


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

The energy consumption in Belgium's manufacturing industry sector decreased from 530 PJ in 2011 to 500 PJ in 2020, before bouncing back to 525 PJ in 2021. The corresponding total gross value added increased from 68 billion EUR in 2011 to 74 billion EUR in 2019, and then decreased in 2020 to 72 billion EUR. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the period 2011-2020.

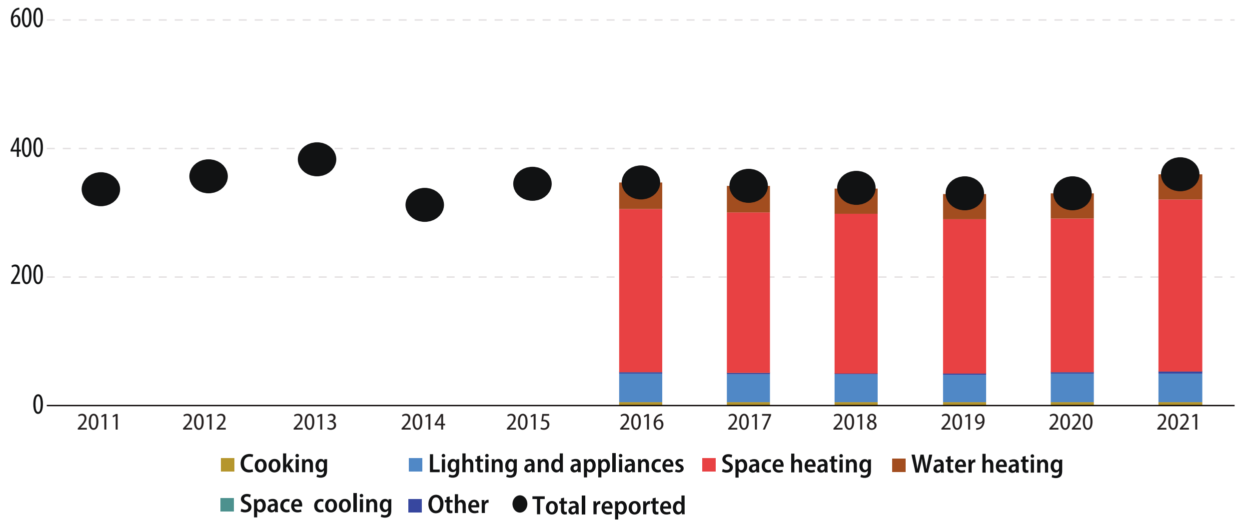
Between these two years, the increase in activity brought energy consumption up by about 30 PJ, and the structural changes in the economy caused an additional 10 PJ of consumption, partly due to a higher share of the chemical and petrochemical sector. Both effects were offset by a decrease in energy intensity, which brought down the consumption by about 70 PJ. Without this reduction, the total energy consumption in the industry sector would have been close to 14 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

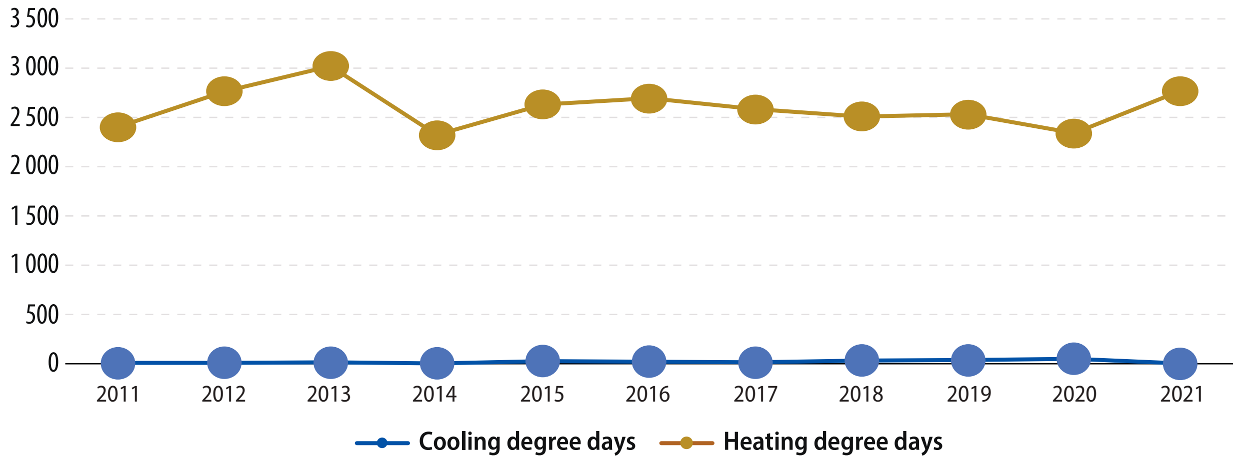
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

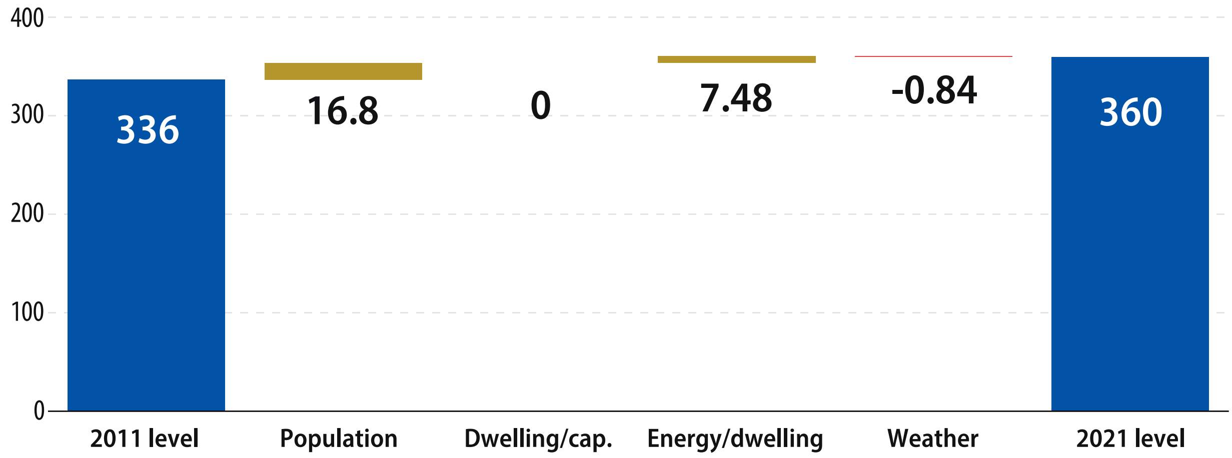


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

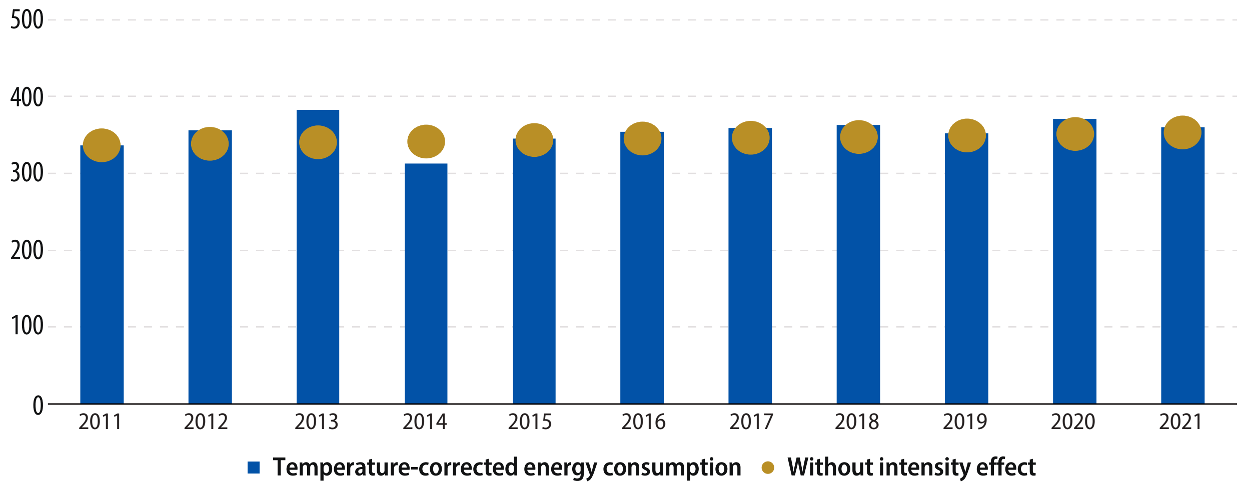


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

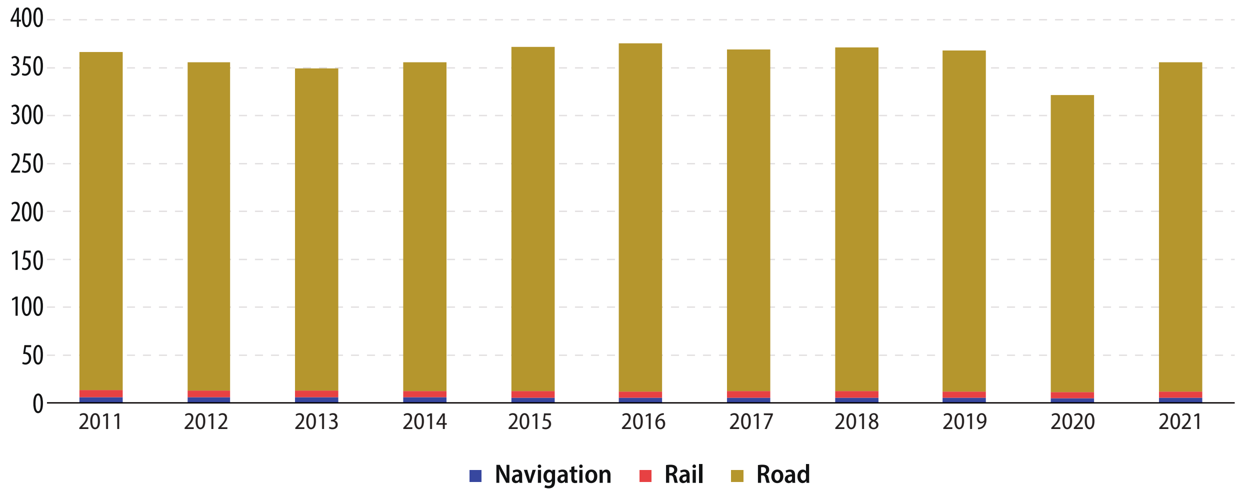
The energy consumption in the Belgian residential sector oscillated between 312 PJ and 381 PJ over the period 2011-2021. The breakdown in energy consumption by end-use is only available from 2016 onward, therefore the temperature correction can also only be calculated from 2016. Between 2011 and 2021, the increase in population was the main driver of growth in energy consumption, pushing up the consumption by about 17 PJ. Meanwhile, the dwelling occupancy remained the same and therefore had no effect. An additional increase of about 7 PJ was due to the increase in energy intensity, which may be partly explained by the absence of temperature correction for the year 2011. For the same reason, the weather effect is very limited, despite an increase in the number of heating degree days between 2011 and 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

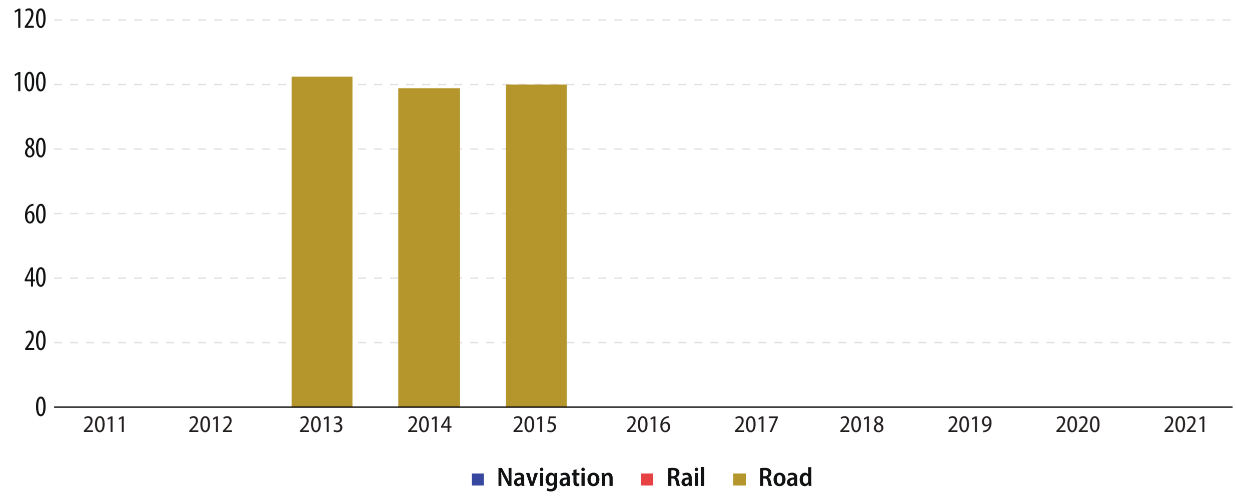


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

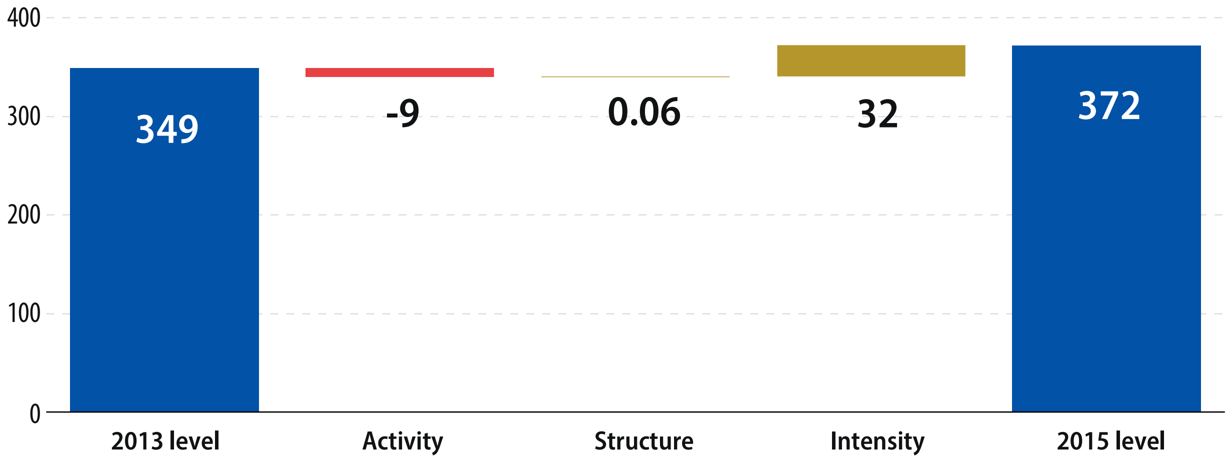


Source: Eurostat dataset (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

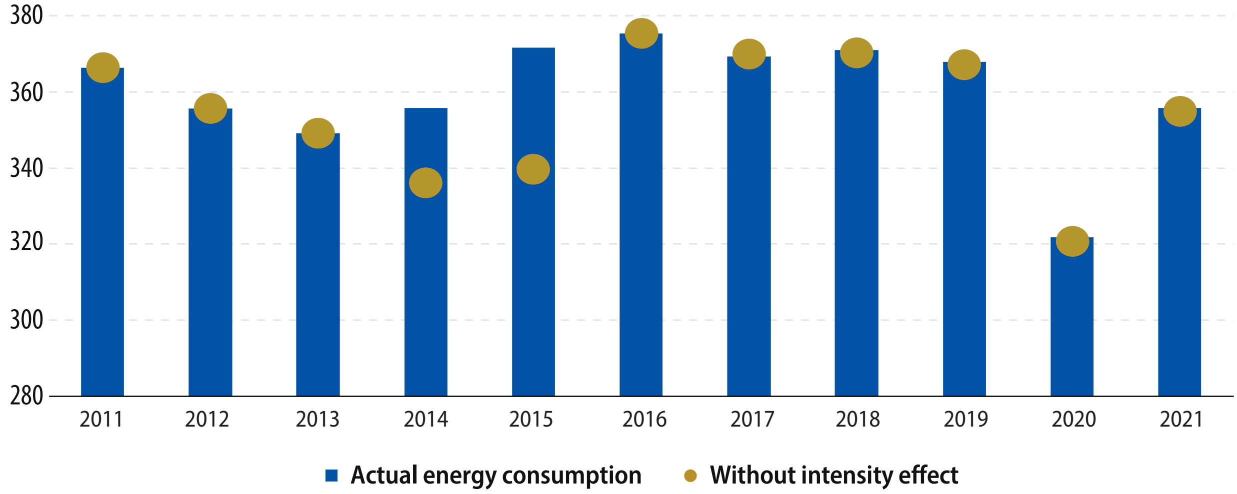


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Belgian transport sector oscillated between 349 PJ and 375 PJ between 2011 and 2019, before dropping to 322 PJ in 2020, and then growing back to 356 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic information is only available for the years 2013 to 2015, therefore the decomposition had to be limited to this three-year period. Between 2013 and 2015, the small decrease in traffic caused a decrease in energy consumption of about 9 PJ, which was offset by the increase in energy intensity, causing an additional 32 PJ of energy consumption. With the absence of variation in the share of the different transport modes, the structural effect was insignificant.

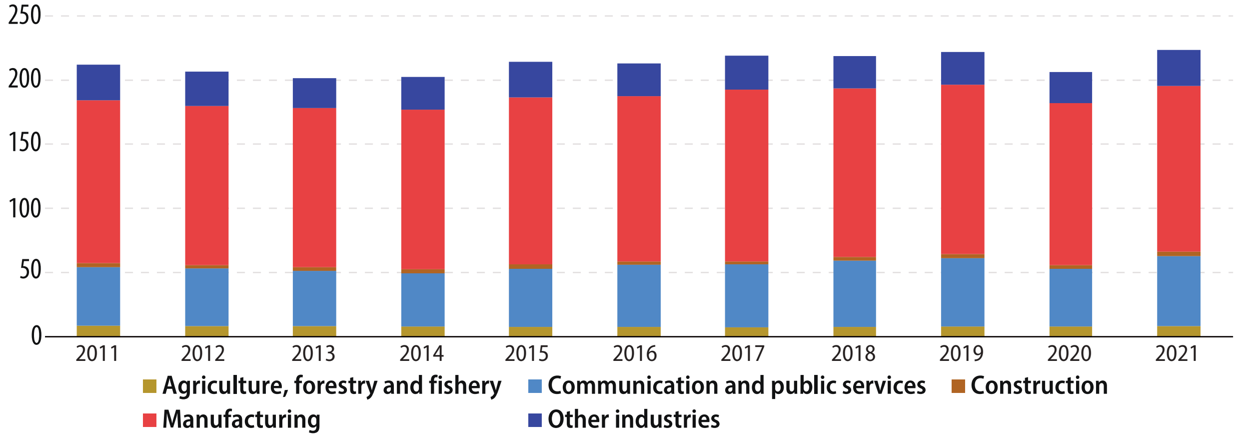
Bulgaria

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

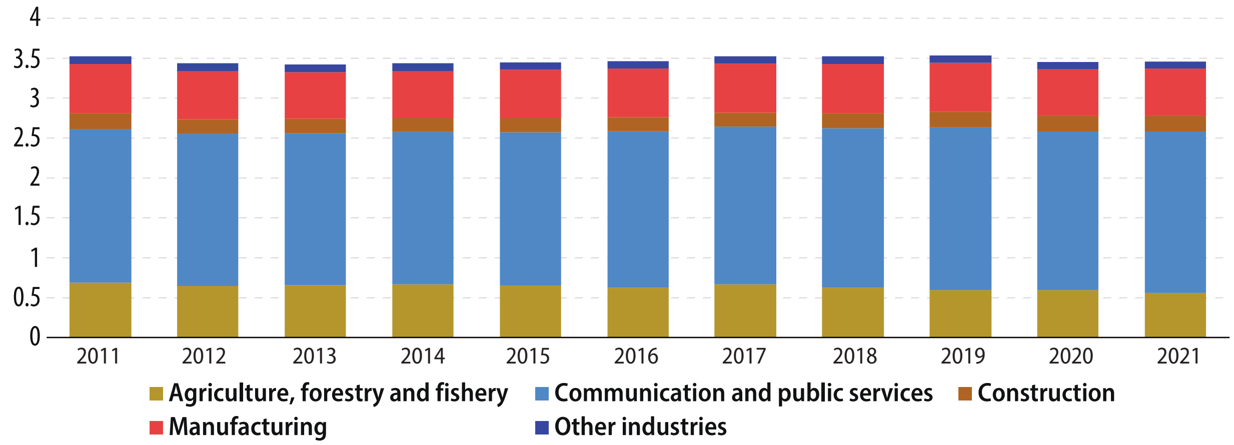


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

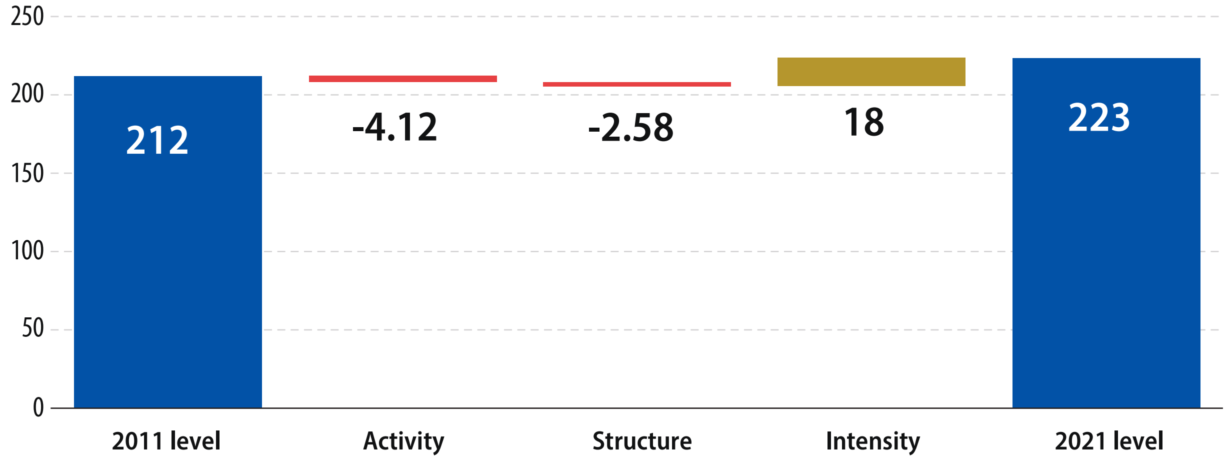


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

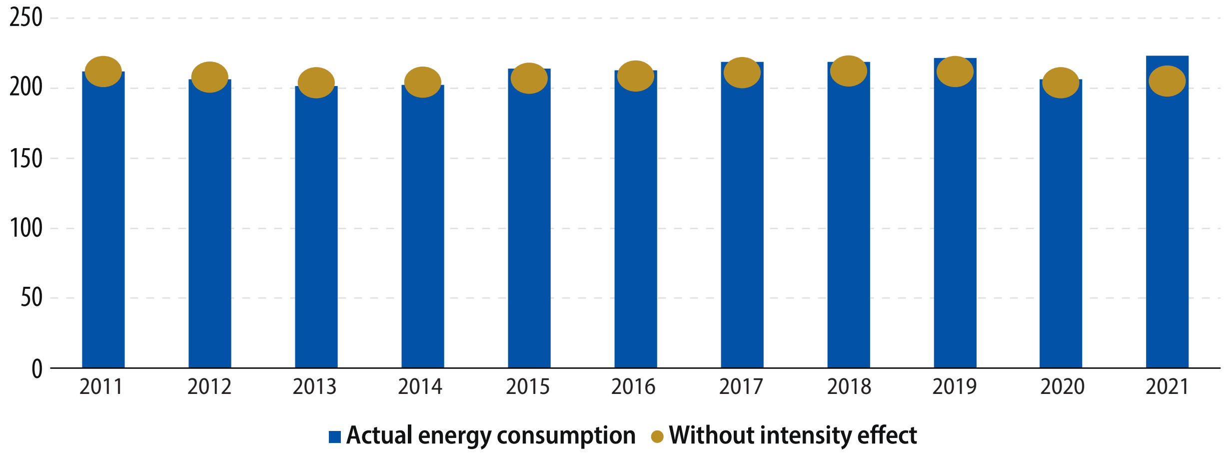


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source:Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

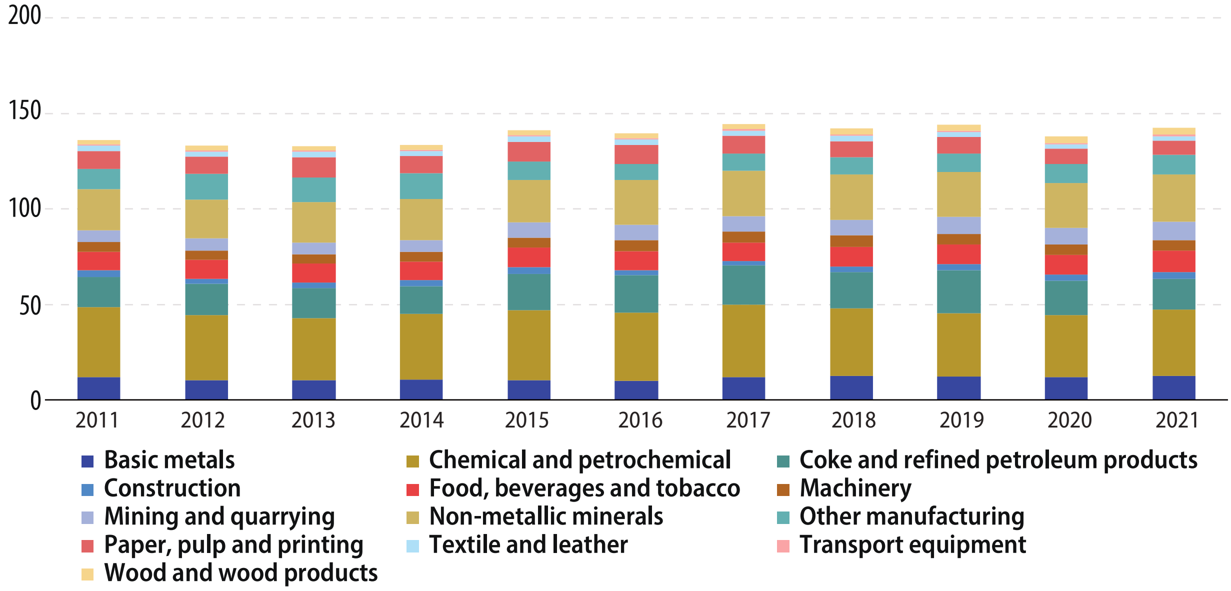
The final energy consumption of the different sectors of the whole economy increased from 212 PJ in 2011 to 222 PJ in 2019, then it dropped to 206 PJ in 2020, before coming back to its highest level in 2021, at 223 PJ. The active population remained stable over the period 2011-2021, oscillating between 3.4 and 3.5 million. Between 2011 and 2021, the slight decrease in activity (measured in terms of employees) brought slightly down the energy consumption by about 4 PJ. The structural changes had an additional small decreasing effect of about 3 PJ, mostly due to the increasing share of the commercial and public services sector (from 55 % to 58 % of the total active population). The most significant driver was the increase in energy consumption per employee, which caused the energy consumption to go up by about 18 PJ. Without this increase, the energy consumption would have been 8 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

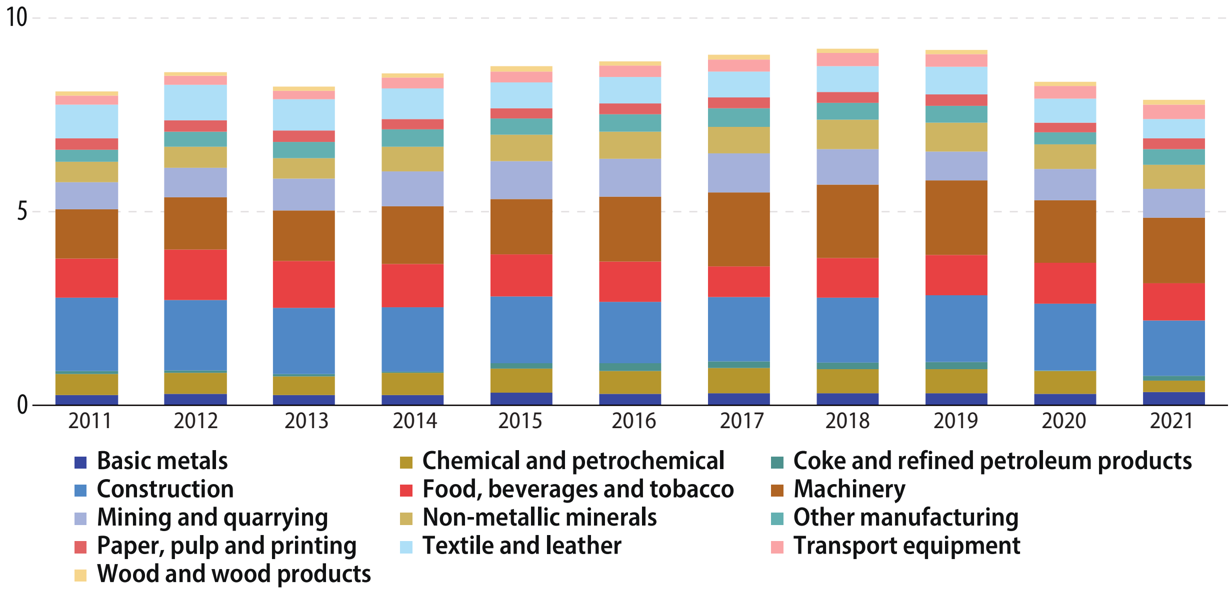


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

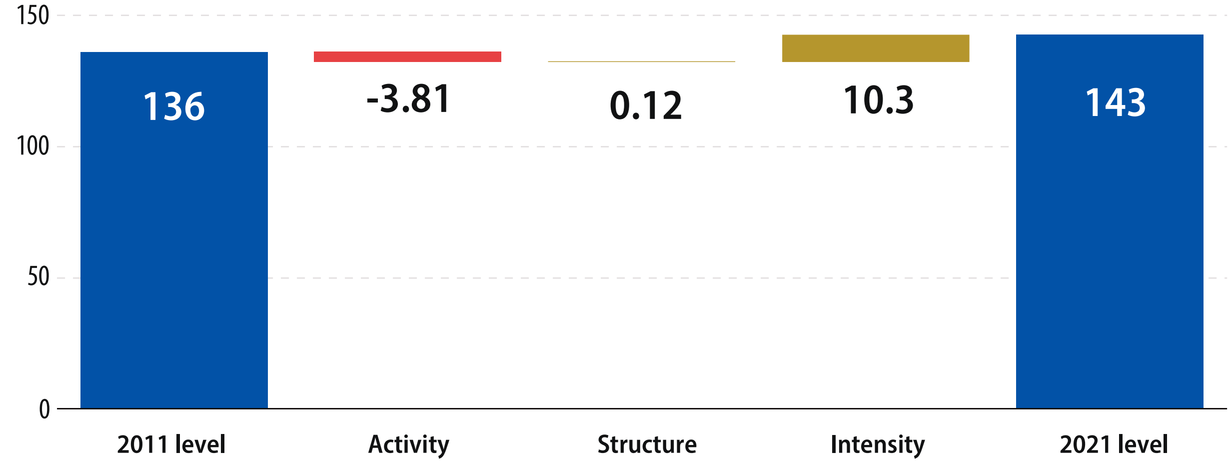


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

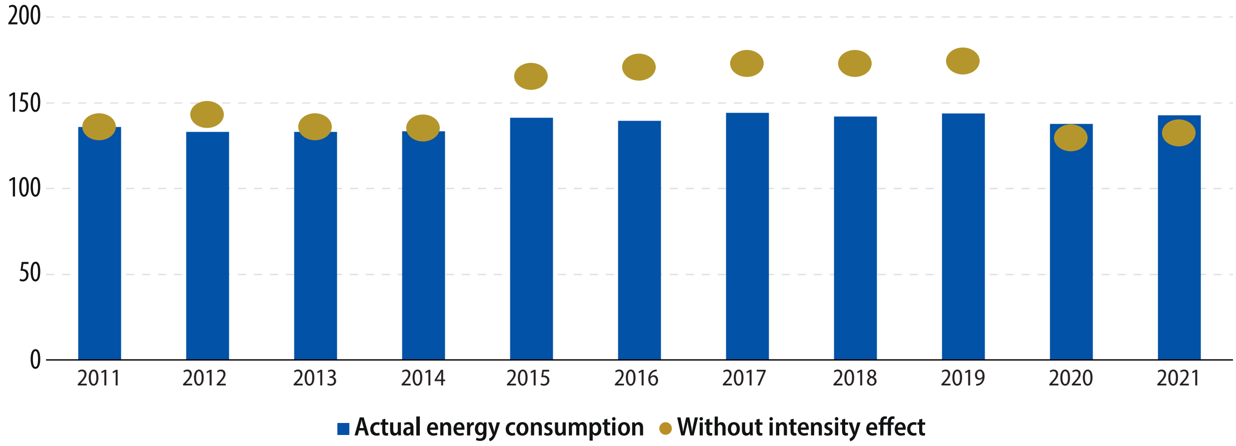


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

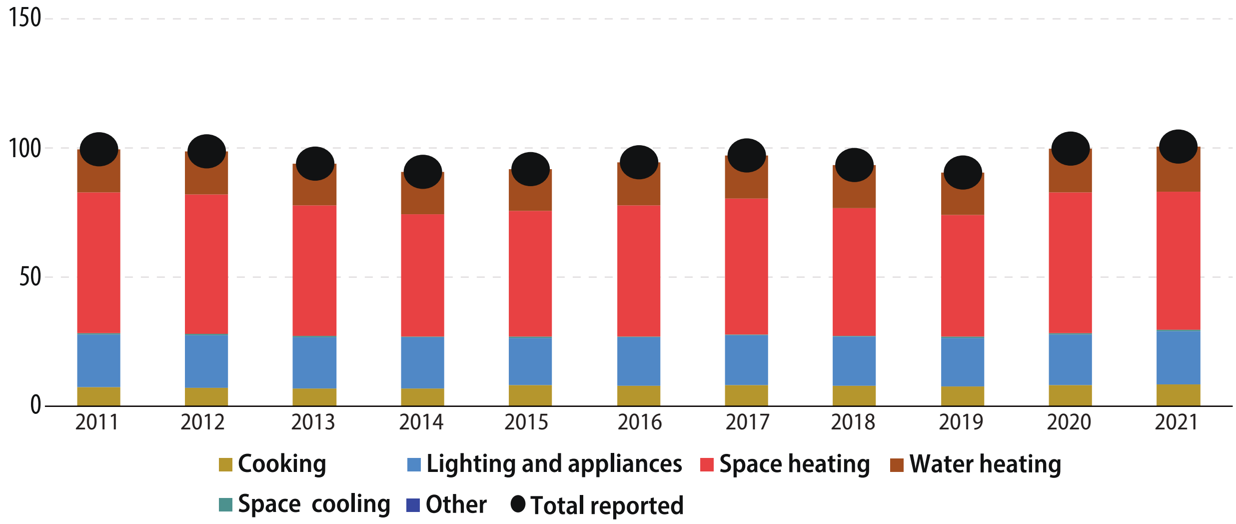
Bulgaria's manufacturing industry sector energy consumption oscillated between 132 and 144 PJ during the period 2011-2021. The corresponding total gross value added increased from 8.1 billion EUR in 2011 to 9.2 billion EUR in 2019, and then dropped in 2020, and even further in 2021, to reach its lowest level over the period at 7.9 billion EUR. Between 2011 and 2021, the decrease in GVA brought energy consumption down by about 4 PJ. With very little variation in the weights of the subsectors, the structural effect was negligible over the period. Finally, the most significant driver was the increase in energy intensity, which brought consumption up by about 10 PJ. Without this increase in intensity, the total energy consumption in the industry sector would have been 7 % lower in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

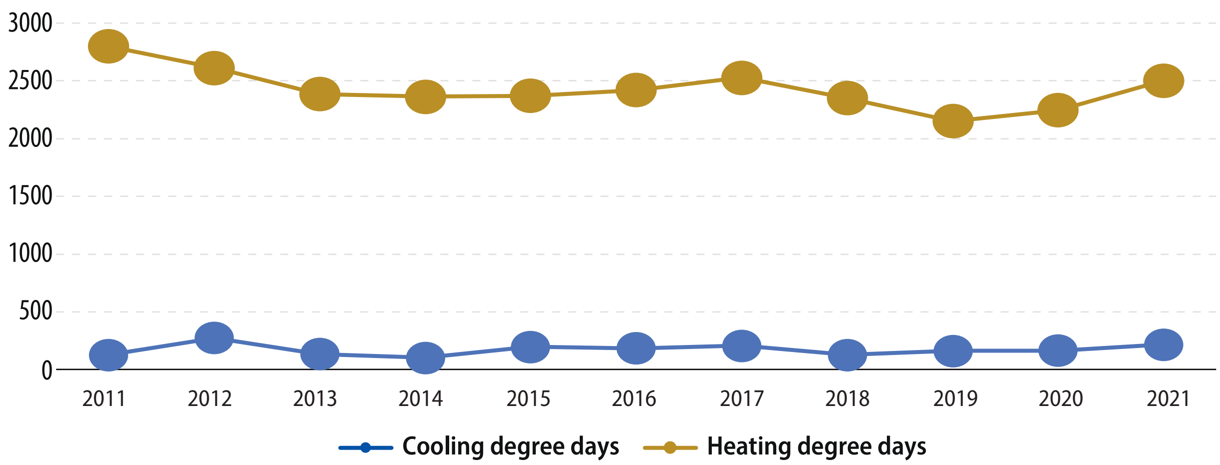
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

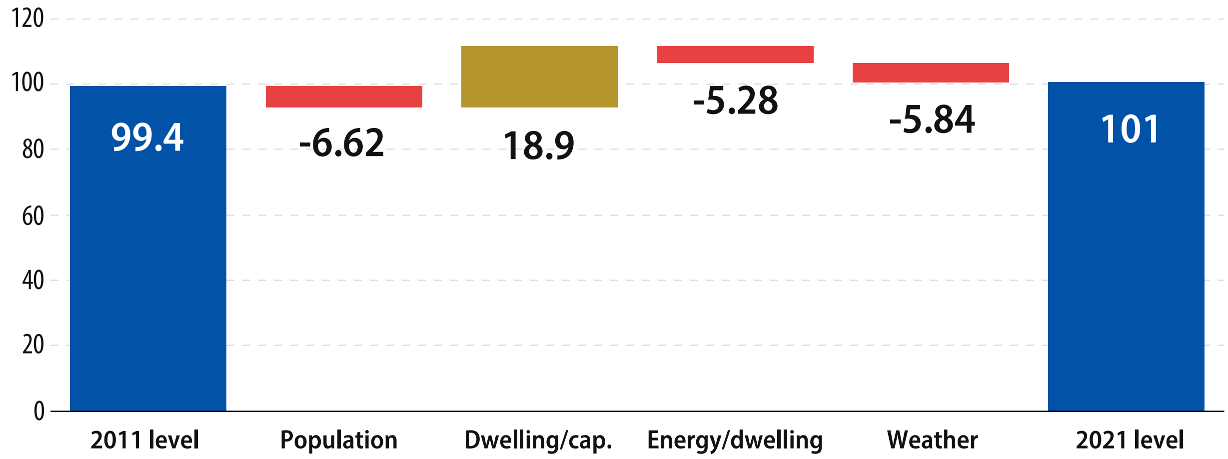


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

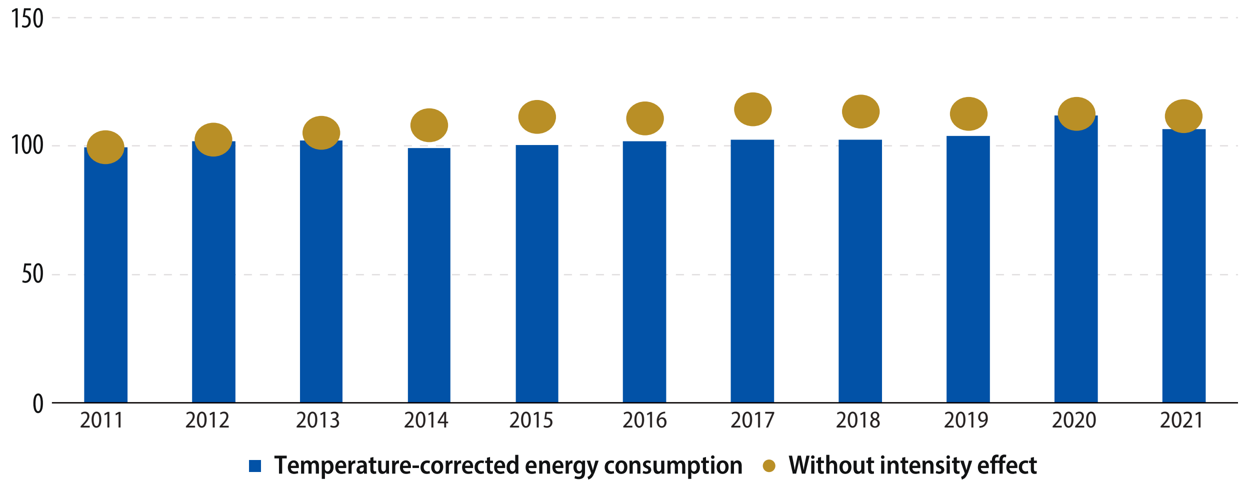


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

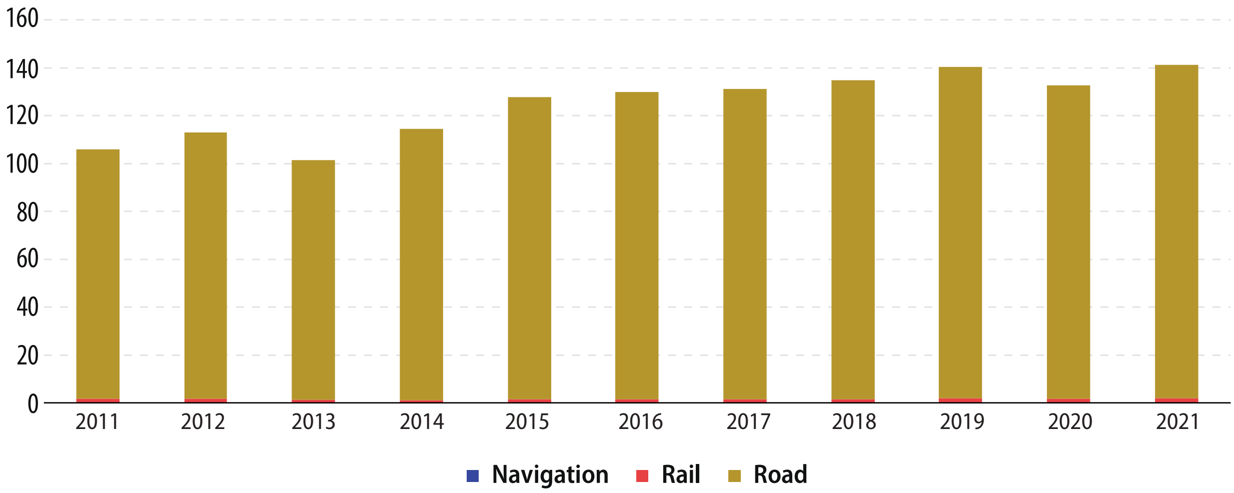
The energy consumption in the Bulgarian residential sector remained very stable over the studied period, from 99 PJ in 2011 to 101 PJ in 2021. Between these two years, the decrease in population can be estimated to have caused a decrease of about 7 PJ, while the decrease in dwelling occupancy had an increasing effect of about 19 PJ. Since there were less heating degree days in 2021 than in 2011, the weather had a decreasing effect of about 5 PJ, and finally energy consumption per dwelling decreased slightly, which reduced the overall consumption by another 5 PJ.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

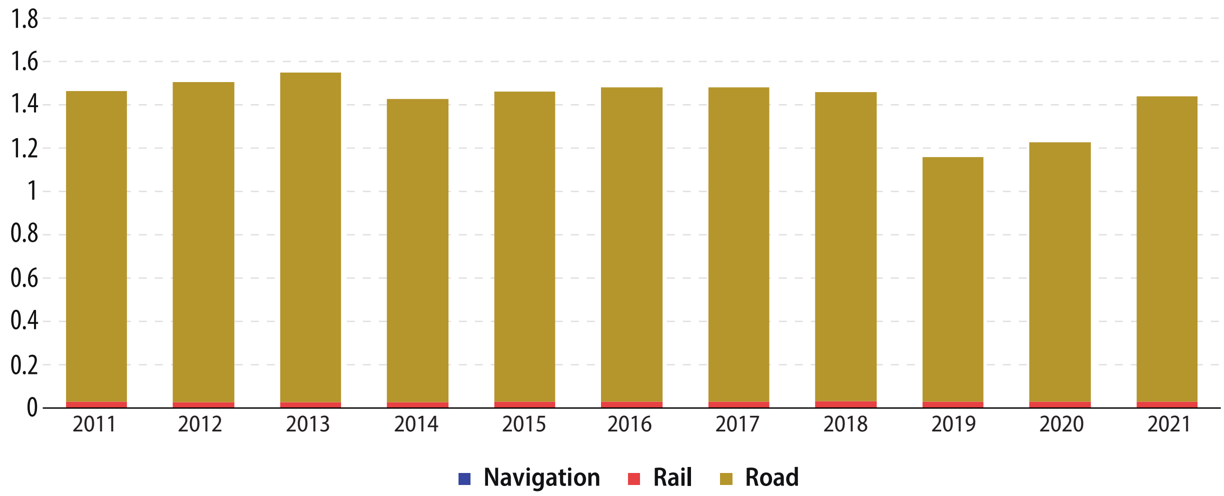


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

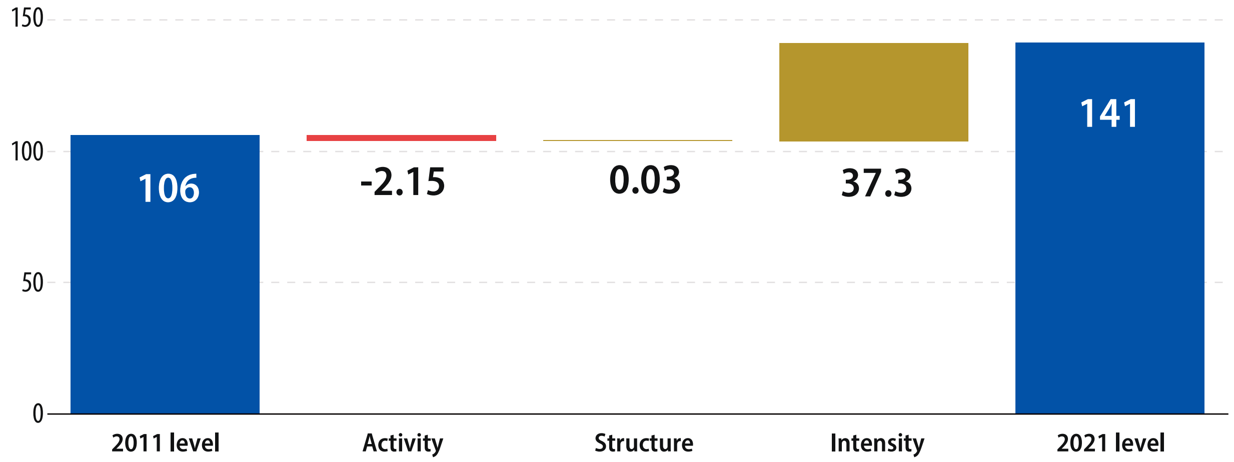


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

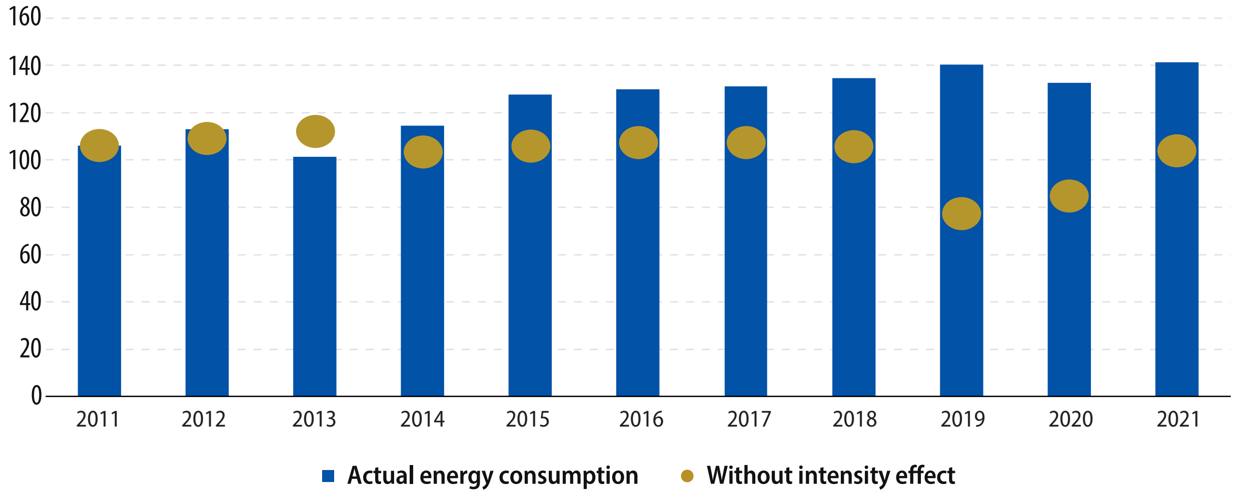


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Bulgarian transport sector grew steadily from 106 PJ in 2011 to 140 PJ in 2019, before dropping to 133 PJ in 2020, and then bouncing back in 2021 to its highest level over the studied period, at 141 PJ. Most of the energy consumption was due to road transport. From 2011 to 2018, road traffic oscillated between 1.4 billion VKM and 1.5 billion VKM, before dropping to 1.1 PJ in 2019, but it was back at 1.4 billion VKM in 2021. Since the traffic in 2021 is pretty much the same as in 2011, the activity effect calculated over the period is very small in magnitude, causing a decrease of about 2 PJ. This was completely offset by the increase in energy intensity, which caused an increase of about 37 PJ. With the absence of variation in the share of the different transport modes, the structural effect was not noticeable.

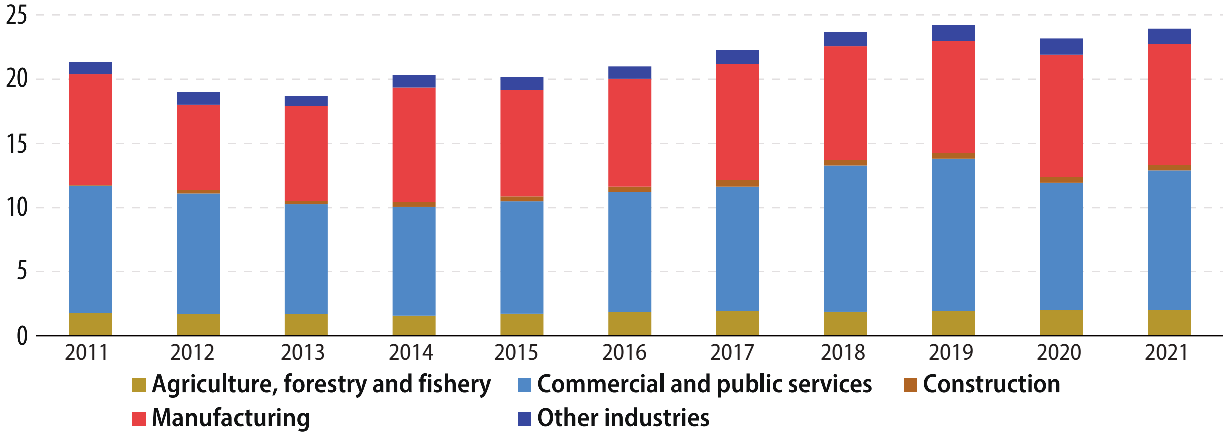
Cyprus

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

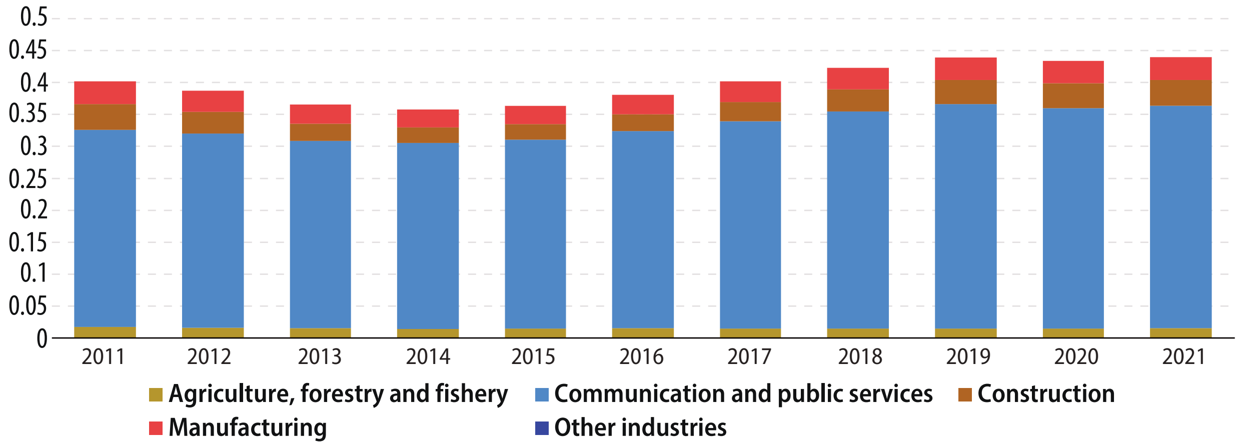


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

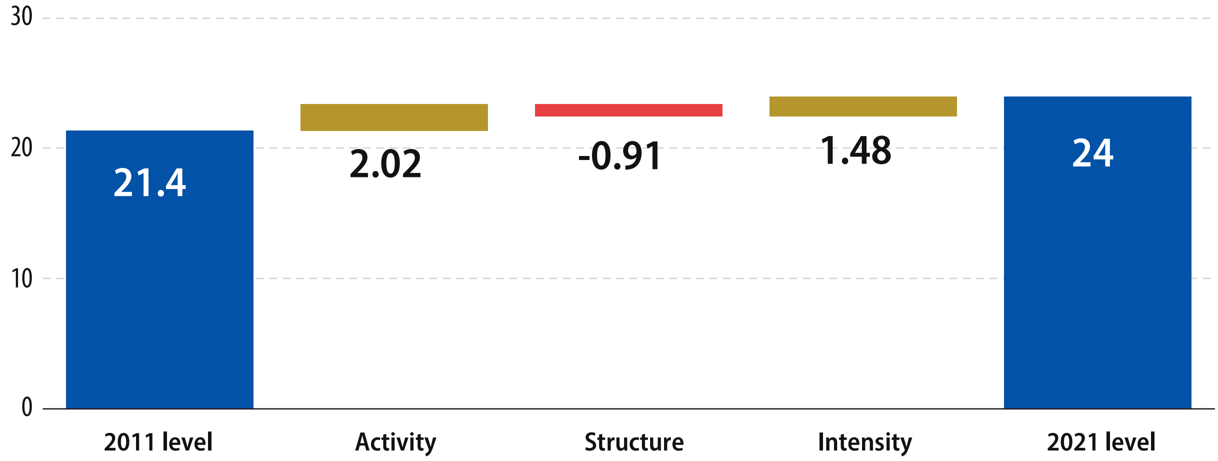


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

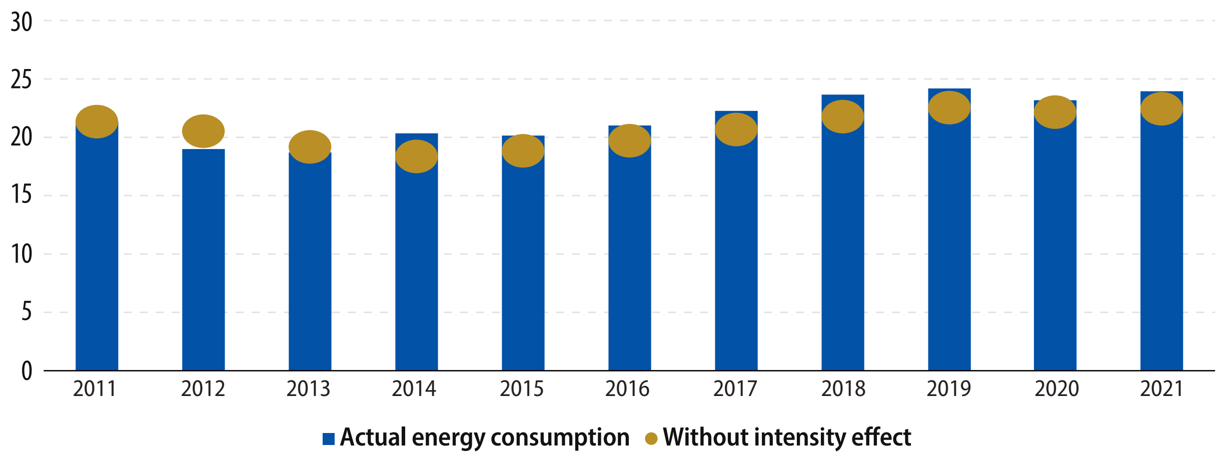


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

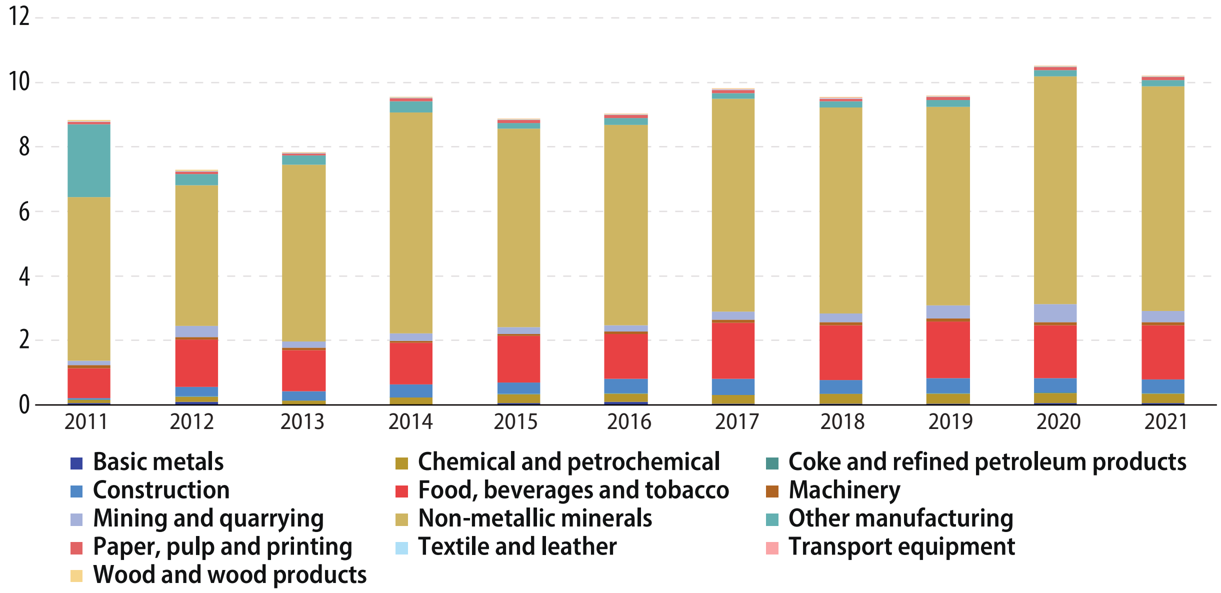
The final energy consumption of the different sectors of the whole economy slightly dropped from 21.3 PJ in 2011 to 18.7 PJ in 2013, then it climbed back to 24.2 PJ in 2019, before dropping again to 23.2 PJ in 2020, and it was back to 24 PJ in 2021. Similarly, the active population dropped from 407 thousand in 2011 to 363 thousand in 2013, then grew to reach 445 thousand in 2019, before dropping slightly in 2020 and coming back to 445 PJ in 2021. Over this period, the increase in activity (measured in terms of employees) brought energy consumption up by about 2 PJ. Meanwhile, the structural change drove down the energy consumption by almost 1 PJ, mostly due to the increasing share of the commercial and public services sector (from 76 % to 78 % of the active population). An additional increase was due to the higher energy consumption per employee, which caused the energy consumption to increase by about 1.5 PJ. Without this increase, energy consumption would have been 6 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

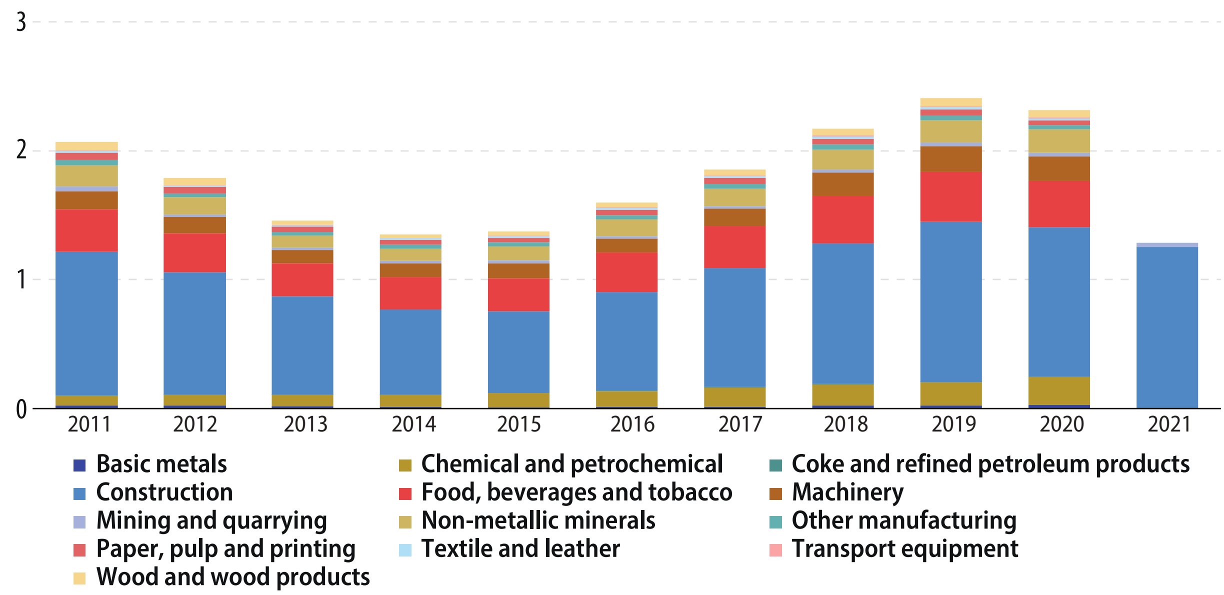


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

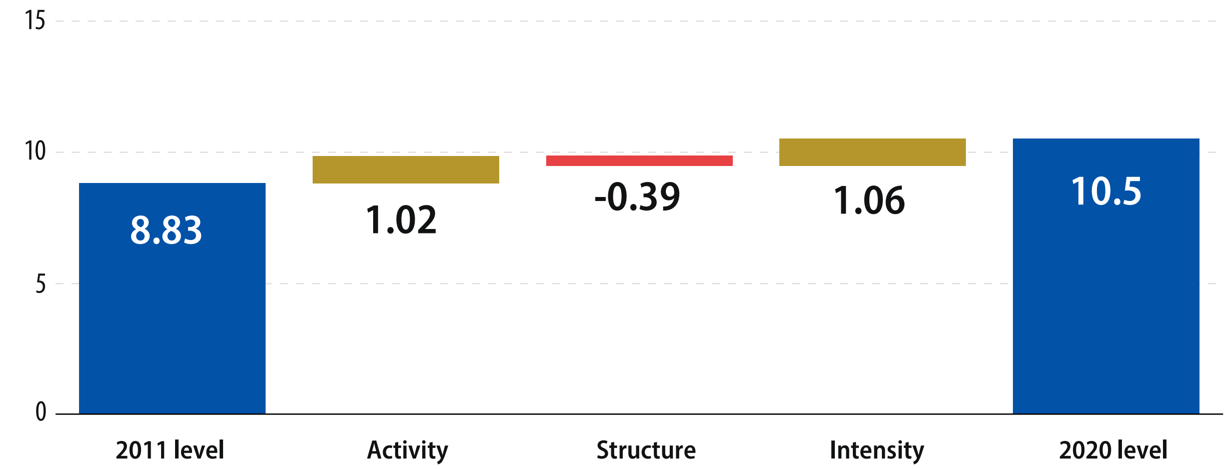


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

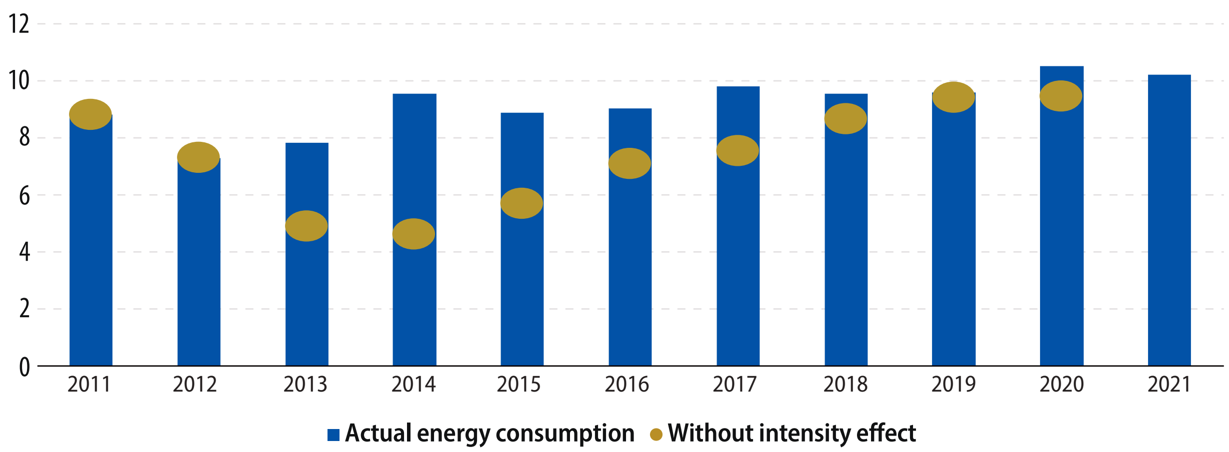


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

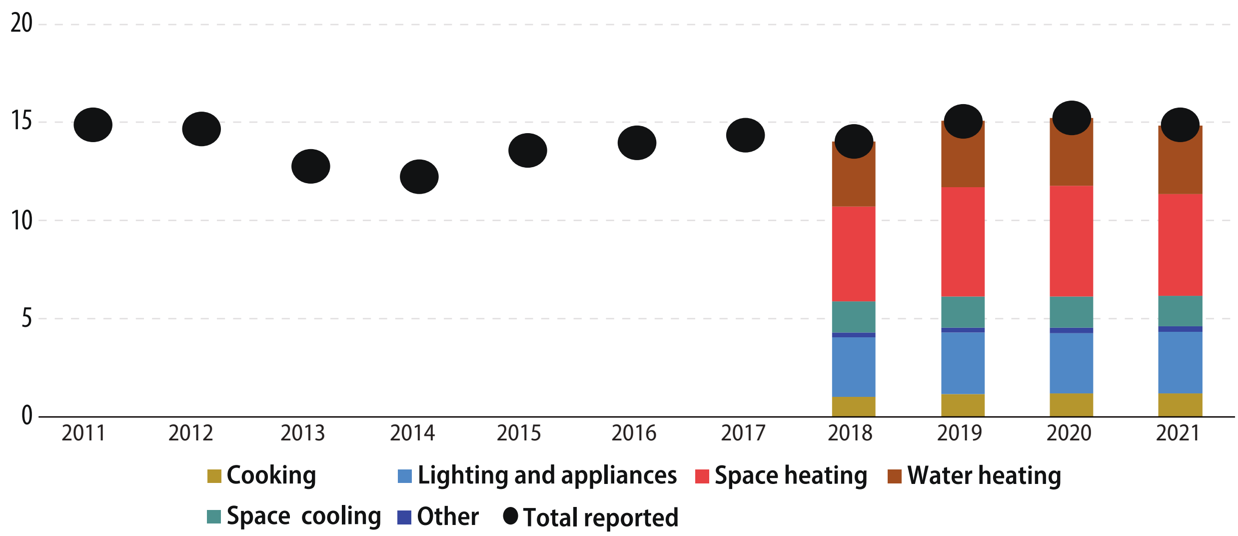
The energy consumption in Cyprus' manufacturing industry sector increased steadily from 8.8 PJ in 2011 to 10.2 PJ in 2020. The corresponding total gross value added decreased from 2.1 billion EUR in 2011 to 1.4 billion EUR in 2014, and then increased back to 2.4 PJ in 2019, before dropping slightly in 2020 to 2.3 billion EUR. The GVA data are incomplete for 2021 and therefore the decomposition had to be limited to the period 2011 to 2020. Between these two years, the increase in activity brought energy consumption up by about 1 PJ. Meanwhile, the structural changes in the economy caused a small decrease of about 0.4 PJ of consumption, partly due to a lower share of the construction sector (from 54 % to 50 % of the GVA). Finally, a further increase was due to the higher energy intensity, which brought consumption up by about 1 PJ. Without this increase, the total energy consumption in the industry sector would have been 9 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

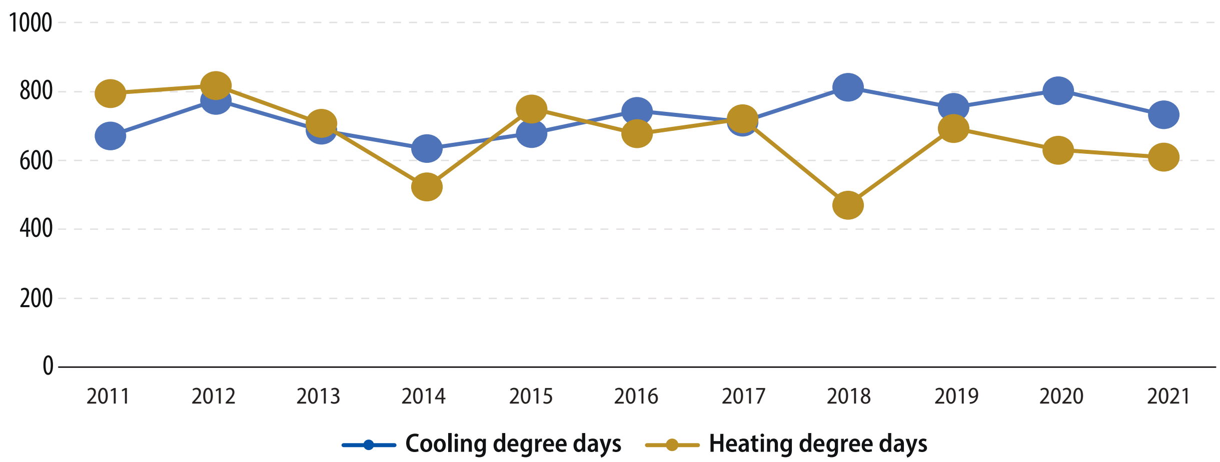
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

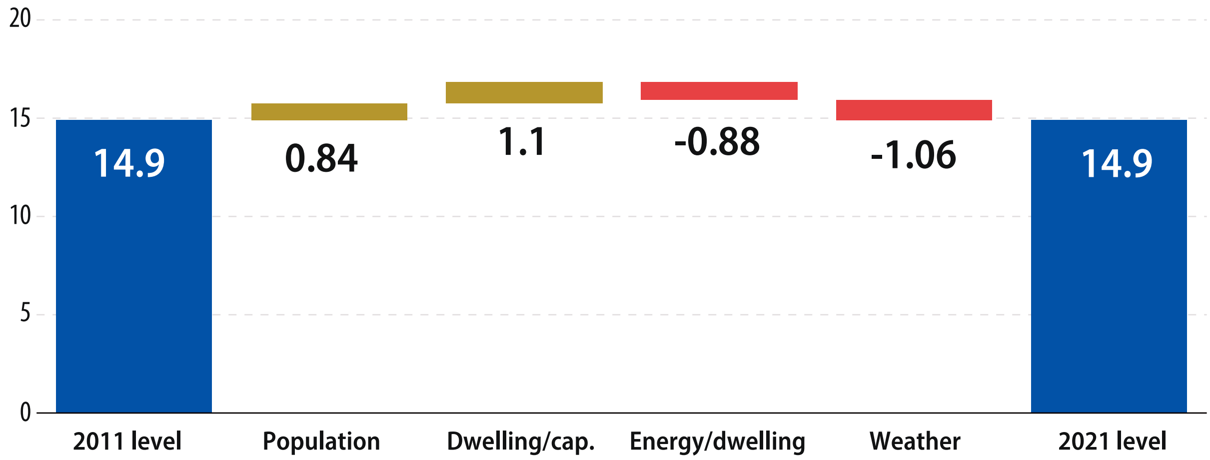


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

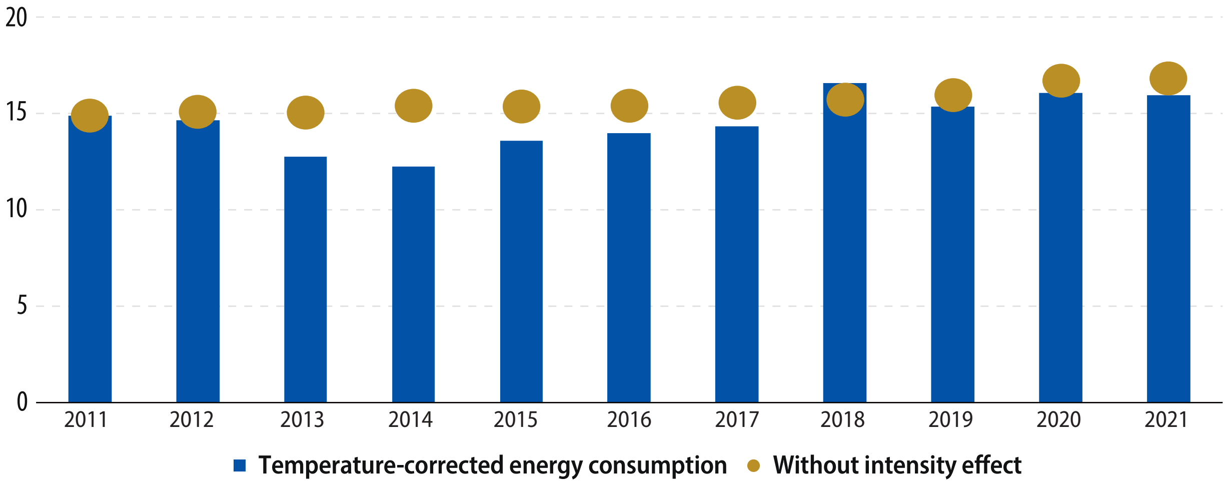


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

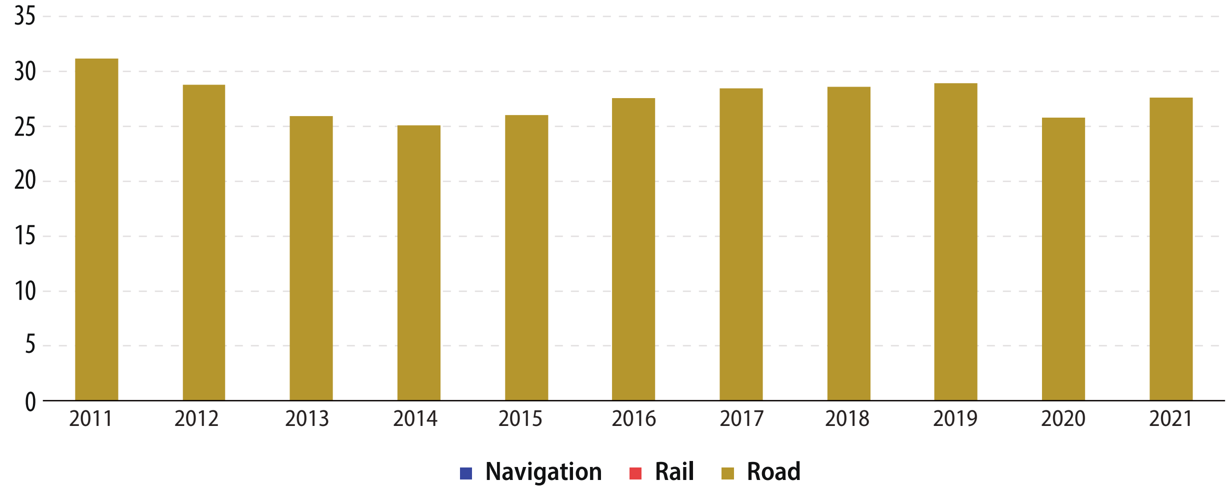
The energy consumption in the Cypriot residential sector was very stable over the period; it was at the same level in 2011 and in 2021, at 14.9 PJ. The disaggregation of energy consumption by end-use is only available from 2018 and therefore the weather effect could only be calculated from this year onward. Between 2011 and 2021, the increase in population can be estimated to have caused an increase of about 1 PJ, and the decrease in dwelling occupancy had an additional increasing effect of about 1 PJ. Meanwhile, the energy consumption per dwelling decreased slightly and caused a decrease in overall consumption of about 1 PJ. Despite a decrease in heating degree days, and an increase in cooling degree days, the weather effect was calculated to be about 1 PJ. However, as said above, the weather correction could not be calculated for the year 2011.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

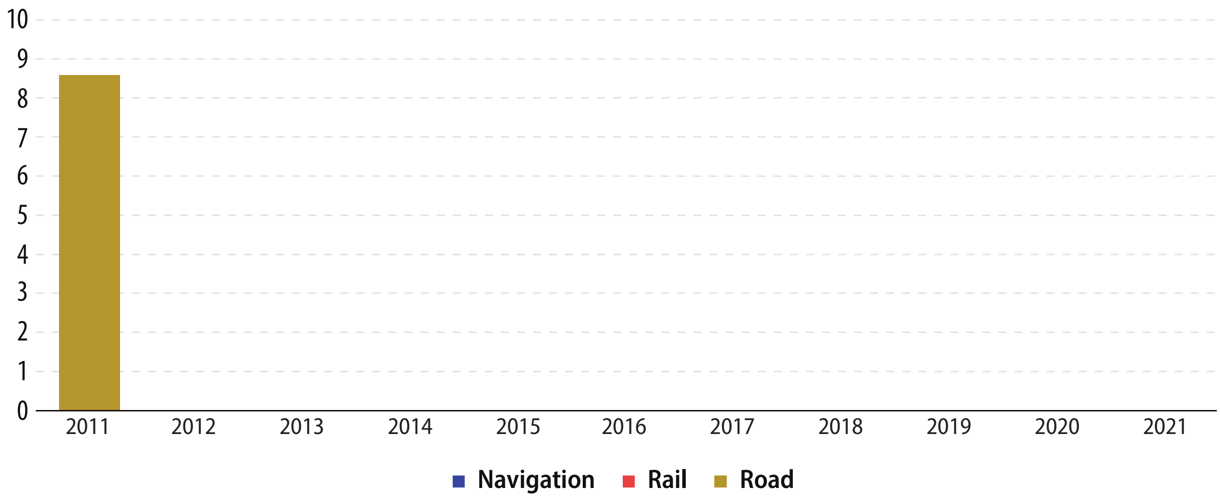


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

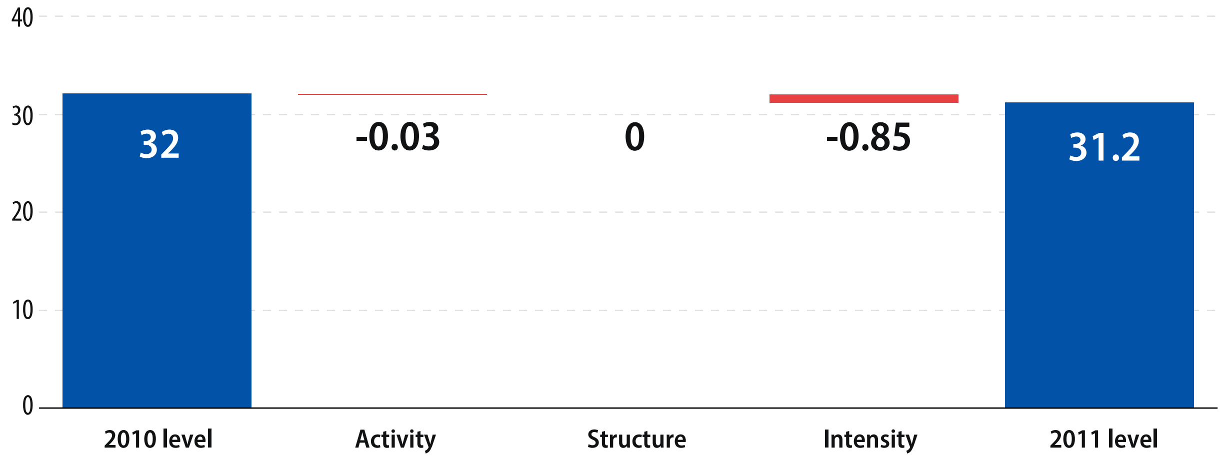


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

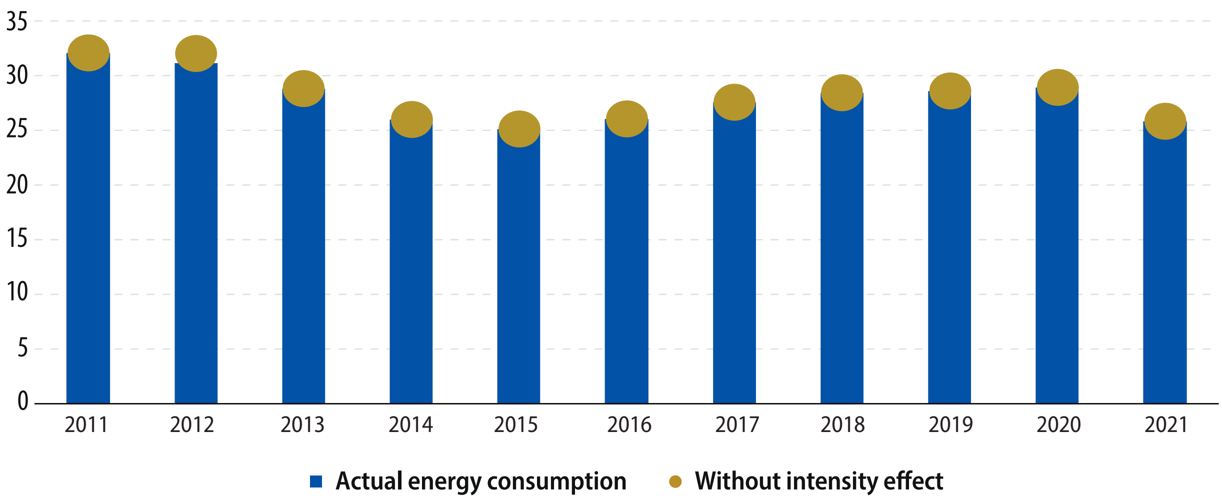


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

From 2011 to 2021, the energy consumption in Cyprus' transport sector oscillated between 25.1 and 31.2 PJ. Most of the energy consumption was due to road transport.

Unfortunately, road traffic information is only available for 2011, and therefore the decomposition could not be performed.

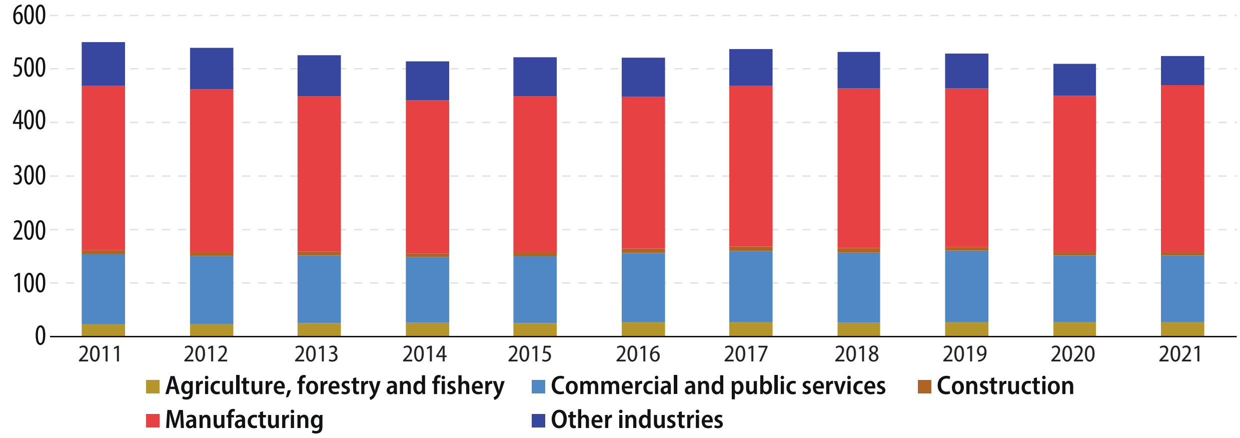
Czechia

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

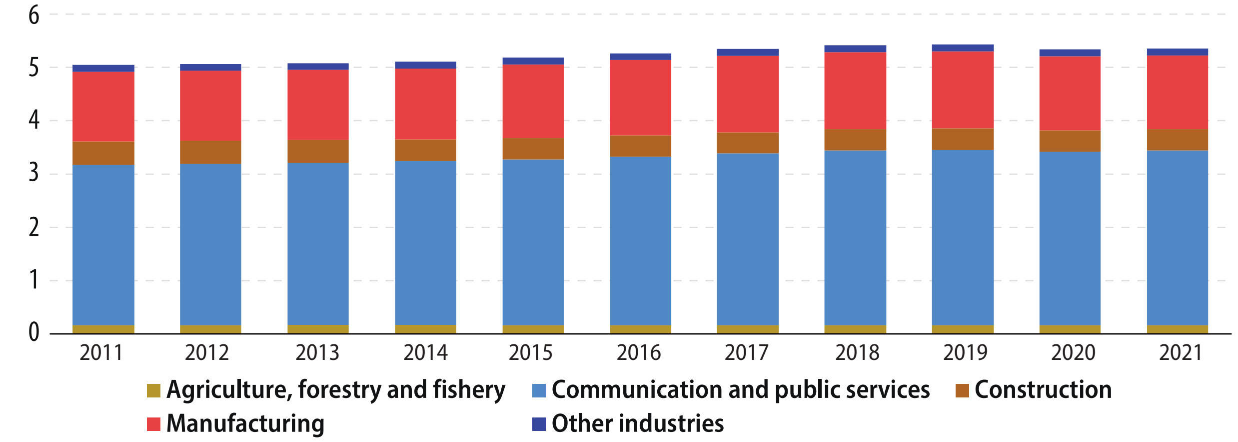


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

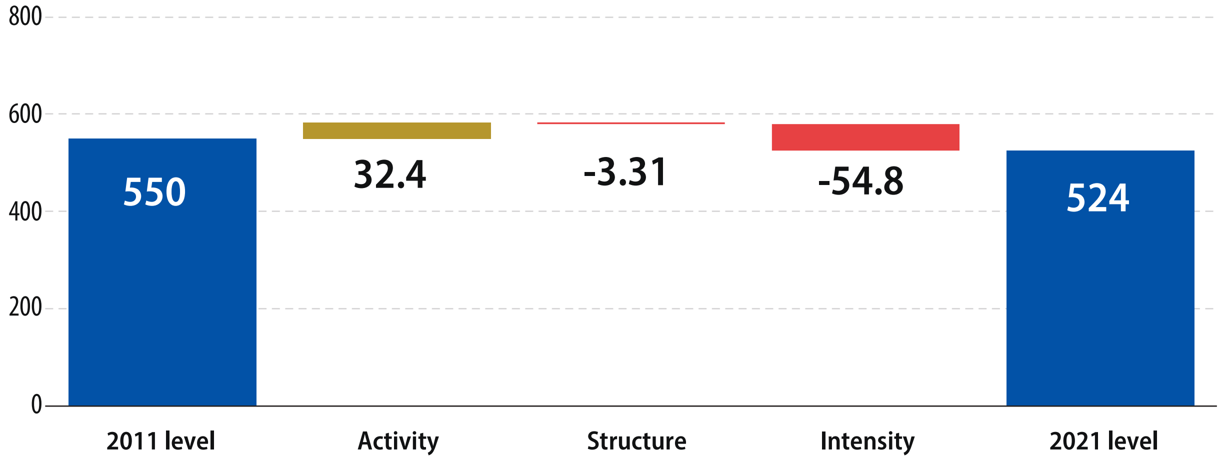


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

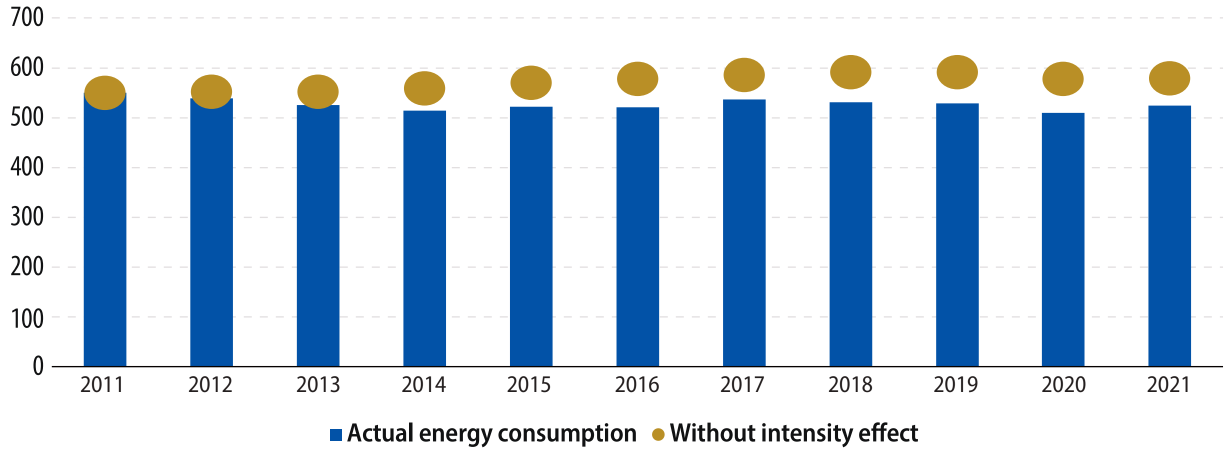


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

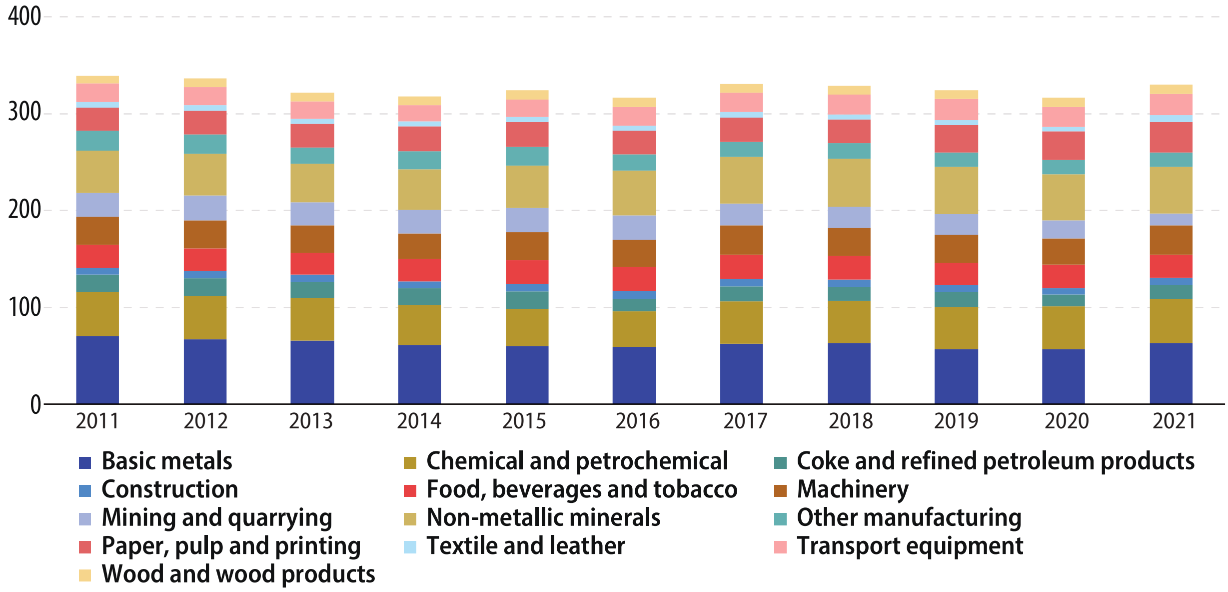
The final energy consumption of the different sectors of the whole Czech economy slightly increased between 2011 and 2021, from 550 PJ to 524 PJ. Meanwhile, the active population steadily increased from 5.0 million in 2011 to 5.3 million in 2021. Over this period, the increase in activity (measured in terms of employees) caused the energy consumption to rise by about 32 PJ. Meanwhile, the structural change slightly brought down the energy consumption by about 3 PJ, mostly due to the increasing share of the commercial and public services sector (from 60 % to 61 % of the total active population). The most significant change was due to a decrease in energy consumption per employee, which caused the energy consumption to decrease by about 55 PJ. Without this decrease, energy consumption would have been 10 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

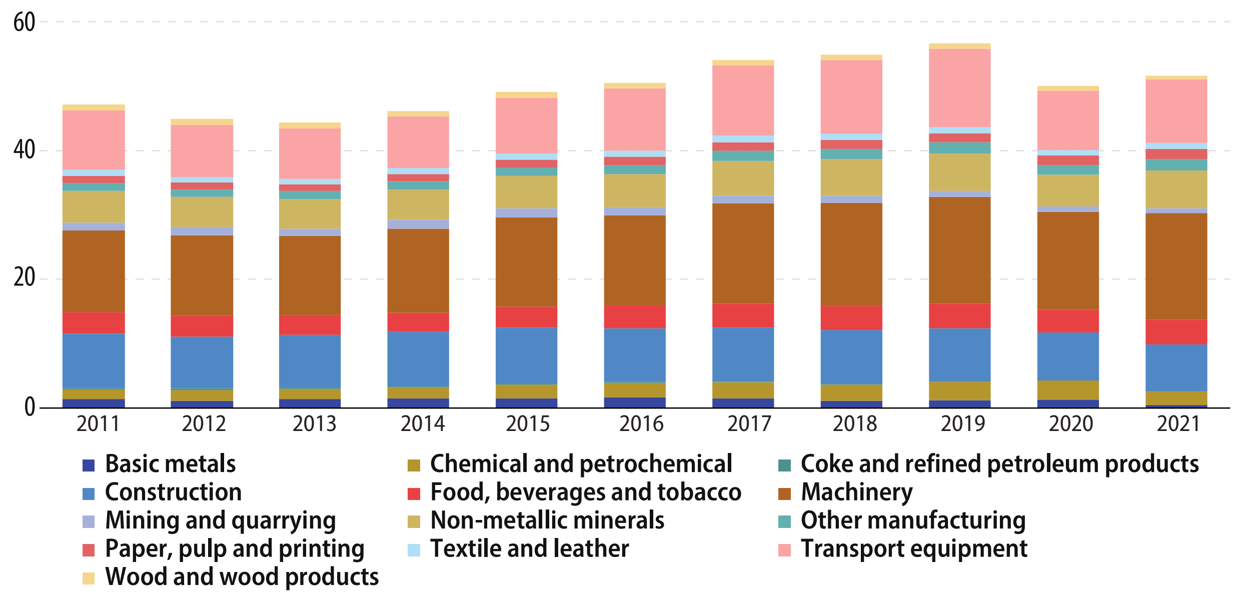


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

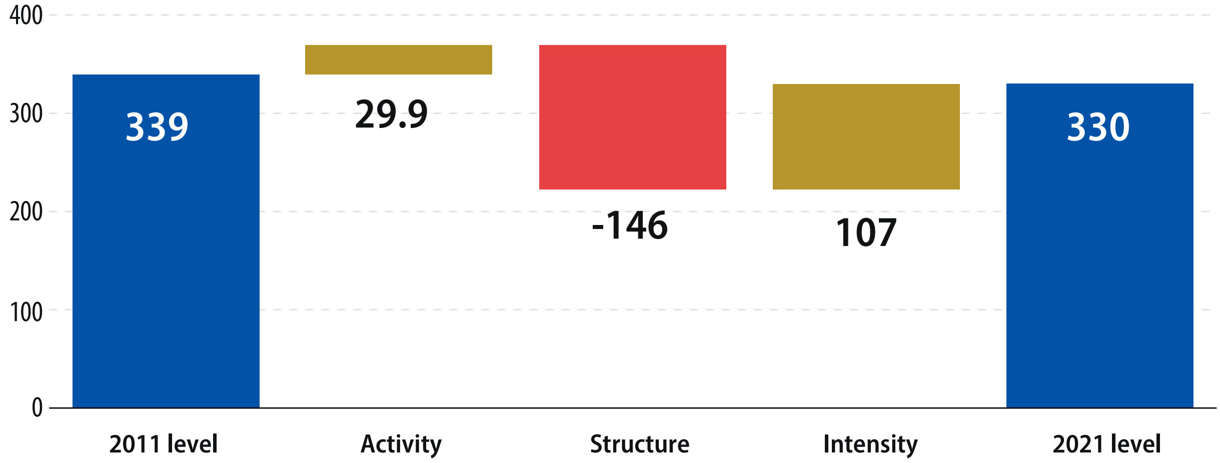


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

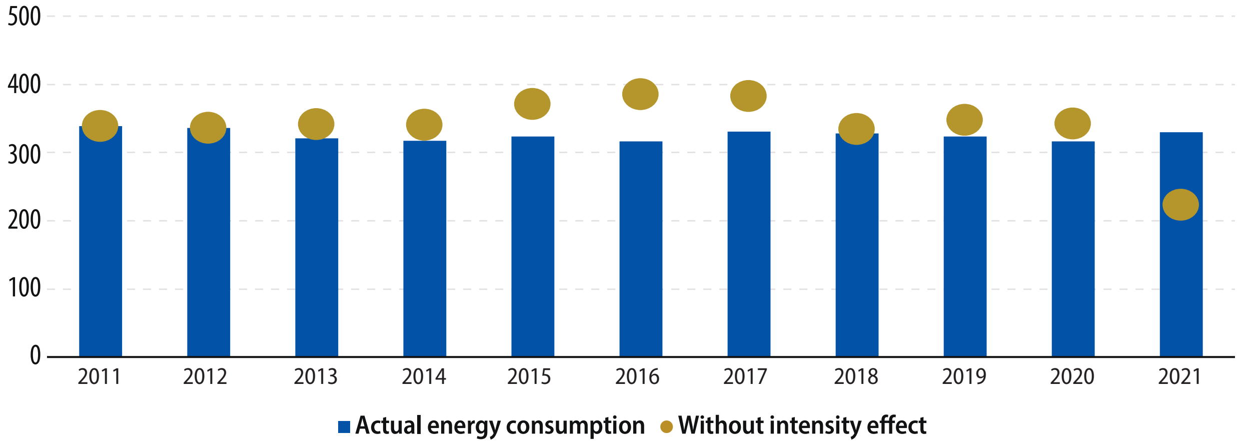


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

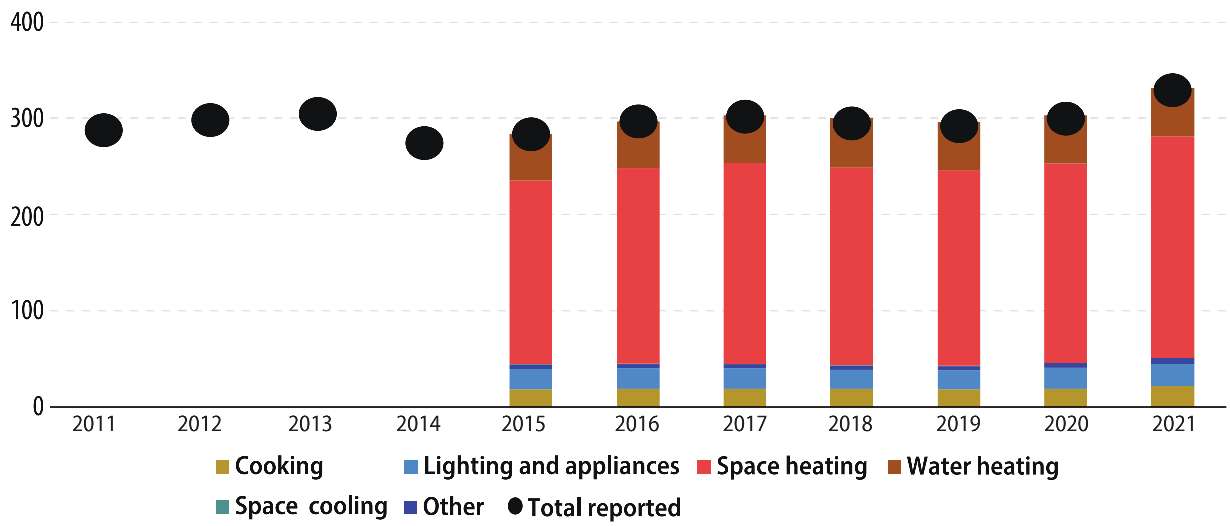
Between 2011 and 2021, the energy consumption in Czechia's manufacturing industry sector oscillated between 316 and 339 PJ between 2011 and 2021. After a first period of slow decrease between 2011 and 2013, the corresponding total gross value added increased from 44 billion EUR in 2013 to 57 billion EUR in 2019, and then decreased in 2020 to 50 billion EUR, and it remained at 52 billion EUR in 2021. Between 2011 and 2021, the increase in activity drove up the consumption of energy by about 30 PJ. Meanwhile, the structural changes in the economy caused a strong decrease of about 146 PJ of consumption, partly due to a lower share of the construction sector (from 18 % to 14 % between these two years). Finally, the increase in energy intensity brought consumption up by about 107 PJ. Without this increase in intensity, the total energy consumption in the industry sector would have been close to 32 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

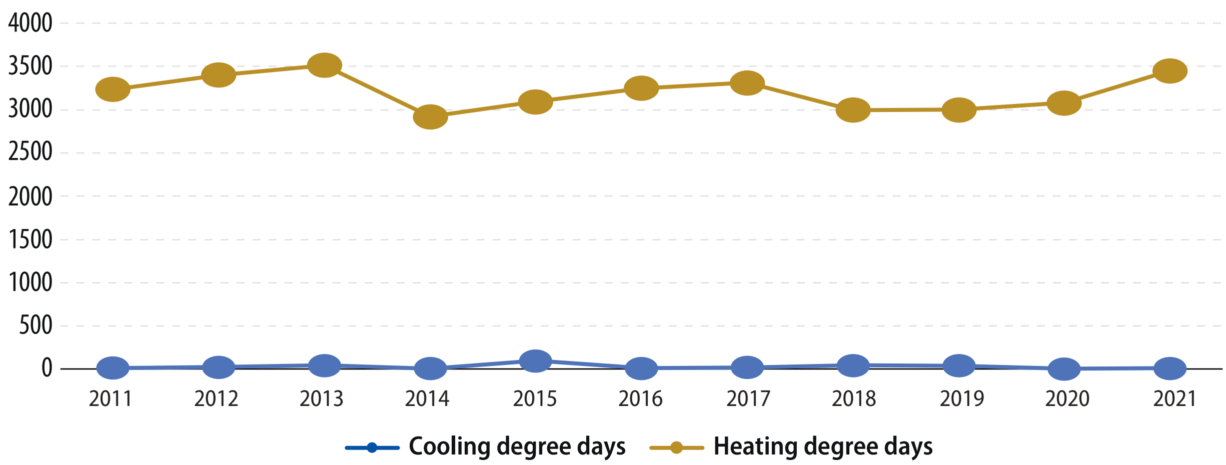
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

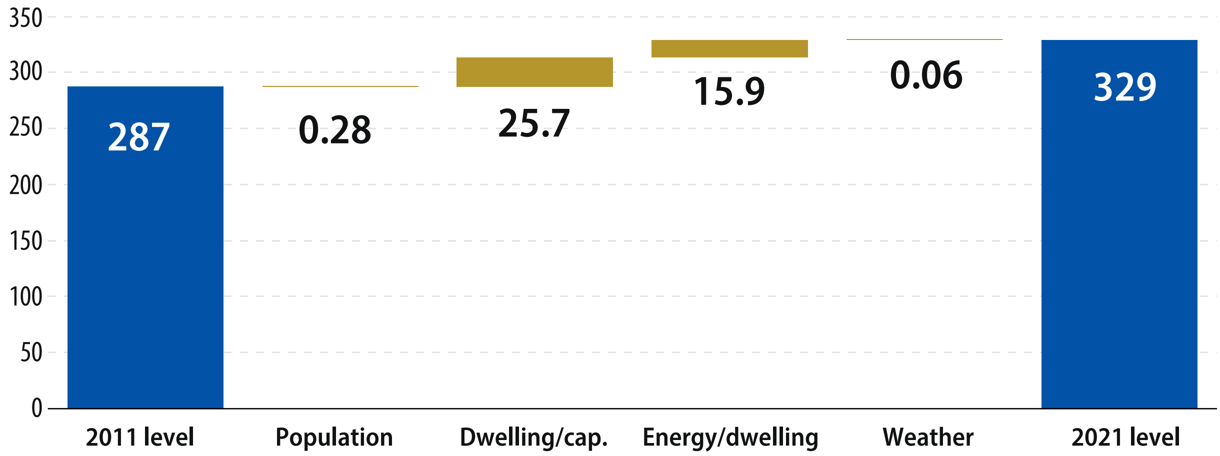


Source: Eurostat dataset (rg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

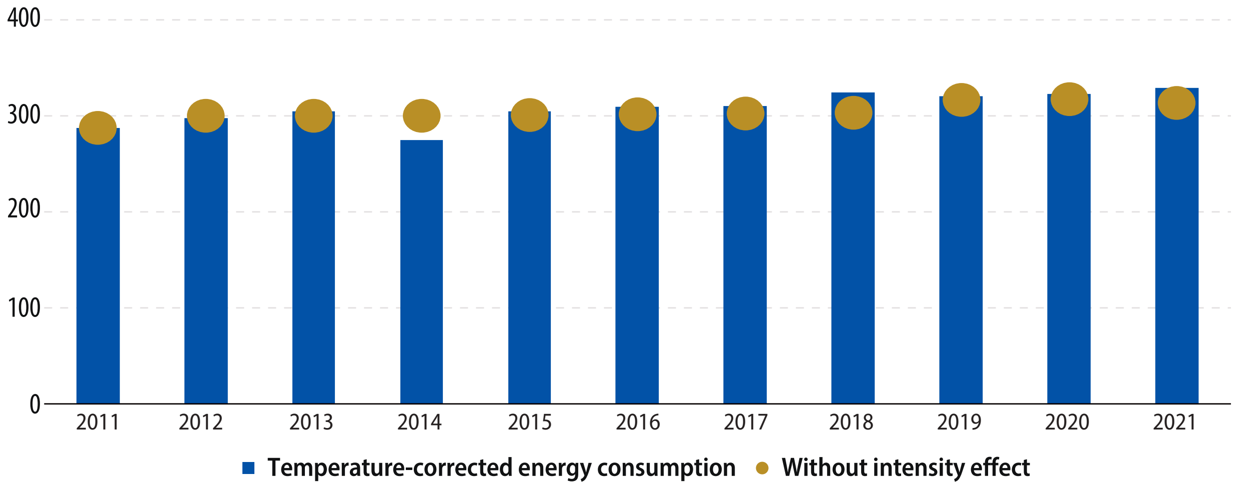


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

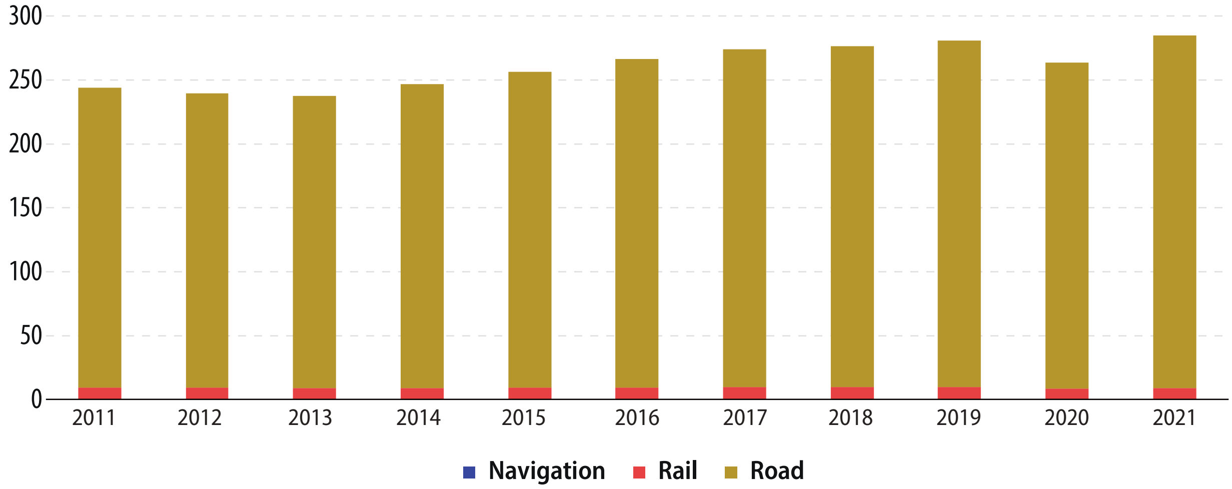
The energy consumption in the Czech residential sector increased from 287 PJ in 2011 to 329 PJ in 2021. During this period, the population remained stable and thus the associated increase was only about 0.3 PJ, while the decrease in dwelling occupancy had a more significant increasing effect of about 26 PJ. With a slight increase in heating degree days between the two years, the weather had a further increasing effect of about 16 PJ, while the energy consumption per dwelling remained very stable and had almost no effect on the overall consumption.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

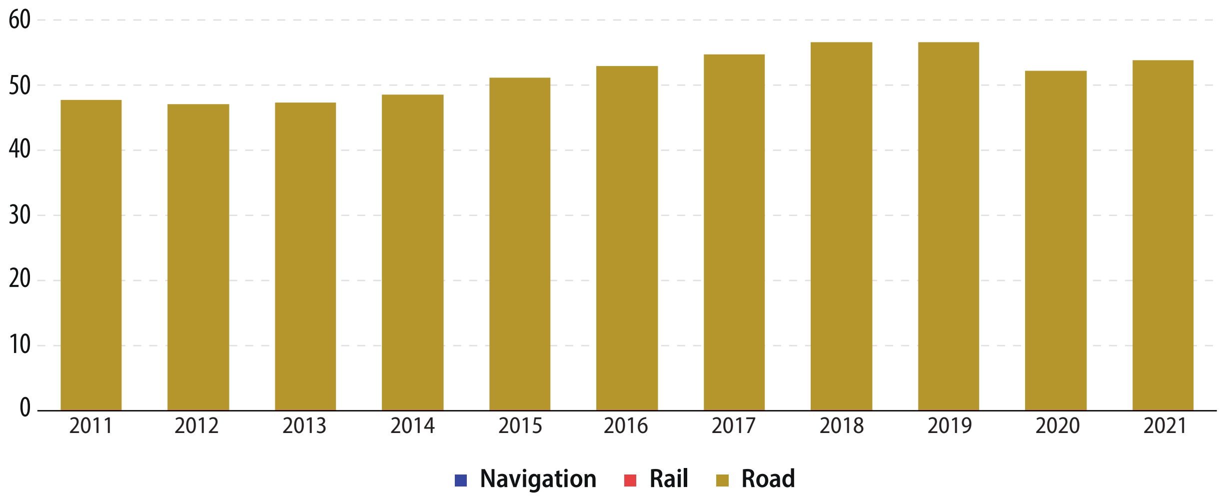


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

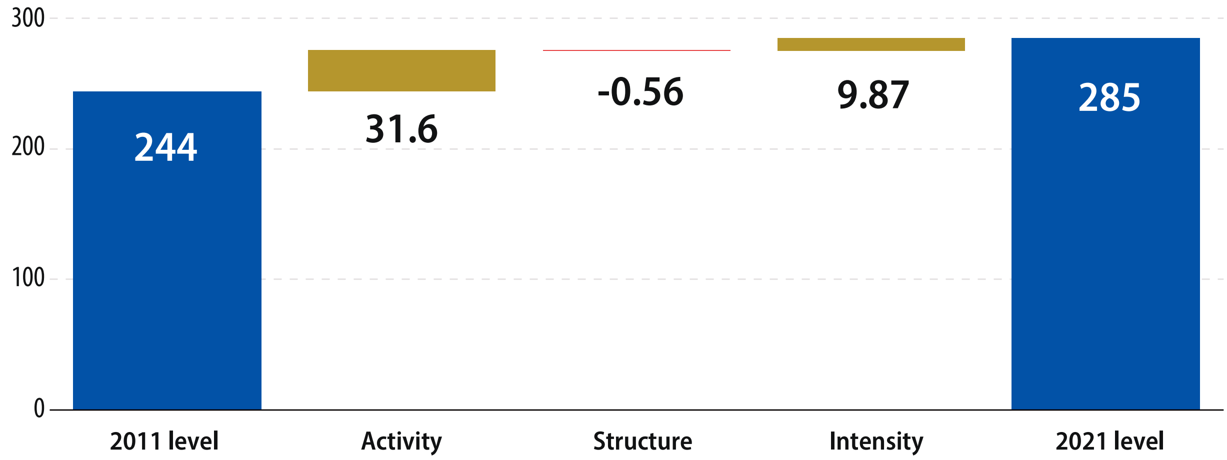


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

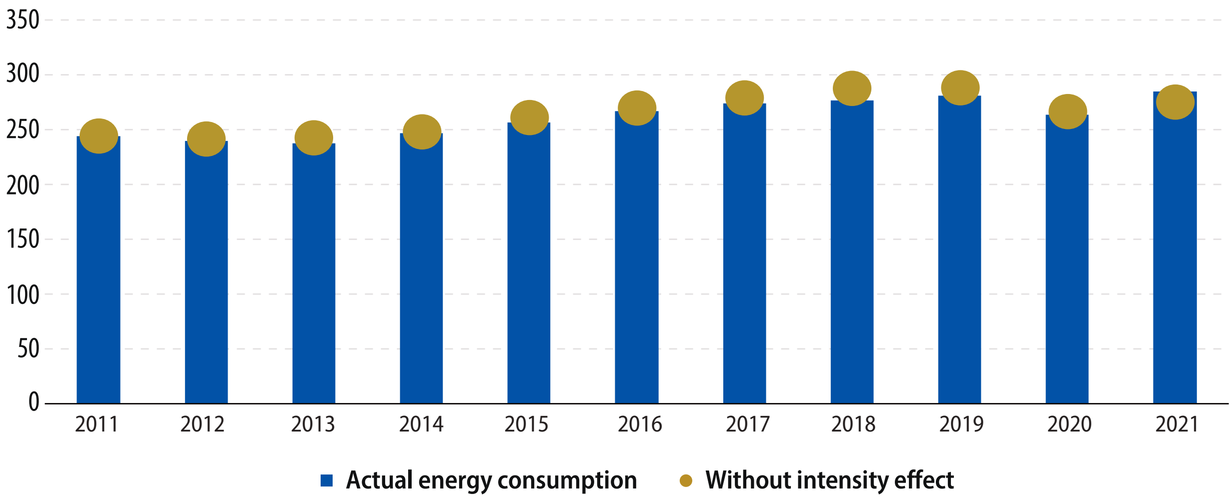


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in Czechia's transport sector grew steadily from 244 PJ in 2011 to 281 PJ in 2019, before dropping to 263 PJ in 2020, and then bouncing back in 2021 to its highest level over the studied period, at 284 PJ. Most of the energy consumption is due to road transport. The traffic grew from 47 billion VKM in 2011 to 57 billion VKM in 2019, then dropped to 52 billion VKM in 2020, and it was still only 54 billion VKM in 2021. Between 2011 and 2021, the increase in traffic caused an increase in energy consumption of about 32 PJ, and the increase in energy intensity, caused and additional increase of almost 10 PJ. With the absence of variation in the share of the different transport modes, the structural effect was very limited.

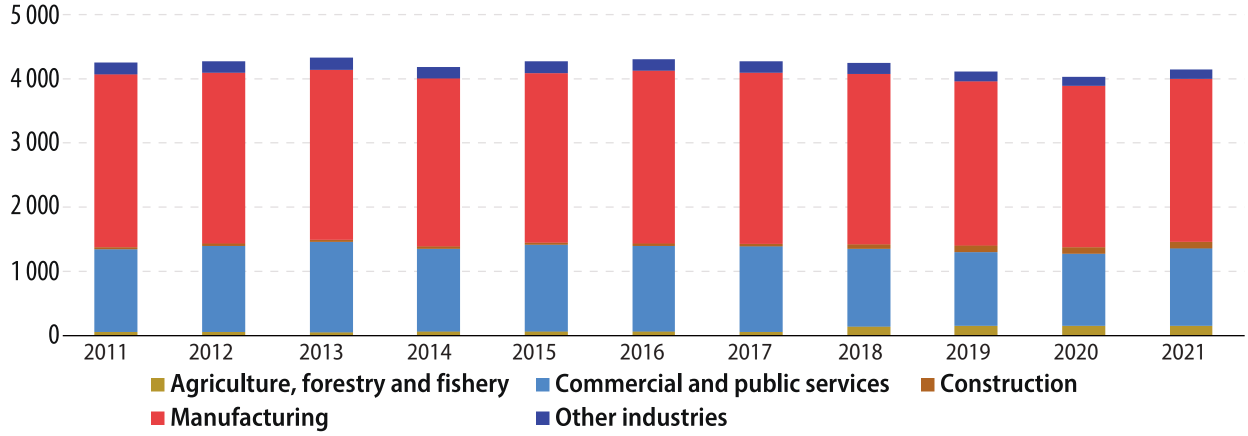
Germany

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

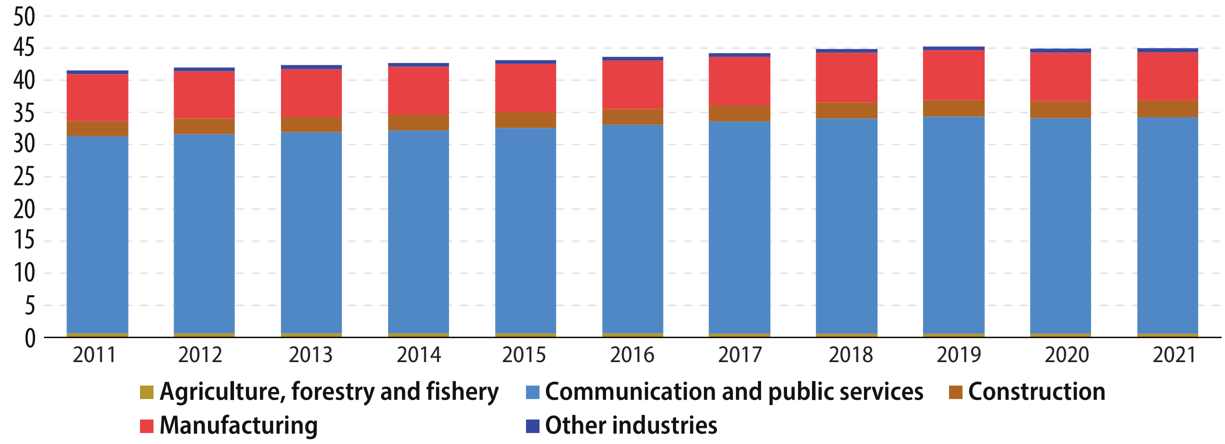


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

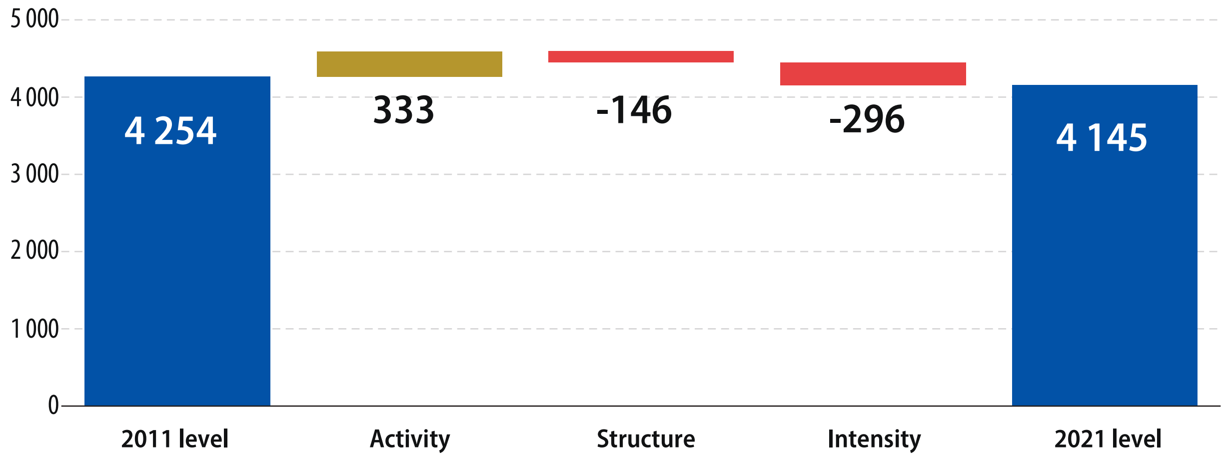


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

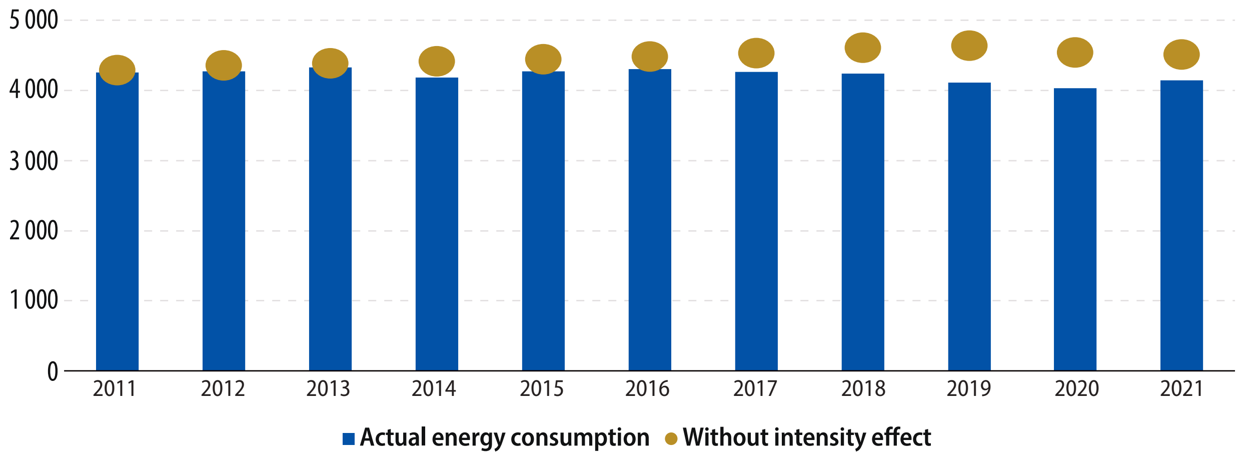


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

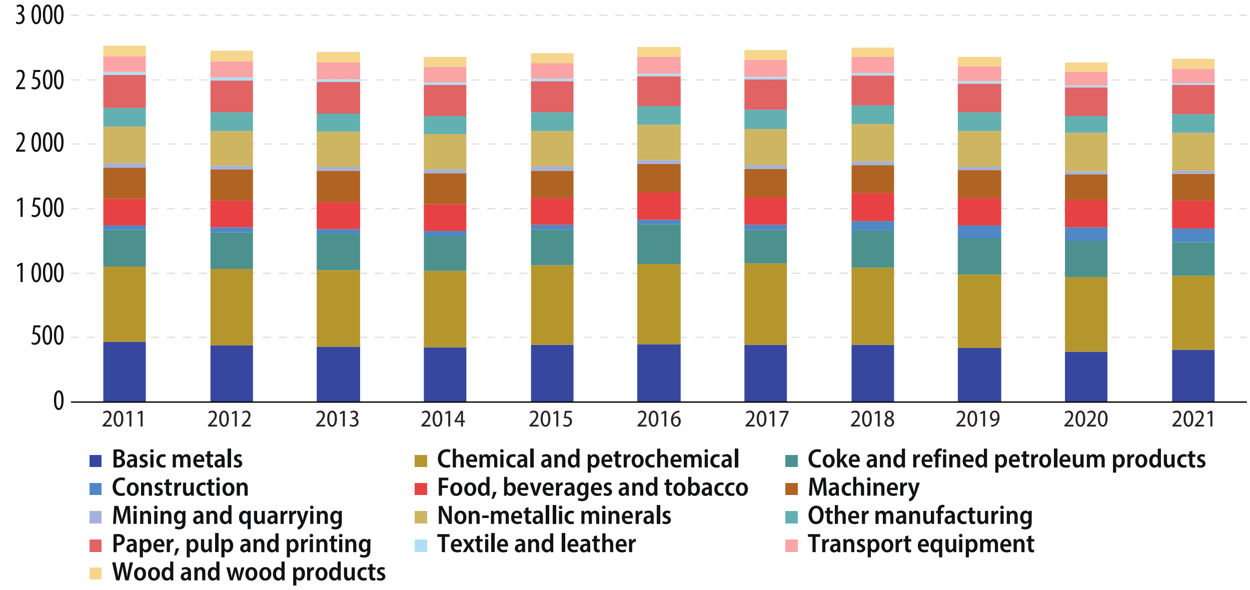
The final energy consumption of the different sectors of the whole economy remained quite constant from 4 254 PJ in 2011 to 4 145 PJ in 2021, with a lowest level at 4 030 PJ in 2020. Meanwhile, the active population steadily increased from 41.5 million in 2011 to 45.2 million in 2019, and then slightly decreased in 2020 and was still 45 million in 2021. Between 2011 and 2021, the increase in activity (measured in terms of employees) drove up the energy consumption by about 333 PJ. Meanwhile, the structural changes brought down the energy consumption by about 146 PJ, mostly due to the increasing share of the commercial and public services sector (from 74 to 75 % of the active population) to the expend of the manufacturing (from 18 % to 17 %). Finally, the decrease in energy consumption per employee caused the energy consumption to decrease by about 296 PJ. Without this decrease, energy consumption would have been 7 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

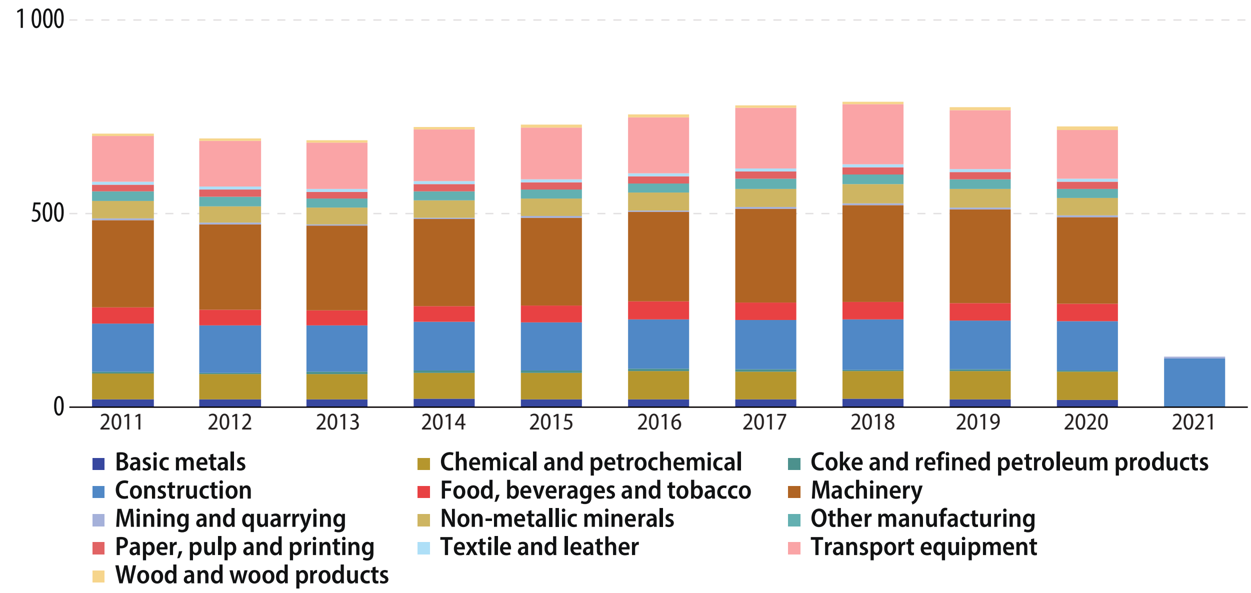


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

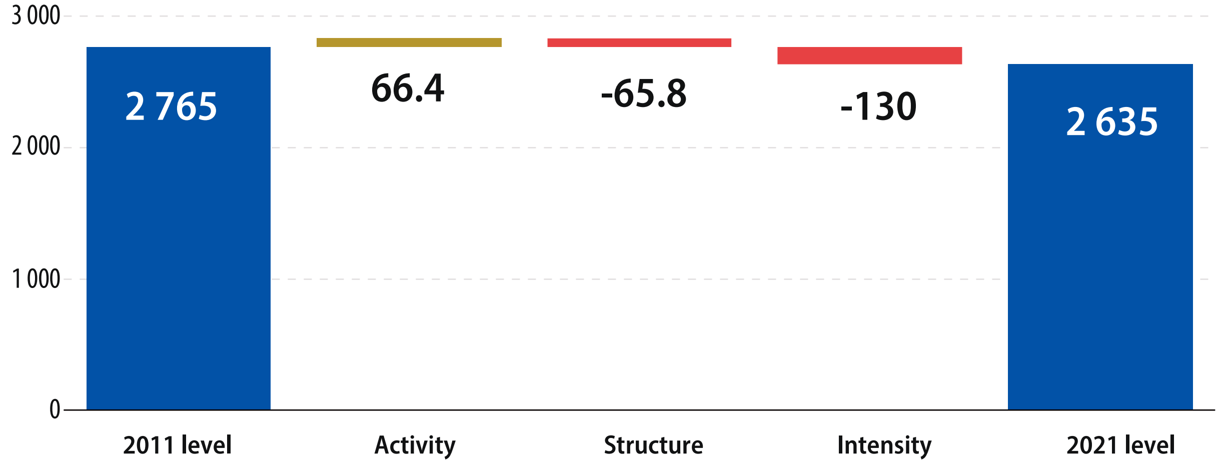


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

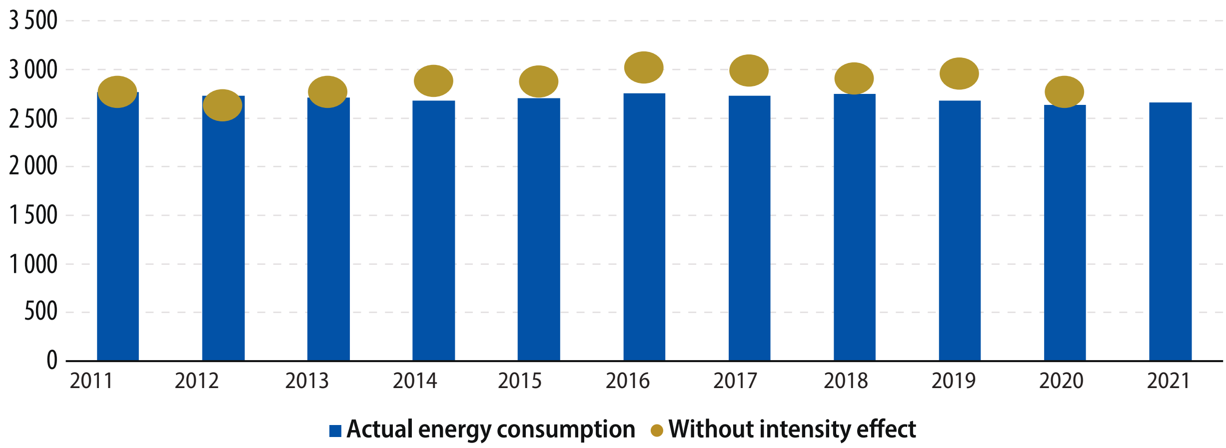


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

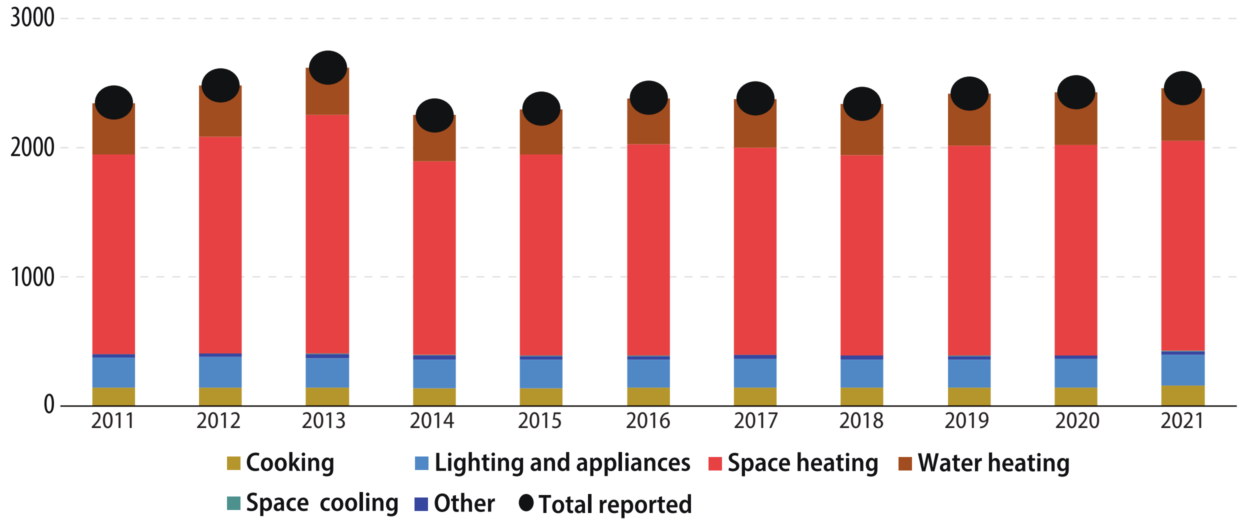
The energy consumption in Germany's manufacturing industry sector decreased from 2 765 PJ in 2011 (its highest level over the studied period) to 2663 PJ in 2021, with its lowest in 2020 at 2 635 PJ. The corresponding total gross value added increased from 707 billion EUR in 2011 to 789 billion EUR in 2018, and then decreased to reach 725 billion EUR in 2020. The gross value added by industry subsector in 2021 was incomplete at the time of the data extraction, and therefore the decomposition was applied on the years 2011 and 2020. Between these two years, the increase in activity drove up the consumption of energy by about 66 PJ. This was exactly offset by the structural changes in the economy which caused a decrease of about 66 PJ of consumption, partly due to a lower share of the machinery sector (from 32 % to 31 % between the two years). Finally, the most significant driver was the decrease in energy intensity, which brought down the consumption by about 130 PJ. Without this reduction, the total energy consumption in the industry sector would have been close to 5 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

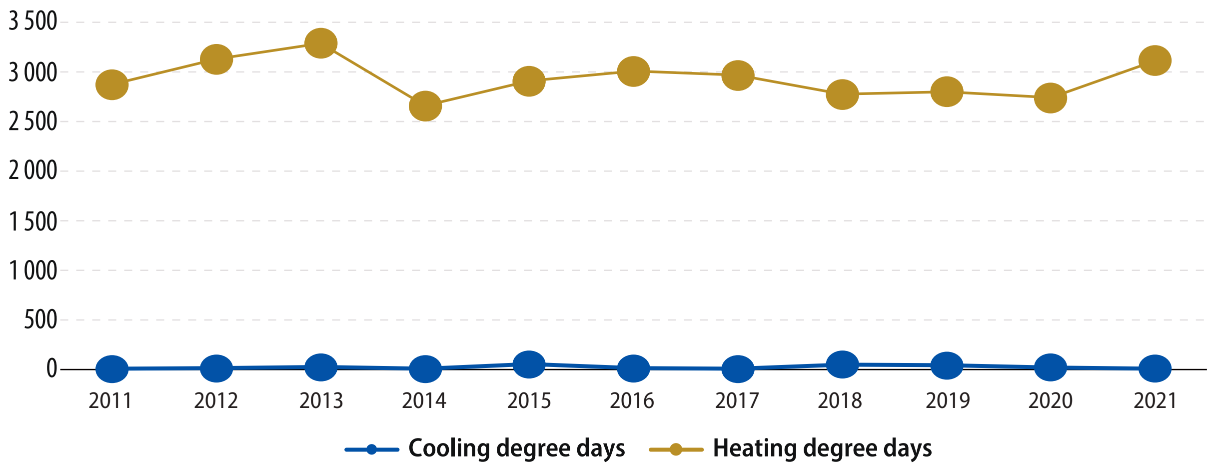
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

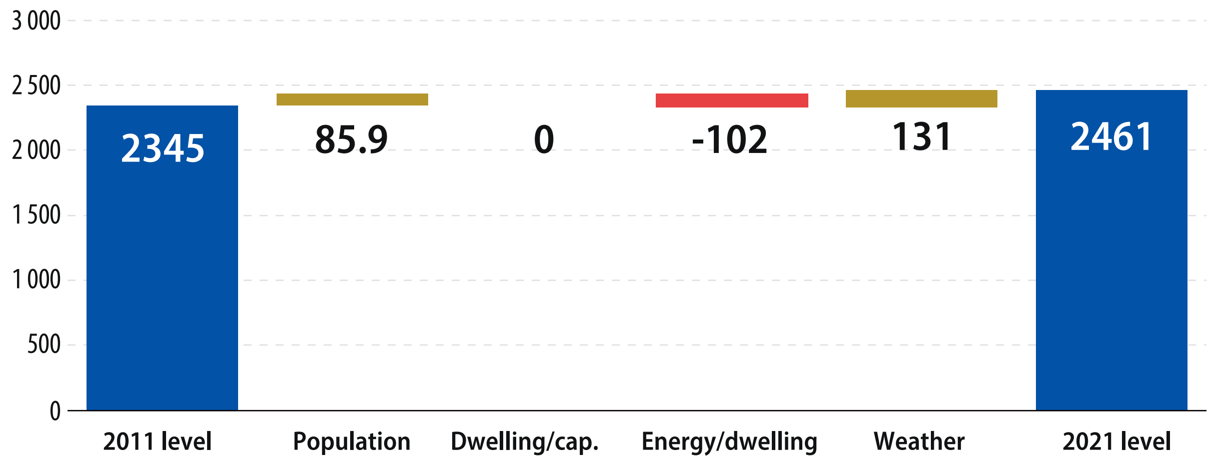


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

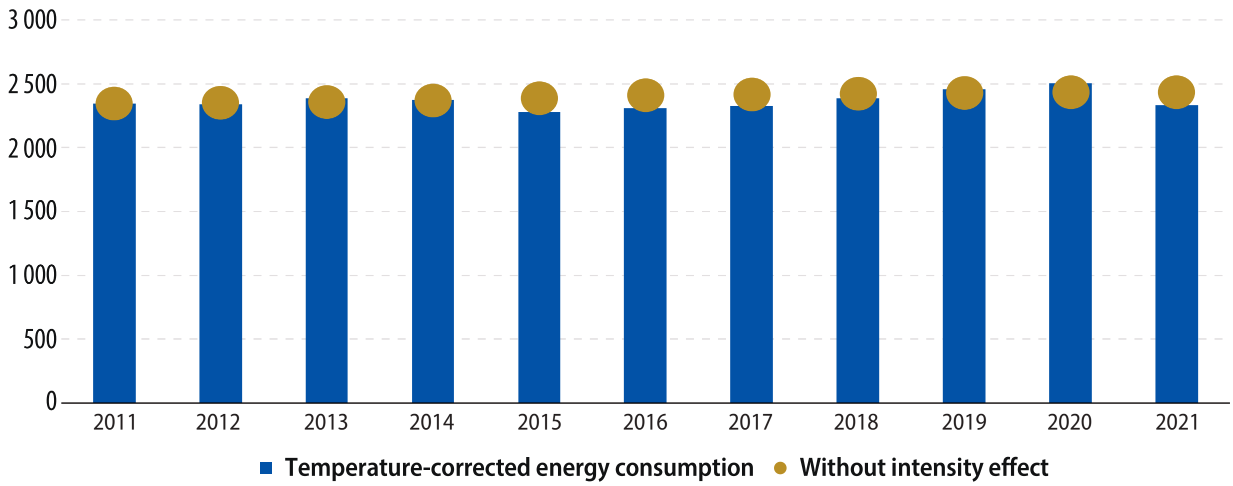


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

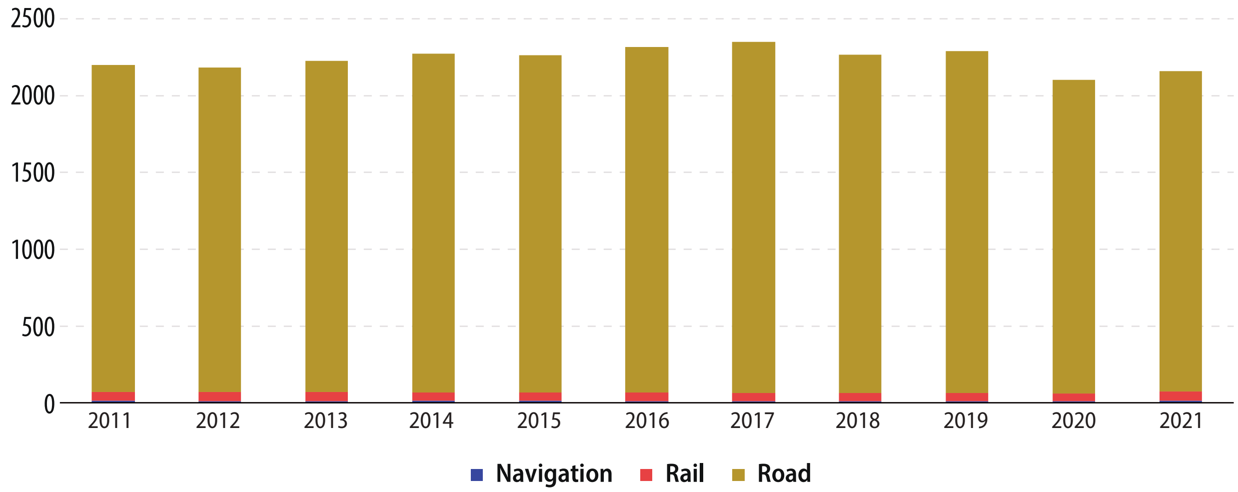
The energy consumption in the German residential sector increased from 2 345 PJ in 2011 to 2 617 PJ in 2013, then dropped abruptly to 2 246 PJ in 2014, to then rise again and reach 2 461 PJ in 2021. From 2011 to 2021, the increase in population can be estimated to have caused an increase of about 86 PJ, while the dwelling occupancy remained stable and therefore had no effect. With an increase in heating degree days between the two years, the weather had an increasing effect of about 131 PJ. Finally, the energy consumption per dwelling decreased and drove the consumption down by about 102 PJ. Without this decrease in intensity, the residential energy consumption could have been 4 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

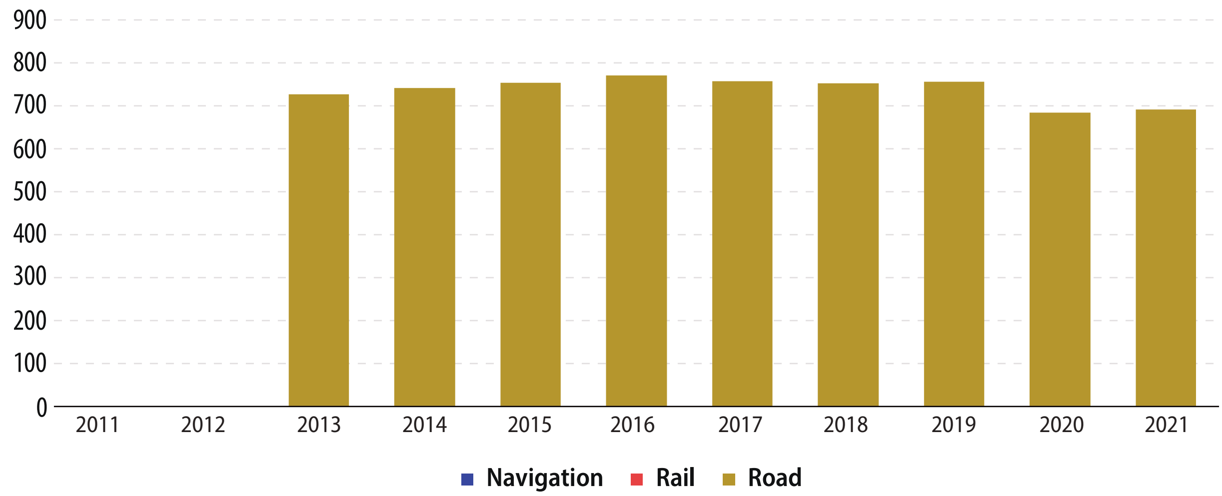


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

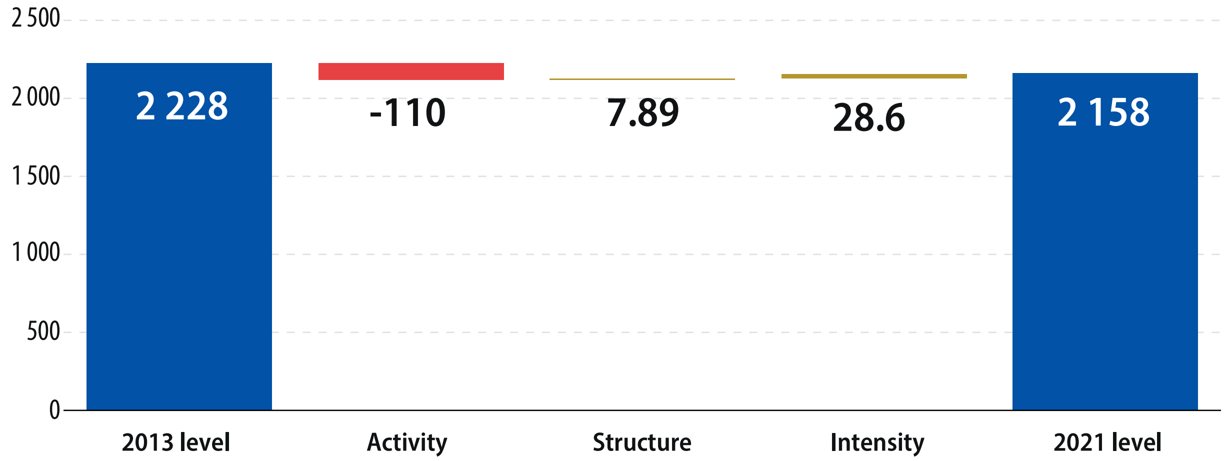


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

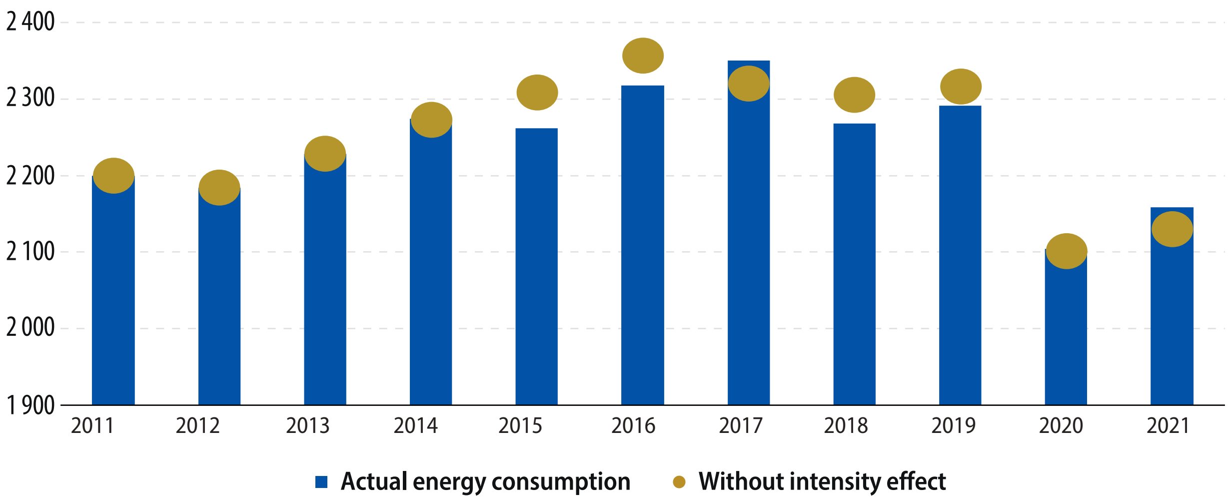


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the German transport sector grew steadily from 2 199 PJ in 2011 to 2 350 PJ in 2017, before dropping to 2 104 PJ in 2020, and finally, increasing slightly to 2 158 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic information was not available prior to 2013, and therefore the decomposition was performed on the period 2013 to 2021. During this period, road traffic increased from 726 billion VKM in 2013 to 769 billion VKM in 2016, before decreasing steadily to 690 billion VKM. Between 2013 and 2021, the decrease in traffic caused a decrease in energy consumption of about 110 PJ, which was only slightly offset by the increase in energy intensity which drove up the consumption by about 29 PJ. With the absence of strong variation in the share of the different modes of transport, the structural effect was very limited, causing an increase in energy consumption by 8 PJ. Without the increase in energy intensity, the energy consumption would have been 1 % lower in 2021.

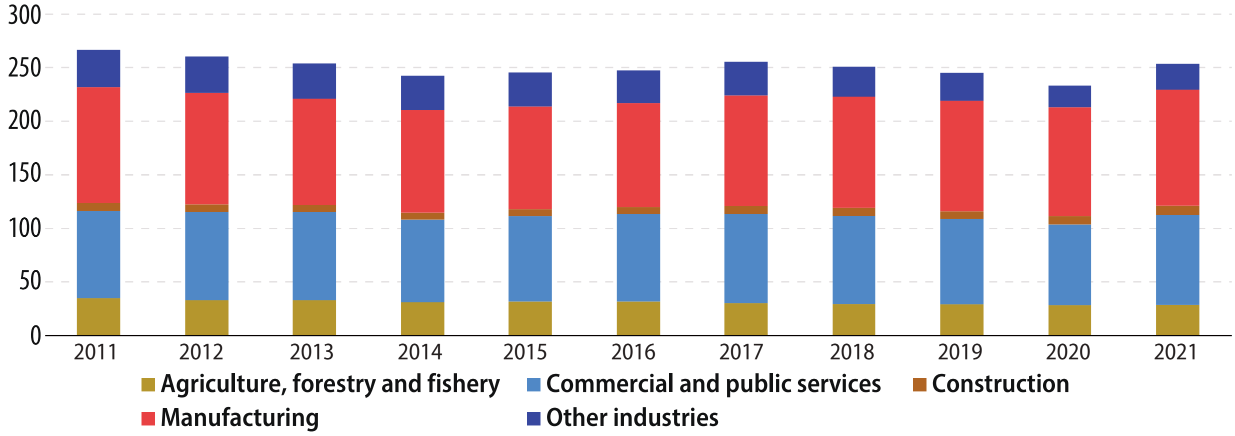
Denmark

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

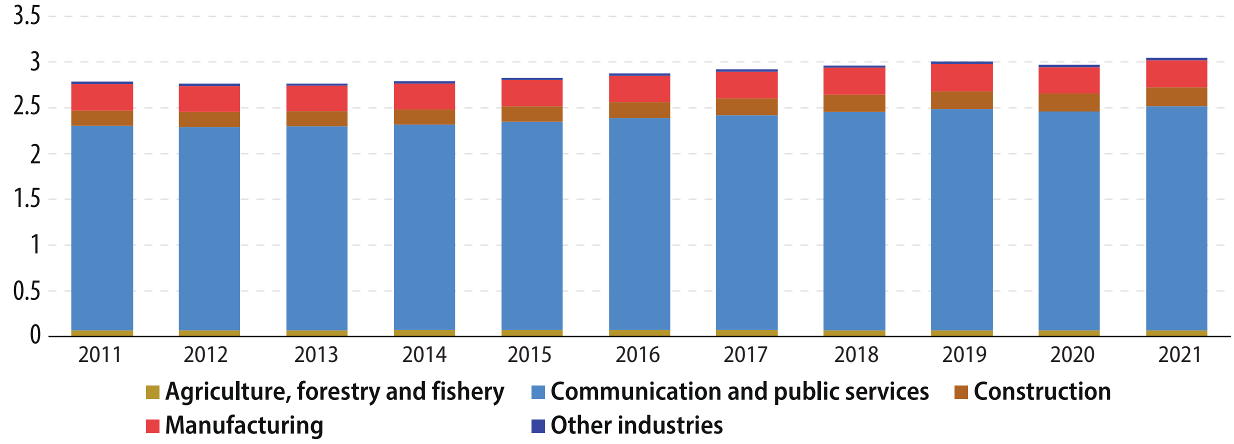


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

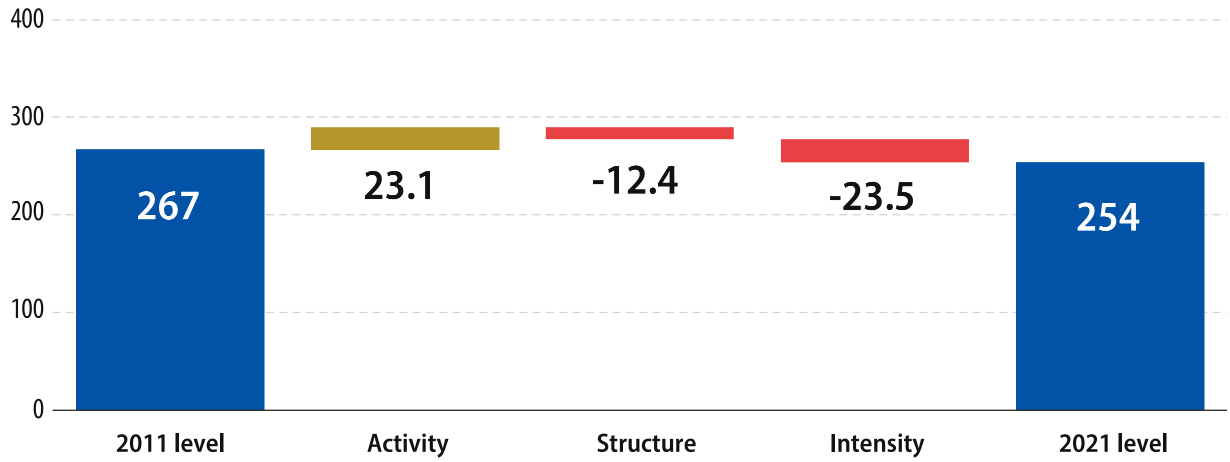


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

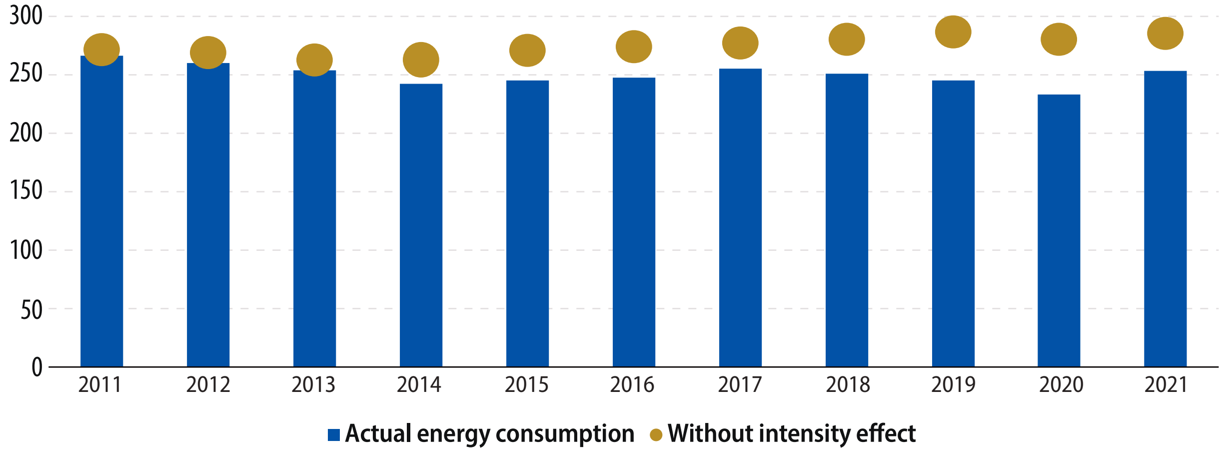


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

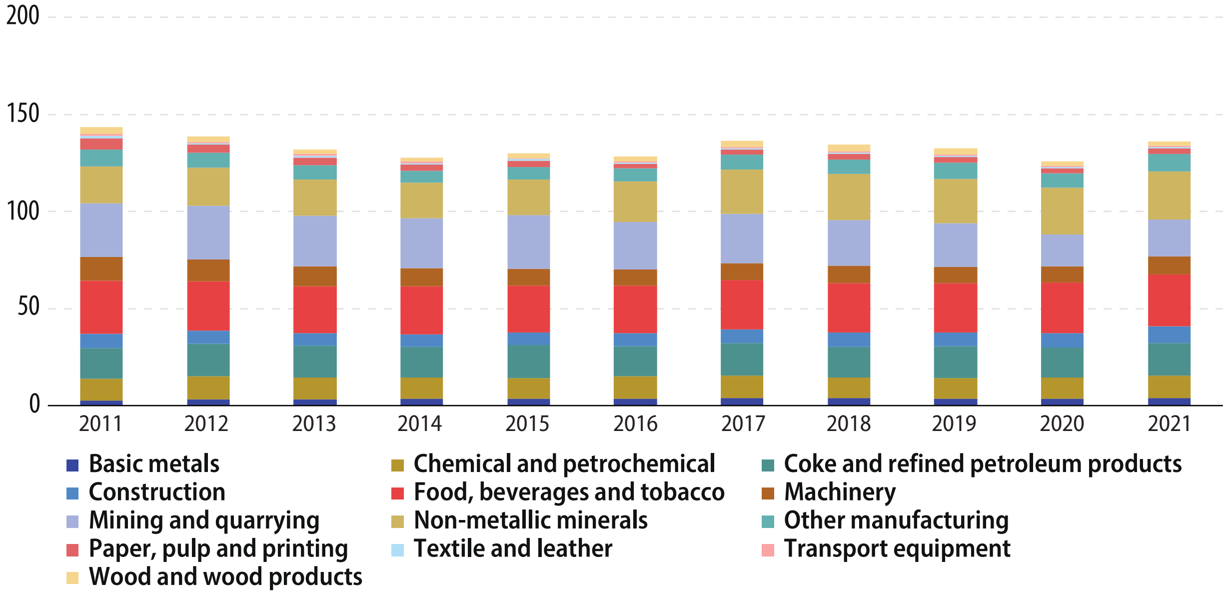
The final energy consumption of the different sectors of the whole economy slightly declined from 267 PJ in 2011 to 233 PJ in 2020, despite a peak at 256 PJ in 2017, and then rose back to 254 PJ in 2021. Similarly, the active population steadily increased from 2.8 million in 2011 to 3.0 million in 2021. Over this period, the increase in activity (measured in terms of employees) brought energy consumption up by about 23 PJ. Meanwhile, the structural change slightly drove down energy consumption by about 12 PJ. Finally, the decrease in intensity, which caused the energy consumption to decrease by about 24 PJ. Without this decrease in energy consumption per employee, energy consumption would have been 9 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

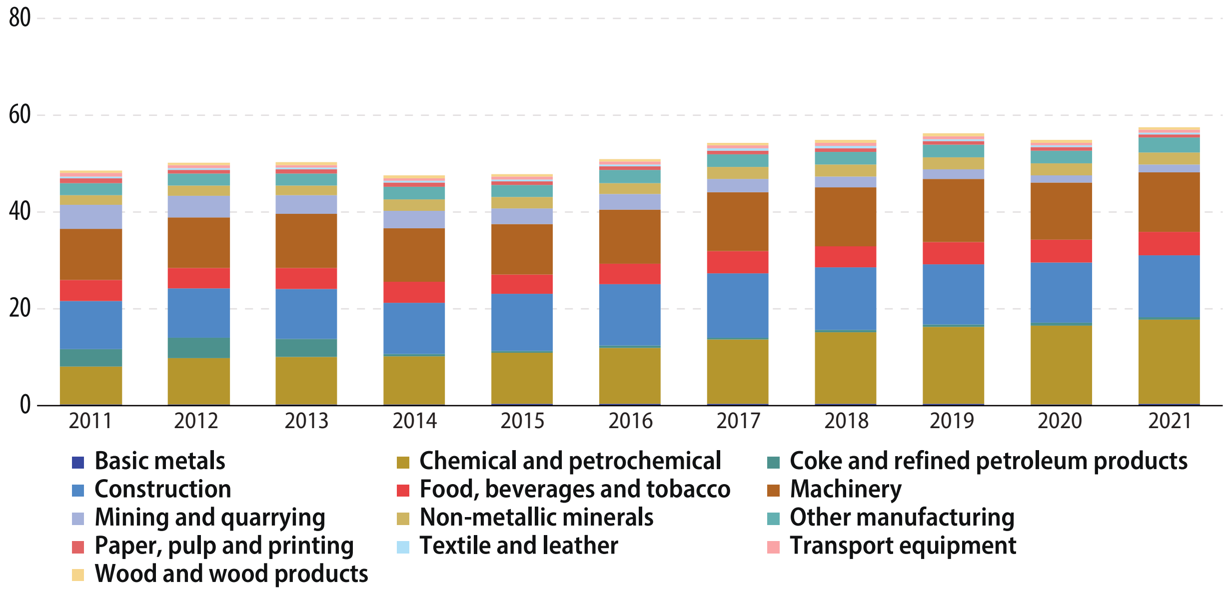


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

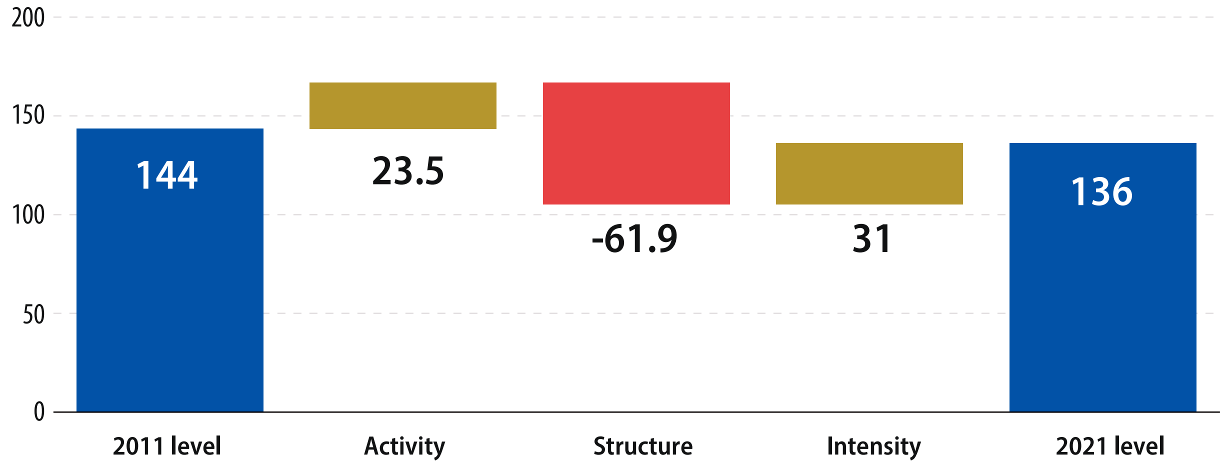


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

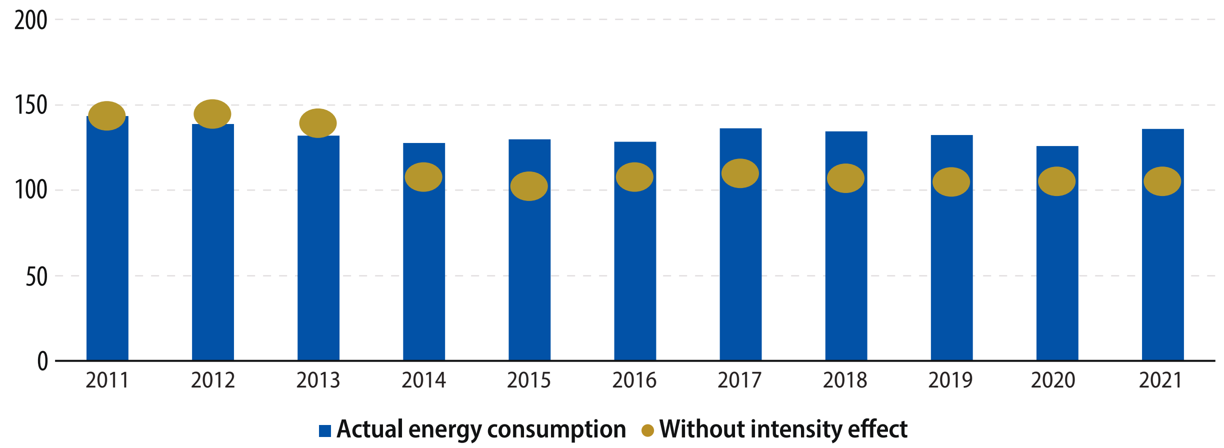


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

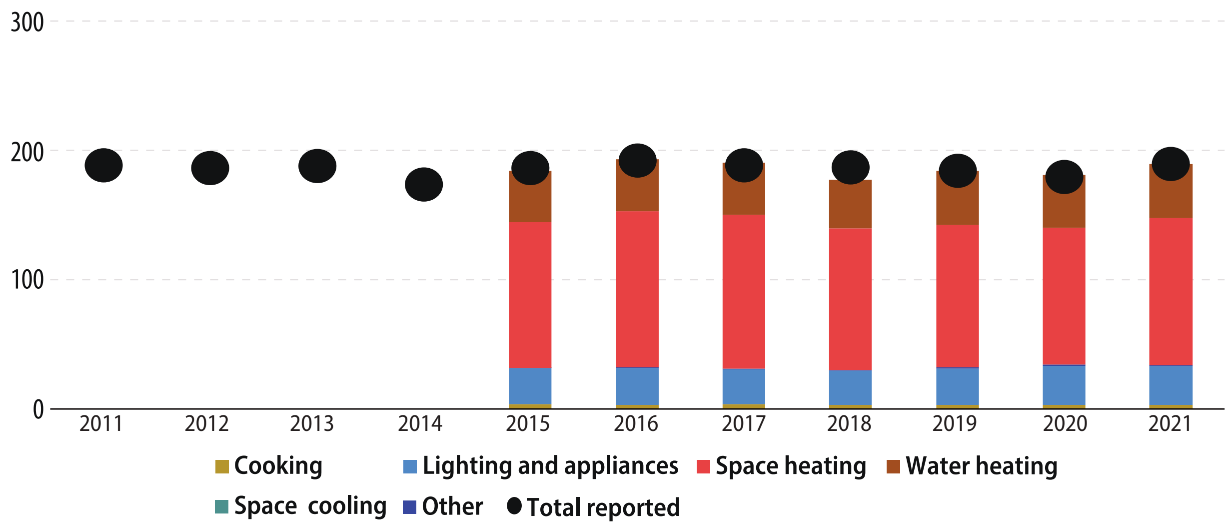
The energy consumption in Denmark's manufacturing industry sector decreased from 144 PJ in 2011 (its highest level) to 128 PJ in 2014, then increased to reach 136 PJ in 2017, before decreasing again to 126 PJ in 2020 and finally bouncing back to 136 PJ in 2021. The corresponding total gross value added increased from 49 billion EUR in 2011 to 56 billion EUR in 2019, then slightly decreased in 2020 to 55 billion EUR, before bouncing back to 58 billion EUR in 2021. Between 2011 and 2021, the increase in activity drove up energy consumption by about 24 PJ. Meanwhile, the structural changes in the economy caused a significant decrease of about 62 PJ of consumption, partly due to a lower share of the mining and quarrying sector (from 10 % to 3 % between 2011 and 2021) and of the coke and refined petroleum product (from 7 % to 1 %). Finally, the increase in energy intensity brought consumption up by about 31 PJ. Without this increase, the total energy consumption in the industry sector would have been close to 23 % lower in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

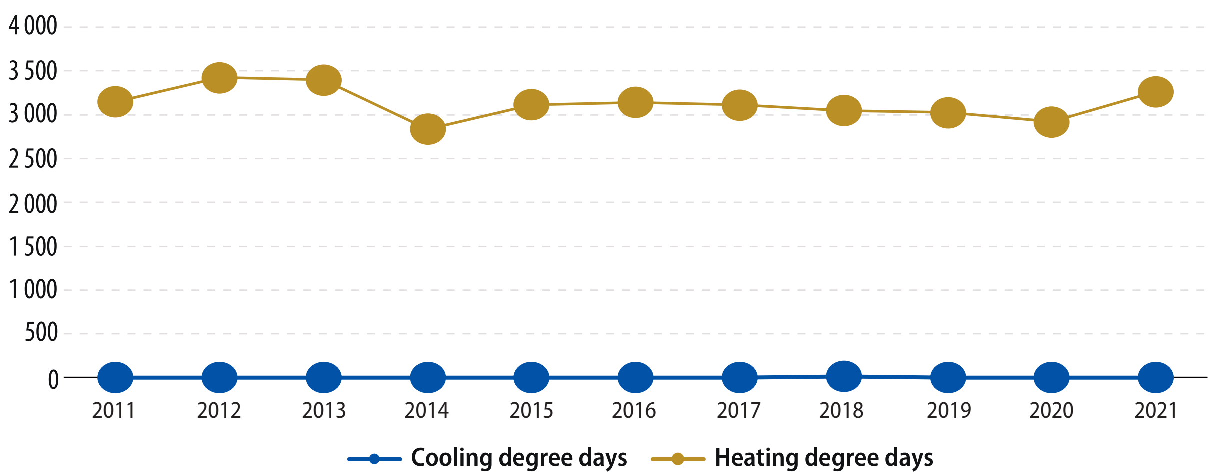
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

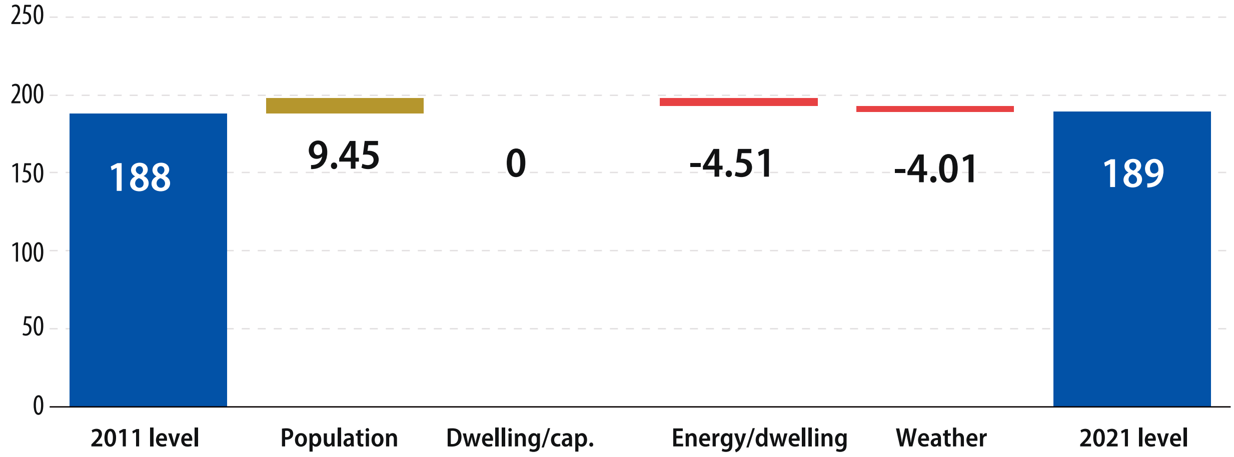


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

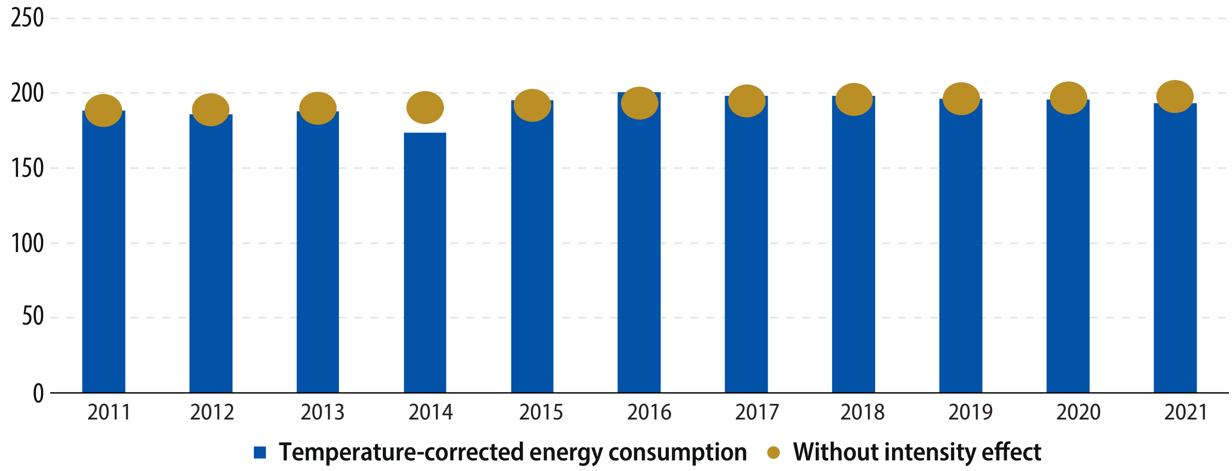


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

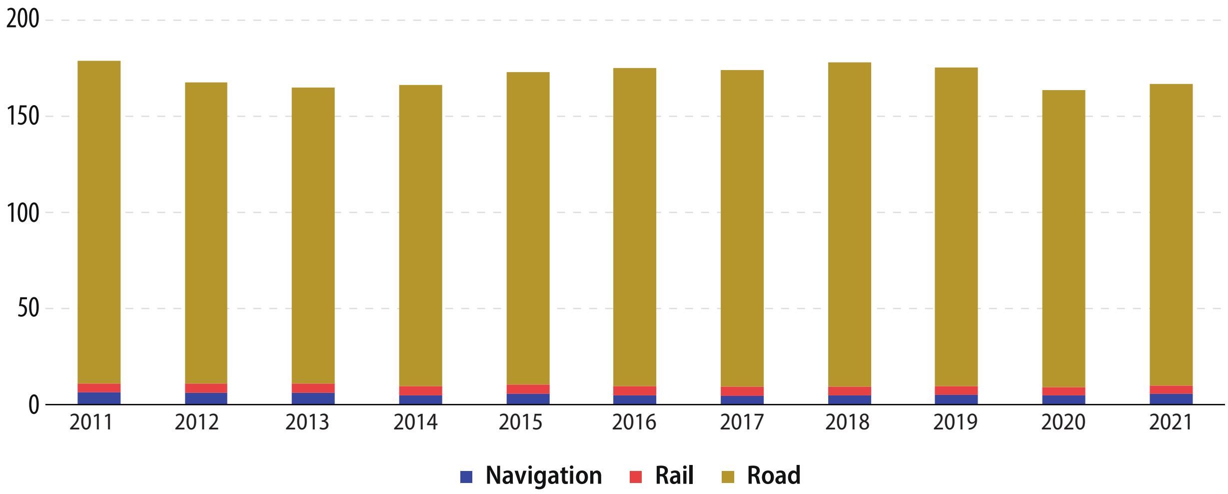
The energy consumption in the Danish residential sector remained quite constant between 2011 and 2021, oscillating between 174 PJ and 192 PJ. The breakdown in energy consumption by end-use is only available from 2015 onward, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the increase in population can be estimated to have caused an increase of about 9 PJ, while the dwelling occupancy remained stable and therefore had no effect on consumption. There were more heating degree days in 2021 than in 2011, however, since the temperature correction could not be calculated for 2011, the weather effect calculated between these two years is not reliable. Finally, the energy consumption per dwelling decreased and drove down consumption by about 5 PJ.in intensity, the residential energy consumption could have been 4 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

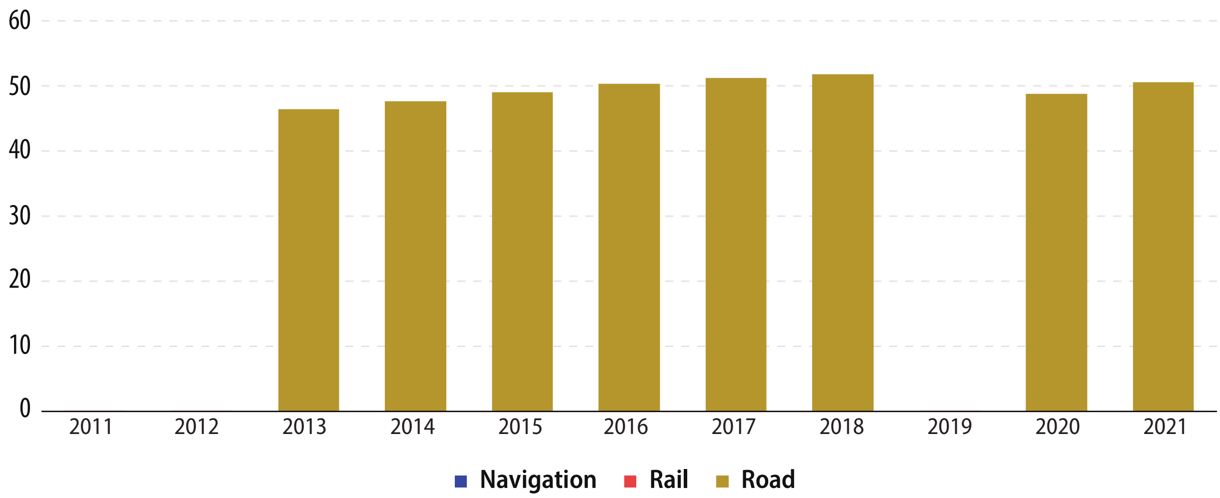


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

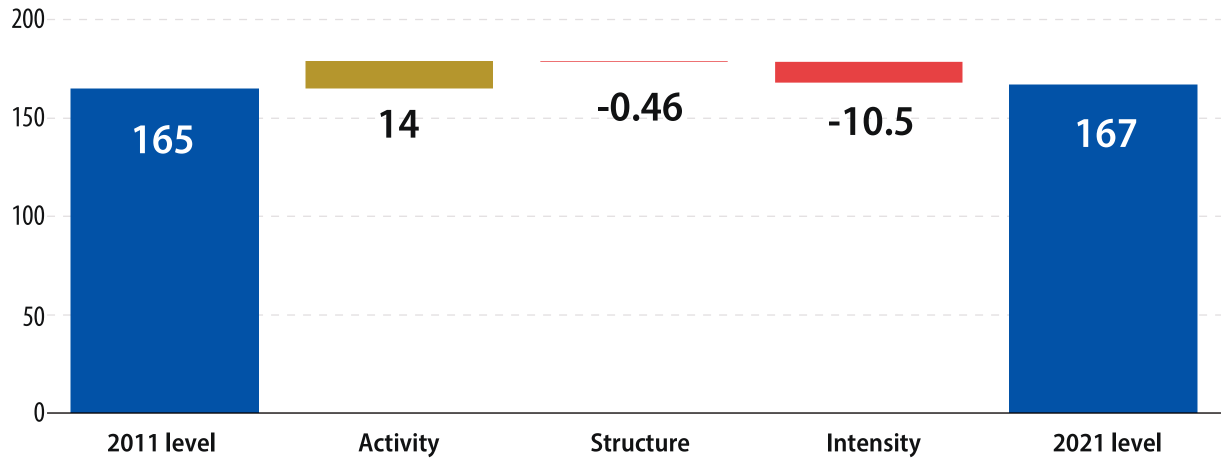


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

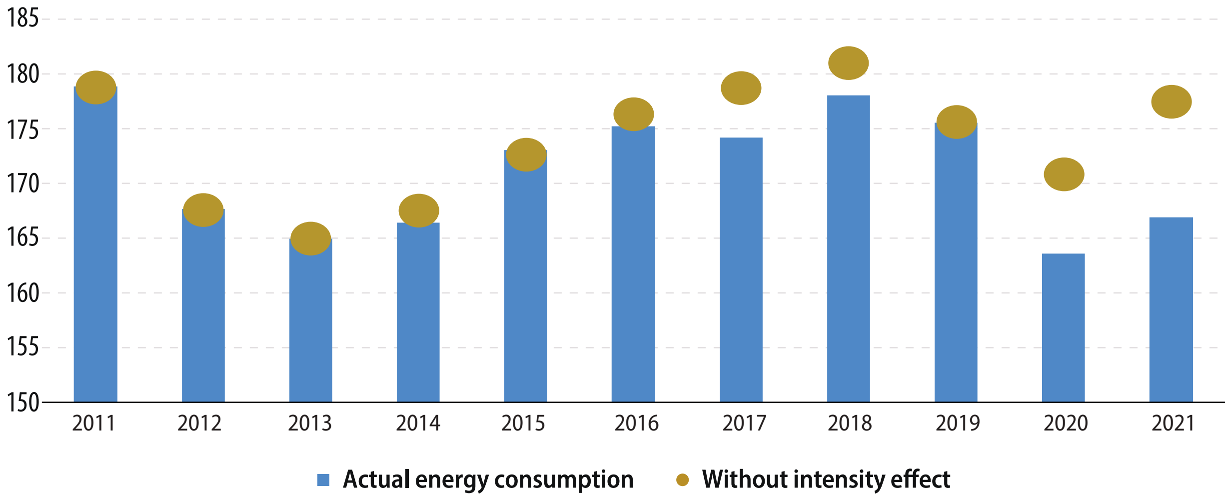


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Danish transport sector decreased from 179 PJ in 2011 to 165 PJ in 2013, before increasing back to 178 PJ in 2018, and then declining to 164 PJ in 2020 before bouncing back to 167 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic information was not available prior to 2013, and therefore the decomposition was performed on the period 2013 to 2021. During this period, road traffic increased from 46.4 billion VKM in 2013 to 51.7 billion VKM in 2018. Road traffic data were missing in 2019, and then the traffic dropped in 2020 and it was still only 50.4 billion VKM in 2021. Between 2013 and 2021, the increase in traffic caused an increase in energy consumption of about 14 PJ, which was only partly offset by the decrease in energy intensity, which caused a decrease of about 11 PJ. Due to the absence of strong variation in the share of the different transport modes, the structural effect was almost unnoticeable. Without the decrease in energy intensity, the energy consumption in the transport sector could have been 6 % higher in 2021.

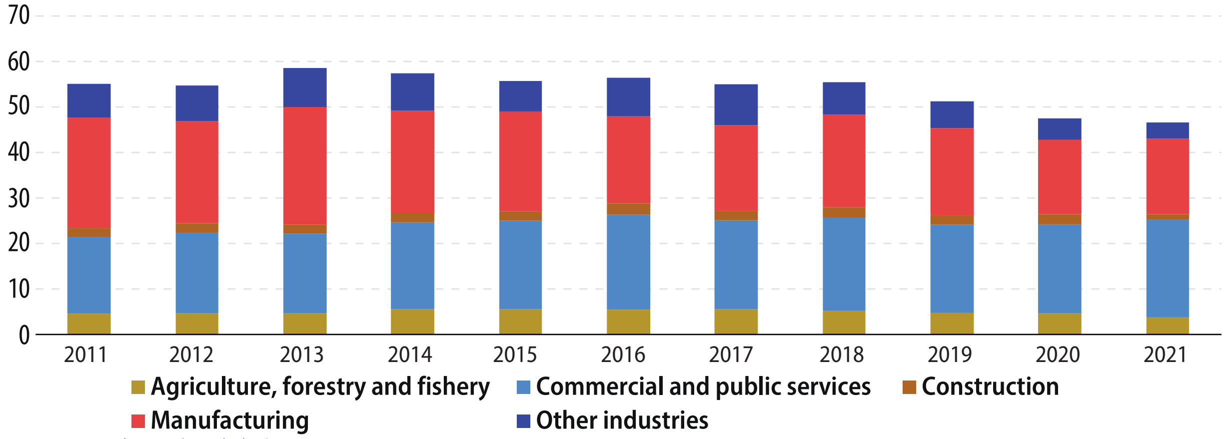
Estonia

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

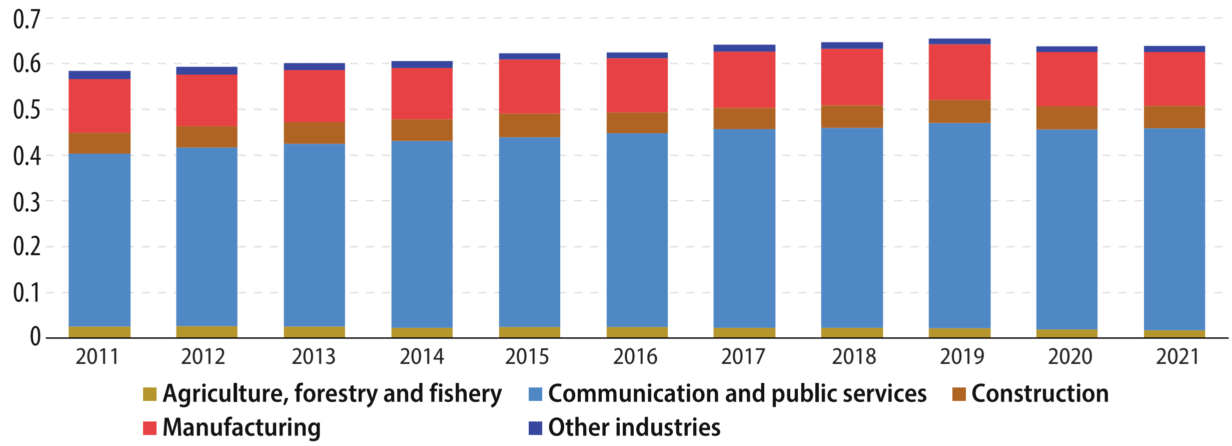


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

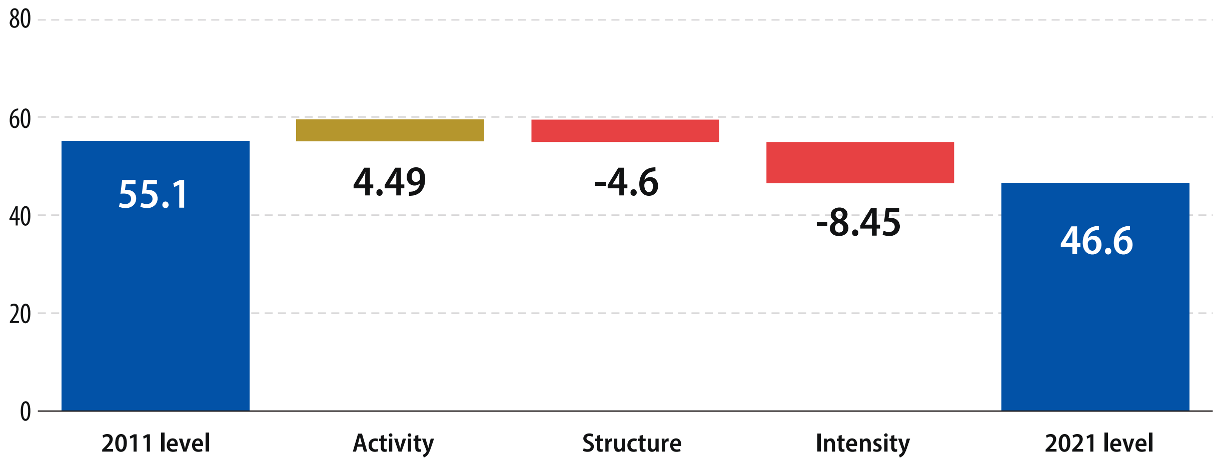


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

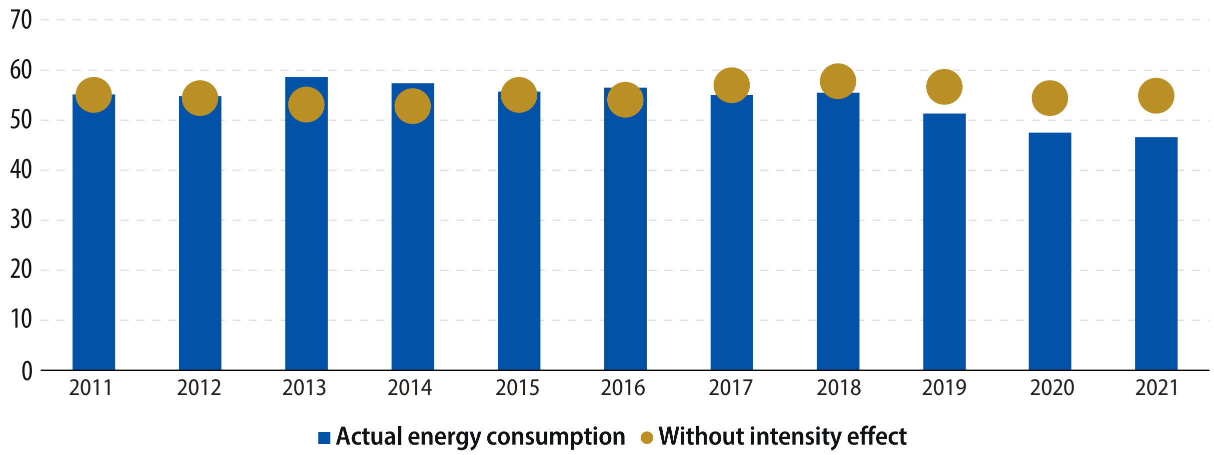


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

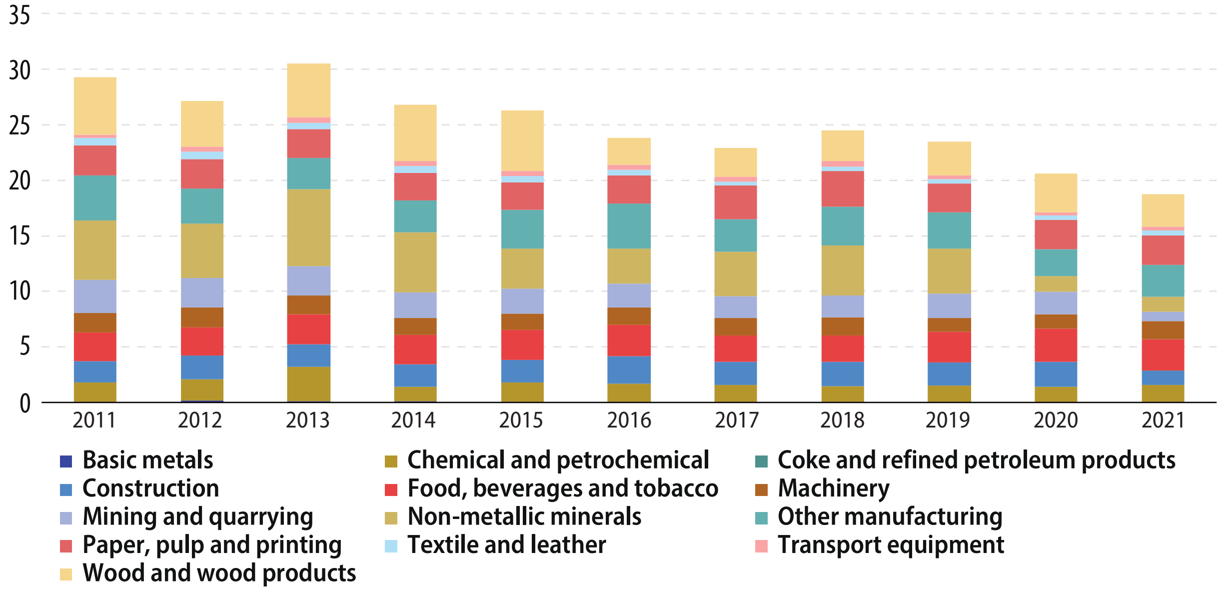
At the level of the whole economy, the final energy consumption of the different sectors also slightly decreased between 2011 and 2021 from 55 PJ to 47 PJ. Meanwhile, the active population steadily increased from 584 thousand in 2011 to 655 thousand in 2019, then it dropped and stabilised to around 638 thousand in 2020-2021. Over this period, the increase in activity (measured in terms of employees) brought energy consumption up by about 4.5 PJ, which was offset by the structural change, bringing down energy consumption by almost the same amount, 4.6 PJ, mostly due to the increasing share of the commercial and public services sector (from 65 % to 69 % of the active population). The most significant driver was the decrease in intensity, which caused energy consumption to decrease by about 8.5 PJ. Without this decrease in energy consumption per employee, the energy consumption would have been 18 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

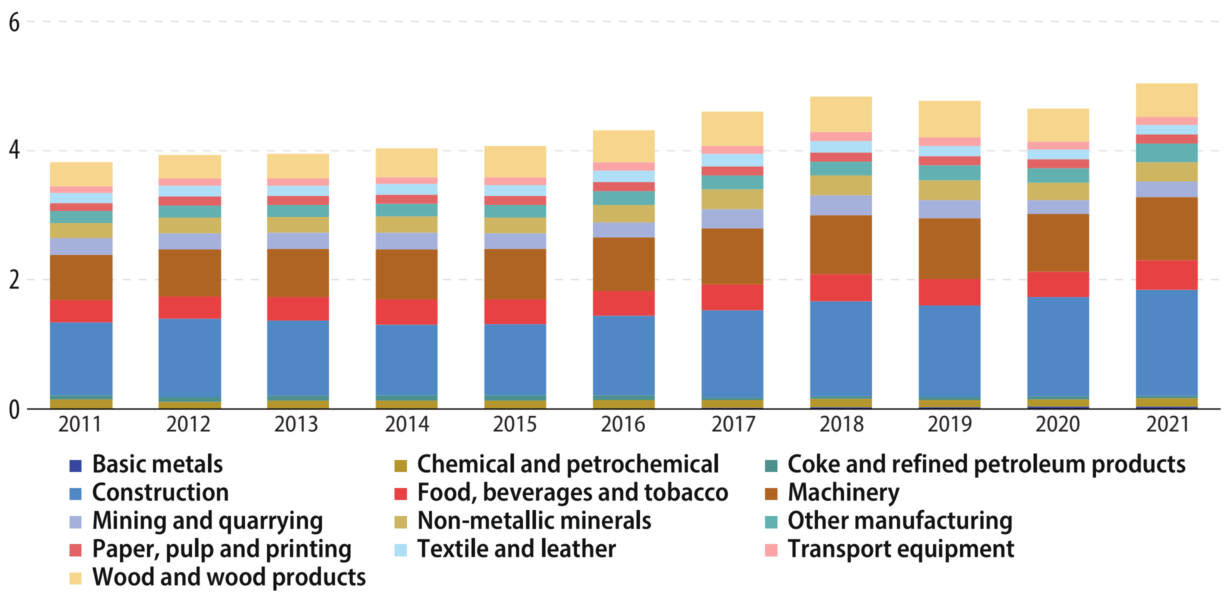


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

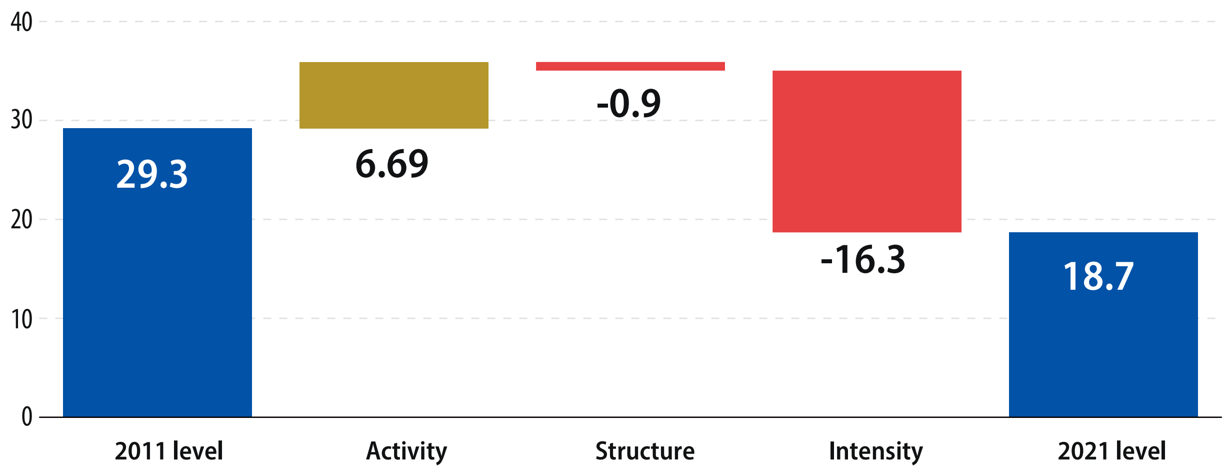


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

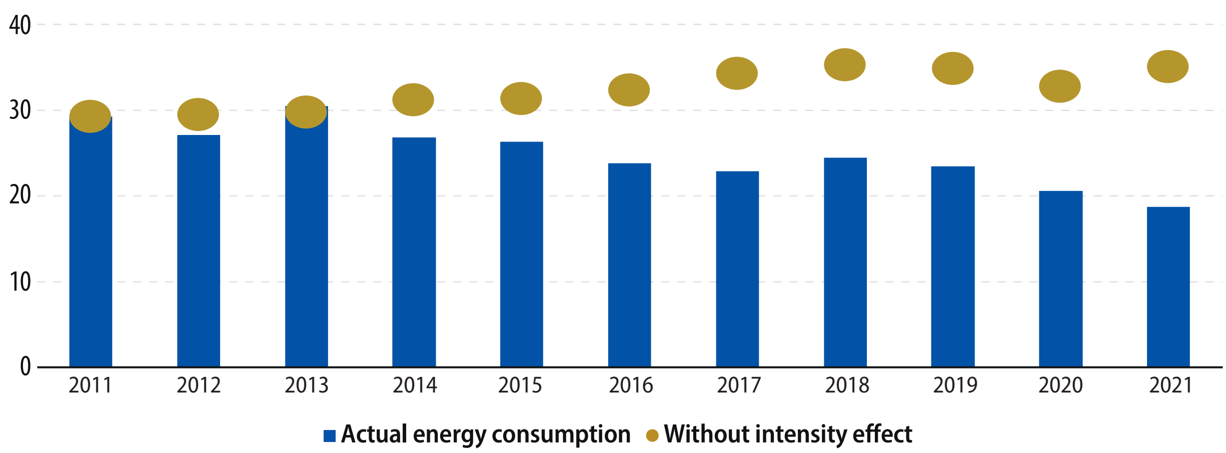


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

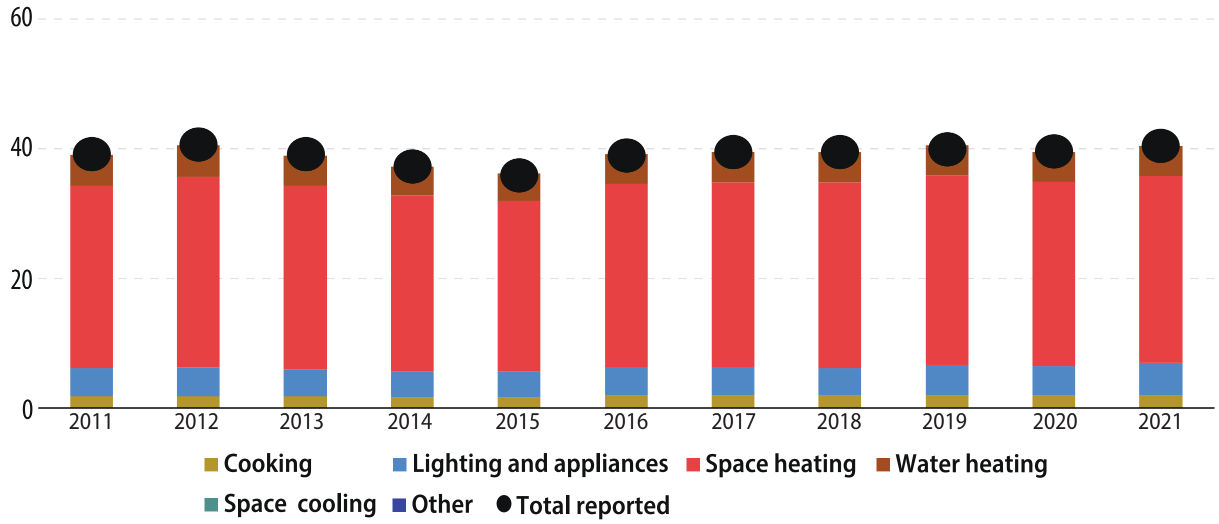
The energy consumption in Estonia's manufacturing industry sector decreased significantly over the period, from 29 PJ in 2011 to less than 19 PJ in 2021. The coke and refined petroleum product energy consumption data were not available and therefore the sector was removed from this analysis. For the remaining sectors, the gross value added increased from below 3.8 billion EUR in 2011 to 5.0 billion EUR in 2021. Due to the strong decoupling between the growth of its industry and its related energy consumption, the most significant driver in the consumption of energy was the reduction in intensity, which brought down the energy consumption by more than 16 PJ between 2011 and 2021. This was only partly offset by the increase in activity, which drove up the consumption of energy by about 7 PJ. The structural changes in the economy caused a very small decrease in energy consumption of almost 1 PJ. Without the reduction in energy intensity, the total energy consumption in the industry sector would have been almost double in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

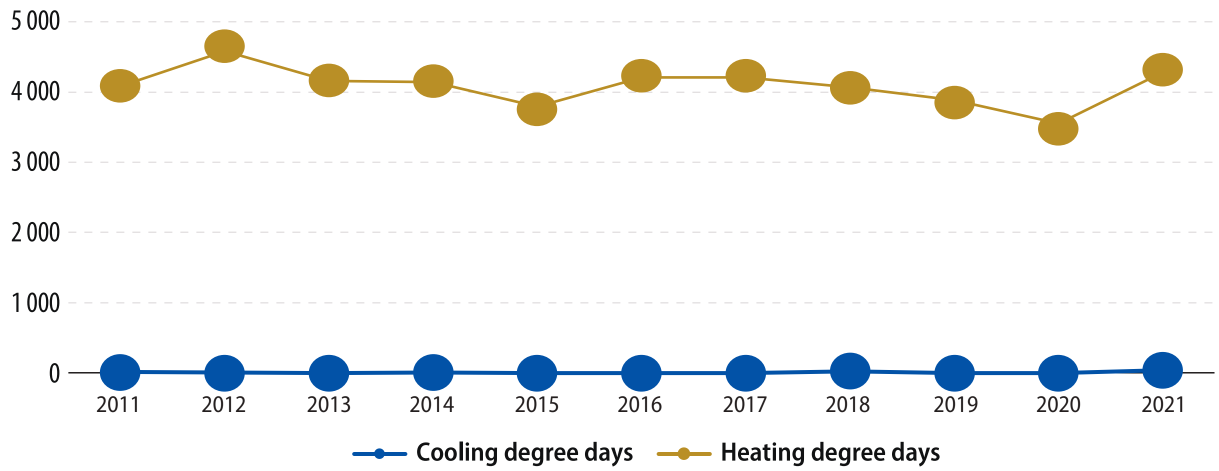
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

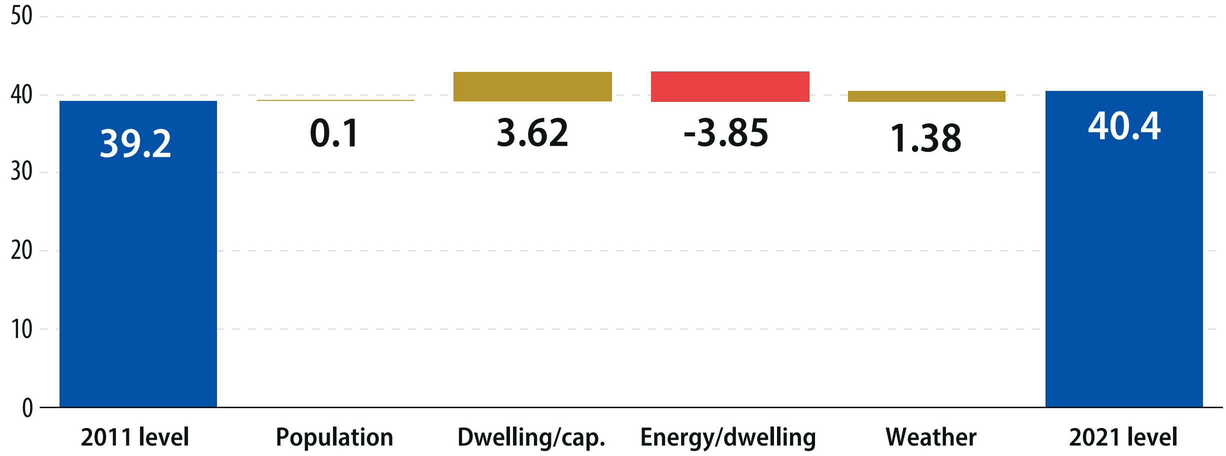


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

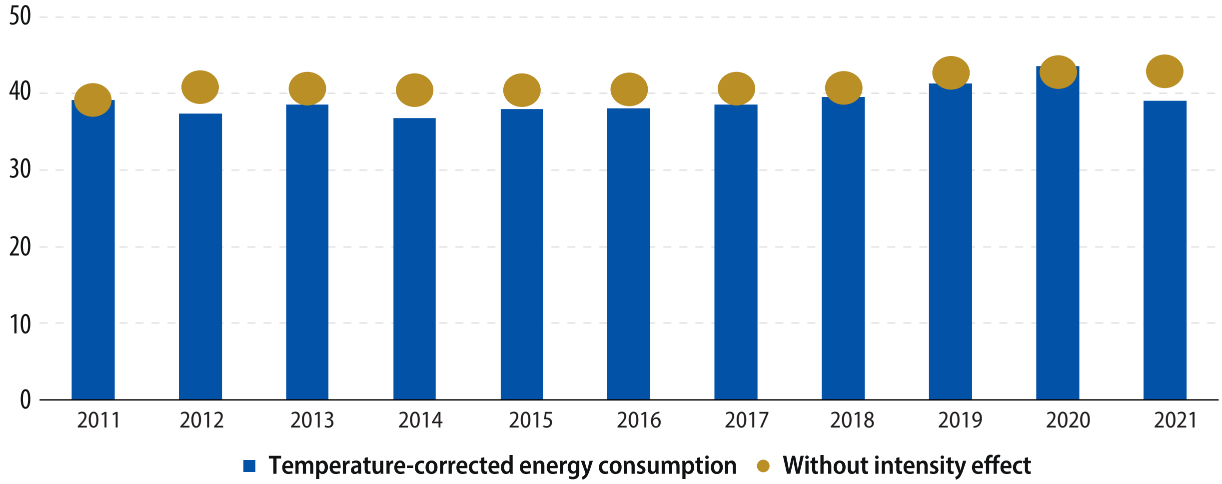


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

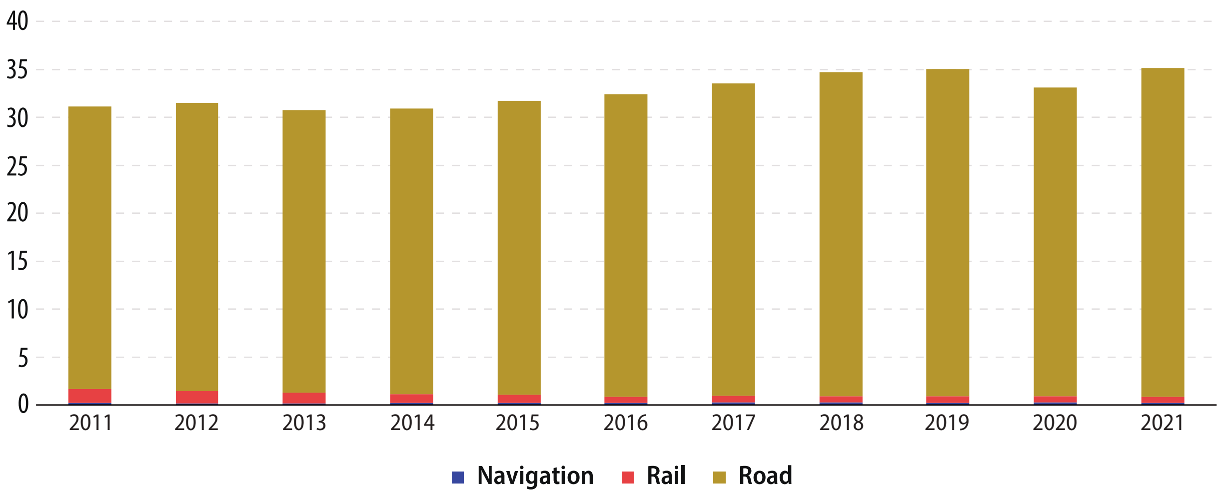
From 2011 to 2021, the energy consumption in the Estonian residential sector remained between 36 PJ and 41 PJ. During this period, the population remained stable and had virtually no effect on consumption. Meanwhile, the decrease in dwelling occupancy had an increasing effect of about 3.6 PJ, but it was offset by the decrease in energy consumption per dwelling, which caused a reduction of about 3.9 PJ. With a slight increase in heating degree days between the two years, the weather had a further increasing effect of about 1.4 PJ.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

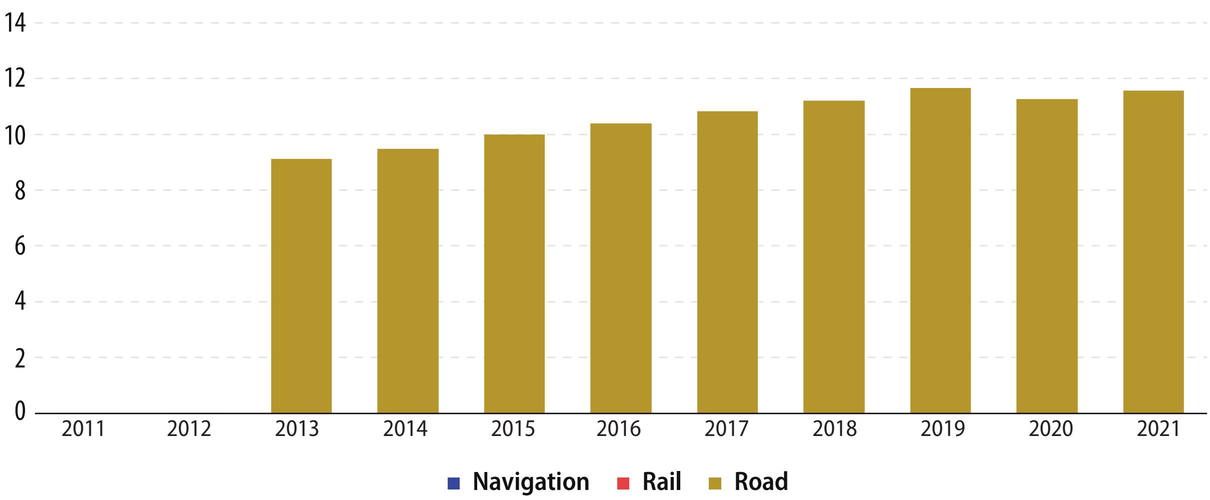


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

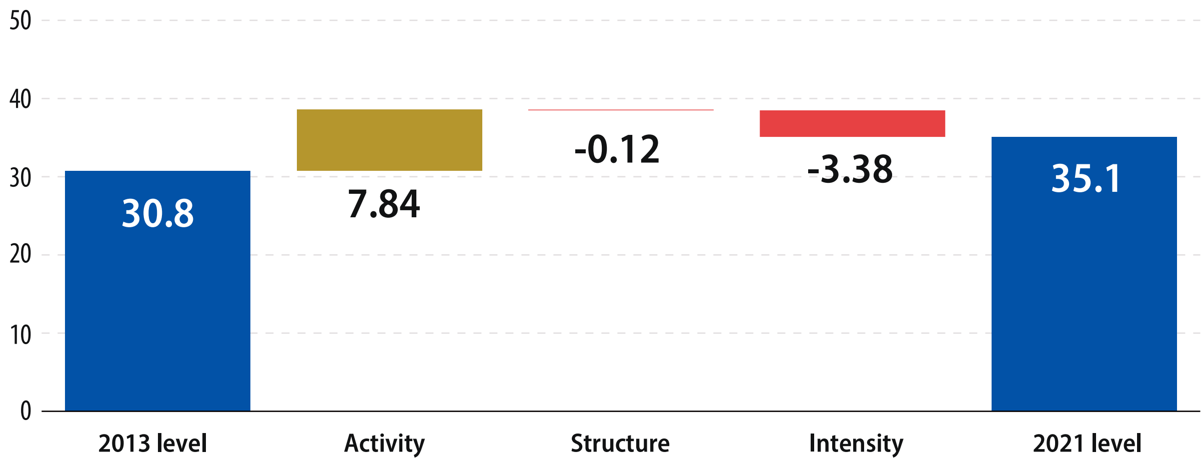


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

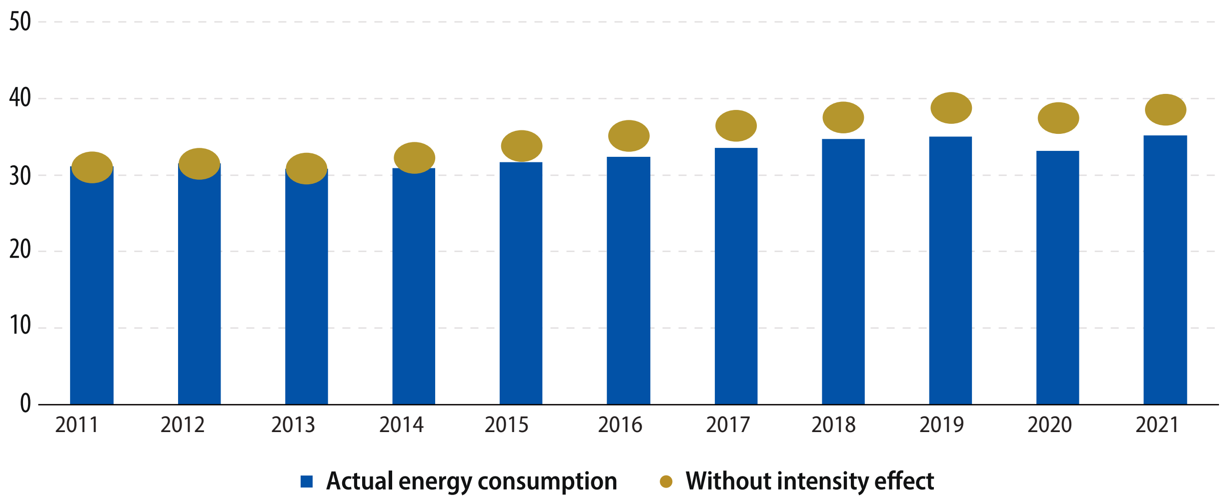


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the transport sector grew steadily from 31 PJ in 2011 to 35 PJ in 2021, despite a drop in 2020 at 33 PJ. Most of the energy consumption was due to road transport. At the time of data extraction, road traffic information was only available from 2013 onwards, therefore the decomposition was performed on the period 2013 to 2021. Between these years, the total traffic grew from 9.1 billion VKM in 2013 to 11.5 billion VKM in 2021, again with a drop in 2020 at 11.3 billion VKM. Between these two years, the increase in traffic caused an increase in energy consumption of about 7.8 PJ, which was only slightly offset by the decrease in energy intensity, causing a reduction of about 3.4 PJ. With the absence of variation in the share of the different transport modes, the structural effect was not significant.

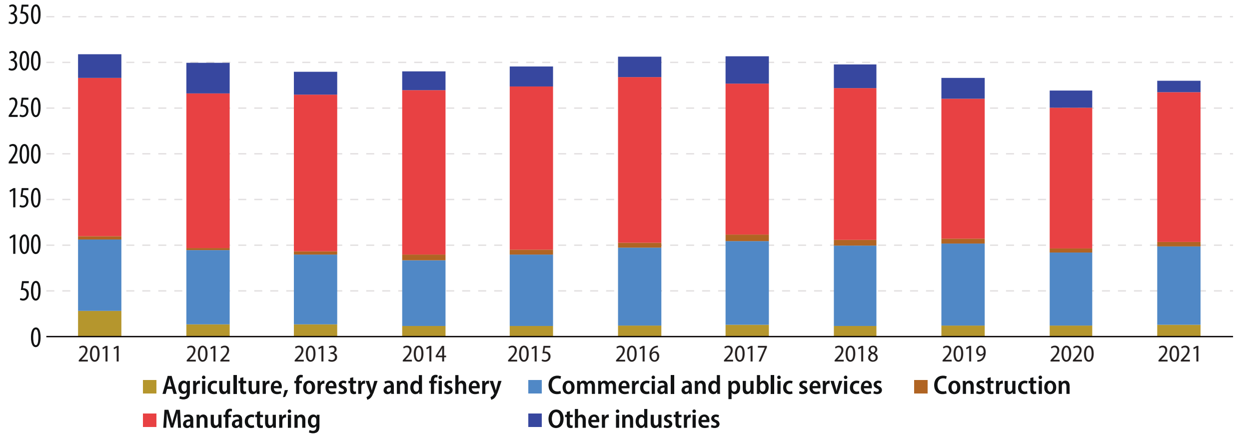
Greece

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

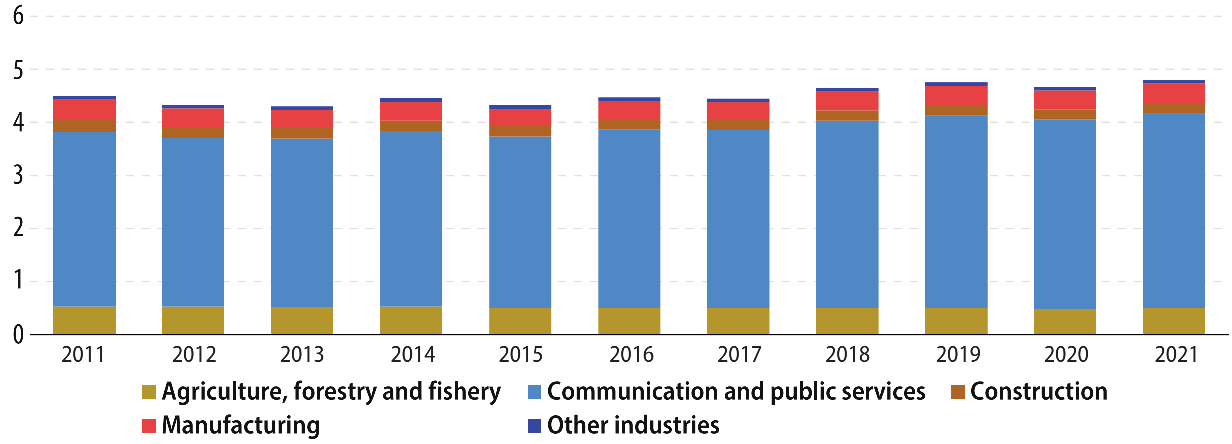


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

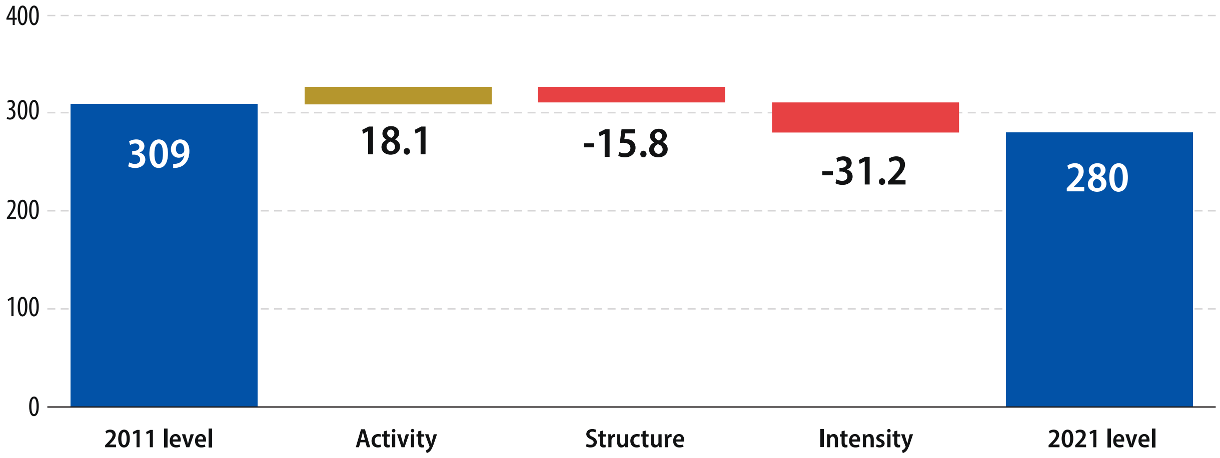


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

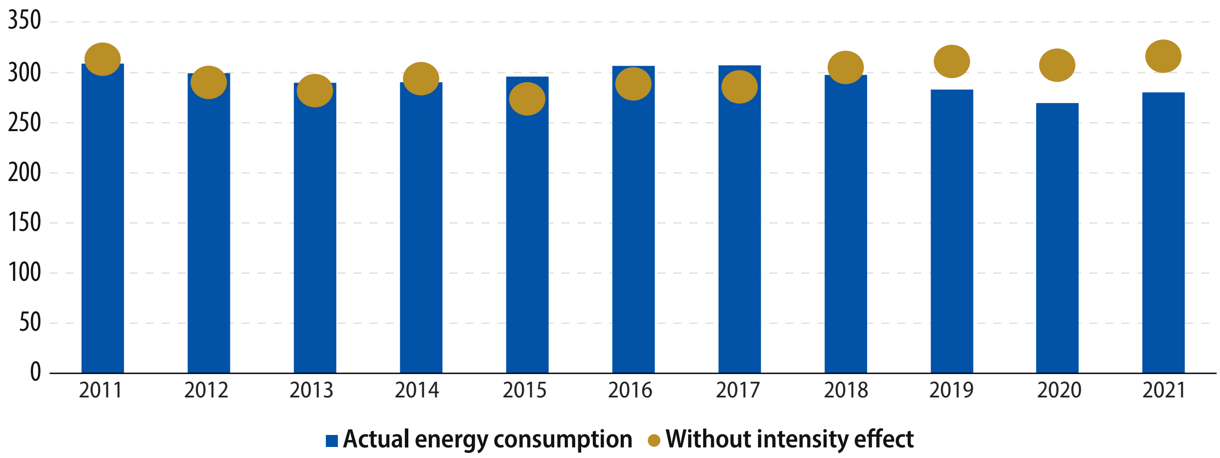


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

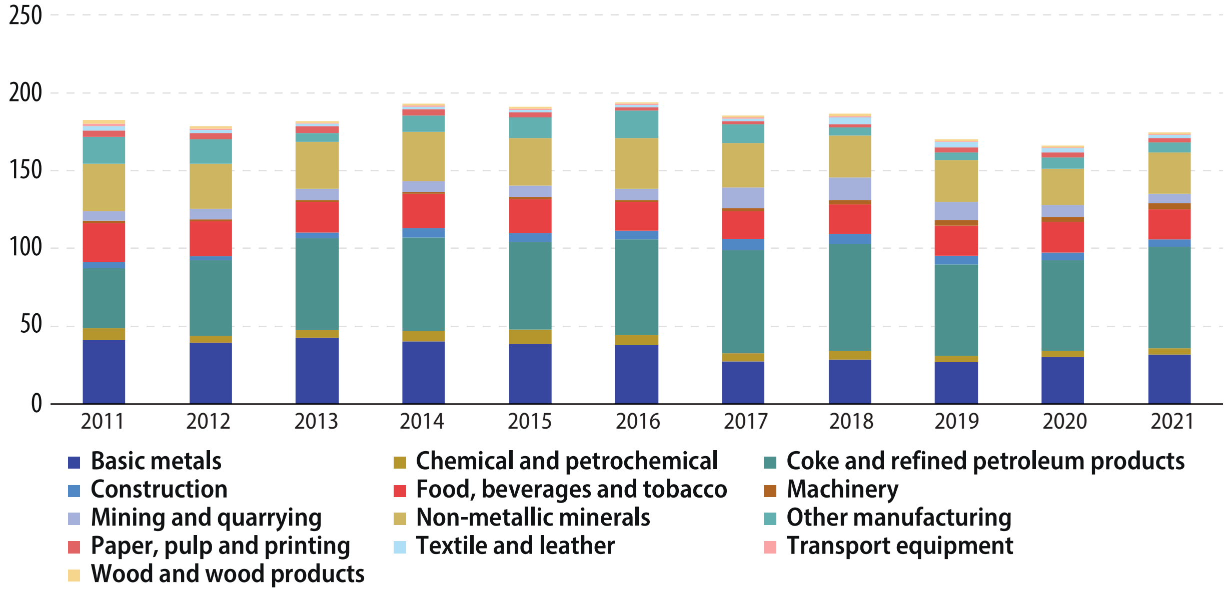
At the level of the whole economy, the final energy consumption of the different sectors also slightly decreased between 2011 and 2021 from 309 PJ to 280 PJ, with a slight drop in 2020 at 269 PJ. Meanwhile, the active population steadily increased from 4.5 million in 2011 to 4.8 million in 2021. Over this period, the increase in activity (measured in terms of employees) brought energy consumption up by about 18 PJ, which was offset by the structural change, bringing down energy consumption by almost the same amount, 16 PJ, mostly due to the increasing share of the commercial and public services sector (from 73 % to 76 % of the active population). The most significant driver was the decrease in energy consumption per employee, which brought energy consumption down by about 31 PJ. Without this decrease, energy consumption would have been 11 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

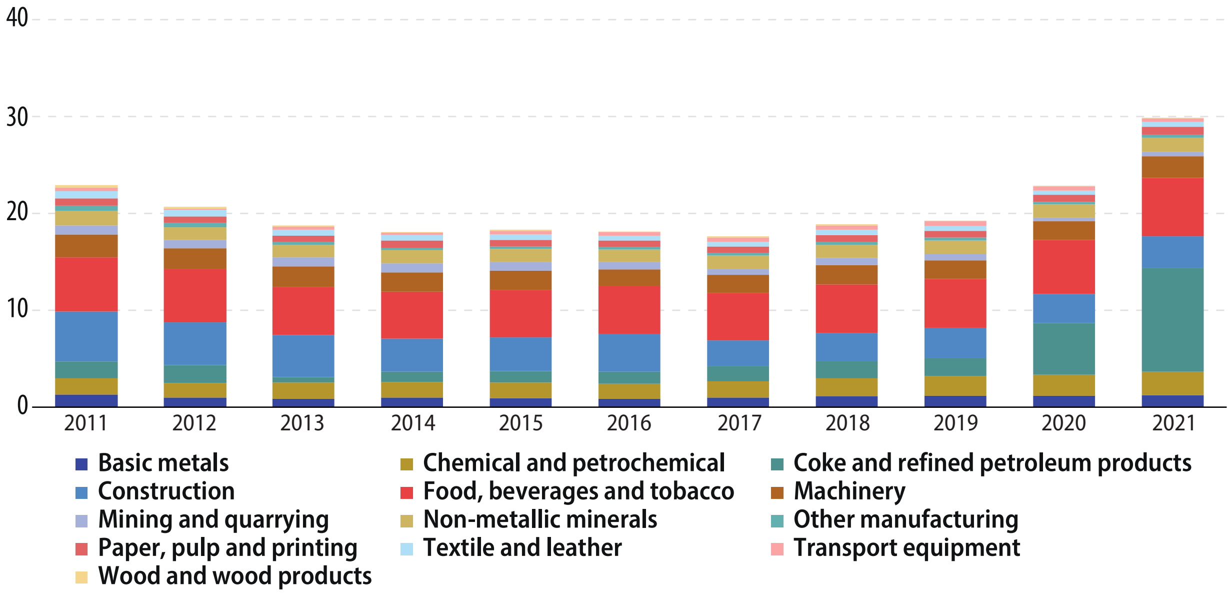


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

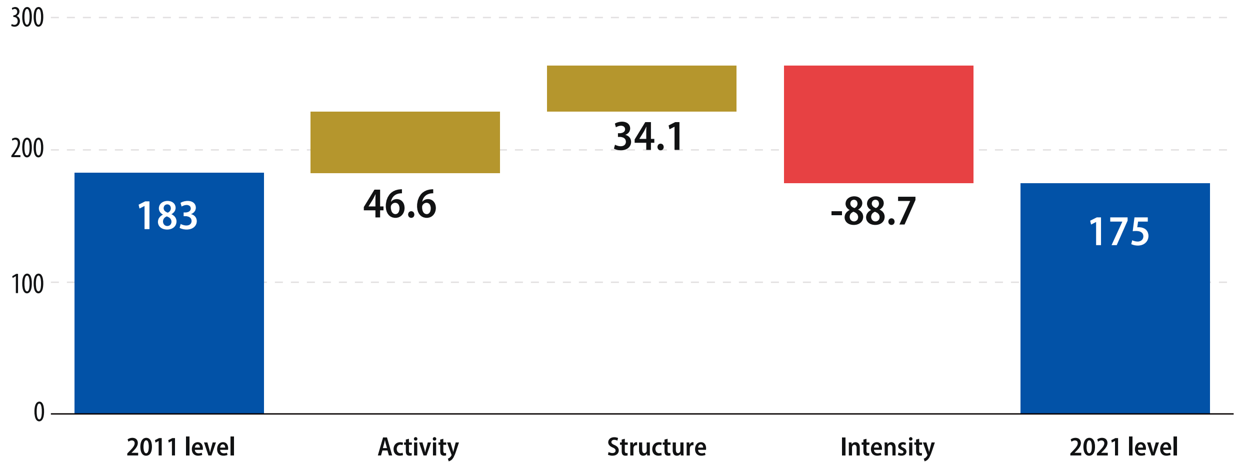


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

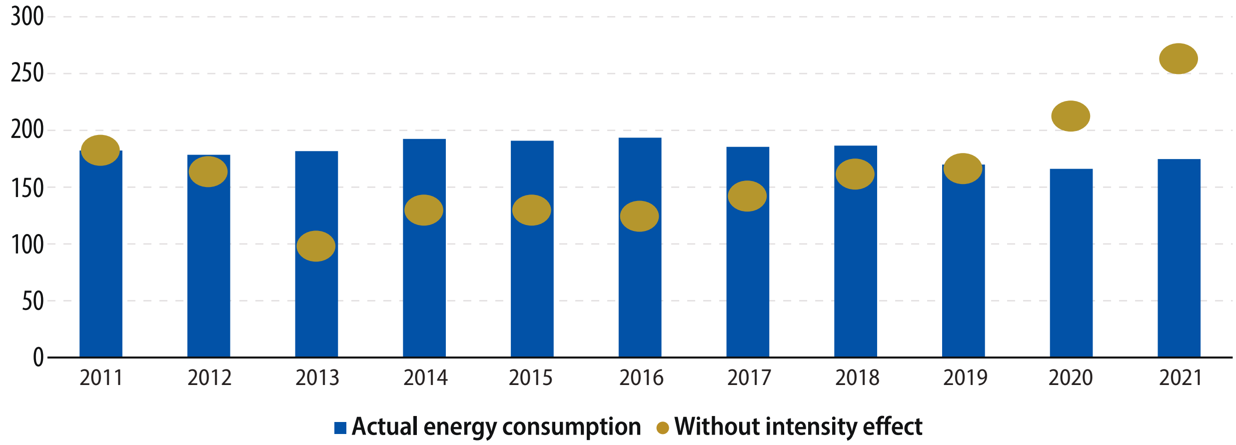


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

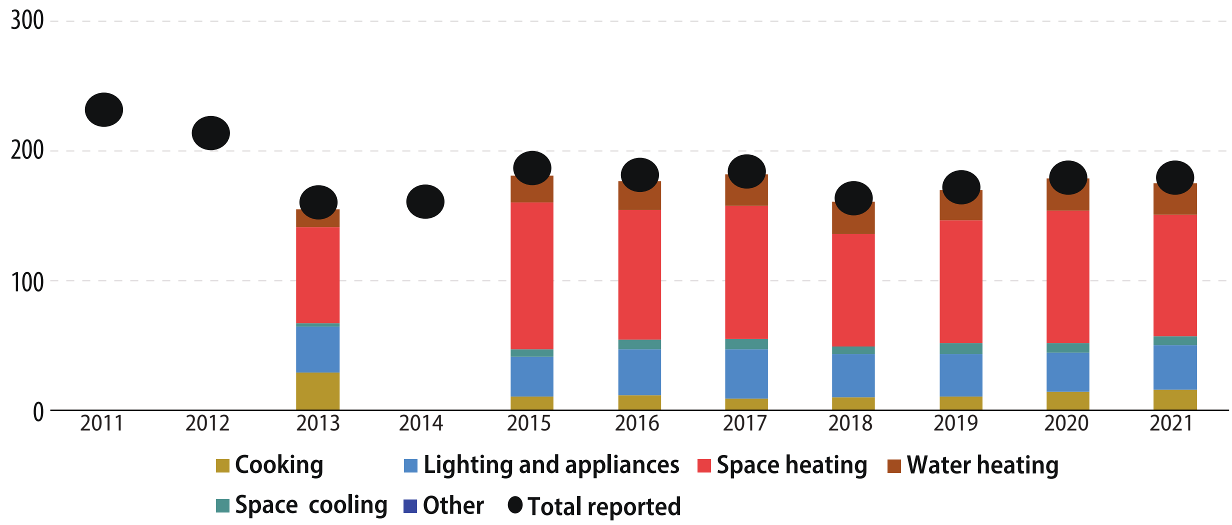
After a first period of growth between 2011 and 2016, from 183 PJ to 194 PJ, the Greek energy consumption in the manufacturing industry sector decreased to 166 PJ in 2020, before growing back to 175 PJ in 2021, still below the 2011 level. Meanwhile, the corresponding total gross value added shows the opposite trend, with a first period of decrease from 23 billion EUR in 2011 to below 18 billion EUR in 2017, followed by a strong growth up to 30 billion EUR in 2021. Due to this strong decoupling between the growth of its industry and its related energy consumption, the reduction in intensity brought down the energy consumption by almost 89 PJ between 2011 and 2021. This was offset by the cumulated effects of the increase in activity, which brought energy consumption up by about 47 PJ, and of the structural changes in the industry, which caused an additional increase of 34 PJ. Without the reduction in energy intensity, the total energy consumption in the industry sector would have been 50 % higher in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

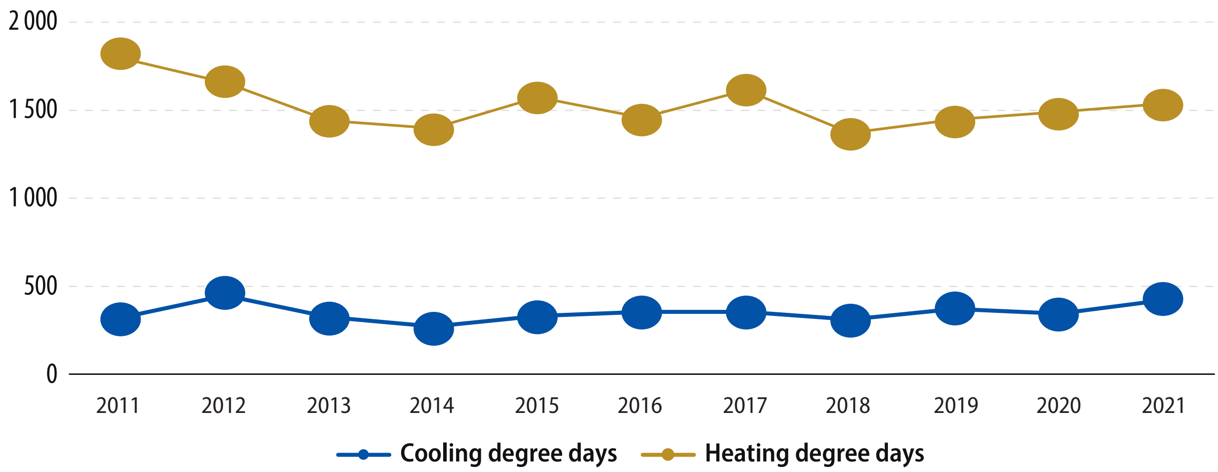
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

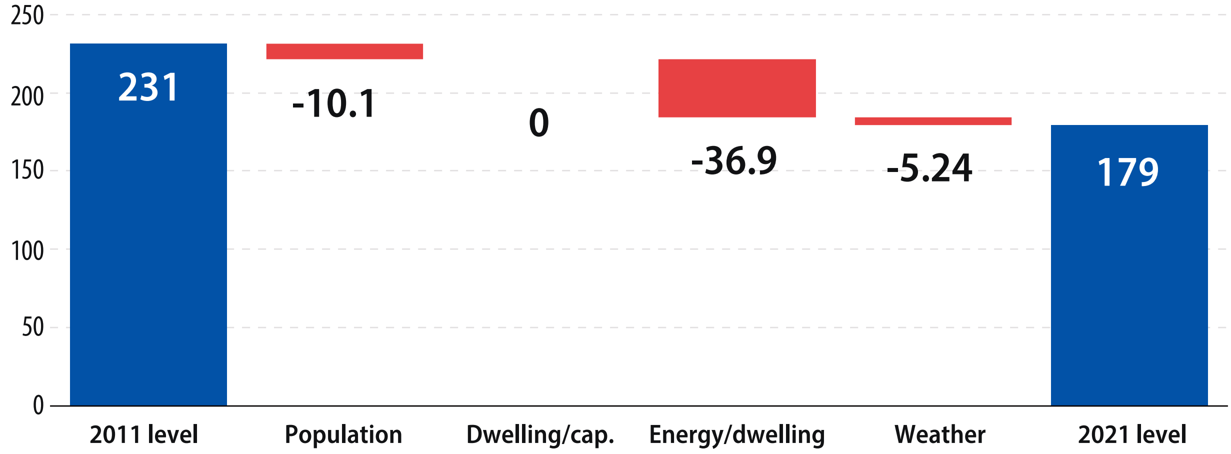


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

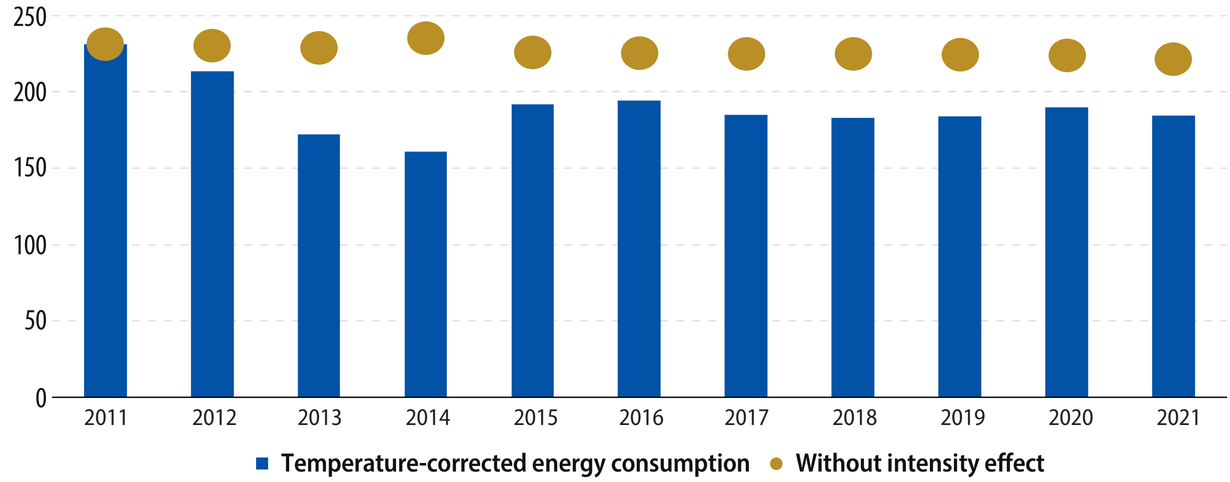


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

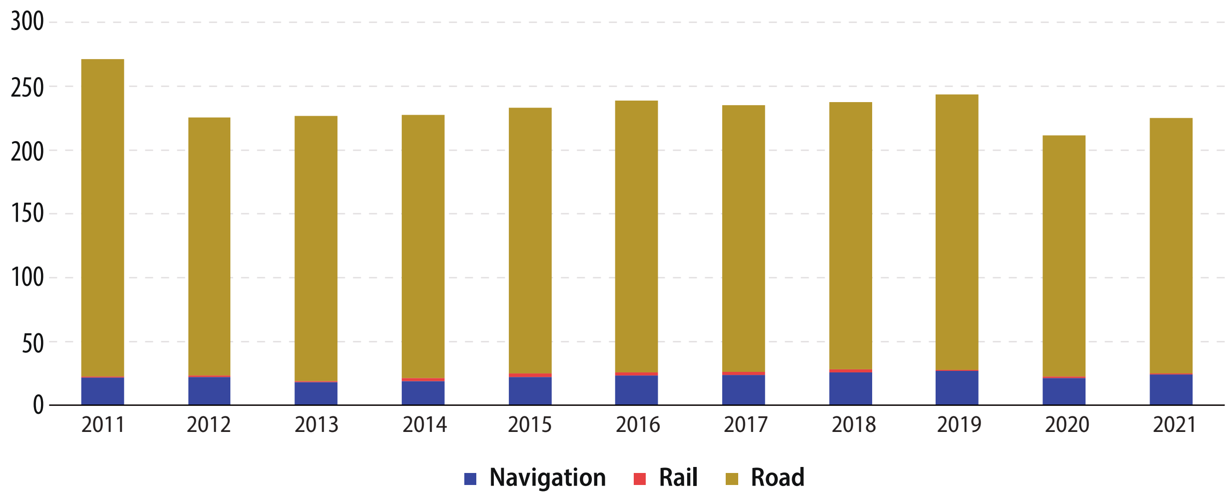
From 2011 to 2021, the energy consumption in the Greek residential sector decreased from 231 PJ to 179 PJ. The disaggregation of energy consumption by end-use is only available in 2013 and from 2015 onward, and therefore the weather effect could only be calculated for these years. Over this period, the decline in population led to a decrease in energy consumption by approximately 10 PJ. The dwelling occupancy remained the same over the period and therefore had no effect. The most significant driver was the decrease in energy consumption per dwelling, which caused a reduction of about 37 PJ. With a slight decrease in heating degree days between the two years, the weather had a further decreasing effect of about 5 PJ. However, as said above, the weather correction could not be calculated for the year 2011.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

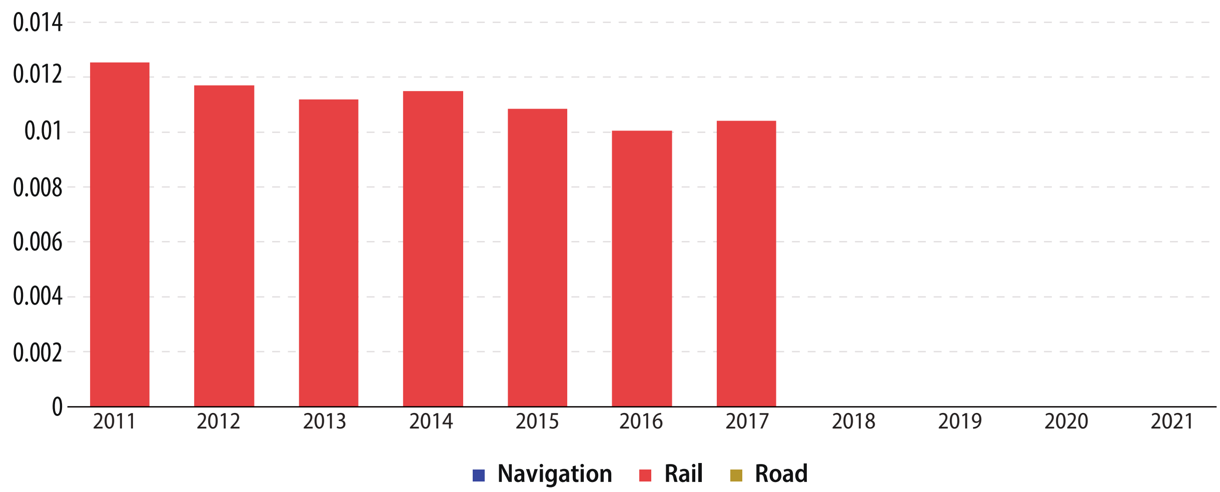


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

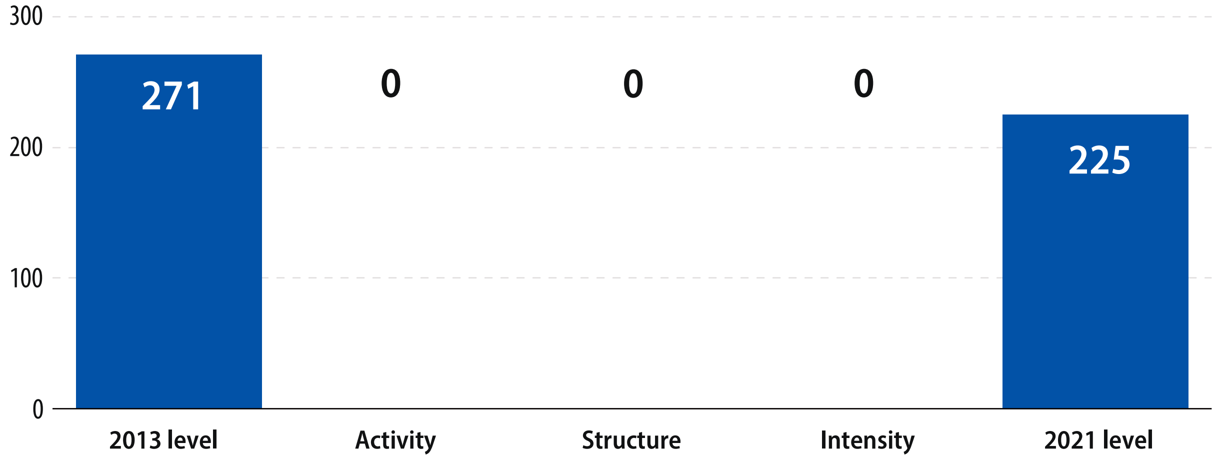


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

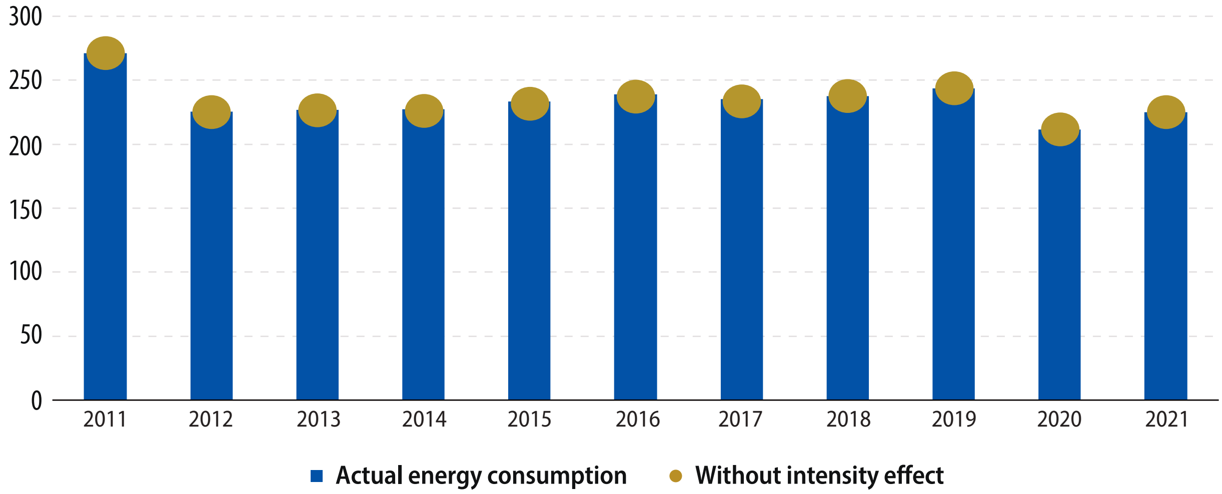


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The reported energy consumption in the transport sector decreased steadily from 271 PJ in 2011 to 225 PJ in 2021, with a drop in 2020 at 211 PJ. Most of the energy consumption was due to road transport. Unfortunately, road traffic information is not available, therefore the decomposition could not be calculated.

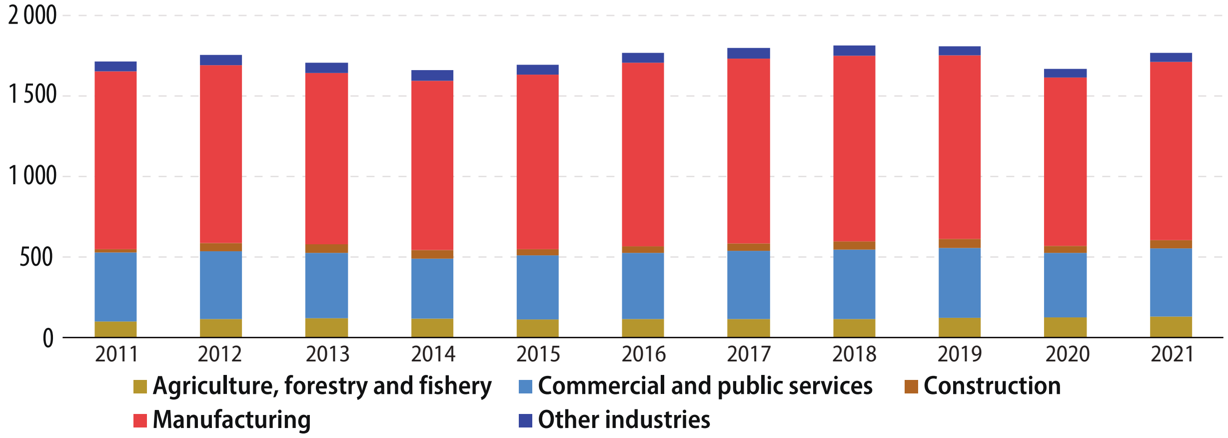
Spain

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

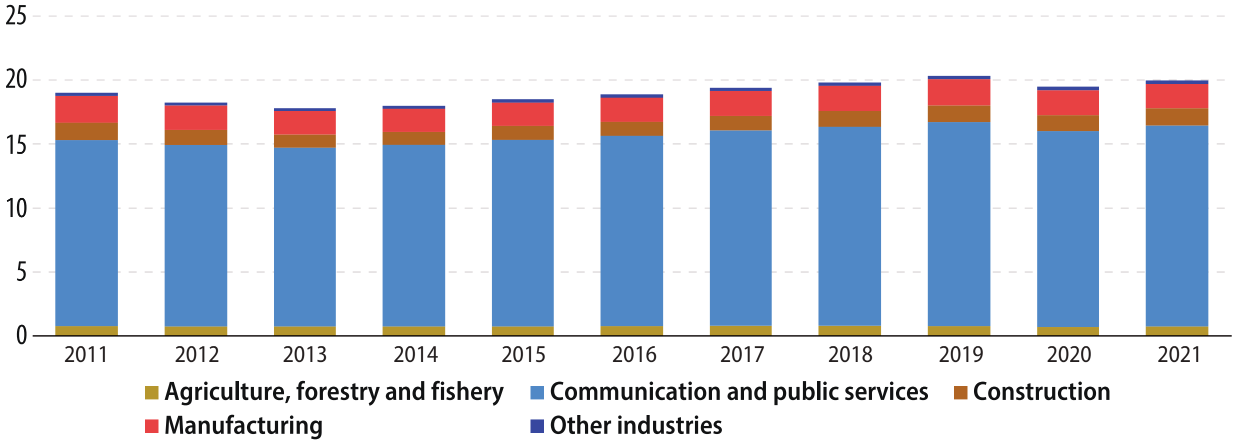


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

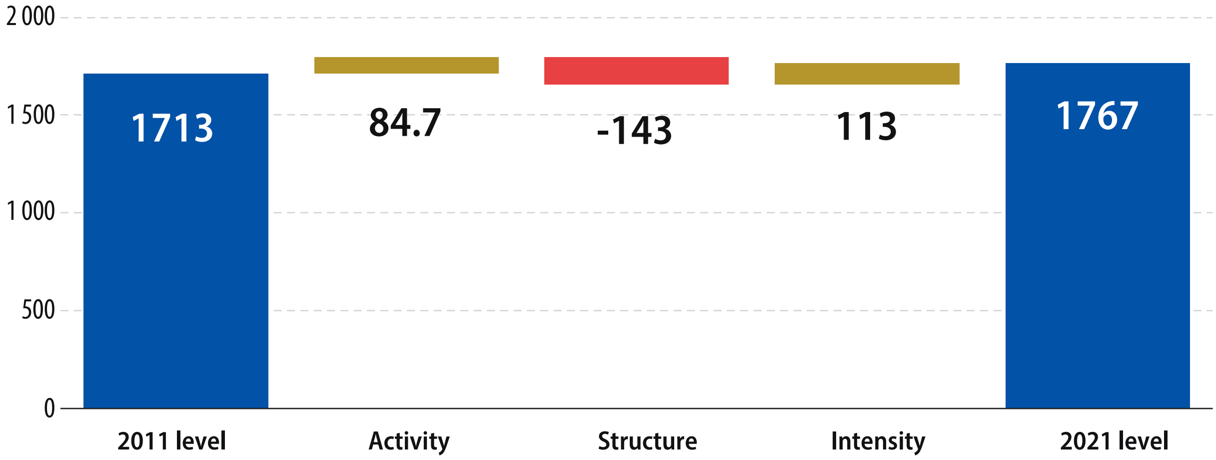


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

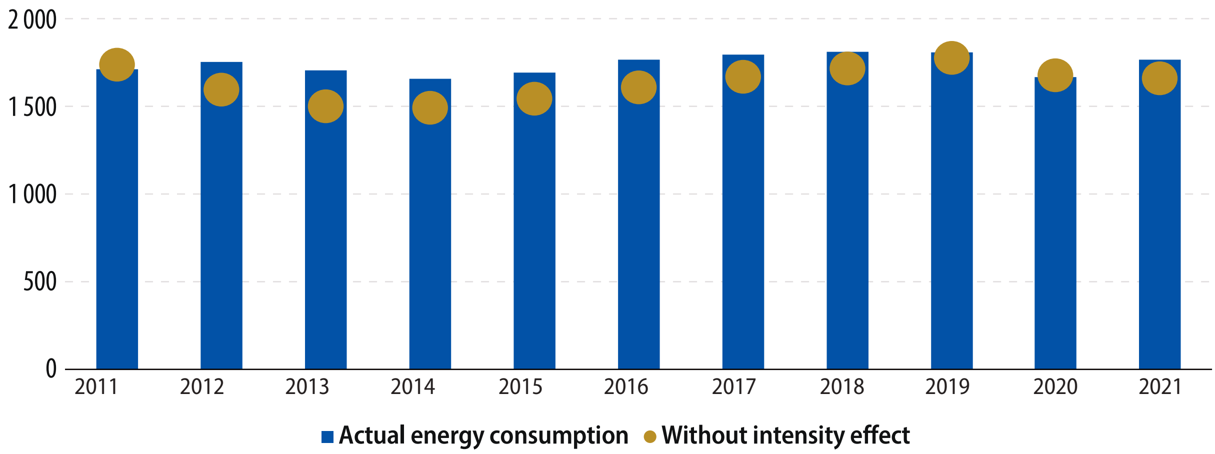


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

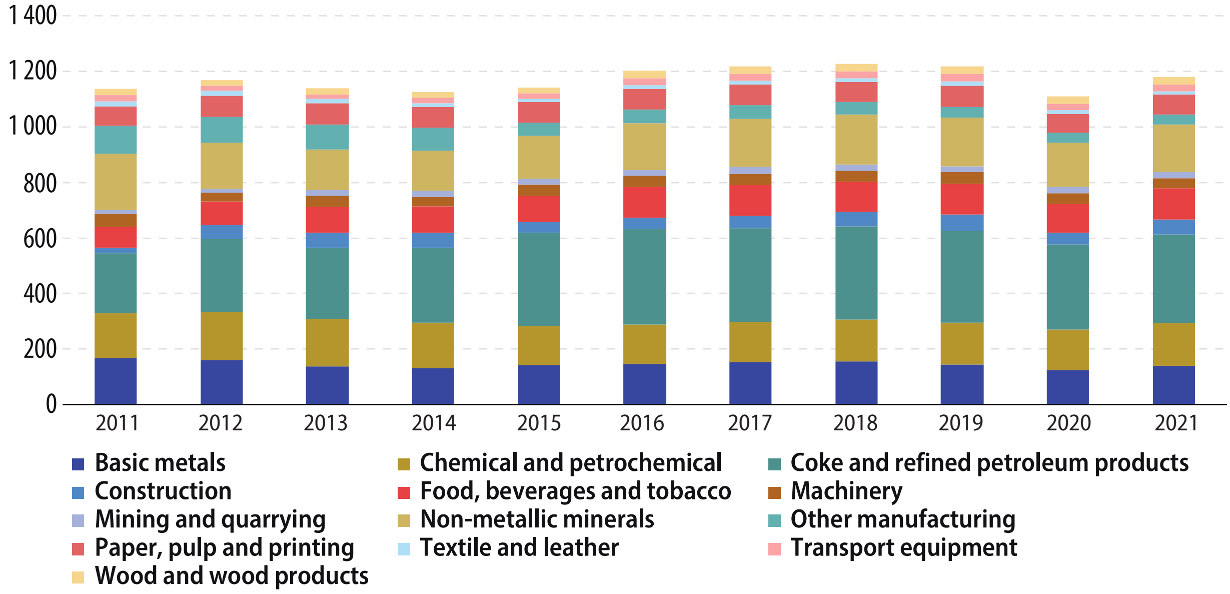
The final energy consumption of the different sectors of the whole economy remained between 1 659 PJ and 1 812 PJ over the studied period. After a first decrease between 2011 and 2013, the active population steadily increased from 17.8 million in 2013 to 20.3 million in 2019, then dropped to 19.5 million in 2020, before bouncing back to 20.0 million in 2021. Over this period, the small increase in activity (measured in terms of employees) brought energy consumption up by about 85 PJ. Meanwhile, the structural changes had a strong decreasing effect on the energy consumption of about 143 PJ, mostly due to the increasing share of the commercial and public services sector (from 73 % to 83 % of the active population). Another significant but increasing effect was due to the increase in energy consumption per employee, which caused energy consumption to go up by about 113 PJ. Without this increase, energy consumption would have been 6 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

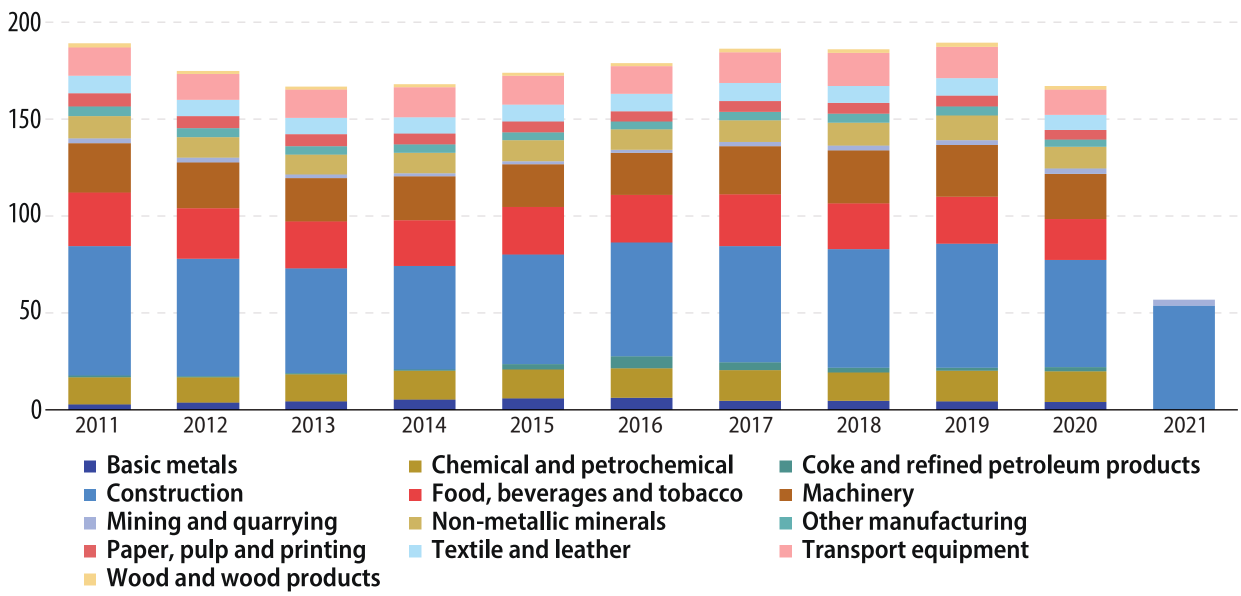


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

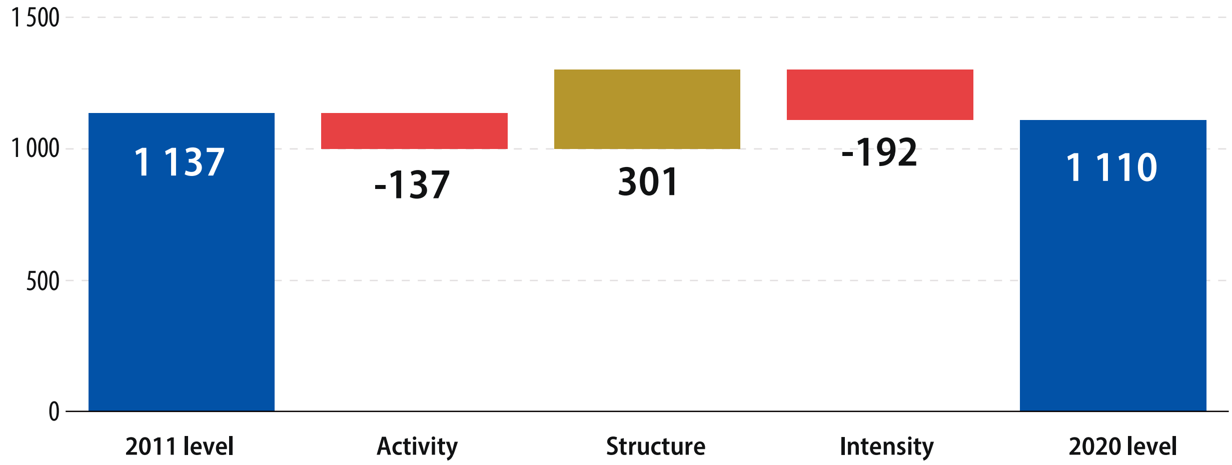


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

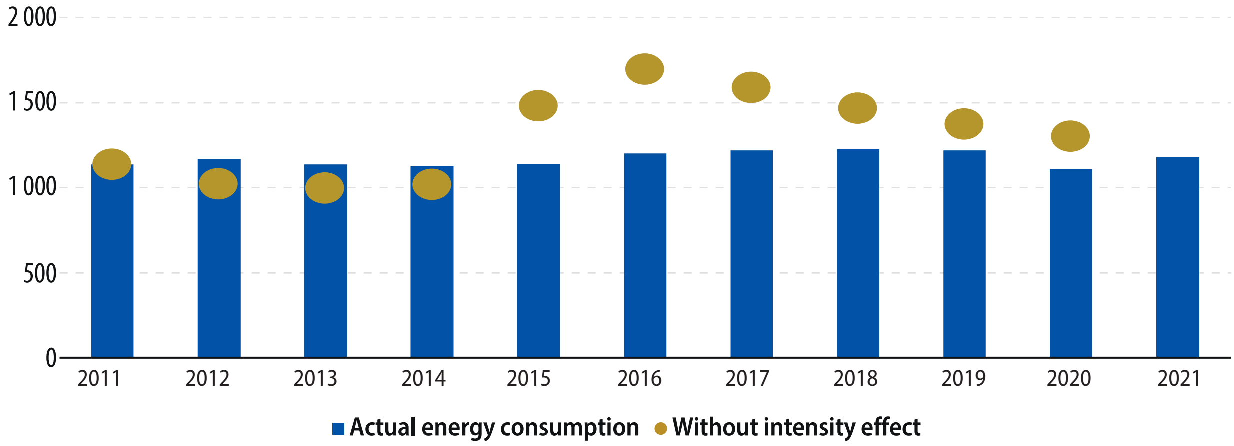


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

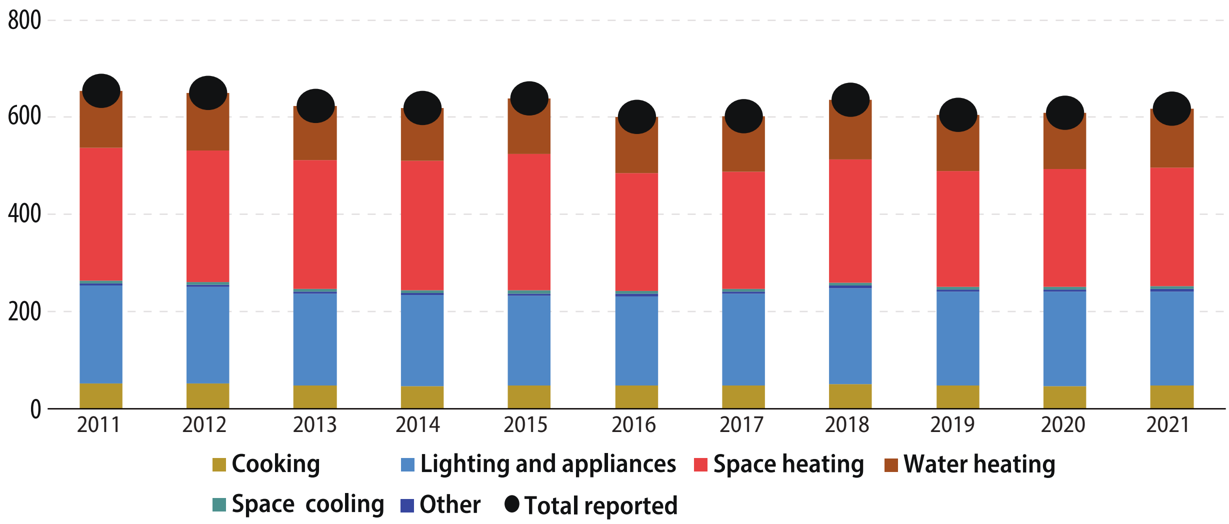
Between 2011 and 2019, Spain's energy consumption in the manufacturing industry sector remained within 1 125 PJ and 1 227 PJ, then it dropped in 2020 to 1110 PJ before bouncing back to 1 180 PJ in 2021. The corresponding total gross value added decreased from 189 billion EUR in 2011 to 167 billion EUR in 2013, then grew to reach 189 billion EUR in 2019, before dropping in 2020 to 167 billion EUR. The GVA data for 2021 was incomplete at the time of the extraction, therefore the decomposition was performed over the period 2011-2020. Between these two years, the decrease in activity brought energy consumption down by about 137 PJ. Meanwhile, the structural changes in the industry caused an increase of about 301 PJ of consumption, partly due to the increasing share of the chemical and petrochemical sector (from 7 % to 10 % between these two years). Finally, the decrease in energy intensity brought down consumption by about 192 PJ. Without this reduction, the total energy consumption in the industry sector would have been 17 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

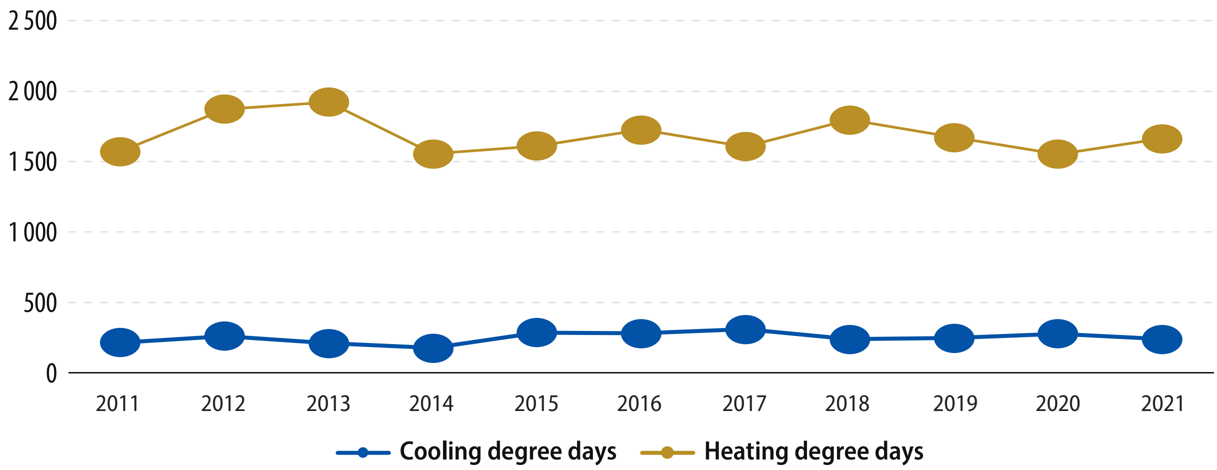
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

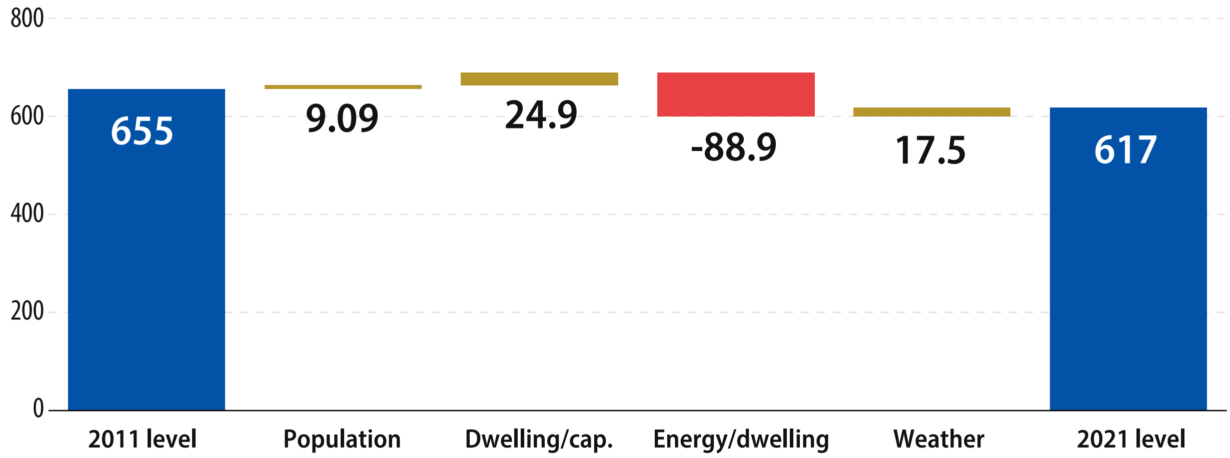


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

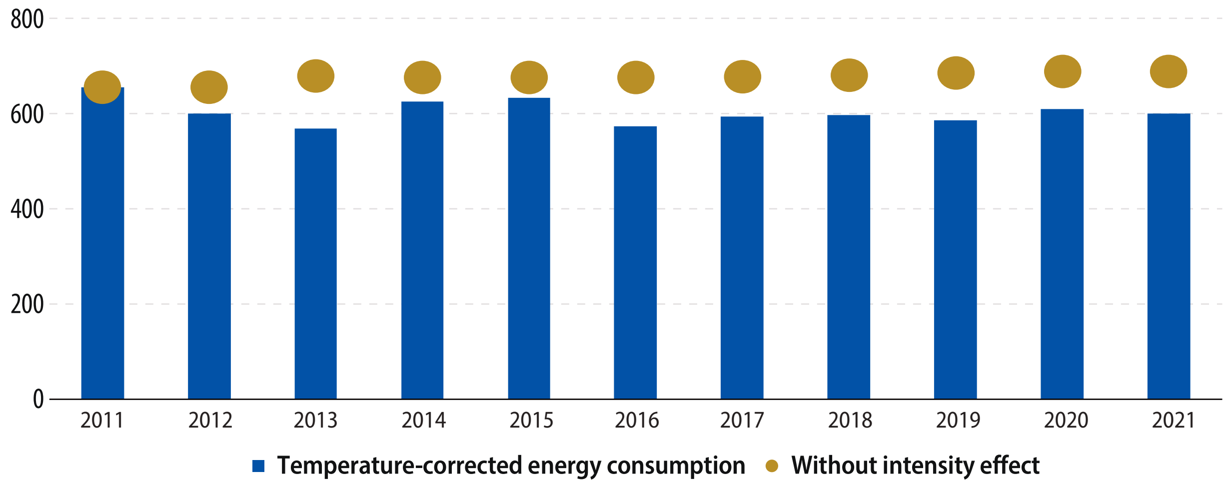


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

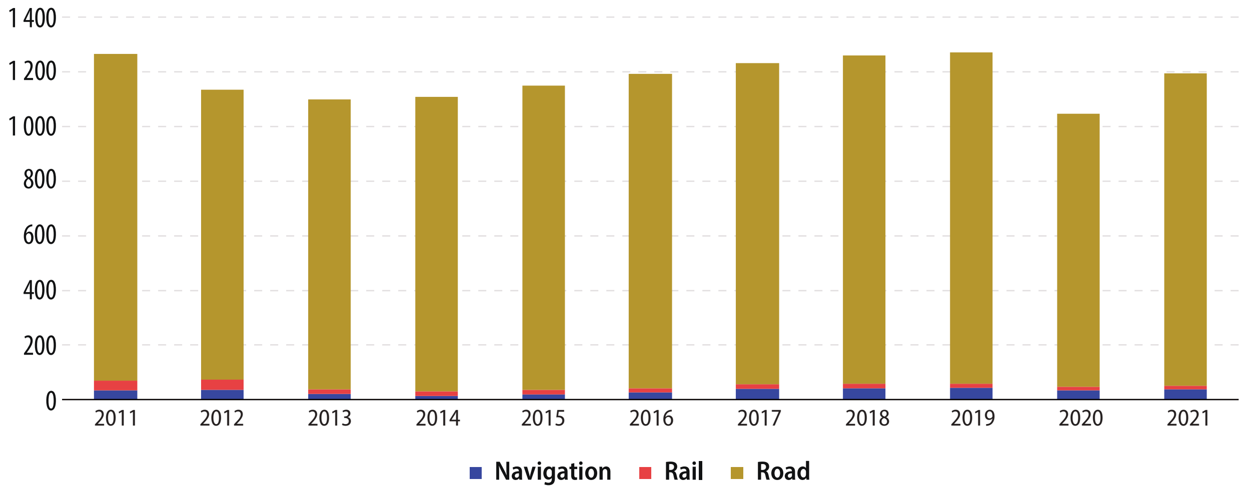
The energy consumption in the Spanish residential sector decreased slowly over the studied period, from 655 PJ in 2011 to 605 PJ in 2019, before increasing slightly to reach 617 PJ in 2021. During this period, the small population growth can be estimated to have caused an increase of only about 9 PJ, and the decrease in dwelling occupancy had an additional increasing effect of about 25 PJ. With a slight increase in heating degree days between the two years, the weather had a further increasing effect of about 18 PJ. The most significant effect however was due to the drop in energy consumption per dwelling which caused a drop of almost 89 PJ. Without this drop, energy consumption in the residential sector would have been 14 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

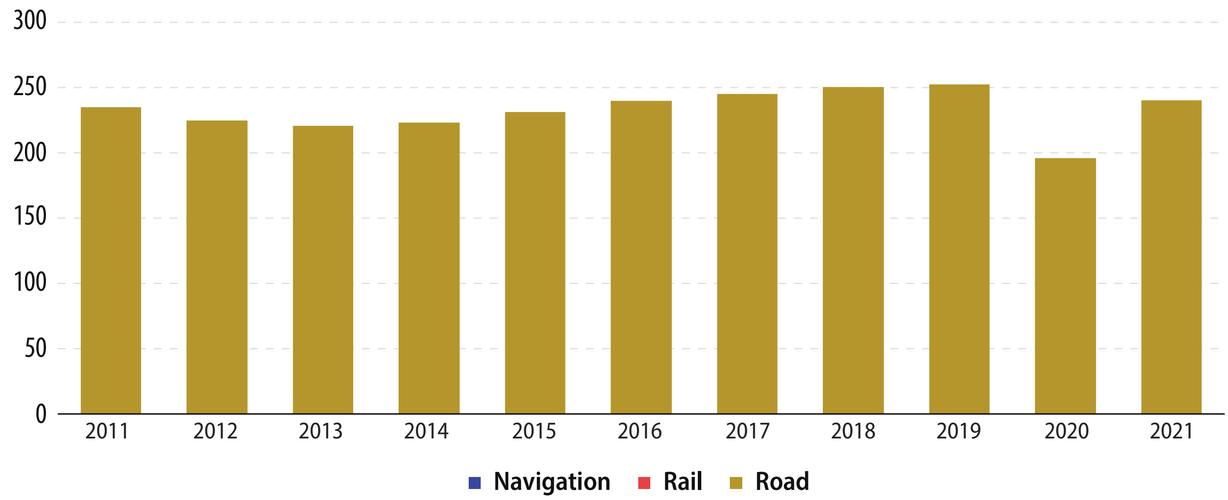


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

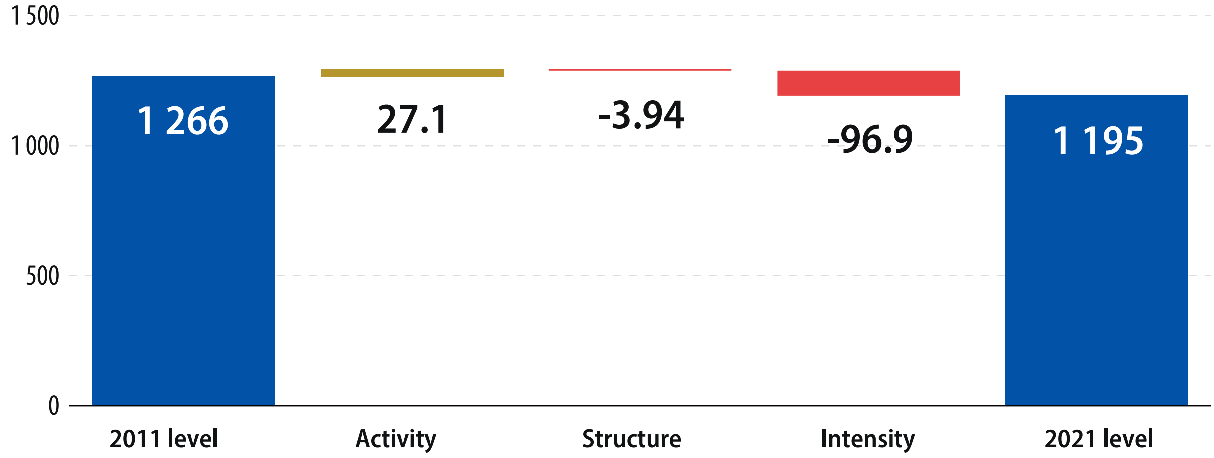


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

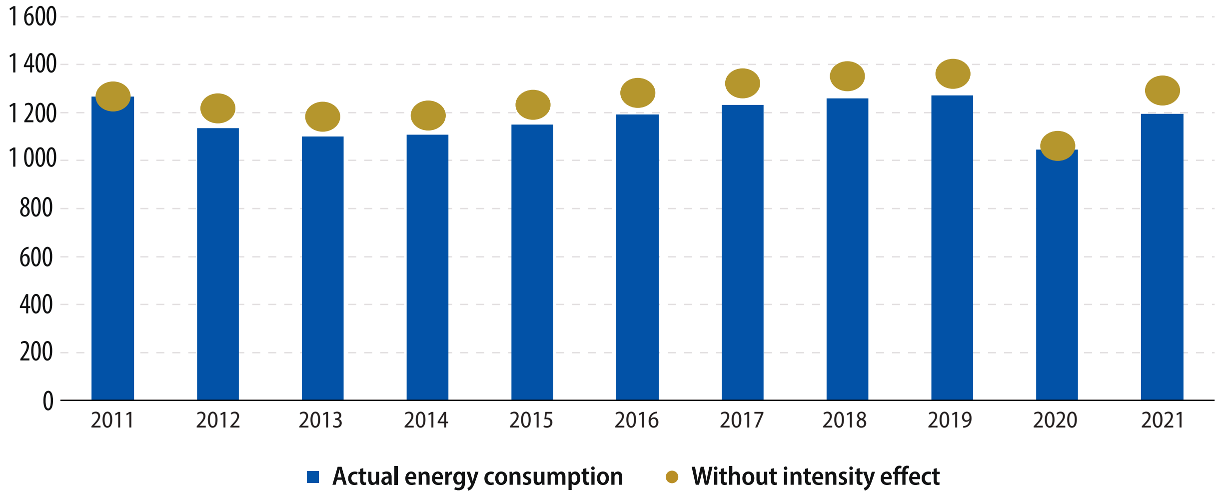


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

After a first decrease until 2013, the energy consumption in the Spanish transport sector grew steadily from 1 100 PJ in 2013 to 1 272 PJ in 2019, before dropping to 1 046 PJ in 2020, and it was still only 1 195 PJ in 2021. Most of the energy consumption is due to road transport. After a decrease from 235 billion VKM in 2011, traffic grew from 220 billion VKM in 2013 to 252 billion VKM in 2019, before dropping to 196 billion VKM in 2020, and it was back to 240 billion VKM in 2021. Between these two years, the small increase in traffic caused an increase in energy consumption of about 27 PJ, which was more than offset by the decrease in energy intensity, causing a reduction of about 97 PJ. With the absence of variation in the share of the different transport modes, the structural effect was relatively minor, causing a decrease of 4 PJ.

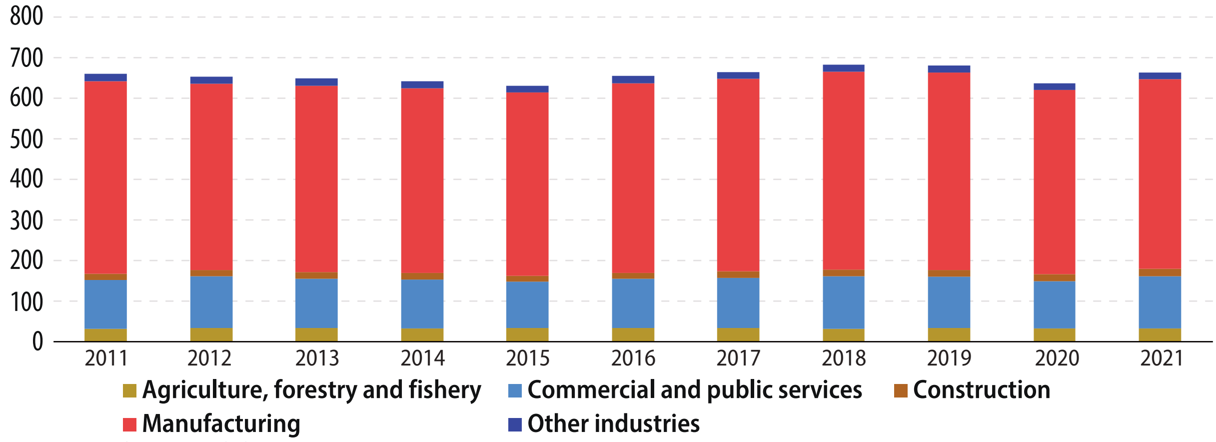
Finland

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

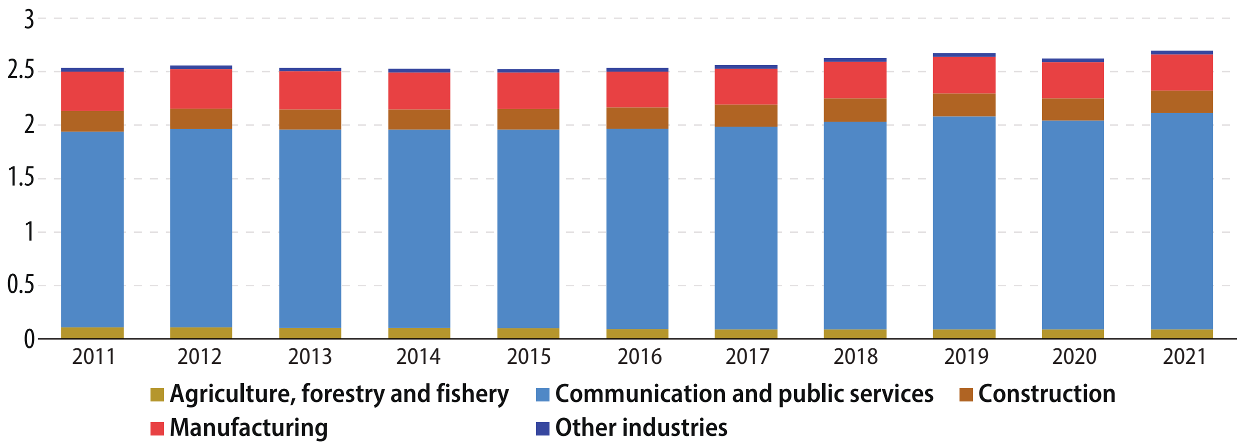


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

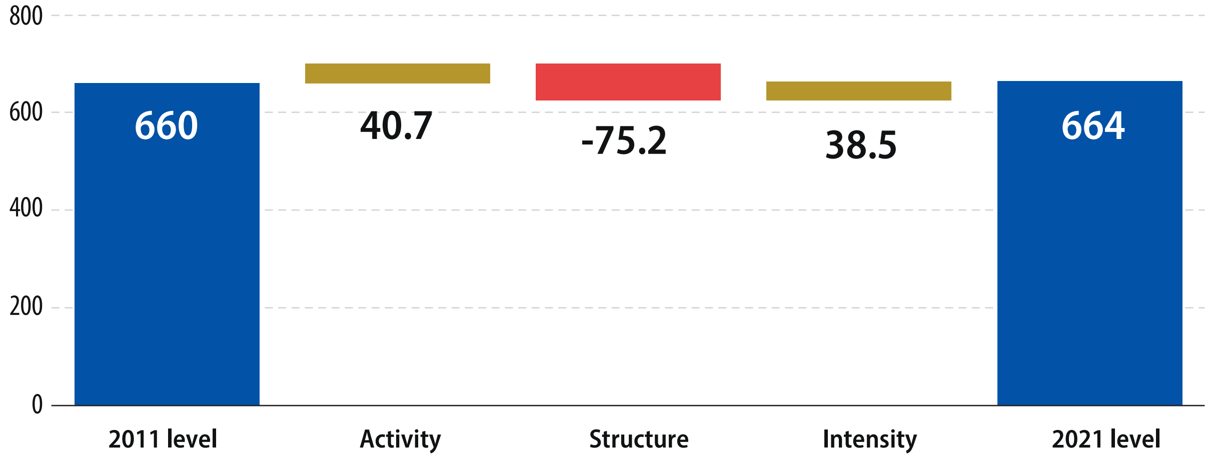


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

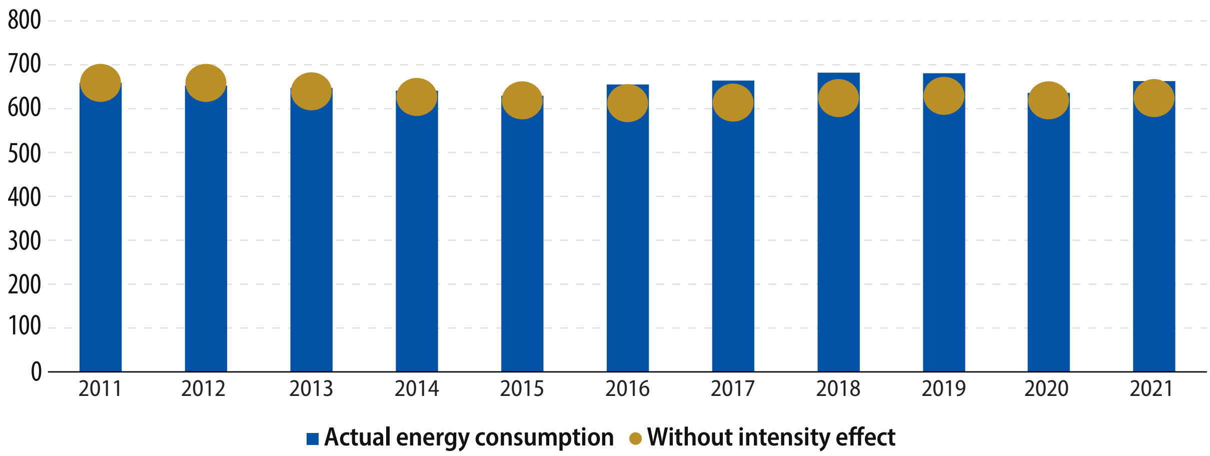


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

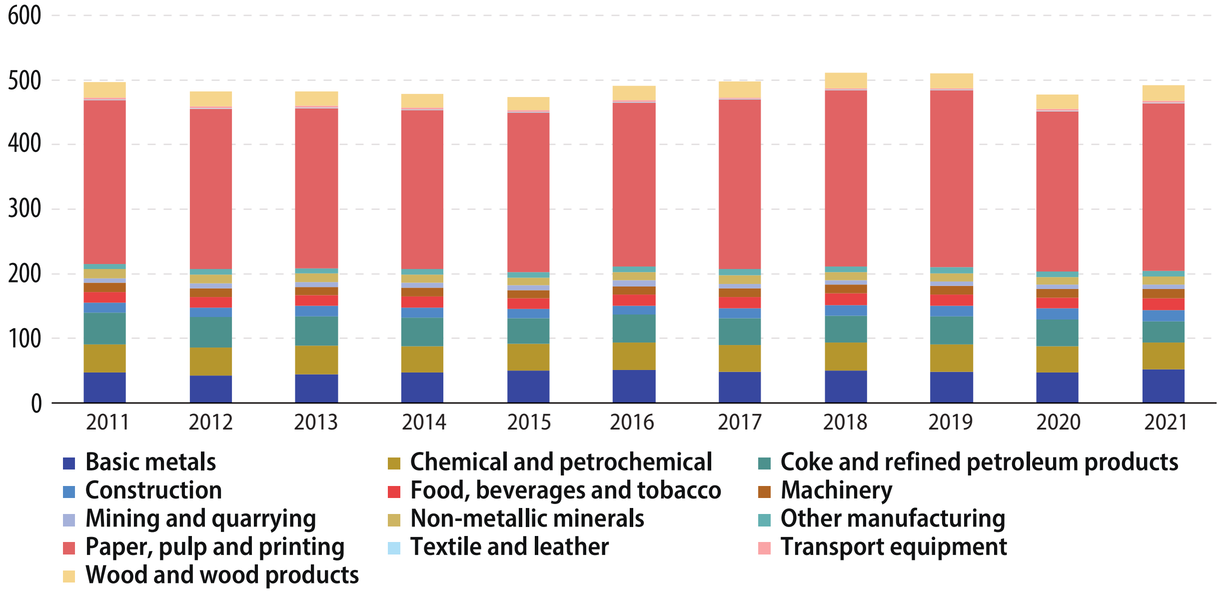
The final energy consumption of the different sectors of the whole economy remained within 631 PJ and 682 PJ over the studied period. Meanwhile, the active population steadily increased from 2.53 million in 2011 to 2.67 million in 2019, dropped to 2.62 million in 2020, then bounced back to 2.69 million in 2021, its highest level over the studied period. Between 2011 and 2021, the small increase in activity (measured in terms of employees) brought energy consumption up by about 41 PJ. Meanwhile, the structural changes had a strong decreasing effect on energy consumption of about 75 PJ, mostly due to the increasing share of the commercial and public services sector (from 72 % to 75 % of the active population). An additional 39 PJ of energy consumption was due to the increase in energy consumption per employee. Without this increase, energy consumption would have been 6 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

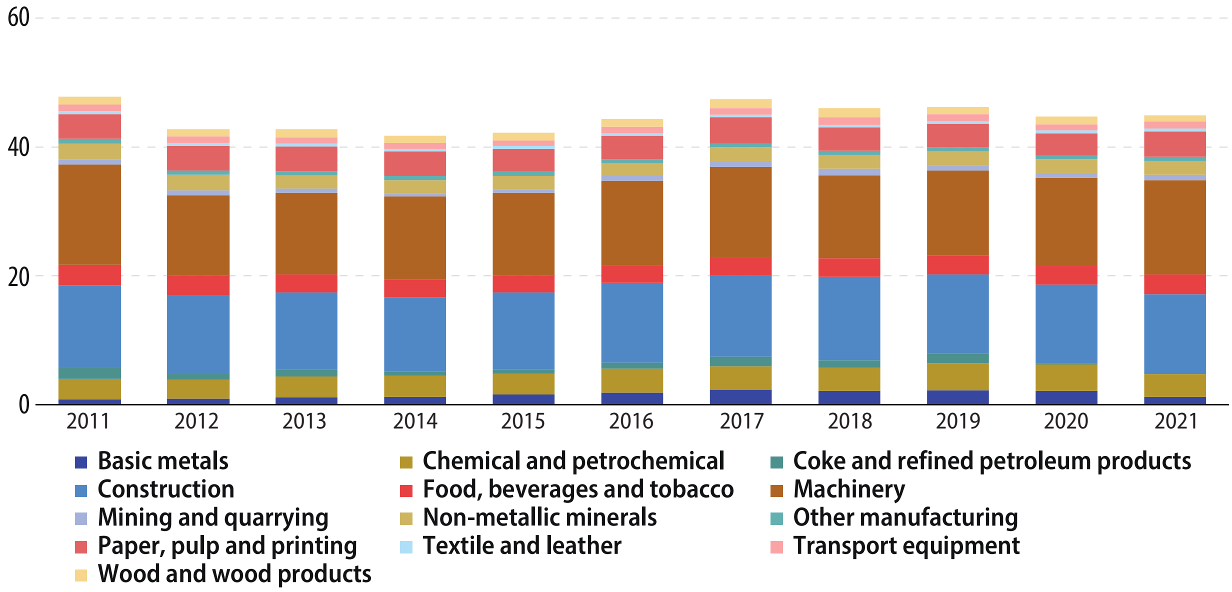


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

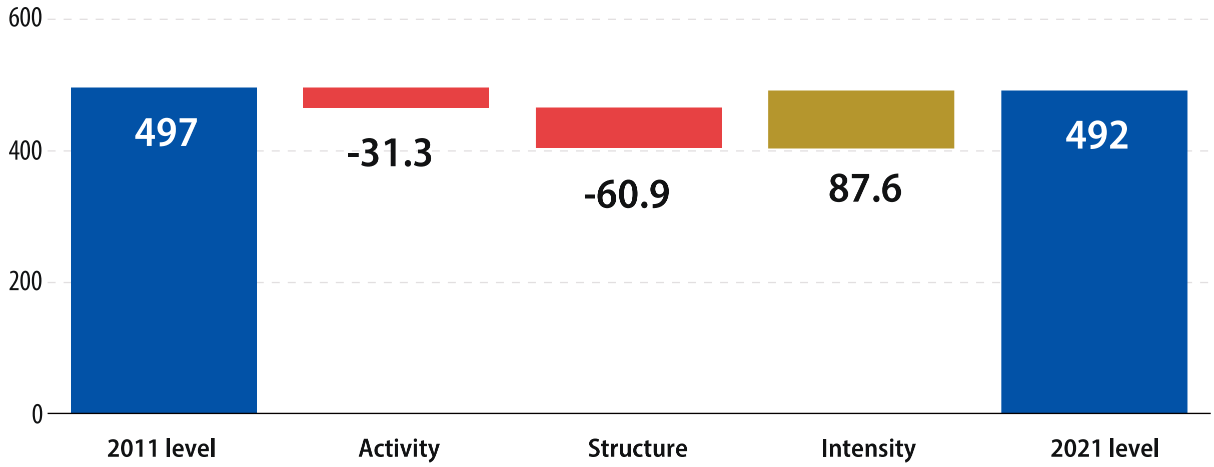


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

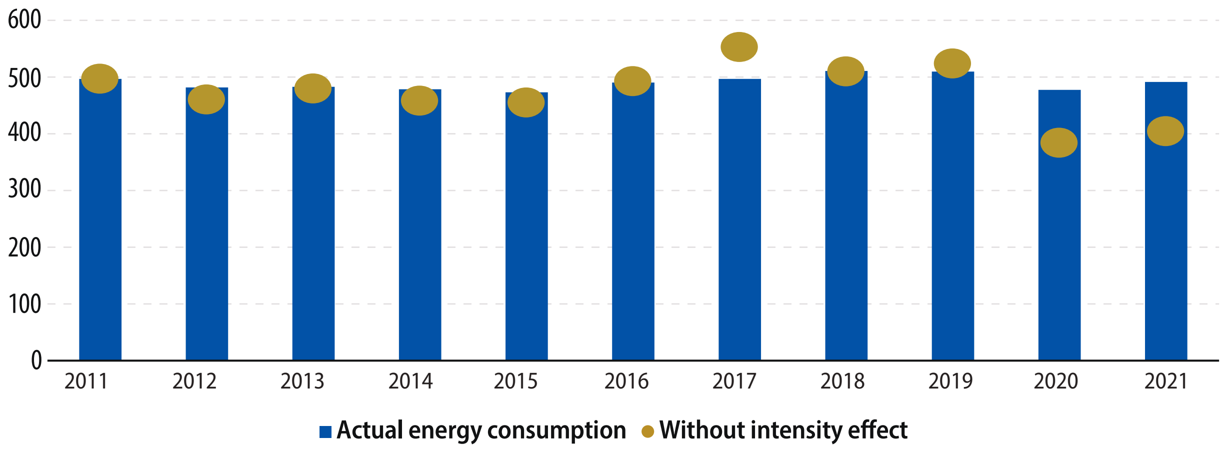


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

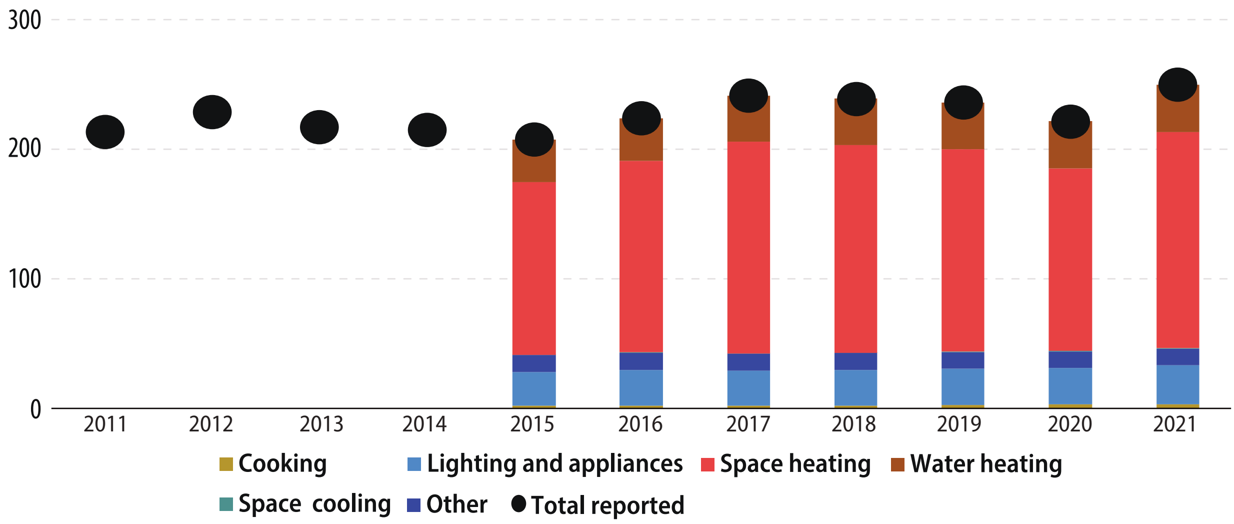
Finland's energy consumption in the manufacturing industry sector was 497 PJ in 2011, then it oscillated within 474 PJ and 512 PJ between 2011 and 2019, with a drop to 478 PJ in 2020 and a bounce back to 492 PJ in 2021. The corresponding total gross value added decreased from 48 billion EUR in 2011 to 42 billion EUR in 2017, then grew to reach 47 billion EUR in 2017, before decreasing to 45 billion EUR in 2021. Between 2011 and 2021, the decrease in activity brought energy consumption down by about 31 PJ. In addition, the structural changes in the industry caused a further decrease of about 61 PJ. The most significant driver however was the increase in energy intensity, which brought consumption up by about 88 PJ. Without this increase, the total energy consumption in the industry sector would have been 18 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

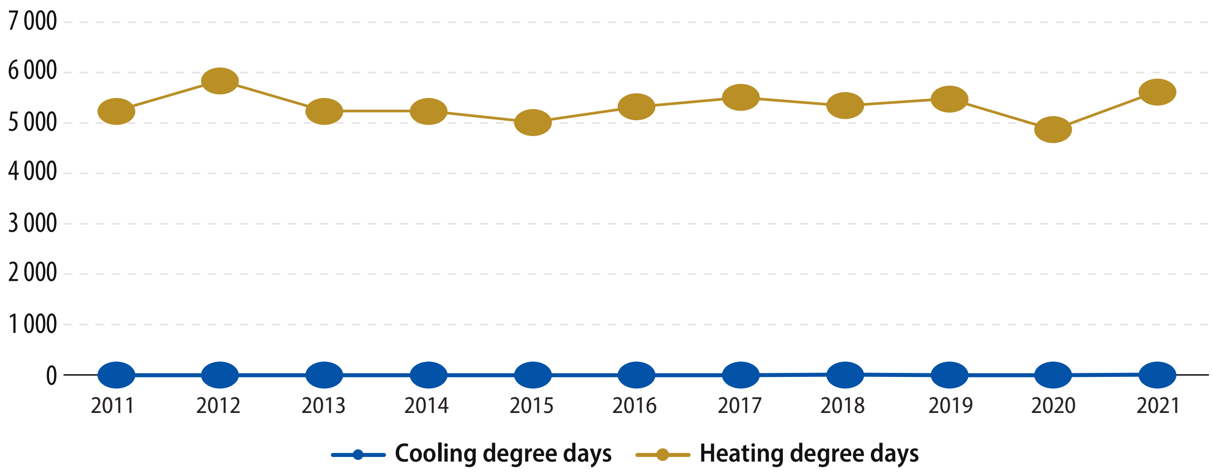
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

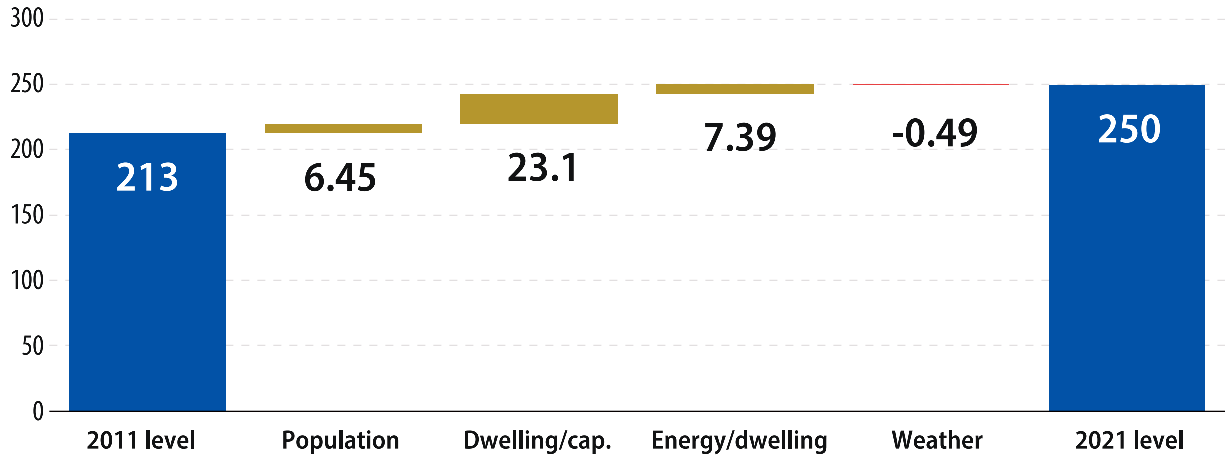


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

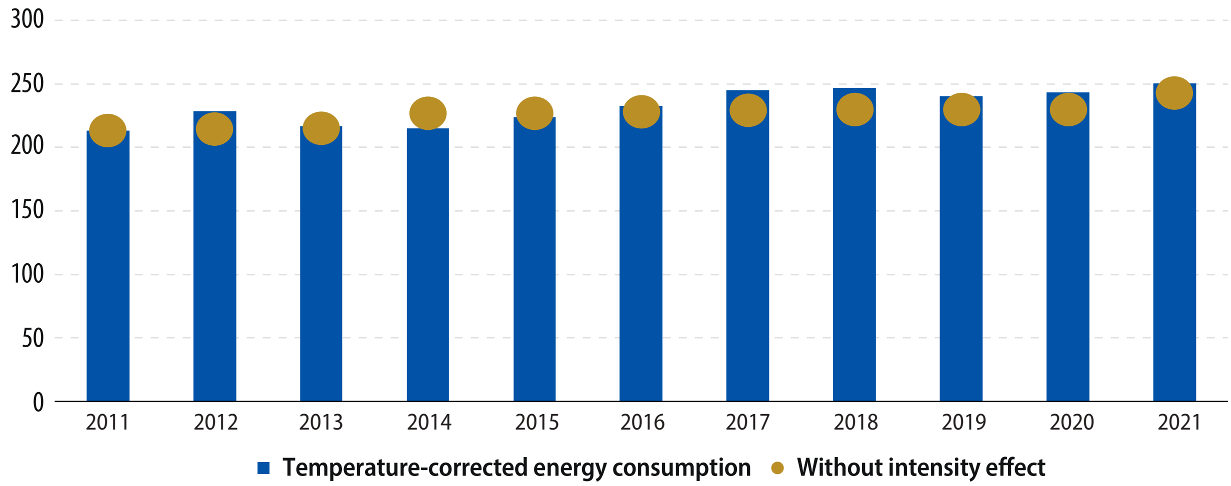


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

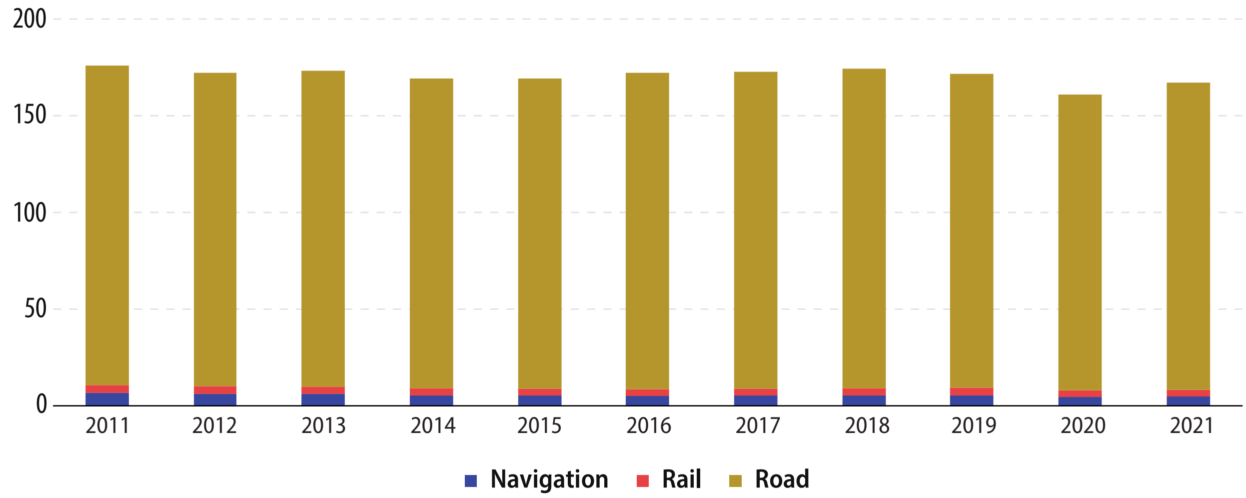
The energy consumption in the Finnish residential sector oscillated between 207 PJ and 250 PJ over the studied period, the highest year in terms of consumption being 2021. The breakdown in energy consumption by end-use is only available from 2015 onward, therefore the temperature correction could also only be calculated from this year onward. Between 2011 and 2021, the slight growth in population can be estimated to have caused an increase of about 6 PJ, and the decrease in dwelling occupancy had an additional increasing effect of about 23 PJ. An additional increase of about 7 PJ was due to the increase in energy consumption per dwelling, which may be partly explained by the absence of temperature correction for the year 2011. For the same reason, the weather effect is very limited, despite a visible increase in the number of heating degree days between 2011 and 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

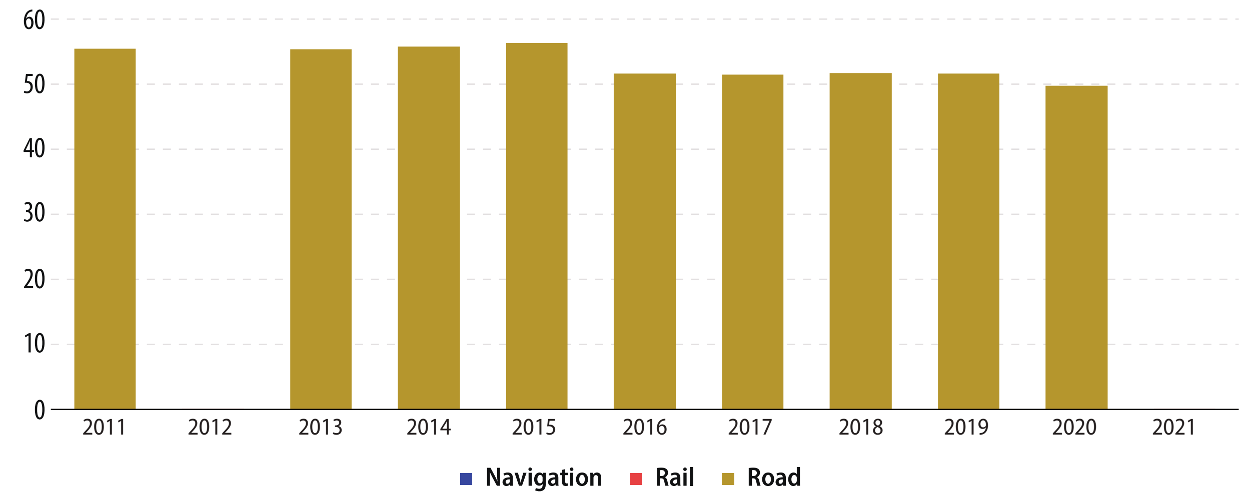


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

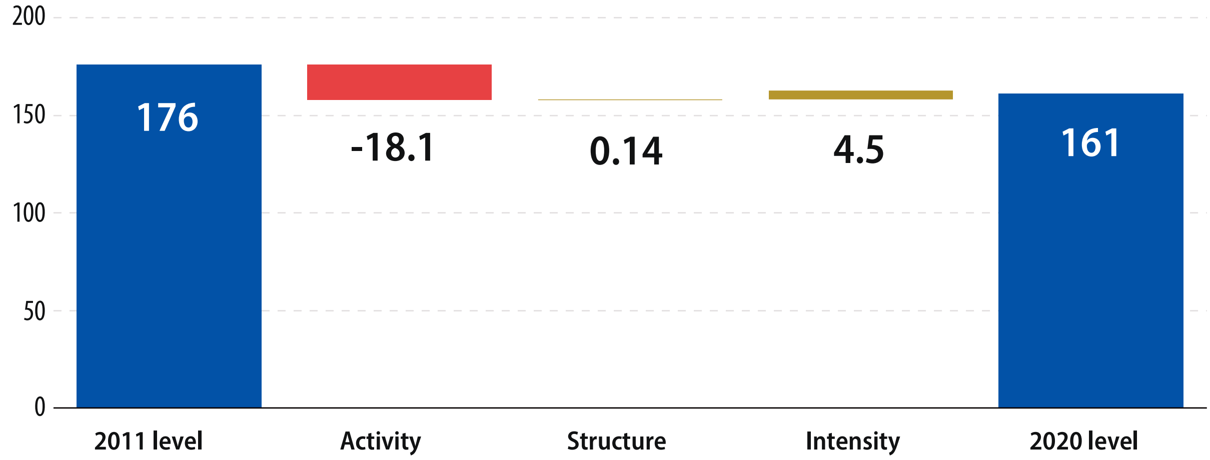


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

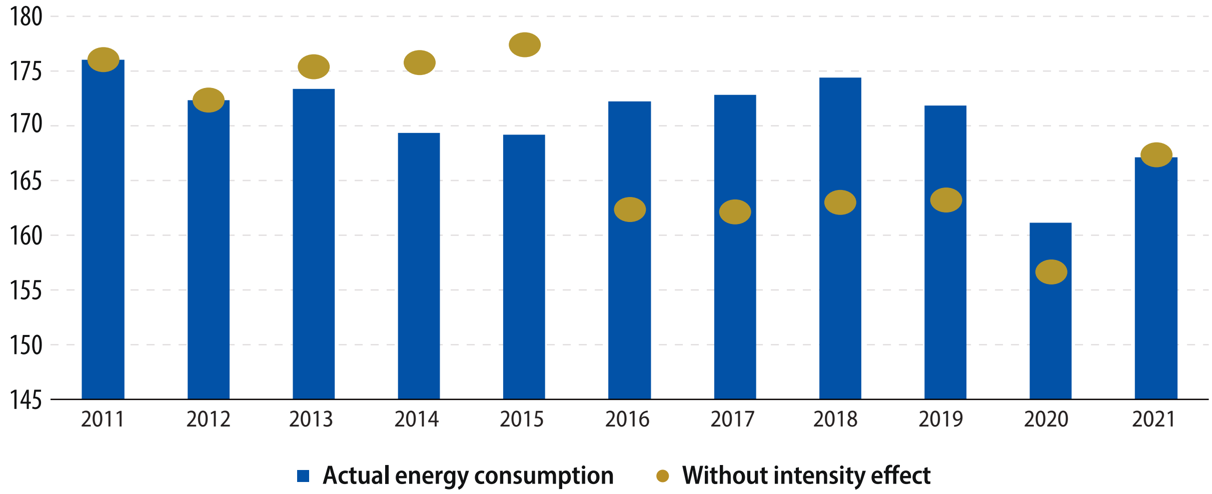


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Finnish transport sector decreased slightly from 176 PJ in 2011 to 167 PJ in 2021, with a strong drop to 161 PJ in 2020. Most of the energy consumption was due to road transport. As road traffic data were not available for 2021, the decomposition had to be performed over the period 2011-2020. Over this period, road traffic also decreased from 55 billion VKM in 2011 to 50 billion VKM in 2020. Between these two years, the decrease in traffic caused a diminution in energy consumption of about 18 PJ, which was partially offset by the increase in energy intensity, causing a rise of about 5 PJ. Due to the absence of variation in the share of the different transport modes, the structural effect was insignificant. Without this increase in intensity, energy consumption in the sector would have been 3 % lower in 2020.

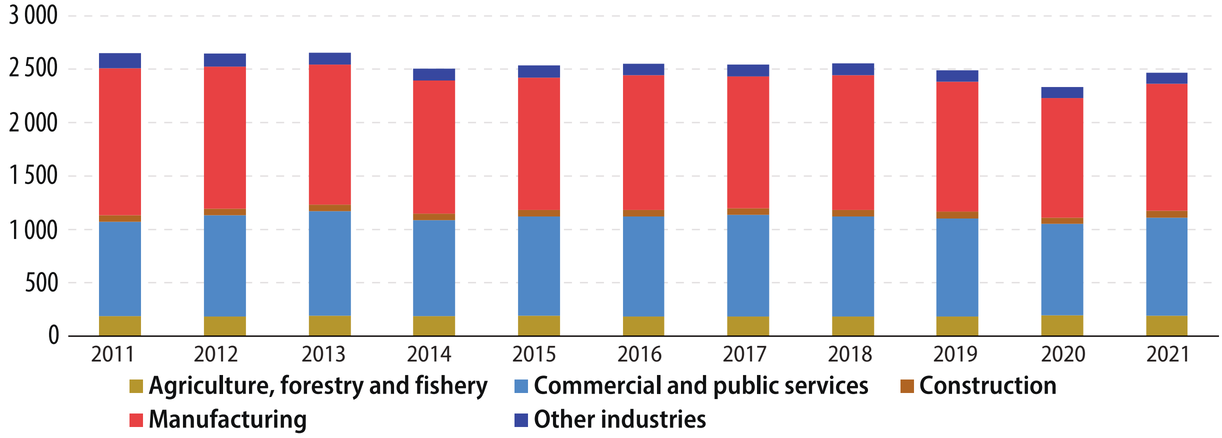
France

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

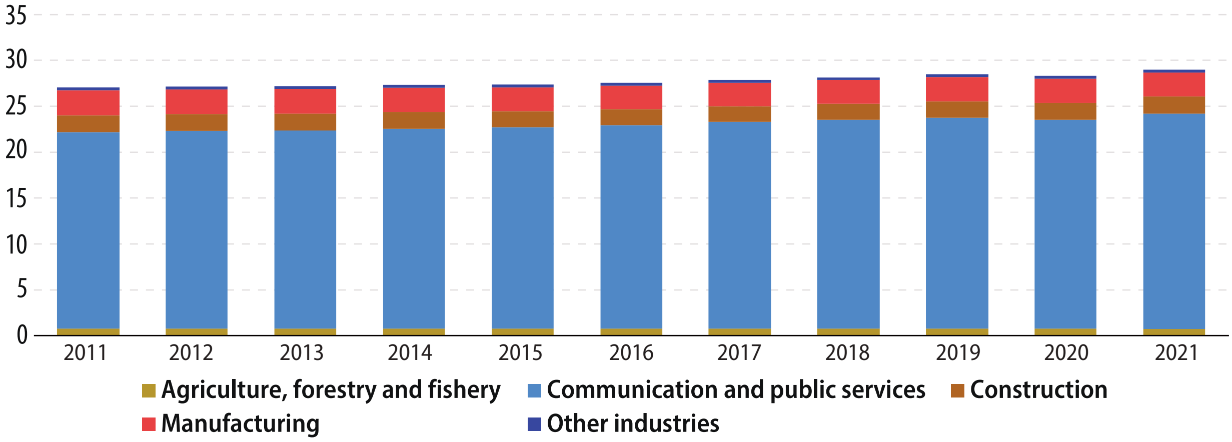


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

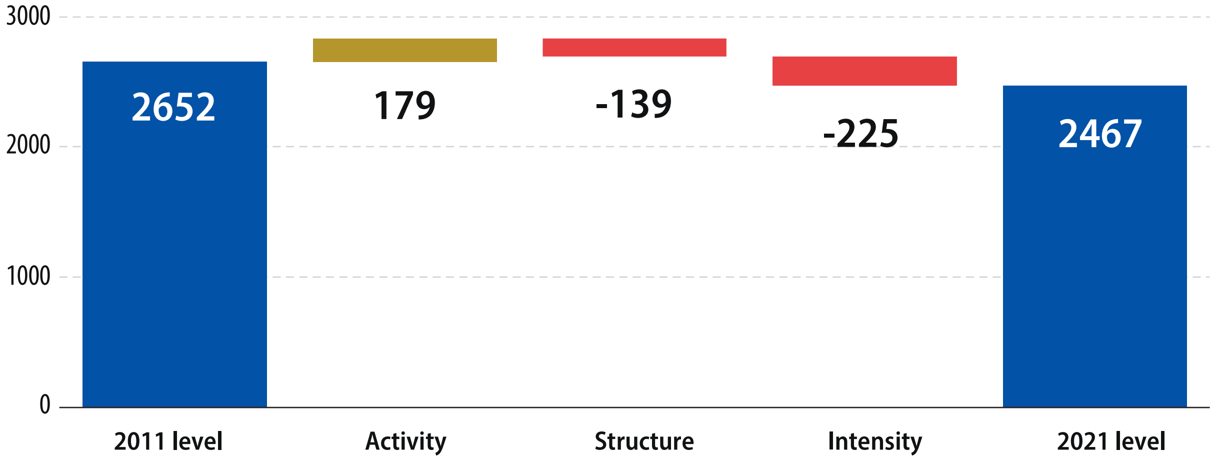


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

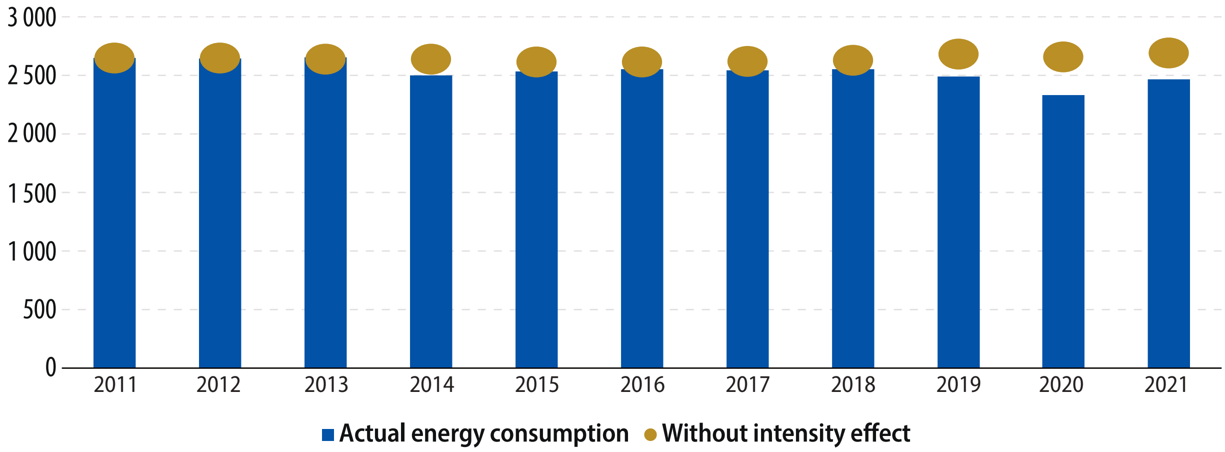


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

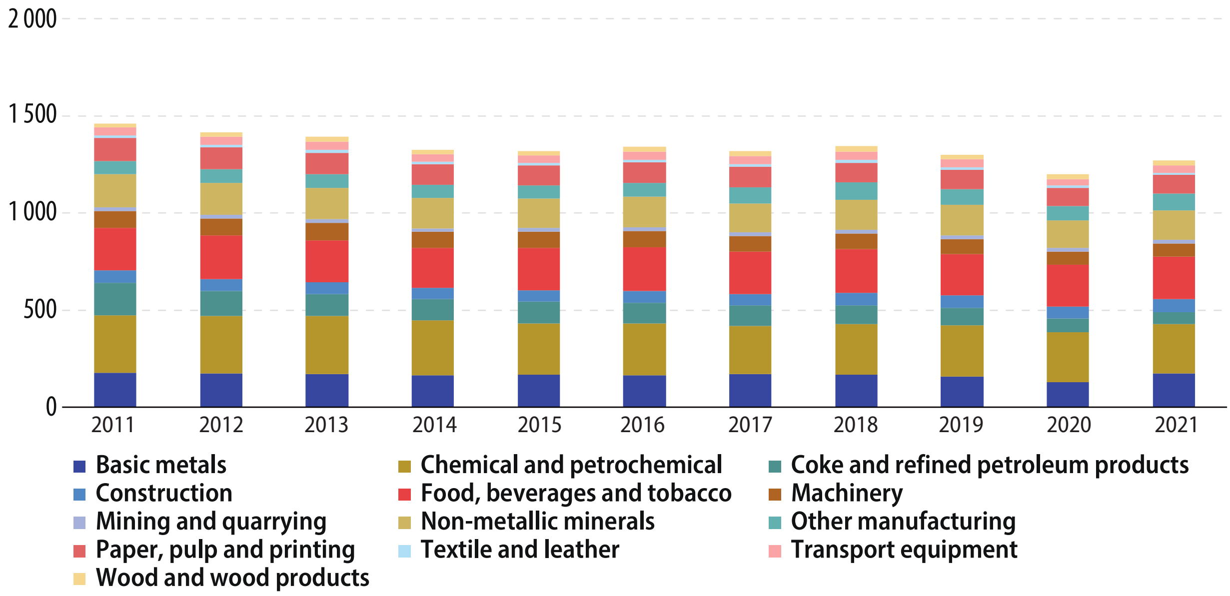
The final energy consumption of the different sectors of the French economy slightly decreased between 2011 and 2019 from 2 652 PJ to 2 492 PJ, then it dropped to 2 335 J in 2020, before coming back to 2 467 PJ in 2021. Meanwhile, the active population steadily increased from 27.0 million in 2011 to 29.0 million in 2021. Between these two years, the increase in activity (measured in terms of employee) brought energy consumption up by about 179 PJ, while the structural changes in the economy caused a drop in energy consumption of about 139 PJ which is mostly related to the increase in the share of the commercial and public services sector (from 79 % to 81 % of the active population between the two years). Finally, the most significant driver was the decrease in energy consumption per employee, which brought the energy consumption down by about 225 PJ. Without this reduction, the energy consumption in the whole economy could have been 9 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

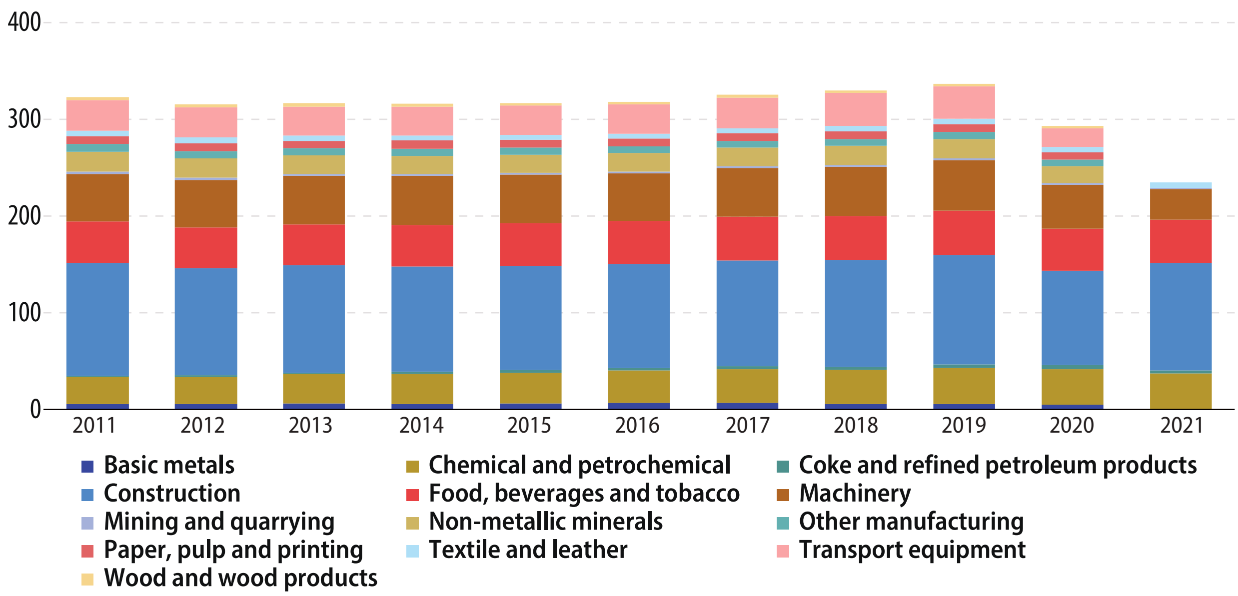


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

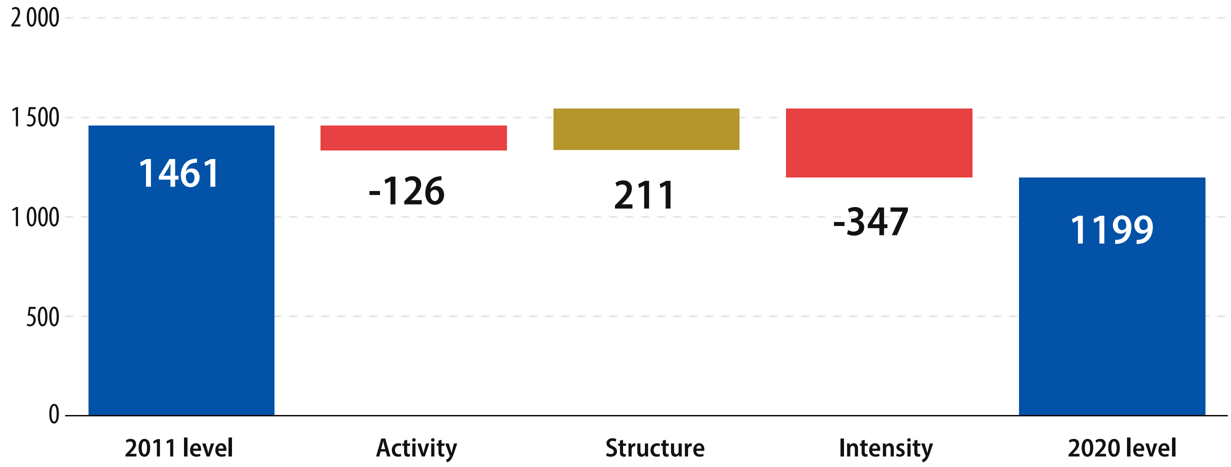


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

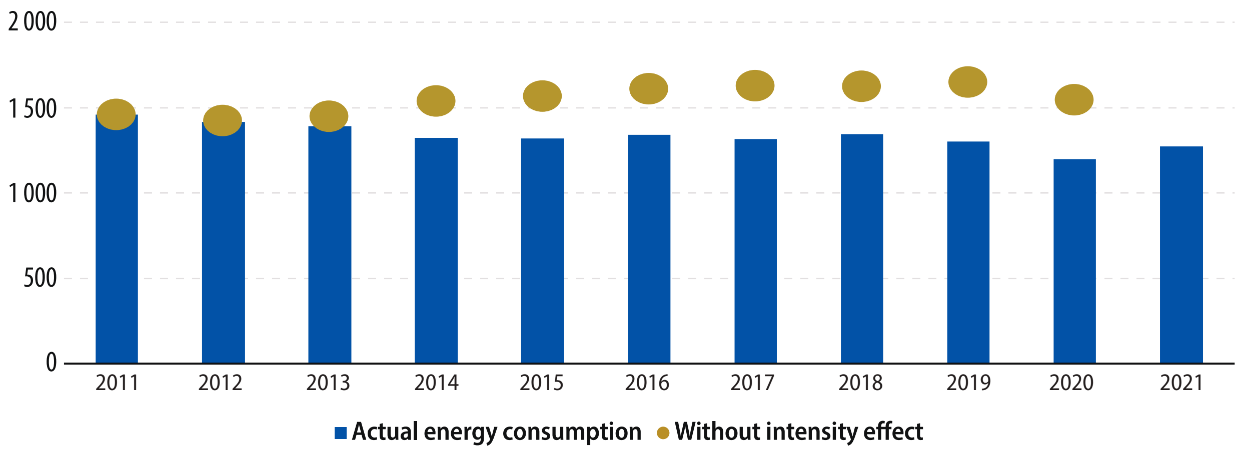


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

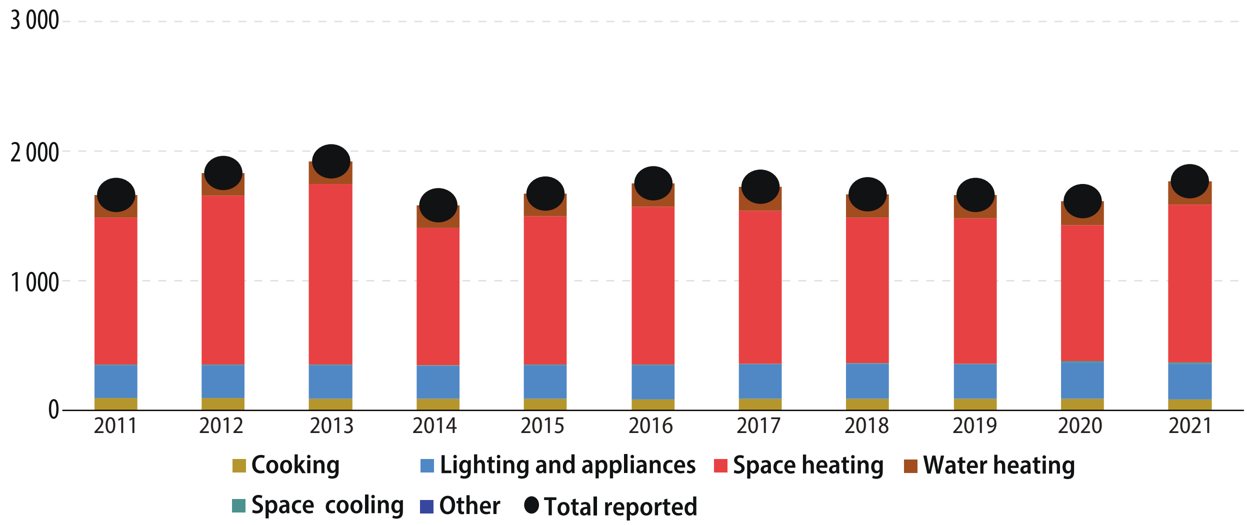
The energy consumption in the French manufacturing industries sector decreased from 1 461 PJ in 2011 to 1 199 PJ in 2020, before bouncing back to 1 272 PJ in 2021. The corresponding total gross value added increased from 323 billion EUR in 2011 to 337 billion EUR in 2019, and then decreased in 2020 to 293 billion EUR. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the period 2011-2020. Between these two years, the decrease in activity brought down consumption of energy by about 126 PJ, however this was offset by the structural changes in the economy which caused an increase of 211 PJ of consumption, partly due to a higher share of the chemical and petrochemical sector (from 9 % to 13 % of the value added between the two years). The most important driver was the decrease in energy intensity, which brought down consumption by about 347 PJ. Without this reduction, the total energy consumption in the industry sector would have been 29 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

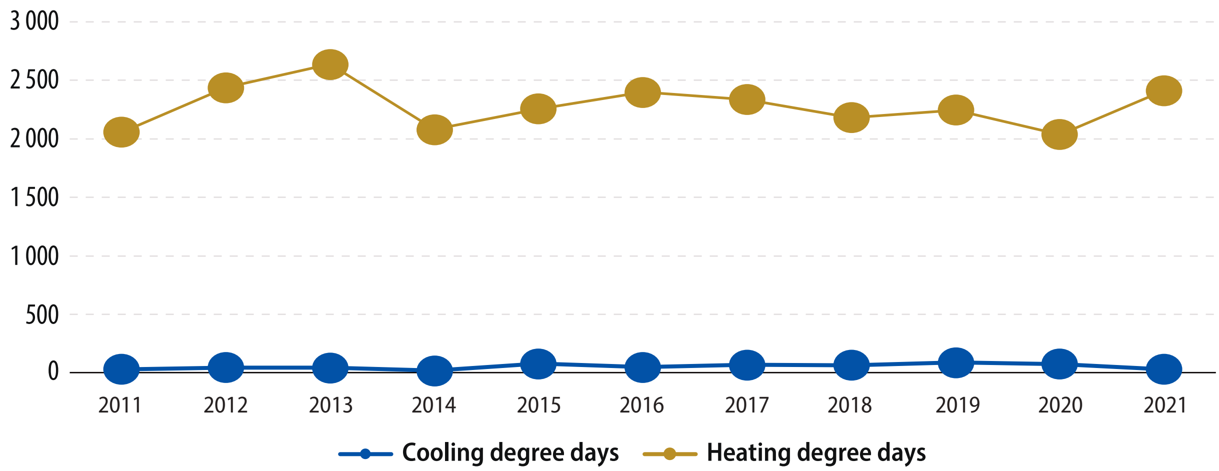
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

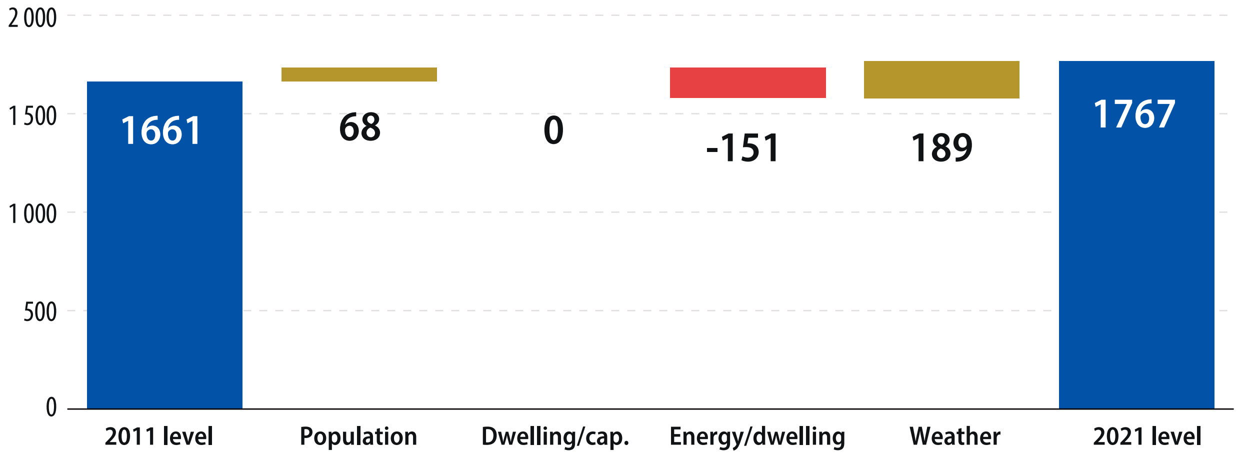


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

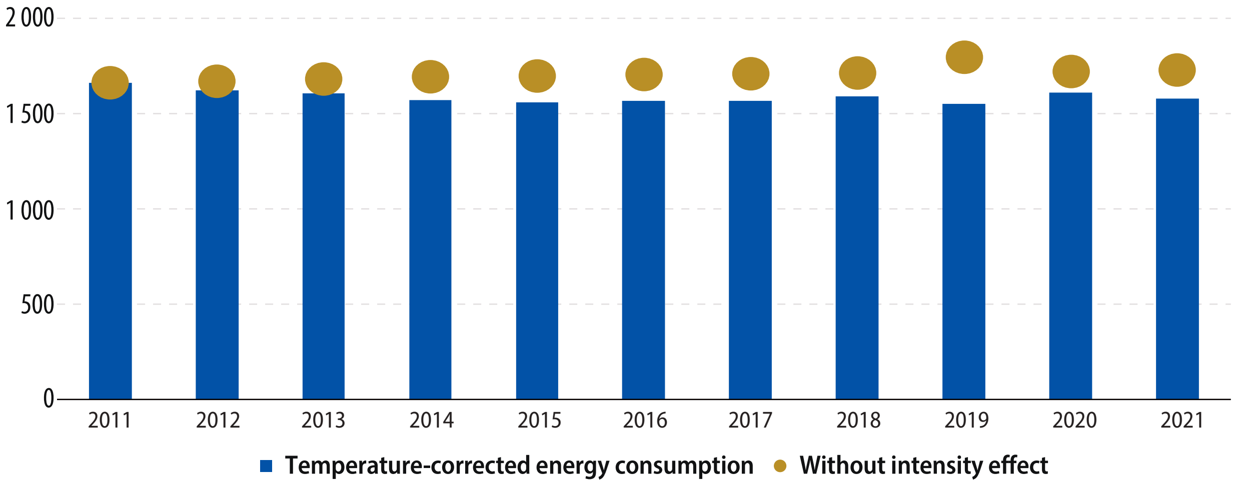


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

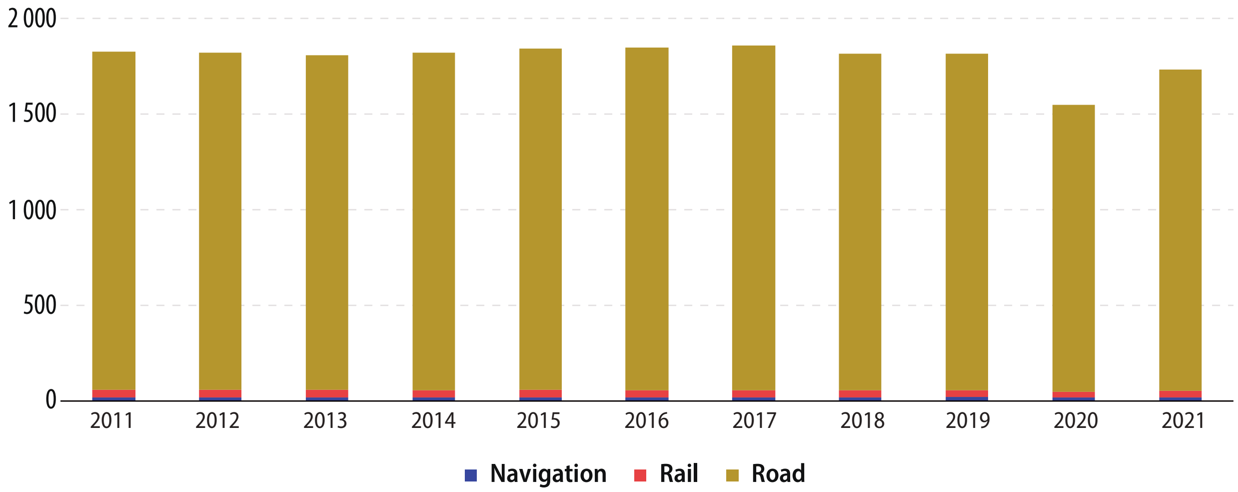
The energy consumption in the French residential sector oscillated between 1 582 PJ and 1 921 PJ over the period 2011-2021. Between 2011 and 2021, the increase in population caused an increase in energy consumption of about 68 PJ, meanwhile dwelling occupancy remained the same and therefore had no effect. A decrease of about 151 PJ was due to the decrease in energy consumption per dwelling. With almost 500 more heating degree days in 2021 than in 2011, the weather was the most significant driver of the consumption over the studied period, bringing up consumption by about 189 PJ. Without the reduction in energy consumption per dwelling, the residential energy consumption could have been 9 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

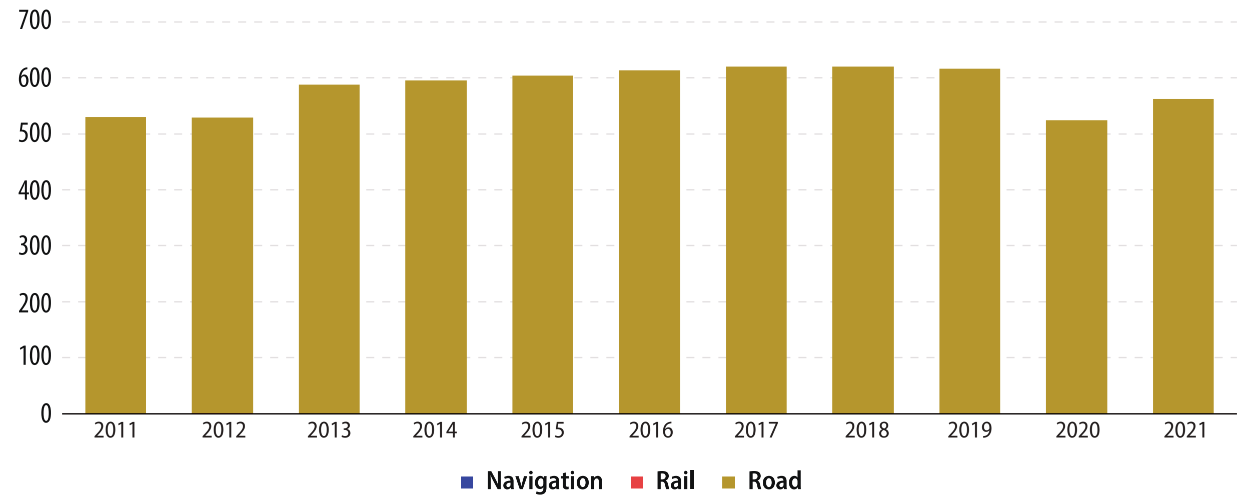


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

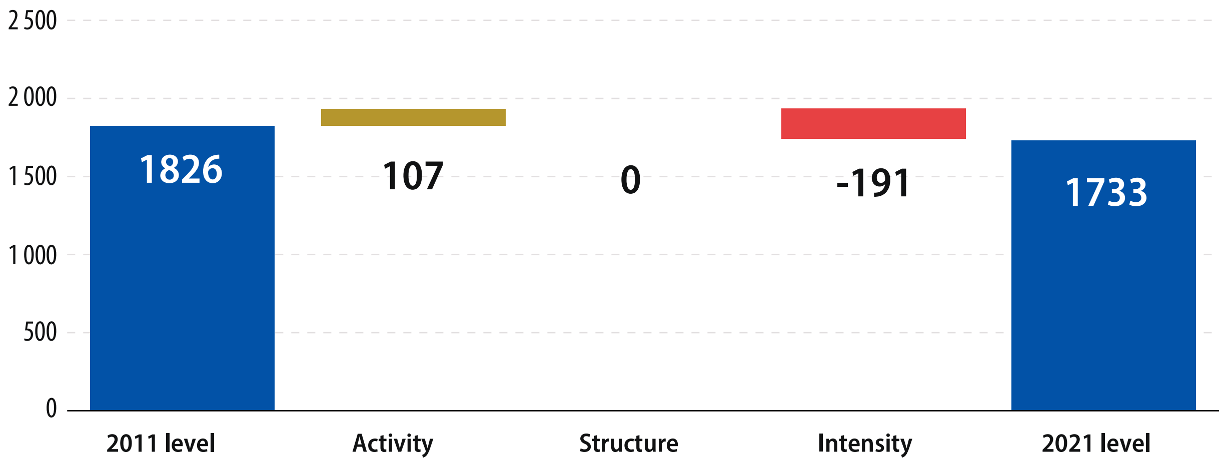


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

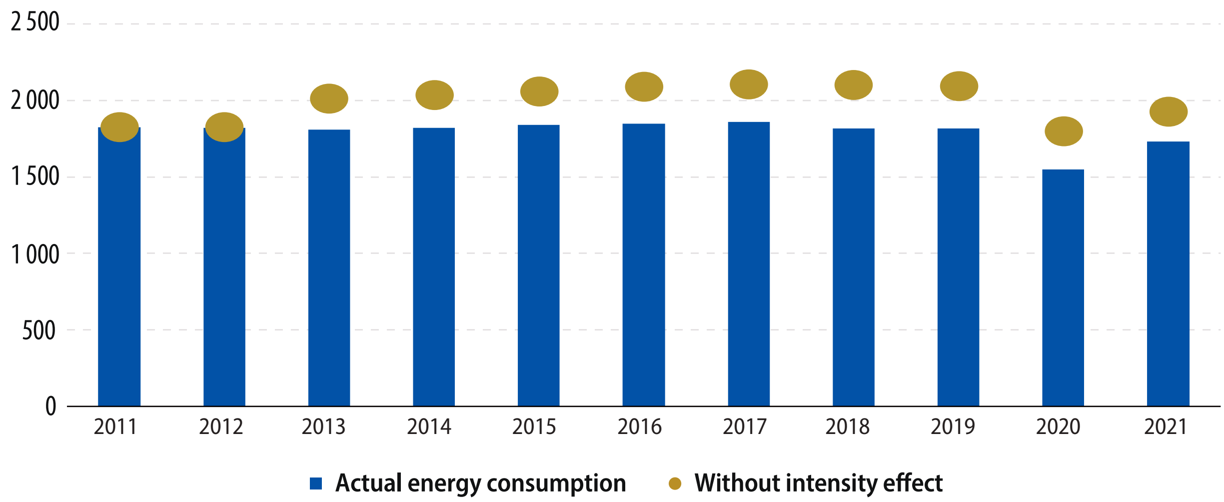


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the French transport sector oscillated between 1 808 PJ and 1 859 PJ between 2011 and 2019, before dropping to 1 549 PJ in 2020, and then growing back to 1 733 PJ in 2021. Most of the energy consumption was due to road transport. Between 2011 and 2019, road traffic increased from 529 billion VKM to 617 billion VKM, before dropping to 524 billion VKM in 2020, and it was still only 562 billion VKM in 2021. During the studied period, the small increase in traffic caused an increase in energy consumption of about 107 PJ, which was more than offset by the decrease in energy intensity, causing a reduction of about 191 PJ of energy consumption. Due to the absence of variation in the share of the different transport modes, the structural effect was insignificant. Without the reduction in intensity, the energy consumption in the sector would have been 11 % higher in 2021.

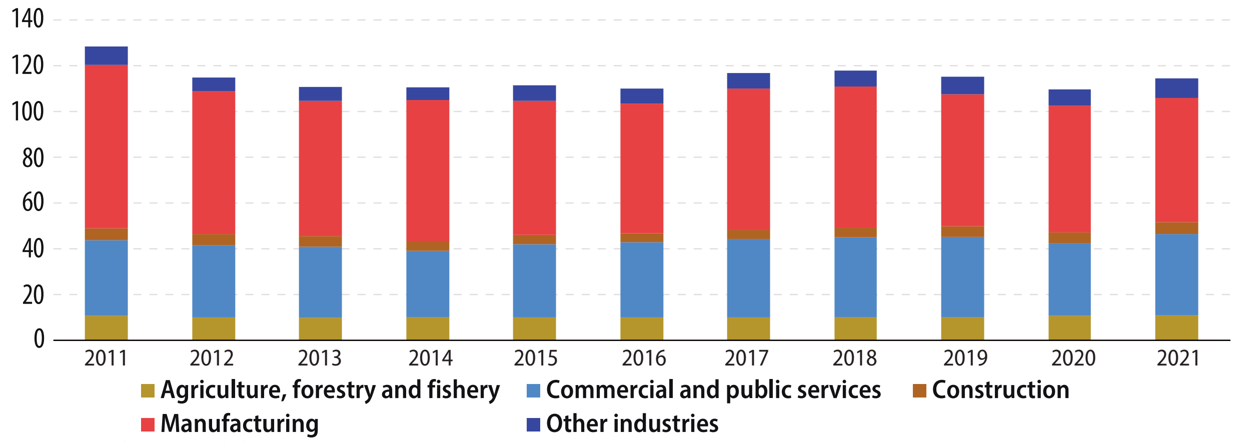
Croatia

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

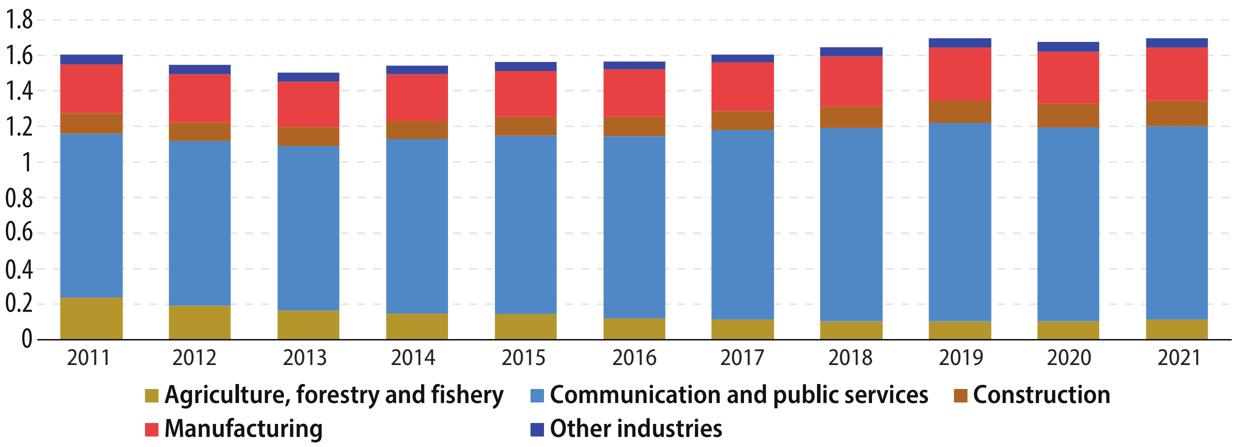


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

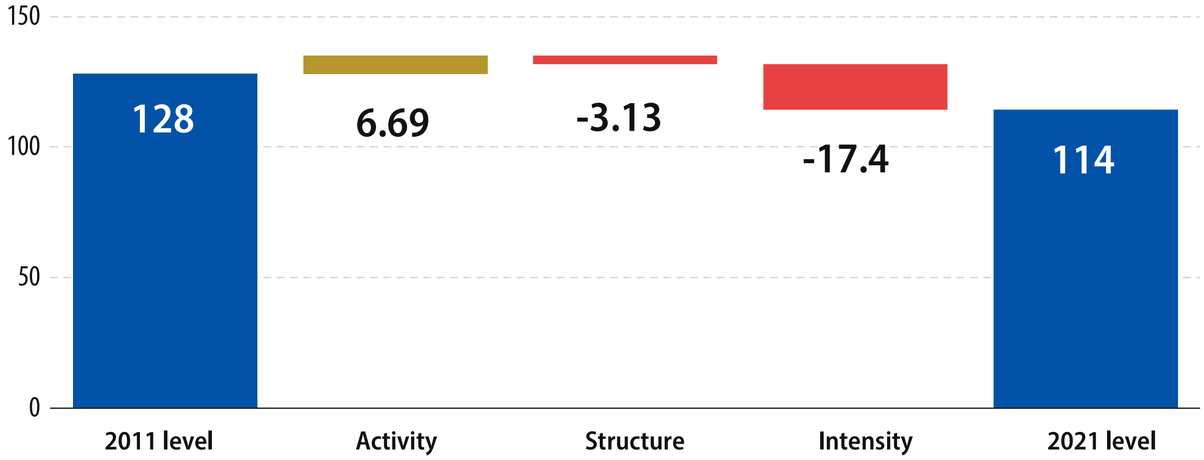


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

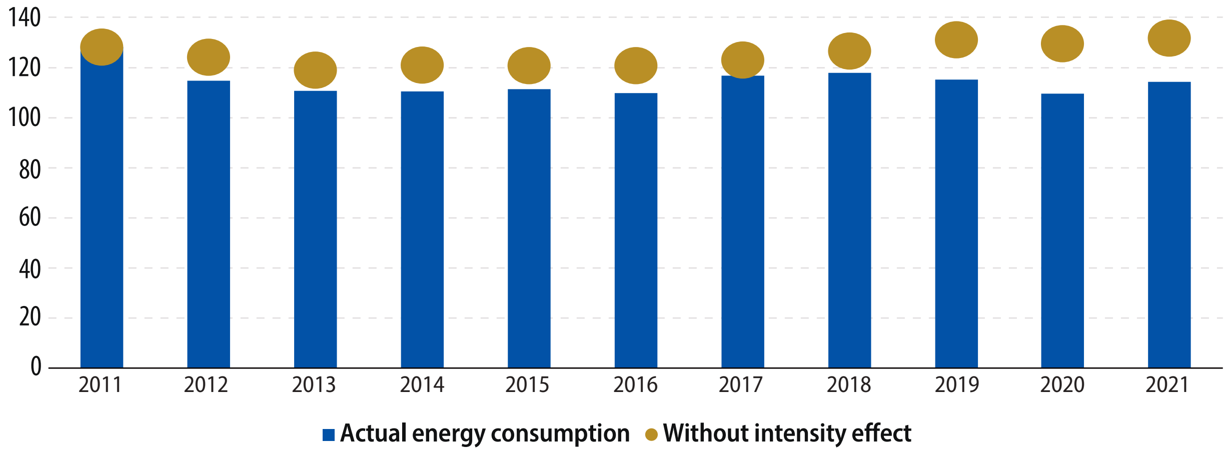


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

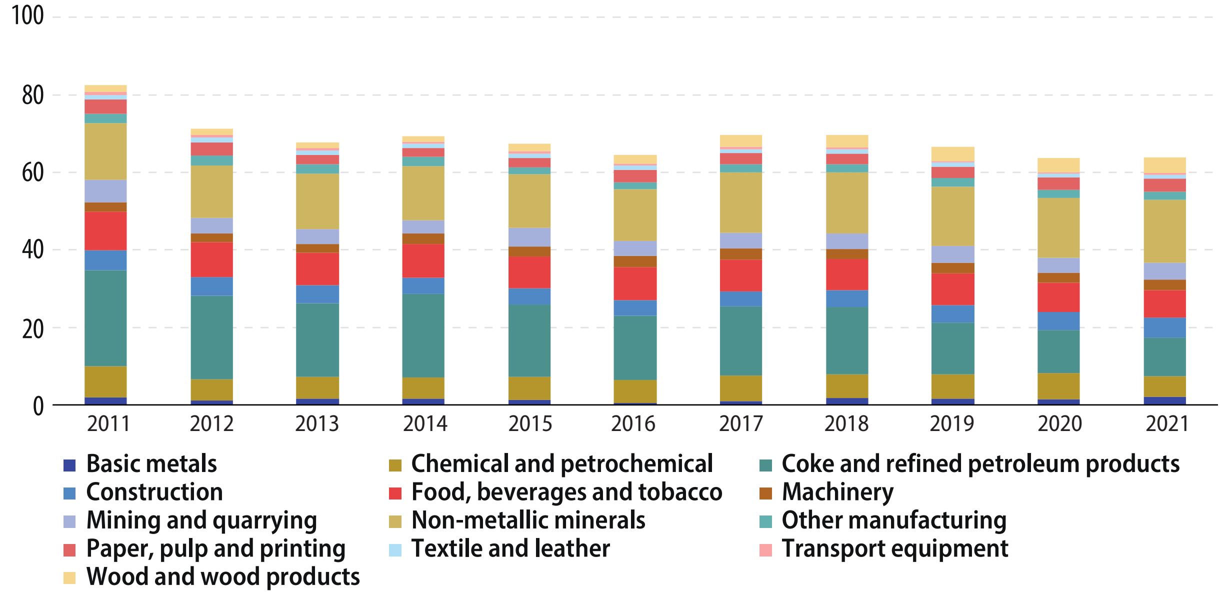
After a first drop from 128 PJ in 2011 to 109 PJ in 2016, the final energy consumption of the different sectors of the Croatian economy increased to 118 PJ in 2018, then it dropped to 110 J in 2020, before a come back to 114 PJ in 2021. Similarly, the active population slightly decreased from 1.6 million in 2011 to 1.5 million in 2013 before slowly growing back to 1.7 million in 2021. Between 2011 and 2021, the increase in activity (measured in terms of employee) brought energy consumption up by about 6.7 PJ, while the structural changes in the economy caused a drop in energy consumption of about 3.1 PJ which is mostly related to the increase in the share of the commercial and public services sector (from 57 % to 64 % of the active population between the two years). Finally, the most significant driver was the decrease in energy consumption per employee which brought the energy consumption down by about 17 PJ. Without this decrease, energy consumption would have been 15 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

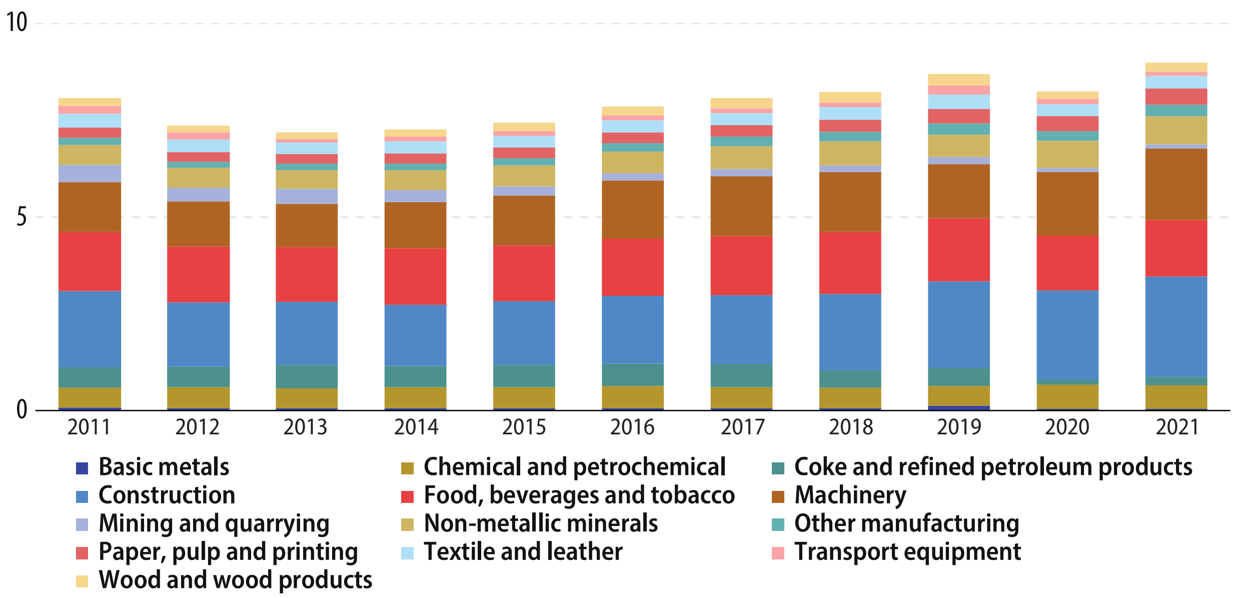


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

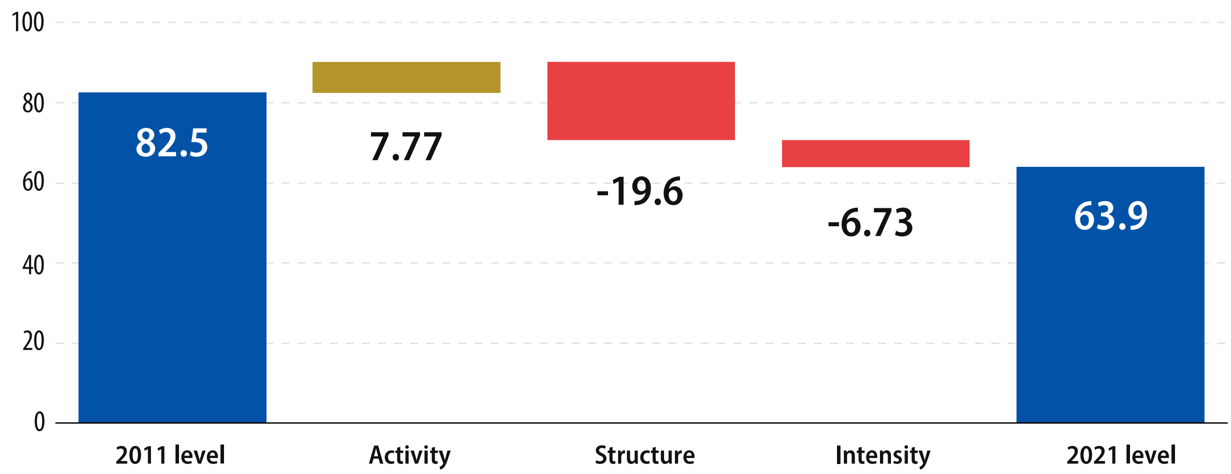


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

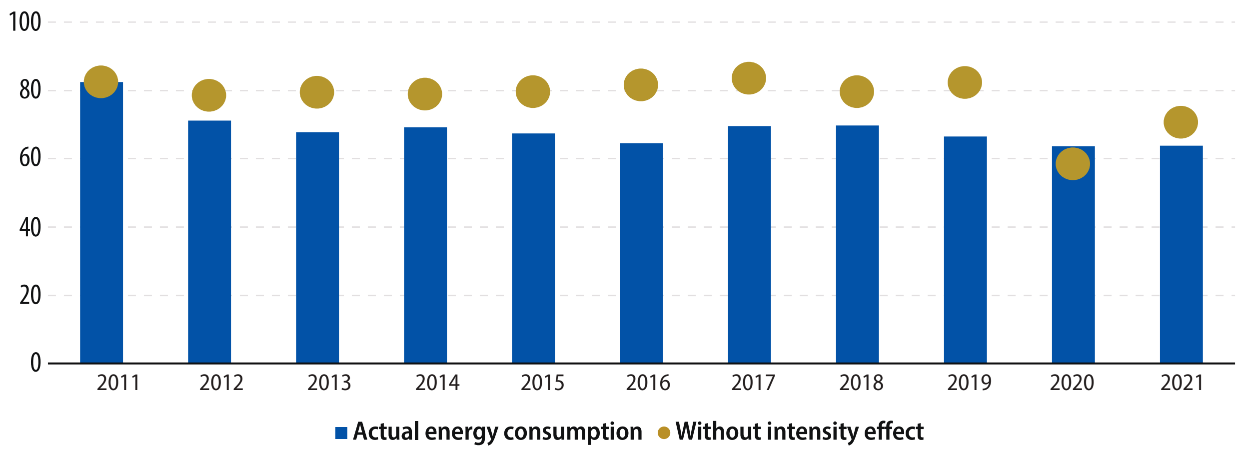


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

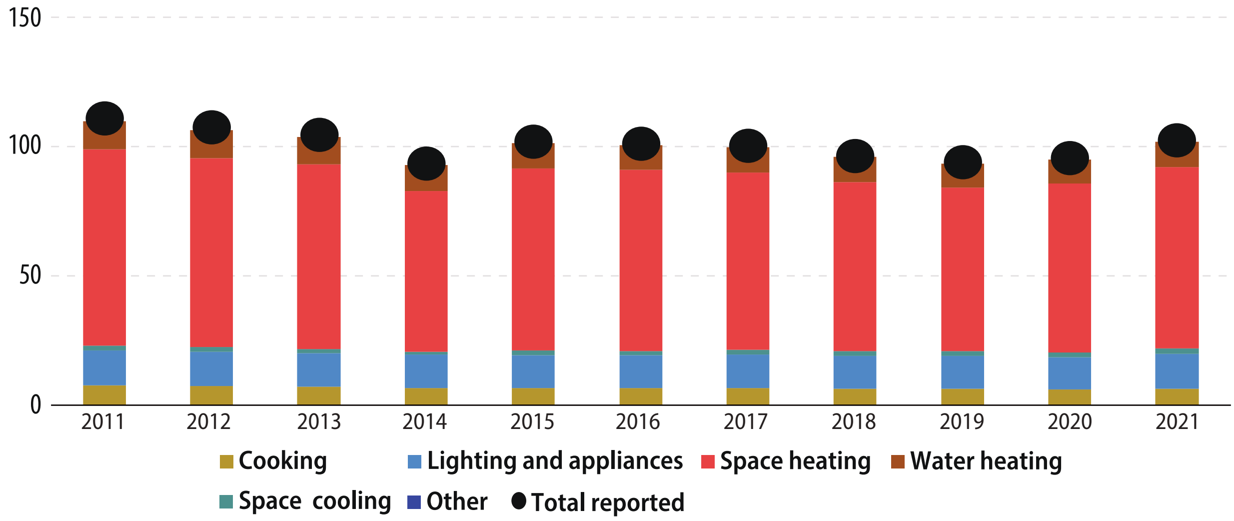
The Croatian energy consumption in the manufacturing industries sector decreased from 82 PJ in 2011 to 64 PJ in 2021. The corresponding total gross value added decreased from 8.1 billion EUR in 2011 to 7.2 billion EUR in 2013, and then increased to reach 8.7 billion EUR in 2019, before dropping to 8.2 billion EUR in 2020, and then bouncing back to its highest level at 9.0 billion EUR in 2021. Between 2011 and 2021, the increase in activity brought energy consumption up by almost 8 PJ. However, this was more than offset by the structural changes in the economy which caused a decrease of about 20 PJ of consumption, partly due to a lower share of the chemical and petrochemical sector (from 7 % to 2 % of the GVA between the two years) and of the mining and quarrying sector (from 6 % to 1 %). In addition, the decrease in energy intensity brought down consumption by almost 7 PJ. Without this reduction, the total energy consumption in the industry sector would have been 11 % higher in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

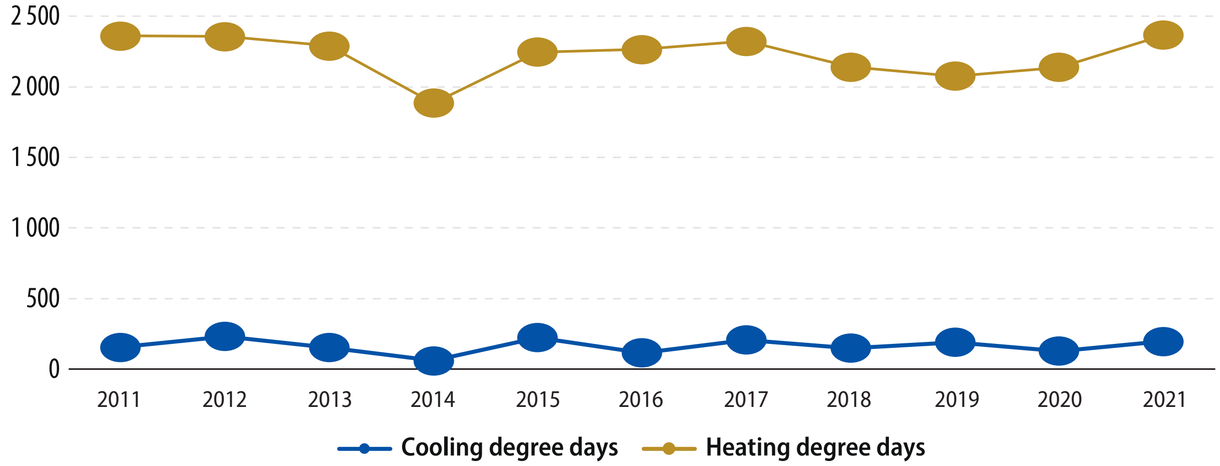
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

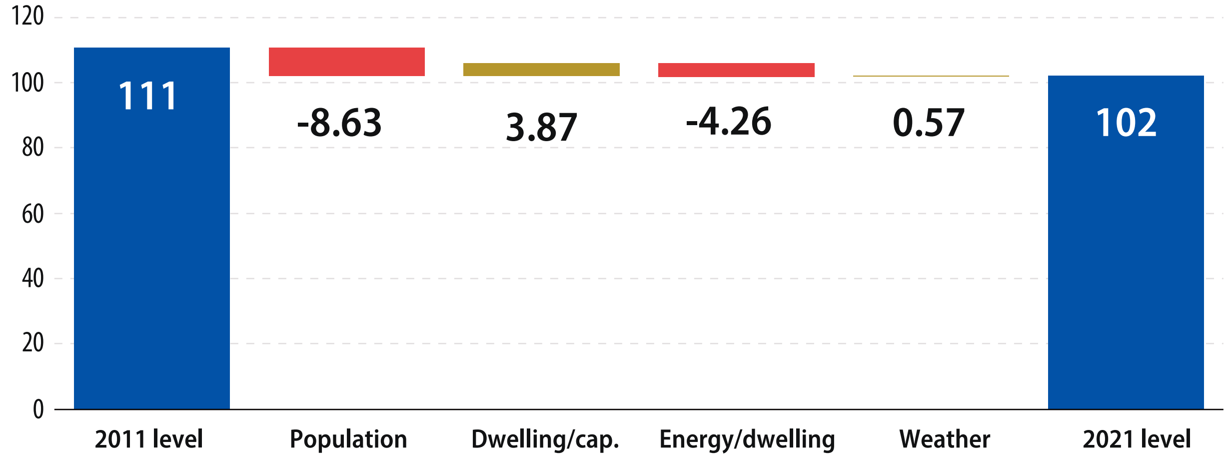


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

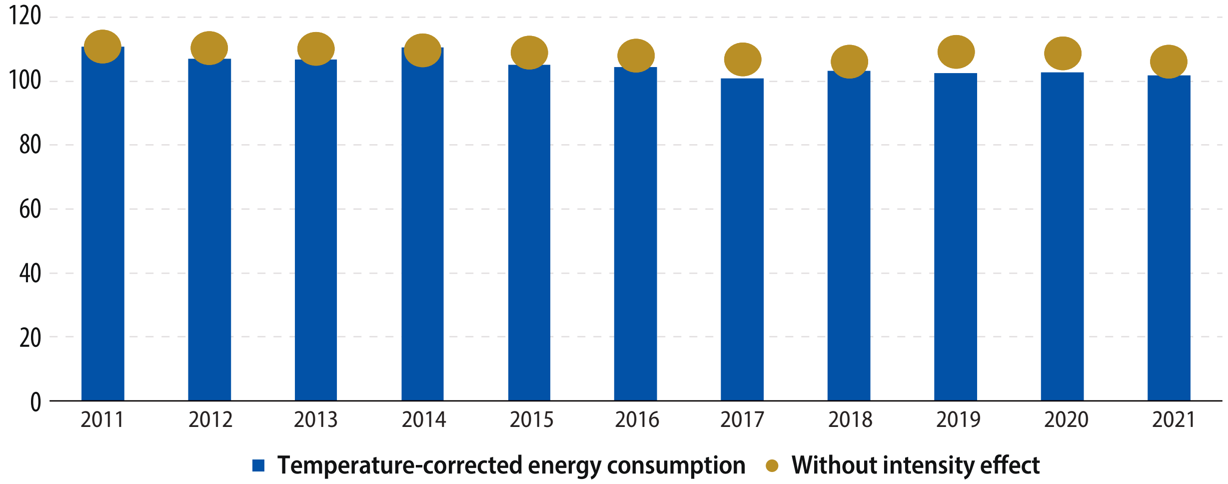


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

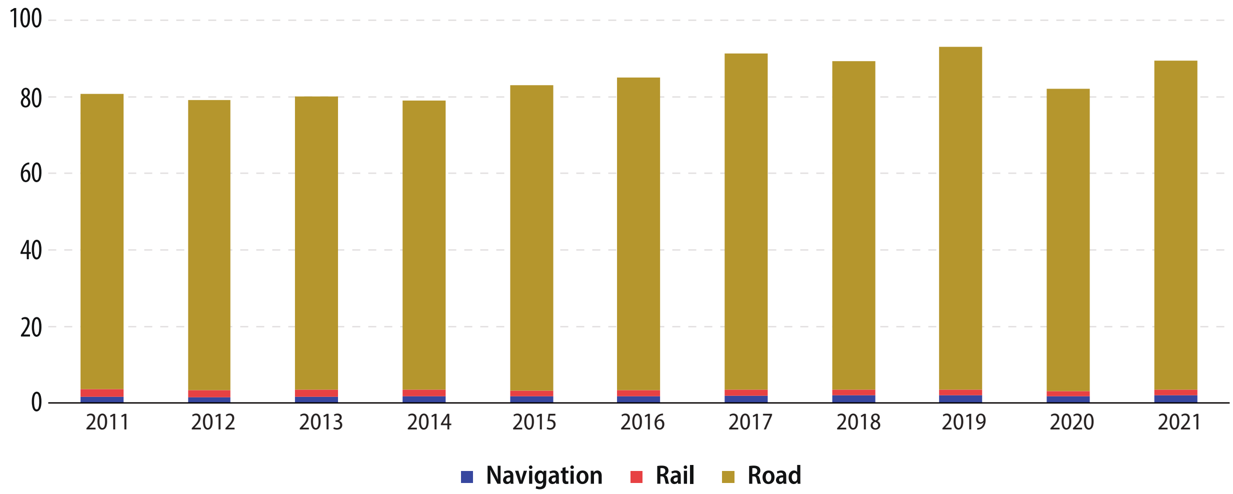
The energy consumption in the residential sector of Croatia oscillated between 93 PJ and 110 PJ over the period 2011-2021. Between 2011 and 2021, the decrease in population dragged down energy consumption by almost 9 PJ, meanwhile dwelling occupancy slightly decreased leading to an additional 4 PJ of energy consumption. A decrease of about 4 PJ was due to the decrease in energy consumption per dwelling. There was approximately the same amount of heating degree days in 2021 and in 2011, therefore the weather effect was almost negligible between these 2 years.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

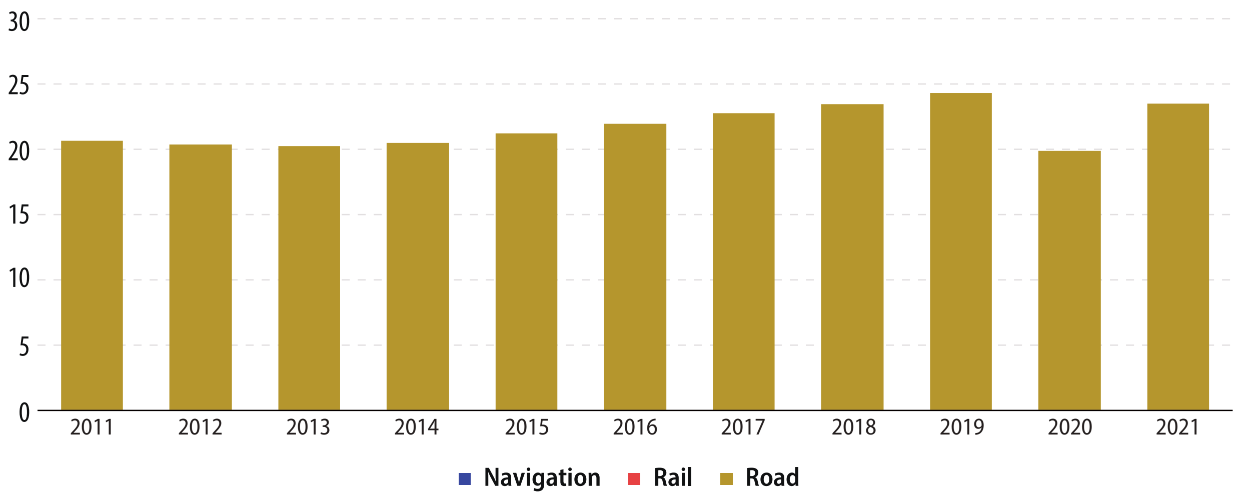


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

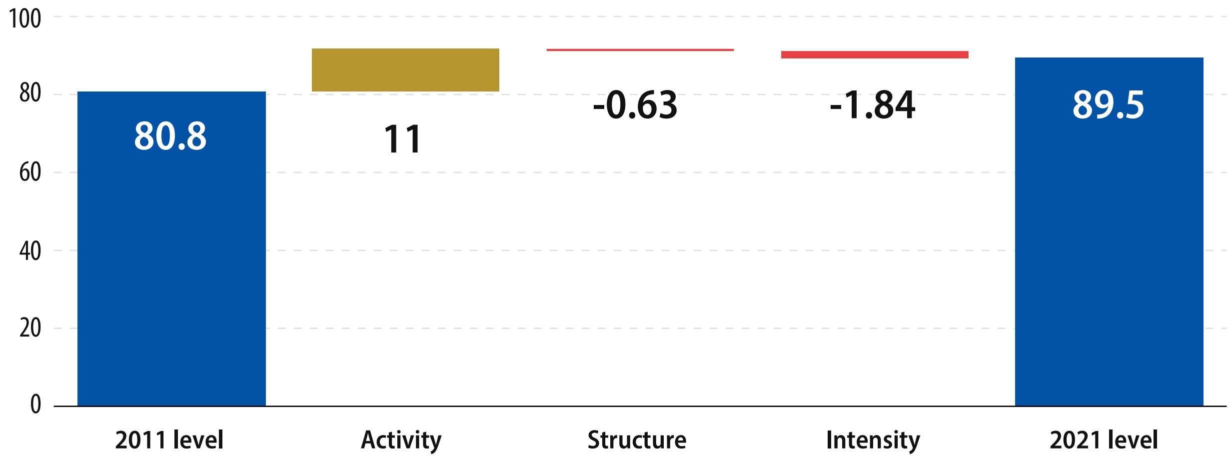


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

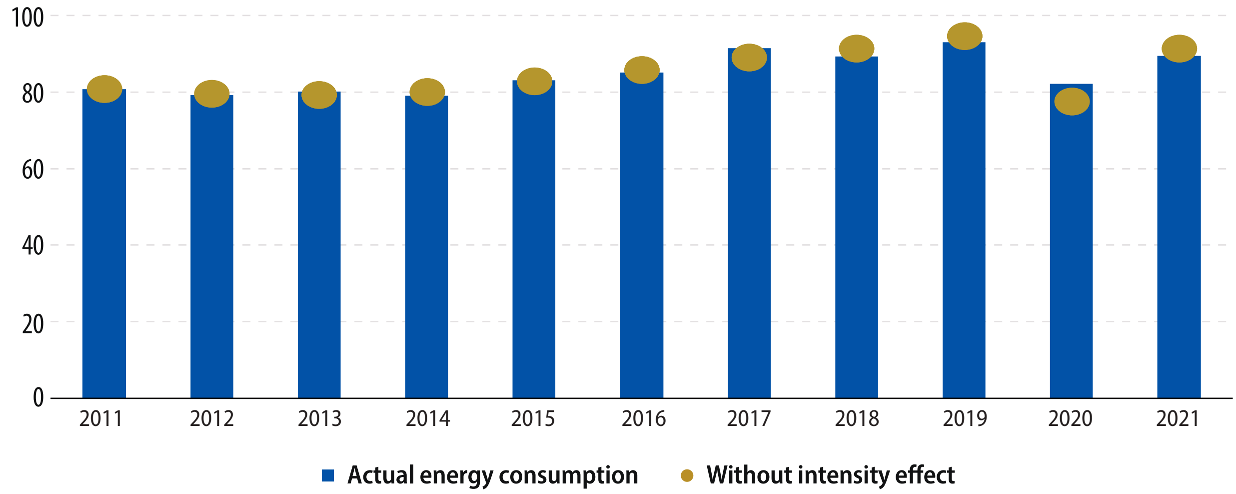


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Croatian transport sector increased from 81 PJ in 2011 and 93 PJ in 2019, before dropping to 82 PJ in 2020, and it was still only 89 PJ in 2021. Most of the energy consumption was due to road transport. Between 2011 and 2019, road traffic increased from 21 billion VKM to 24 billion VKM, before dropping to 20 billion VKM in 2020, and then bouncing back to 23 billion VKM in 2021. Over the studied period, the main driver was the strong increase in traffic which caused an increase in energy consumption of about 11 PJ. Meanwhile, the slight decrease in energy intensity caused a reduction of almost 2 PJ of energy consumption. With the absence of variation in the share of the different transport modes, the structural effect was almost insignificant. Without the reduction in intensity, energy consumption in the transport sector would have been 12 % higher in 2021.

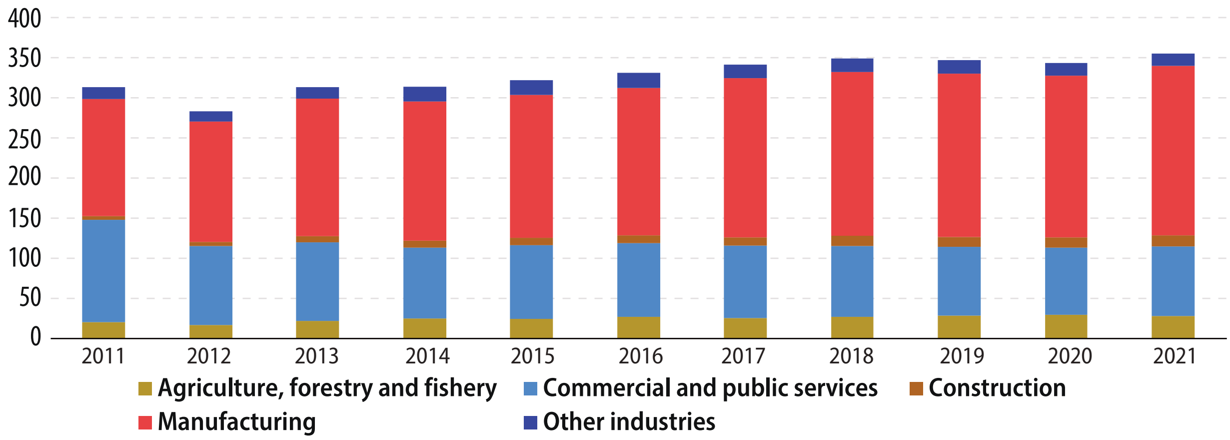
Hungary

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

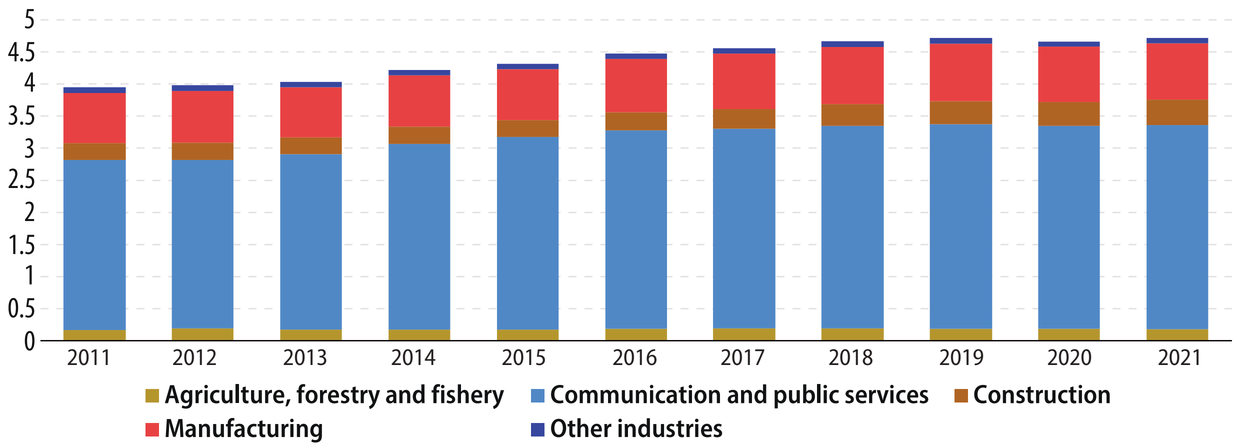


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

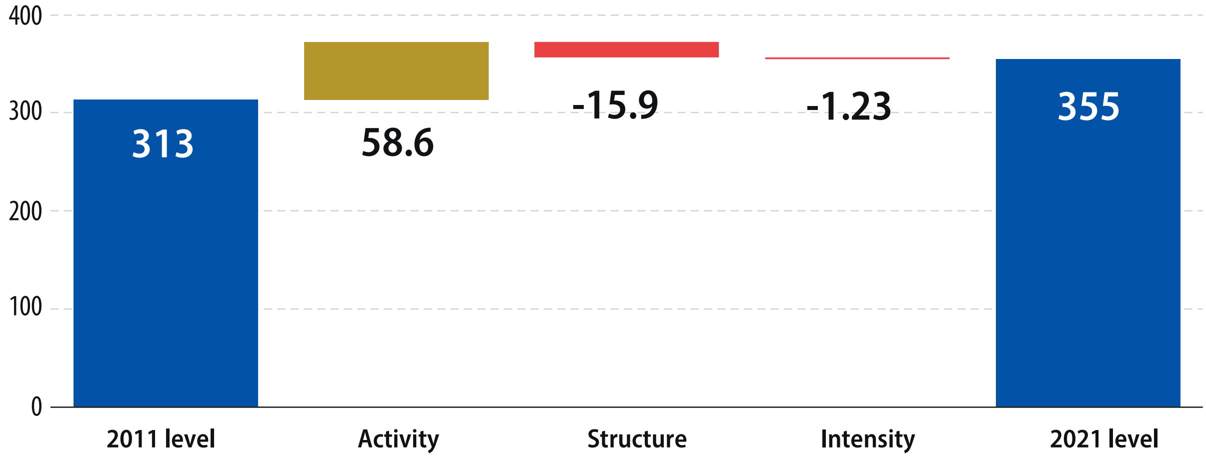


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

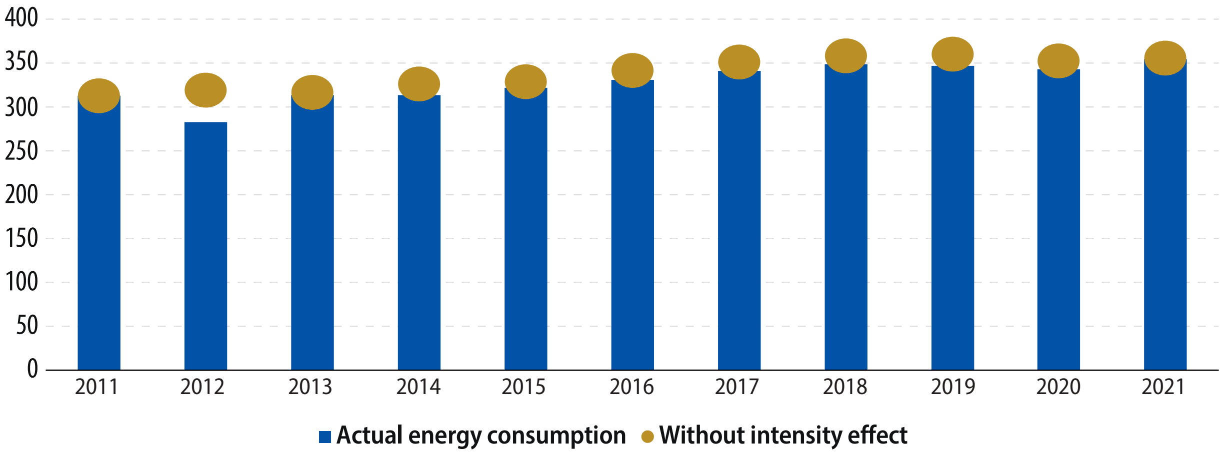


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

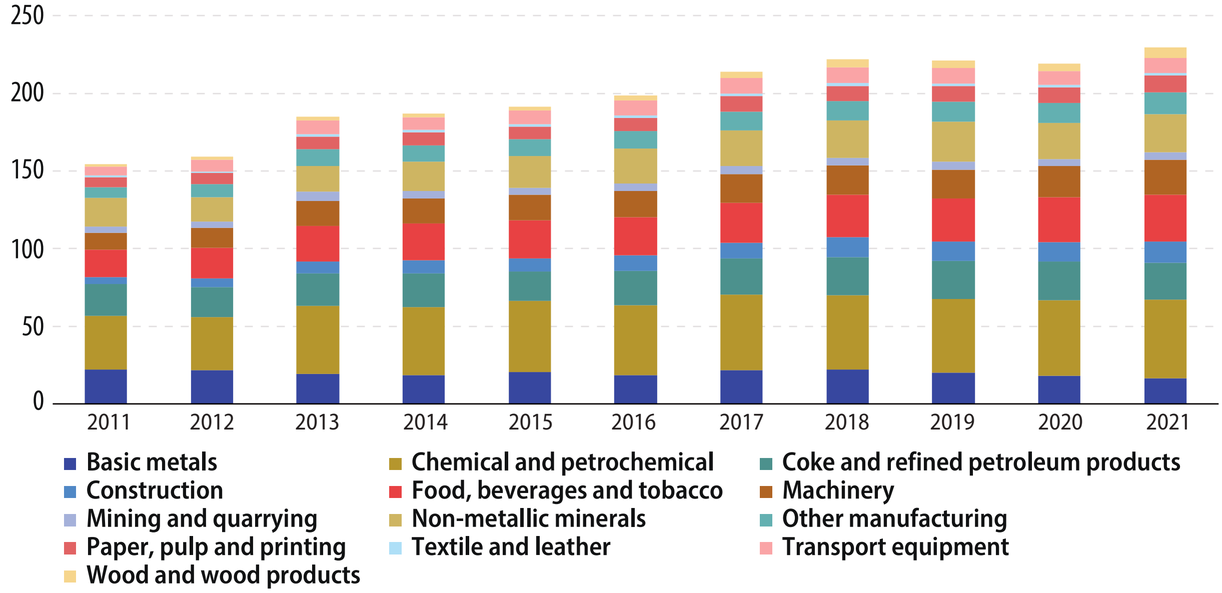
After a first drop from 313 PJ in 2011 to 283 PJ in 2012, the final energy consumption of the different sectors of the Hungarian economy increased to reach 355 PJ in 2021. The active population also increased from 3.9 million in 2011 to 4.7 million in 2021. Between 2011 and 2021, the increase in activity (measured in terms of employees) drove up energy consumption by about 59 PJ, while the structural changes in the economy caused a drop in energy consumption of about 16 PJ. Finally, the very small decrease in energy consumption per employee brought energy consumption down by only about 1 PJ.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

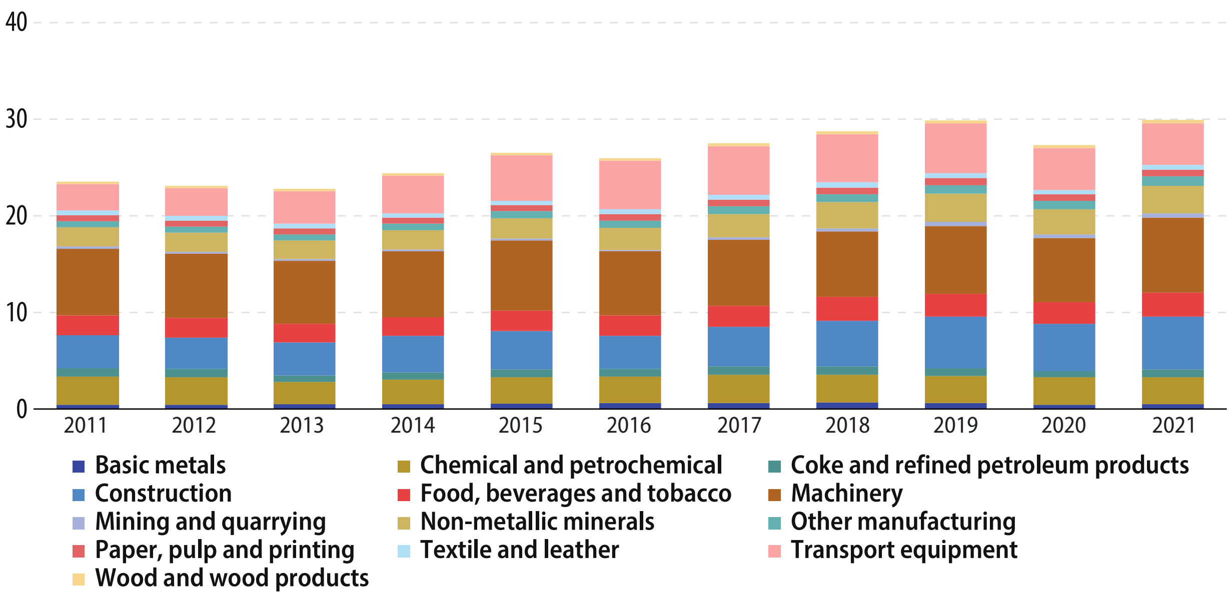


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

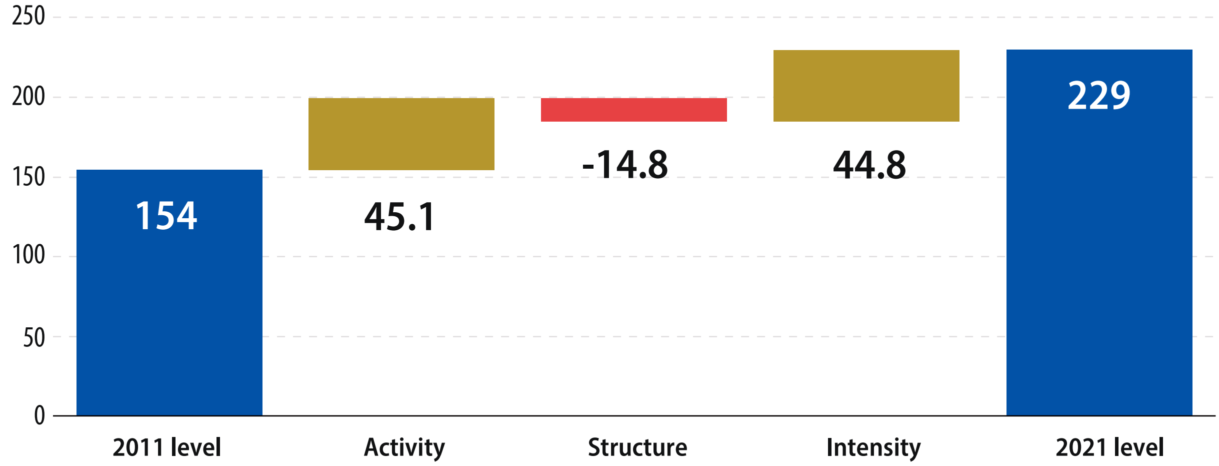


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

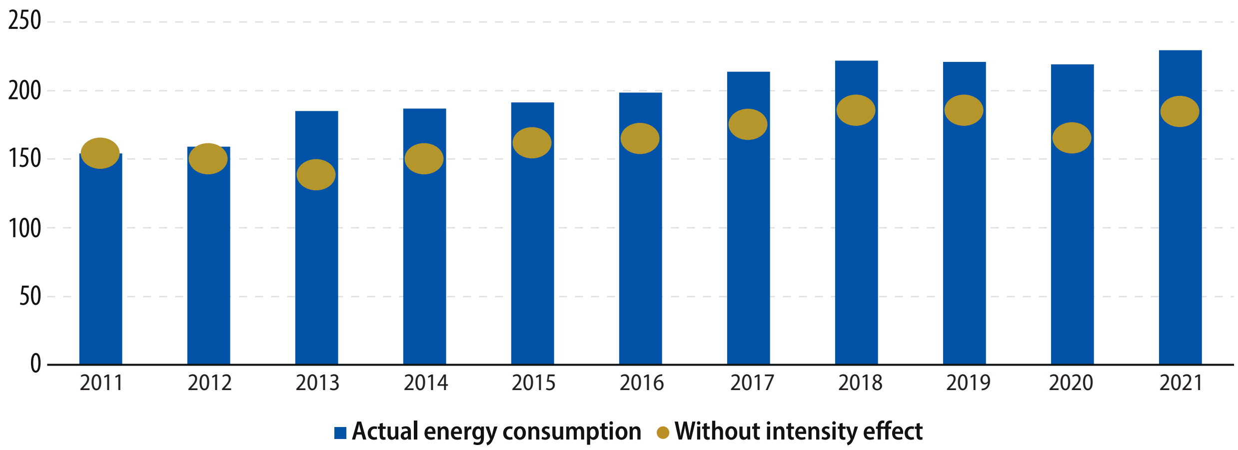


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

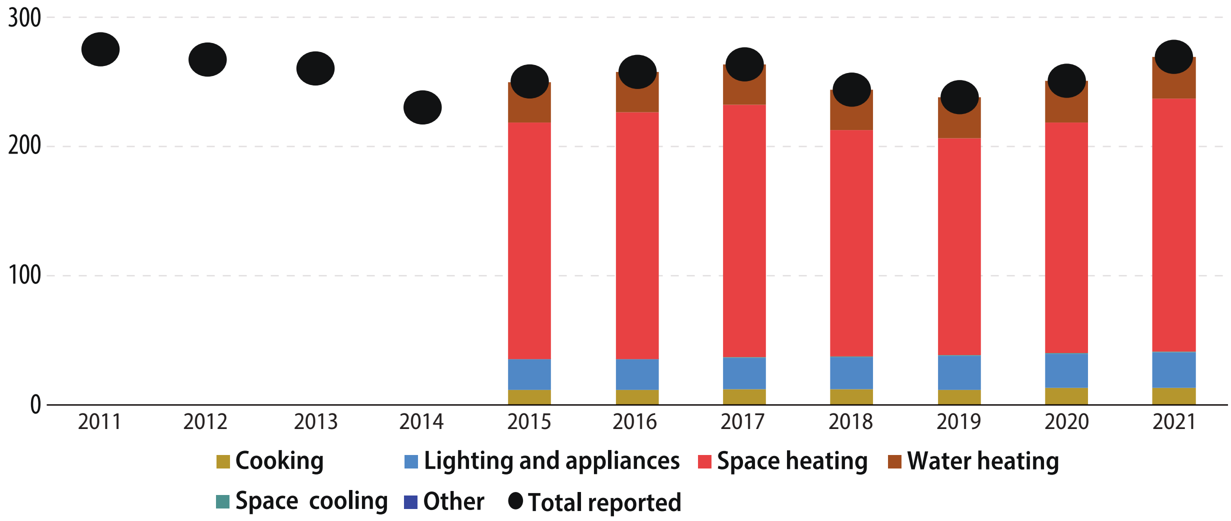
The Hungarian energy consumption in the manufacturing industries sector increased steadily from 154 PJ in 2011 to 229 PJ in 2021. The corresponding total gross value added decreased from 23.6 billion EUR in 2011 to 29.9 billion EUR in 2019, before dropping to 27.4 billion EUR in 2020, and then bouncing back to its highest level at 30.0 billion EUR in 2021. Between 2011 and 2021, the increase in activity brought energy consumption up by almost 45 PJ. This was offset by the structural changes in the economy which caused a decrease of about 15 PJ of consumption, partly due to a lower share of the chemical and petrochemical sector (from 12% to 9 % of the value added between the two years) and of the machinery sector (from 29 % to 26 % of the value added). In addition, the increase in overall energy intensity brought consumption up by almost 45 PJ. Without this increase, the total energy consumption in the industry sector would have been almost 20 % lower in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

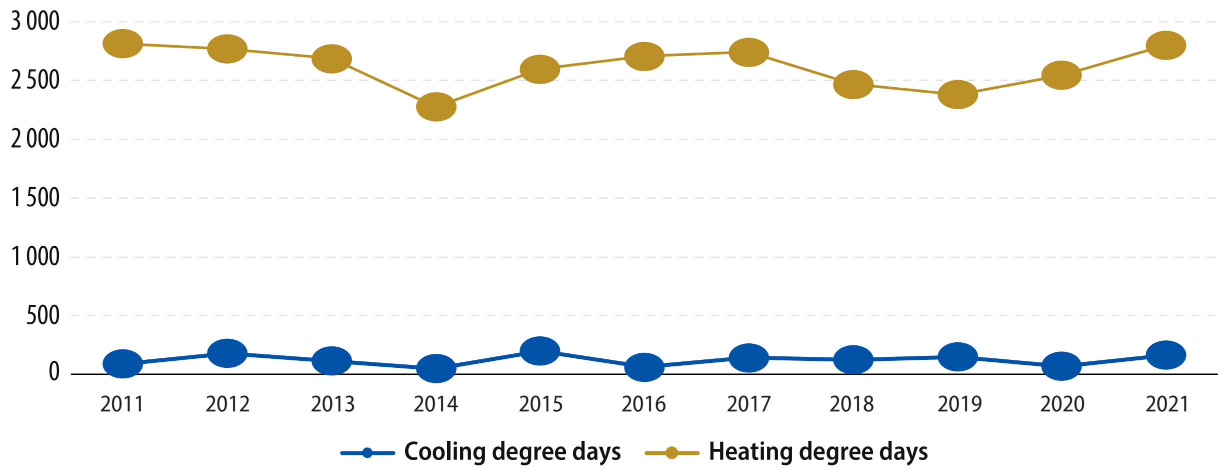
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

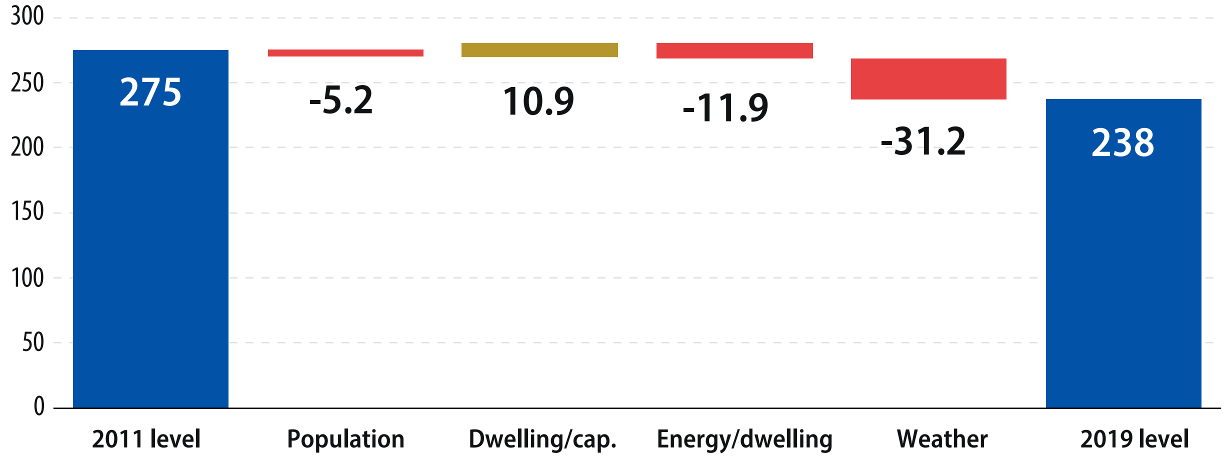


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

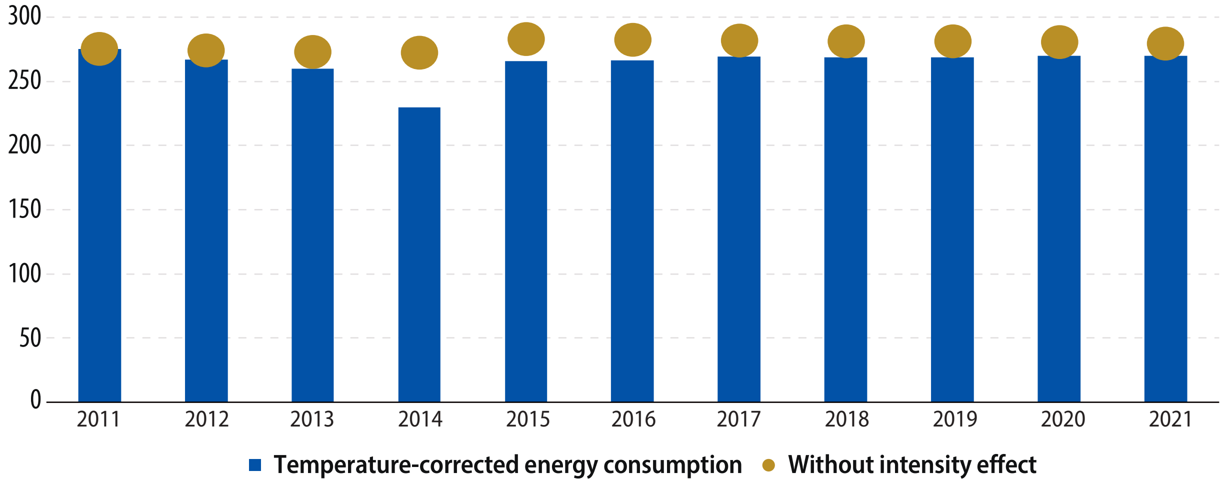


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

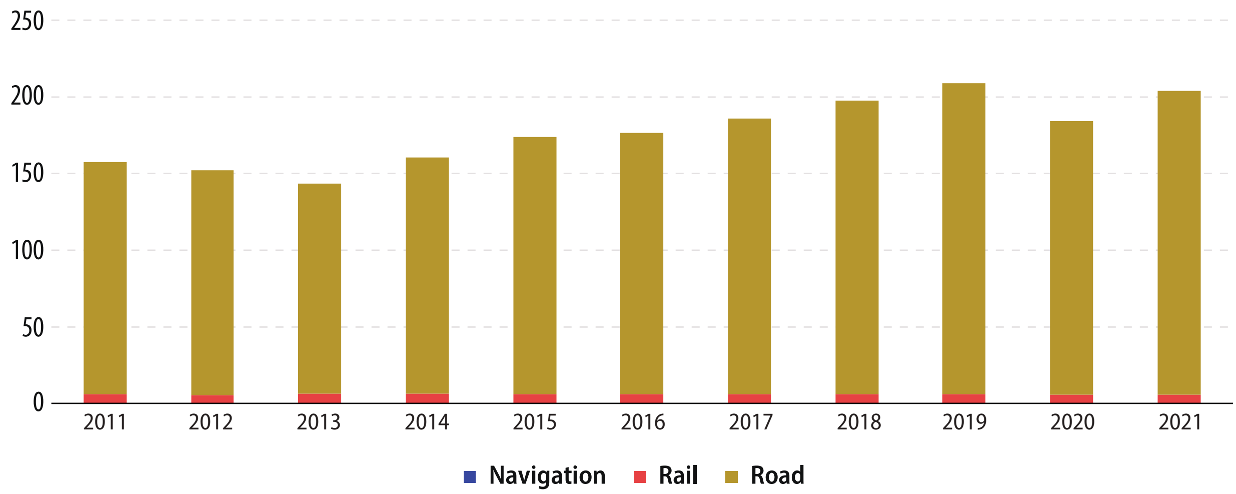
The energy consumption in the residential sector of Hungary oscillated between 230 PJ and 275 PJ over the period 2011-2021. The breakdown in energy consumption by end-use is only available from 2015 onward, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the small decrease in population dragged down the energy consumption by about 5 PJ, meanwhile the dwelling occupancy decreased leading to an additional 11 PJ of energy consumption. A decrease of about 12 PJ was due to the decrease in energy consumption per dwelling, which may be partly explained by the absence of temperature correction for the year 2011. There were slightly more heating degree days in 2021 than in 2011, however, since the temperature correction could not be calculated for 2011, the weather effect between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

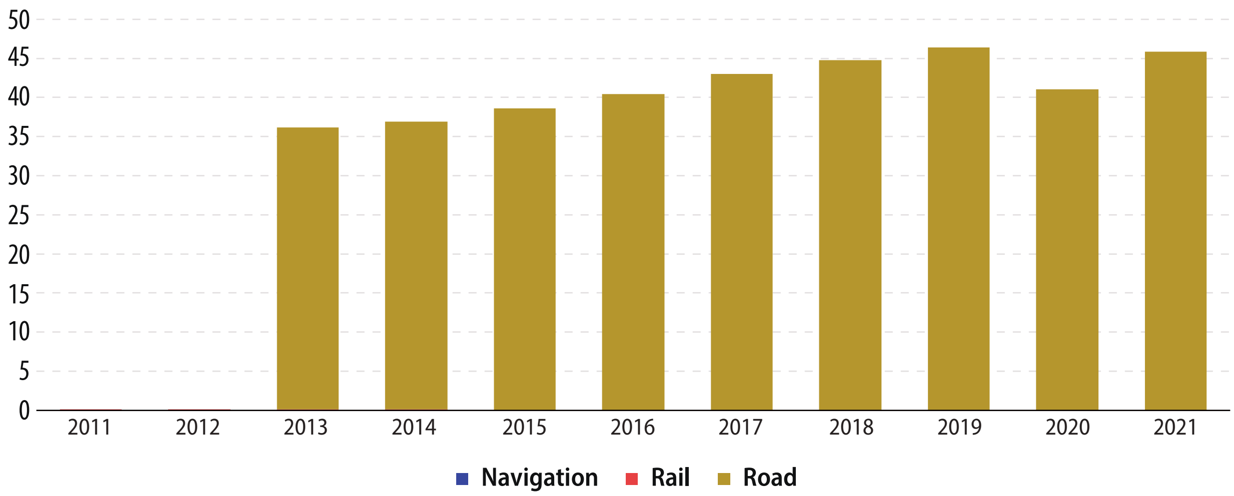


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

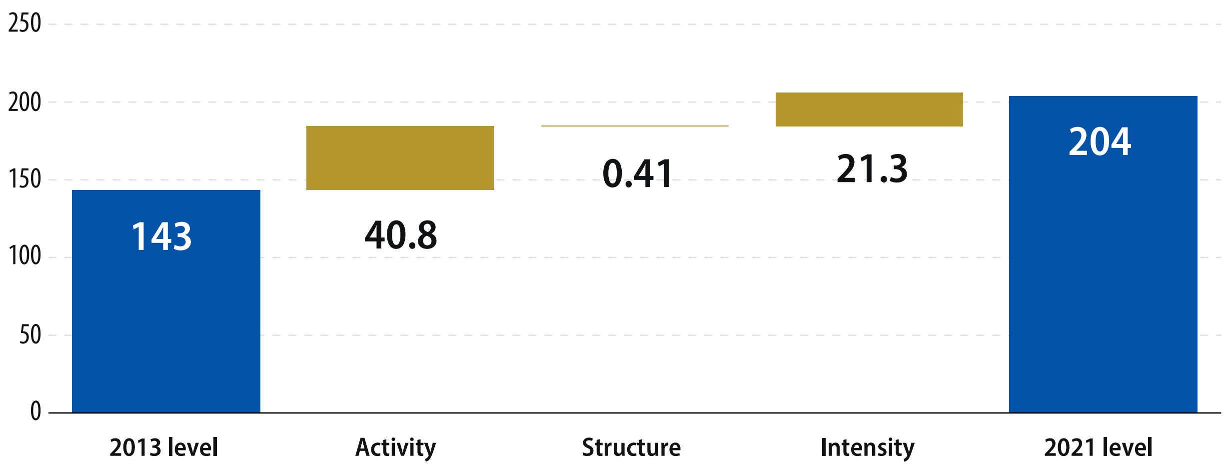


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

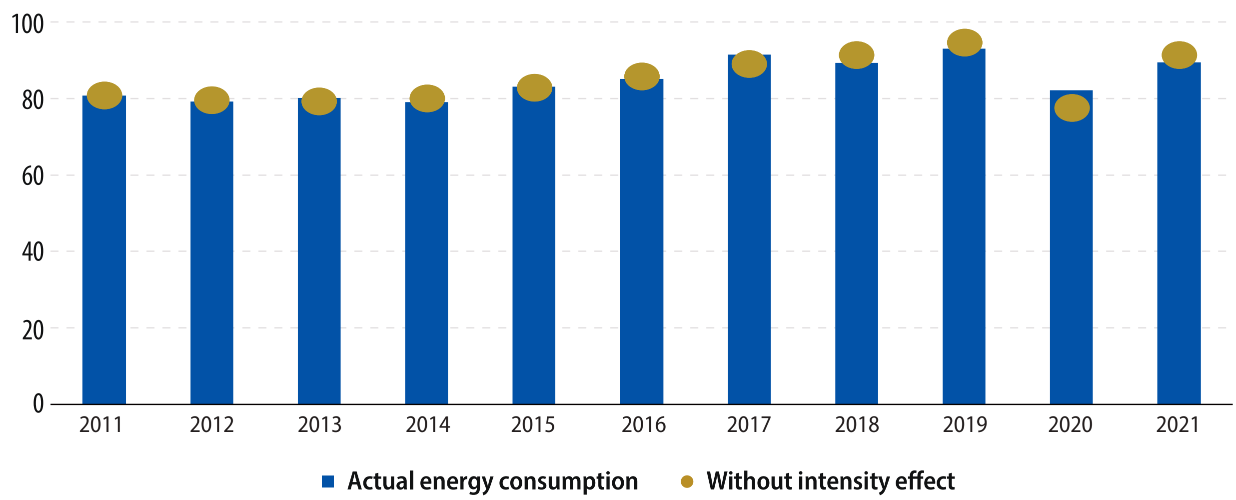


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Hungarian transport sector decreased from 158 PJ in 2011 and 143 PJ in 2013, before increasing steadily until 2019 when it reached 209 PJ, and then it dropping to 184 PJ in 2020, to bounce back in 2021 to 204 PJ. Most of the energy consumption was due to road transport. Unfortunately, road traffic was not available prior to 2013, therefore the decomposition had to be performed between the years 2013 and 2021. Road traffic increased from 36 billion VKM in 2013 to 46 billion VKM in 2019, before dropping to 41 billion VKM in 2020, and then bouncing back to 46 billion VKM in 2021. Between 2013 and 2021, the most significant driver of energy consumption was the strong increase in traffic which caused an increase in energy consumption of almost 41 PJ. In addition, the increase in energy intensity caused an additional 21 PJ of energy consumption. With the absence of variation in the share of the different transport modes, the structural effect was almost insignificant. Without the increase in intensity, the energy consumption in the sector would have been 10 % lower in 2021.

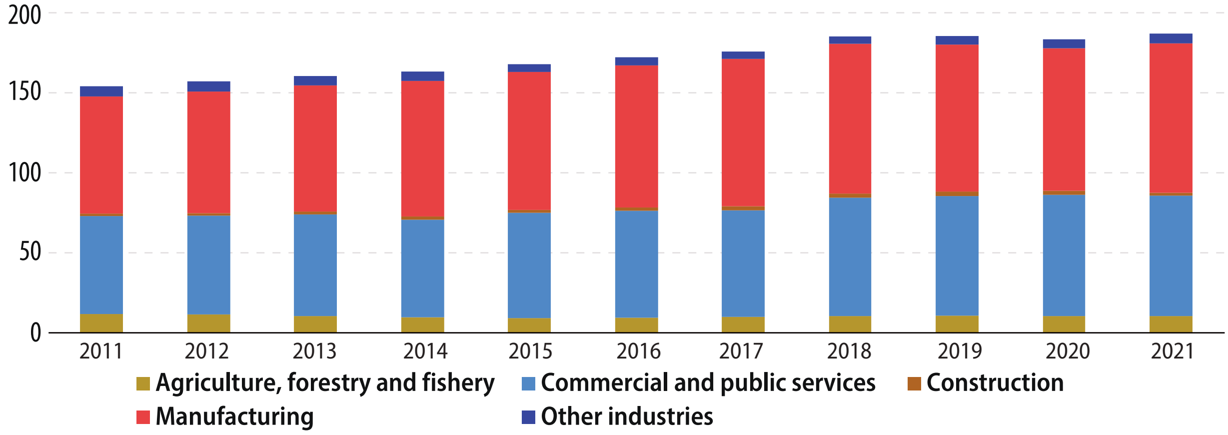
Ireland

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

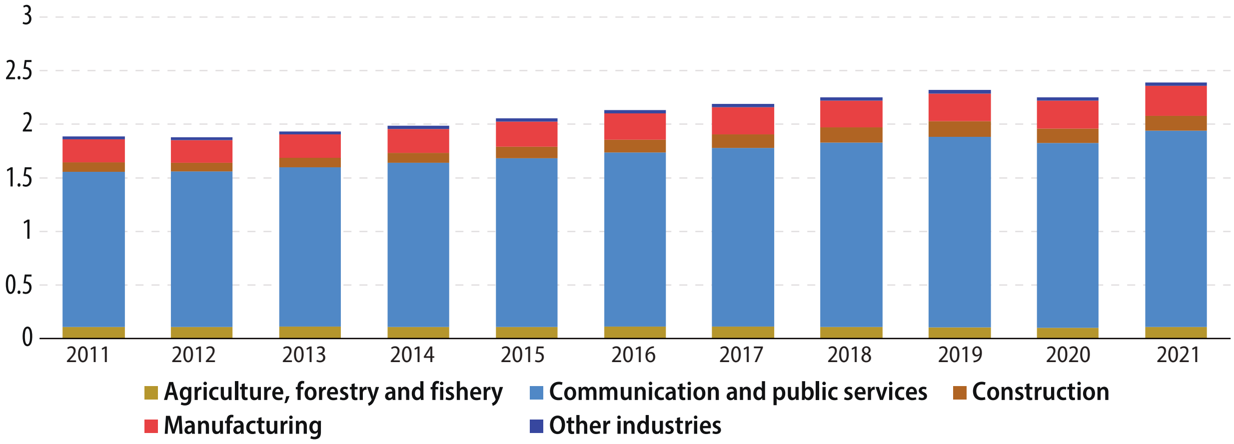


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

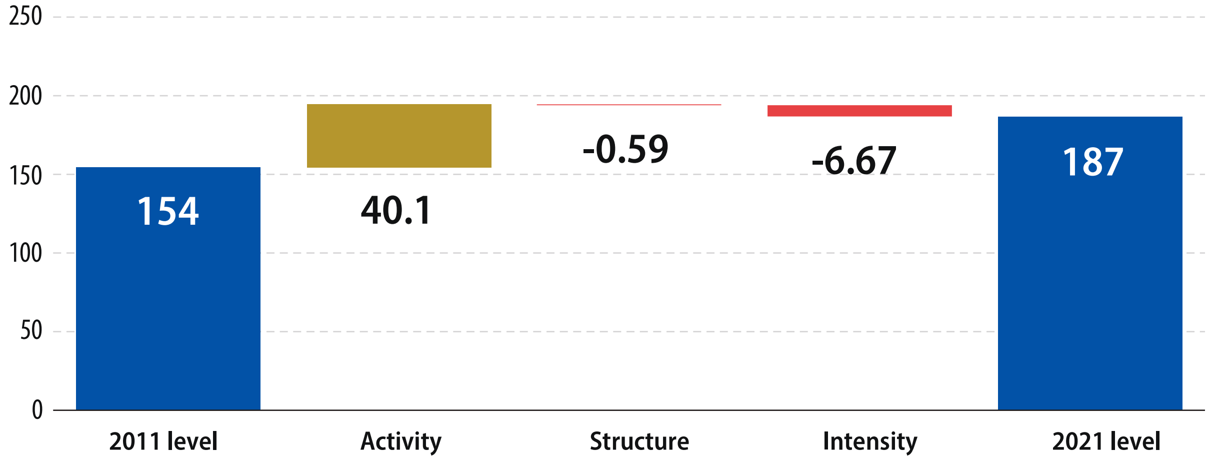


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

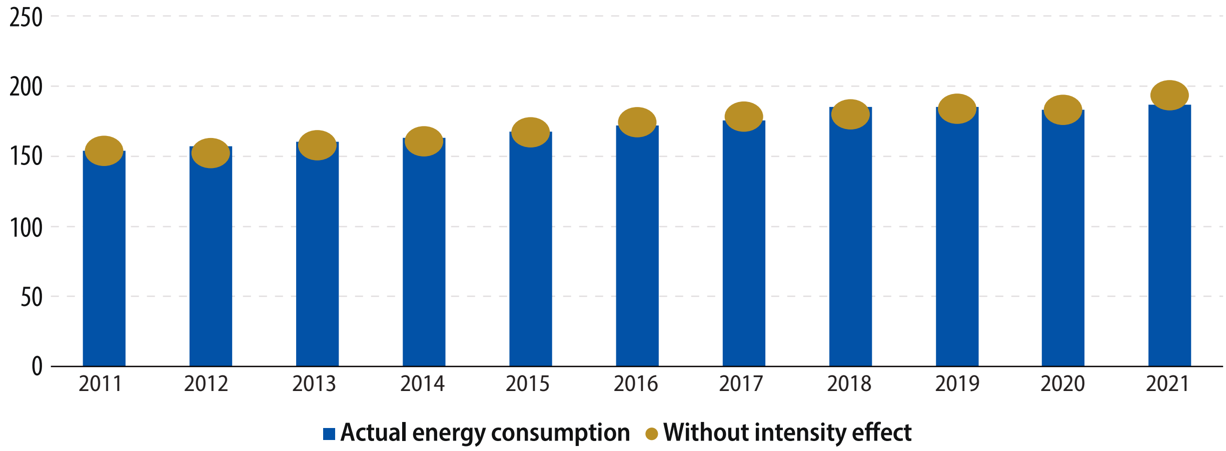


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

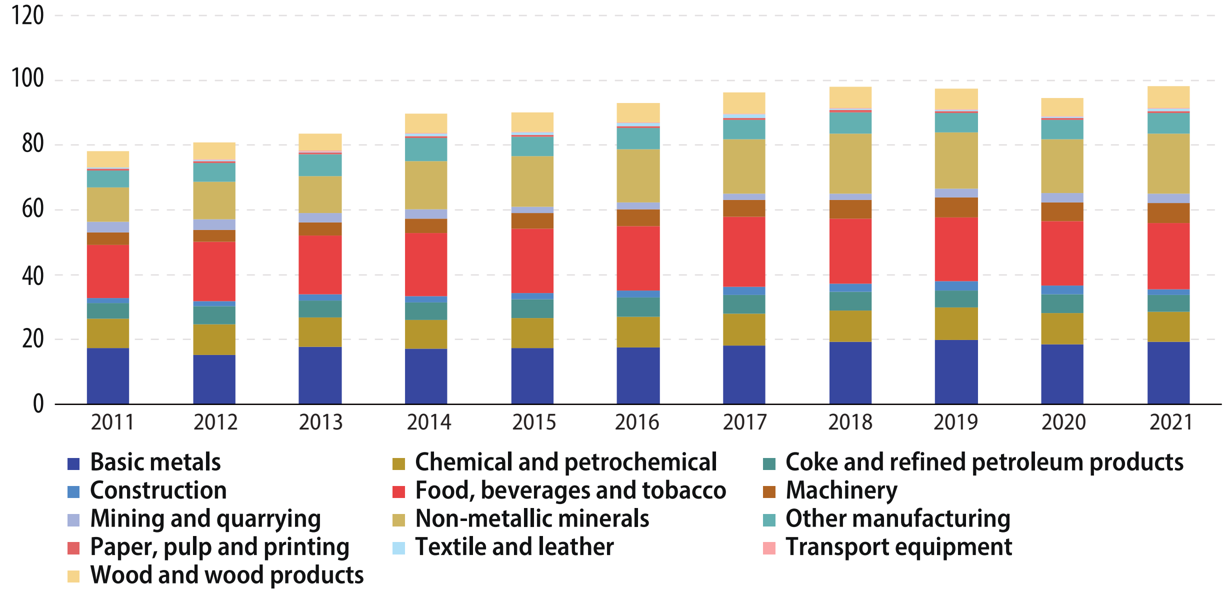
The final energy consumption of the different sectors of the Irish economy increased from 154 PJ in 2011 to 185 PJ in 2019, before a slight drop to 183 PJ in 2020, and a comeback to almost 187 PJ in 2021. The active population steadily increased from 1.9 million in 2011 to almost 2.4 million in 2021, despite a small drop in 2020. Between 2011 and 2021, the increase in activity (measured in terms of employees) brought energy consumption up by more than 40 PJ, while the structural changes in the economy had almost no effect (below 1 PJ of decrease). Finally, the decrease in intensity (measured as energy consumption per employee) brought energy consumption down by about 6.7 PJ. Without this decrease, energy consumption would have been almost 4 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

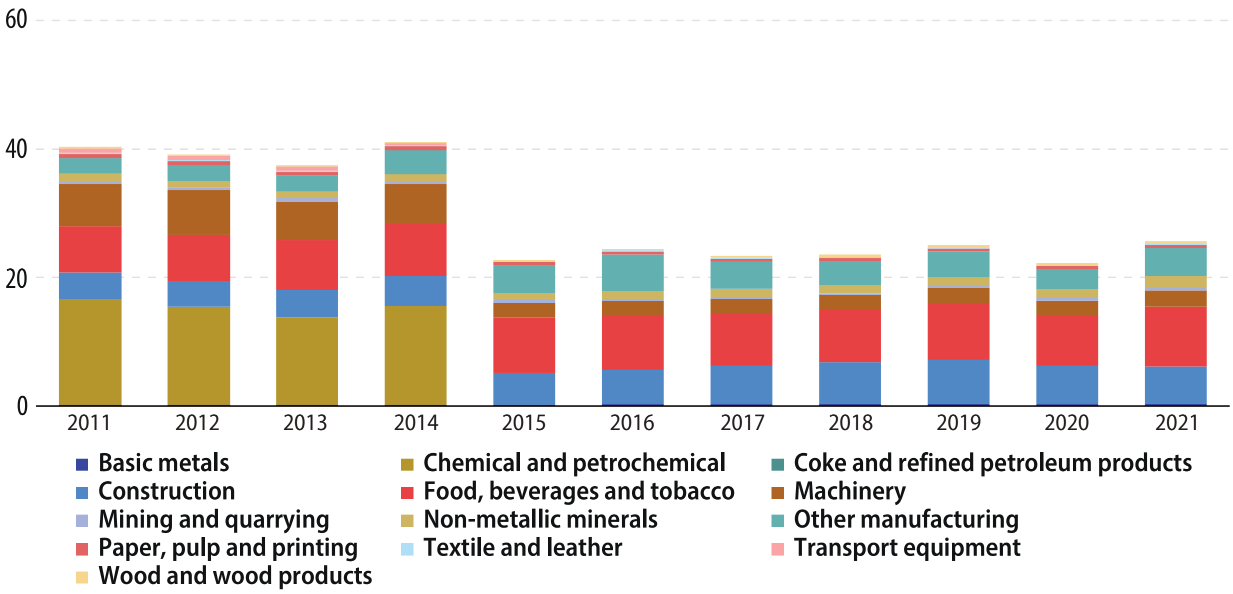


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

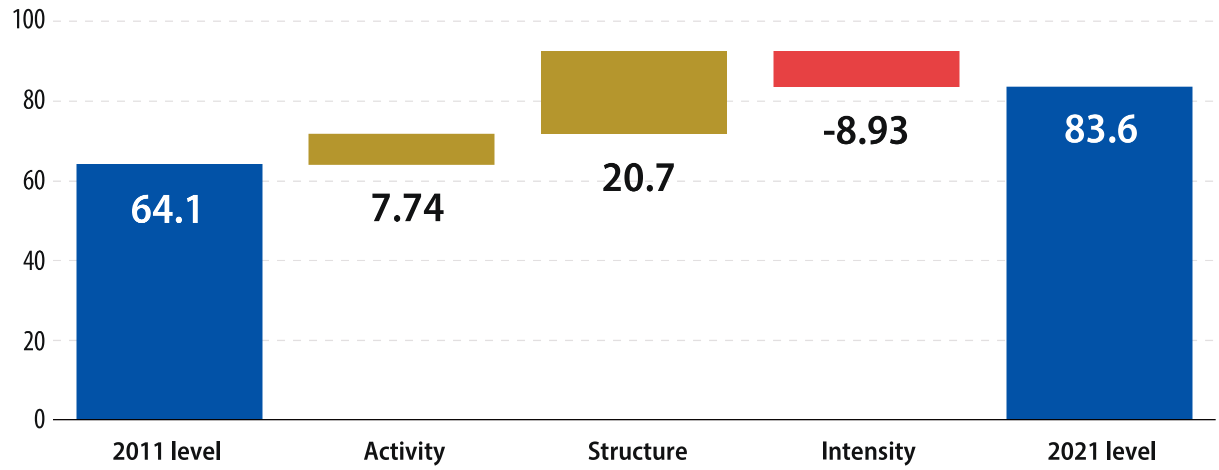


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

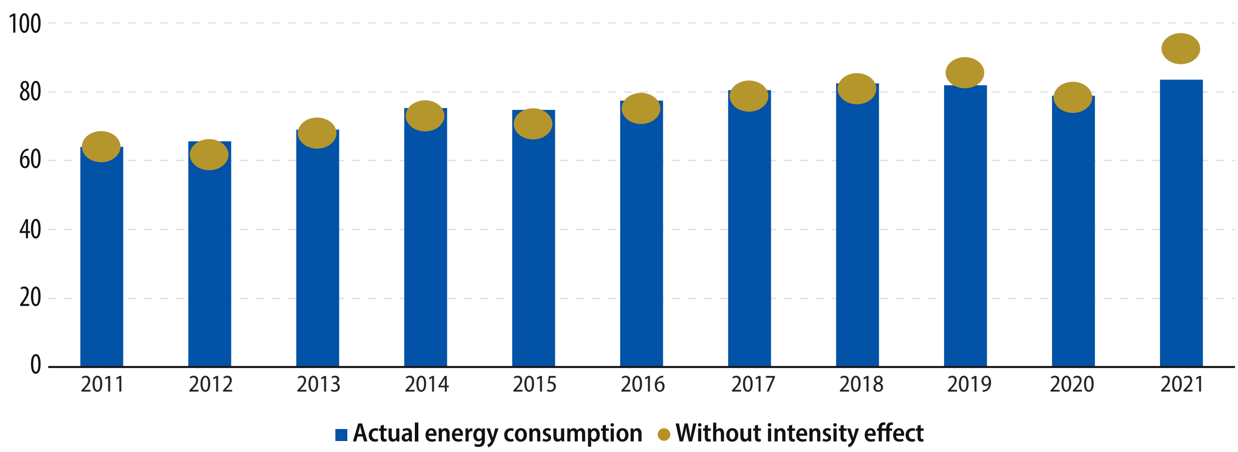


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

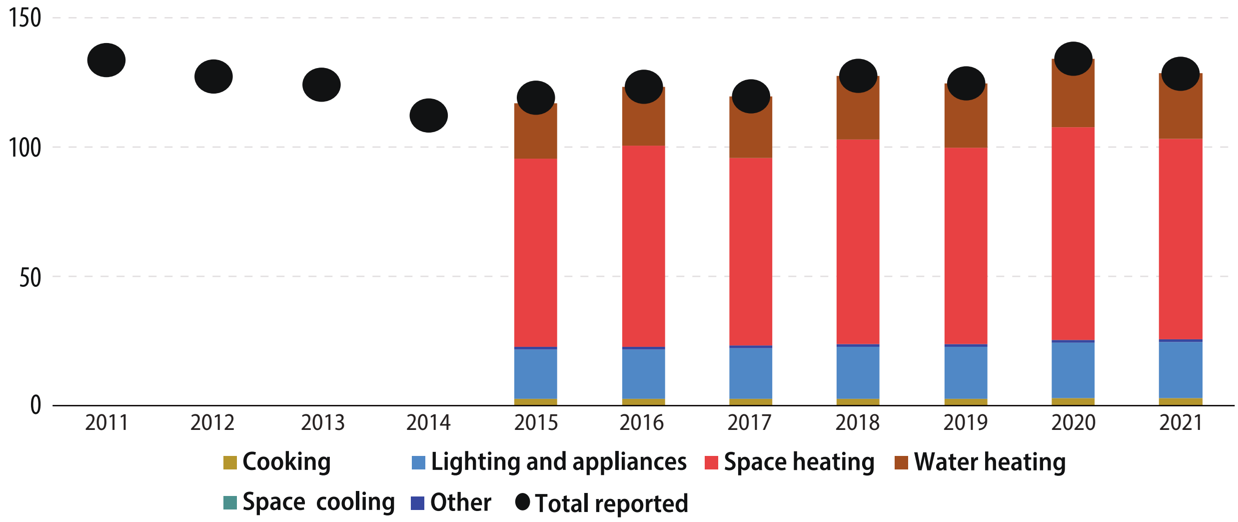
The Irish energy consumption in the manufacturing industries increased steadily from 78.2 PJ in 2011 to 98.0 PJ in 2019, then it started to decrease and reached 94.5 PJ in 2020, before bouncing back to 98.1 PJ in 2021, its highest level over the studied period. From 2015 onward, the gross value added was not available for the sectors transport equipment and chemical and petrochemicals, consequently these sectors were excluded from the decomposition. For the remaining sectors, the GVA grew from 23.1 billion EUR in 2011 to 25.1 billion EUR in 2019, before dropping to 22.2 billion EUR in 2020, and then climbing back up to its highest level at 25.6 billion EUR in 2021. Between 2011 and 2021, the increase in activity in the sectors covered brought energy consumption up by almost 7.7 PJ. The most important driver however was the structural changes in the economy which caused an increase of about 20.7 PJ of consumption, partly due to a higher share of the construction sector (from 17 % to 27 % of the value added included in the analysis between the two years). Finally, the decrease in overall energy intensity brought down consumption by almost 9 PJ. Without this decrease, the energy consumption in the industry sectors covered would have been almost 11 % higher in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

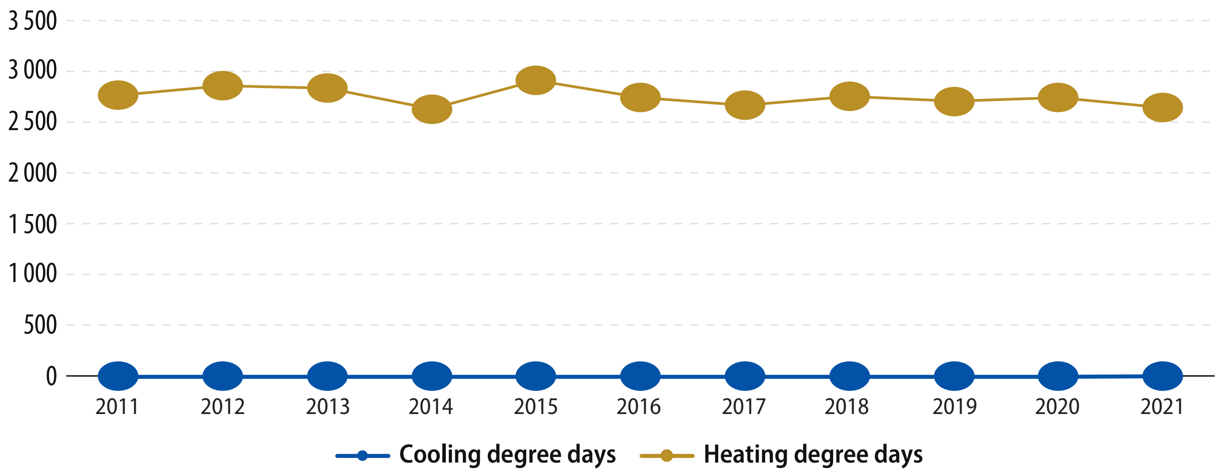
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

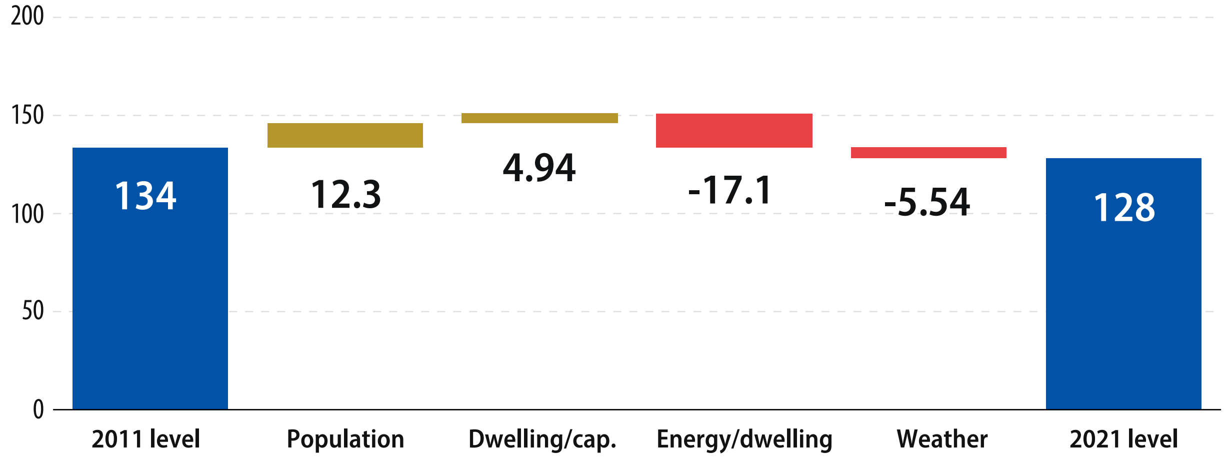


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

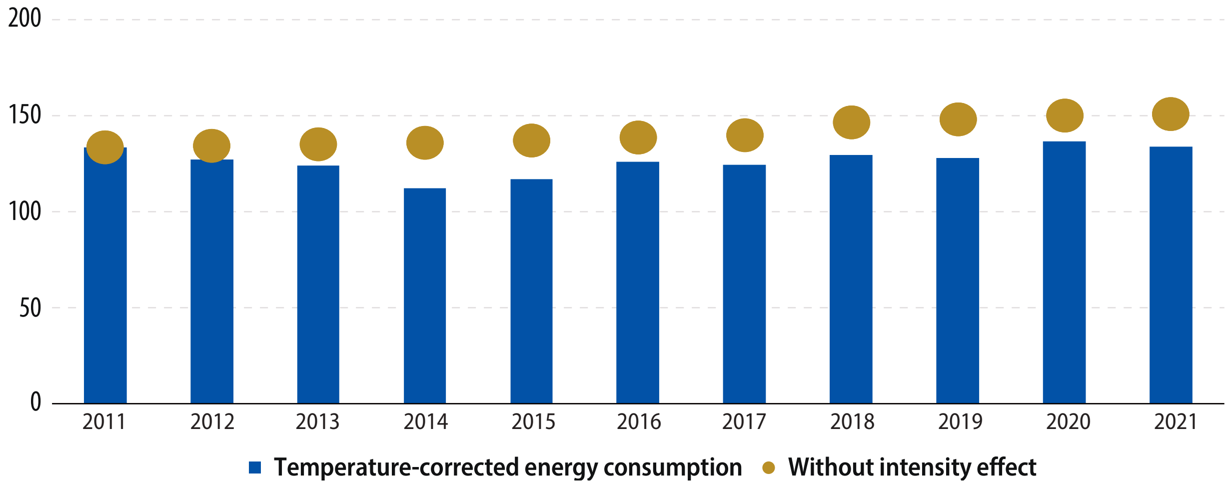


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

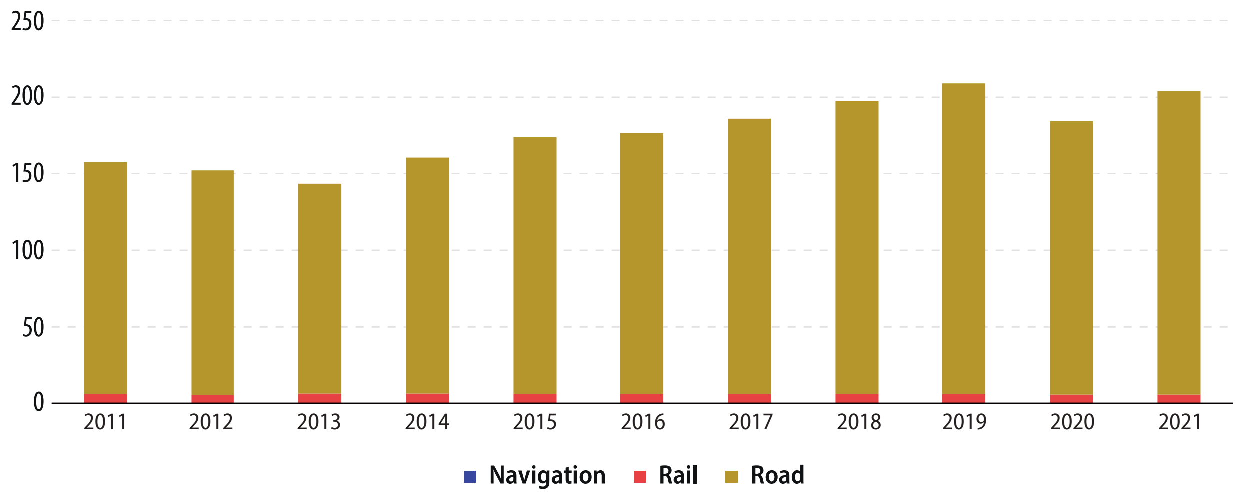
The energy consumption in the residential sector of Ireland oscillated between 112 PJ and 134 PJ over the period 2011-2021. The breakdown in energy consumption by end-use is only available from 2015, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the increase in population drove up the energy consumption by about 12 PJ, and the dwelling occupancy decrease brought it further up by almost 5 PJ. A decrease of about 17 PJ was due to the decrease in energy consumption per dwelling, which may be partly explained by the absence of temperature correction for the year 2011. There were slightly less heating degree days in 2021 than in 2011, however since the temperature correction could not be calculated for 2011, the weather effect between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

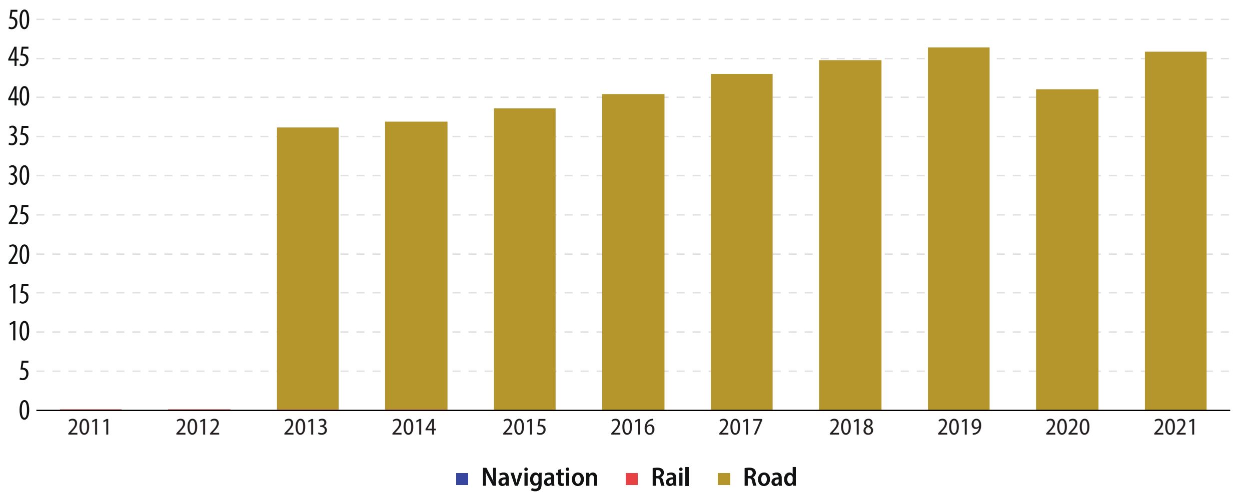


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

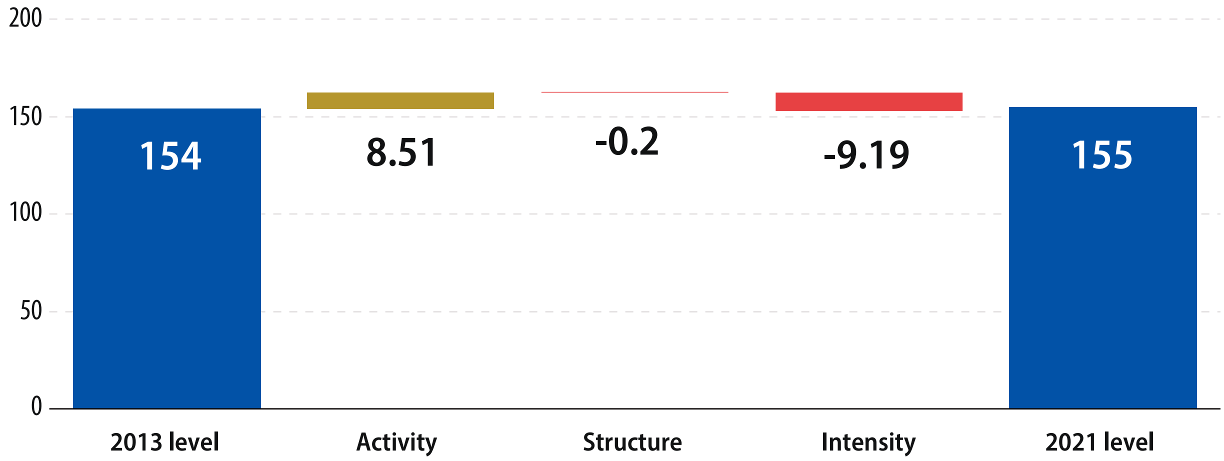


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

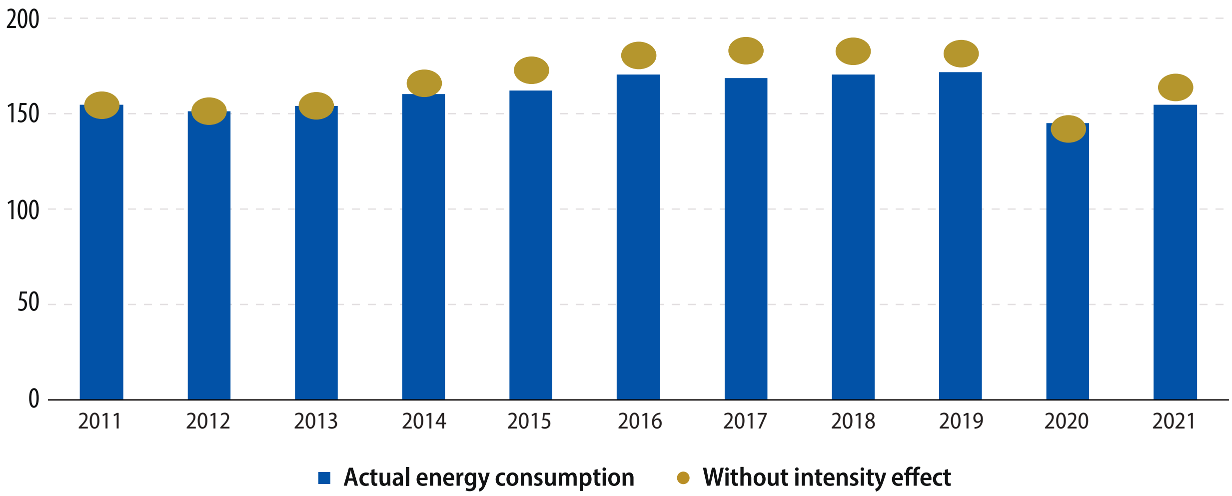


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Irish transport sector increased from 155 PJ in 2011 to 172 PJ in 2019, before dropping to 145 PJ in 2020, and it was still only 155 PJ in 2021. Most of the energy consumption is due to road transport. Unfortunately, road traffic was not available prior to 2013, therefore the decomposition had to be performed between 2013 and 2021. Road traffic increased from almost 40 billion VKM in 2013 to 47 billion VKM in 2019, before dropping to 36 billion VKM in 2020, and it was just below 42 billion VKM in 2021. Between 2013 and 2021, the small increase in traffic caused an increase in energy consumption of about 8.5 PJ. Meanwhile, the decrease in energy intensity caused a decrease of about 9 PJ of energy consumption. Because of the absence of variation in the share of the different transport modes, the structural effect was almost insignificant. Without the increase in intensity, the energy consumption in the sector would have been 6 % higher in 2021.

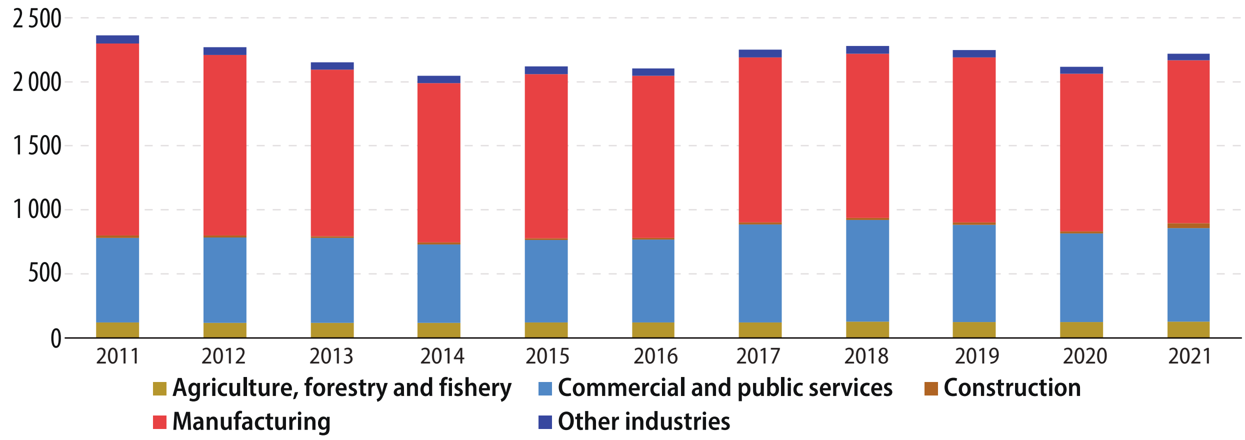
Italy

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

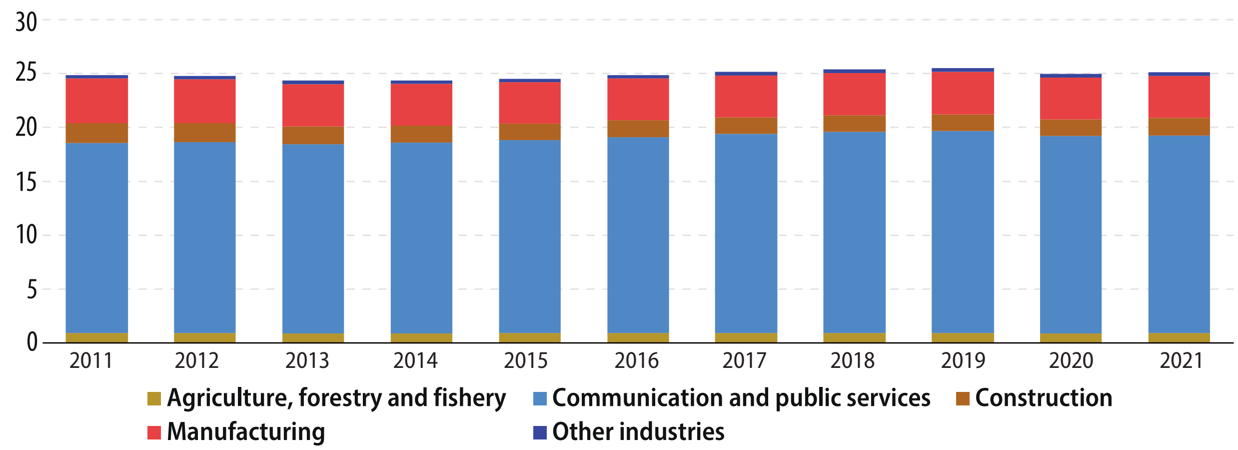


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

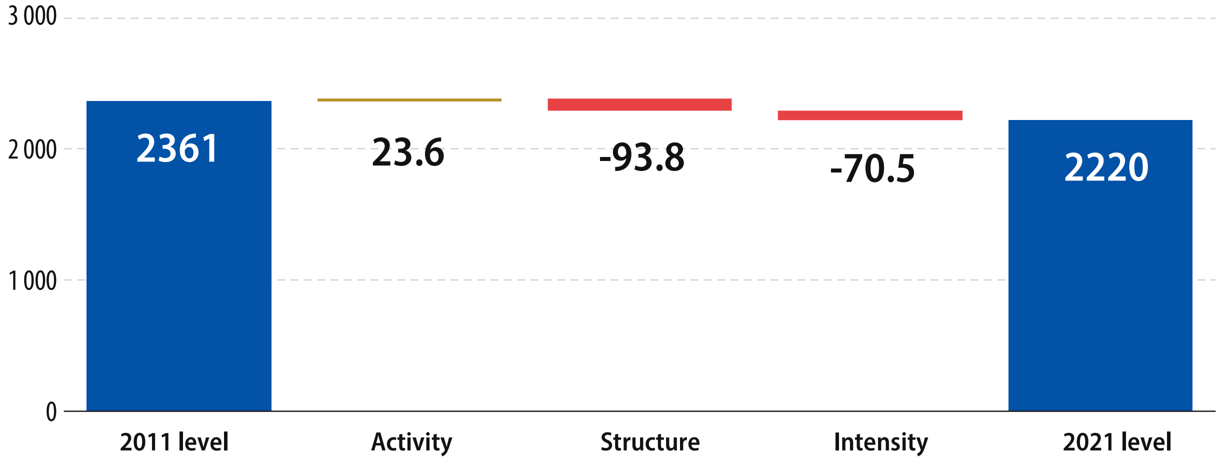


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

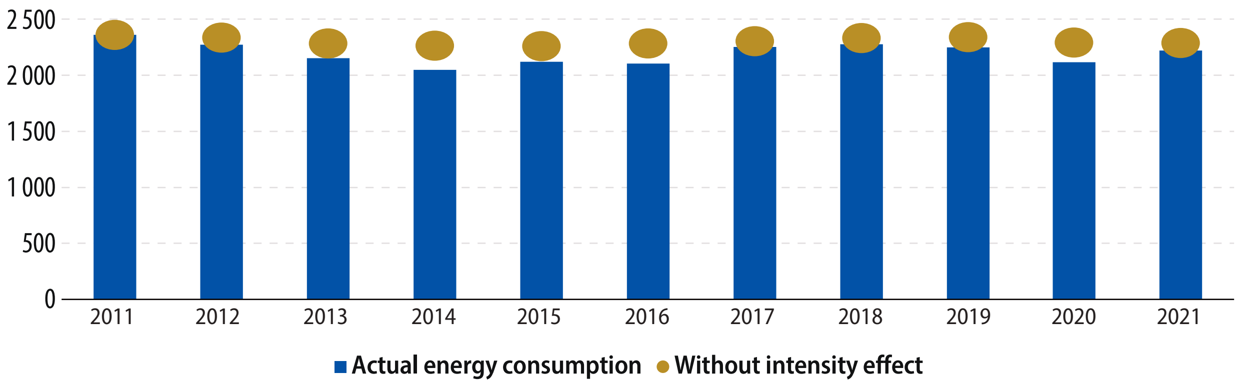


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

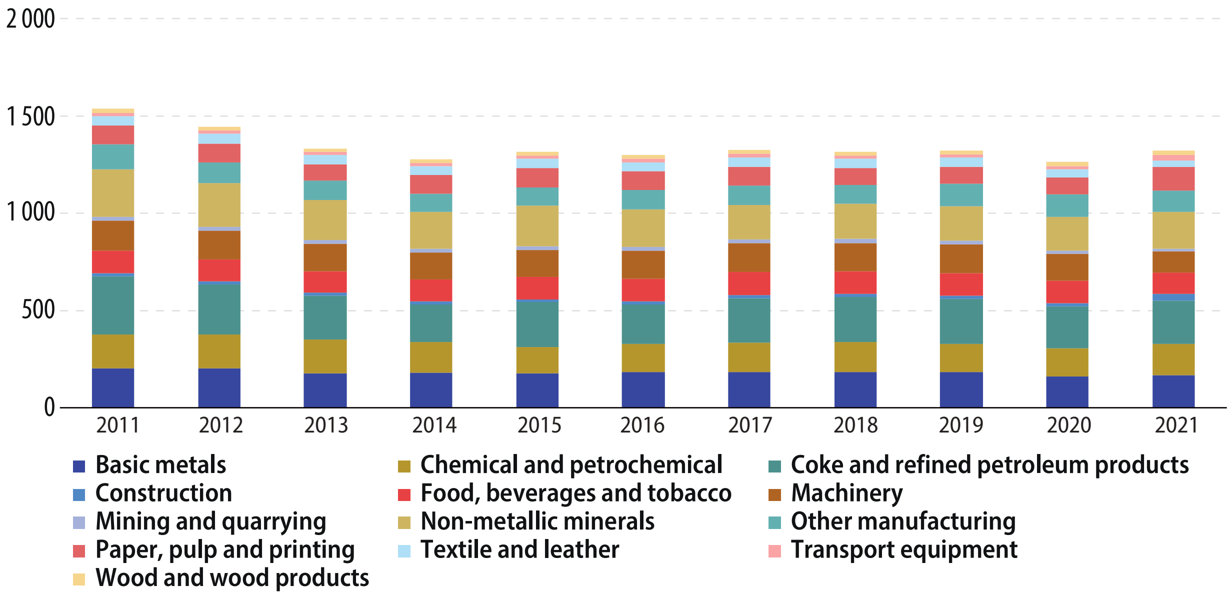
Between 2011 and 2021, the final energy consumption of the different sectors of the Italian economy oscillated between 2 047 PJ and 2 361 PJ. The active population was also very stable and remained within 24.3 and 25.5 million. Between the start and the end of the studied period, the increase in activity (measured in terms of employees) brought energy consumption up by almost 23.6 PJ, while the structural changes in the economy had a significant decreasing effect, bringing down the consumption by almost 94 PJ. This was mostly due to the increasing weight of the commercial and public services sector (from 71 % to 73 % of the employment over the period) at the expanse of the manufacturing sector (from 17 % to 15 %). Finally, the decrease in energy consumption per employee brought energy consumption down further by about 70.5 PJ. Without this decrease, energy consumption would have been 3 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

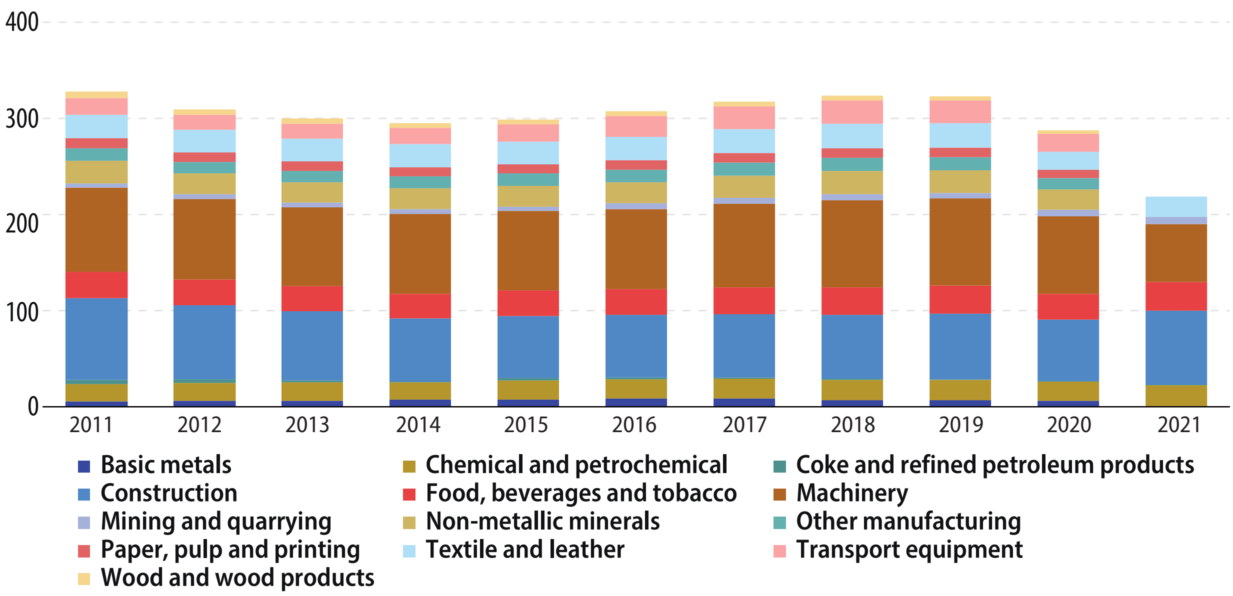


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

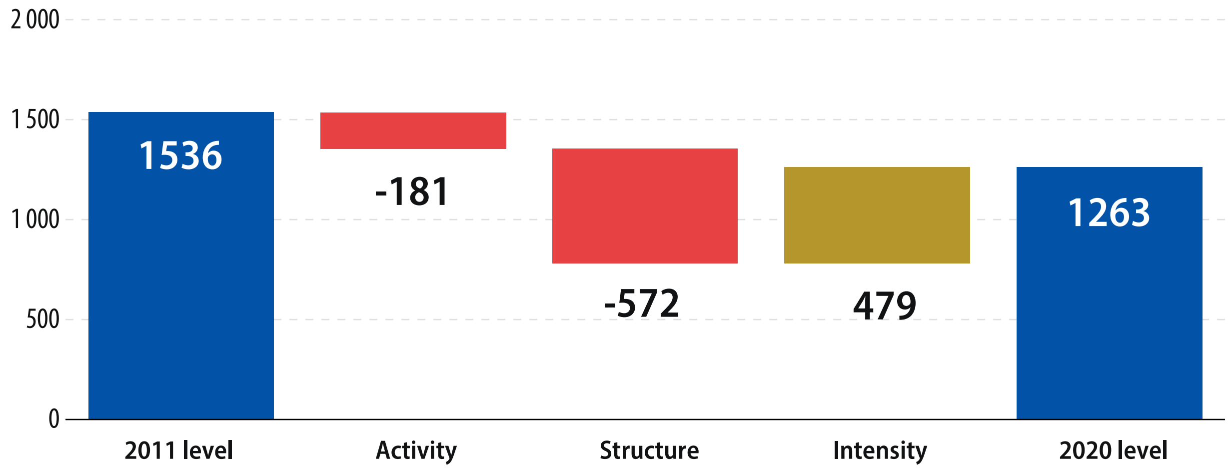


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

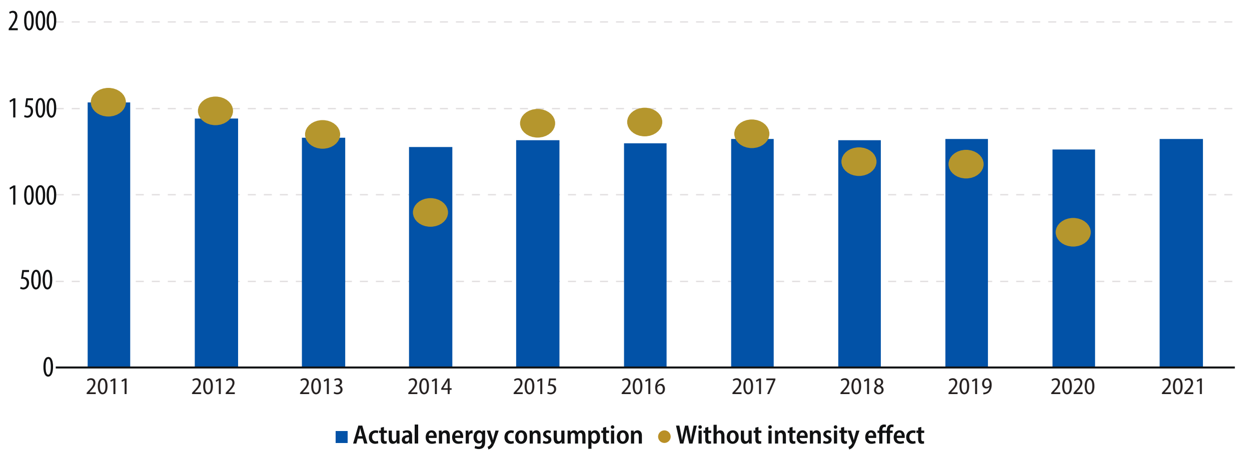


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

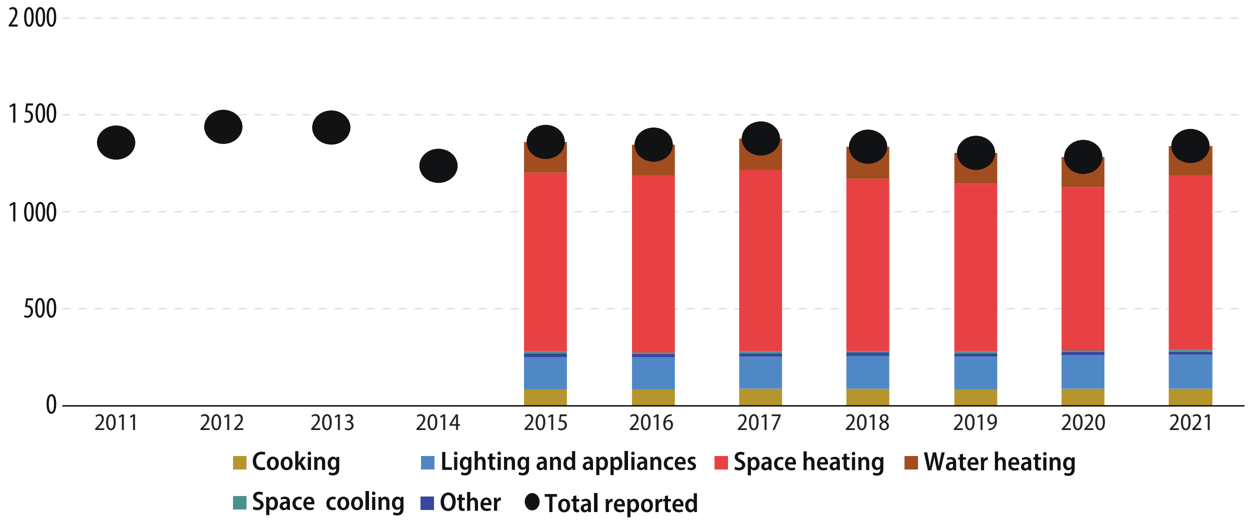
The Italian energy consumption in the manufacturing industries sector decreased from 1 536 PJ in 2011 to 1 276 PJ in 2014, then it increased slowly to reach 1 323 PJ in 2019, before dropping to 1 263 PJ in 2020, and then bouncing back to 1 323 PJ in 2021, its highest level over the studied period. The corresponding gross value added also decreased from 327 billion EUR in 2011 to 295 billion EUR in 2014, before growing to 323 billion EUR in 2019, and then dropping to 288 billion EUR in 2020. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the period 2011-2020. Between these two years, the reduction in activity brought down the consumption of energy by about 181 PJ. The most important driver, however, was the structural changes in the industries which caused a decrease of about 572 PJ of consumption, partly due to a lower share of the construction sector (from 26 % to 22 % of the value added between the two years). Finally, the increase in overall energy intensity in the different sectors brought consumption up by 479 PJ. Without this increase, the energy consumption in the industry sectors covered would have been almost 38 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

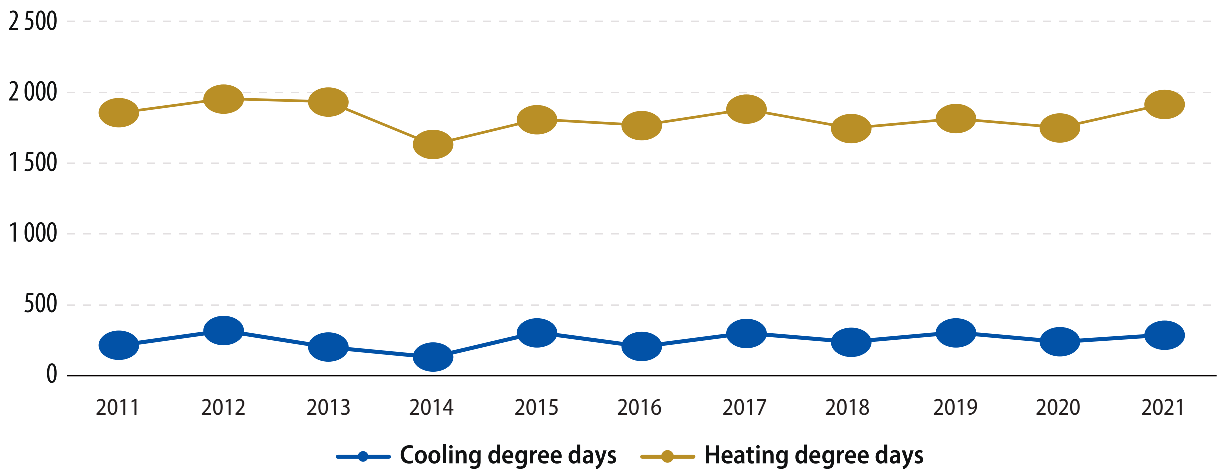
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

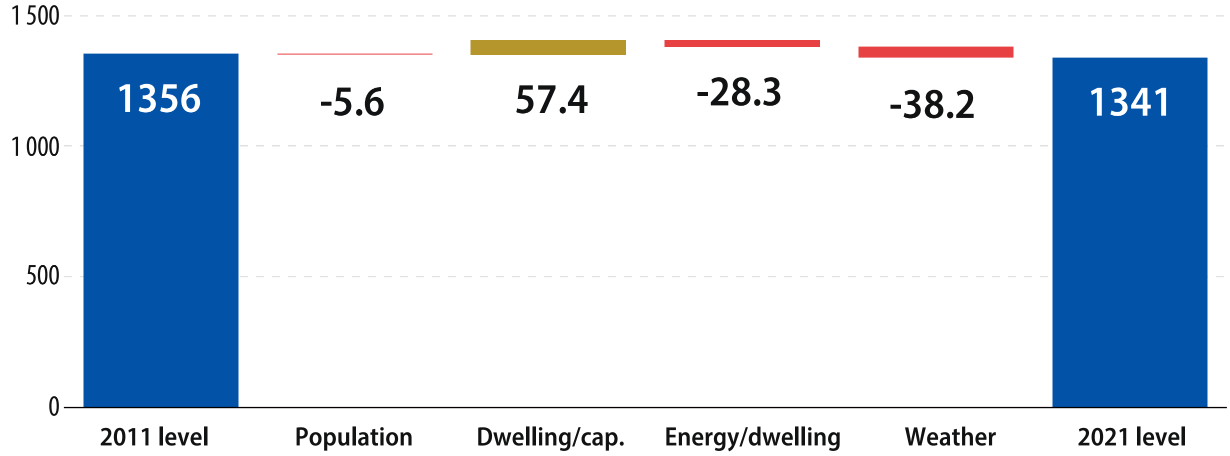


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 12

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

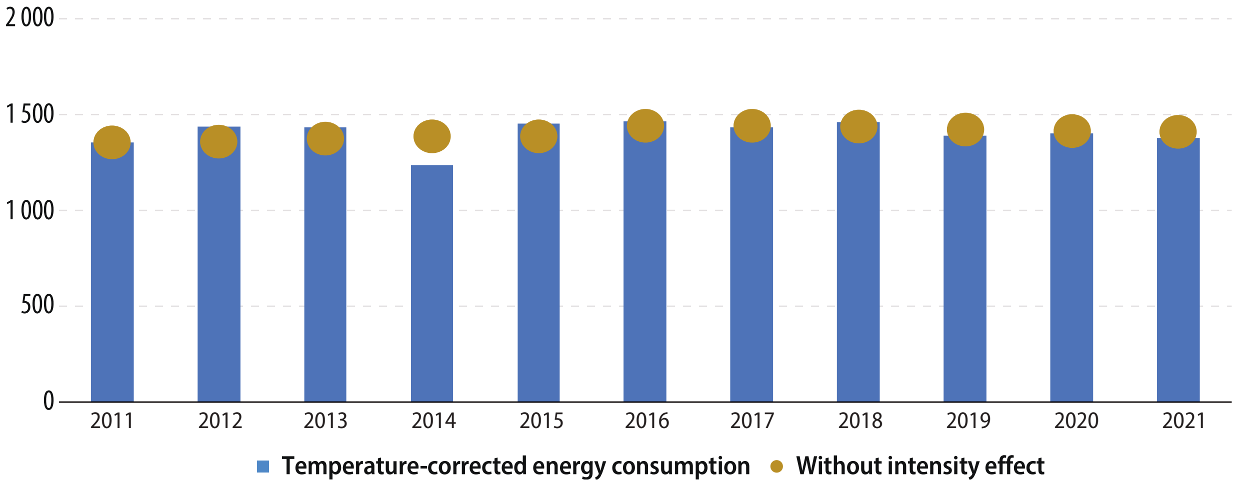


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 11

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

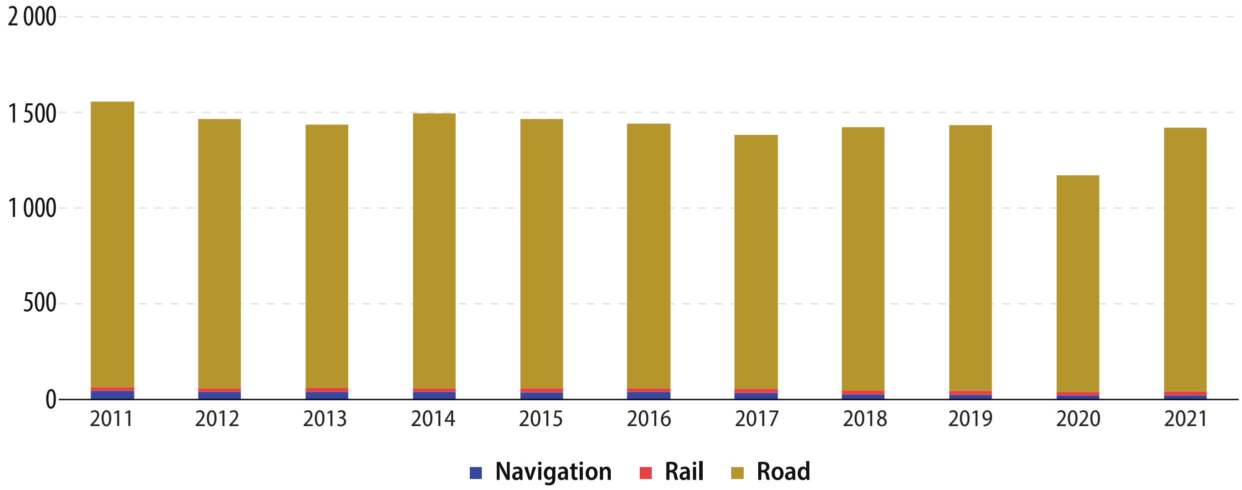
The energy consumption in the residential sector of Italy oscillated between 1 237 PJ and 1 438 PJ over the period 2011-2021. The breakdown in energy consumption by end-use is only available from 2015, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the small decrease in population brought down the energy consumption by almost 6 PJ, while the dwelling occupancy decrease brought it up by 57 PJ. A decrease of about 28 PJ was due to the decrease in energy consumption per dwelling, which may be partly explained by the absence of temperature correction for the year 2011. There were slightly more heating degree days in 2021 than in 2011, however since the temperature correction could not be calculated for 2011, the weather effect between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

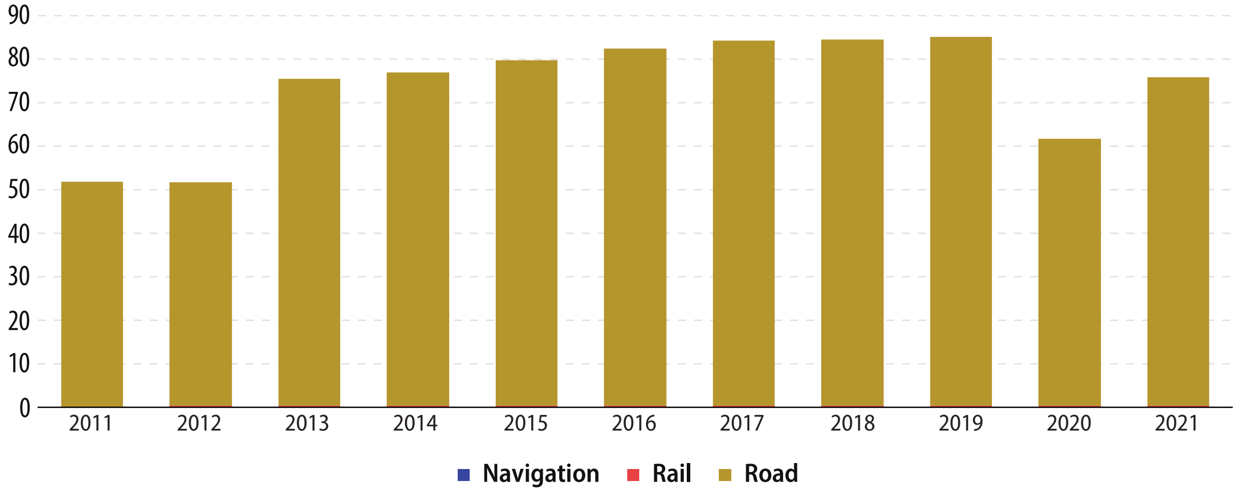


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

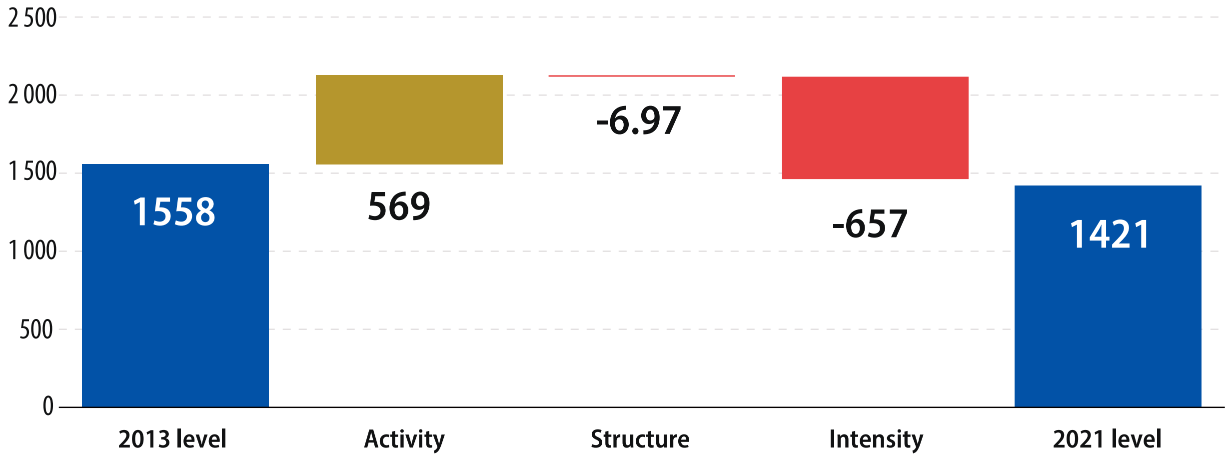


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

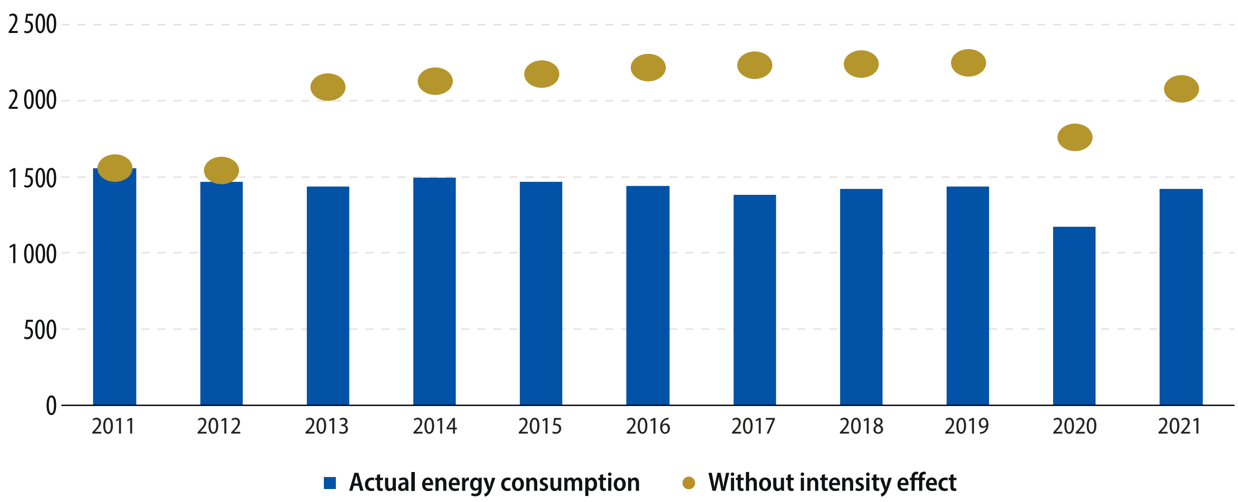


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

Between 2011 and 2021, the energy consumption in the Italian transport sector oscillated between 1 383 PJ and 1 558 PJ, except in 2020 where it dropped to 1 172 PJ. Most of the energy consumption is due to road transport. The reported road traffic increased from almost 52 billion VKM in 2011 to 85 billion VKM in 2019, before dropping to 61 billion VKM in 2020, and it was still below 76 billion VKM in 2021. Between 2011 and 2021, the increase in traffic caused an increase in energy consumption of about 569 PJ. It was offset by the decrease in energy intensity, which caused a decrease of about 657 PJ of energy consumption. Due to the absence of significant variation in the share of the different transport modes, the structural effect was relatively small (-6 PJ). Without the decrease in intensity, the energy consumption in the sector would have been 46 % higher in 2021.

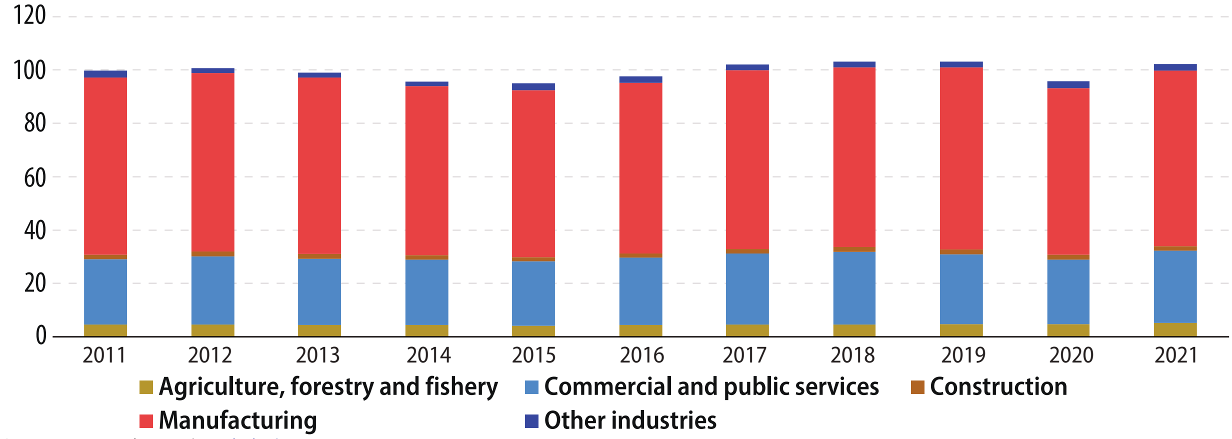
Lithuania

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

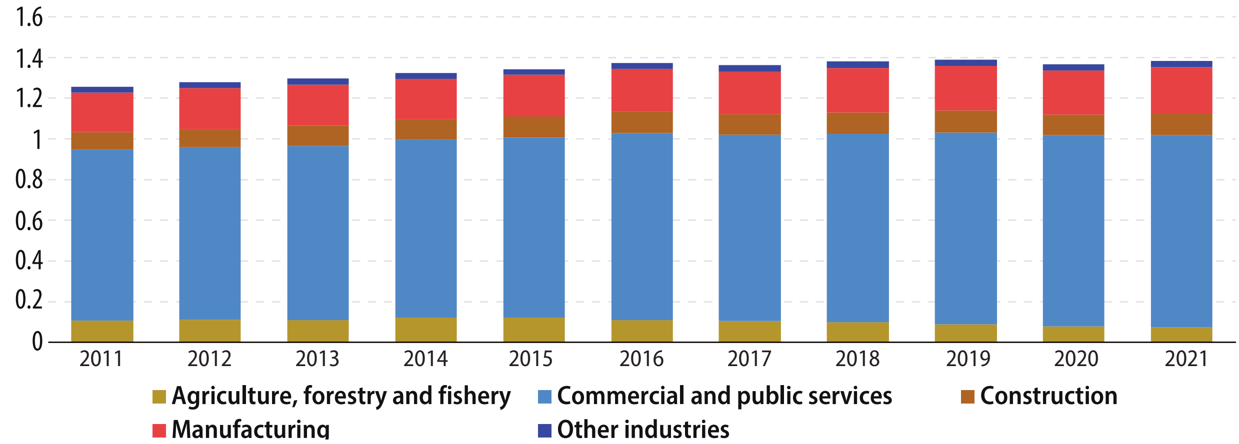


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

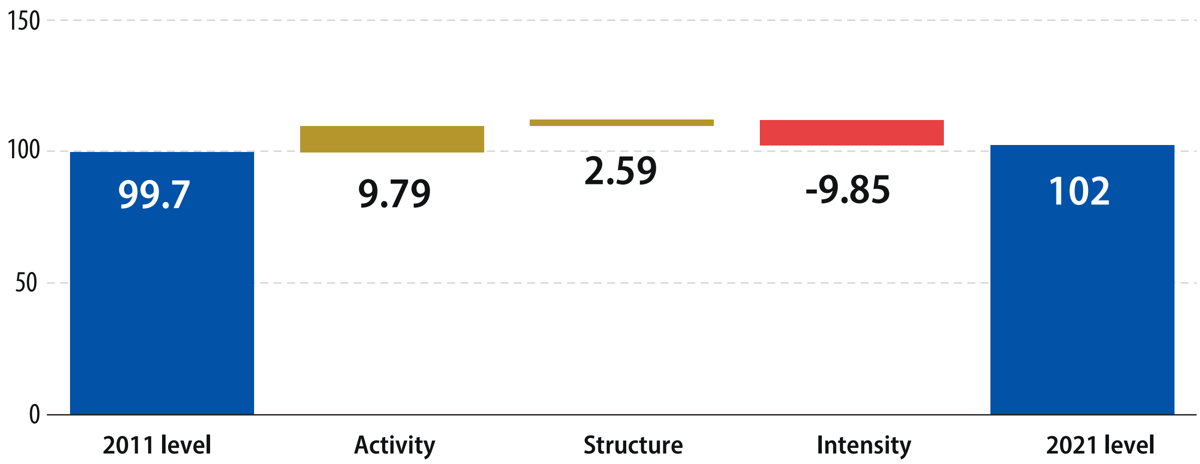


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

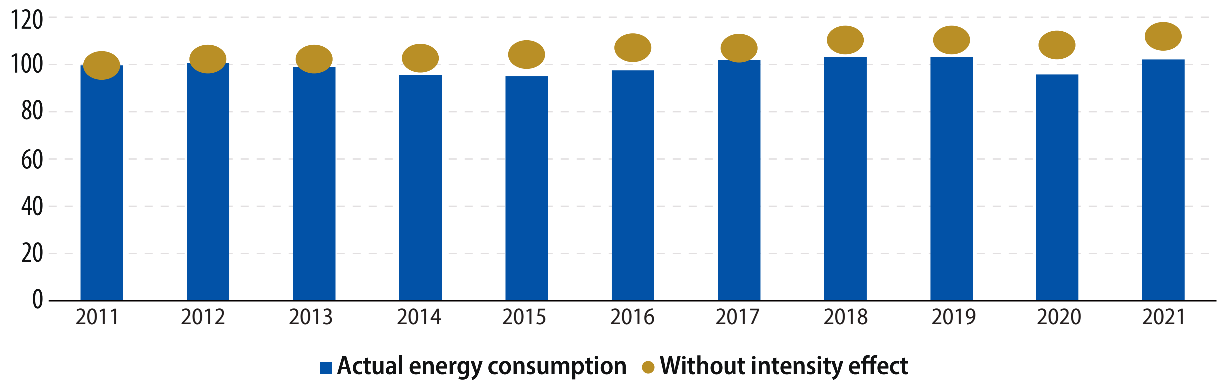


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

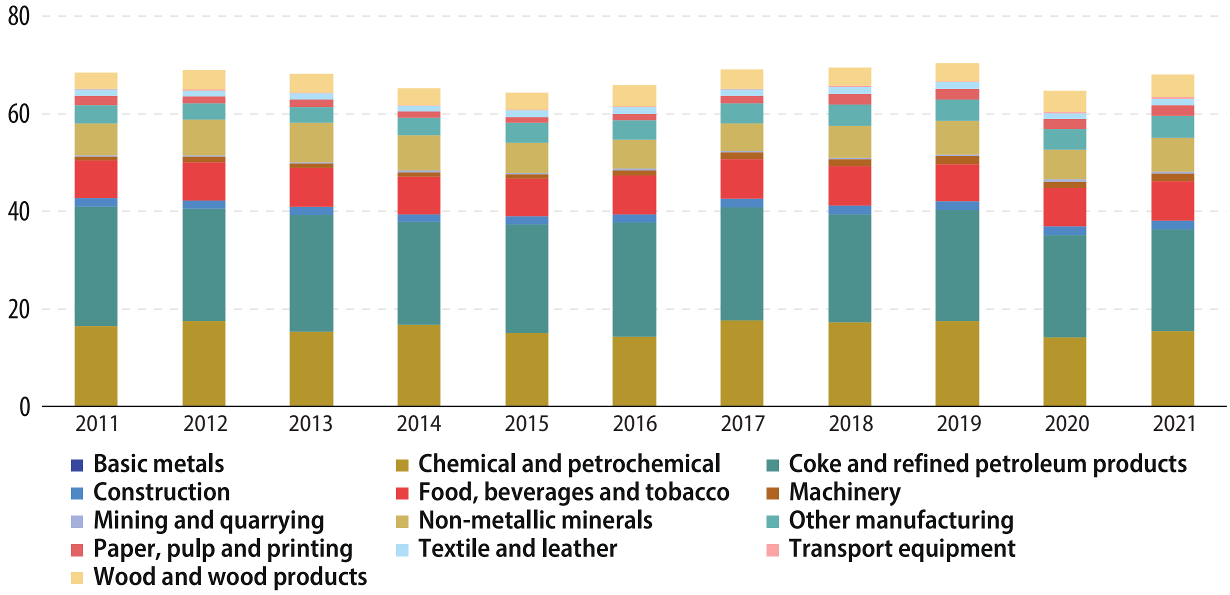
At the level of the whole economy, the final energy consumption of the different sectors was also quite stable between 2011 and 2021 and remained within 95 PJ and 103 PJ. Meanwhile, the active population steadily increased from 1.26 million in 2011 to 1.37 million in 2016, then it stabilised, and it was around 1.38 million in 2021. Over the period 2011-2021, the increase in activity (measured in terms of employees) brought energy consumption up by about 9.8 PJ. This was offset by the decrease in energy consumption per employee, which caused energy consumption to decrease by about 9.9 PJ. Finally, the structural changes in the economy brought energy consumption down by about 2.6 PJ. Without the decrease in energy consumption per employee, energy consumption would have been almost 10 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

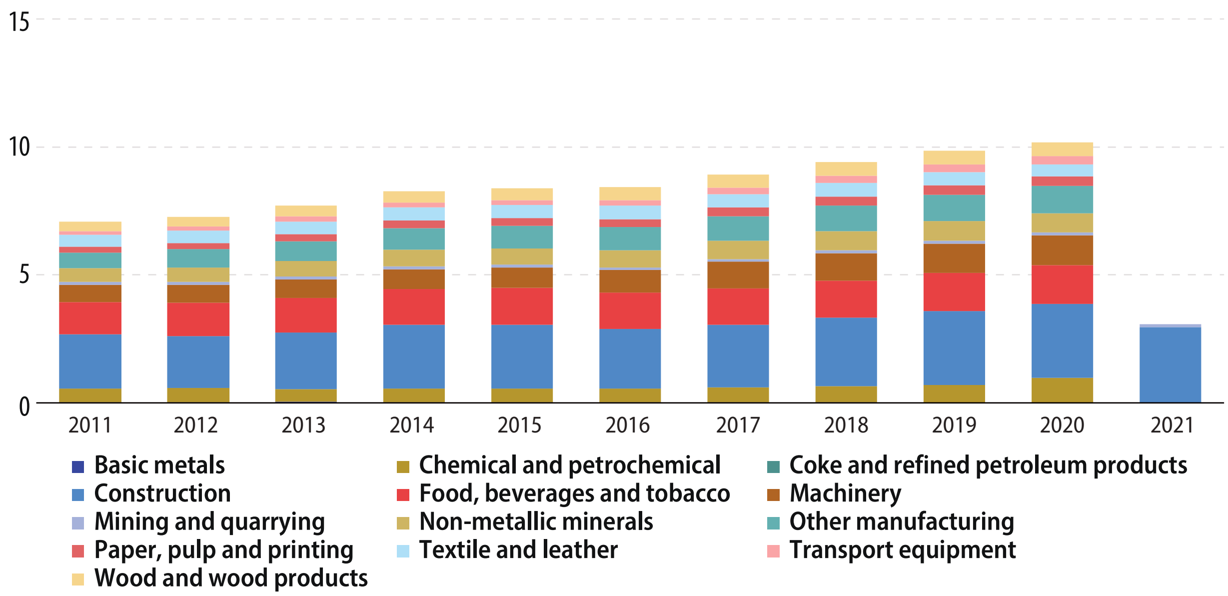


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

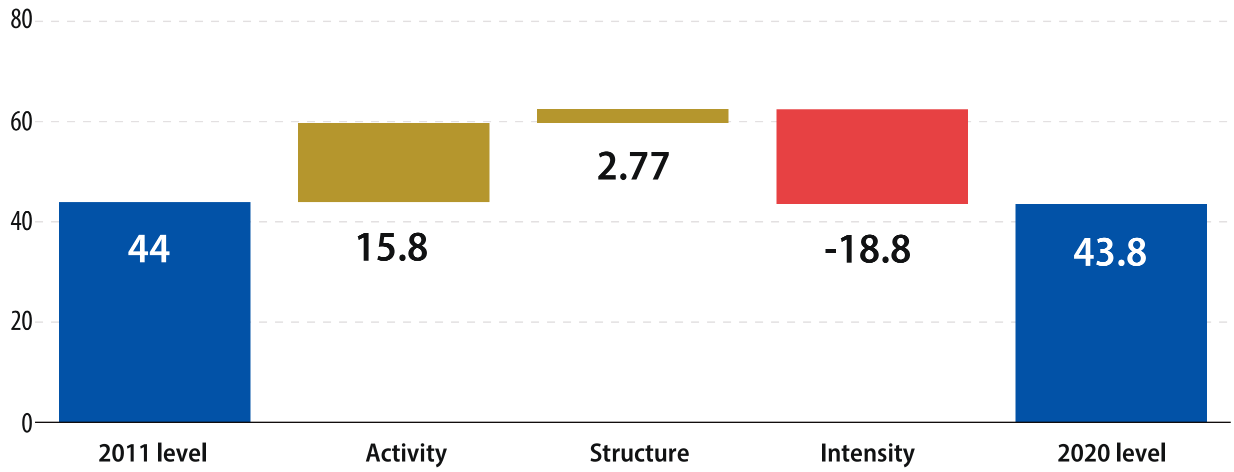


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

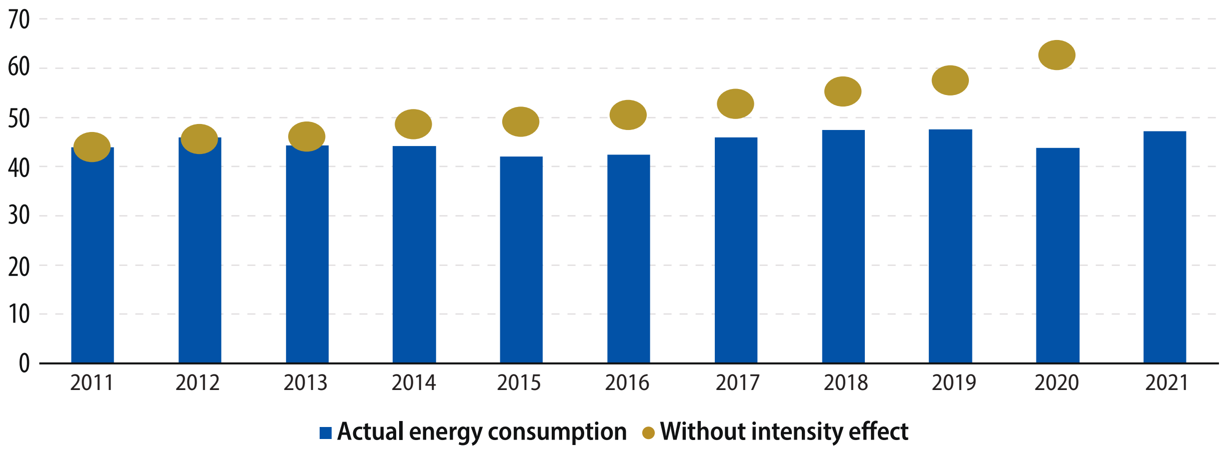


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

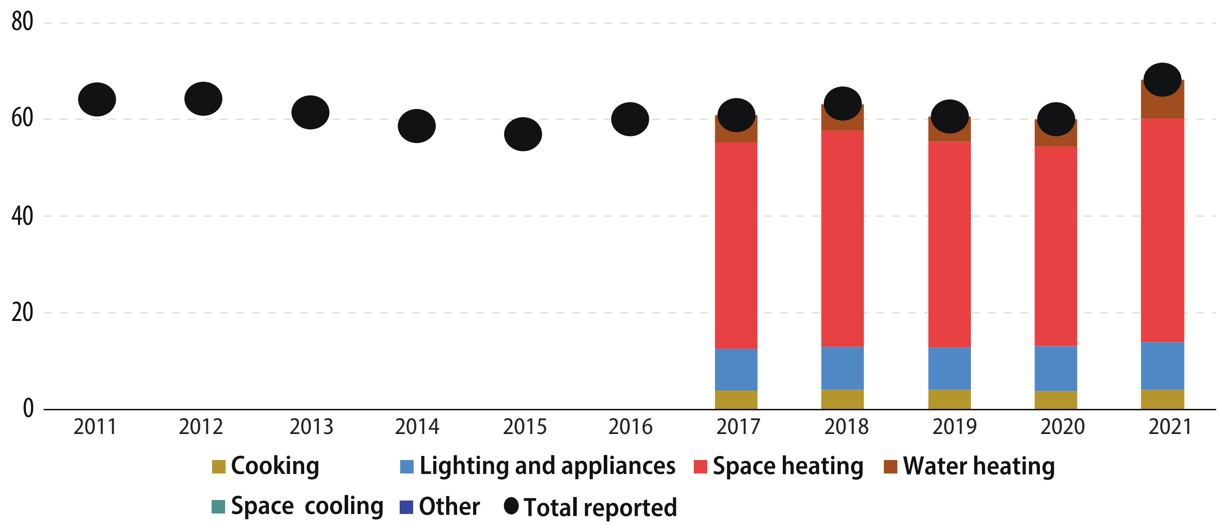
The Lithuanian energy consumption in the manufacturing industry sector oscillated between 64 PJ and 74 PJ over the studied period. Meanwhile, the corresponding total gross value added increased steadily from below 7.1 billion EUR in 2011 to 10.2 billion EUR in 2020. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the period 2011-2020. Thanks to the strong decoupling between the growth of the value added and the related energy consumption, the reduction in intensity brought down the energy consumption by almost 19 PJ between 2011 and 2020. This was only partly offset by the increase in activity, which brought energy consumption up by close to16 PJ. The structural changes in the industry caused a very small decrease in energy consumption of almost 3 PJ. Without the reduction in energy intensity, the total energy consumption in the industry sector would have been more than 43 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

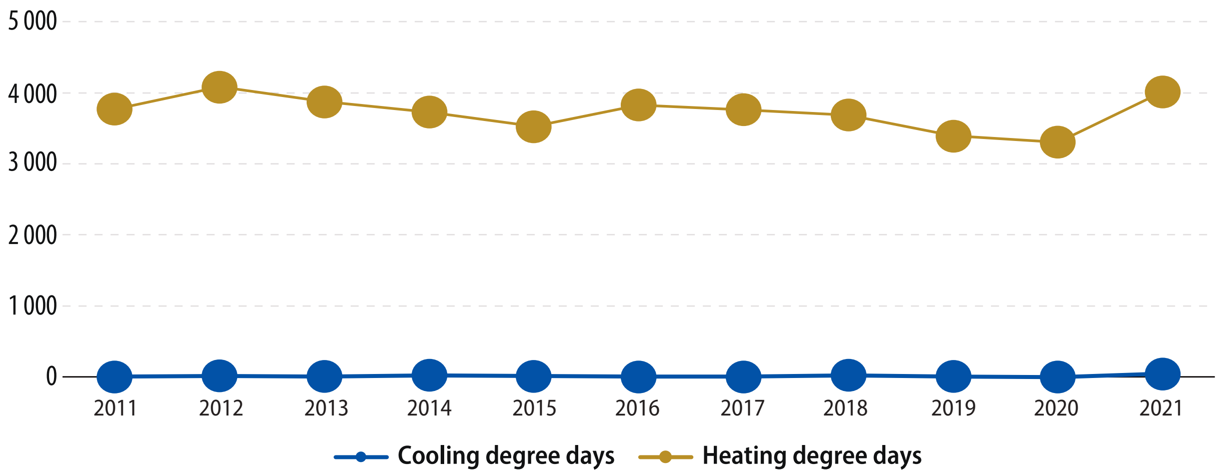
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

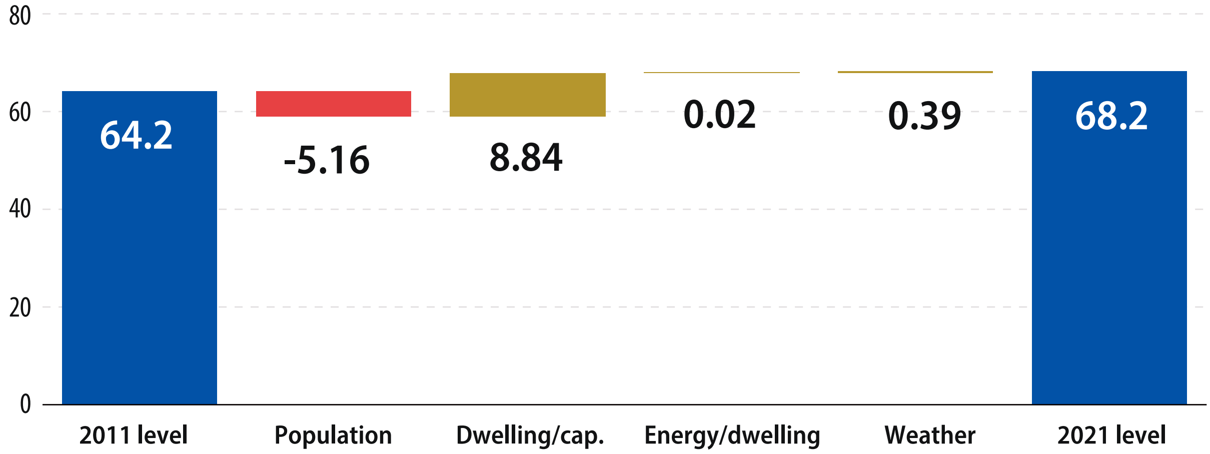


Source: Eurostat dataset (rg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

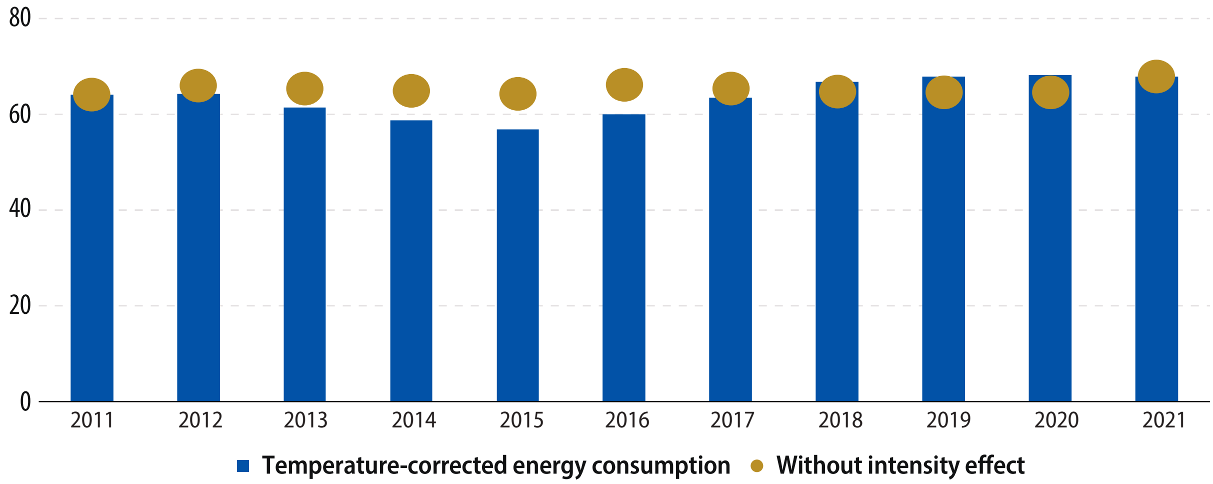


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

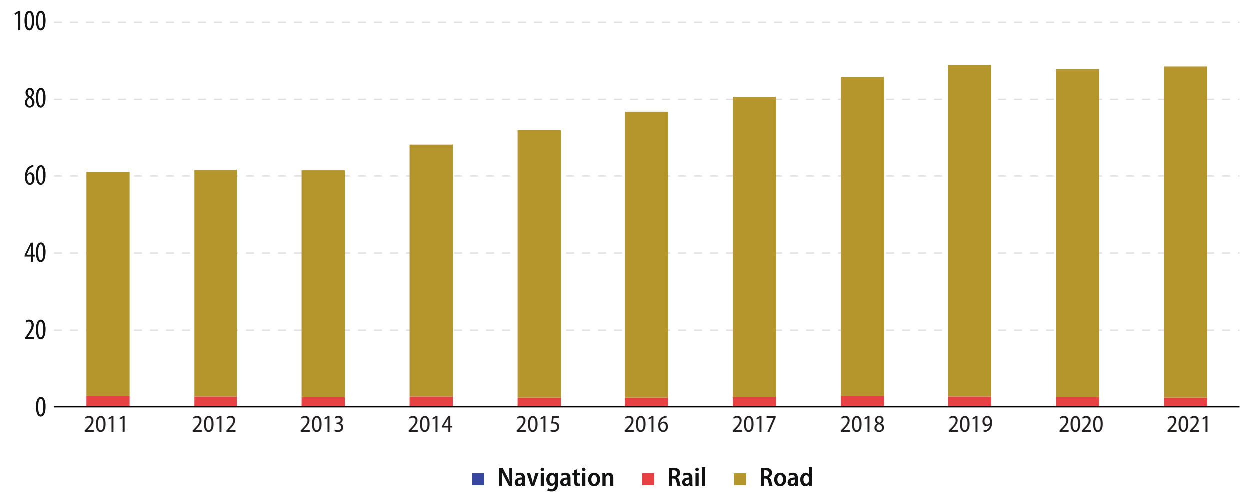
From 2011 to 2021, the energy consumption in the Lithuanian residential sector remained between 57 PJ and 68 PJ. The breakdown in energy consumption by end-use is only available from 2017, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the decrease in population brought down the energy consumption by about 5 PJ, but this was offset by the decrease in dwelling occupancy, which had an increasing effect of almost 9 PJ. The energy consumption per dwelling remained the same, and it had therefore no effect. This may be partly explained by the absence of temperature correction for the year 2011. For the same reason, the weather effect is very limited, despite a visible increase in the number of heating degree days between 2011 and 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

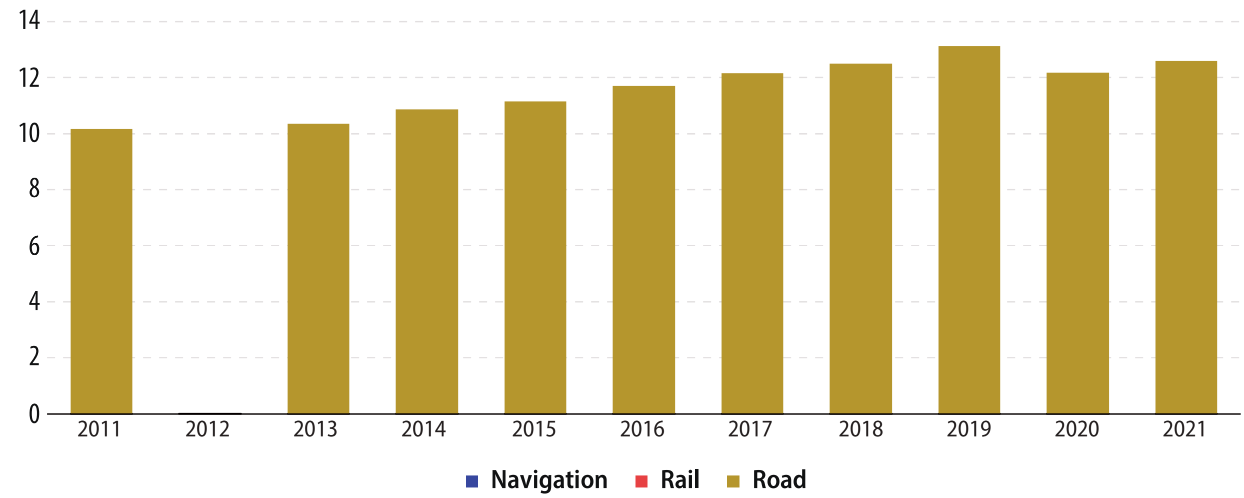


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

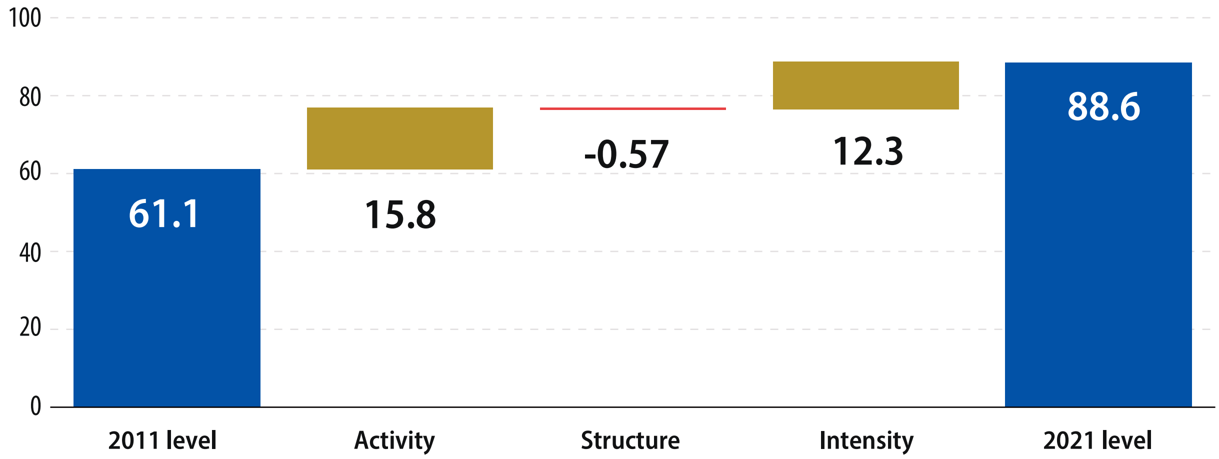


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

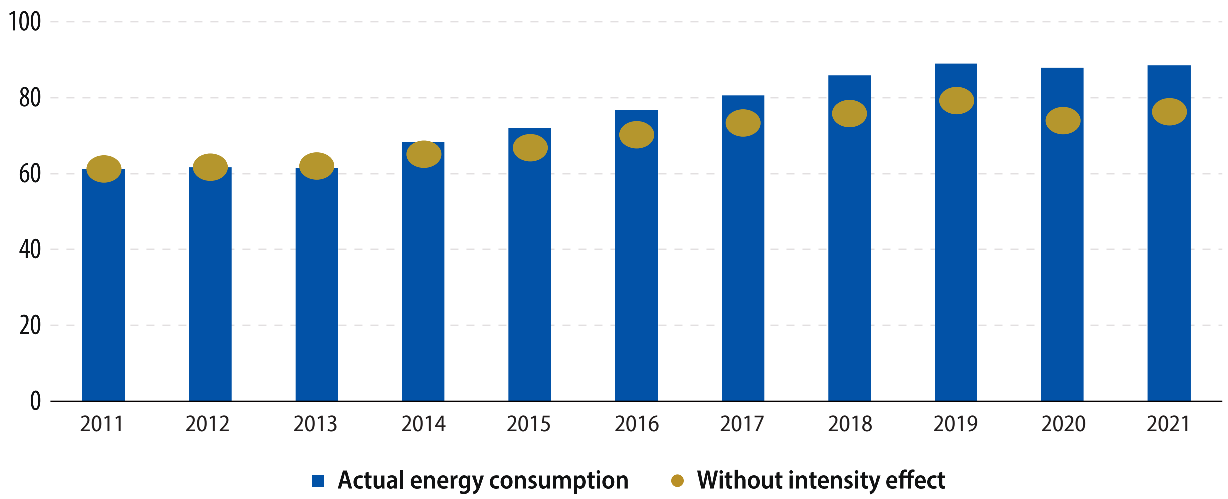


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

After a first stable period from 2011 to 2013, where it was 61 PJ, the energy consumption in the transport sector grew steadily to reach 89 PJ in 2019, then it stabilised around this level until 2021. Most of the energy consumption is due to road transport. Road traffic grew from 10.1 billion VKM in 2011 to 13.1 billion VKM in 2019, then it dropped, and it was 12.6 billion VKM in 2021. Between 2011 and 2021, the increase in traffic caused an increase in energy consumption of almost 16 PJ. Finally, the increase in energy intensity caused a rise of about 12 PJ. Because of the absence of variation in the share of the different sectors, the structural effect was not significant.

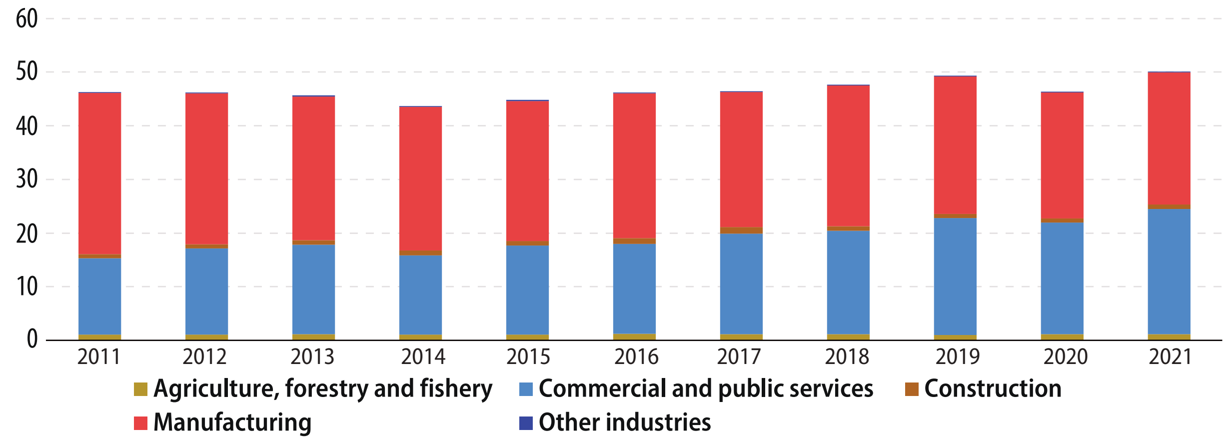
Luxembourg

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

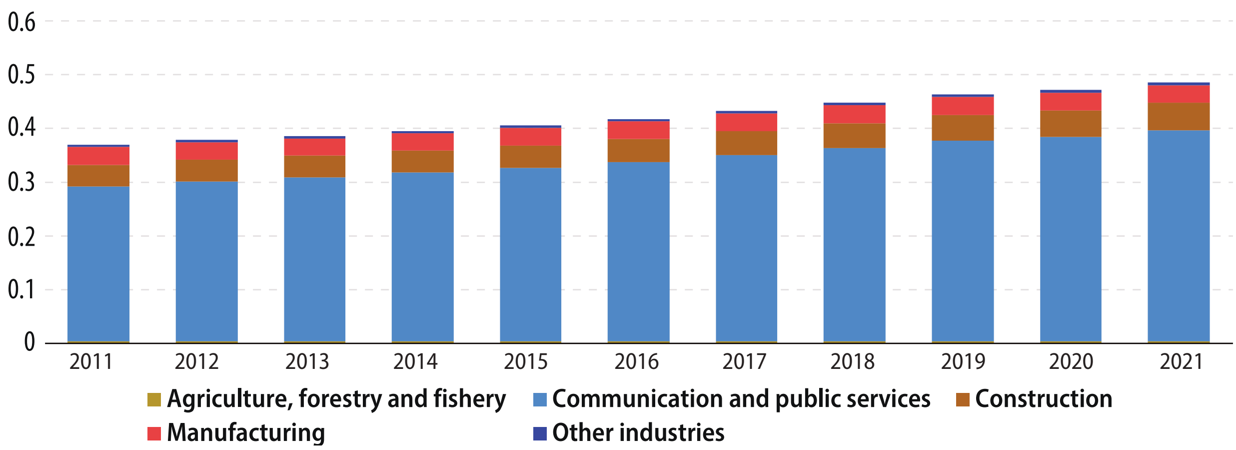


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

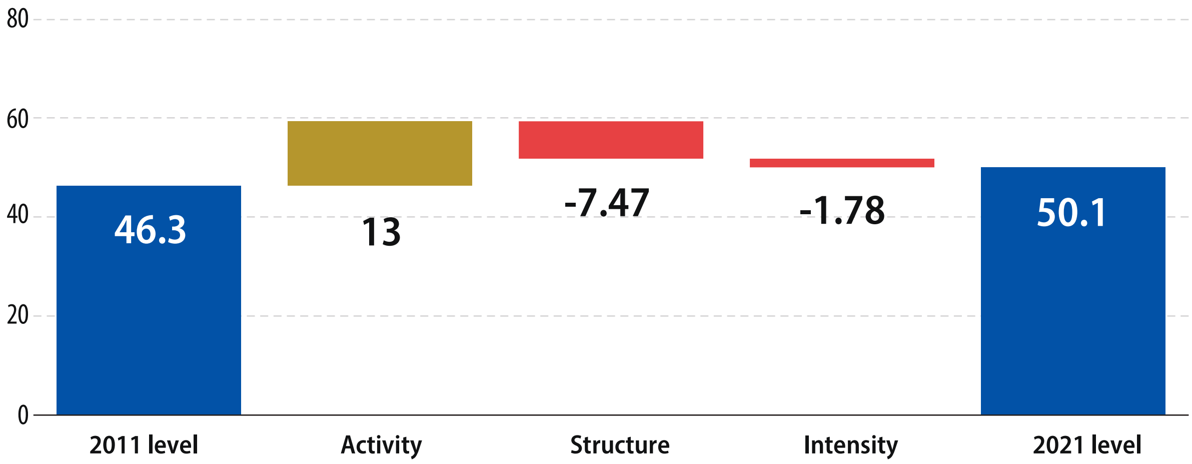


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

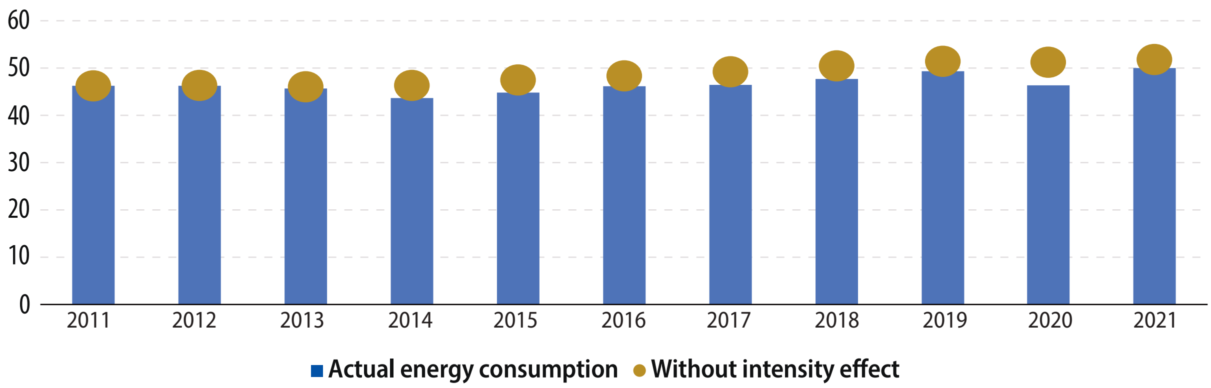


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

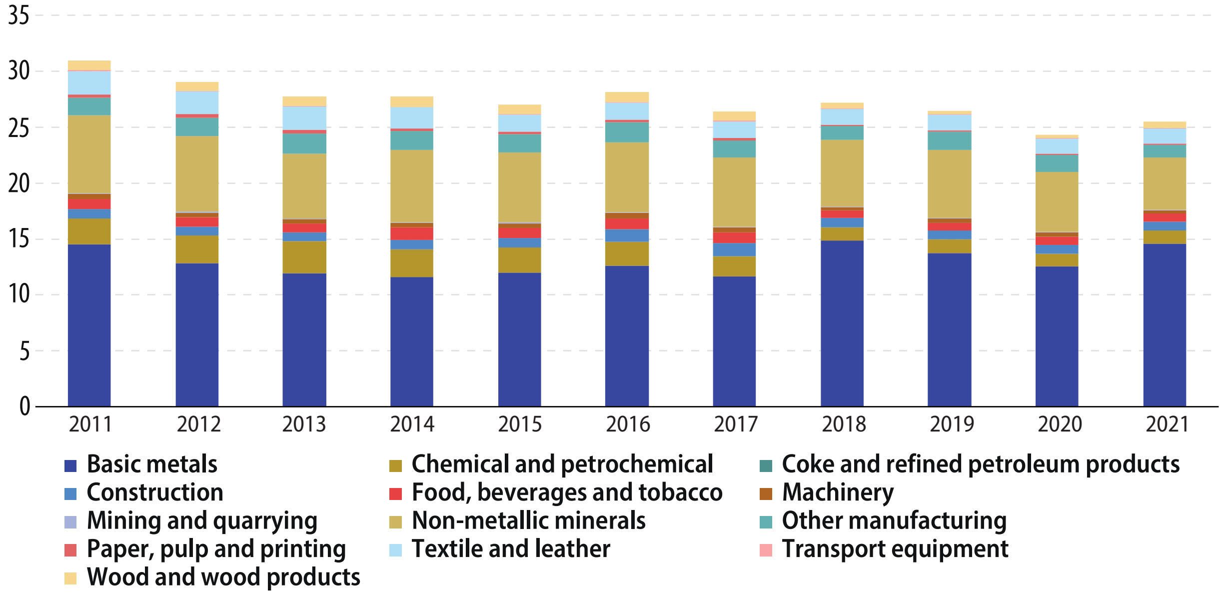
At the level of the whole economy, the final energy consumption of the different sectors increased from 46.3 PJ in 2011 to 50.1 PJ in 2021. Meanwhile, the active population steadily increased from 369 thousand in 2011 to 485 thousand in 2021. Over the period 2011-2021, the increase in activity (measured in terms of employees) brought energy consumption up by about 13 PJ, which was partly offset by the structural change in the economy, which brought energy consumption down by about 7.5 PJ. Finally, the decrease in energy consumption per employee caused the energy consumption to decrease by about 1.8 PJ. Without this decrease, energy consumption would have been 3.5 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

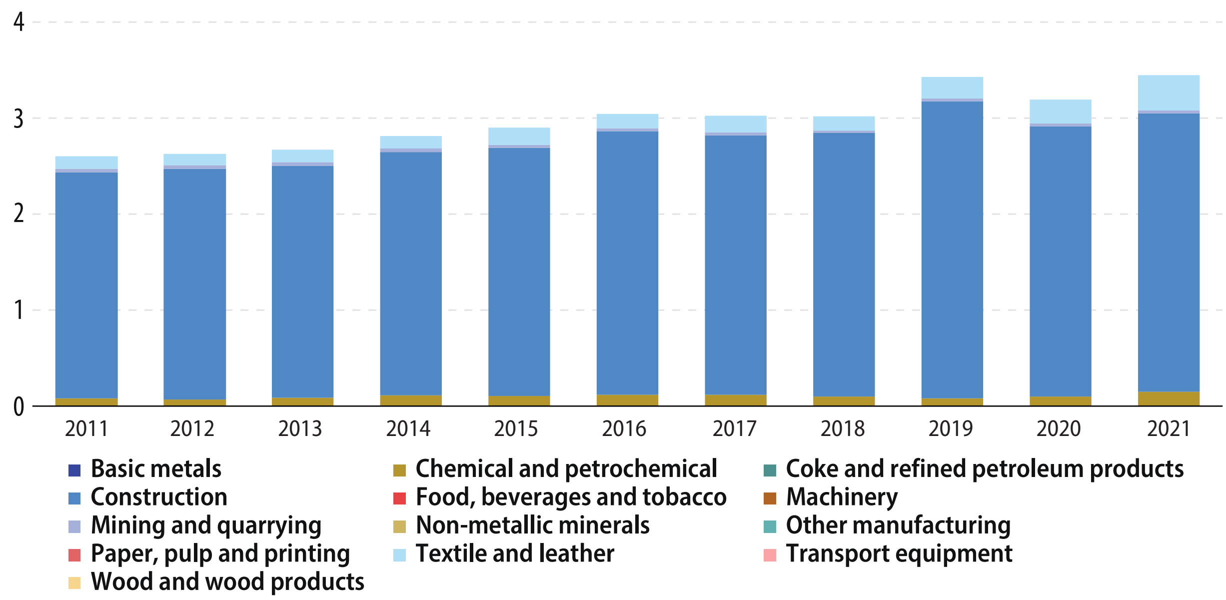


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

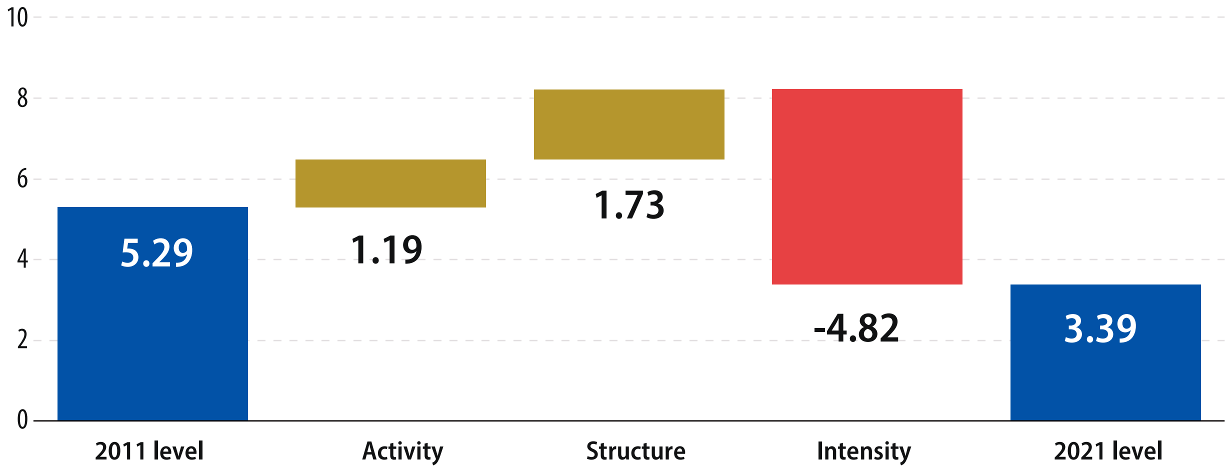


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

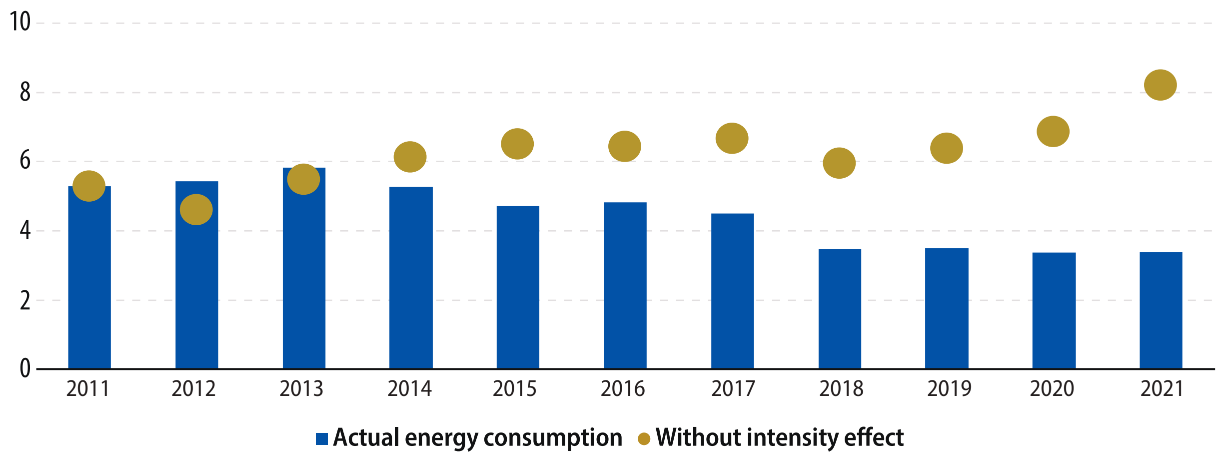


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

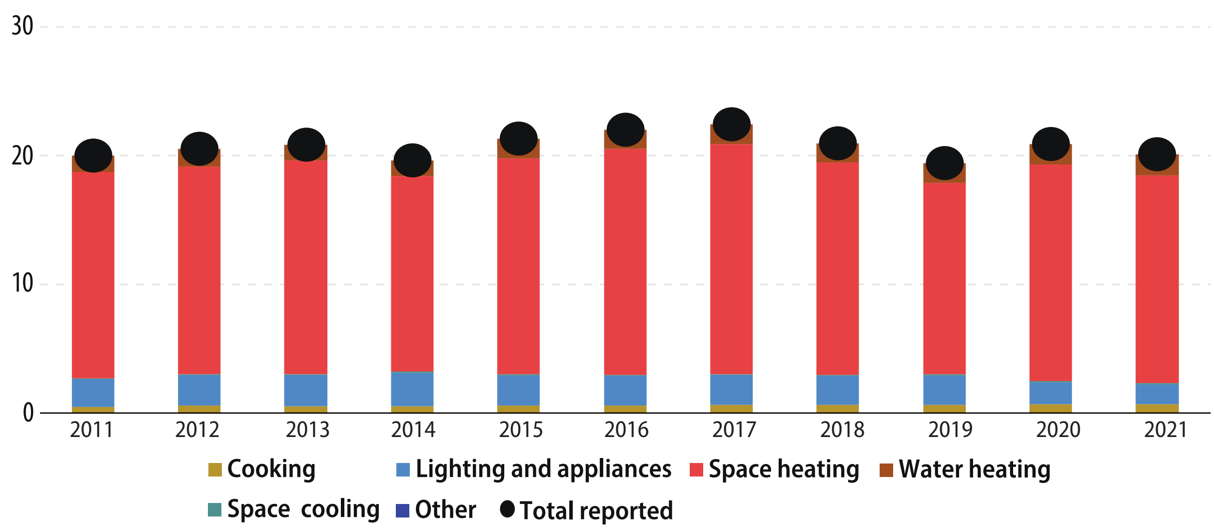
The Luxembourgish total energy consumption in the manufacturing industry sector decreased from 30.9 PJ in 2011 to 25.4 PJ in 2021. However, for many of the sectors covered, the corresponding gross value added was not available. Consequently, multiple sectors had to be excluded from the analysis, including food, beverages and tobacco, wood and wood products, basic metals, paper, pulp and printing, non-metallic minerals, machinery, transport equipment, and other manufacturing sectors. For the remaining sectors, the GVA increased from below 2.6 billion EUR in 2011 to 3.4 billion EUR in 2021. Between these two years, the reduction in intensity in the sectors covered brought energy consumption down by almost 5 PJ. This was partly offset by the increase in activity, which brought consumption up by 1.2 PJ, and by the structural changes in the industry which caused a further increase of about 1.7 PJ. Without the reduction in energy intensity, the total energy consumption in the industry sectors covered would have been more than double in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

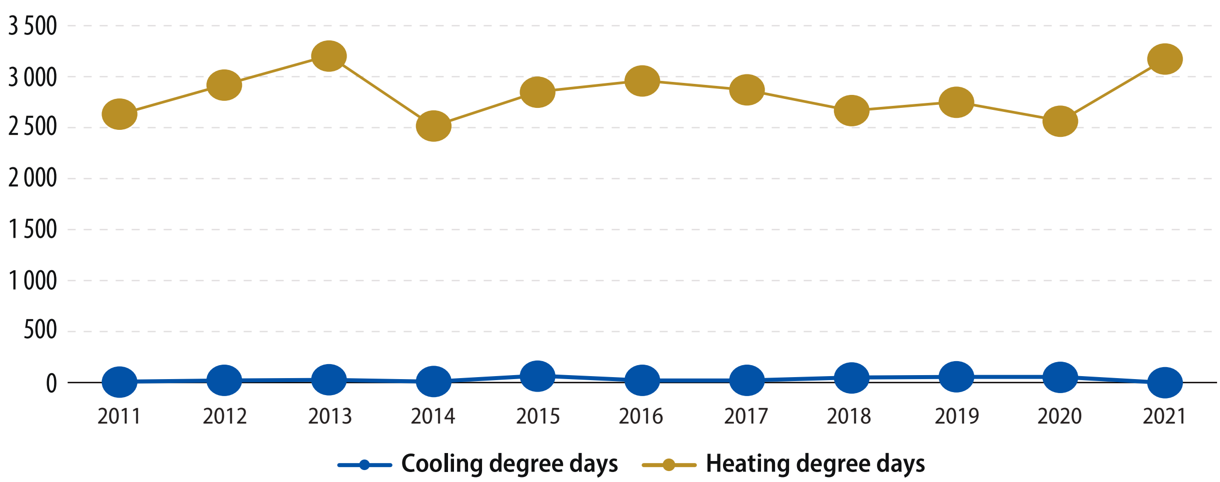
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

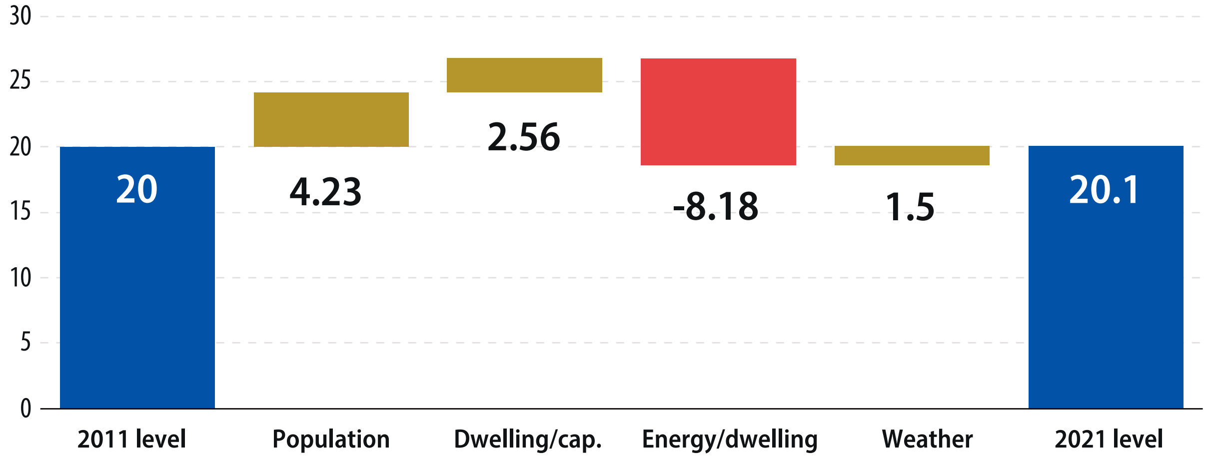


Source: Eurostat dataset (rg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

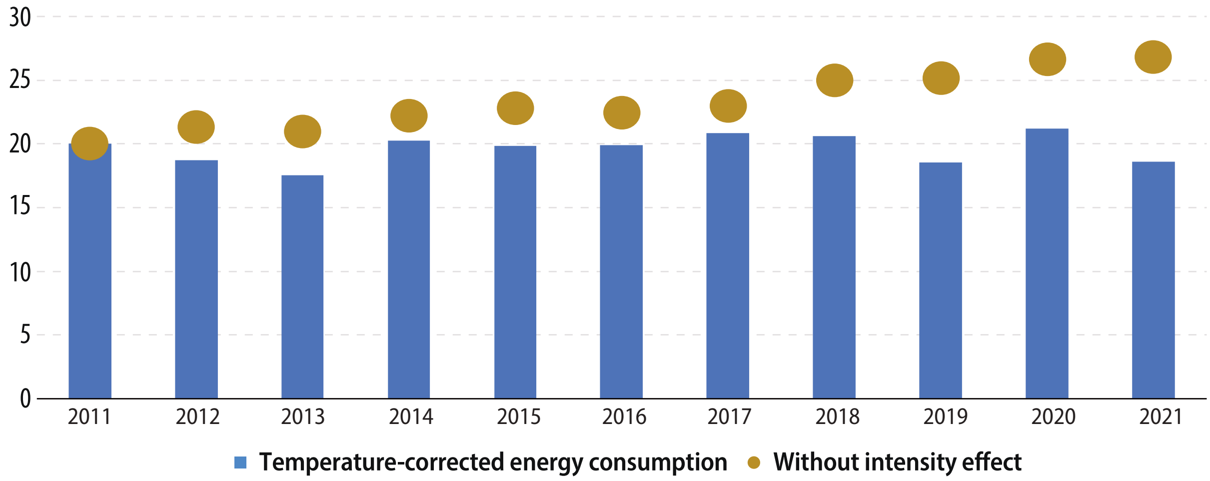


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

From 2011 to 2021, the energy consumption in the Luxembourgish residential sector remained between 19 PJ and 22 PJ. Between these two years, the increase in population drove up the energy consumption by about 4.2 PJ, and the decrease in dwelling occupancy brought the consumption further up by about 2.6 PJ.

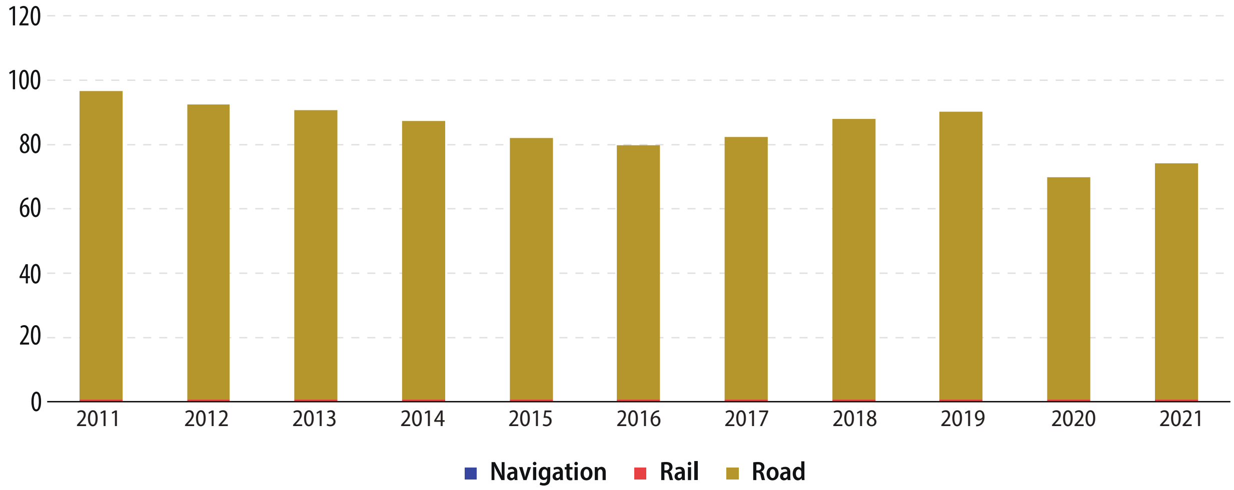
The most significant driver was the energy consumption per dwelling, which decreased considerably and brought down consumption in the sector by about 8.2 PJ. Finally, with more heating degree days in 2021 than in 2011, the weather caused an additional 1.5 PJ of energy consumption.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

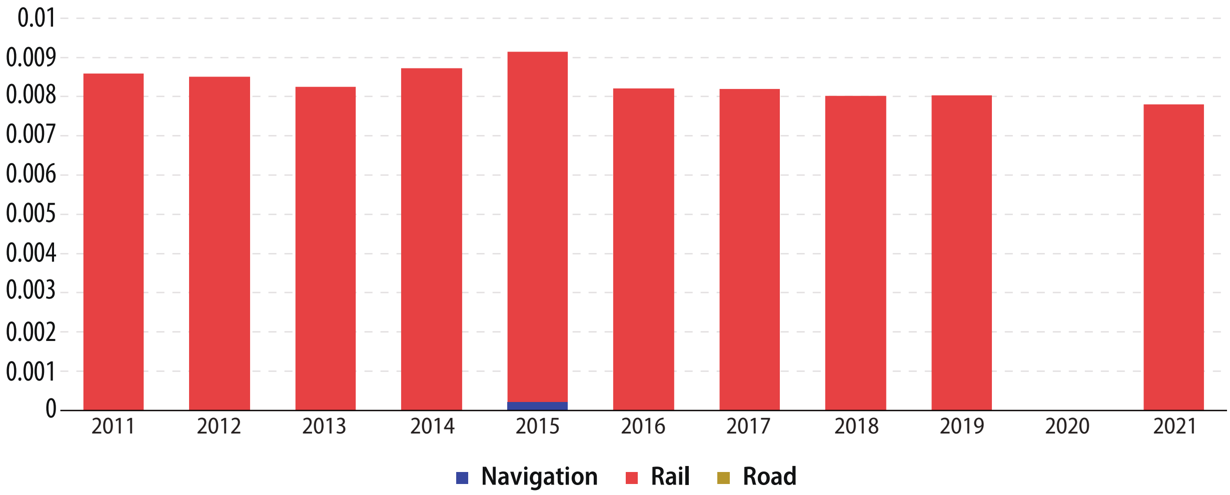


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

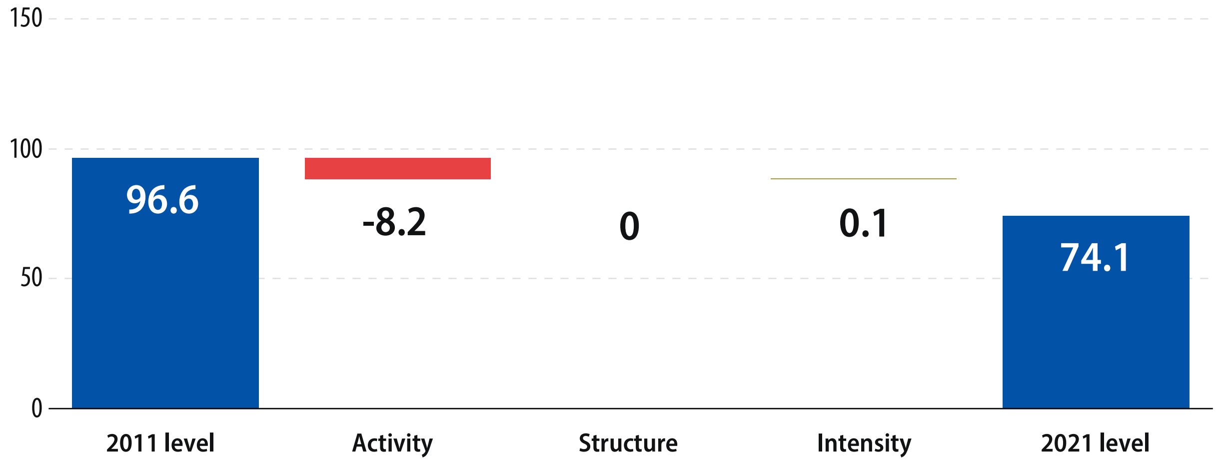


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

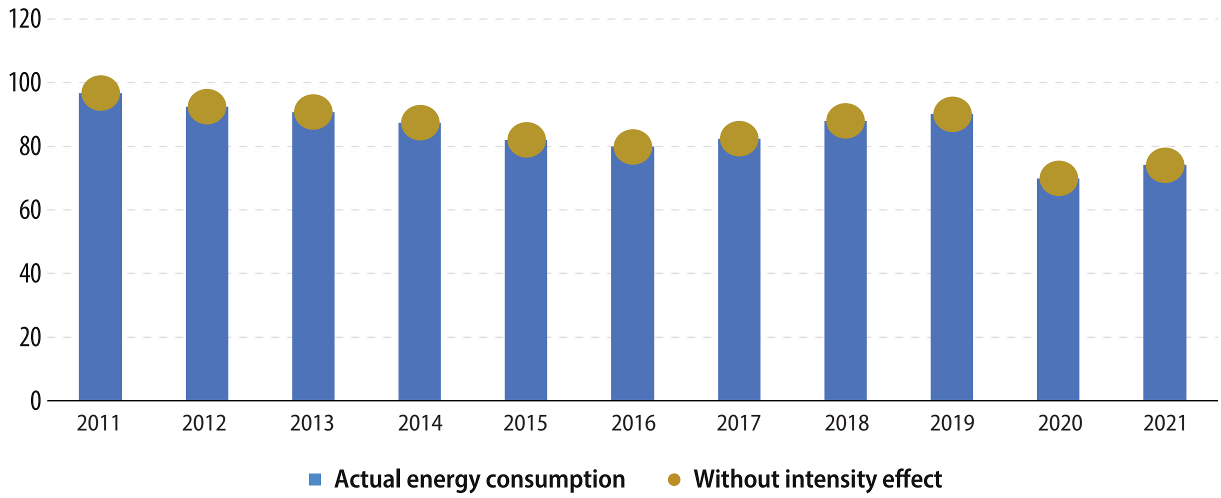


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

After a first decrease from 96 PJ in 2011 to 80 PJ in 2016, the energy consumption in the transport sector grew steadily to reach 90 PJ in 2019, then it dropped to 70 PJ in 2020, and it was only 74 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic was not available at the time of extraction, and therefore the decomposition could not be performed.

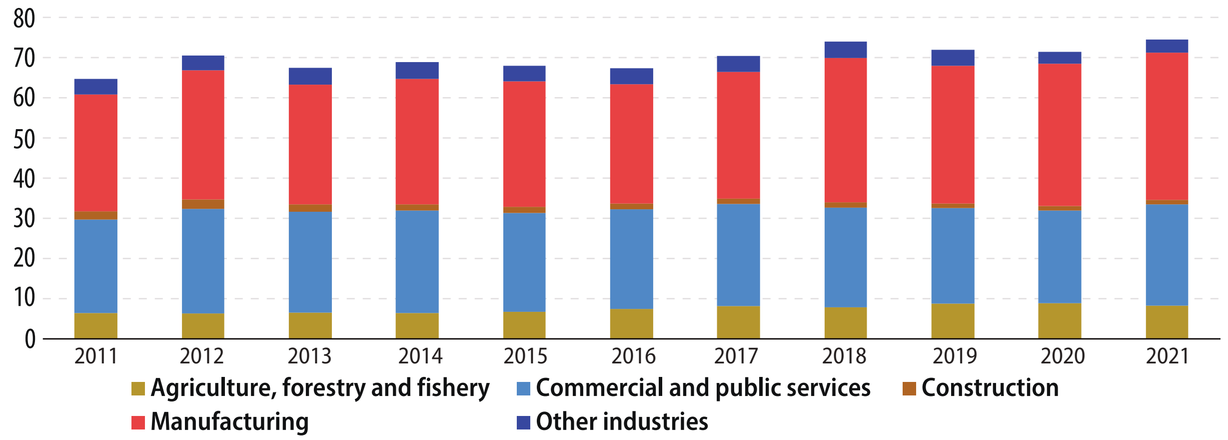
Latvia

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

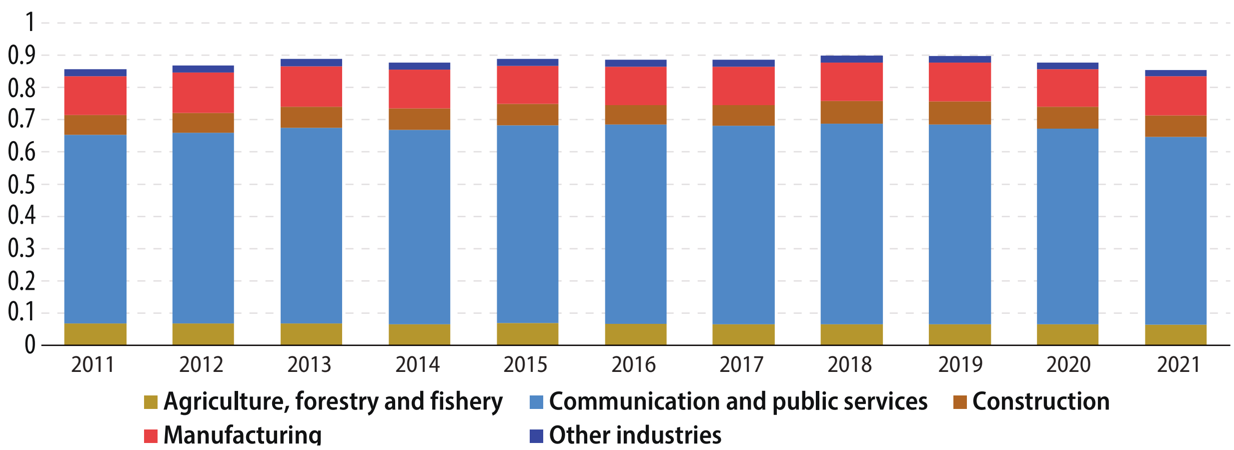


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

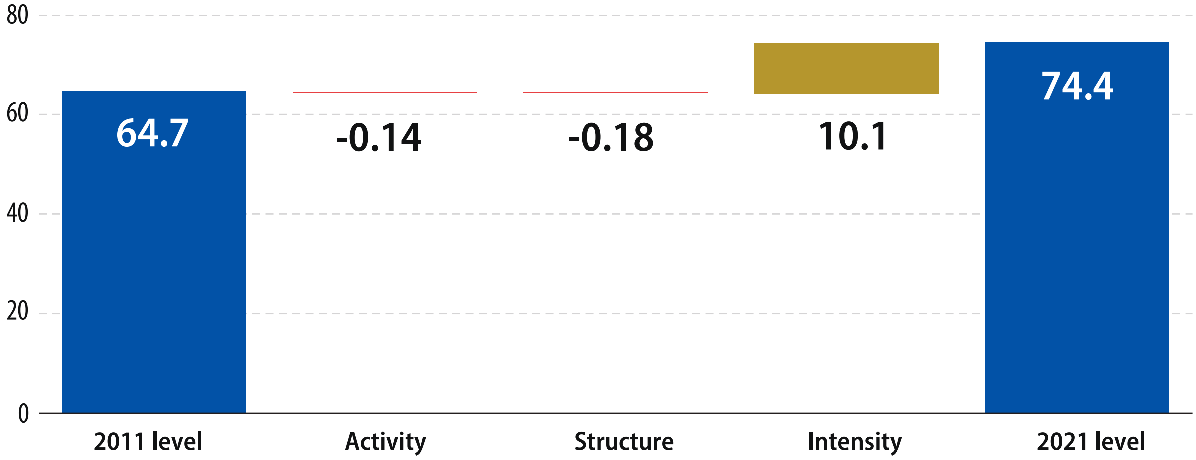


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

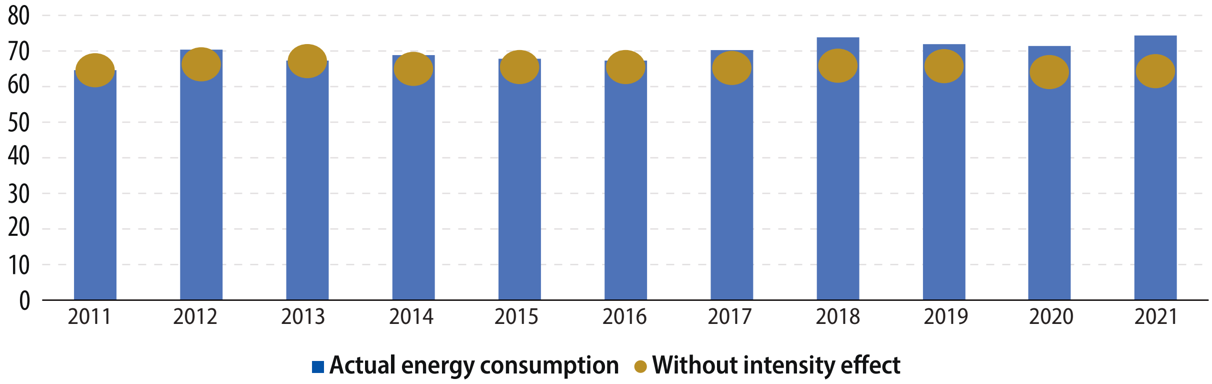


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

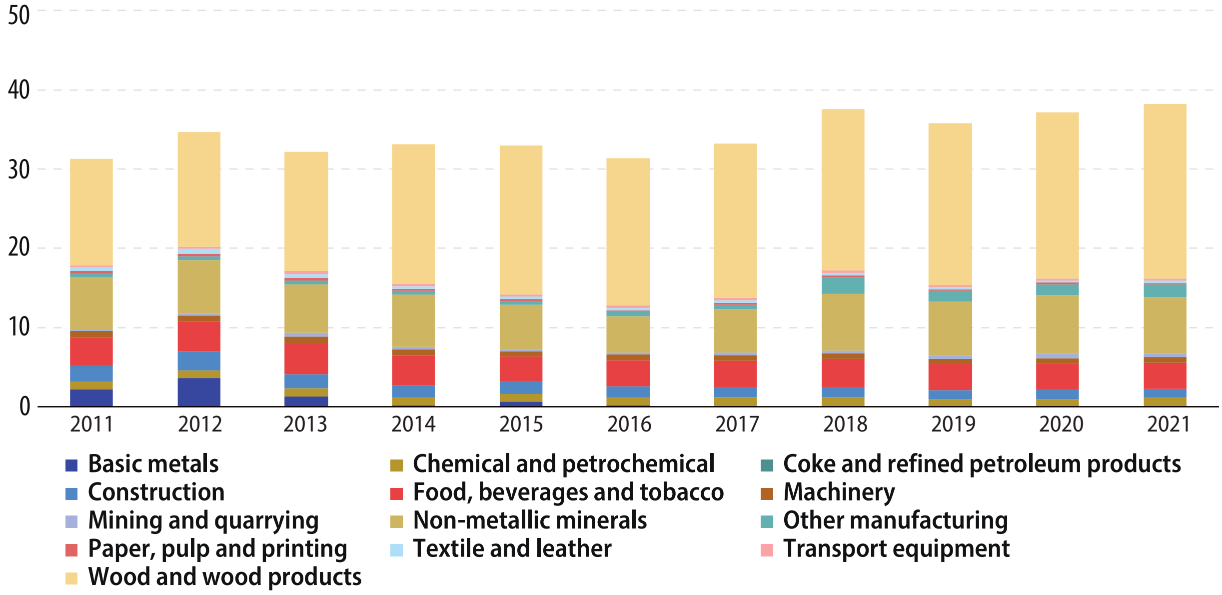
At the level of the whole economy, the final energy consumption of the different sectors increased steadily from 64.6 PJ to 74.4 PJ in 2021. Meanwhile, the active population steadily increased from 856 thousand in 2011 to 899 thousand in 2018, then it decreased to reach 855 thousand in 2021, at the same level as in 2011. Between 2011 and 2021, the number of employees was almost the same, and therefore it was not a strong driver of energy consumption. Similarly, the share of each sector in employment remained very stable, and so there was no structural effect to report. What brought energy consumption up was mainly the increase in energy consumption per employee, which caused energy consumption to go up by about 10 PJ. Without this increase, energy consumption would have been almost 14 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

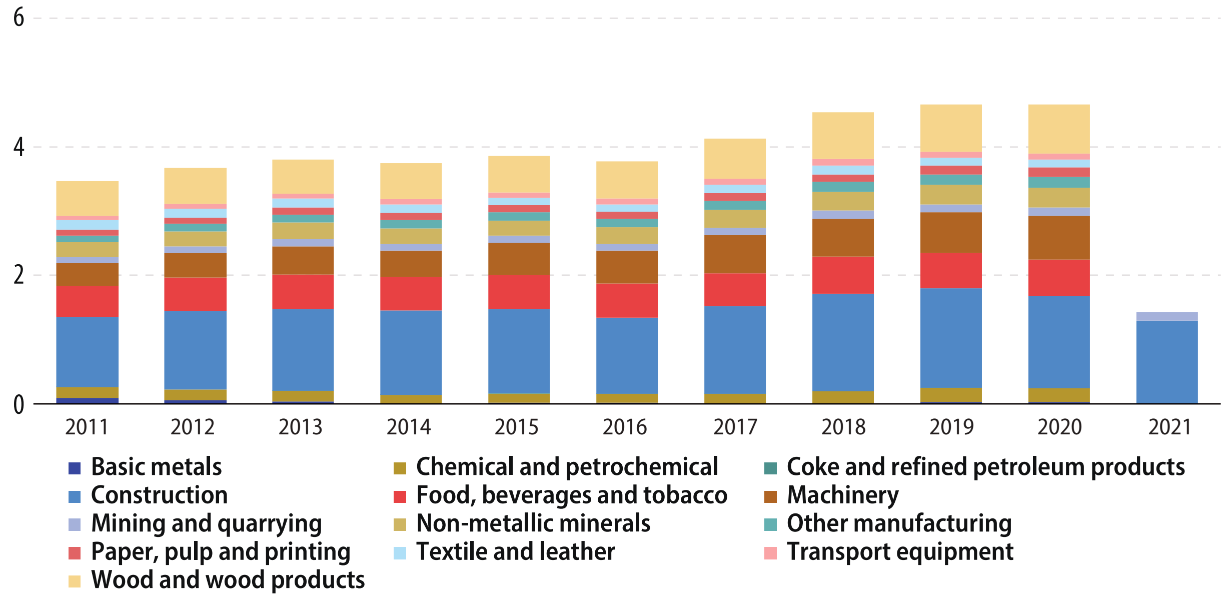


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

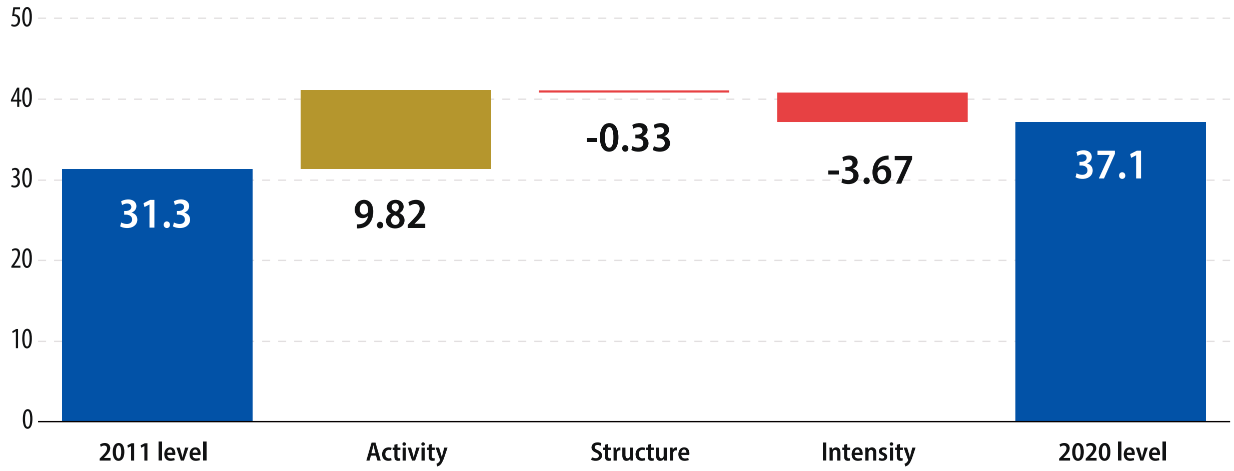


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

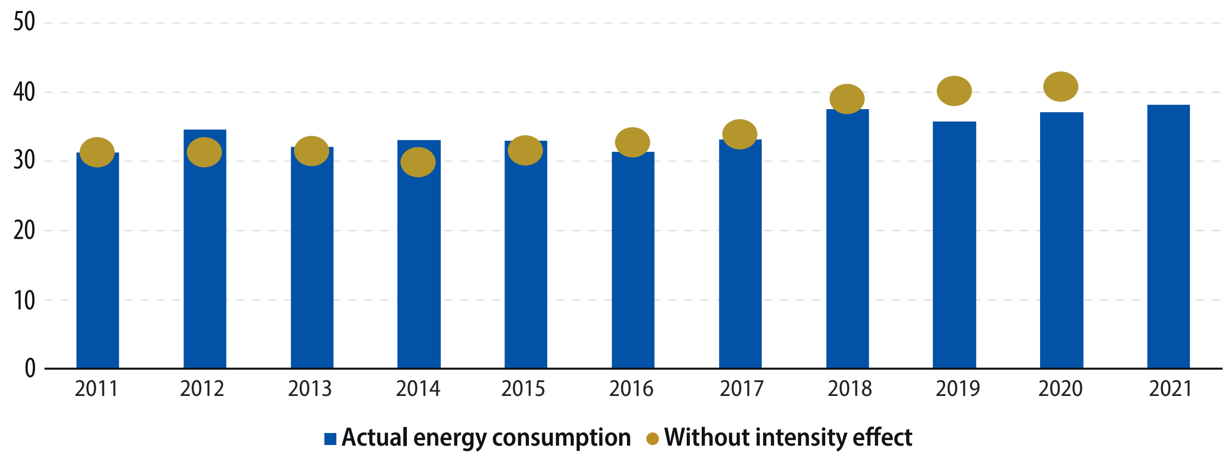


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

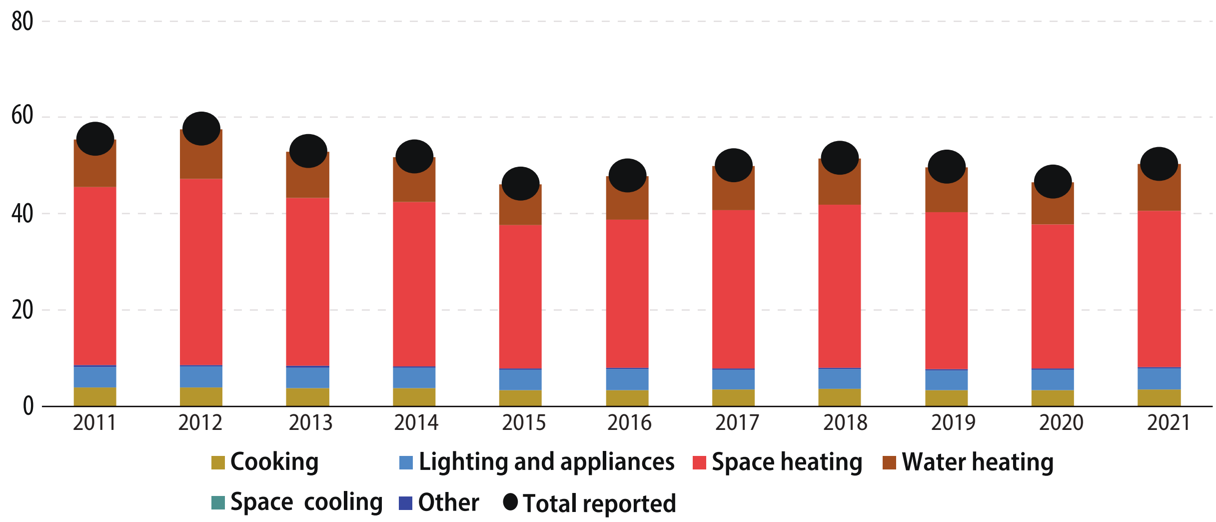
The energy consumption in the Latvian manufacturing industry sectors grew from 31.3 PJ in 2011 to 38.2 PJ in 2021. Meanwhile, the corresponding total gross value added increased steadily from below 3.5 billion EUR in 2011 to 4.7 billion EUR in 2020. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the period 2011-2020. During this period, the increase in activity brought energy consumption up by almost 10 PJ. This was partly offset by the reduction in intensity, which brought energy consumption down by 3.7 PJ between 2011 and 2020. The structural changes in the industry caused a very small decrease in energy consumption of 0.3 PJ. Without the reduction in energy intensity, the total energy consumption in the industry sector would have been almost 10 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

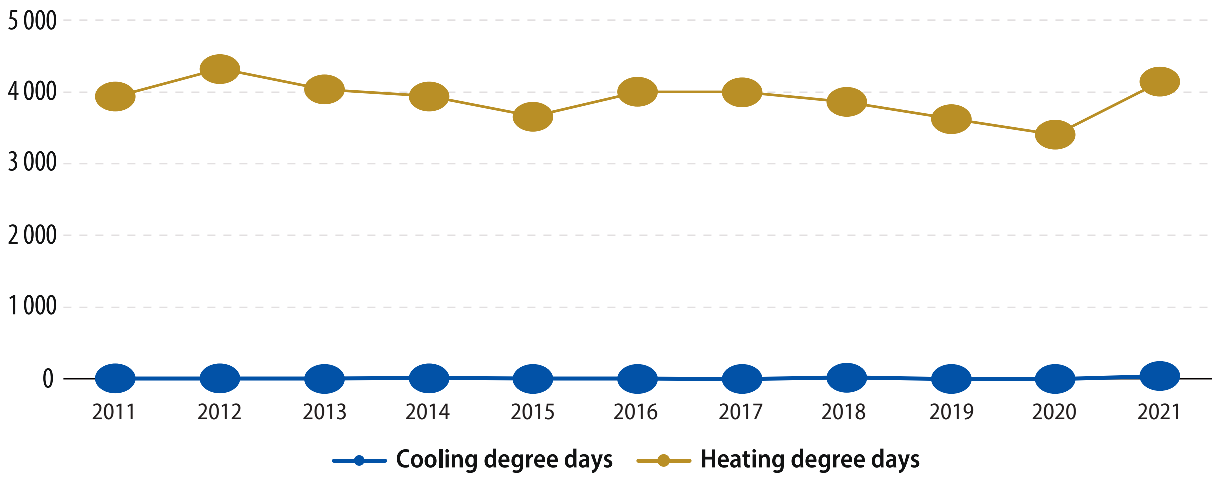
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

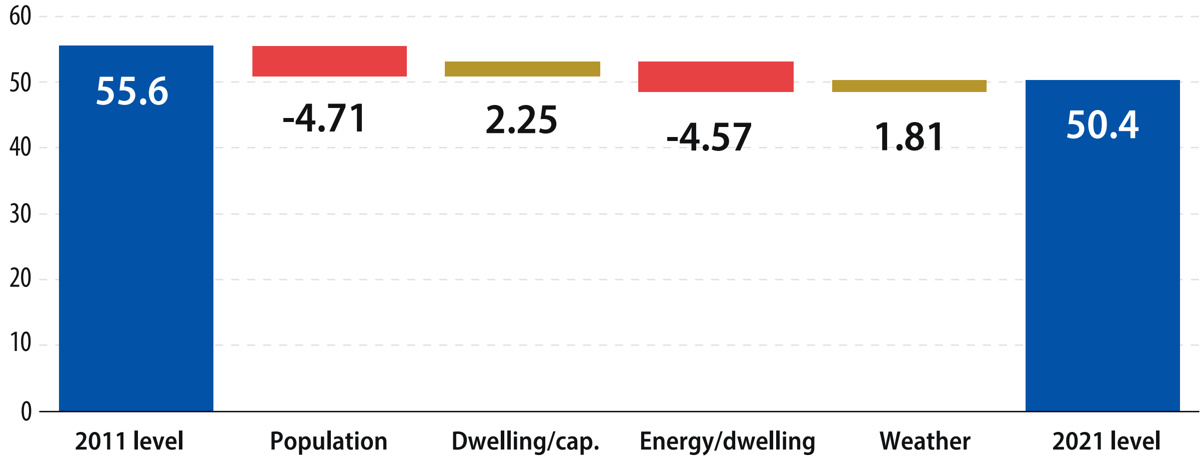


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

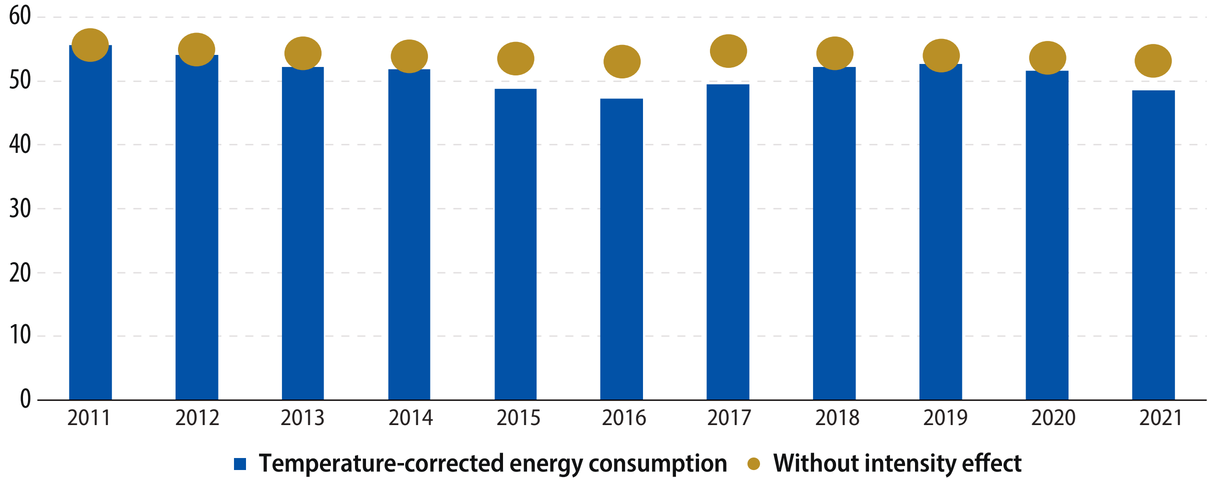


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

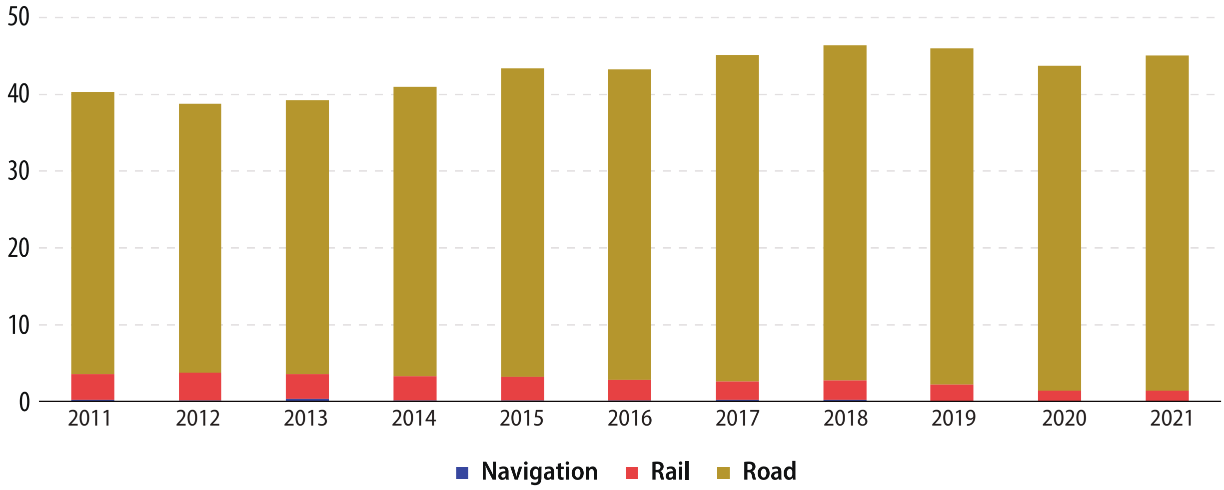
From 2011 to 2021, the energy consumption in the Latvian residential sector remained within 46 PJ and 58 PJ. Over this period, the decrease in population brought energy consumption down by about 4.7 PJ, but this was partly offset by the decrease in dwelling occupancy, which had an increasing effect of about 2.2 PJ. Meanwhile, energy consumption per dwelling decreased significantly, and it brought down the total consumption by about 4.6 PJ. Finally, as there were slightly more heating degree days in 2021 than in 2011, the weather caused an additional 1.8 PJ of energy consumption. Without the decrease in energy consumption per dwelling, the total energy consumption in the sector would have been 9 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

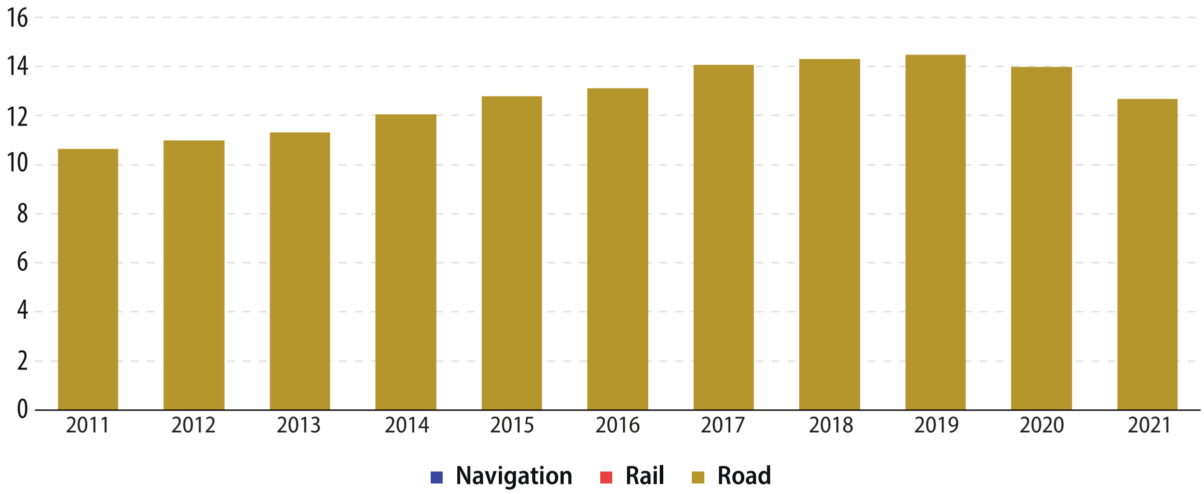


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

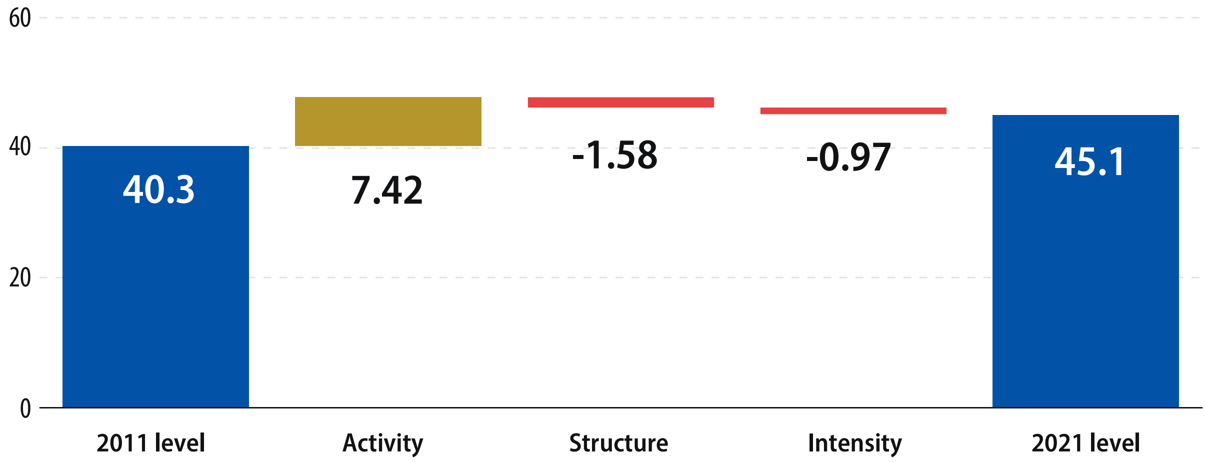


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

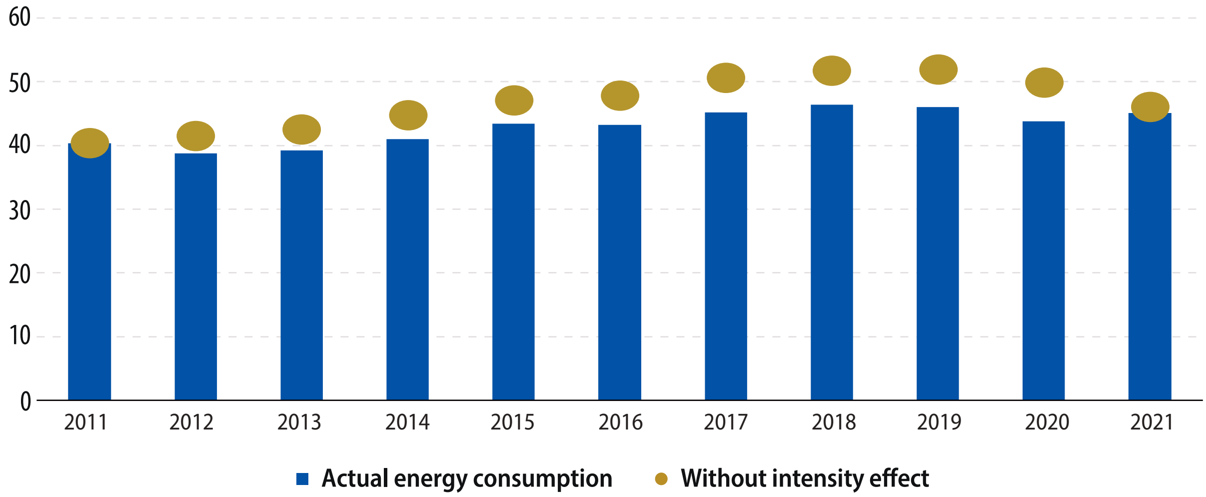


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Latvian transport sector grew steadily from 40 PJ in 2011 to 46 PJ in 2019, then it decreased to reach 44 PJ in 2020, and it was still only 45 PJ in 2021. Most of the energy consumption is due to road transport. Road traffic grew from 10.6 billion VKM in 2011 to 14.5 billion VKM in 2019, then it dropped, and it was 12.7 billion VKM in 2021. Between 2011 and 2021, the increase in traffic caused an increase in energy consumption of about 7.4 PJ. Meanwhile the energy intensity remained quite stable, causing a small reduction below 1 PJ. The small variation in the share of the different modes of transport caused a further decrease of about 1.6 PJ.

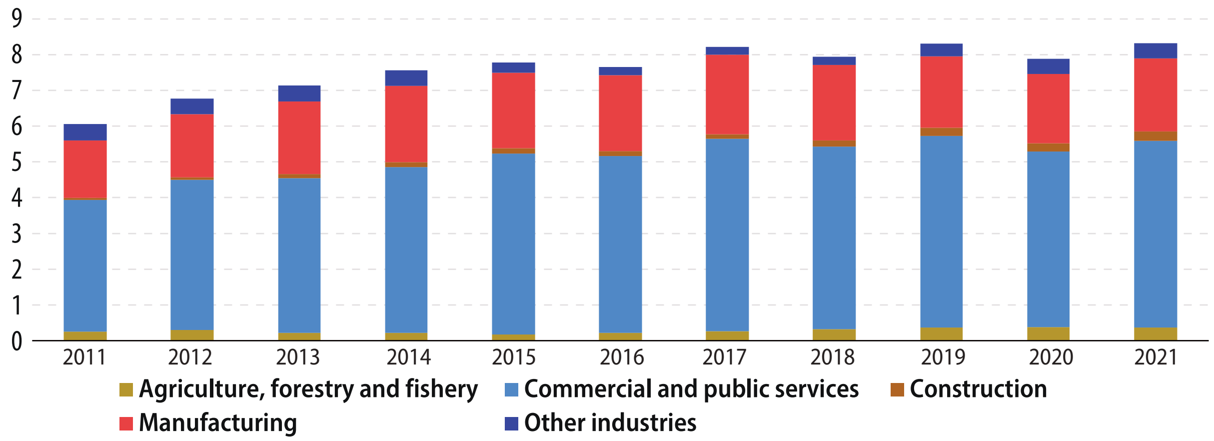
Malta

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

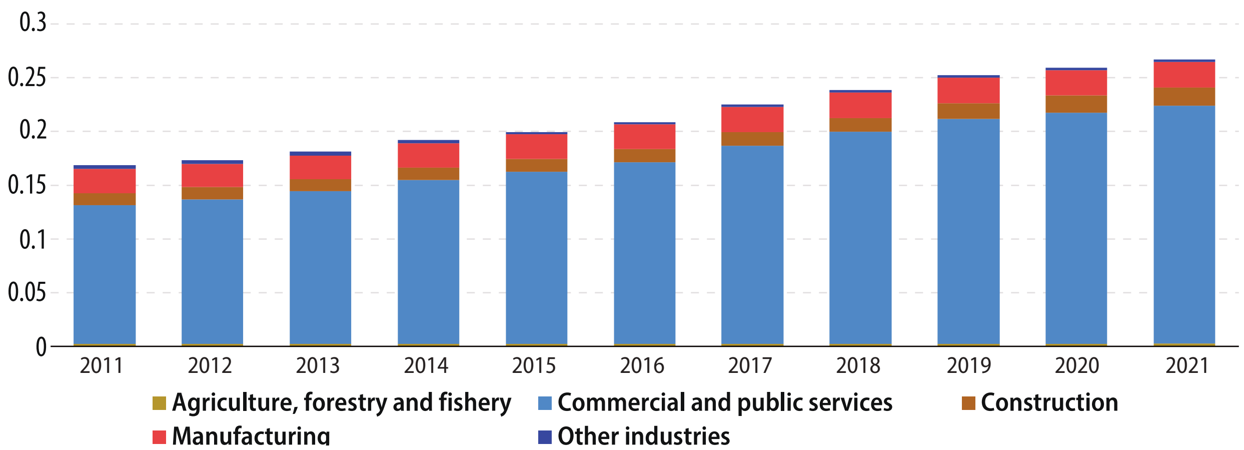


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

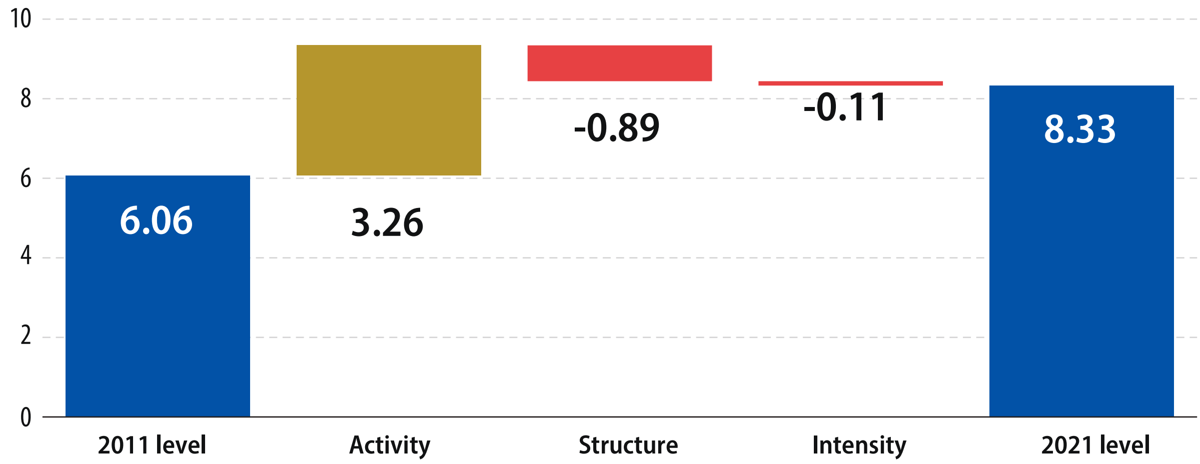


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

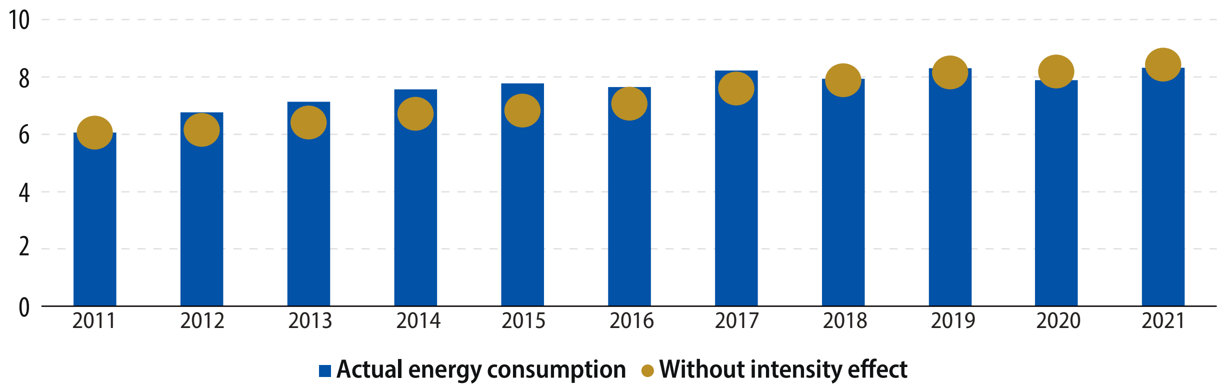


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

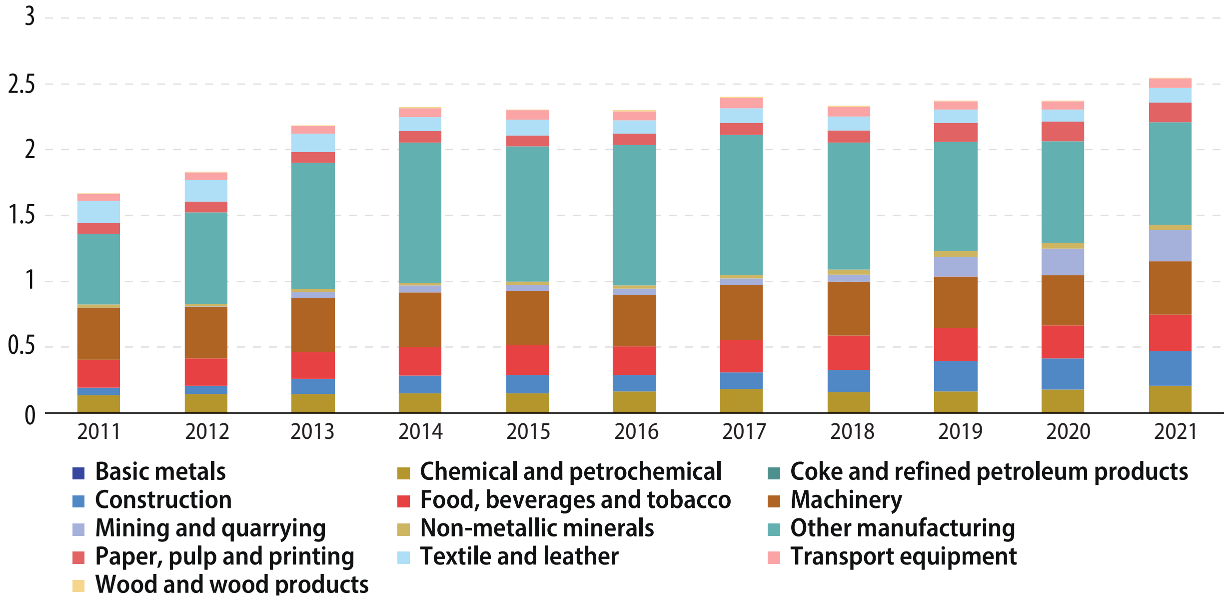
At the level of the whole economy, the final energy consumption of the different sectors increased steadily, from 6.1 PJ in 2011 to 8.3 PJ in 2021. Meanwhile, the active population steadily increased from 169 thousand in 2011 to 267 thousand in 2021. Over the period 2011-2021, the increase in activity (measured in terms of employees) was by far the main driver of energy consumption, bringing it up by about 3.3 PJ, while the structural changes in the economy brought it down by only 0.9 PJ. Finally, the decrease in energy consumption per employee caused an almost negligible decrease of 0.1 PJ.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

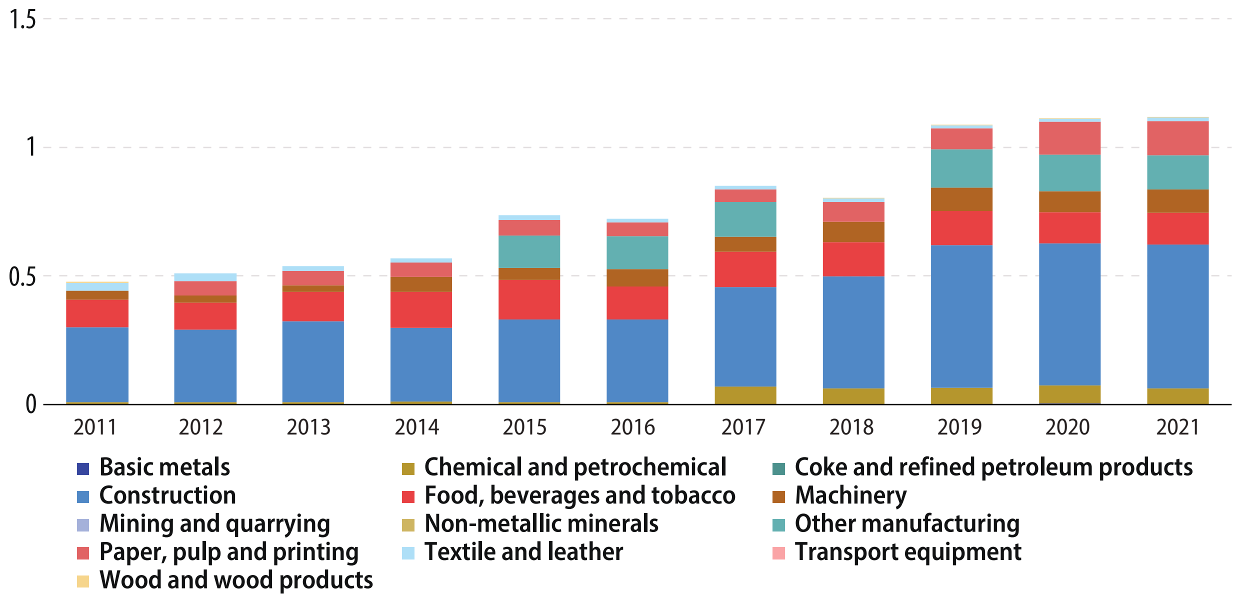


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

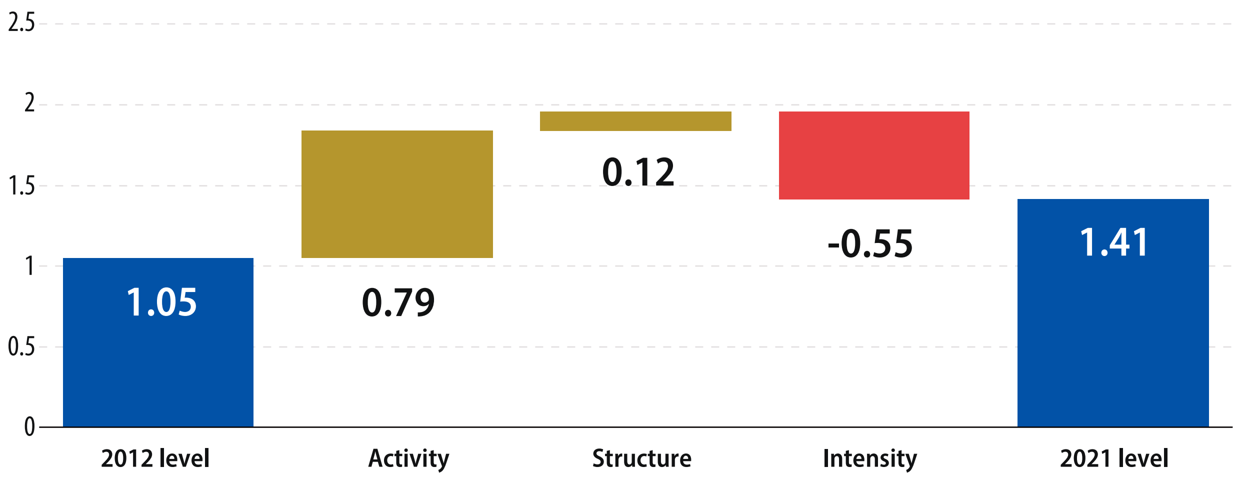


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

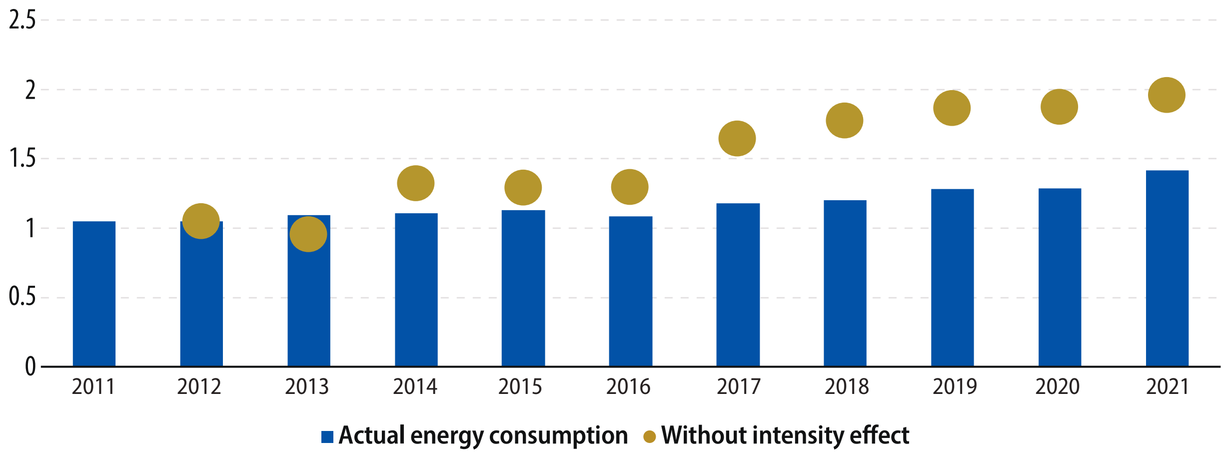


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

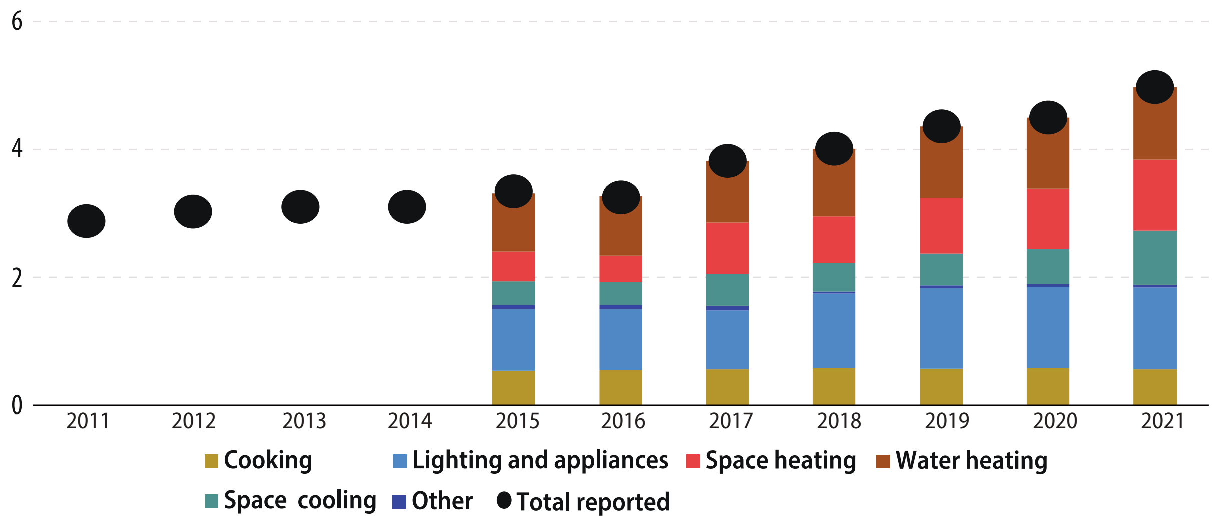
The Maltese energy consumption in the manufacturing industry sector increased from 16.7 PJ in 2011 to 25.5 PJ in 2021. However, for many of the sectors covered, the corresponding gross value added was not available. Consequently, multiple sectors had to be excluded from the analysis, including mining and quarrying, coke and refined petroleum products, and wood and wood products. Moreover, the GVA in the paper, pulp and printing sector was not available for 2011, therefore the decomposition was applied on the years 2012 to 2021. For the covered sectors, the GVA increased from 511 million EUR in 2012 to 1.1 billion EUR in 2021. Between these two years, the increase in activity brought energy consumption up by 0.8 PJ. This was partly offset by the reduction in intensity in the sectors covered, which brought energy consumption down by almost 0.6 PJ. The small structural changes within the industry caused a further increase of about 0.1 PJ. Without the reduction in energy intensity, the total energy consumption in the industry sectors covered would have been 39 % higher in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

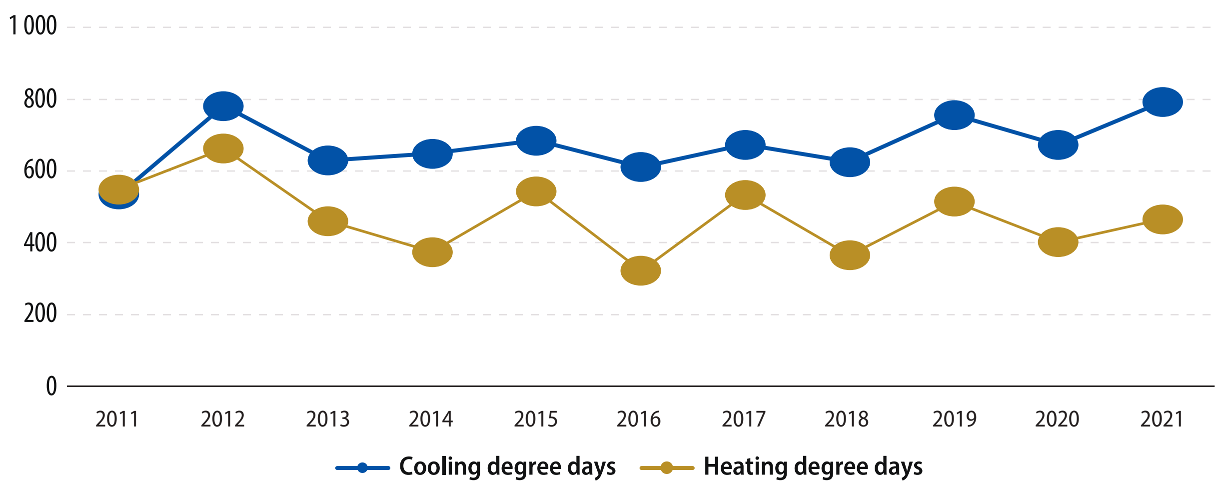
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

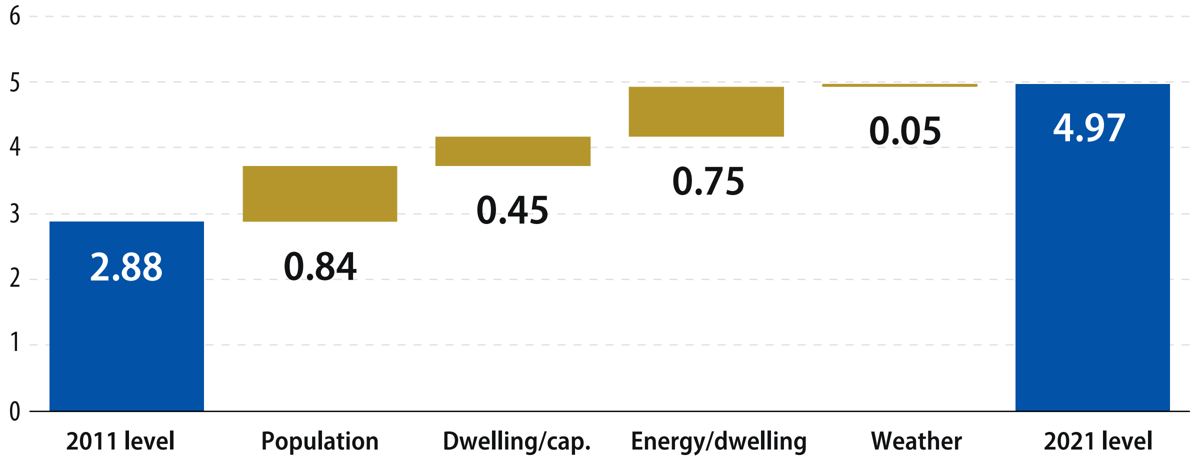


Source: Eurostat dataset (rg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

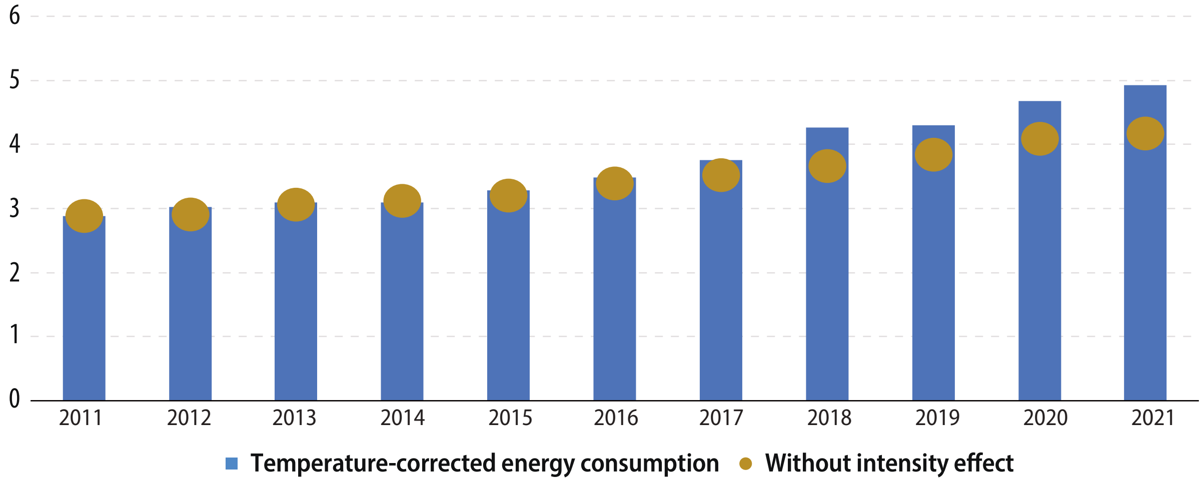


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

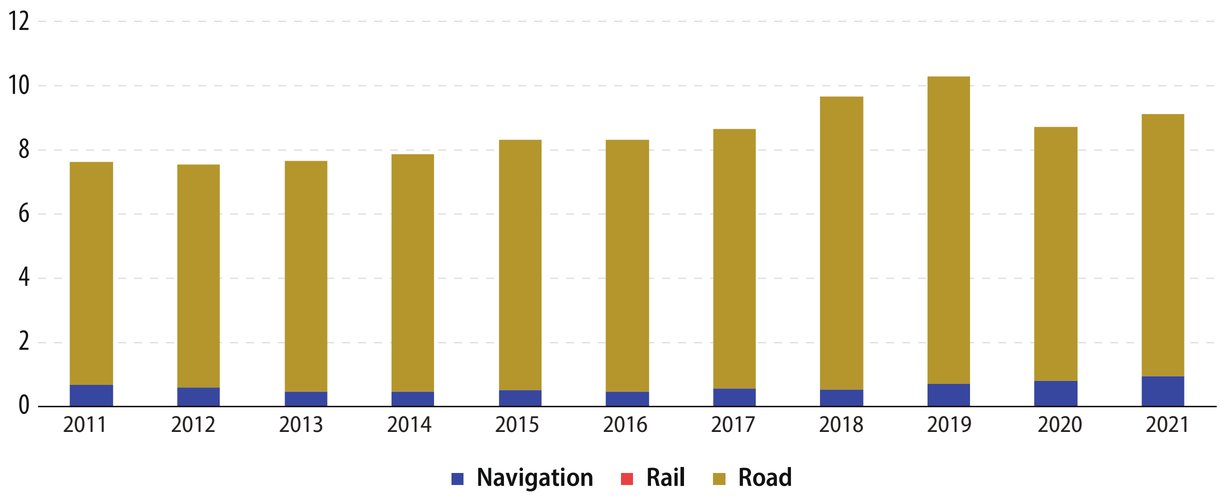
The energy consumption in the Maltese residential sector increased from 2.9 PJ in 2011 to 5.0 PJ in 2021. The breakdown in energy consumption by end-use is only available from 2015, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the increase in population brought energy consumption up by about 0.8 PJ, and the decrease in dwelling occupancy brought consumption up further, by about 0.5 PJ. The energy consumption per dwelling also increased and brought consumption up further, by about 0.8 PJ. Finally, with less heating degree days in 2021 than in 2011, but more cooling degree days, the weather effect was almost insignificant between the two years, however this may be partly due to the absence of temperature correction for the year 2011.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

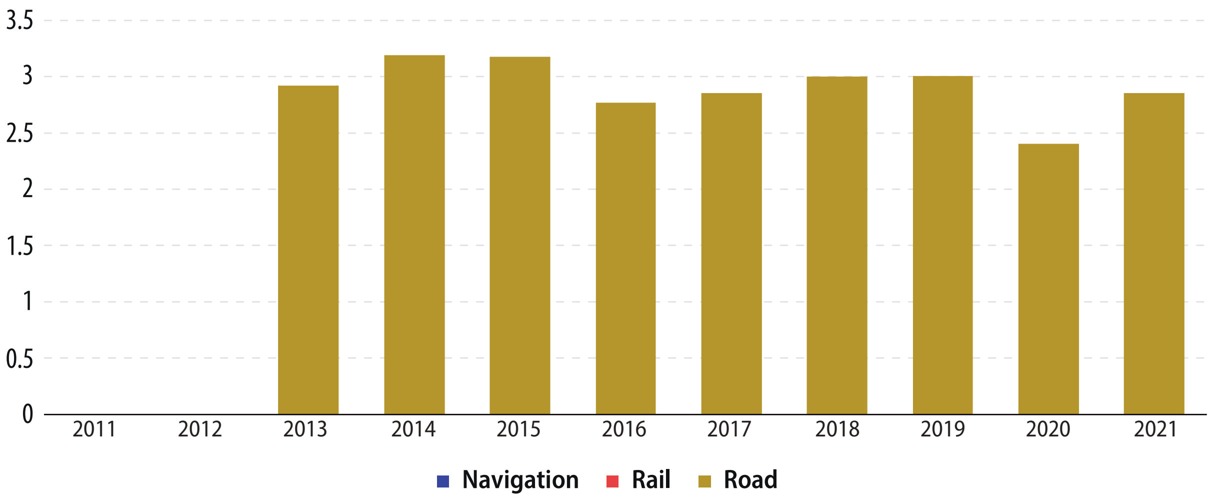


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

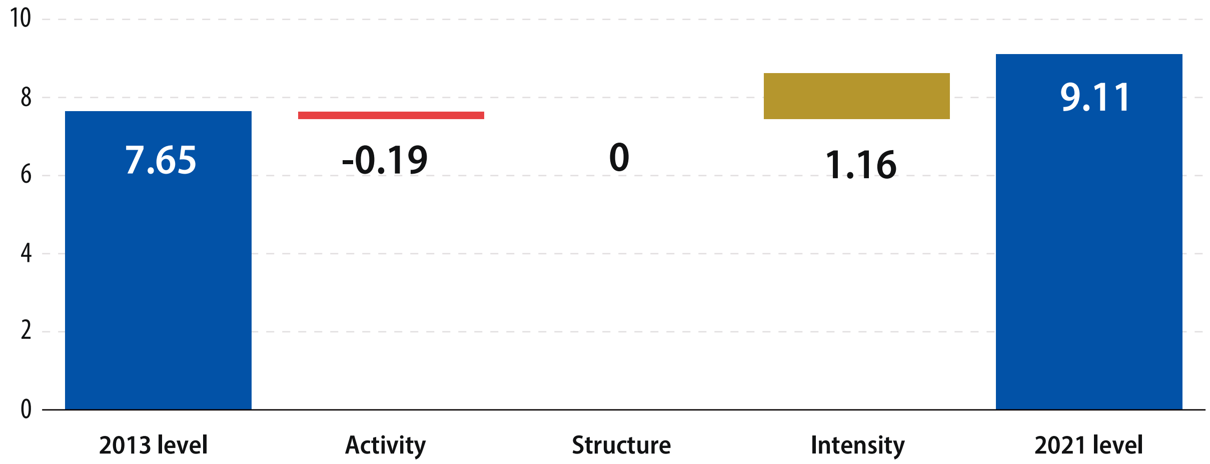


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

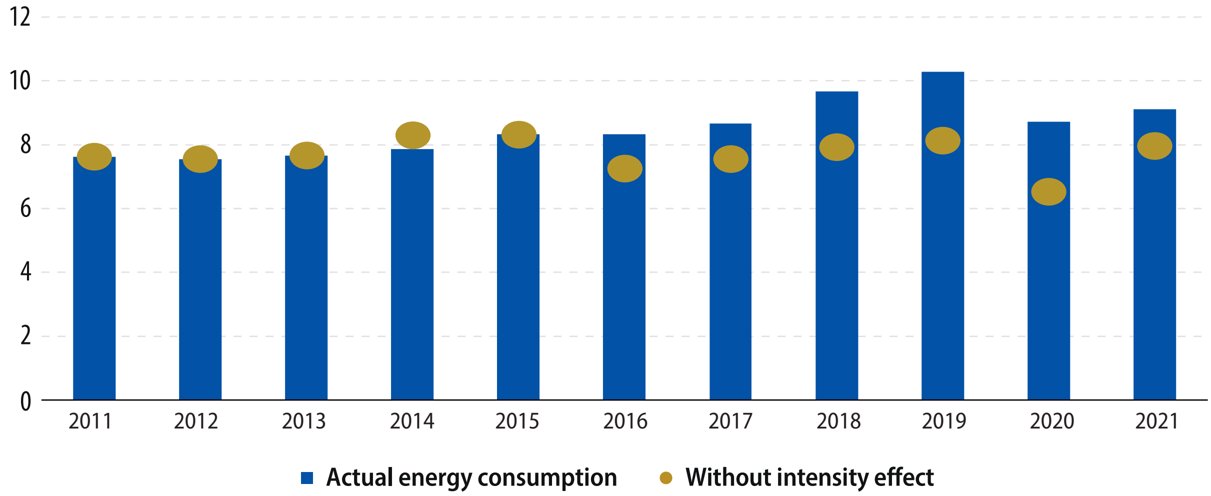


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the transport sector of Maltese grew steadily from 7.6 PJ in 2011 to 10.3 PJ in 2019, then it decreased to reach 8.7 PJ in 2020, and it was still only 9.1 PJ in 2021. Most of the energy consumption is due to road transport, and it is also the only mode of transport reported in terms of traffic. Unfortunately, road traffic information is not available prior to 2013, therefore the decomposition was performed for the years 2013 and 2021. During this period, road traffic oscillated between 2.4 and 3.2 billion VKM. Between 2013 and 2021, the stable traffic had no significant effect on energy consumption, and since road is the only mode of transport reported, there is no structural effect to report. The only significant driver was the increase in energy intensity, which caused an additional 1.1 PJ of consumption. Without this increase in intensity, the total consumption would have been 12 % lower in 2021.

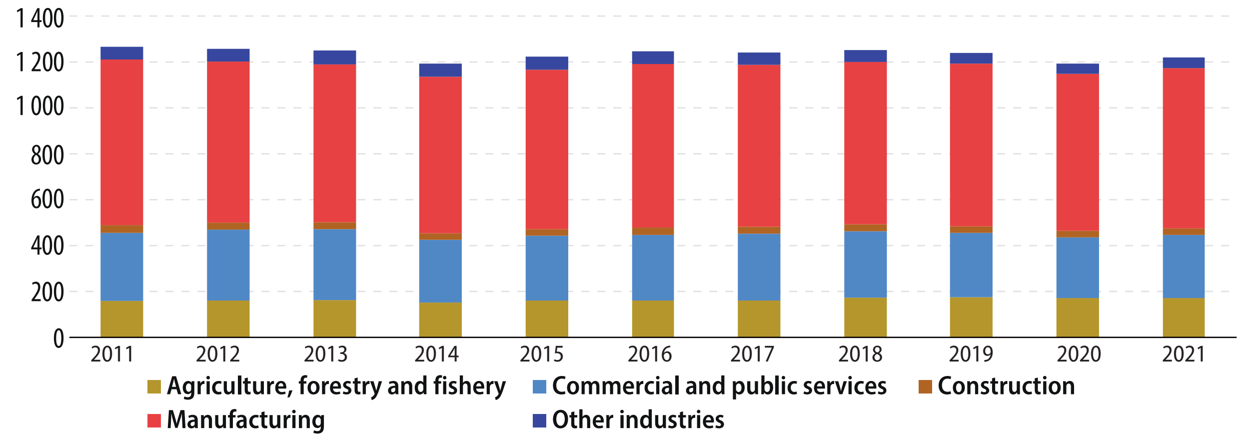
The Netherlands

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

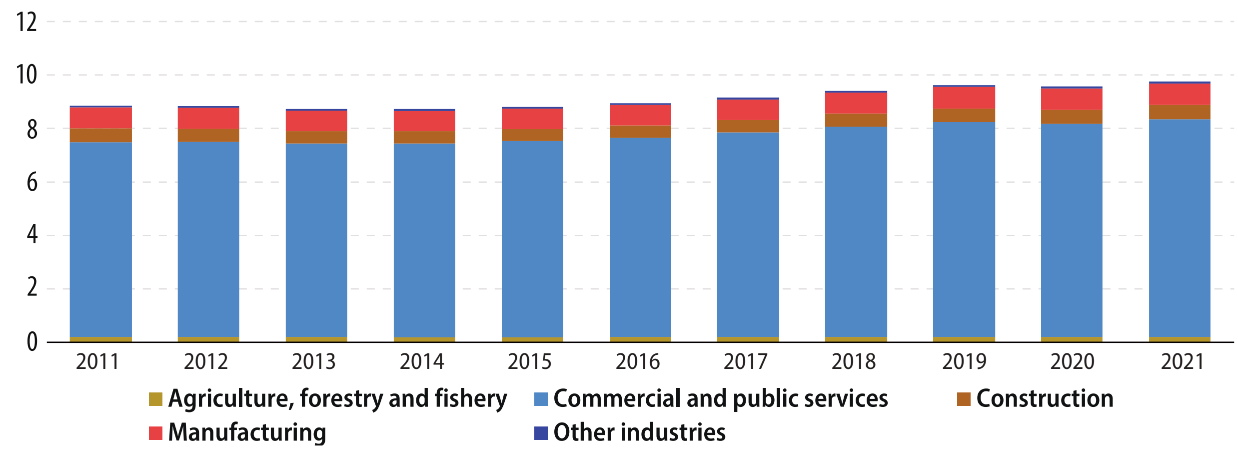


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

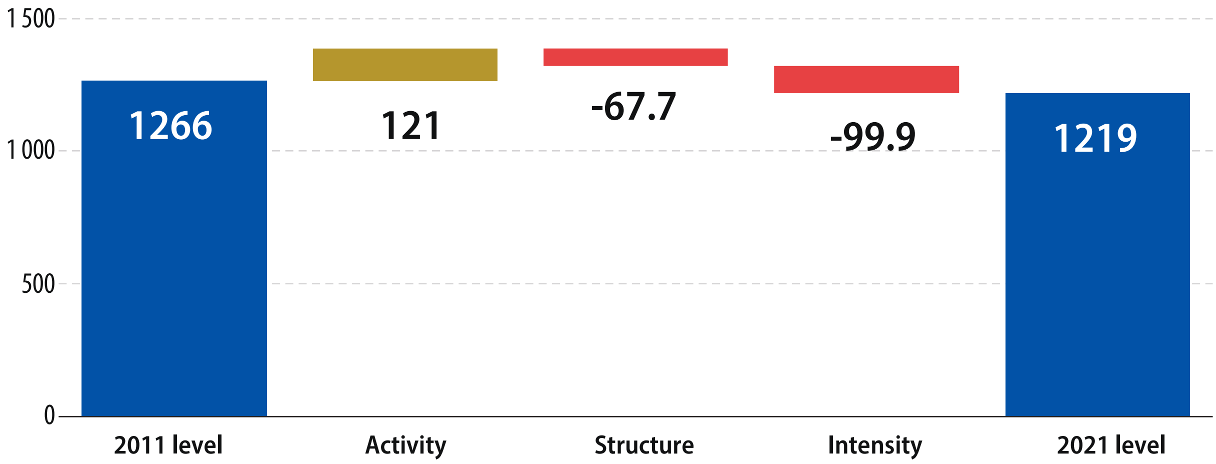


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

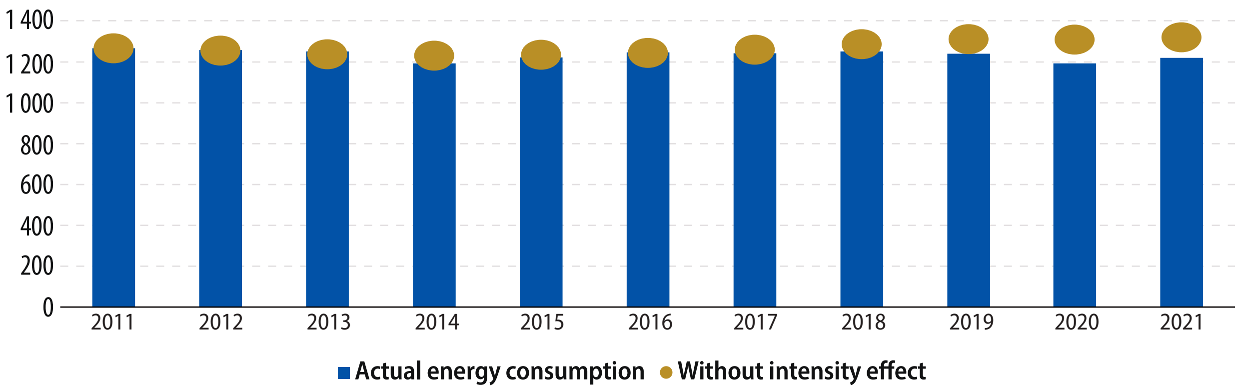


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

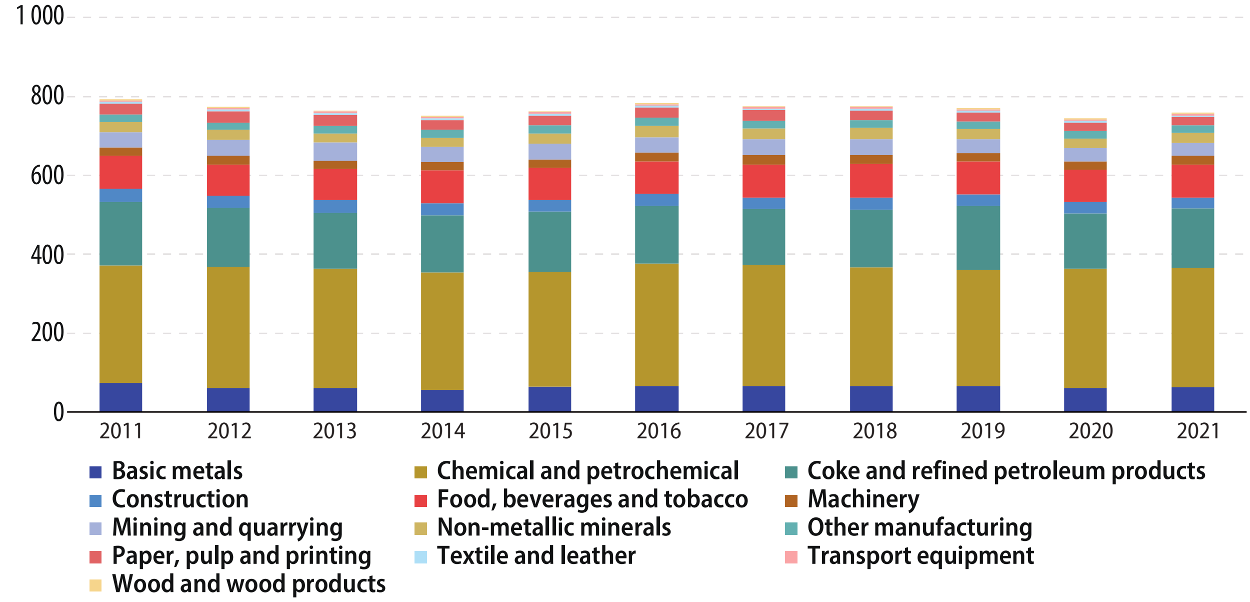
The final energy consumption of the different sectors of the whole Dutch economy slightly decreased between 2011 and 2021, from 1 266 PJ to 1 219 PJ. Meanwhile, the active population steadily increased from 8.9 million in 2011 to 9.7 million in 2021. Over this period, the increase in activity (measured in terms of employees) caused energy consumption to rise by about 121 PJ. Meanwhile, the structural change brought energy consumption down by about 68 PJ, mostly due to the decreasing share of the manufacturing industries sector (from 9 % to 8 % of the total active population over the period). The decrease in energy consumption per employee caused the energy consumption to decrease by about 100 PJ. Without this decrease, the energy consumption for the whole economy would have been 8 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

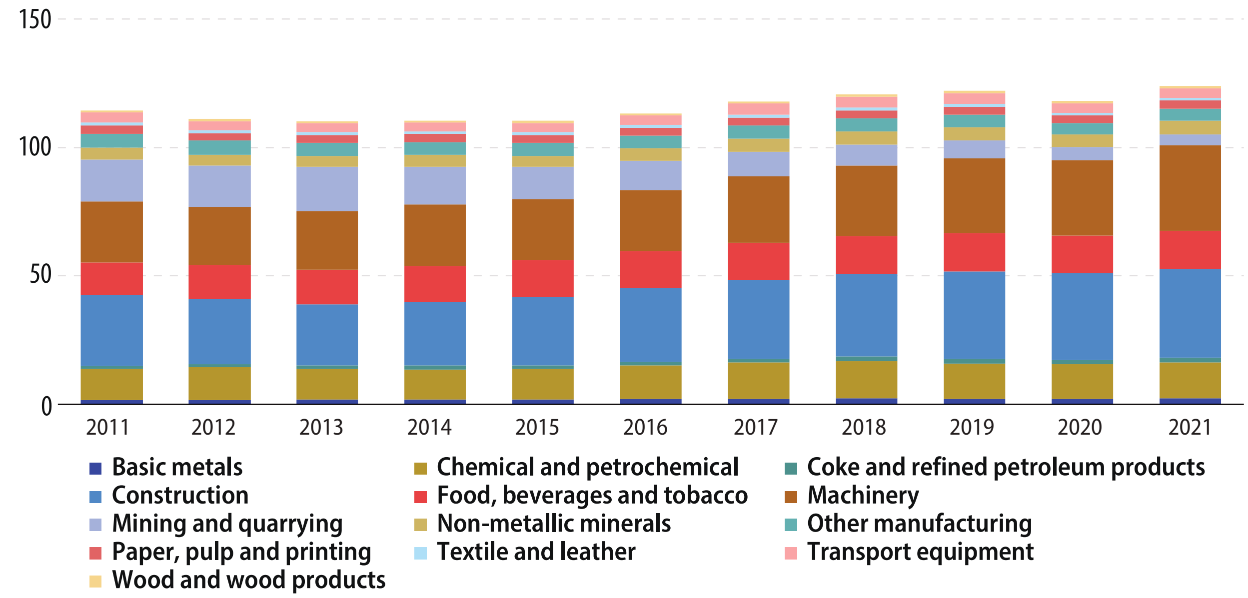


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

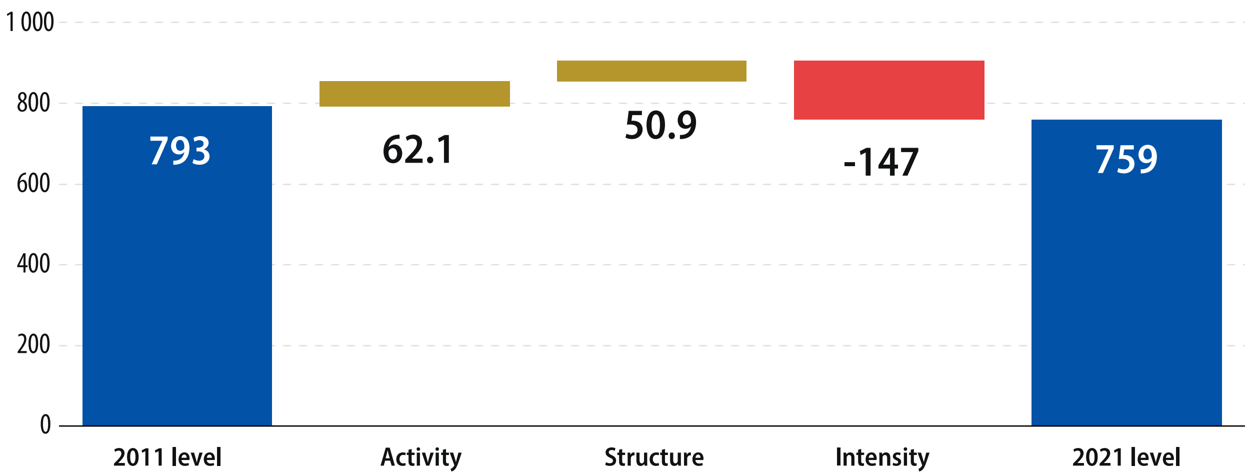


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

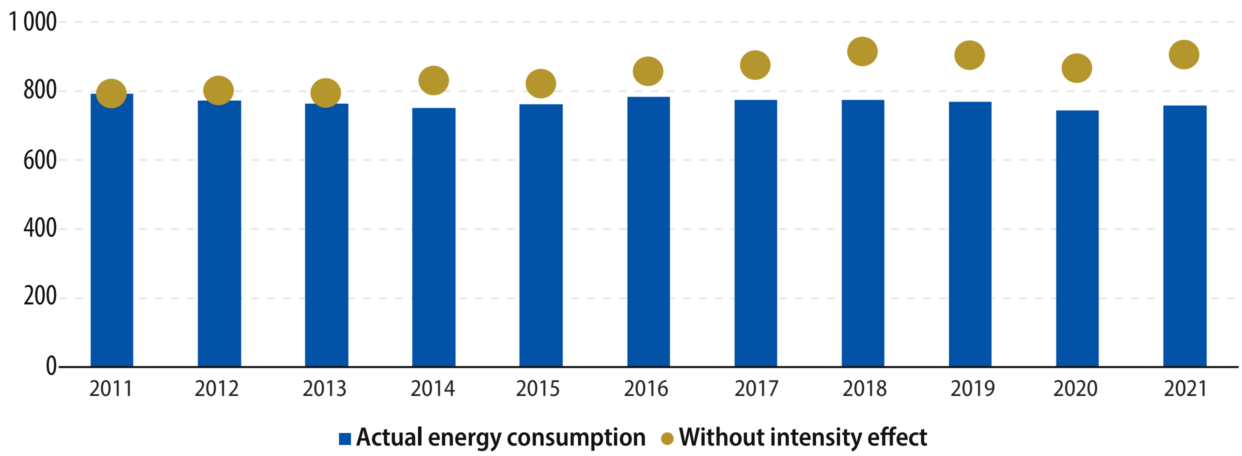


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

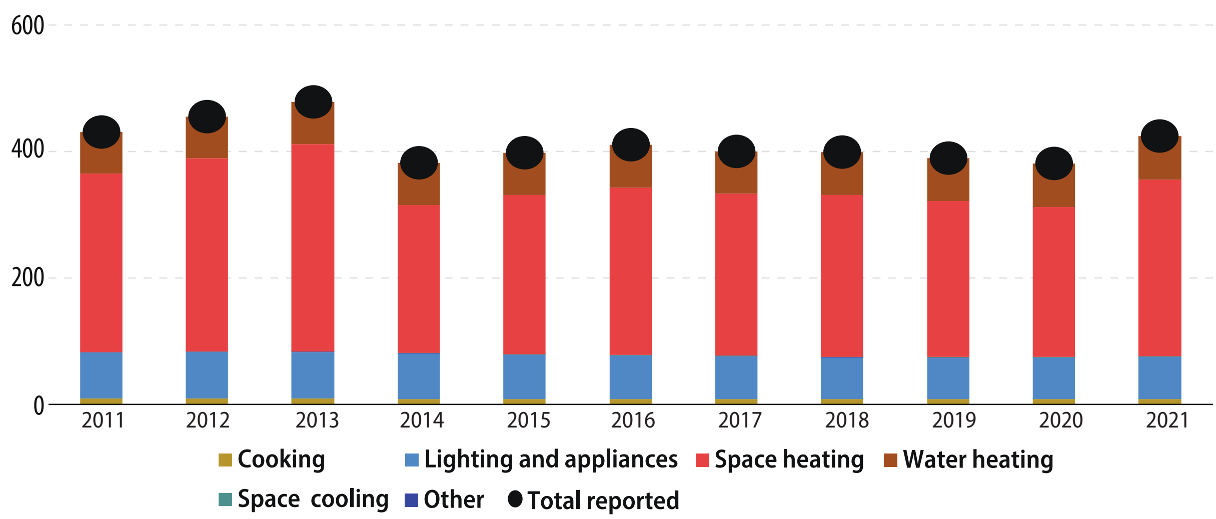
The energy consumption in the Netherlands' manufacturing industry sector oscillated between 744 PJ and 793 PJ between 2011 and 2021. After a first period of slow decrease from 114 billion EUR in 2011 to 110 billion EUR in 2013, the corresponding total gross value added increased to 122 billion EUR in 2019, and then dropped in 2020 to 118 billion EUR, to bounce back in 2021 to its highest level over the period, at 124 billion EUR. Between 2011 and 2021, the increase in activity brought energy consumption up by about 62 PJ, and the structural changes in the industry caused a further increase of about 51 PJ of consumption, partly due to a higher share of the machinery sector (from 21 % to 27 % of the GVA between these two years). However, both effects were more than offset by the decrease in energy intensity, which brought down the consumption by about 147 PJ. Without this decrease, the total energy consumption in the industry sector would have been 19 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

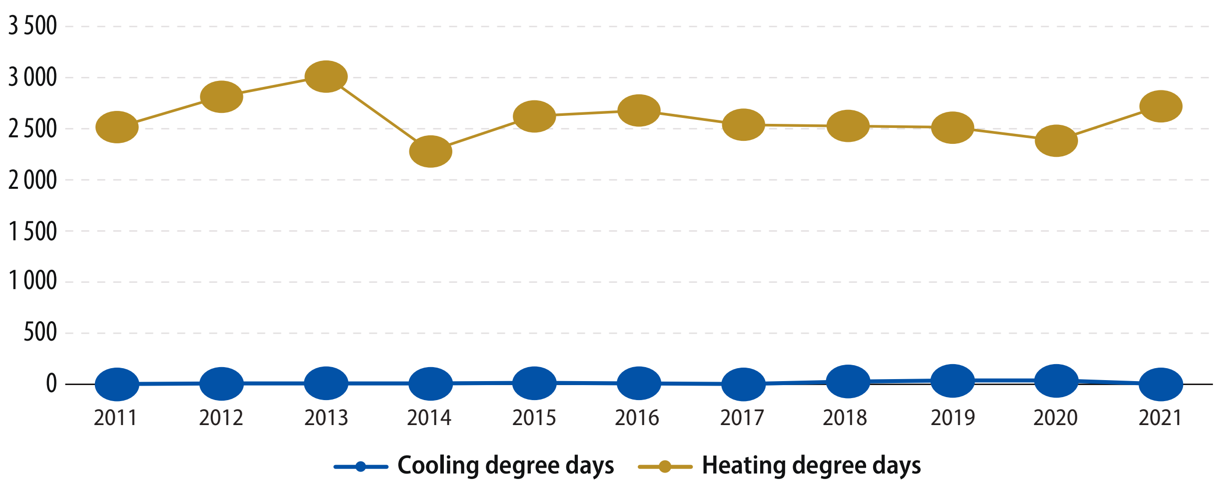
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

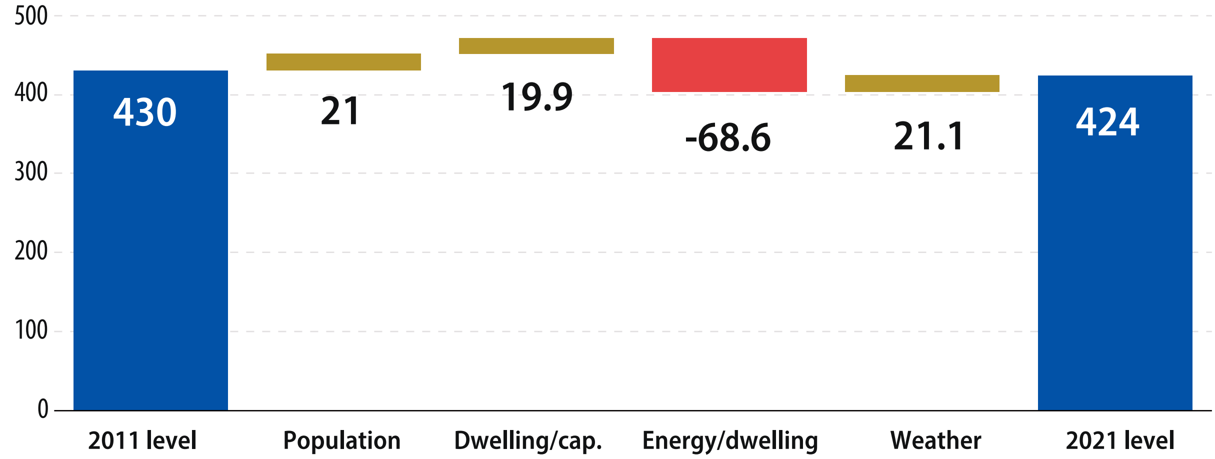


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

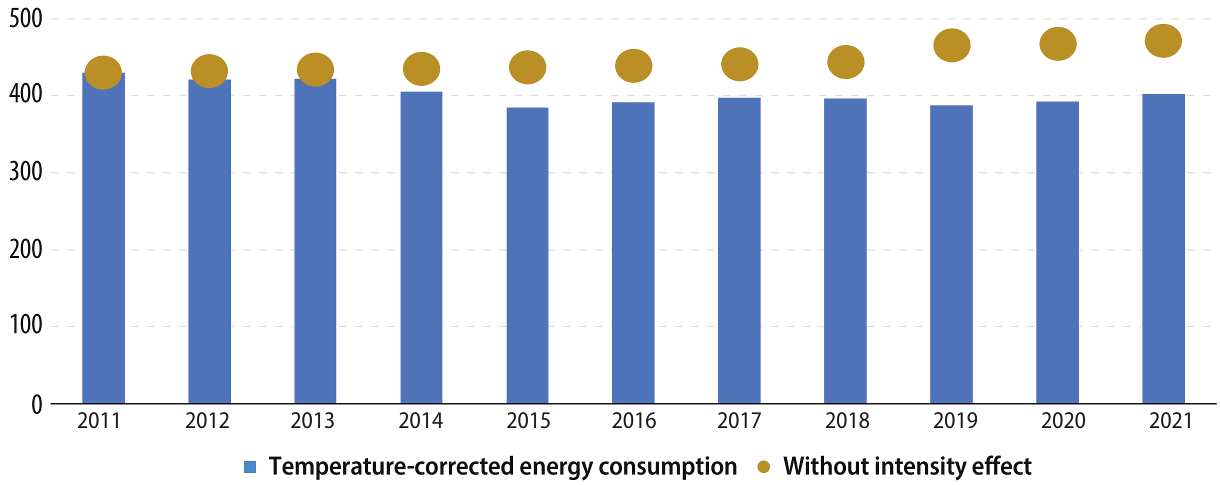


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

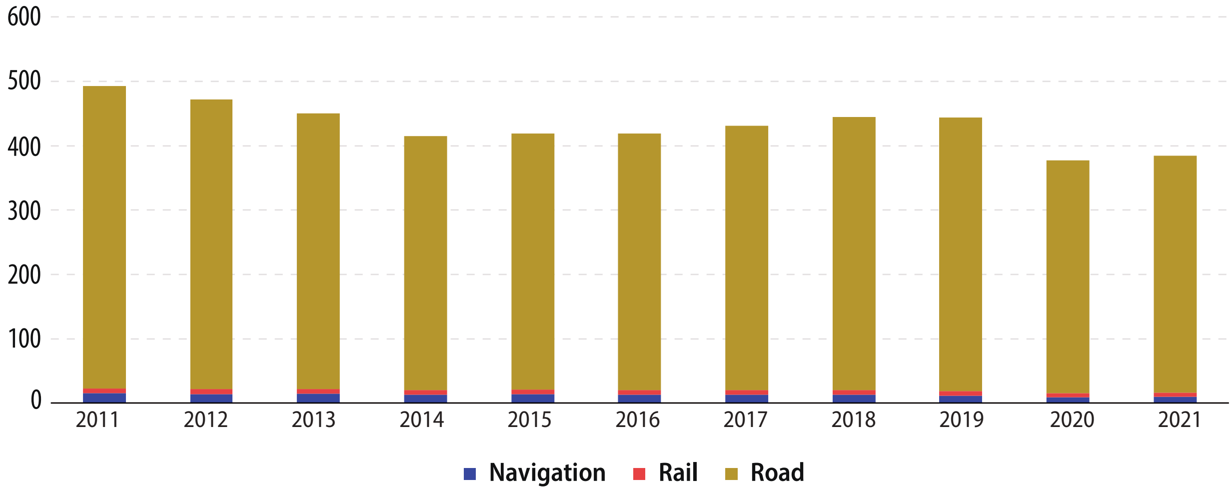
The reported energy consumption in the Dutch residential sector increased from 430 PJ in 2011 to 478 PJ in 2013, then dropped to 382 PJ in 2014. It oscillated around this level until 2020, then climbed back up to 424 PJ in 2021. During this period, the population slightly increased, causing an increase of about 21 PJ of energy consumption, and the decrease in dwelling occupancy caused an additional 20 PJ of energy consumption. With a slight increase in heating degree days between the two years, the weather had a further increasing effect of about 21 PJ. Finally, the most significant driver was the decrease in energy consumption per dwelling which caused a decrease of about 69 PJ. Without this decrease, the residential sector energy consumption could have been 5 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

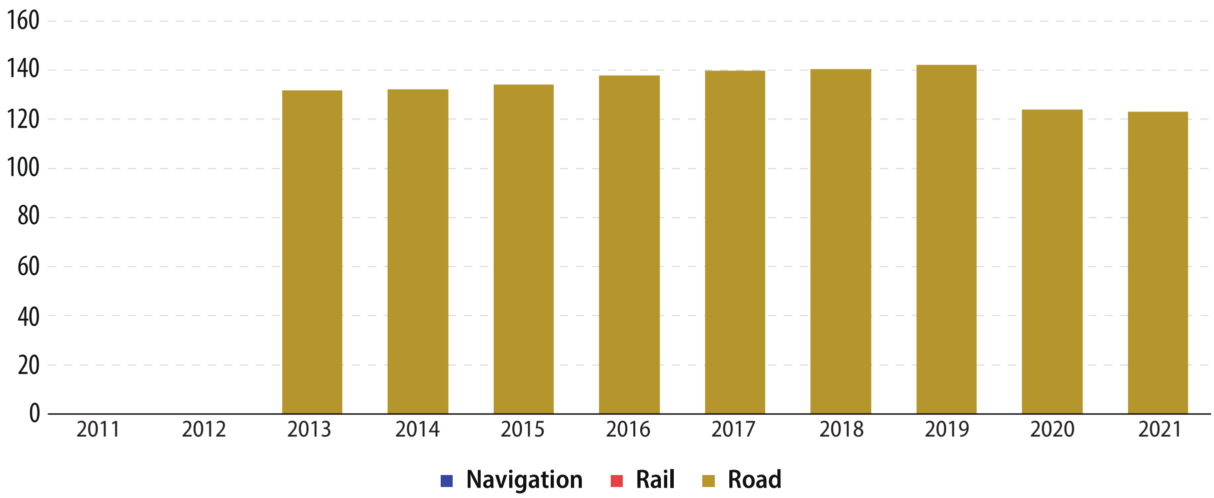


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

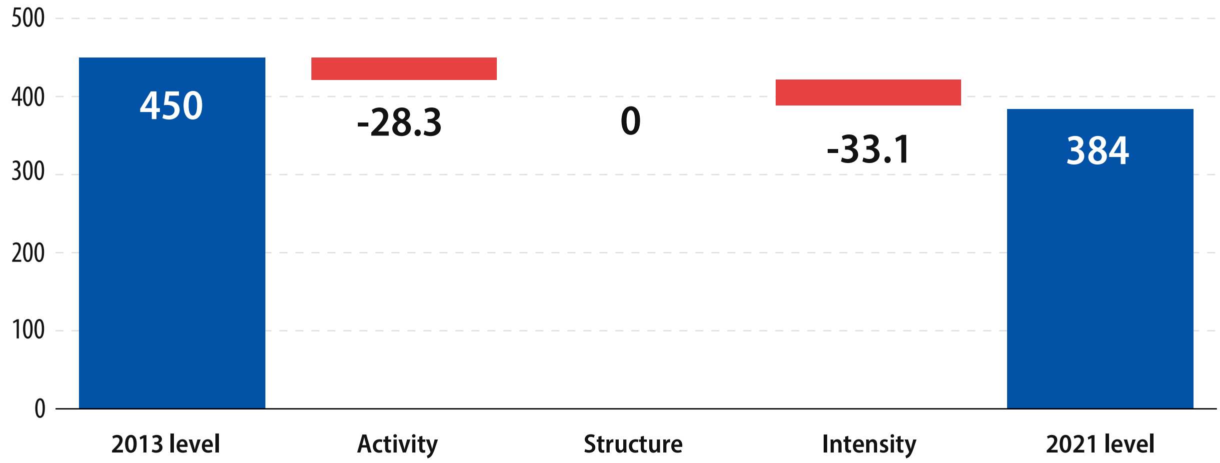


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

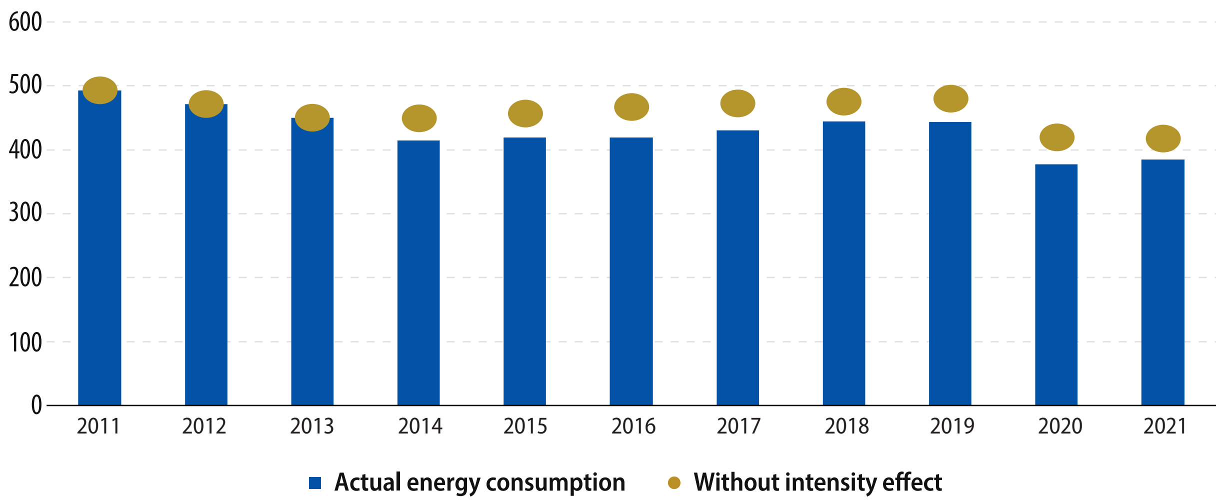


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Dutch transport sector steadily decreased from 493 PJ in 2011 to 444 PJ in 2019, before dropping to 377 PJ in 2020, and it was still only 384 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic was not available for data prior to 2013 at the time of the extraction, so the decomposition was performed between the years 2013 and 2021. Between these two years, road traffic grew from 131 billion VKM to 142 billion VKM in 2019, then dropped to 124 billion VKM in 2020, and it was still only 123 billion VKM in 2021. Between 2013 and 2021, the decrease in traffic caused a drop in energy consumption of about 28 PJ. In addition, the decrease in energy intensity caused a reduction of almost 33 PJ. Because of the absence of variation in the share of the different transport modes, the structural effect was very limited. Without the decrease in energy intensity, the energy consumption in the transport sector could have been almost 9 % higher in 2021.

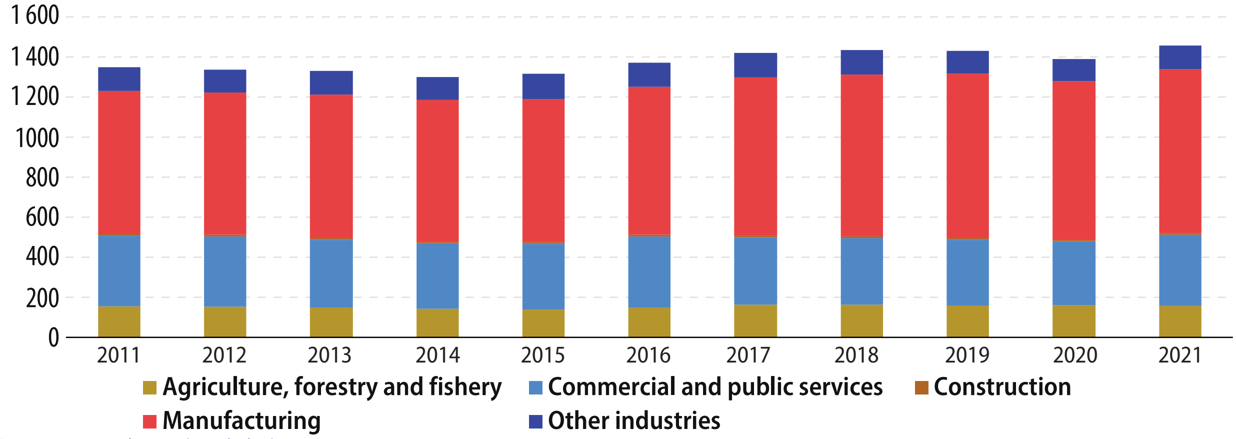
Poland

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

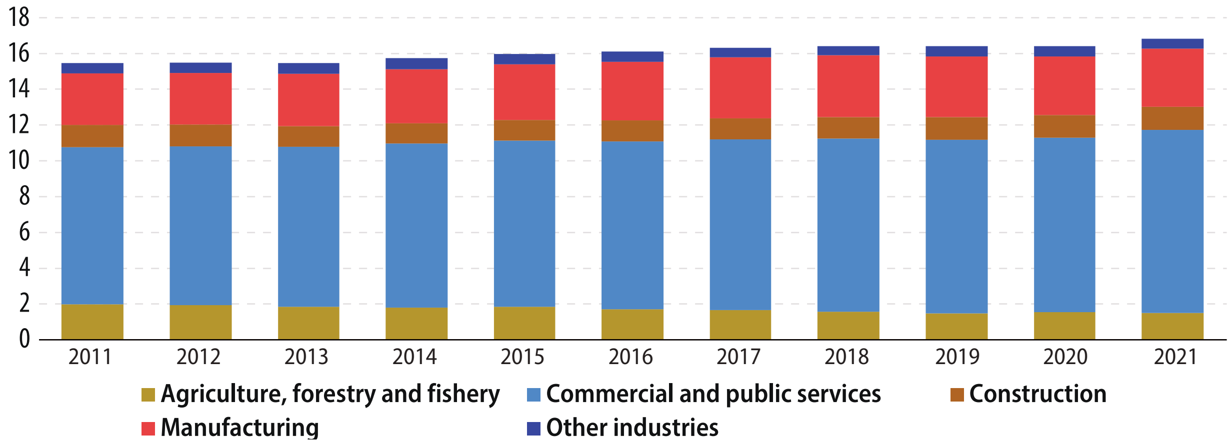


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

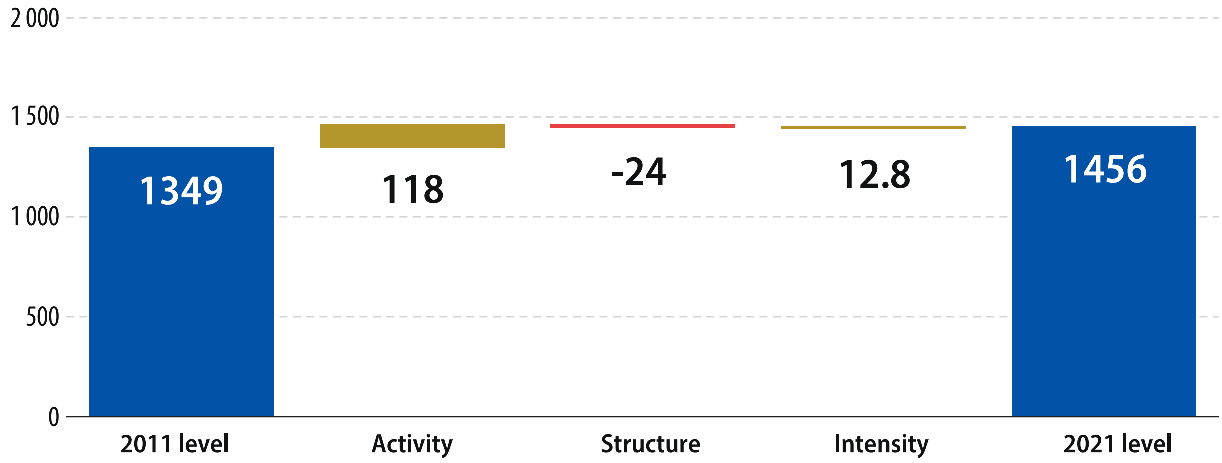


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

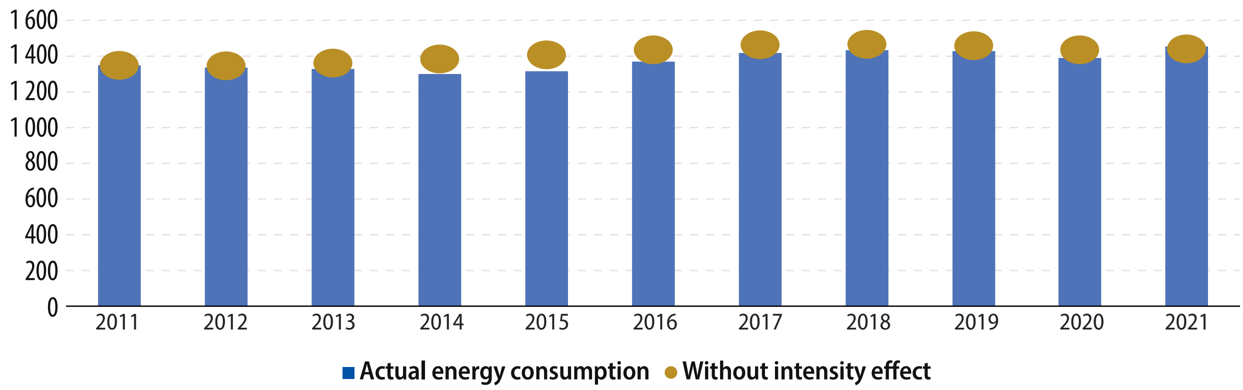


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

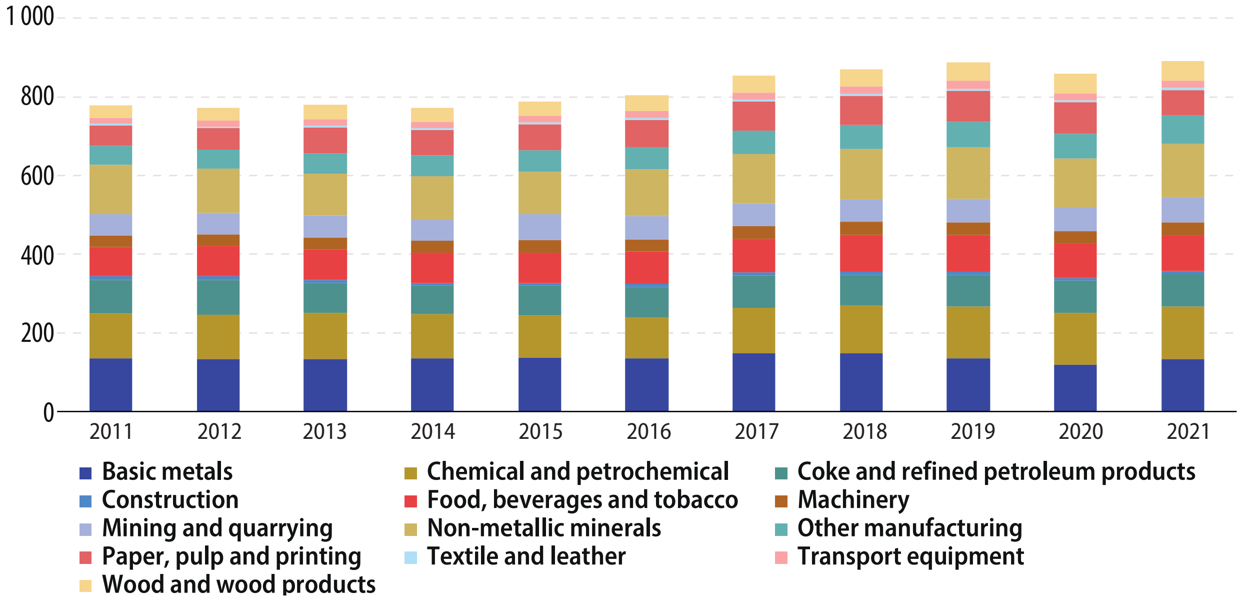
The final energy consumption of the different sectors of the Polish economy slightly increased between 2011 and 2019 from 1 349 PJ to 1 430 PJ, then it dropped to 1 390 J in 2020, before coming back to 1 456 PJ in 2021. Meanwhile, the active population steadily increased from 15.5 million in 2011 to 16.8 million in 2021. Between these two years, the most significant driver was the increase in activity (measured in terms of employee) which brought energy consumption up by about 118 PJ, while the structural changes in the economy caused a drop in energy consumption of about 24 PJ, which is mostly related to the increase in the share of the commercial and public services sector (from 57 % to 61 % of the active population between the two years). Finally, the small increase energy consumption per employee brought the energy consumption up by about 13 PJ.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

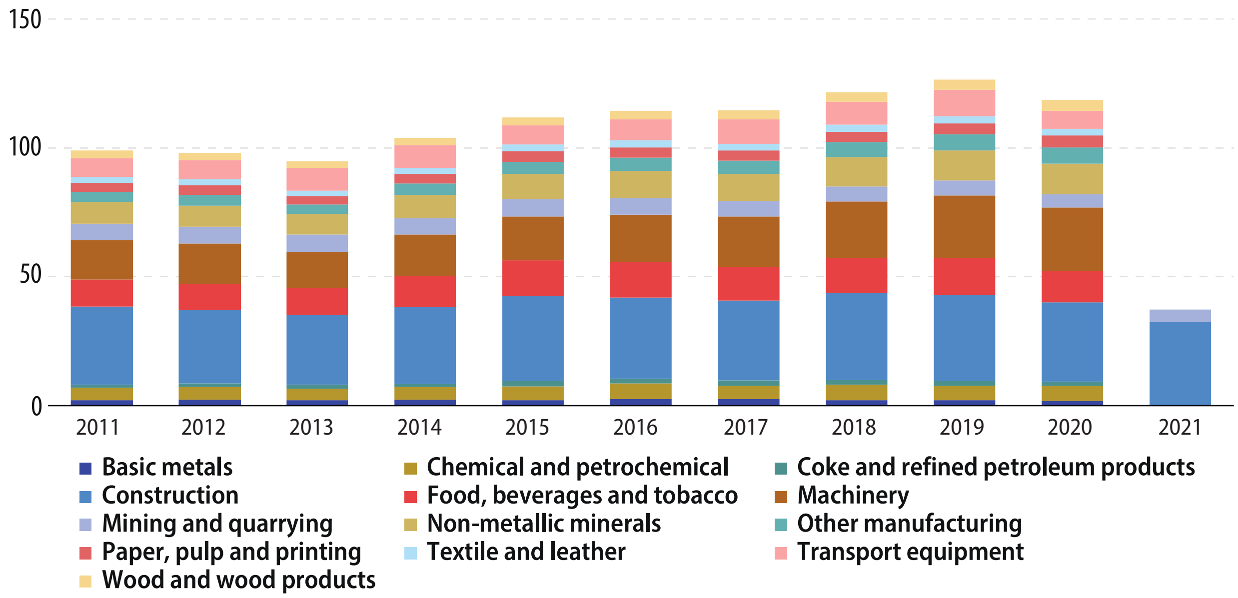


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

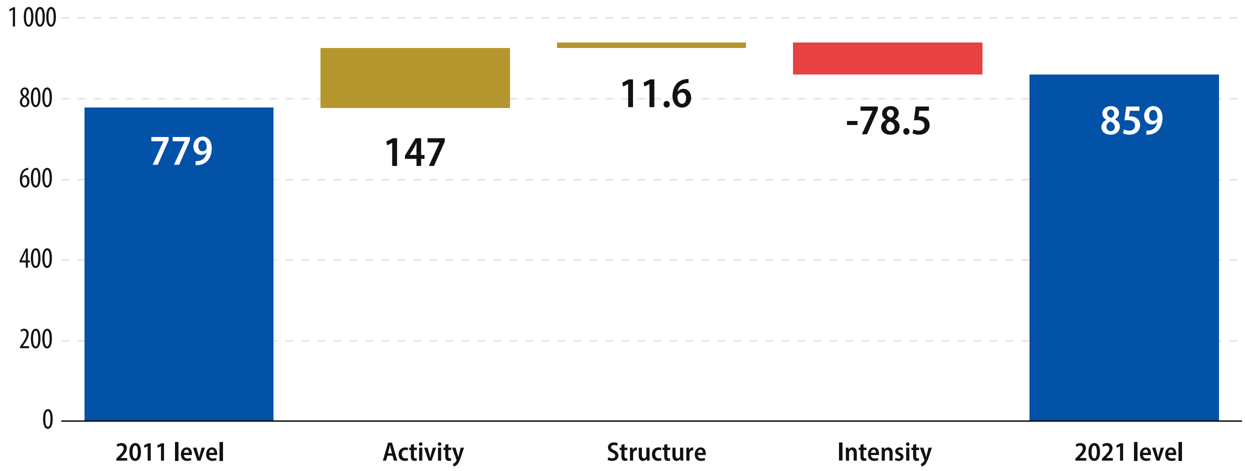


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

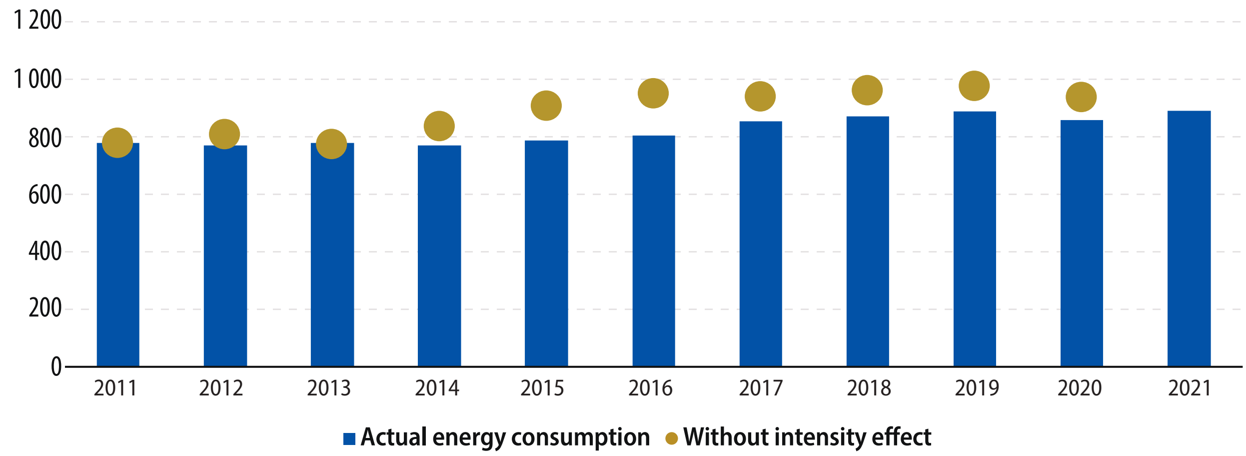


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

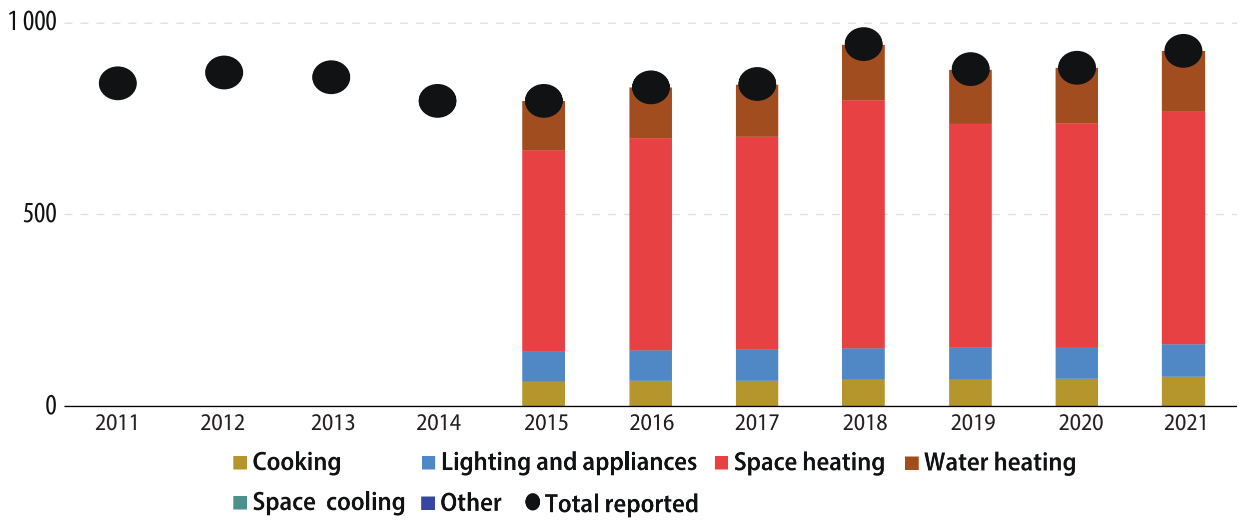
The Polish energy consumption in the manufacturing industries sector increased from 779 PJ in 2011 to 888 PJ in 2019, then dropped to 859 PJ in 2020 before bouncing back to 891 PJ in 2021, its highest level over the studied period. The corresponding total gross value added increased from 99 billion EUR in 2011 to 127 billion EUR in 2019, and then decreased in 2020 to 119 billion EUR. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the period 2011-2020. Between these two years, the increase in activity brought energy consumption up by about 147 PJ. Moreover, the structural changes in the economy caused an increase of almost 12 PJ of consumption, due to a higher share of the machinery sector (from 16 % to 25 % of the value added between the two years and in the non-metallic minerals sector (from 8 to 12 %), but was offset by the decrease in energy intensity, which brought down consumption by almost 79 PJ. Without this reduction, the total energy consumption in the industry sector would have been 9 % higher in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

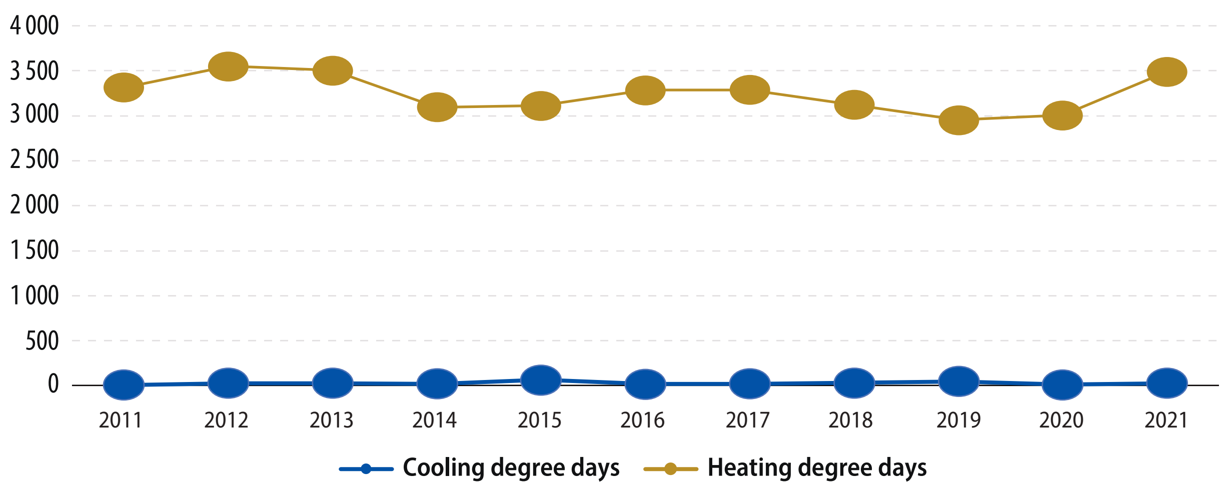
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

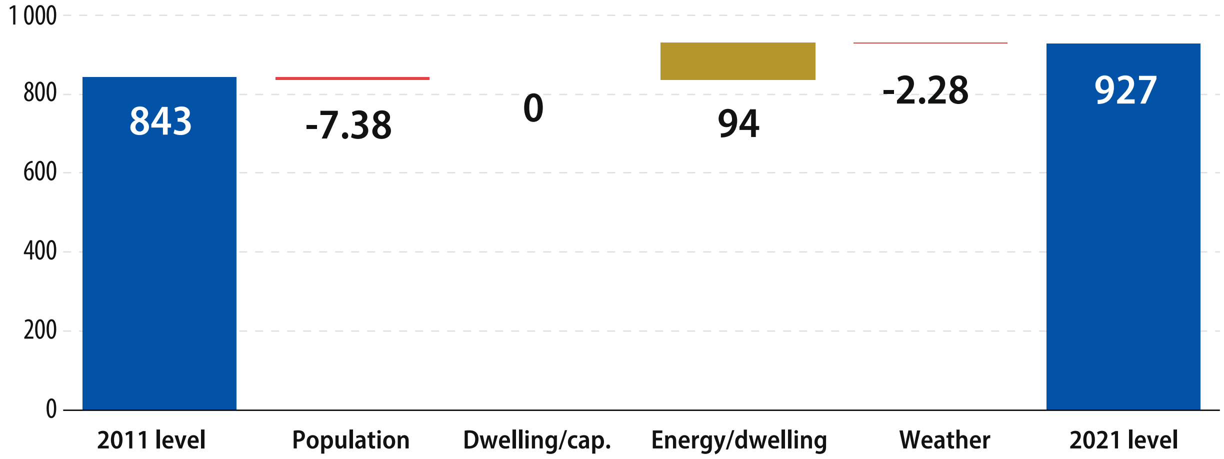


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

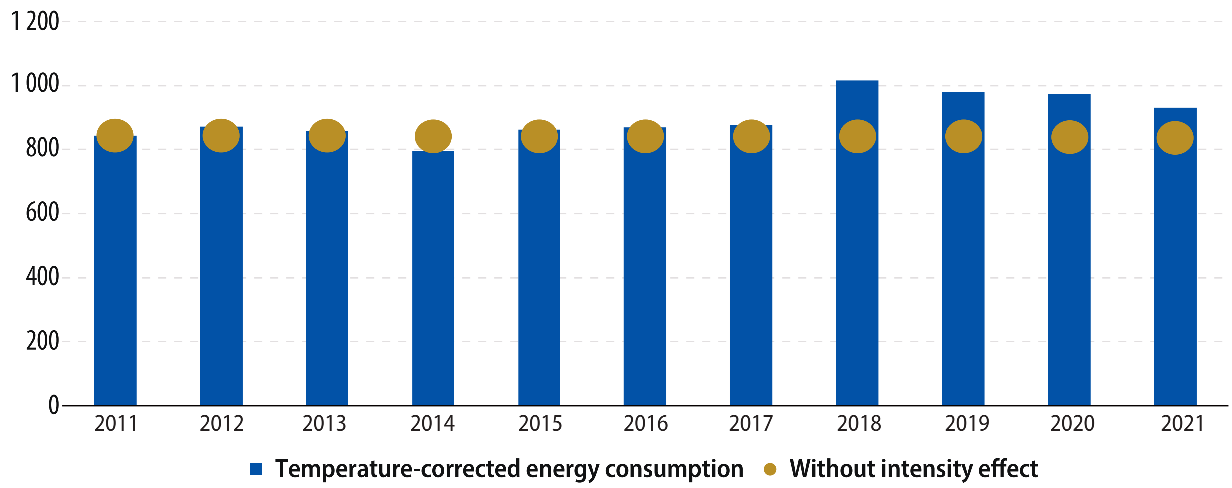


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

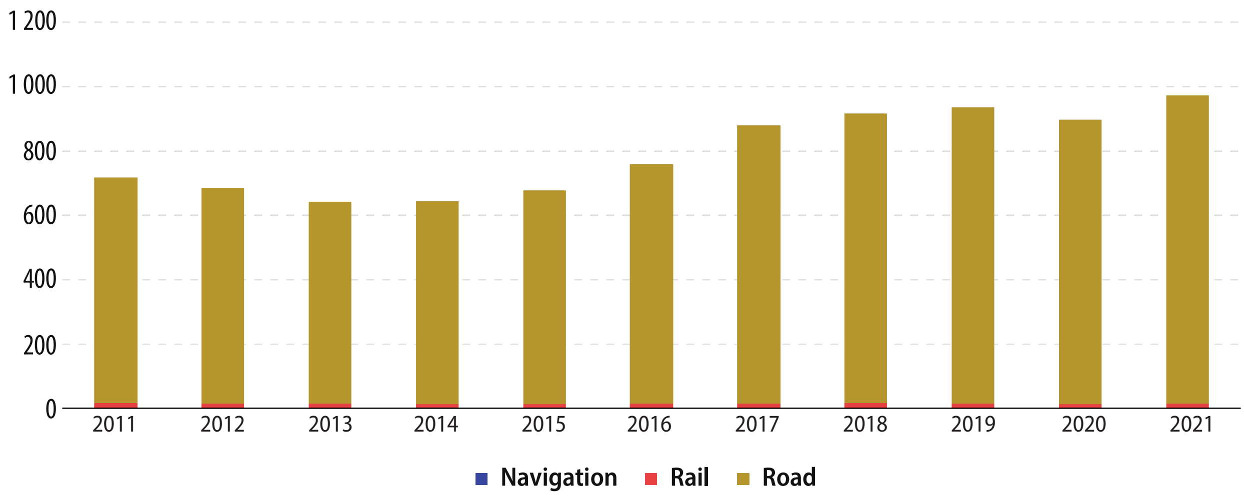
The energy consumption in the Polish residential sector shows strong year-on-year variation, and overall, it increased from 843 PJ in 2011 to 927 PJ in 2021. The breakdown in energy consumption by end-use is only available from 2015, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the decrease in population caused a reduction in energy consumption of about 7 PJ, meanwhile dwelling occupancy remained the same and therefore had no effect. An increase of about 94 PJ was due to the higher energy consumption per dwelling in 2021, which may be partly explained by the absence of temperature correction for the year 2011. There were slightly more heating degree days in 2021 than in 2011, however since the temperature correction could not be calculated for 2011, the weather effect between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

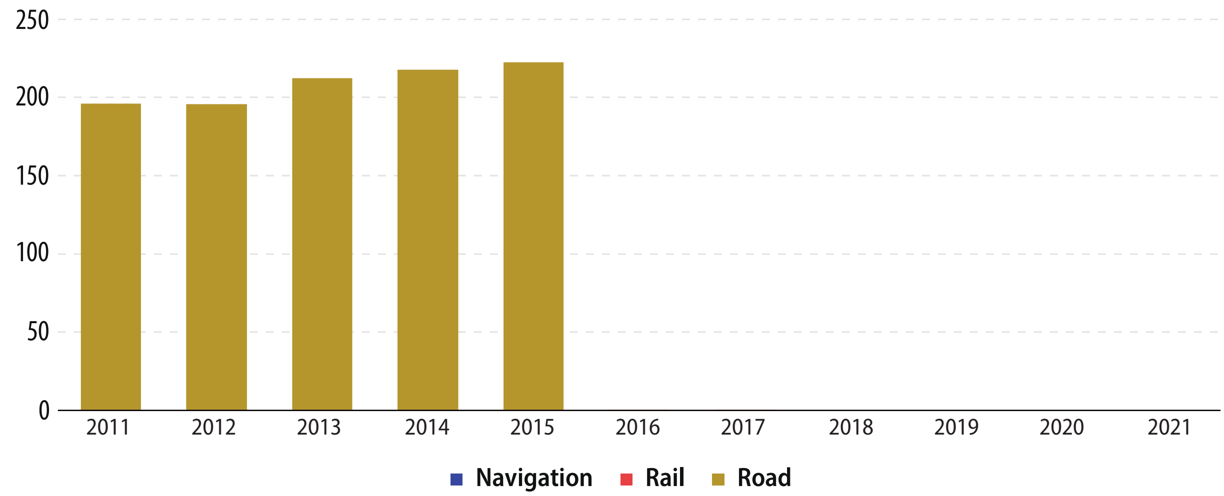


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

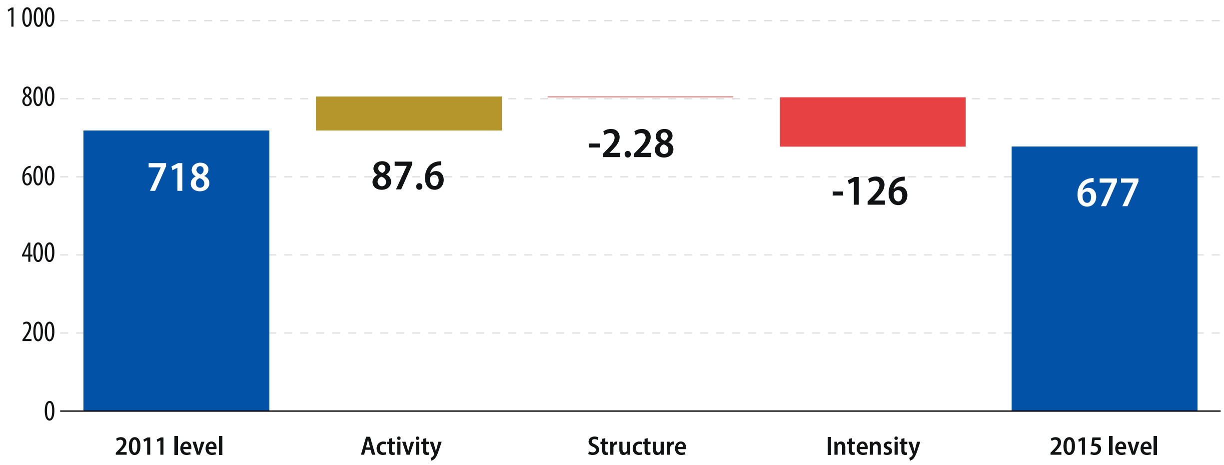


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

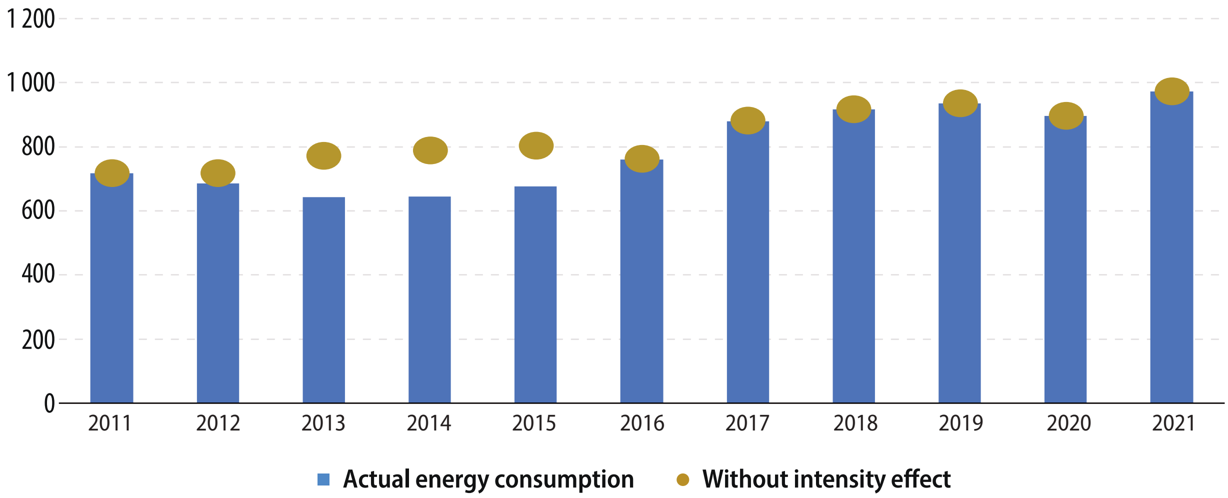


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Polish transport sector firstly decreased from 718 PJ in 2011 to 641 PJ in 2013, then it grew to reach 936 PJ in 2019, before dropping to 896 PJ in 2020, and then bouncing back to 972 PJ in 2021, its highest level over the studied period. Most of the energy consumption is due to road transport. Unfortunately, road traffic is only available for data up to 2015, therefore the decomposition had to be performed between the years 2011 and 2015. Over this short period, road traffic increased from 196 billion VKM in 2011 to 222 billion VKM in 2015.

Between 2011 and 2015, the increase in traffic caused an increase in energy consumption of almost 88 PJ, which was more than offset by the decrease in energy intensity, causing a reduction of about 126 PJ of energy consumption. Because of the absence of significant variation in the share of the different transport modes, the structural effect was very small (around 2.2 PJ). Without the reduction in intensity, the energy consumption in the sector would have been 18 % higher in 2015.

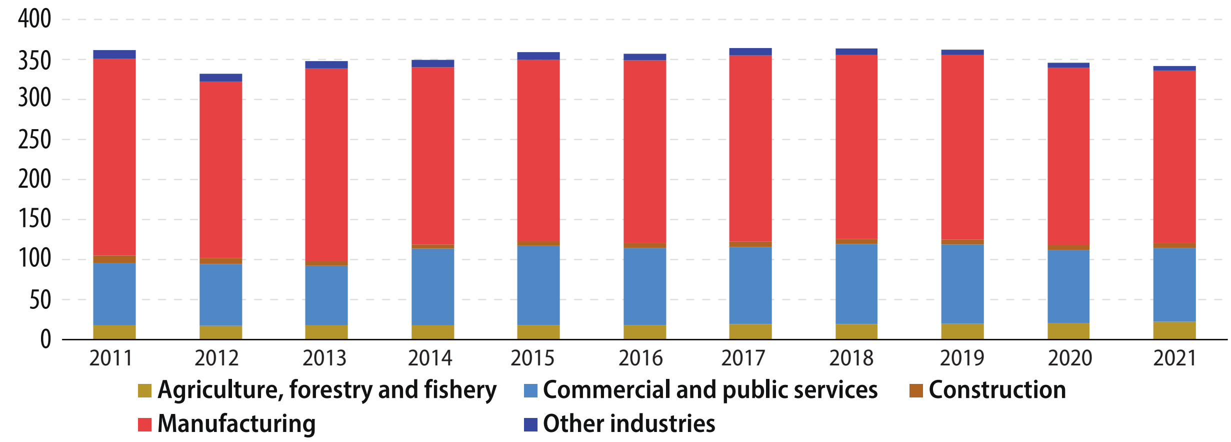
Portugal

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

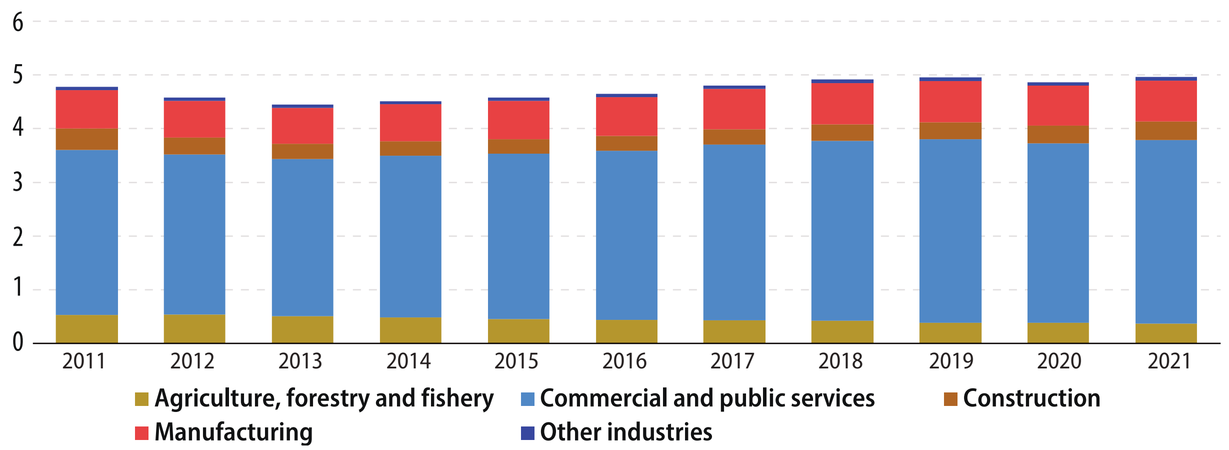


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

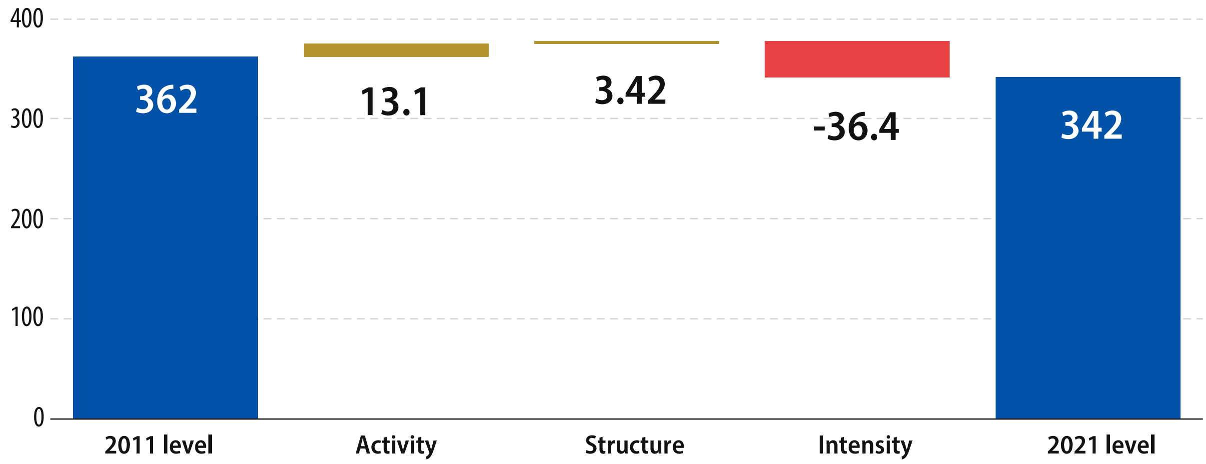


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

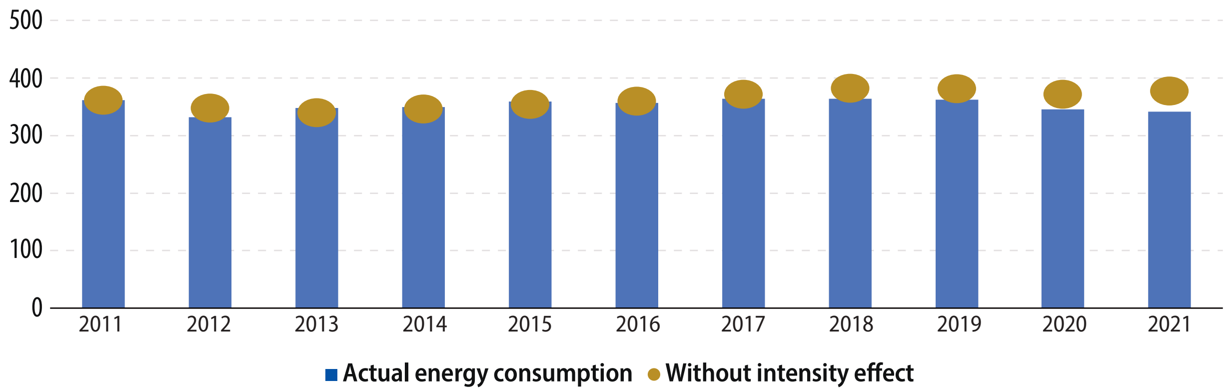


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

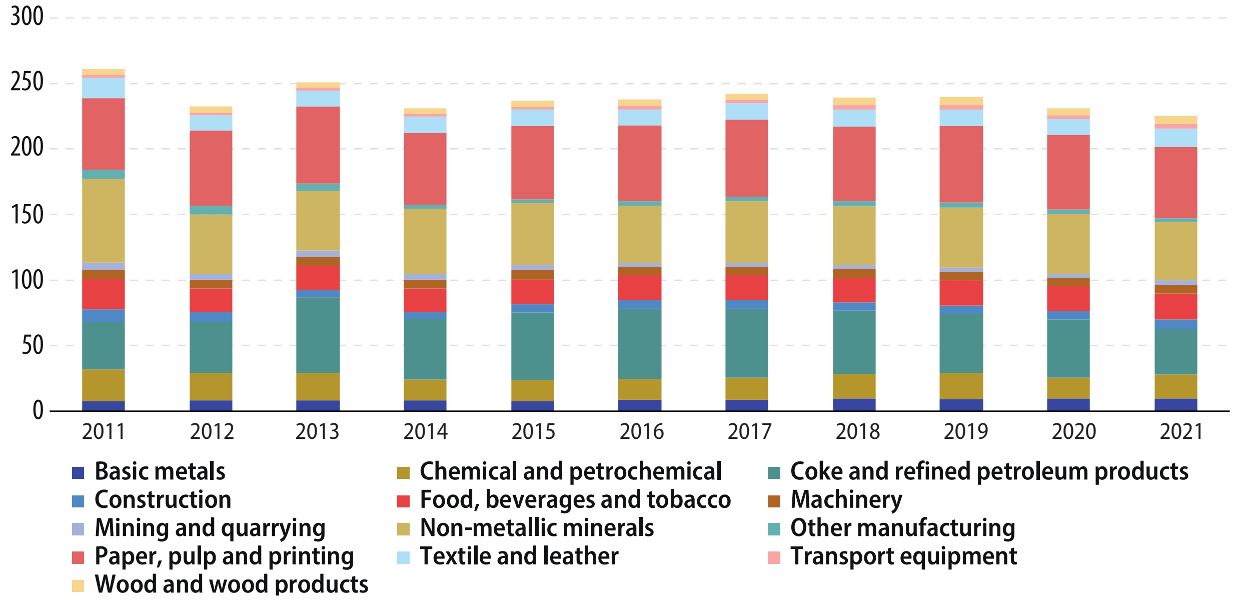
The final energy consumption of the different sectors of the Portuguese economy strongly dropped from 362 PJ in 2011 to 332 PJ in 2012, before increasing steadily to reach 364 PJ in 2017. From there it decreased to reach 342 PJ in 2021. Meanwhile, the active population went through a decrease, from 4.8 million in 2011 to 4.5 million in 2013, before growing steadily to reach almost 5 million in 2021. Between 2011 and 2021, the most significant driver for energy consumption was the decrease in energy consumption per employee which brought the energy consumption down by about 36 PJ. This was partly offset by the increase in activity (measured in terms of employee) which brought energy consumption up by about 13 PJ, while the structural changes in the economy caused a further increase in energy consumption by about 3 PJ. This was mostly related to the increase in the share of the commercial and public services sector (from 64 % to 69 % of the active population between the two years). Without the decrease in energy consumption per employee, the total energy consumption of the different sectors covered would have been 11 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

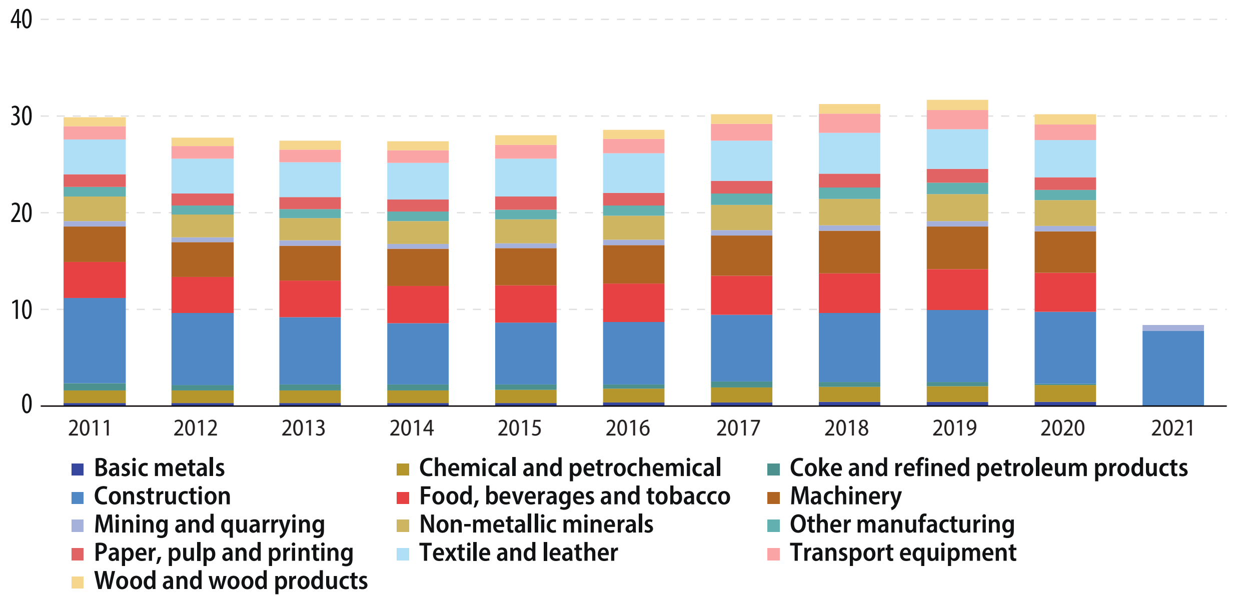


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

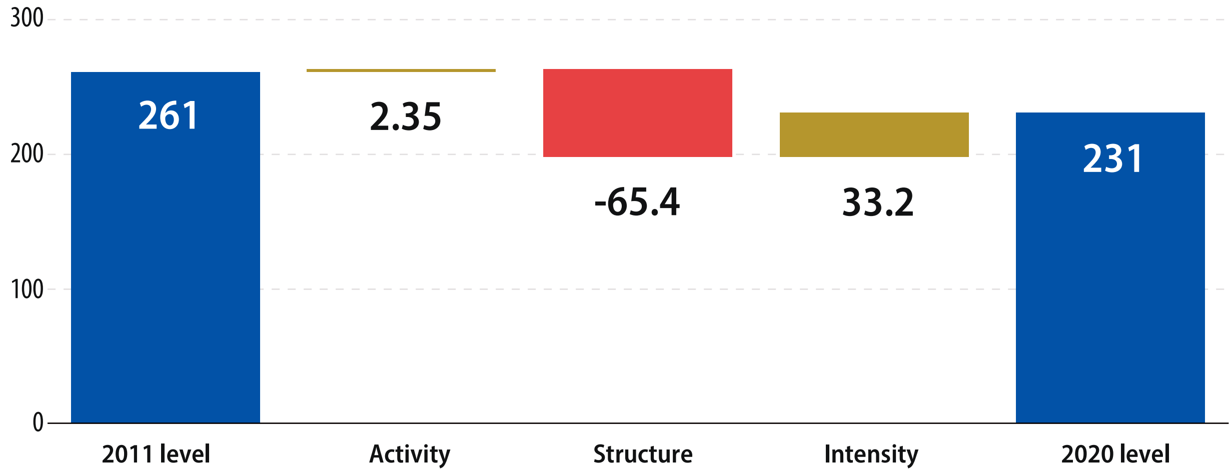


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

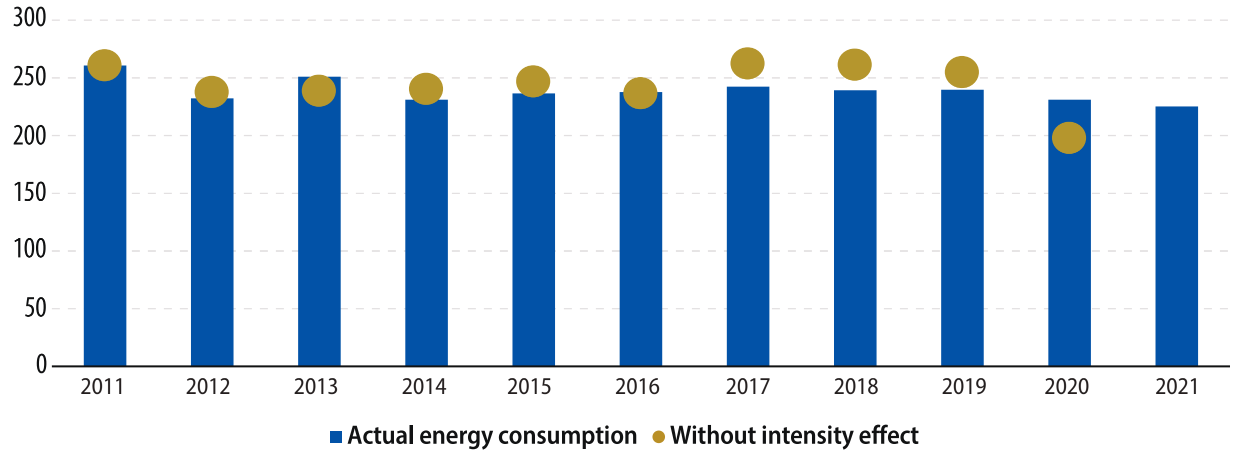


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

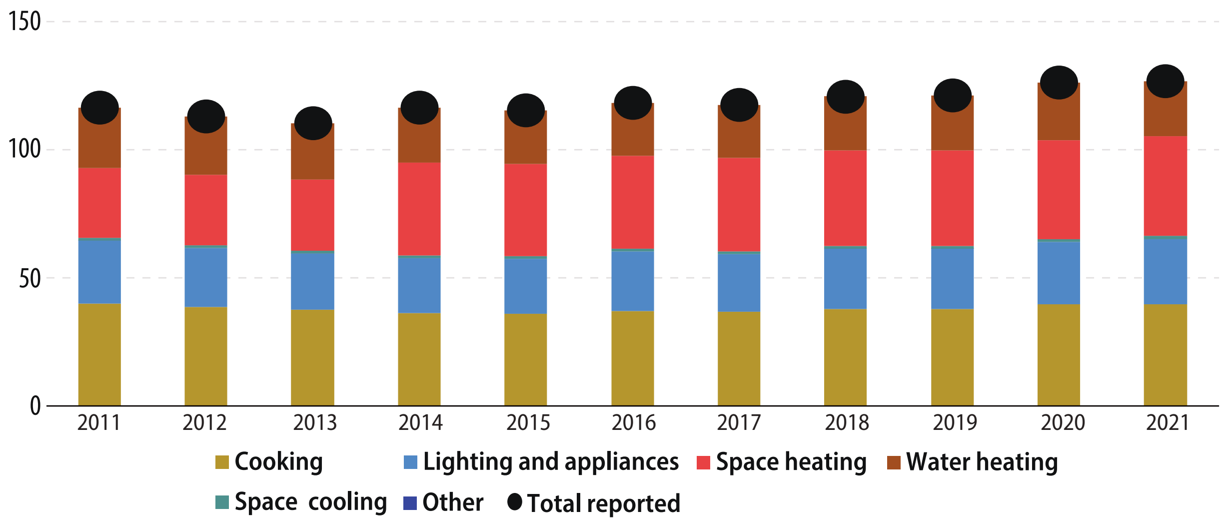
The energy consumption in the Portuguese manufacturing industries sector decreased from 261 PJ in 2011 to 225 PJ in 2021 (except for a peak in 2013). The corresponding total gross value added firstly decreased, from 30 billion EUR in 2011 to 27 billion EUR in 2014, and then increased to reach almost 32 billion EUR in 2019, before dropping back to 30 billion EUR in 2020. The value-added information for some sectors was incomplete in 2021 at the time of the data extraction and therefore the decomposition was performed on the years 2011 and 2020. For these two years, the GVA figures were very similar and therefore the activity had a limited positive impact on the consumption of energy (only 2 PJ). The most significant driver was the structural changes in the industry which caused a decrease of almost 65 PJ of consumption, partly due to a lower share of the construction sector (from 29 % to 25 % of the value added between the two years), even if it was partly offset by the increase in energy intensity, which brought consumption up by almost 33 PJ. Without this increase, the total energy consumption in the industry sector would have been 14 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

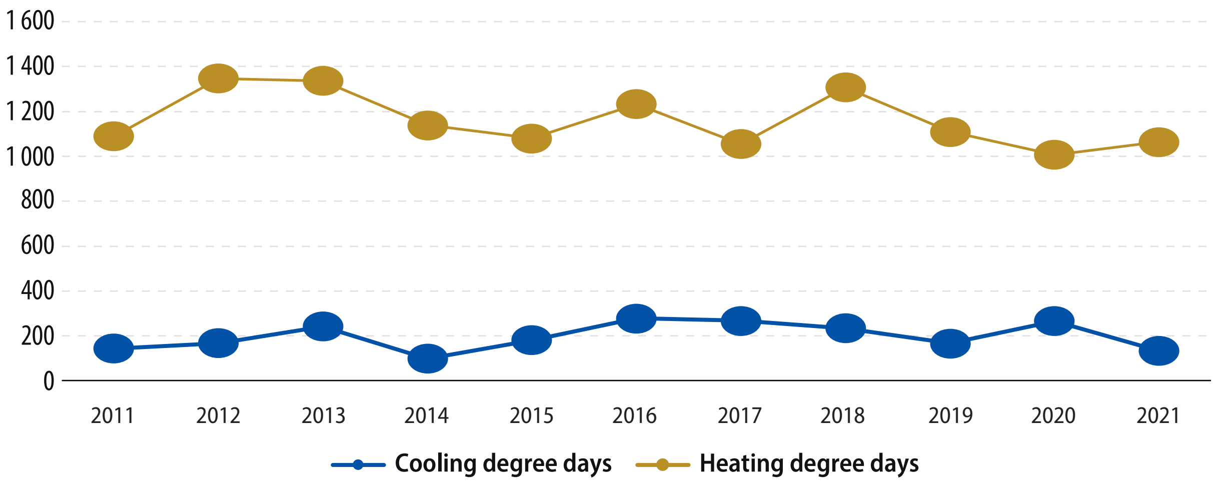
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

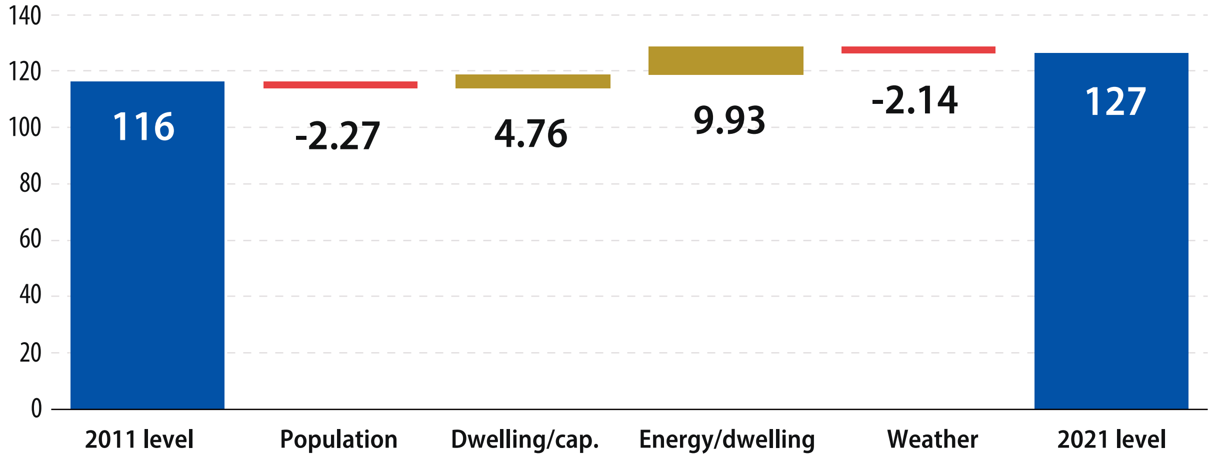


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

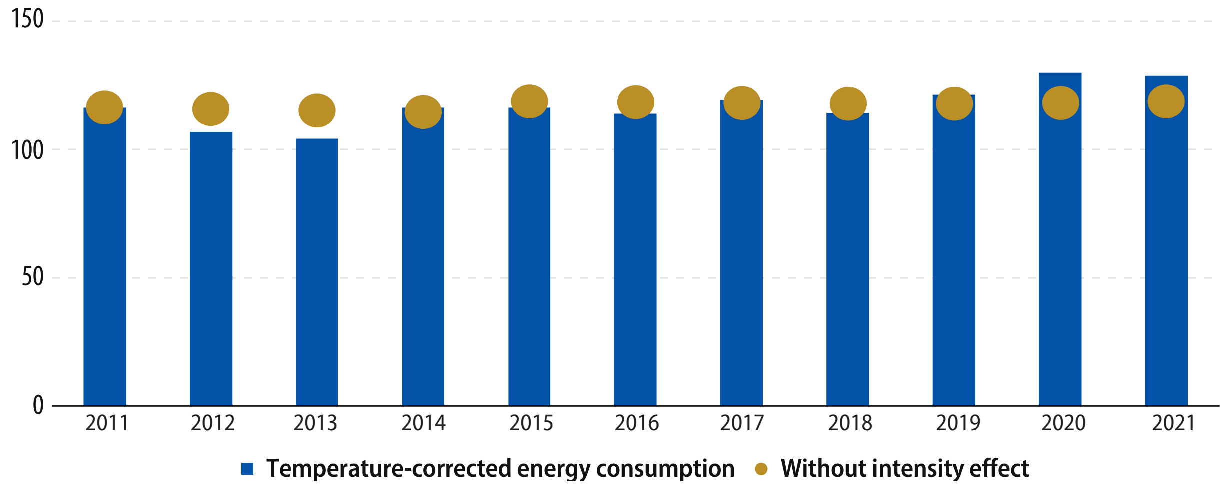


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

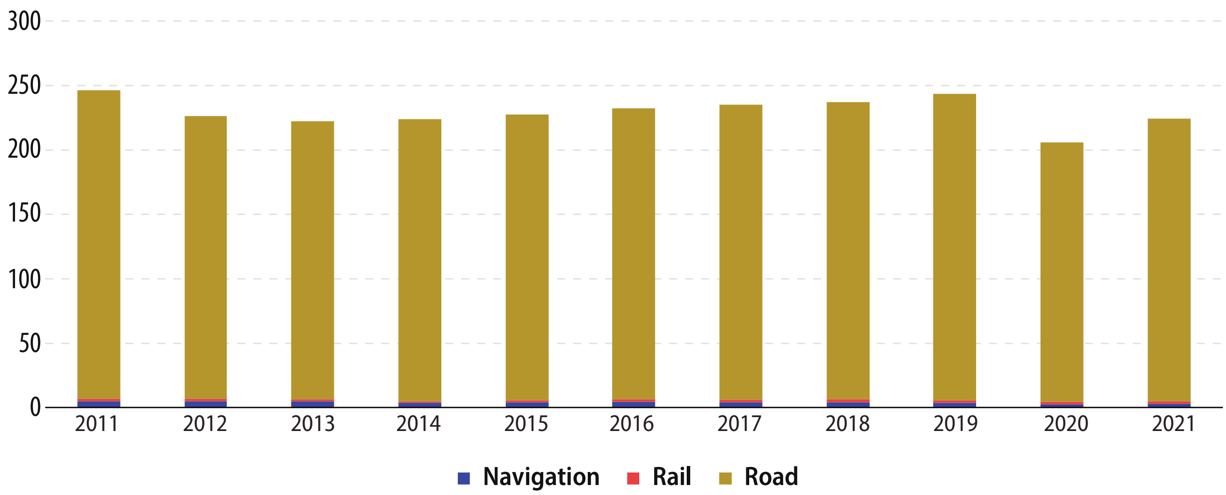
The energy consumption in the Portuguese residential sector grew steadily over the studied period, from 116 PJ in 2011 to 127 PJ in 2021. Between these two years, the small decrease in population caused a reduction in energy consumption of about 2.2 PJ, meanwhile dwelling occupancy decreased and drove up overall consumption by about 4.8 PJ. The most significant change however, was due to the increase in energy consumption per dwelling, which caused an additional 10 PJ of energy consumption. There were slightly less heating and cooling degree days in 2021 than in 2011, and consequently the weather caused a decrease of about 2.1 PJ.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

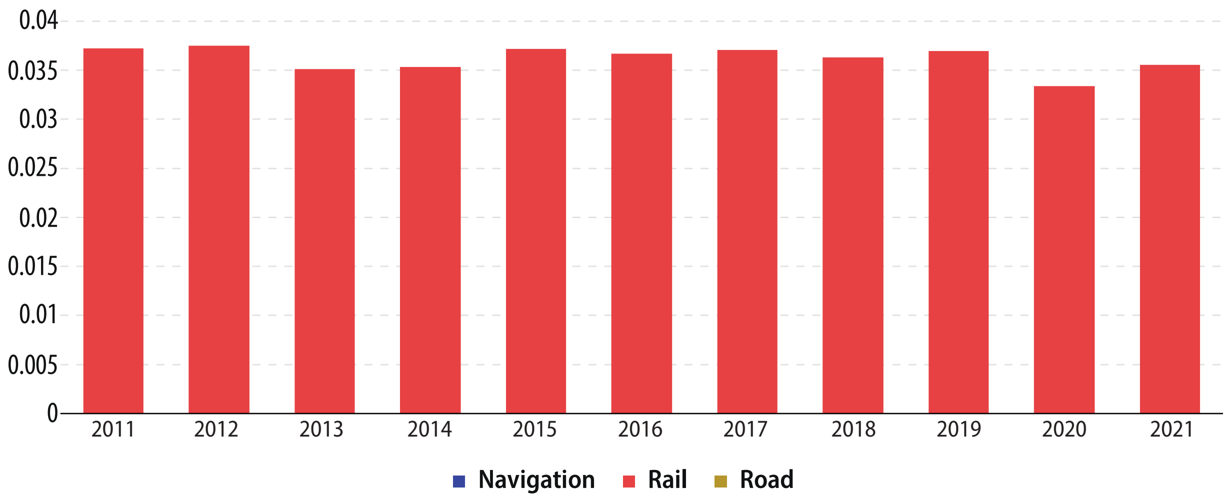


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

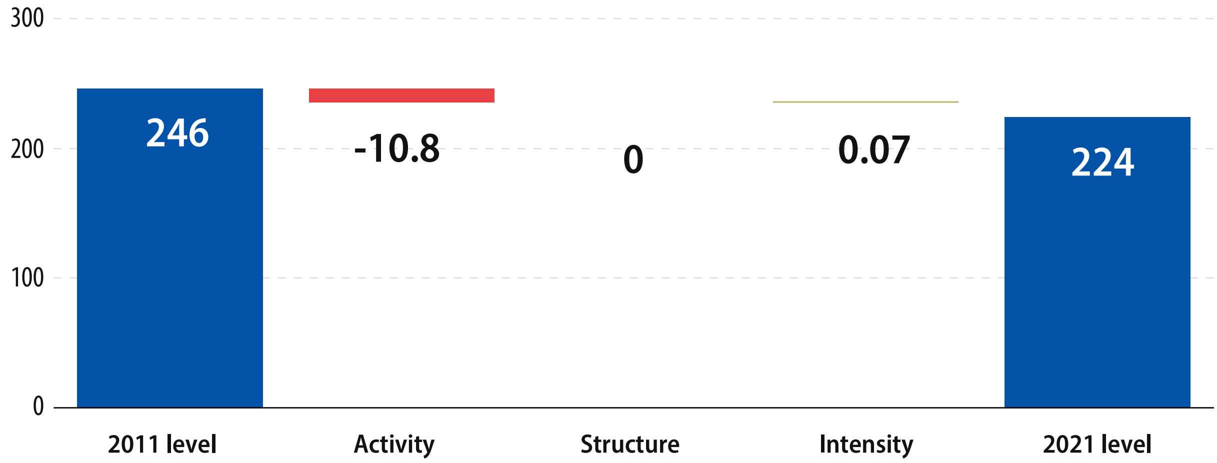


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

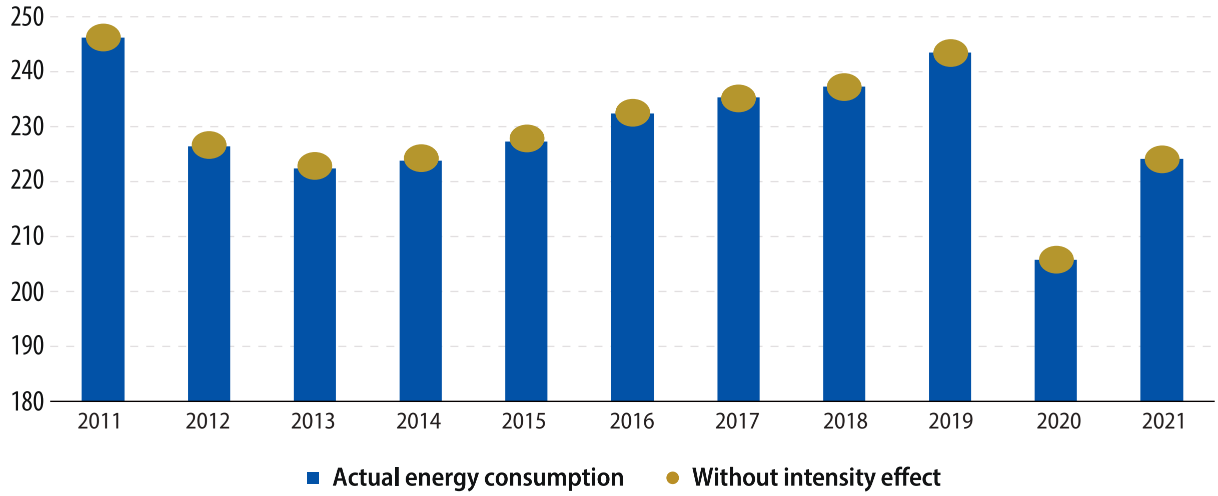


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Portuguese transport sector firstly decreased from 246 PJ in 2011 to 222 PJ in 2013, then it grew to reach 243 PJ in 2019, before dropping to 206 PJ in 2020, and it was still only 224 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic data were not available at the time of the extraction, and therefore the decomposition could not be performed.

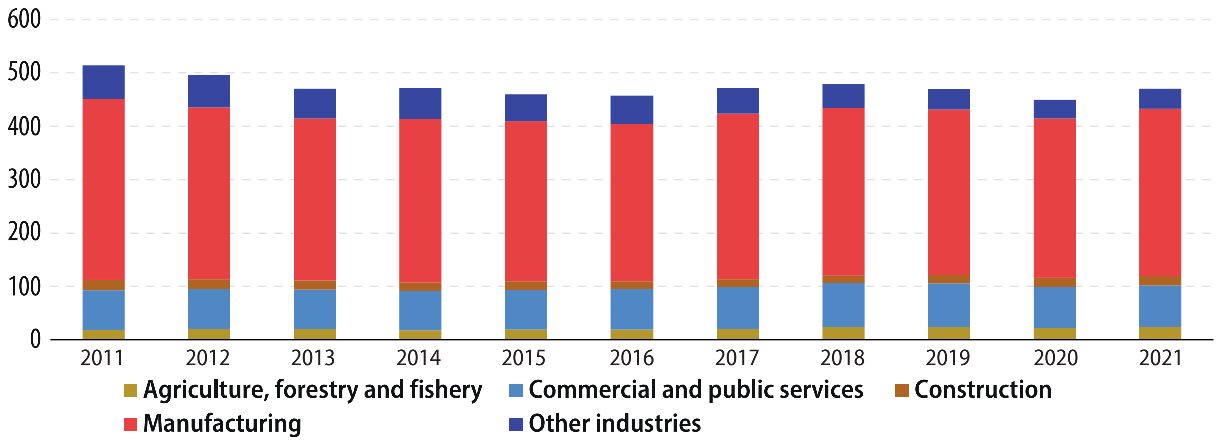
Romania

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

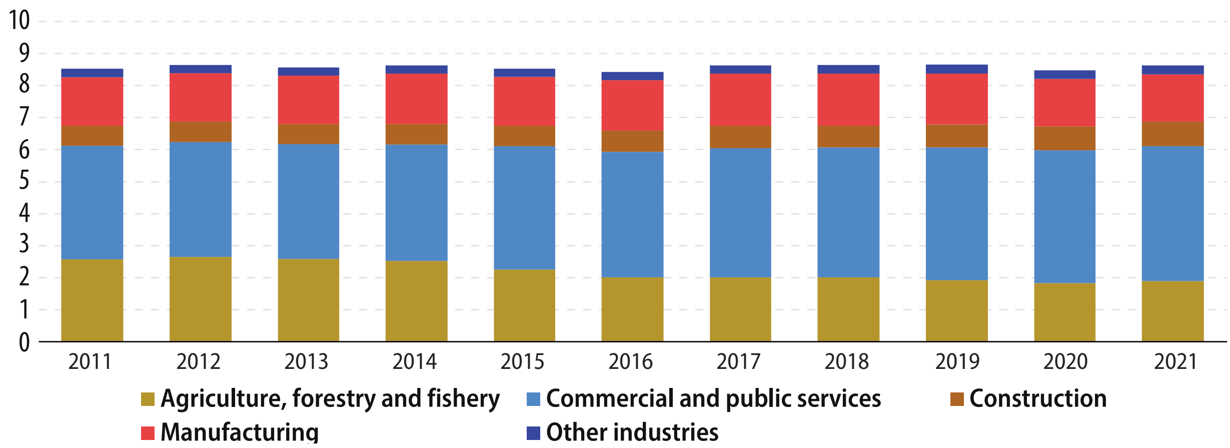


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

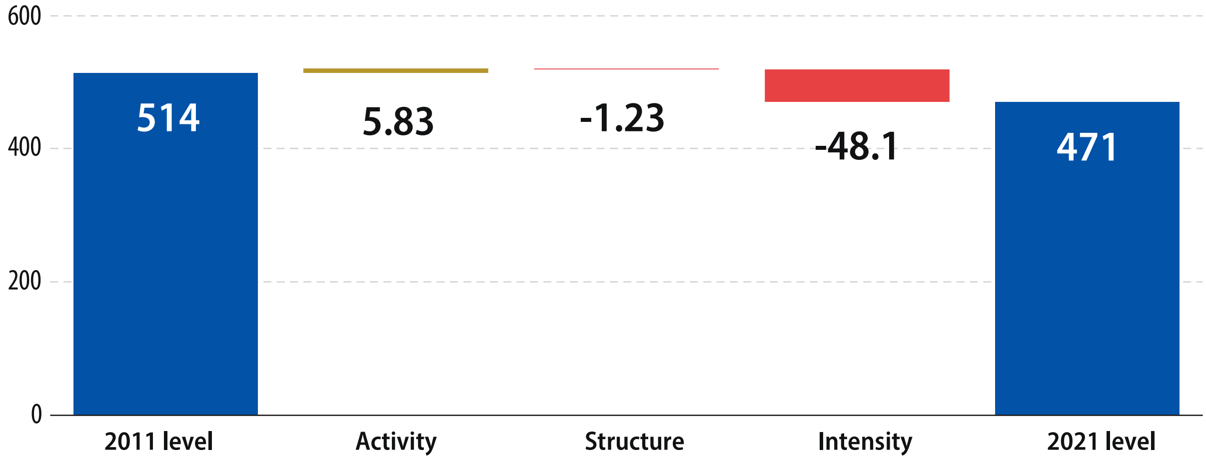


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

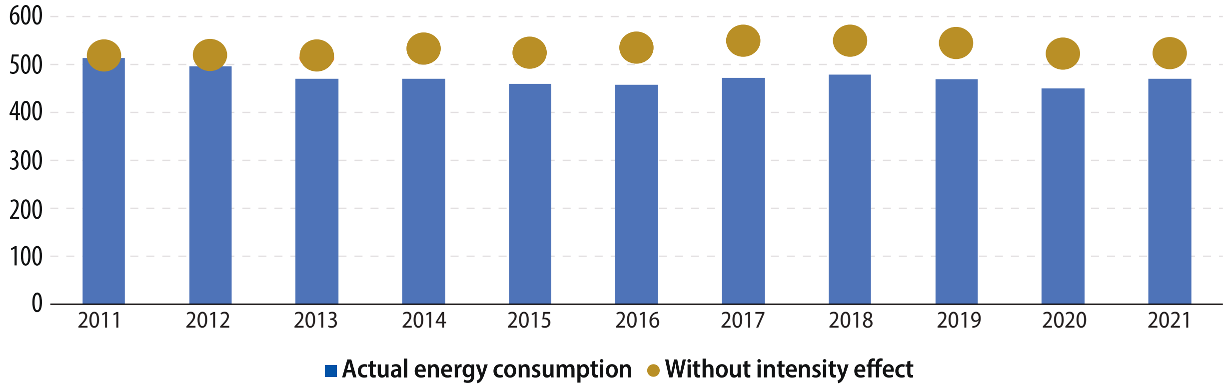


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

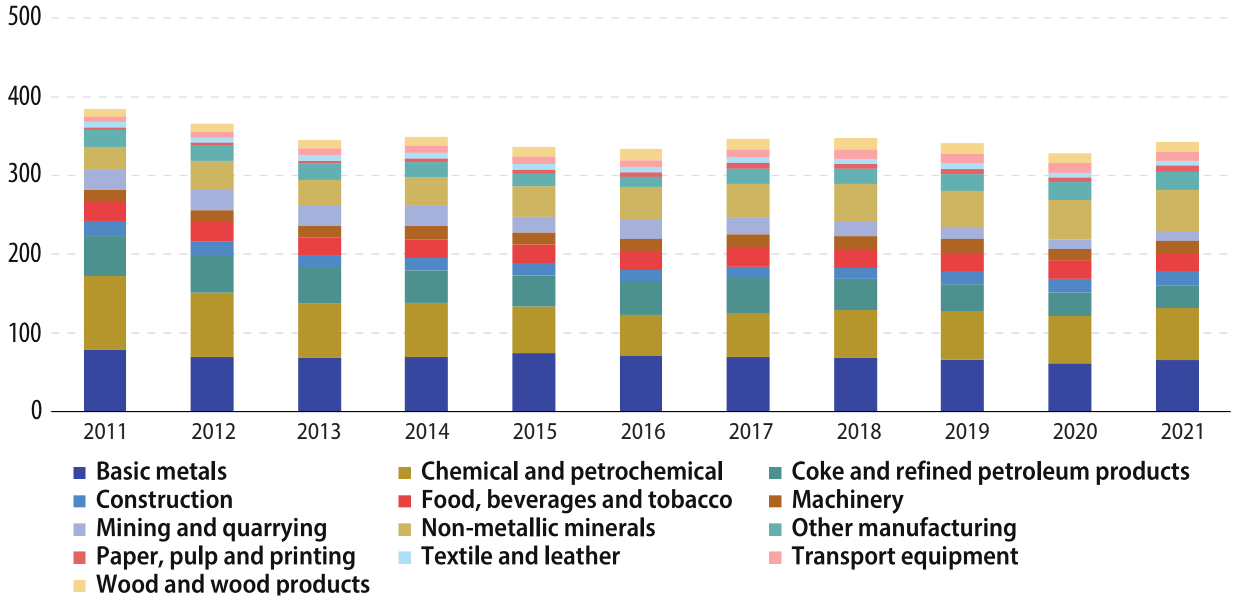
The final energy consumption of the different sectors of the Romanian economy decreased from 514 PJ in 2011 to 450 PJ in 2020 before bouncing back to 471 PJ in 2021. The active population remained very stable, oscillating between 8.4 and 8.6 million over the studied period. Because of this stability in active population, the activity effect was very limited (below 6 PJ of increase). Similarly, due to the lack of changes in the shares of the different sectors, the structural effect was almost negligible (around 1 PJ of decrease). The most important driver for the decrease in energy consumption was the decrease in energy consumption per employee, which brought energy consumption down by about 48 PJ. Without this decrease, energy consumption would have been 10 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

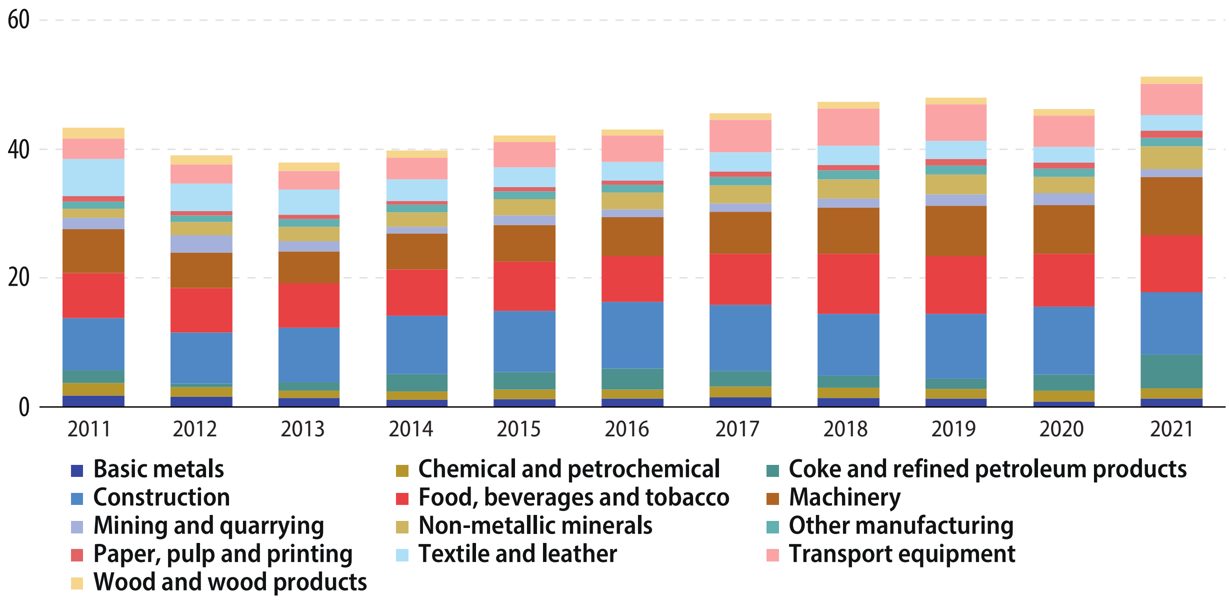


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

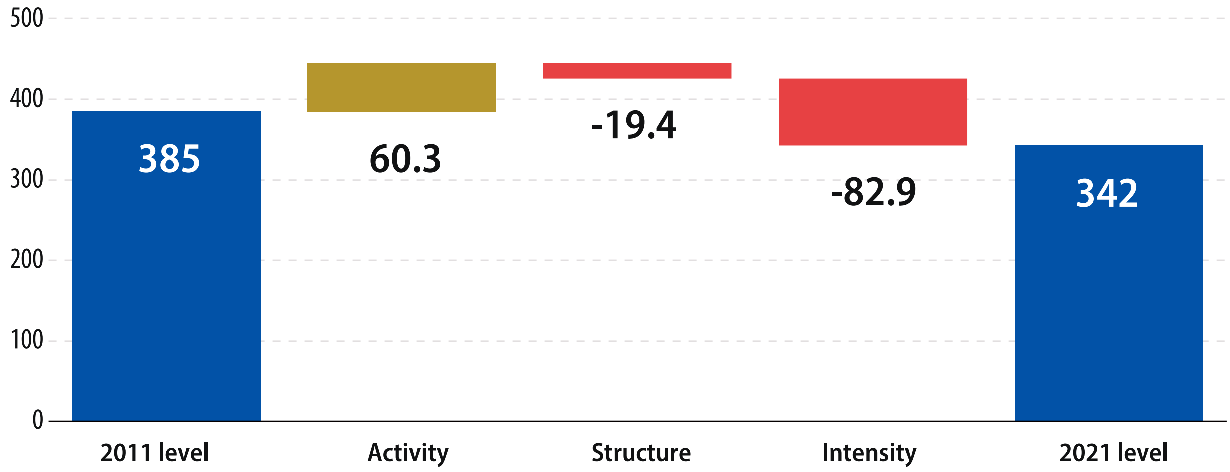


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

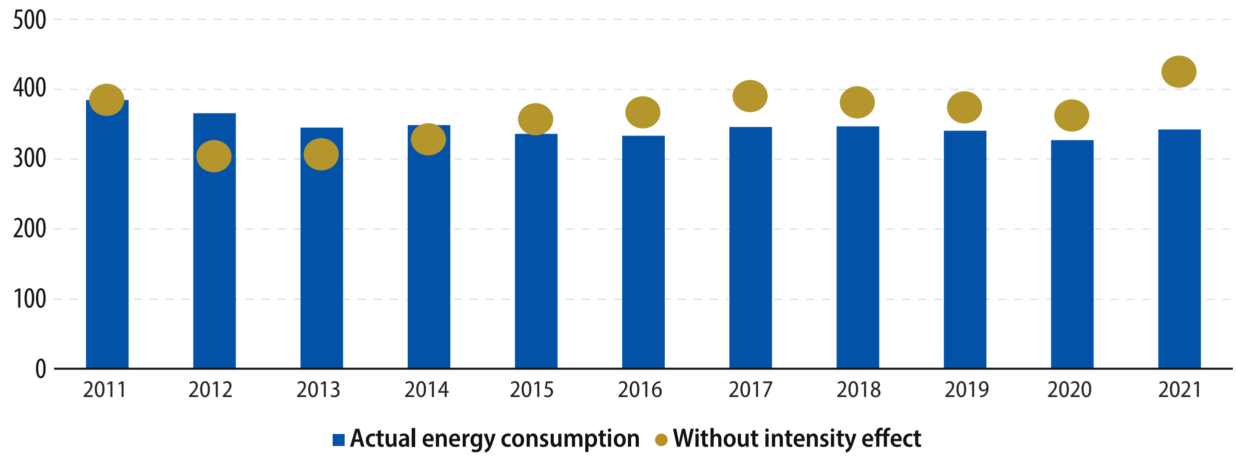


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

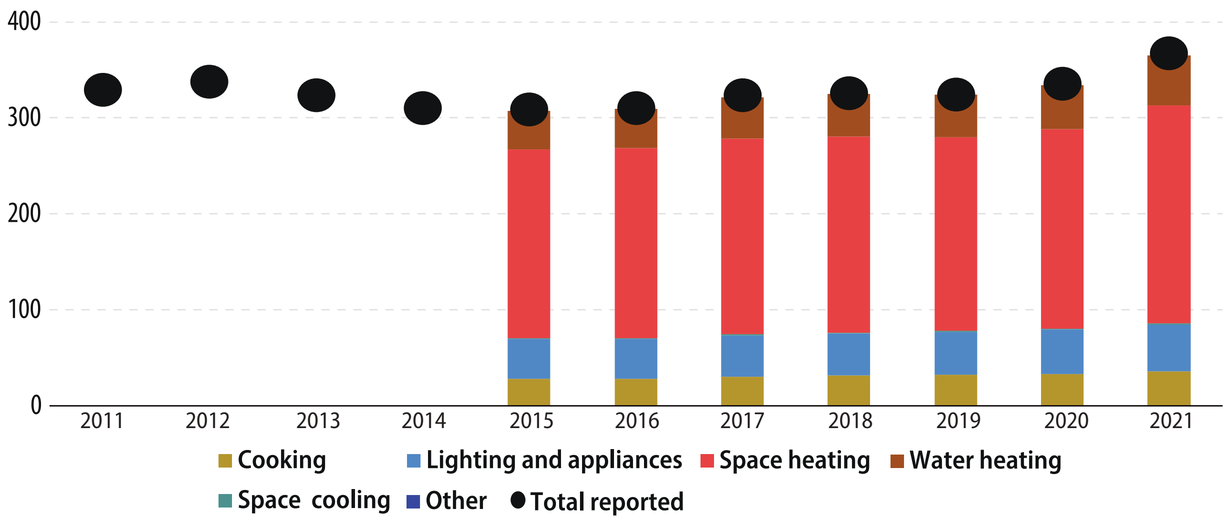
The Romanian energy consumption in the manufacturing industries sector decreased steadily from 385 PJ in 2011 to 327 PJ in 2020 its lowest level over the studied period, before bouncing back in 2021 to 342 PJ. After a first drop from 43 billion EUR in 2011 to 38 billion EUR in 2013, the gross value added grew steadily to reach 48 billion EUR in 2019, before dropping to 46 billion EUR in 2020, and then bouncing back to its highest level at 51 billion EUR in 2021. Between 2011 and 2021, the increase in activity drove up the consumption of energy by about 60 PJ. Meanwhile, the structural changes in the industry sector caused a decrease of about 19 PJ. The most important driver, however, was the decrease in overall energy intensity, which brought down consumption by almost 83 PJ. Without this decrease, energy consumption would have been almost 24 % higher in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

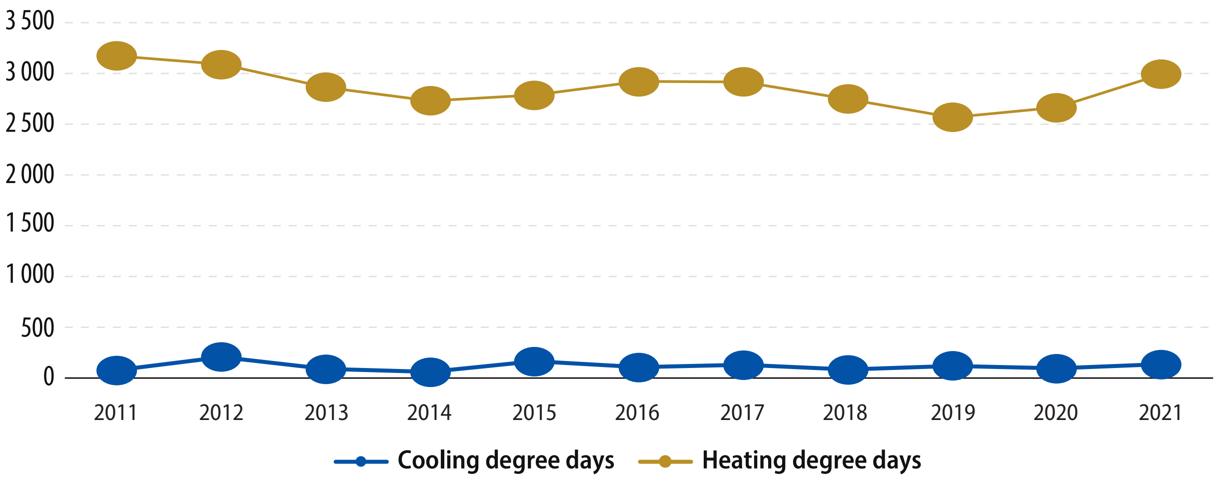
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

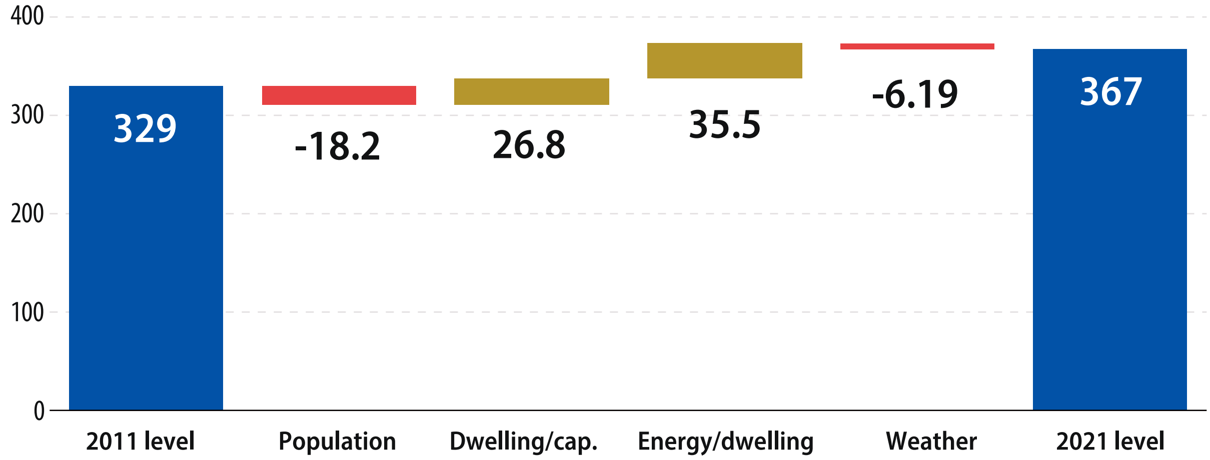


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

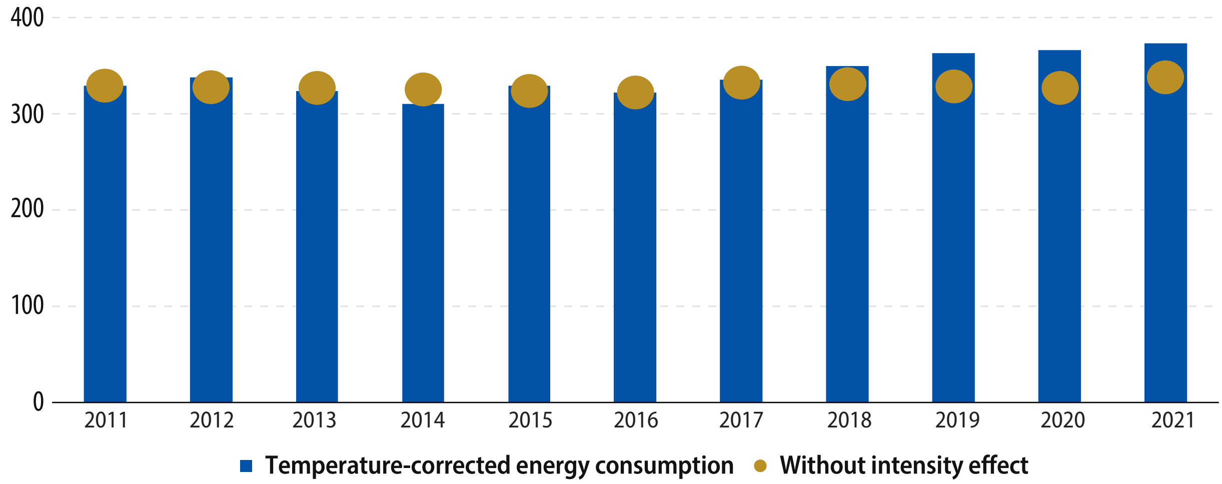


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

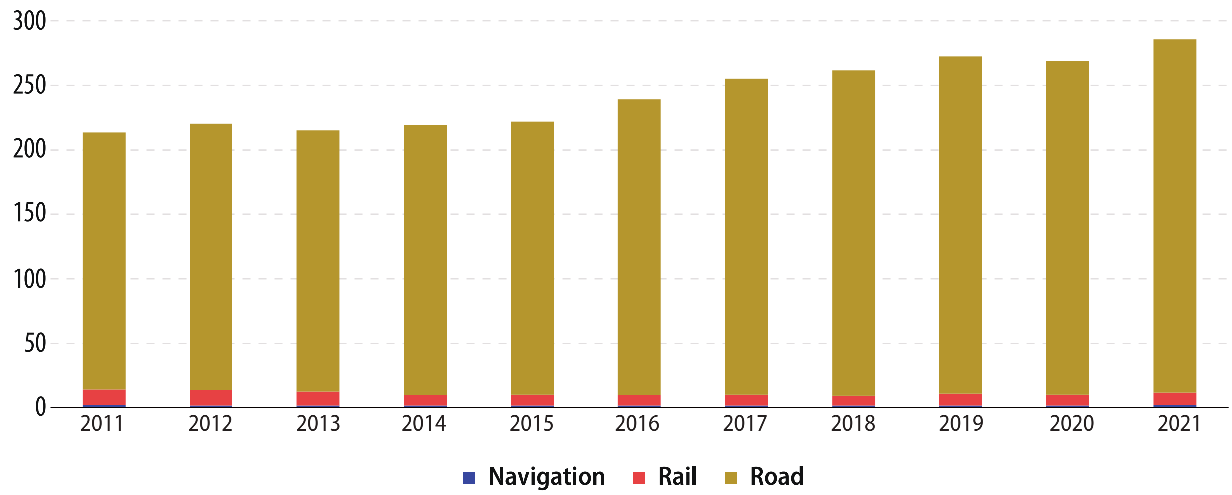
The energy consumption in the residential sector of Romania oscillated between 309 PJ and 367 PJ over the period 2011-2021. The breakdown in energy consumption by end-use is only available from 2015 onward, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the decrease in population brought down the residential energy consumption by about 18 PJ, while the dwelling occupancy decrease brought it up by almost 27 PJ. The main driver however was the increase in energy consumption per dwelling, which may be partly explained by the absence of temperature correction for the year 2011. There were slightly less heating degree days in 2021 than in 2011, and therefore the weather brought down the energy consumption. However, since the temperature correction could not be calculated for 2011, the weather effect calculated between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

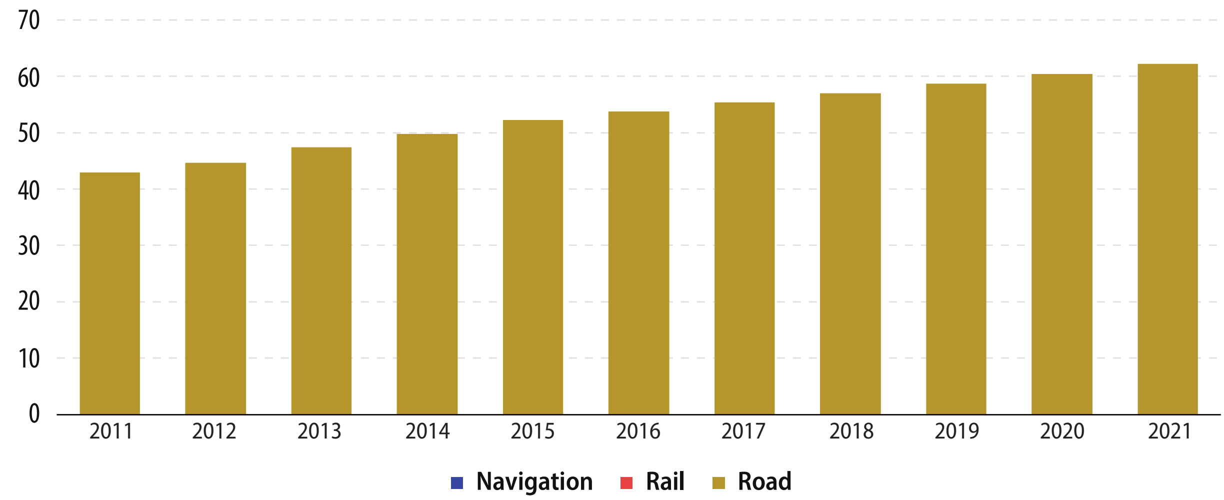


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

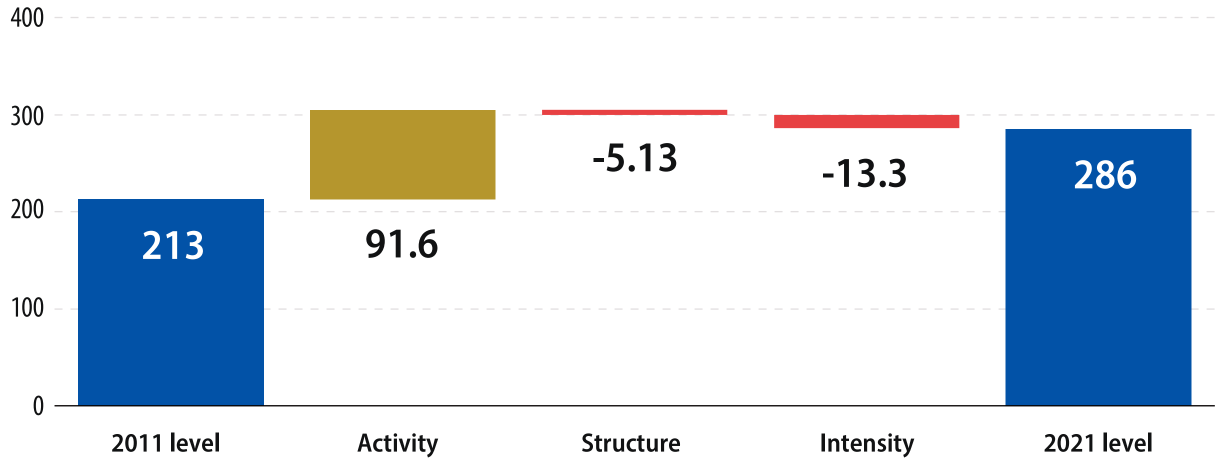


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

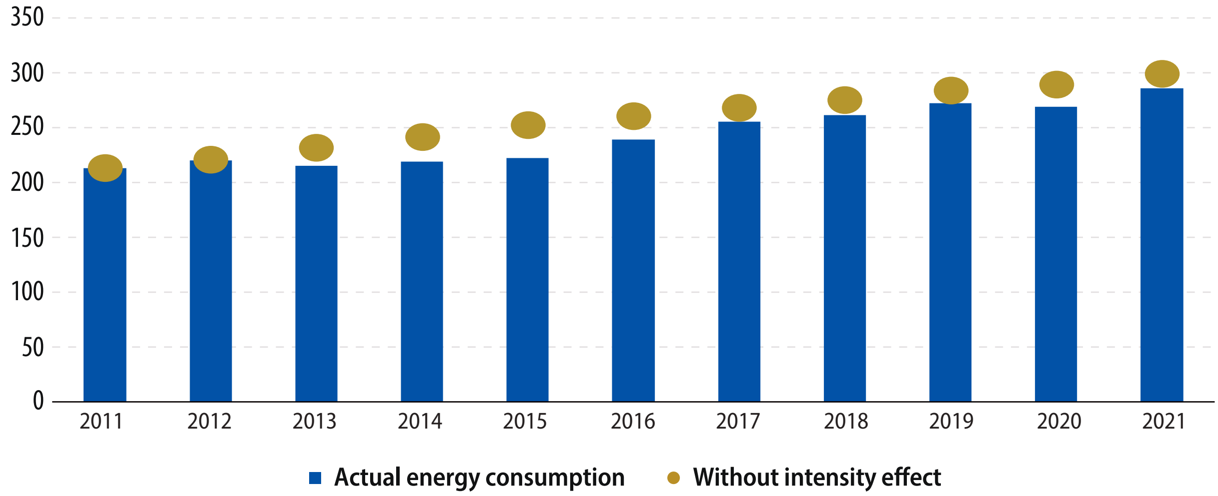


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

The energy consumption in the Romanian transport sector increased steadily from 213 PJ in 2011 to 286 PJ in 2021. Most of the energy consumption was due to road transport. Road traffic increased from almost 43 billion VKM in 2011 to 62 billion VKM in 2021. Between these two years, the increase in traffic was the main driver for the increase in energy consumption, and it resulted in almost 92 PJ of additional consumption. Meanwhile, the decrease in energy intensity caused a decrease of about 13 PJ of energy consumption. Thanks to the availability of transport data for the different modes, the structural effect can also be estimated even if it only caused a decrease of 5 PJ of energy consumption. Without the decrease in intensity, the energy consumption in the sector would have been 5 % higher in 2021.

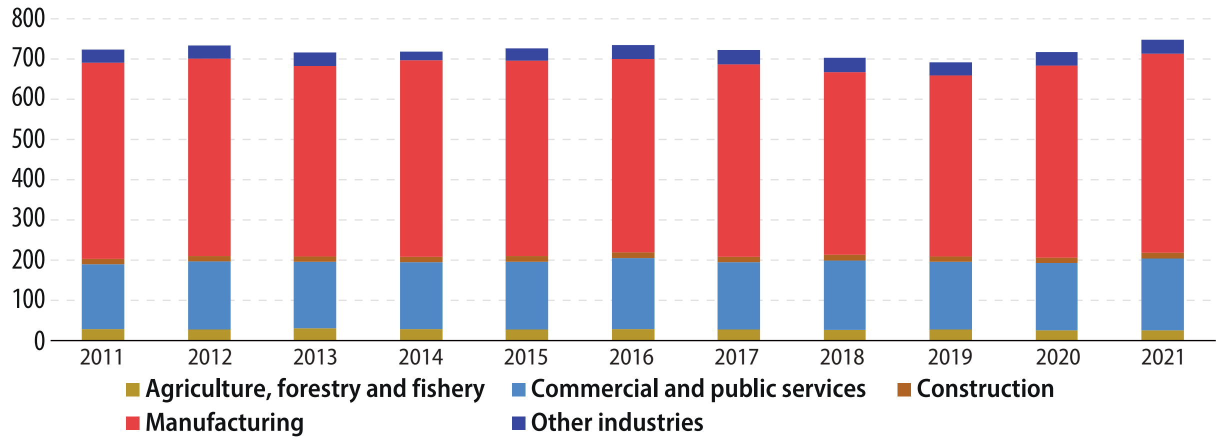
Sweden

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

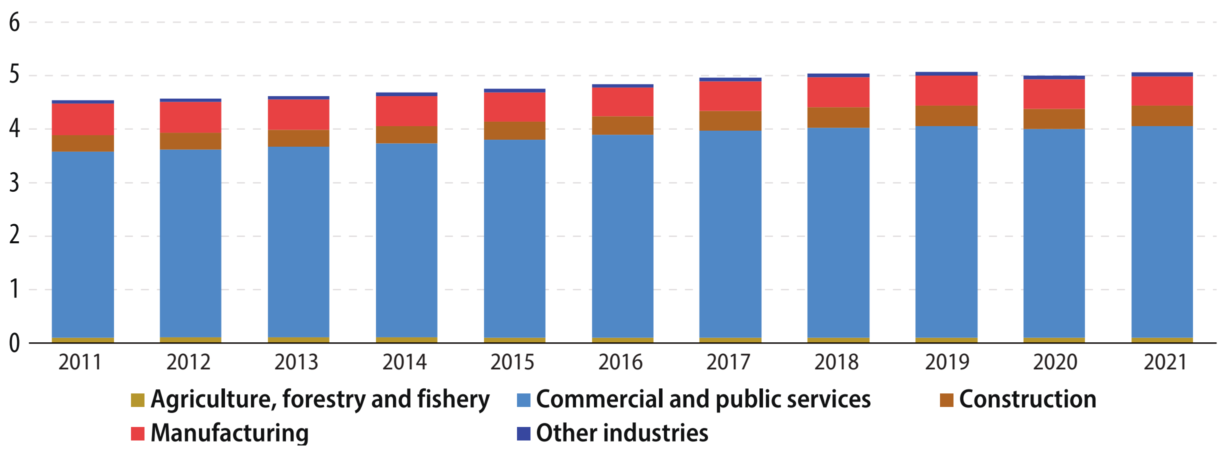


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

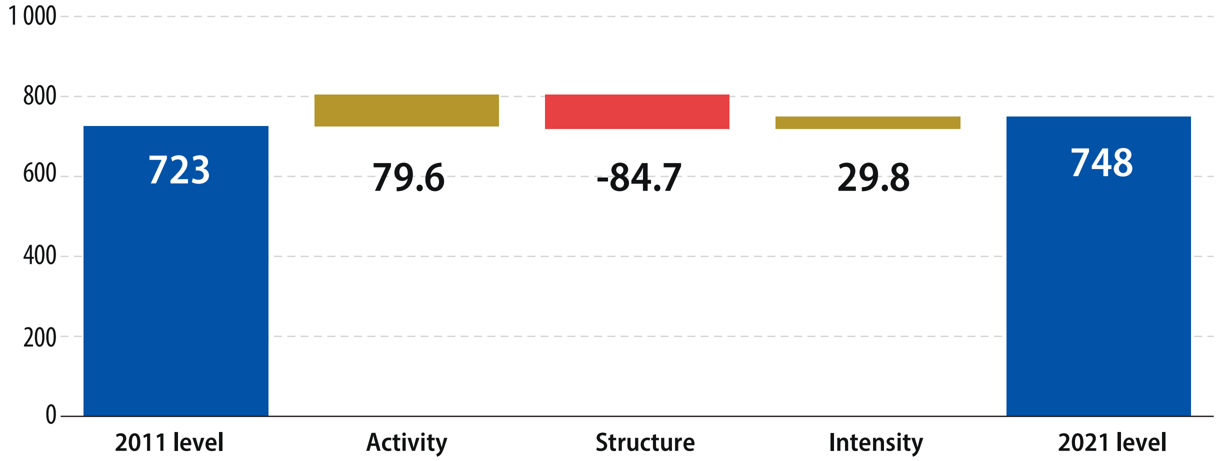


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

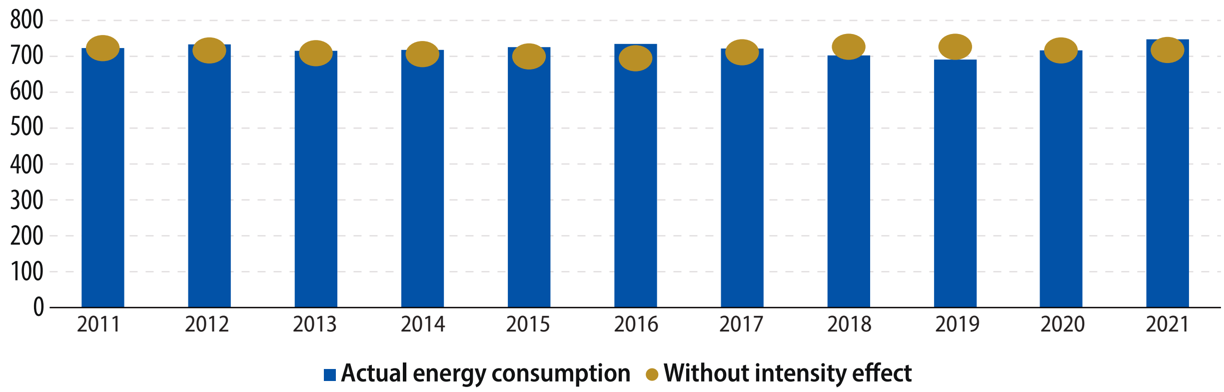


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

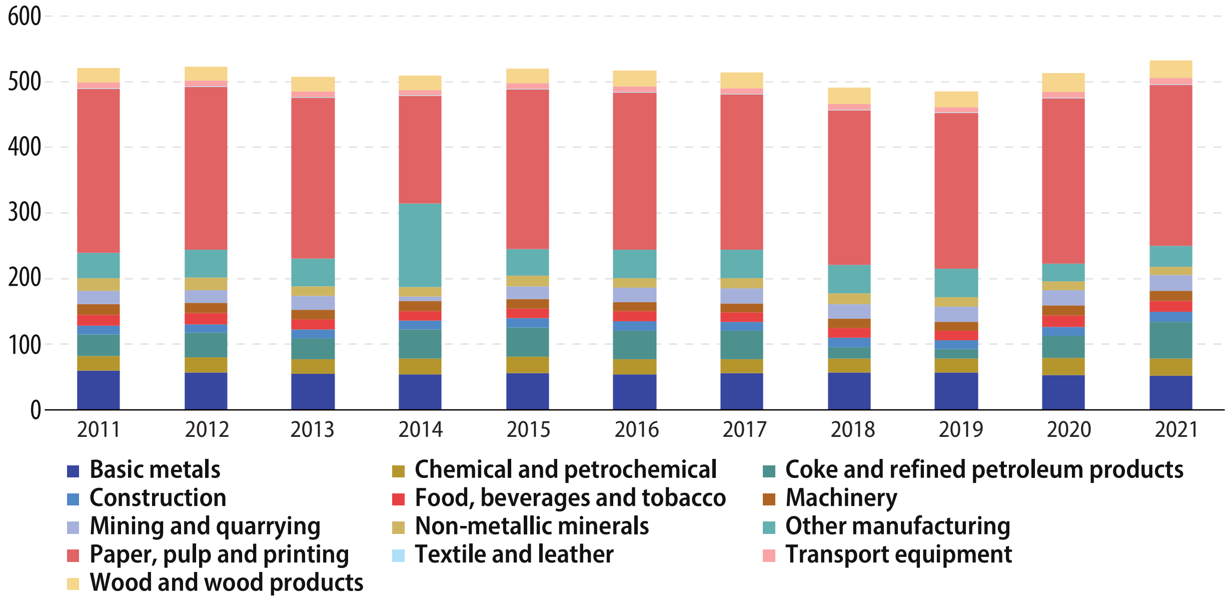
The final energy consumption of the different sectors of the whole economy was also very stable from 2011 to 2017, going from 723 PJ to 722 PJ, before decreasing to reach 691 PJ in 2019, and then growing to reach 748 PJ in 2021. Meanwhile, the active population steadily increased from 4.5 million in 2011 to 5.1 million in 2019 and it was still at this level in 2021. Between 2011 and 2021, the increase in activity (measured in terms of employees) brought energy consumption up by almost 80 PJ. This was offset by the structural changes which brought down the energy consumption by almost 85 PJ, mostly due to the decreasing share of the manufacturing sector (from 13 to 11 % of the active population over the period). Finally, the increase in energy consumption per employee drove up energy consumption by almost 30 PJ. Without this decrease, energy consumption would have been 4 % higher in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

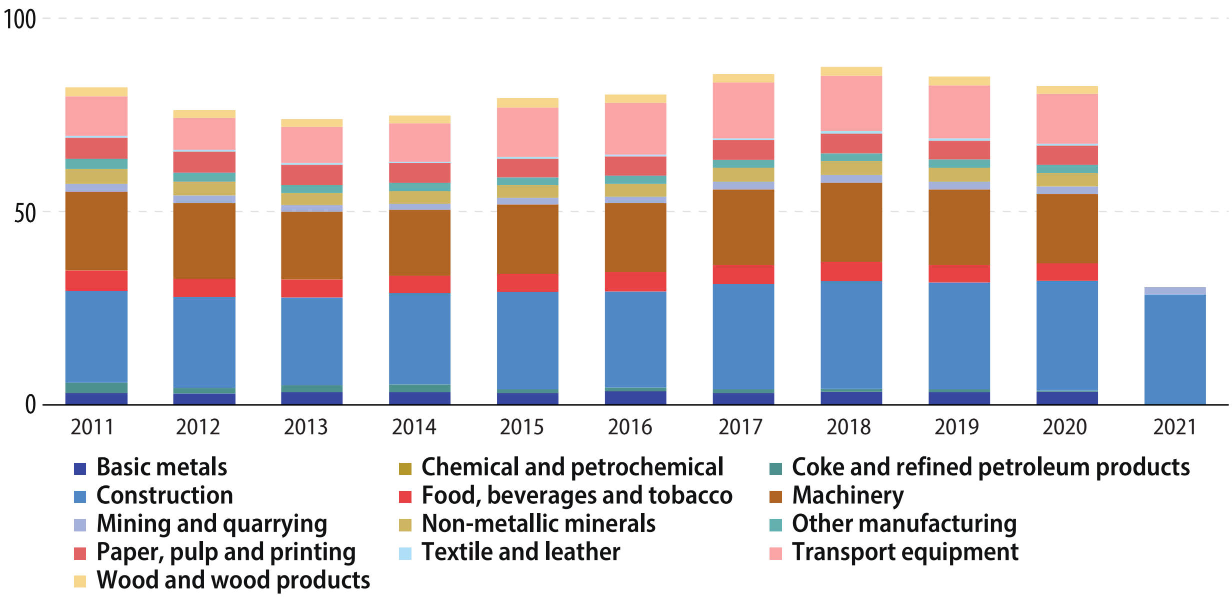


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

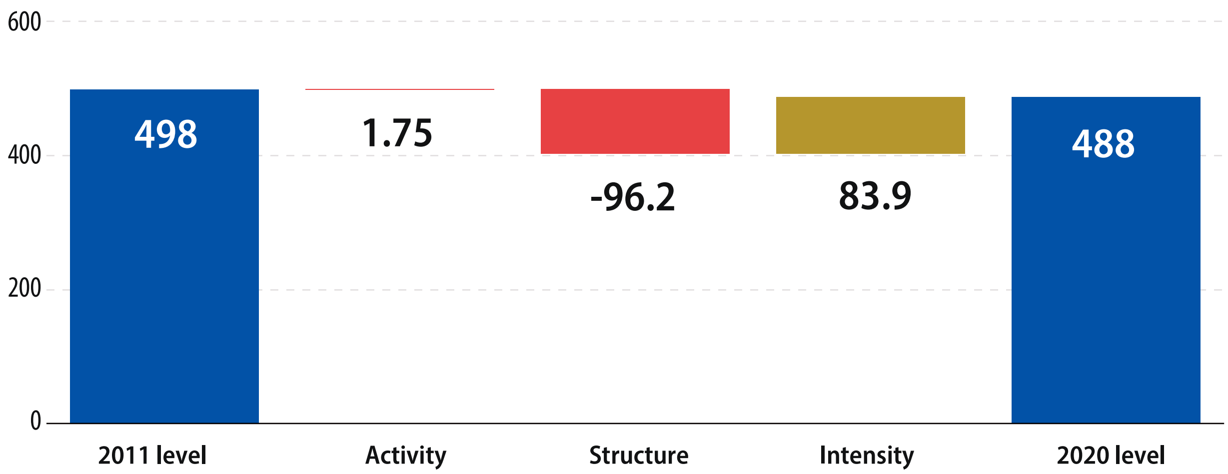


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

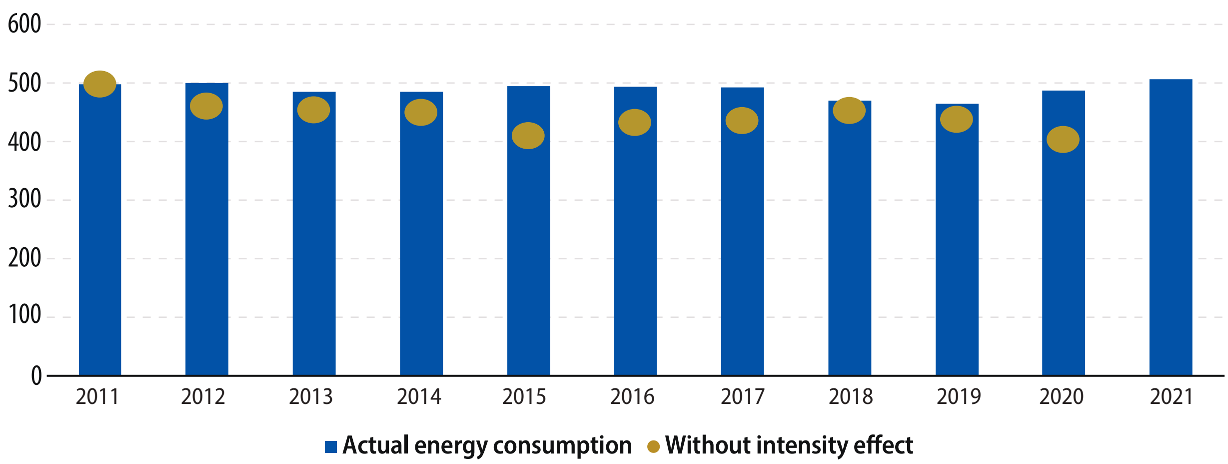


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

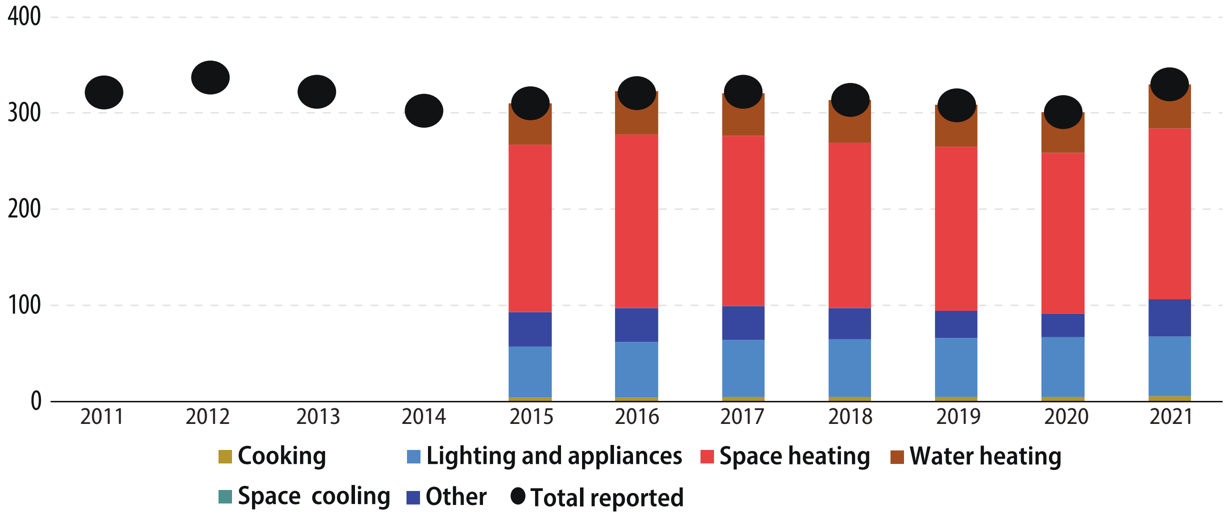
The energy consumption in Sweden's manufacturing industry sector remained very stable in the first part of the studied period and went from 521 PJ in 2011 to 515 PJ in 2017, then decreased to 486 PJ in 2019, before climbing back to 533 PJ in 2021. The gross value added was not available for the chemical and petrochemical sector, therefore it was excluded from the analysis for the entire period. For the remaining sectors, the GVA decreased from 82 billion EUR in 2011 to 74 billion EUR in 2013, then grew to reach 87 billion EUR in 2018, before decreasing again to 82 PJ in 2020. The GVA was not complete for the year 2021 at the time of extraction, and consequently the decomposition was applied to the period 2011-2020. Since the level of the GVA was very similar between 2011 and 2020, the activity effect is very limited (causing an increase below 2 PJ). Meanwhile, the structural changes in the economy caused a significant decrease of about 96 PJ of consumption, partly due to a lower share of the machinery sector (from 25 % to 22 % between 2011 and 2020). This was mostly offset by the increase in energy intensity, which brought consumption up by about 84 PJ. Without this increase, the total energy consumption in the covered sectors would have been close to 17 % lower in 2020.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

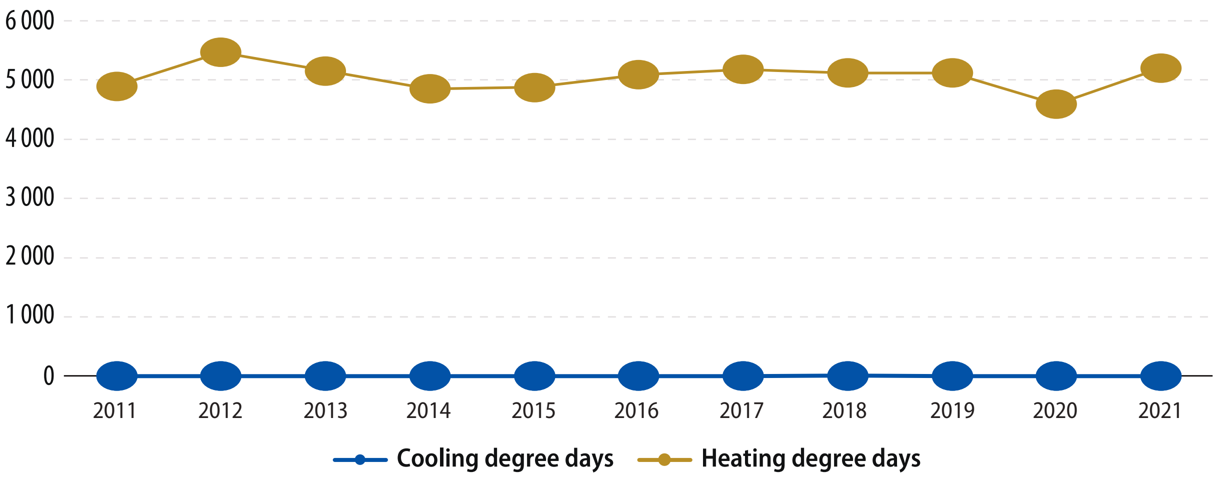
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

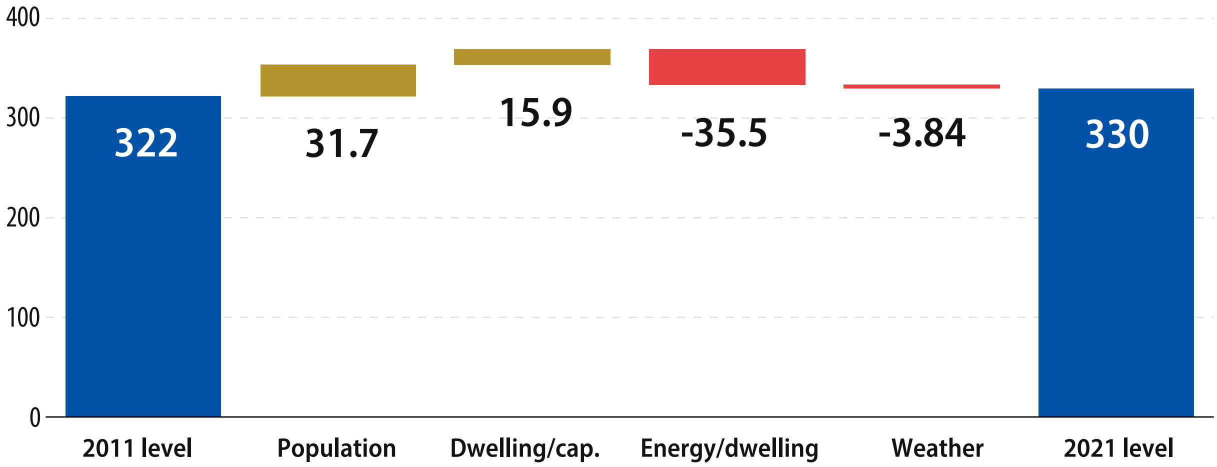


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

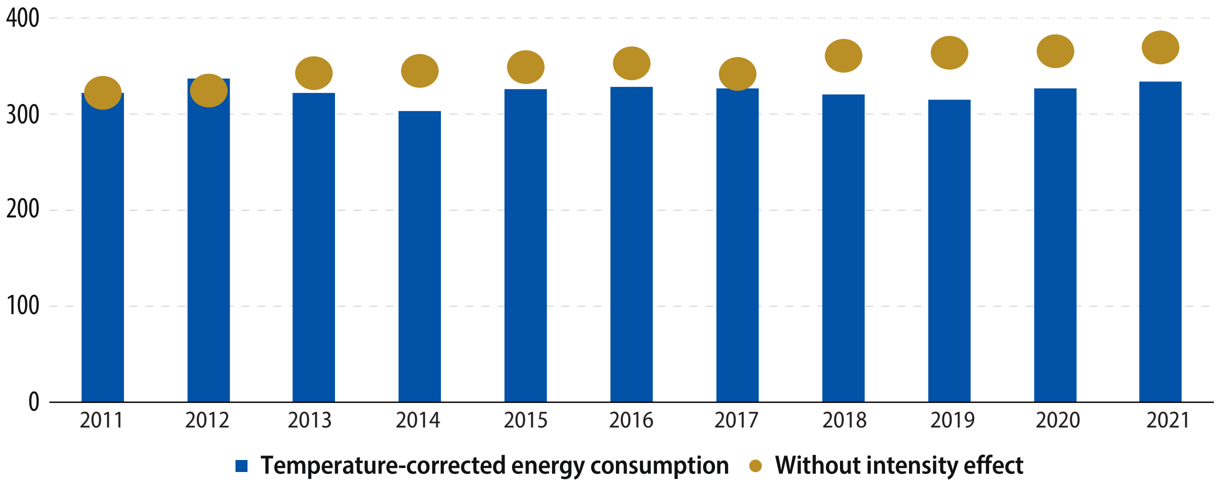


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 1

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

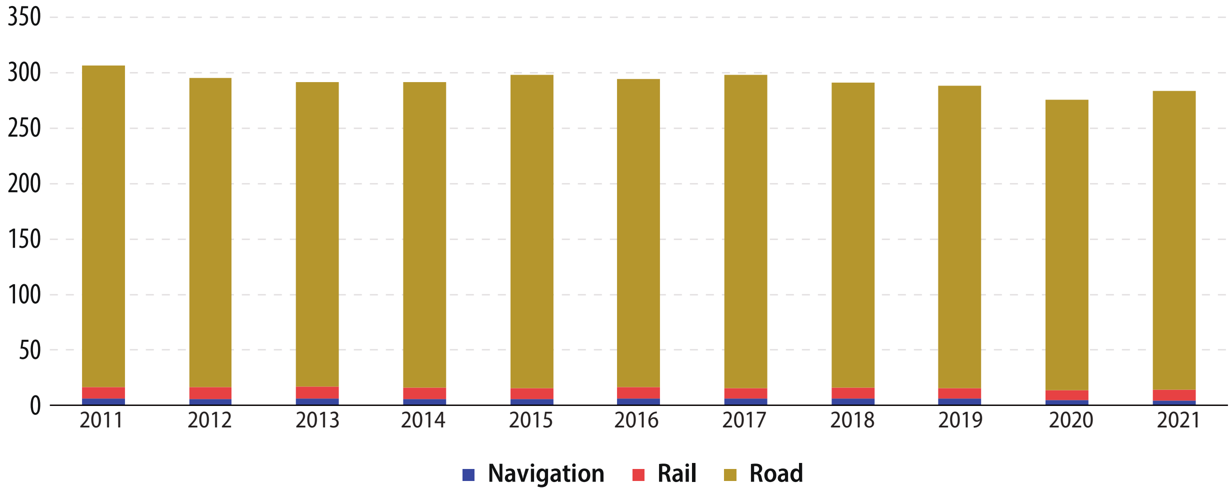
The energy consumption in the Swedish residential sector remained quite constant between 2011 and 2021, oscillating between 300 PJ and 337 PJ. The breakdown in energy consumption by end-use is only available from 2015, therefore the temperature correction can also only be calculated from this year onward. Between 2011 and 2021, the increase in population can be estimated to have caused an increase of about 32 PJ, and the decrease in dwelling occupancy brought the consumption further up by about 16 PJ. The main driver however was the decrease in energy consumption per dwelling, which brought down the sector consumption by about 36 PJ. This may be partly explained by the absence of temperature correction for the year 2011. There were slightly more heating degree days in 2021 than in 2011, however, since the temperature correction could not be calculated for 2011, the weather effect calculated between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

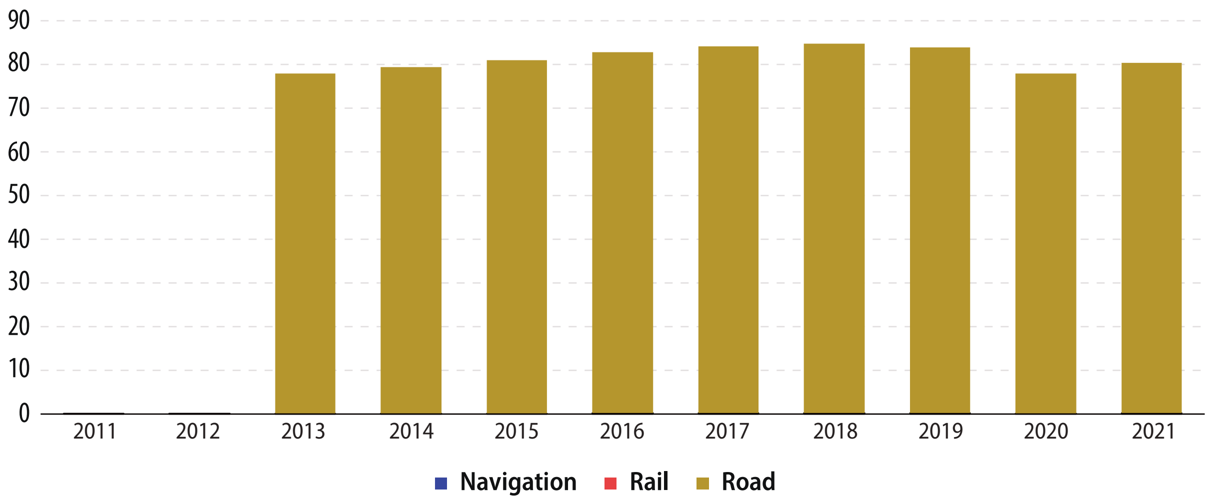


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

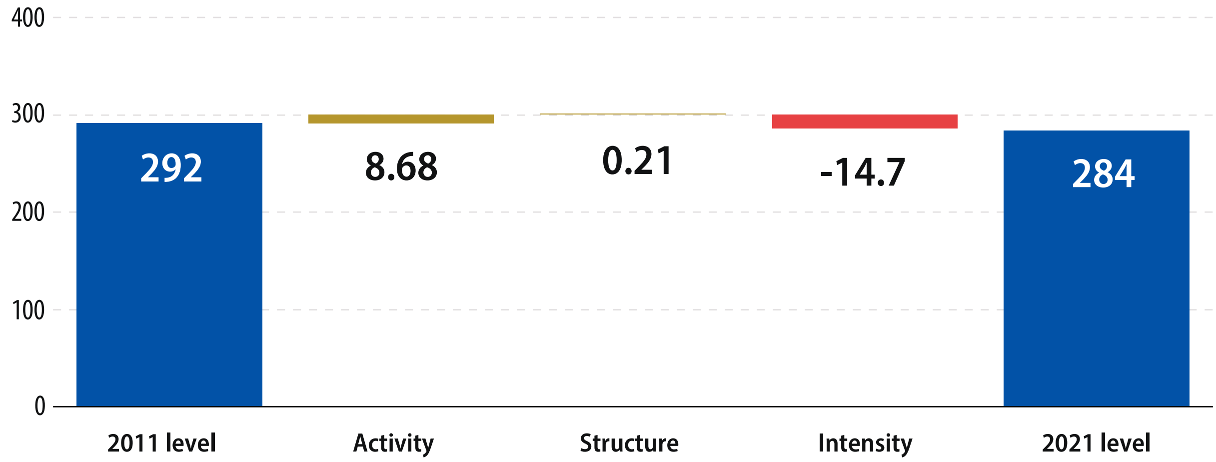


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

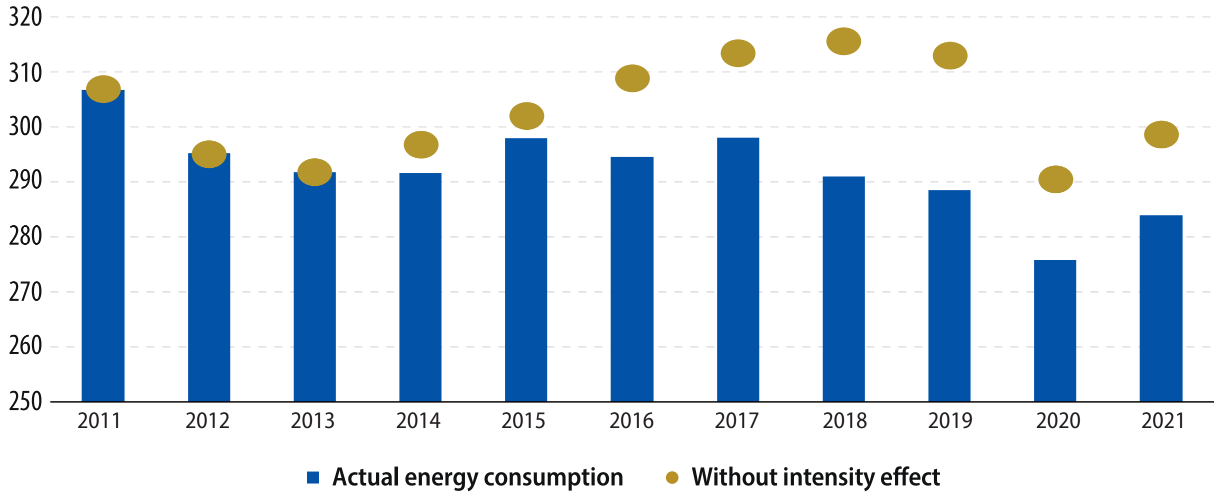


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

In the first part of the studied period, the energy consumption in the Swedish transport sector remained quite stable, going from 307 PJ in 2011 to 298 PJ in 2017, before decreasing to reach 276 PJ in 2020, and finally growing back to 284 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic data were not available prior to 2013, and therefore the decomposition had to be applied to the period 2013-2021. Over this period, road traffic grew from 77.8 billion VKM in 2013 to 84.5 billion VKM in 2018, before decreasing back to 77.8 billion VKM in 2020 and finally bouncing back to 80 billion VKM in 2021. From 2013 to 2021, the increase in traffic drove up energy consumption by about 9 PJ, which was more than offset by the decrease in energy intensity, which caused a decrease of about 15 PJ. With the absence of strong variation in the share of the different transport modes, the structural effect was almost unnoticeable. Without the decrease in energy intensity, the energy consumption in the transport sector could have been 5 % higher in 2021.

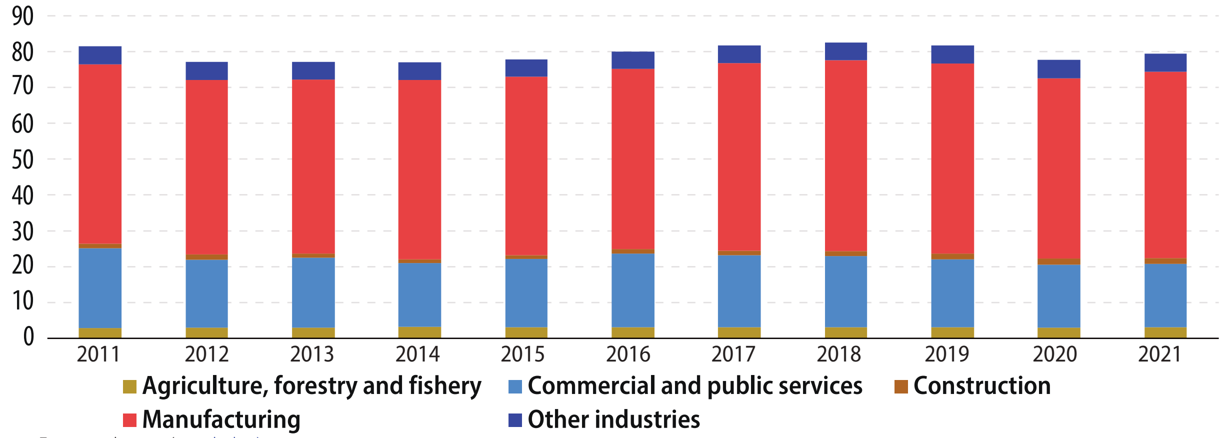
Slovenia

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

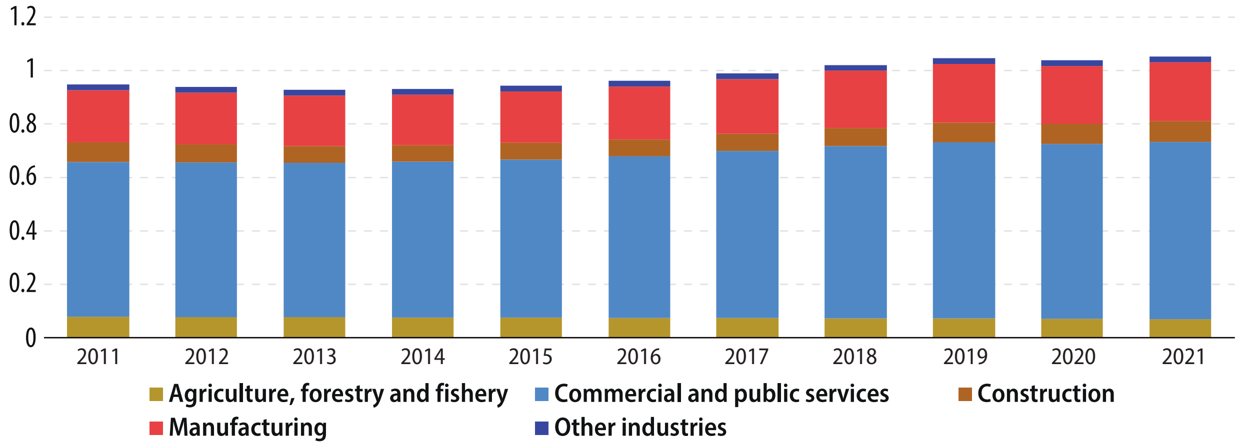


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

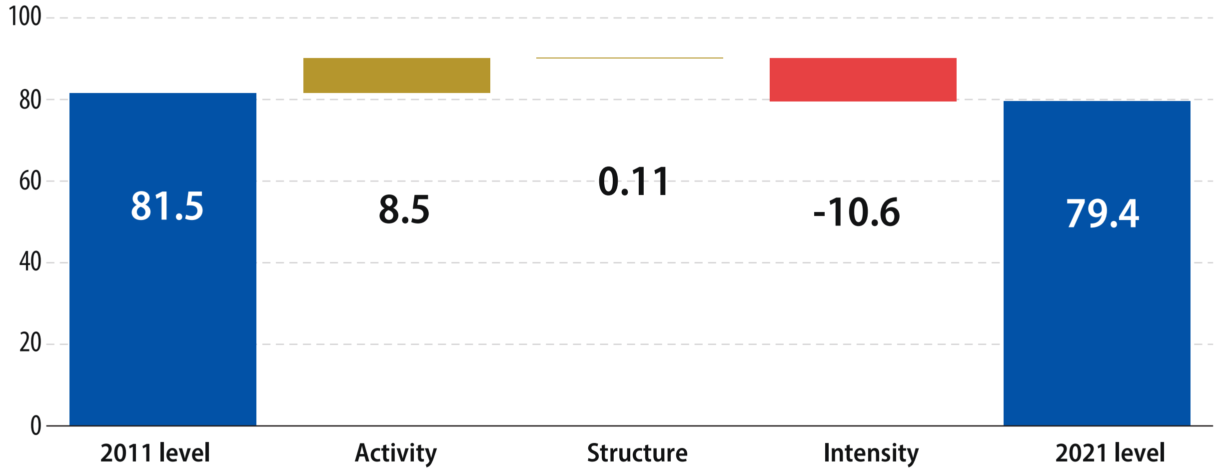


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

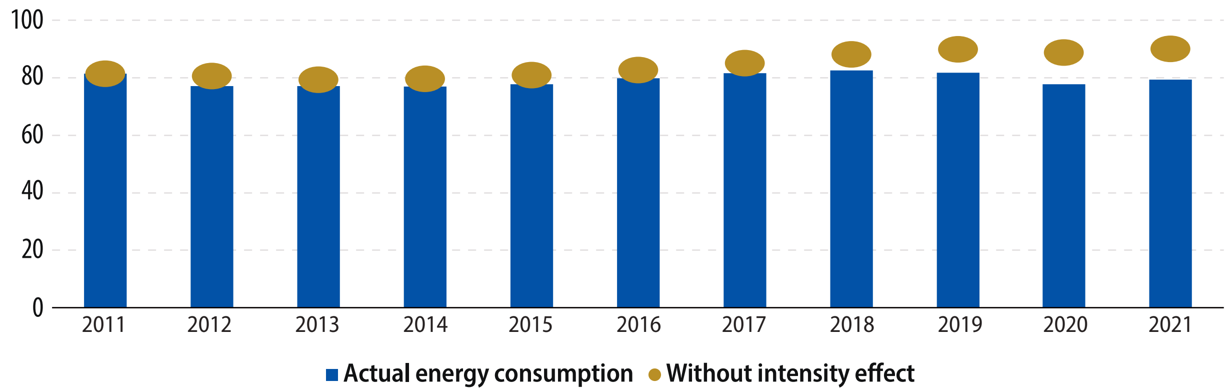


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

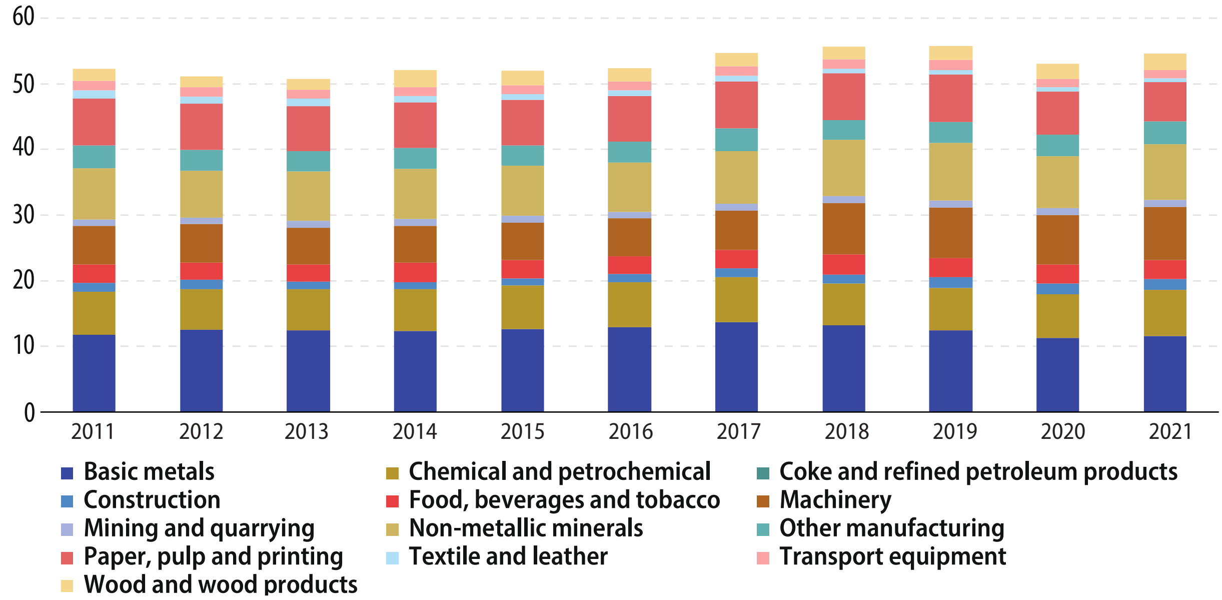
The final energy consumption of the different sectors of the whole economy was also quite stable over the studied period, oscillating between 77 PJ and 83 PJ. Meanwhile, the active population steadily increased from 947 thousand in 2011 to 1.05 million in 2021. Between these two years, the increase in activity (measured in terms of employees) drove up the energy consumption by almost 8.5 PJ. This was more than offset by the decrease in energy consumption per employee, which reduced the energy consumption by almost 11 PJ. As there were no significant changes in the share of the different sectors in terms of employment, the structural effect was almost negligible. Without the decrease, the whole economy's energy consumption would have been 13 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

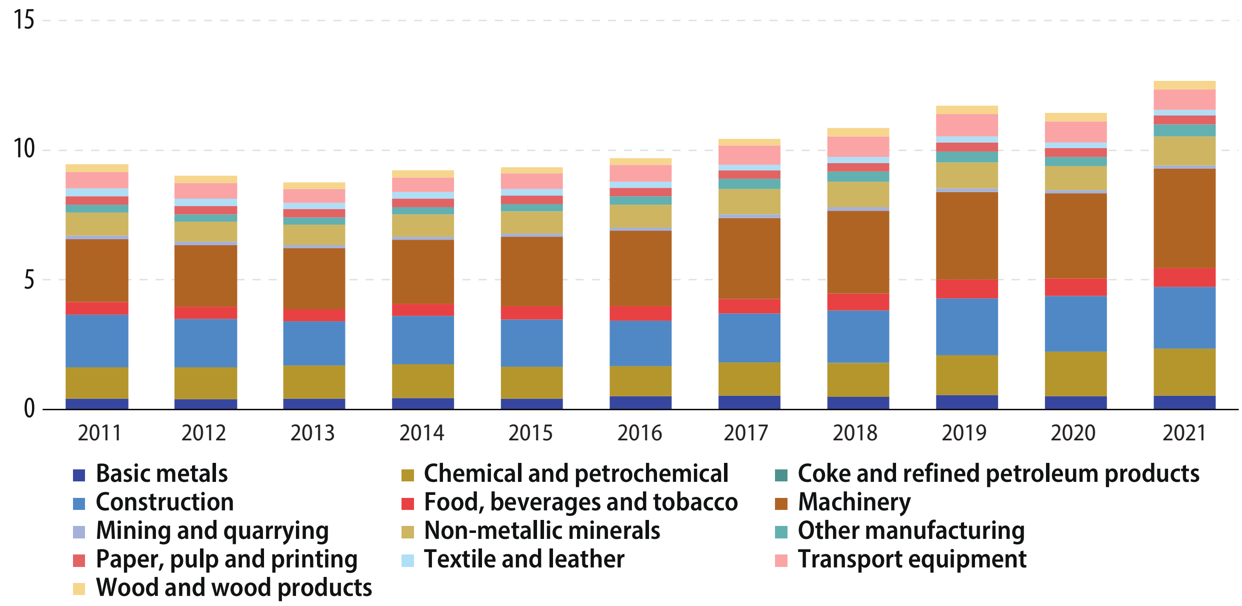


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

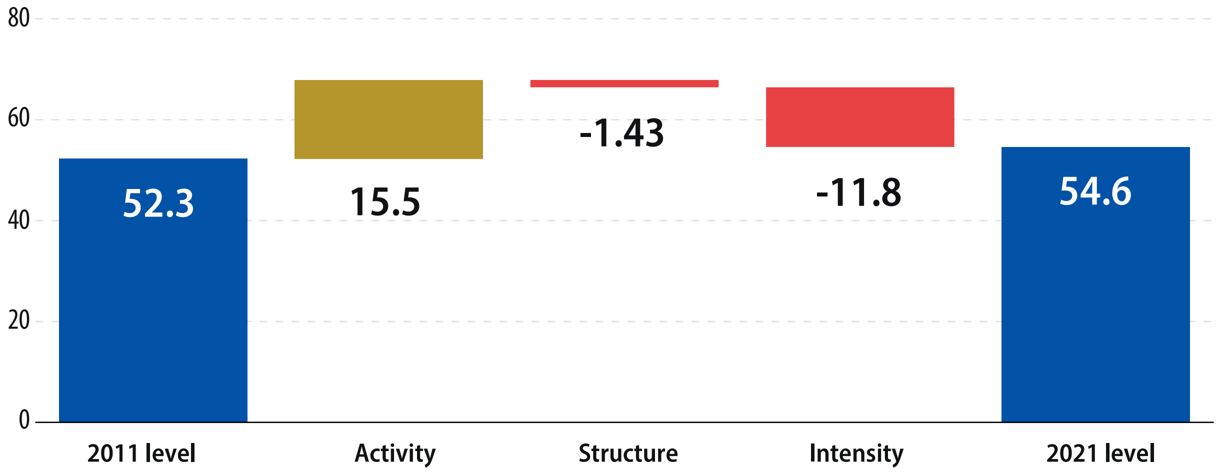


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

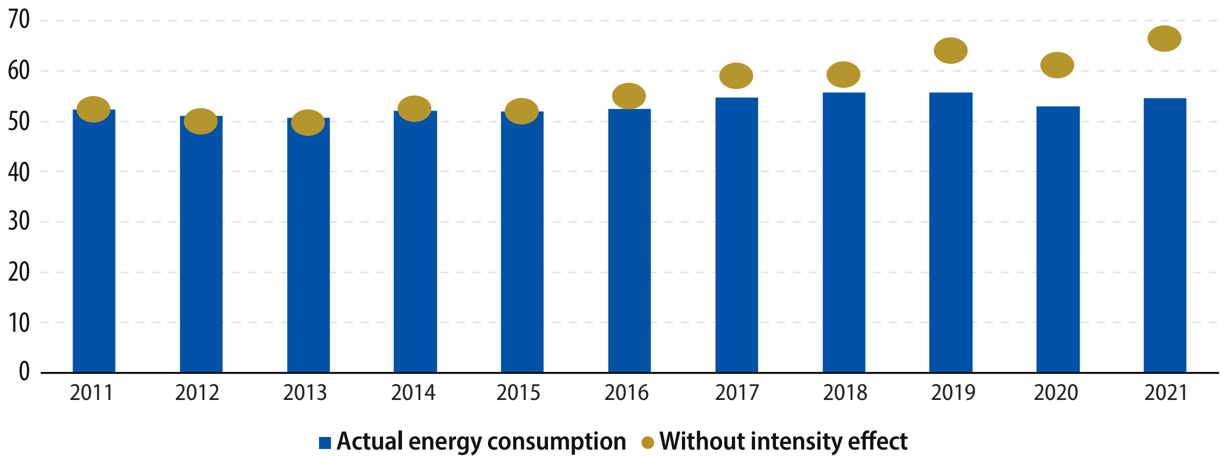


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

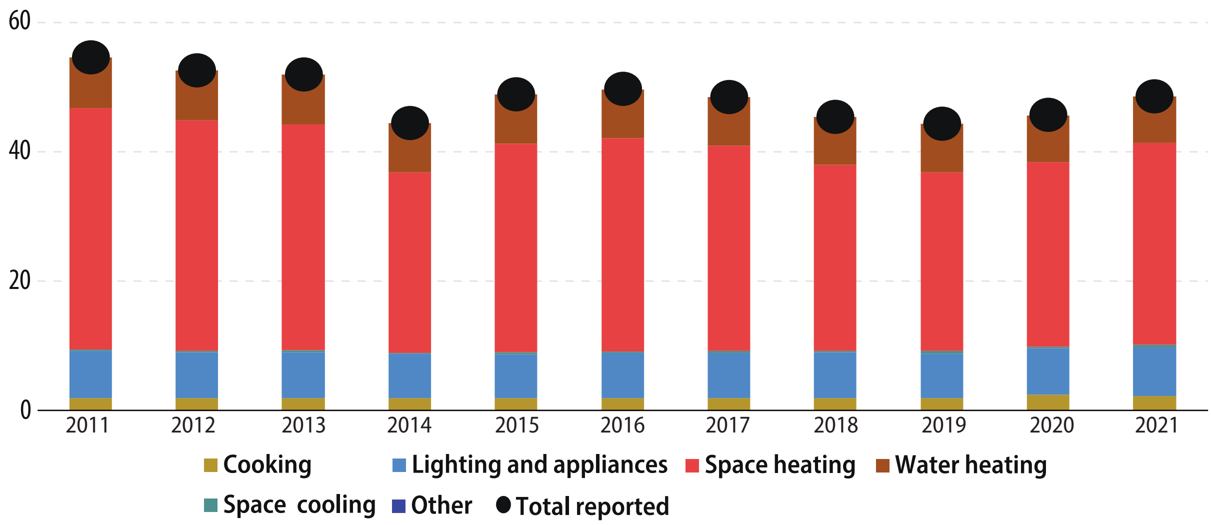
The energy consumption in Slovenia's manufacturing industry sector slightly increased from 52 PJ in 2011 to 56 PJ in 2019, before dropping to 53 PJ in 2020, and it was still below 55 PJ in 2021. The gross value added was not available for the coke and refined petroleum products sector, therefore it was excluded from the analysis for the entire period. For the remaining sectors, the GVA first decreased from 9.4 billion EUR in 2011 to 8.8 billion EUR in 2013, before it increased steadily to 11.7 billion EUR in 2019, then dropped very slightly in 2020 to 11.4 billion EUR, to immediately bounce back to its highest level over the studied period, at 12.6 billion EUR in 2021. Between 2011 and 2021, the increase in GVA drove up the energy consumption by about 16 PJ. This was mostly offset, mainly by the decrease in energy intensity, which brought down the consumption by almost 12 PJ, and to a lesser extent by the structural changes in the industry, which caused a slight decrease of about 2 PJ of consumption, partly due to a lower share of the construction sector (from 21 % to 19 % between 2011 and 2021). Without the decrease in energy intensity, the total energy consumption in the covered sectors would have been close to 22 % higher in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

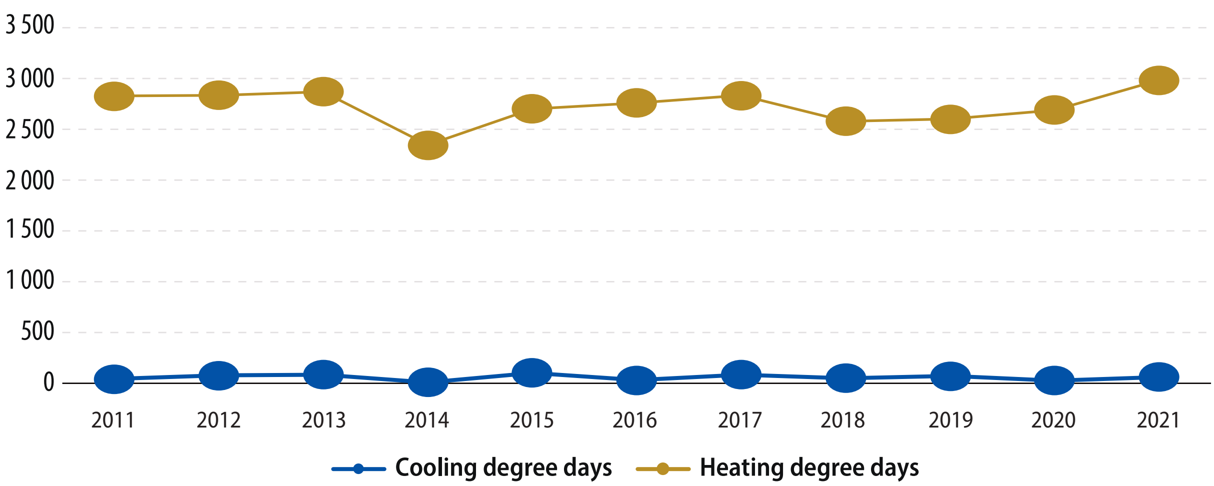
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

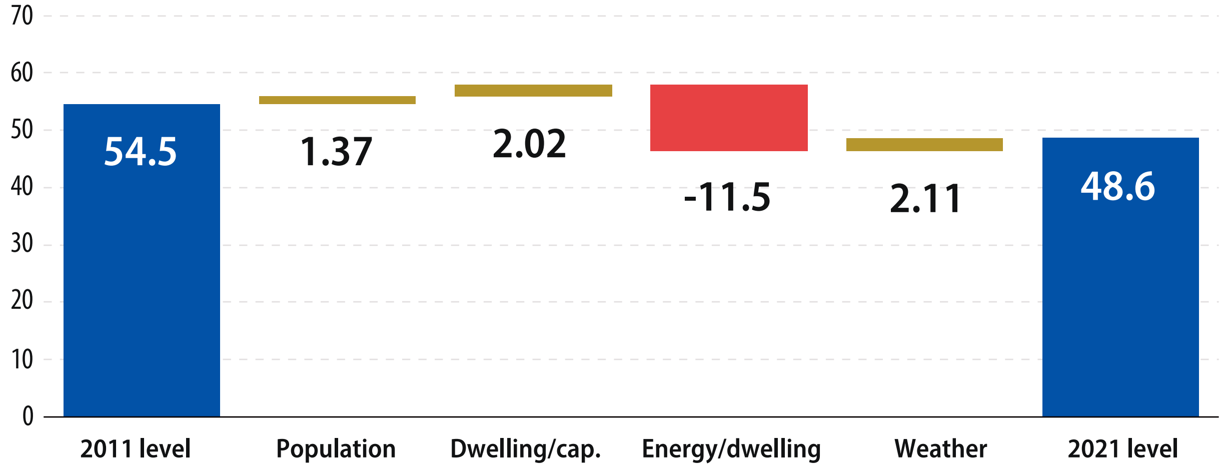


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

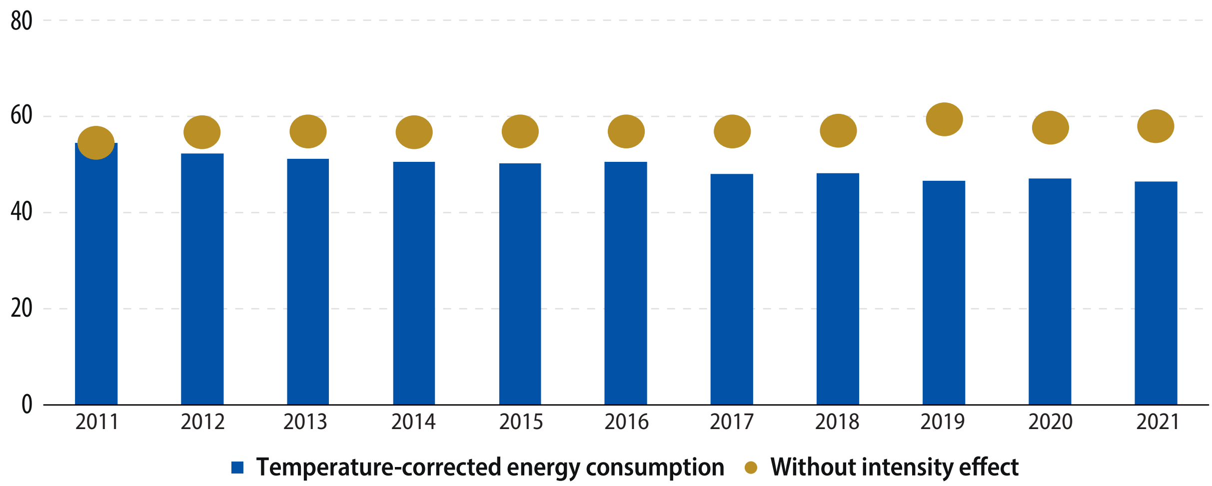


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

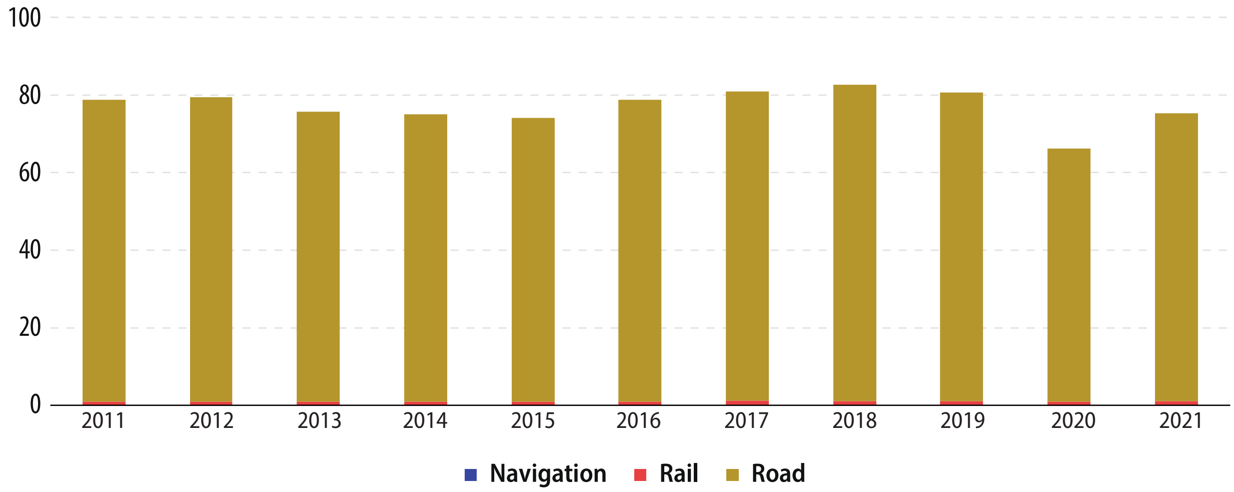
The energy consumption in the Slovenian residential sector decreased from 55 PJ in 2011 to 49 PJ in 2021. Between these two years, the increase in population can be estimated to have caused an increase of about 1 PJ, and the decrease in dwelling occupancy brought the consumption further up by about 2 PJ. The main driver, however, was the decrease in energy consumption per dwelling, which brought down the sector consumption by almost 12 PJ. There were slightly more heating degree days in 2021 than in 2011, and consequently the weather brought consumption up by about 2 PJ. Without the decrease in energy consumption per dwelling, residential energy consumption could have been up to 24 % higher in 2021.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

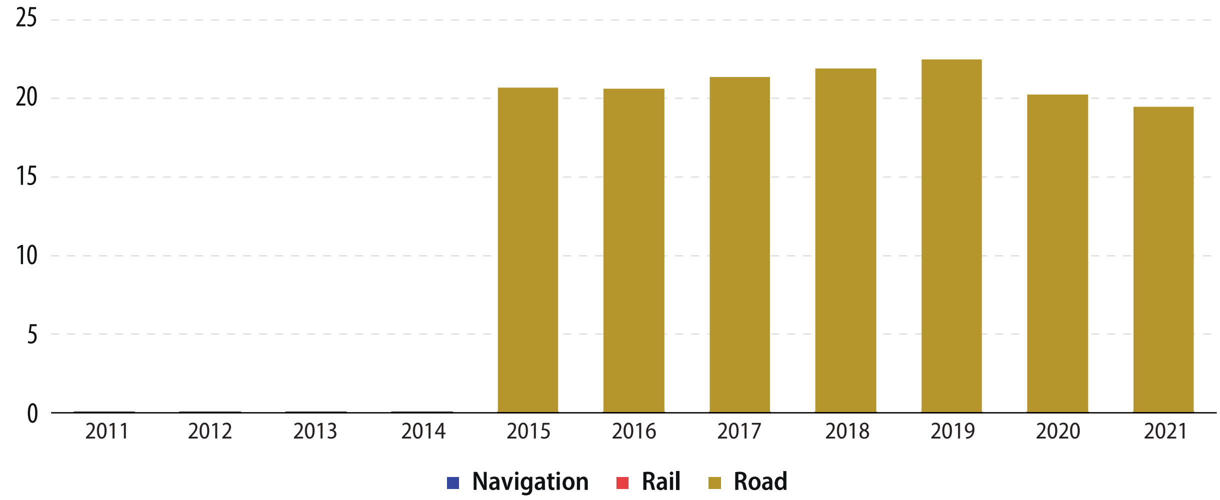


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

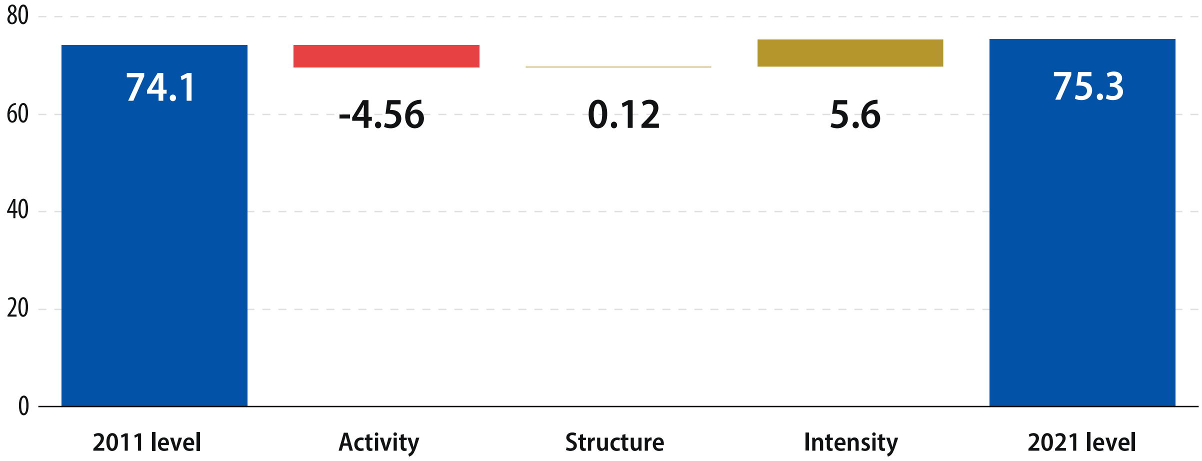


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

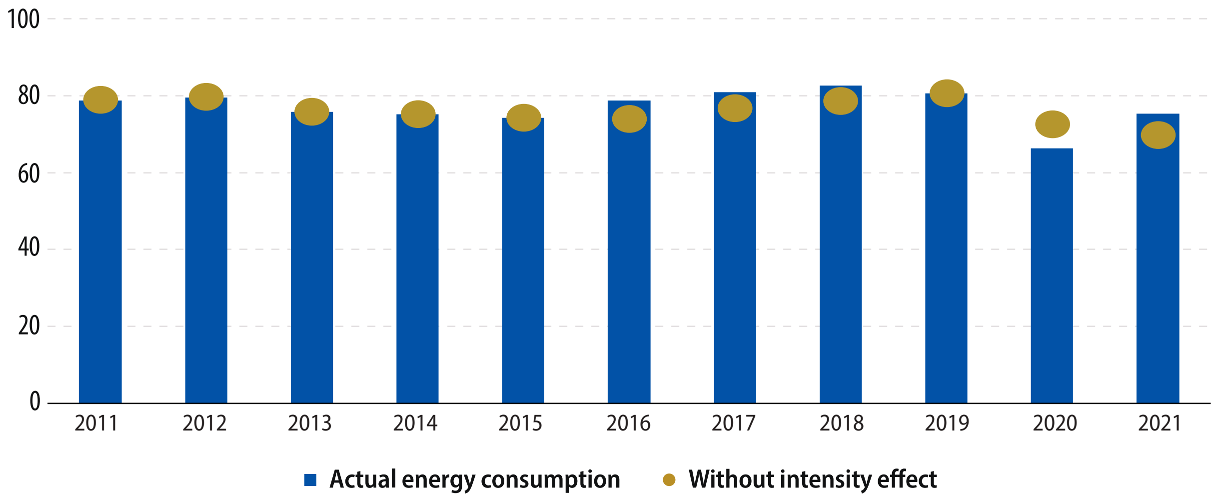


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

In the first part of the studied period, the energy consumption in the Slovenian transport sector remained quite stable, going from 79 PJ in 2011 to 81 PJ in 2019, before dropping to 66 PJ in 2020, and finally bouncing back to 75 PJ in 2021. Most of the energy consumption was due to road transport. Unfortunately, road traffic data were not available prior to 2015, and therefore the decomposition had to be applied to the period 2015-2021. Over this period, the road traffic grew from 20.7 billion VKM in 2015 to 22.5 billion VKM in 2019, before decreasing to reach 19.4 billion VKM in 2021. From 2015 to 2021, the decrease in traffic drove down the energy consumption by almost 5 PJ, which was more than offset by the increase in energy intensity, which caused an additional consumption of almost 6 PJ. With the absence of strong variation in the share of the different transport modes, the structural effect was almost unnoticeable. Without the increase in energy intensity, the energy consumption in the transport sector could have been 7 % lower in 2021.

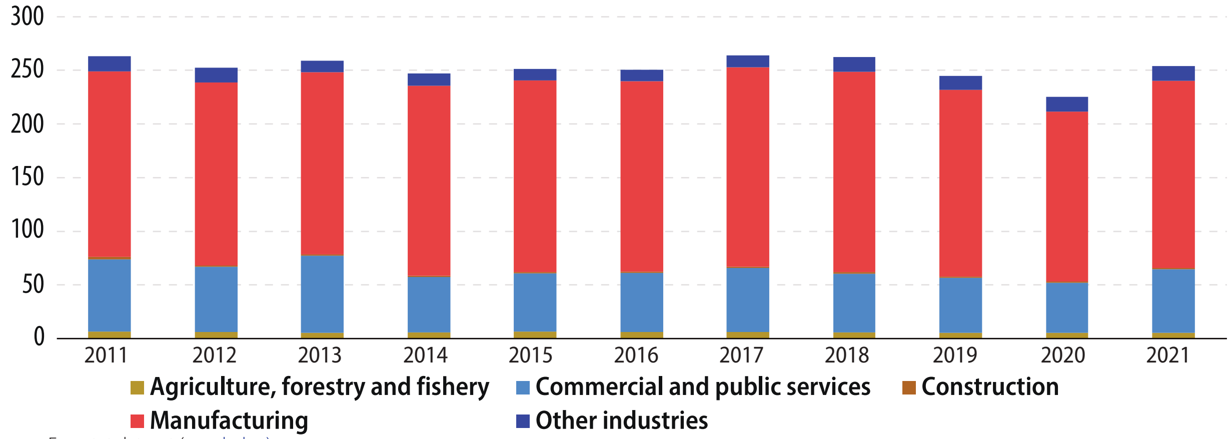
Slovakia

Economy

FIGURE 1

Overall economy energy consumption by subsector, 2011-2021

(In PJ)

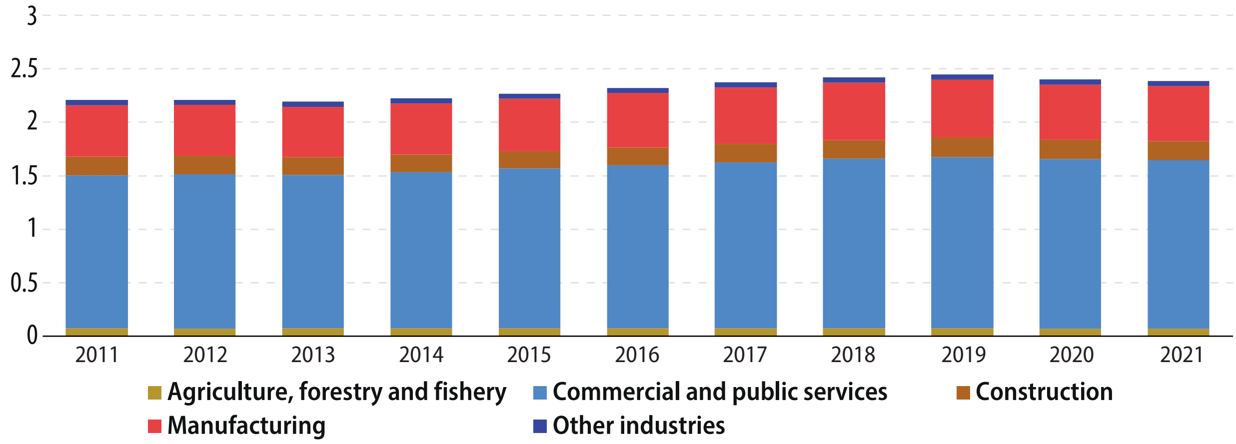


Source: Eurostat dataset (nrg_bal_c)

FIGURE 2

Overall economy employment by subsector, 2011-2021

(In millions)

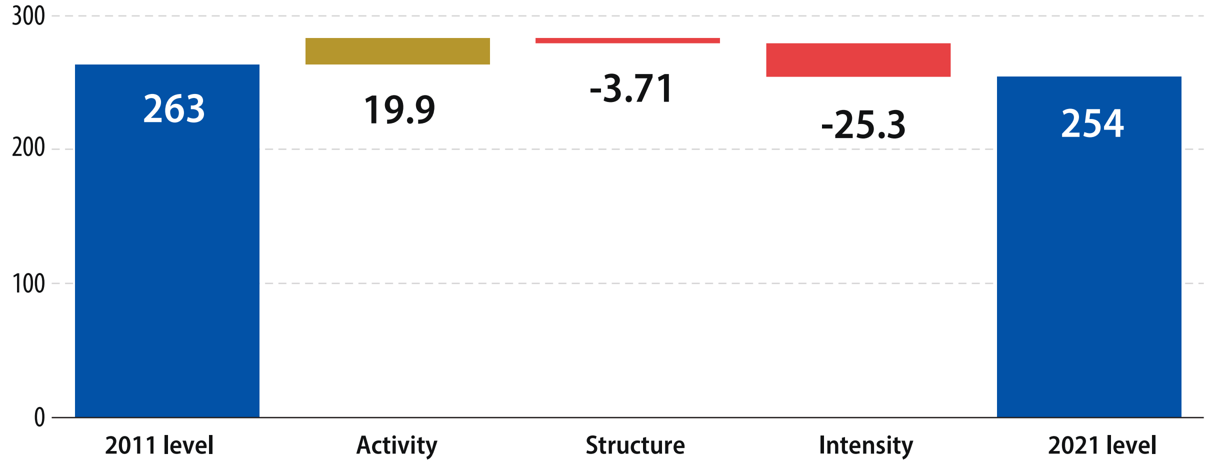


Source: Eurostat dataset (nama_10_a10_e)

FIGURE 3

Decomposition analysis of energy consumption of the overall economy, 2011-2021

(In PJ)

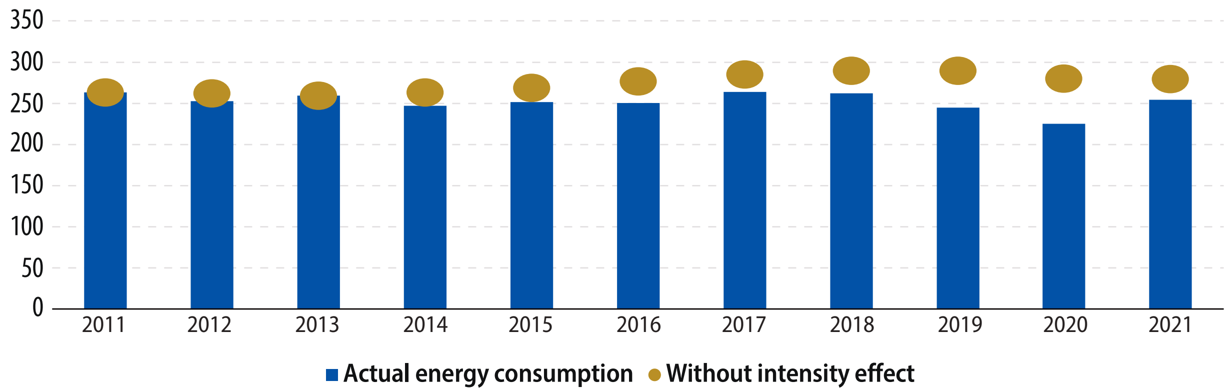


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

FIGURE 4

Actual vs theoretical energy consumption in the economy, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a10_e)

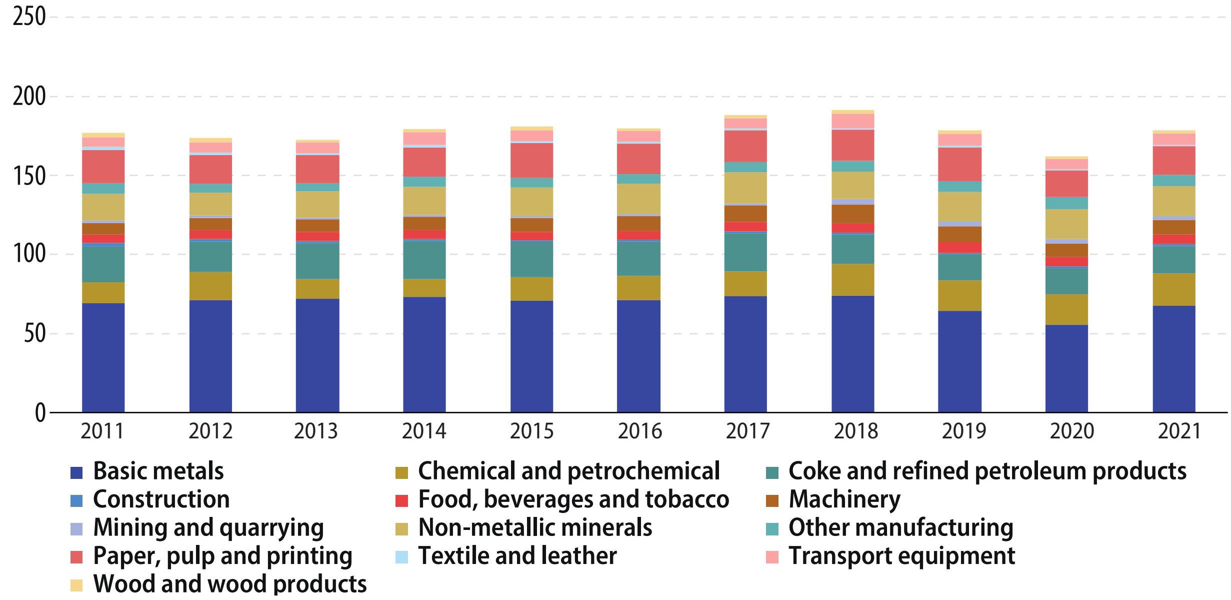
The final energy consumption of the different sectors of the whole economy was also quite stable between 2011 and 2018, oscillating between 247 PJ and 264 PJ, then it decreased and reached 225 PJ in 2020, before bouncing back to 254 PJ. Meanwhile, the active population steadily increased from 2.2 million in 2011 to 2.4 million in 2019, and it stabilised at this level until 2021. Between 2011 and 2021, the increase in activity (measured in terms of employees) drove up the energy consumption by almost 20 PJ. This was more than offset by the decrease in energy consumption per employee, which reduced energy consumption by about 25 PJ. As there were no significant changes in the share of the different sectors in terms of employment, the structural effect was quite small, driving down consumption by about 4 PJ. Without the decrease in energy consumption per employee, the whole economy's energy consumption would have been 10 % lower in 2021.

Industry

FIGURE 5

Industry energy consumption by subsector, 2011-2021

(In PJ)

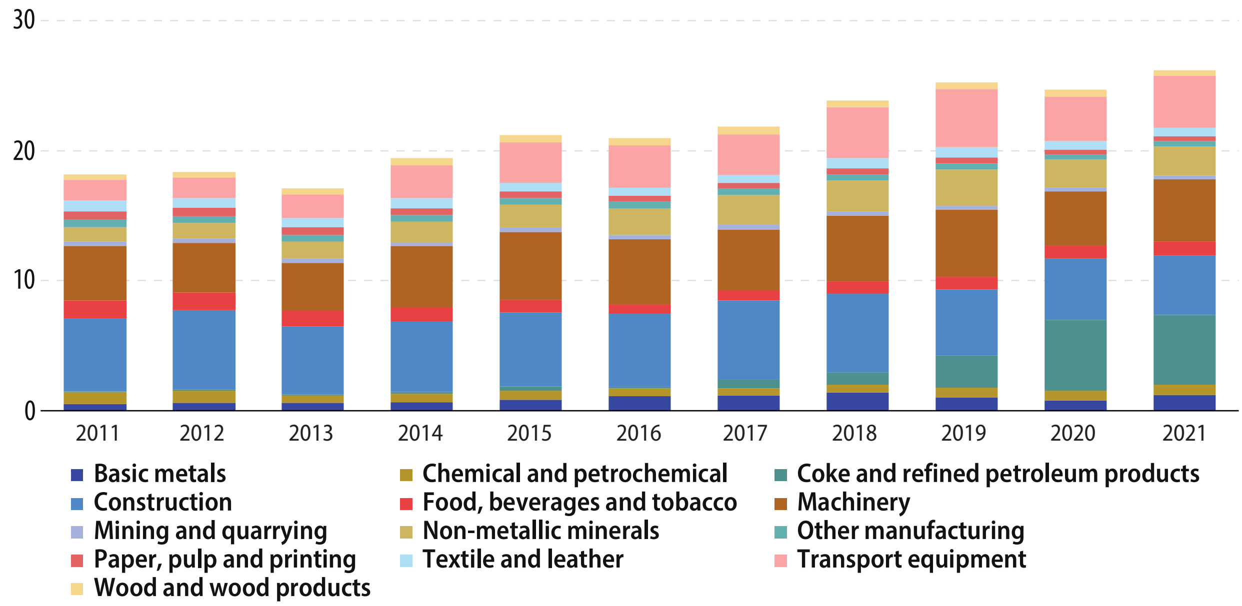


Source: Eurostat dataset (nrg_bal_c)

FIGURE 6

Industry GVA by subsector, 2011-2021

(In EUR billions)

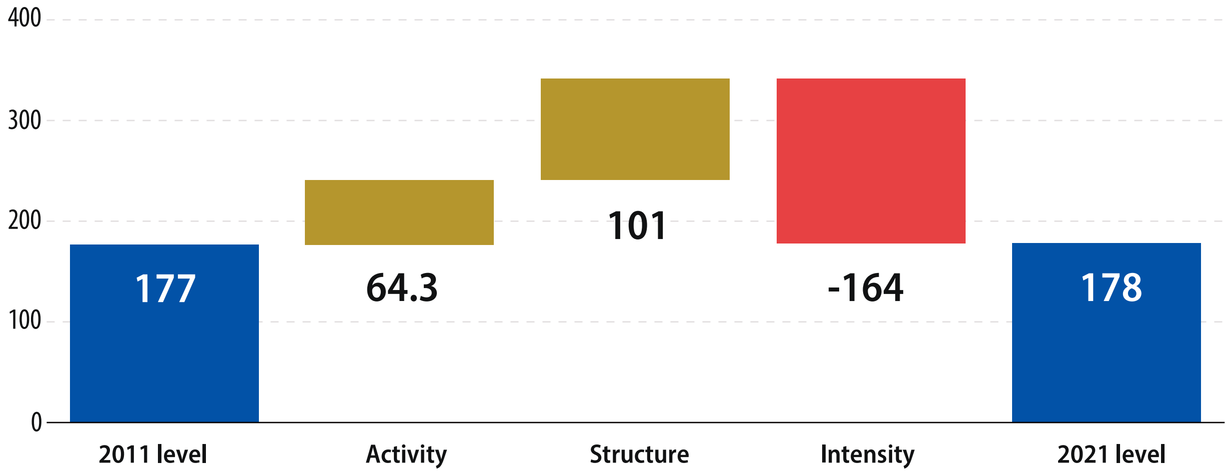


Source: Eurostat dataset (nama_10_a64)

FIGURE 7

Decomposition analysis of energy consumption of the industry, 2011-2021

(In PJ)

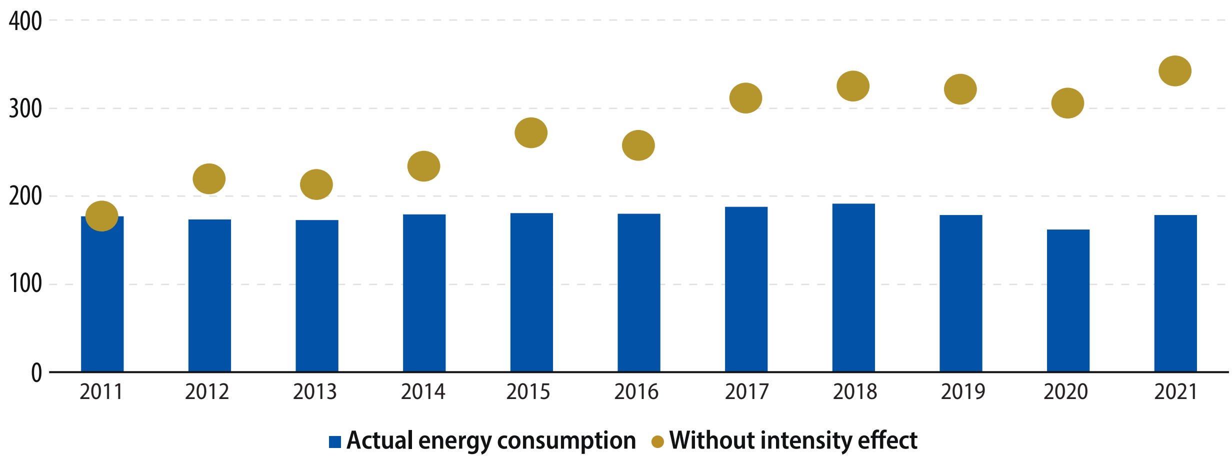


Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

FIGURE 8

Actual vs theoretical energy consumption in the industry, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c and nama_10_a64)

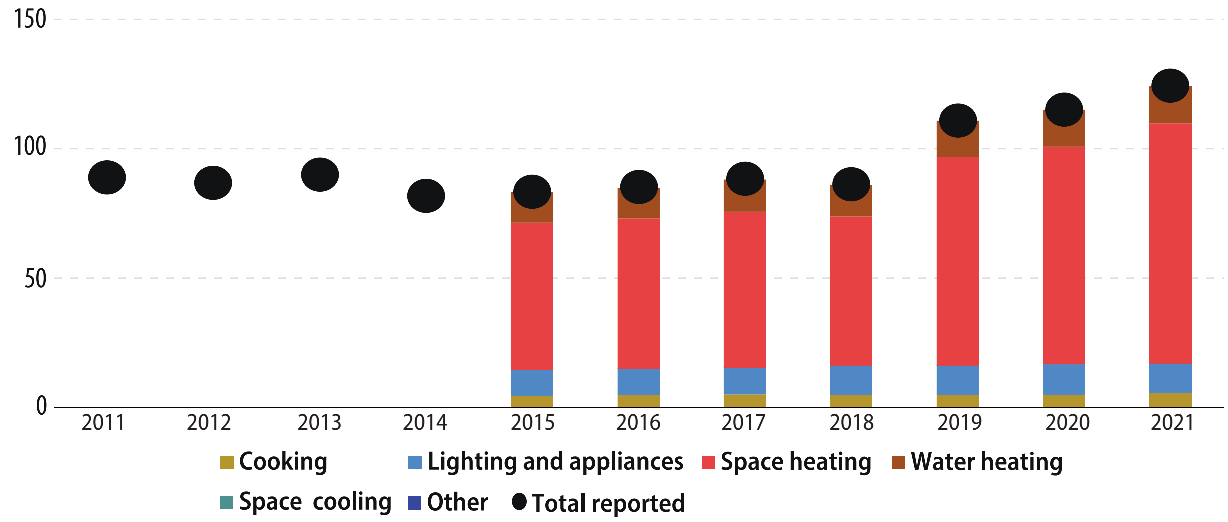
The energy consumption in Slovakia's manufacturing industry sector slightly increased from 176 PJ in 2011 to 191 PJ in 2018, before decreasing to reach 162 PJ in 2020, and it was only 178 PJ in 2021, barely above its 2011 level. Meanwhile, the gross value added increased from 18 billion EUR in 2011 to 26 billion EUR in 2021. Between 2011 and 2021, the increase in GVA drove up energy consumption by about 64 PJ. In addition, changes in the respective shares of the different subsectors drove up consumption further, by about 101 PJ, partly due to a lower share of the construction sector (from 31 % to 17 % between 2011 and 2021) and of the machinery sector (from 23 to 18 %). Both effects were offset by the decrease in energy intensity, which brought down consumption by 164 PJ. Without this decrease, the total energy consumption in the industry sector would have been almost twice as high in 2021.

Residential

FIGURE 9

Residential energy consumption by end-use, 2011-2021

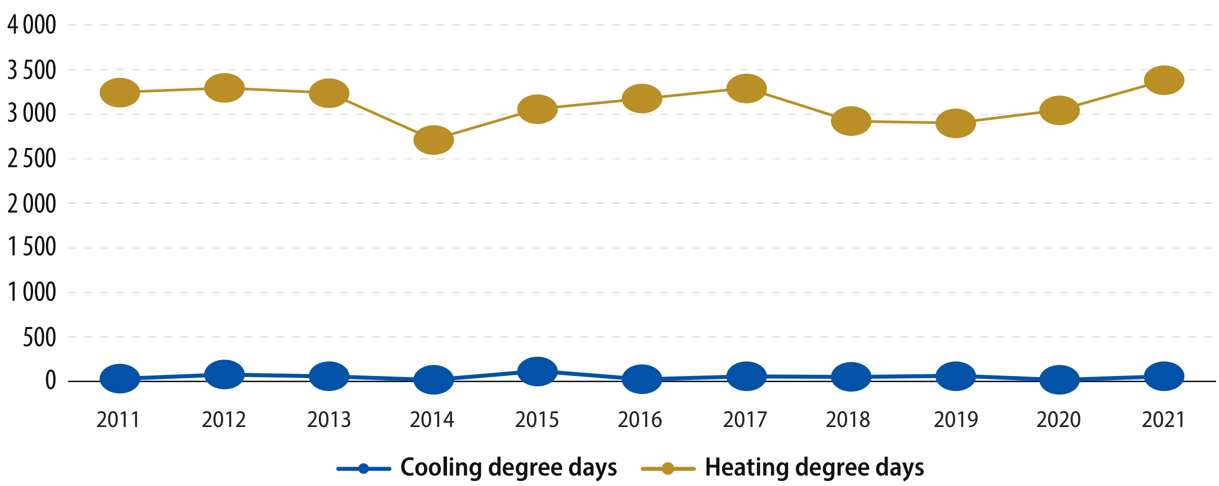
(In PJ)



Source: Eurostat datasets (nrg_bal_c and nrg_d_hhq)

FIGURE 10

Heating and cooling degree days, 2011-2021

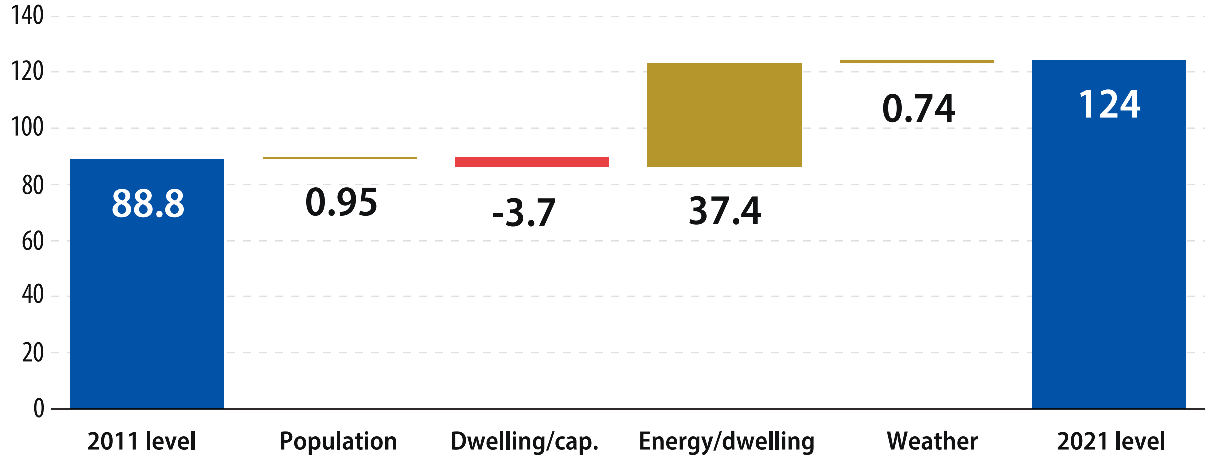


Source: Eurostat dataset (nrg_chdd_a)

FIGURE 11

Decomposition analysis of energy consumption of the residential sector, 2011-2021

(In PJ)

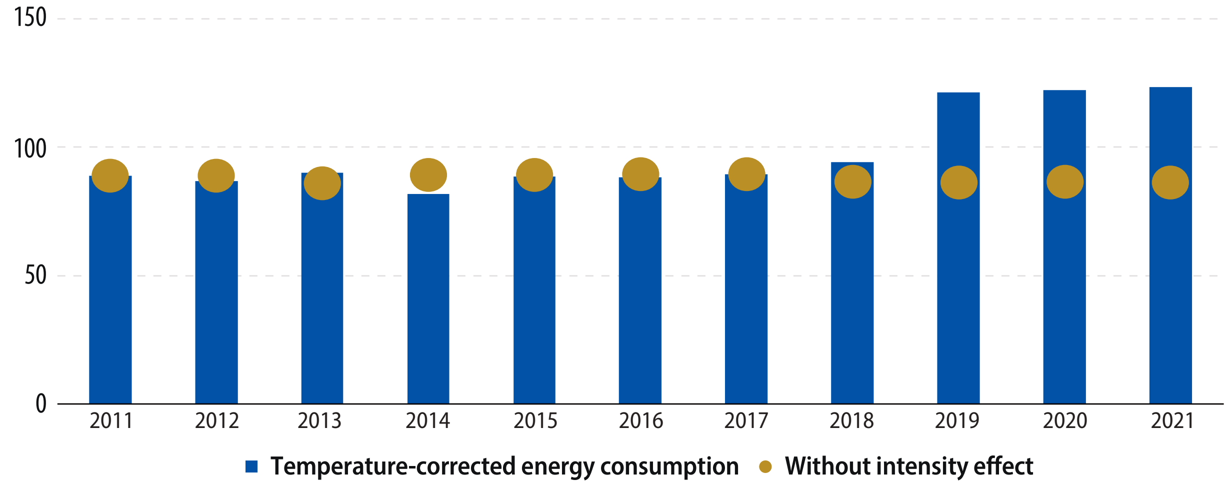


Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

FIGURE 12

Climate-corrected vs theoretical energy consumption in the residential sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_d_hhq, demo_gind, ilc_lvph01, nrg_chdd_a)

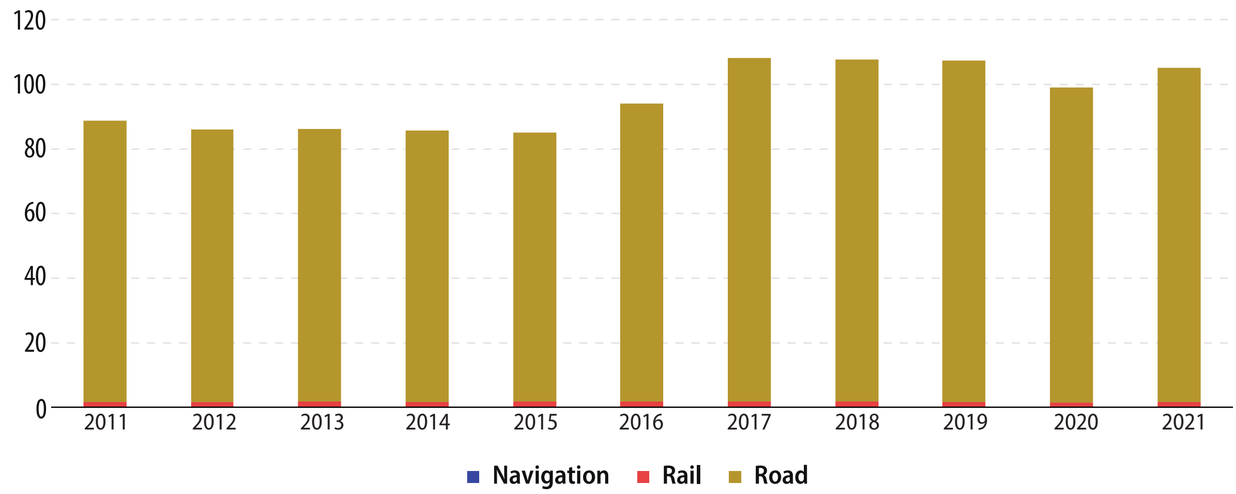
The energy consumption in the Slovakian residential sector remained stable from 2011 to 2018, oscillating within 82 PJ and 90 PJ. From 2019, the reported consumption jumped up and kept increasing, to reach 124 PJ in 2021. The breakdown in energy consumption by end-use is only available from 2015, therefore the temperature correction can also only be calculated from this year onward. Between these two years, the increase in population can be estimated to have caused an increase of about 1 PJ, but the increase in dwelling occupancy brought consumption down by about 4 PJ. The main driver, however, was the decrease in energy consumption per dwelling, which brought the sector's consumption up by almost more than 37 PJ. There were slightly more heating degree days in 2021 than in 2011, however since the temperature correction could not be calculated for 2011, the weather effect calculated between these two years is not reliable.

Transport

FIGURE 13

Transport energy consumption by mode, 2011-2021

(In PJ)

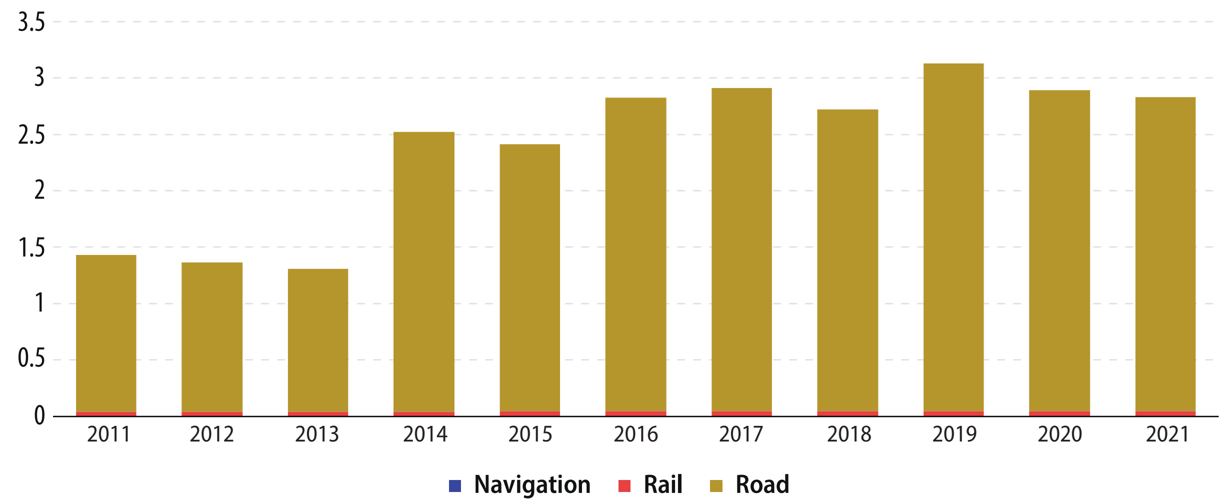


Source: Eurostat dataset (nrg_bal_c)

FIGURE 14

Transport traffic by mode, 2011-2021

(In billion VKM)

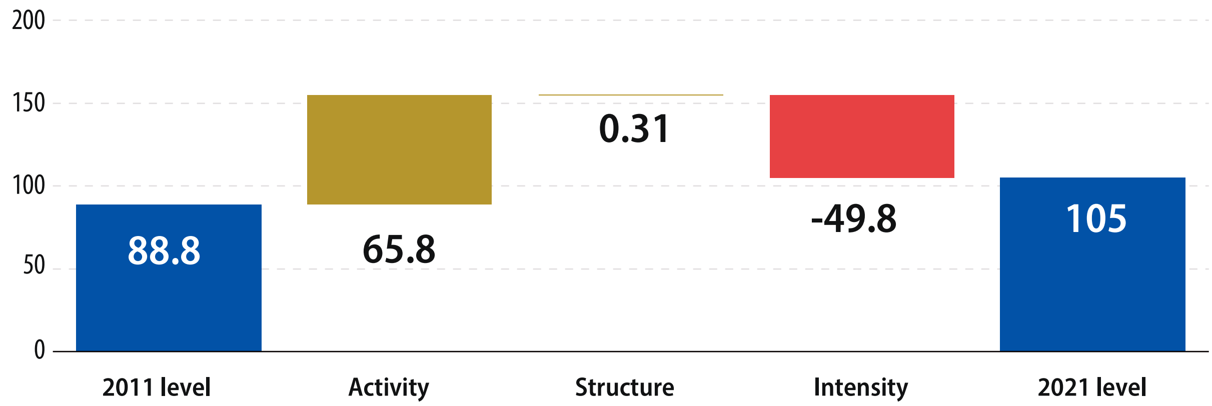


Source: Eurostat datasets (rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 15

Decomposition analysis of energy consumption of the transport sector, 2011-2021

(In PJ)

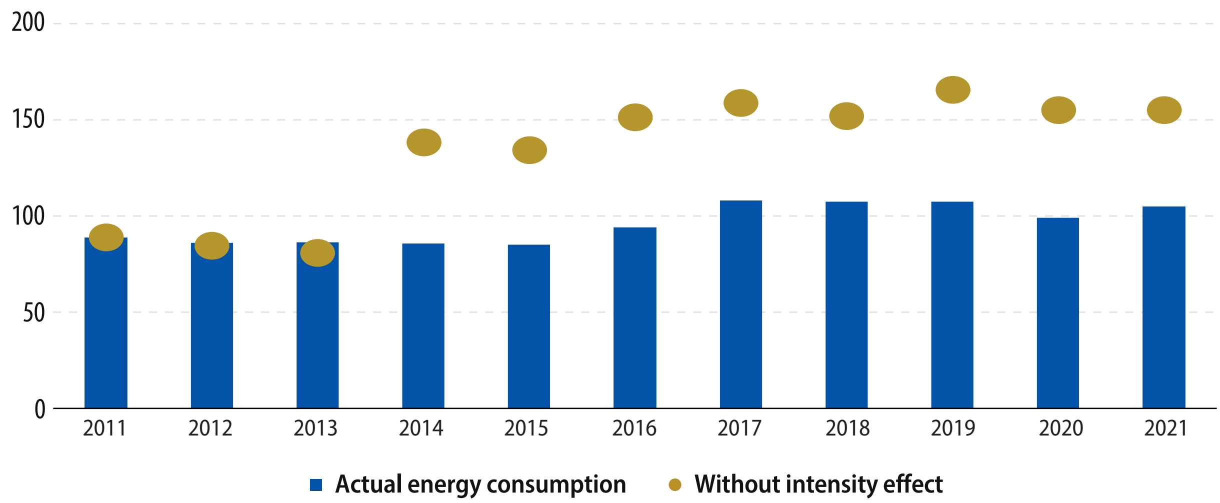


Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

FIGURE 16

Actual vs theoretical energy consumption in the transport sector, 2011-2021

(In PJ)



Source: Artemis, based on Eurostat datasets (nrg_bal_c, rail_tf_trainmv, road_tf_vehmov, iww_tf_vetf)

From 2011 to 2015, the energy consumption in the Slovakian transport sector remained quite stable, oscillating within 85 PJ and 89 PJ. From 2016, the energy consumption grew to reach 108 PJ in 2017, before stabilising around this level, except for a drop to 99 PJ in 2020. Most of the energy consumption is due to road transport. The reported road traffic data were stable around 1.4 billion VKM from 2011 to 2013, before jumping up to 2.54.8 billion VKM in 2014, and growing up to 3.1 billion VKM in 2019.From then it decreased slightly to reach 2.8 billion VKM in 2021. From 2011 to 2021, the strong increase in traffic drove up the energy consumption by almost 66 PJ, while the increase decrease in energy intensity reduced the consumption by almost 50 PJ. With the absence of strong variation in the share of the different transport modes, the structural effect was almost unnoticeable. Without the increase in energy intensity, the energy consumption in the transport sector could have been 47 % higher in 2021, although this figure might be exaggerated due to a potential underreporting of the road traffic in 2011.

Conclusion

The importance of energy consumption monitoring has been widely recognised, and decomposition analysis is a particularly interesting tool for this purpose, as it can separate the different factors that affect the variations in the consumption level, especially by separating actual energy efficiency gains from external factors.

The overall objective of this report was to

- Present the methodology applied to perform the decomposition.
- Use the datasets that were identified as suitable for the task.
- Apply the developed tool to calculate the different effects which impact energy consumption across all sectors, for each EU-27 country, and in the EU-27 as a whole.
- Allow comparisons of energy consumption between countries.
- Enable potential data issues to be identified, such as lack of disaggregation or unstable time series.

In doing so, the overall objective is to enable the European Union and its Member States to analyse their energy consumption and then develop efficient energy policies, adapted to their own characteristics.

The first decomposition covered the energy consumption in the economy as a whole, including manufacturing and constructions industries, commercial and public services, agriculture and forestry. The most common observation across the different countries was the growing share of the services sector in the employment, while the same sector's share in energy consumption remained far below the industrial sector.

In the second decomposition presented, the energy consumption in the manufacturing and construction industries was treated. This is the most commonly found example of decomposition in the energy sector, and for good reasons, as it provides useful insights regarding the importance of some subsectors in energy consumption that did not always translate in terms of added value.

The third decomposition covered the residential sector energy consumption. The disaggregated energy consumption data, when available, highlighted that among all end use for energy, space heating is almost systematically the first, accounting usually for more than a half of the residential energy consumption. Of course, the climate of the country played a big role, with Malta, Cyprus and Portugal using far less energy for space heating than countries with colder climates such as Sweden, Finland or Estonia. However, thanks to decomposition analysis, and in cases where disaggregated energy data were available, it was possible to separate out other factors such as appliance consumption and variations in dwelling occupancy, which can also have a significant impact on consumption.

The fourth decomposition was applied to the transport sector, which is one of the most important sectors in terms of energy consumption for all countries. Unfortunately, due to the limited data available (no energy consumption disaggregated by type of transport, transport data not available for air transport), the decomposition only covered road, rail and navigation transport, but most importantly, the activity was measured in vehicle kilometre, which gathers together passenger and goods transport. Therefore, the only aspect that could really be highlighted was the importance of road transport compared to rail and navigation.

The comparison of intensities across all EU-27 countries provides an interesting perspective as the national intensity figures are normalised, and do not depend on the size of their respective economies. This comparison there allows an assessment of the potential gains (or losses) in energy efficiency over the period, and it also highlights potential data quality issues.

It is important to bear in mind the limitations of using decomposition analysis for energy consumption. However, it must be recognised that provided that good quality and complete data are available, it provides a clear and useful hindsight, which can guide the analysis before or after implementing measures, e.g. for energy savings, and as such, its use should be recommended.

Annexes

Annex 01: Industry sector – value added

National accounts aggregate by industry data (nama_10_a64)		Complete energy balance (nrg_bal_c)		Breakdown used
NACE Rev. 2 - Statistical classification of economic activities				
F	Construction	FC_IND_CON_E	Final consumption – industry sector – construction	Construction
B	Mining and quarrying	FC_IND_MQ_E	Final consumption – industry sector – mining and quarrying	Mining and quarrying
		NRG_CM_E	Energy sector – coal mines	
		NRG_OIL_NG_E	Energy sector – oil and natural gas extraction plants	
C10-C12	Manufacture of food products; beverages and tobacco products	FC_IND_FBT_E	Final consumption – industry sector – food, beverages, and tobacco	Food, beverages, and tobacco
C13-C15	Manufacture of textiles, wearing apparel, leather, and related products	FC_IND_TL_E	Final consumption – industry sector – textile and leather	Textile and leather
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	FC_IND_WP_E	Final consumption – industry sector – wood and wood products	Wood and wood products
C17	Manufacture of paper and paper products	FC_IND_PPP_E	Final consumption – industry sector – paper, pulp, and printing	Paper, pulp, and printing
C18	Printing and reproduction of recorded media			
C19	Manufacture of coke and refined petroleum products	NRG_PR_E	Energy sector – petroleum refineries (oil refineries)	Coke and refined petroleum products
C20	Manufacture of chemicals and chemical products	FC_IND_CPC_E	Final consumption – industry sector – chemical and petrochemical	Chemical and petrochemical
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations			

C22	Manufacture of rubber and plastic products	FC_IND_NMM_E	Final consumption – industry sector – non-metallic minerals	Non-metallic minerals
C23	Manufacture of other non-metallic mineral products			
C24	Manufacture of basic metals	FC_IND_IS_E	Final consumption – industry sector – iron and steel	Basic metals
		NRG_CO_E	Energy sector – coke ovens	
		NRG_BF_E	Energy sector – blast furnaces	
		FC_IND_NFM_E	Final consumption – industry sector – non-ferrous metals	
C25	Manufacture of fabricated metal products, except machinery and equipment	FC_IND_MAC_E	Final consumption – industry sector – machinery	Machinery
C26	Manufacture of computer, electronic and optical products			
C27	Manufacture of electrical equipment			
C28	Manufacture of machinery and equipment n.e.c.			
C29	Manufacture of motor vehicles, trailers, and semi-trailers	FC_IND_TE_E	Final consumption – industry sector – transport equipment	Transport equipment
C30	Manufacture of other transport equipment			
C31_C32	Manufacture of furniture; other manufacturing	NRG_PF_E	Energy sector – patent fuel plants	Other manufacturing
		NRG_BKBPB_E	Energy sector – brown coal briquettes and peat briquettes plants	
		NRG_CL_E	Energy sector – coal liquefaction plants	
		NRG_GTL_E	Energy sector – gas-to-liquids plants	
		NRG_CPP_E	Energy sector – charcoal production plants	
		NRG_NSP_E	Energy sector – not elsewhere specified	
		FC_IND_NSP_E	Final consumption – industry sector – not elsewhere specified	
C33	Repair and installation of machinery and equipment	Not included		
D	Electricity, gas, steam, and air conditioning supply			
E	Water supply; sewerage, waste management and remediation activities			

Annex 02 : Economy sector– Employment

Employment by A*10 industry breakdowns (nama_10_a10_e) NACE Rev. 2 - Statistical classification of economic activities		Complete energy balance (nrg_bal_c)		Breakdown used
A	Agriculture, forestry, and fishing	FC_OTH_AF_E	Final consumption – other sectors – agriculture and forestry	Agriculture, forestry, and fishing
		FC_OTH_FISH_E	Final consumption – other sectors – fishing	
C	Manufacturing	FC_IND_FBT_E	Final consumption – industry sector – food, beverages, and tobacco	Manufacturing industry
		FC_IND_TL_E	Final consumption – industry sector – textile and leather	
		FC_IND_WP_E	Final consumption – industry sector – wood and wood products	
		FC_IND_PPP_E	Final consumption – industry sector – paper, pulp, and printing	
		NRG_PR_E	Energy sector – petroleum refineries (oil refineries)	
		FC_IND_CPC_E	Final consumption – industry sector – chemical and petrochemical	
		FC_IND_NMM_E	Final consumption – industry sector – non-metallic minerals	
		FC_IND_IS_E	Final consumption – industry sector – iron and steel	
		NRG_CO_E	Energy sector – coke ovens	
		NRG_BF_E	Energy sector – blast furnaces	
		FC_IND_NFM_E	Final consumption – industry sector – non-ferrous metals	
		FC_IND_MAC_E	Final consumption – industry sector – machinery	
		FC_IND_TE_E	Final consumption – industry sector – transport equipment	
		NRG_PF_E	Energy sector – patent fuel plants	
		NRG_BKBPB_E	Energy sector – brown coal briquettes and peat briquettes plants	
		NRG_CL_E	Energy sector – coal liquefaction plants	
		NRG_GTL_E	Energy sector – gas-to-liquids plants	
		NRG_CPP_E	Energy sector – charcoal production plants	
		NRG_NSP_E	Energy sector – not elsewhere specified	
		FC_IND_NSP_E	Final consumption – industry sector – not elsewhere specified	

B-E – C = **B +** **D +**	Industry (except construction) – Manufacturing = Mining and quarrying Electricity, gas, steam, and air conditioning supply	FC_IND_MQ_E	Final consumption – industry sector – mining and quarrying	Other Industries
		NRG_CM_E	Energy sector – coal mines	
		NRG_OIL_NG_E	Energy sector – oil and natural gas extraction plants	
		NRG_EHG_E	Energy sector – electricity and heat generation	
		NRG_GW_E	Energy sector – gas works	
		NRG_LNG_E	Energy sector – liquefaction and regasification plants (LNG)	
		NRG_BIOG_E	Energy sector – gasification plants for biogas	
		NRG_NI_E	Energy sector – nuclear industry	
E	Water supply; sewerage, waste management and remediation activities	Not included		
F	Construction	FC_IND_CON_E	Final consumption – industry sector – construction	Construction Industry
G-I	Wholesale and retail trade, transport, accommodation, and food service activities	FC_OTH_CP_E	Final consumption – other sectors – commercial and public services	Commercial and public services
J	Information and communication			
K	Financial and insurance activities			
L	Real estate activities			
M_N	Professional, scientific, and technical activities; administrative and support service activities			
O-Q	Public administration, defense, education, human health, and social work activities			
R-U	Arts, entertainment, and recreation; other service activities; activities of household and extra-territorial organizations and bodies			

Annex 03: Transport sector mapping – Vehicle-Kilometre

Eurostat transport datasets					Complete energy balance (nrg_bal_c)		Breakdown used
rail_tf_trainmv	TOTAL		Total		FC_TRA_RAIL_E	Rail	Rail
road_tf_vehmov	TOTAL	D001	Total	Motor vehicle movements on national territory (irrespective of registration country)	FC_TRA_ROAD_E	Road	Road
iww_tf_vetf	TOTAL	TOTAL	Total transport	Total loaded and empty	FC_TRA_DNAVI_E	Domestic navigation	Water
Not available					FC_TRA_DAVI_E	Domestic aviation	Not included
Not applicable					FC_TRA_PIPE_E	Pipeline transport	
					FC_TRA_NSP_E	Not elsewhere specified	

Annex 04: Residential sector - Final Uses

Eurostat datasets		
Disaggregated final energy consumption in households (nrg_d_hhq)	FC_OTH_HH_E_SH	Space heating
	FC_OTH_HH_E_SC	Space cooling
	FC_OTH_HH_E_WH	Water heating
	FC_OTH_HH_E_CK	Cooking
	FC_OTH_HH_E_LE	Lighting and electrical appliances
	FC_OTH_HH_E_OE	Other end use
Demographic balance and crude rates at national level (demo_gind)	AVG	Average population – total
Average household size – EU-SILC survey (ilc_lvph01)	AVG	Average
Cooling and Heating Degree Days by country – annual data (nrg_chdd_a)	HDD	Heating Degree Days
	CDD	Cooling Degree Days

ANNEX 05: LMDI calculations

The LMDI decomposition offers interesting mathematical properties:

- It results in perfect decomposition, i.e. the results do not contain any residual term.
- It can be used to investigate the effects of more than two factors (in the present case, three factors are needed). Moreover, the complexity does not increase as more factors are included.
- There is a simple relationship between multiplicative and additive forms.
- It is consistent-in-aggregation, meaning that the effect of sub-sectors can be aggregated to calculate the effect at the sector level.
- It can handle zero values.

This decomposition has been widely used and the main equations are shown in the below table.

Table 1: LMDI coefficients

Method	Activity	Structure	Intensity	Weighting factor
Additive (ΔE)	$\sum_i w_{i,t} \ln\left(\frac{A_t}{A_0}\right)$	$\sum_i w_{i,t} \ln\left(\frac{S_{i,t}}{S_{i,0}}\right)$	$\sum_i w_{i,t} \ln\left(\frac{I_{i,t}}{I_{i,0}}\right)$	$w_{i,t} = L(E_{i,0}, E_{i,t})$
Multiplicative (DE)	$e^{\sum_i \widetilde{w_{i,t}} \ln\left(\frac{A_t}{A_0}\right)}$	$e^{\sum_i \widetilde{w_{i,t}} \ln\left(\frac{S_{i,t}}{S_{i,0}}\right)}$	$e^{\sum_i \widetilde{w_{i,t}} \ln\left(\frac{I_{i,t}}{I_{i,0}}\right)}$	$\widetilde{w_{i,t}} = \frac{L(E_{i,0}, E_{i,t})}{L(E_0, E_t)}$

Where:

$$L(X_1, X_2) = \frac{X_2 - X_1}{\ln\left(\frac{X_2}{X_1}\right)}) \; if X_1 \neq X_2$$

$$L(X_1, X_1) = X_1$$

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List of Acronyms

CDD	Cooling degree days
EU	European Union
EUR	Euro
GHG	Greenhouse gases
GVA	Gross value added
HDD	Heating degree days
JRC	Joint Research Centre
LMDI	Logarithmic Mean Divisia Index
PI	Production Index
IDA	Indexed Decomposition Analysis
IEA	International Energy Agency
SDG	Sustainable Development Goals
SDG7	7th Sustainable Development Goal
TJ	Terajoules
UN	United Nations
VKM	Vehicle-kilometres

Contributors

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Energy consumption decomposition analysis on EU-27 and EU-27 members

Decomposition energy efficiency: Paving the road to sustainability using energy monitoring

The imperative of monitoring energy consumption is clear. Decomposition analysis stands out as a crucial method, allowing us to distinguish real energy efficiency gains from other external factors.

The project achieves several goals, by shedding light on and facilitating the analysis of decomposed energy consumption. Firstly, this report outlines a comprehensive methodology for future decomposition analysis, including how to choose appropriate datasets. Secondly, it examines the factors affecting energy consumption in various sectors within each EU-27 nation and the EU-27 as a whole, enabling comparisons of energy use between countries. In doing so, it also tackles potential data challenges, thus shaping future energy data policies.

The findings offer significant contributions to the fields of national statistics, methodological applications, and energy data analysis.

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