Sectoral Profile - Industry

Energy consumption

Energy consumption trends in EU

- The energy consumption of industry decreased between 2003 and 2015, although there was growth in industrial activity from 2003 to 2007 and after 2013. However, it rose between 2015 and 2018, following a strong growth in industry activity. It decreased again in 2019 due to a slowdown in industrial growth.

- Between 2007 and 2015, electricity followed the same declining trend as total consumption, while it was increasing regularly before. Since 2015, it has been following the same trend as total energy consumption.

- In 2019, industry energy consumption is around 13% lower than in 2000.

![Energy consumption and activity in industry (2000 = 100)](image)

Change in fuel mix in EU industry

- Natural gas has the highest share in industry consumption (32% in 2019), closely followed by electricity (31%). The share of gas has slightly decreased (33% in 2000) and the share of electricity has increased (27.5% in 2000).

- The shares of oil and coal have been decreasing since 2000 (-6.4 points and -4 points respectively).

- The shares of biomass and heat have been increasing (+4.9 points and +2.8 points respectively).
Industry absorbs a declining share of final consumption

- In most EU countries, the share of industry in the final energy consumption is declining (by 3.7 points at EU level since 2000). This decline was very significant in Bulgaria, Romania, Spain, Poland, Czechia and Italy (by 8 to 13 points).
- This share has however increased in 4 countries, namely Germany, Austria, Latvia and Hungary, by 0.5 to 4 points.
- There are large discrepancies in the share of industry in final consumption among countries: from more than 45% in Finland to around 15% in Estonia, Denmark, Luxembourg, Malta and Cyprus (27% for EU on average).

Energy consumption trend by industrial branch

- Chemicals, steel, paper and non-metallic industries contribute to more than 60% of industry energy consumption in the EU. Chemicals is the largest consumer (20% in 2019), followed by steel (17%), paper and non-metallic minerals (13% each).
- Energy consumption of steel and non-metallic minerals have strongly decreased since 2000 (-29% and -24% respectively). Textile energy consumption has dropped by 62%.
• In 7 branches, energy consumption has been rising again since 2014, after a reduction over 2007-2014.

Energy consumption of industry by branch (EU)

• At country level, the situation is very different from one country to another. Chemicals is the main industrial consumer of industry in 7 EU Member States, as well as in the UK and Switzerland. Paper and pulp is the most important branch in Scandinavian countries and Portugal. Steel is an important consuming branch in some central and eastern European countries.

Energy consumption by industrial branch (2019)

Variation of electricity consumption of industry by branch

• In most branches, electricity consumption has been rising again since 2014 after a decrease between 2007 and 2014.

• Chemical is the largest electricity intensive branch (18%) followed by machinery, steel (12% each) and paper and food (11%)

• Machinery, food and, to a lesser extent, transport equipment and wood have known a rising electricity demand since 2000.
Specific consumption

Energy efficiency trends in steel industry

- There is an apparent deterioration of energy efficiency in steel production since 2007 in 9 EU countries, as shown by the increase in the specific consumption per ton of steel: this is mainly a result of the deep recession in this sector due to the economic crisis. At EU level, the specific consumption of steel has slightly decreased since 2007.

- Regular decrease in the specific consumption of steel over years in 6 EU MS (Poland, Austria, Italy, Spain, Czechia, Sweden) and Switzerland.

- Different performances, partly explained by the share of the electric process, the less intensive process, in steel production are visible across countries.
The energy performance of the steel industry should be considered in relation to the share of electric steel: the higher this ratio, the lower the specific consumption. In Slovenia and Portugal, all the steel is produced from the electric process, while in Italy and Spain, the share of this process is around 80%, which explains the low specific consumption.
Energy efficiency trends in cement industry

- Decrease of the specific consumption of cement since 2000 in 6 EU MS (Italy, Germany, Sweden, France, Croatia and Poland) and in the UK.

- Since 2007, this specific consumption has increased in countries strongly affected by the economic crisis (e.g. Portugal and Spain). It remained stable at EU level.

- Differences among countries are explained by differences in the efficiency of clinker production, the energy intensive component of cement, as well as in the ratio clinker to cement production: the higher this ratio, the higher the specific energy consumption.
Energy efficiency trends in paper industry

- Around half of the EU MS have seen a decrease in the specific consumption per ton of pulp and paper, and the other half have seen an increase. At EU level, the level is roughly stable.
- The largest reduction is observed in The Netherlands and Spain (respectively 2.5% and 2.2%/year since 2000).
- These trends are influenced by energy efficiency but also by variation of the share of pulp produced in the country.
- Differences among countries also depend on the level of pulp production.

![Specific consumption of paper and pulp](image)

- There is a decreasing share of pulp production over total paper and pulp production in most countries over time, with huge difference among countries: from 1% for Netherlands to more than 50% in Scandinavian countries (Finland, Sweden) as well as in Portugal.

![Ratio pulp/paper production in EU countries](image)
- The lower the share of pulp is, the lower the average energy consumption per ton of pulp and paper production is, on average.

**Specific energy consumption per tonne of pulp and paper (2019)**

**Energy efficiency and savings**

**Slower energy efficiency progress in industry since 2007**

- Energy efficiency in EU industry improved by 1.1%/year on average since 2000, as measured with the energy efficiency index.

- The energy efficiency improvement rate has slowed down since 2007 (0.8%/year compared to 1.6%/year between 2000 and 2007) because of a slower progress in some branches and even no more energy efficiency improvement for others because of the recession (in particular in most energy intensive branches, e.g. cement, steel).

- The energy efficiency index in industry is calculated as a weighted average of sub-sectoral indices of energy efficiency progress at the level of 10 branches:
  - 4 main branches: chemicals, food, textile and equipment goods;
  - 3 energy intensive branches: steel, cement and pulp and paper
  - 3 residual branches: other primary metals (i.e. primary metals minus steel), other non-metallic minerals (i.e. non-metallic minerals minus cement) and printing. This index is corrected from the apparent loss of energy efficiency due to the recession and corresponds to a technical index.
Since 2007, the deterioration of energy efficiency is observed in almost all countries due to the economic crisis.
Energy savings lower since 2007

- In 2019, energy savings reached 60 Mtoe compared to 2000. In other words, without energy efficiency improvement, energy consumption would have been higher by 60 Mtoe.
- Energy savings growth was rapid until 2007 when it reached 33 Mtoe. It has been slower since then but is however accelerating again since 2013.

![Energy savings in industry - EU](image)

Structural changes

Relative levels of energy intensities by branch (machinery = 1) in the EU

- Primary metals, the most energy intensive branch, require around 27 times more energy to produce one unit of value added than machinery, the second lowest energy intensive branch. Transport equipment is the only branch with a lower intensity than machinery.
- Non-metallic minerals are 17 times more intensive and paper 16 times.
- Due to that fact, a reduction in the share of energy intensive branches in the industrial value added with an increase in the share of equipment and machinery will result, all things being equal, in a reduction of the average energy intensity of manufacturing.

![Energy intensities by branch (EU)](image)
Impact of structural changes on industry intensity

- Structural changes, i.e. changes in the contribution of each branch in industrial value added, have an impact on the energy intensity variation.

- To measure the impact of structural changes, an energy intensity at constant structure is calculated. It reflects the variation of the energy intensity assuming a constant structure of value added between the various branches, so as to leave out the influence of structural changes.

- The difference in the variations of the intensity and the intensity at constant structure measures the effect of structural changes.

- Since 2000, structural changes towards less energy intensive branches explain on average around 35% of the intensity decrease. The role of structural changes was greater over 2000-2007 (50%) and since 2014 (43%).

Decomposition of energy consumption

Drivers of energy consumption variation

- Industrial energy consumption was around 40 Mtoe lower in 2019 than in 2000.

- This lower consumption is mainly due to energy savings (-60 Mtoe) and, to a lesser extent, to structural changes to less energy intensive branches (-24 Mtoe).

- Change in industrial activity (measured with the production index) had a relatively limited effect (31 Mtoe), because of the recession on part of the period.
**CO2 emissions**

**CO2 emissions from fuel combustion**

CO2 emissions from fuel combustion have been decreasing since 2000 in almost all countries (-27% at EU level). The exceptions are Austria, Hungary and Lithuania that have seen their CO2 emissions in industry increase over the period.

*Source: EEA*