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HORIZON 2020 Project Nr. 693845

# *Analysis of the industrial sectors in different Countries: Romania*

WP4: Picture of efficiency projects implemented by the Industry sector-by-sector and process-by-process

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# 1 General overview of industry in Romania

The Romanian GDP was in 1989 – 42.6 Billion (Euro – equivalent) and in 2014 -150 Billion (Euro – equivalent), so 3.5 times bigger. If we analyse the structure, the main sector is the industry. In 1989, industry was responsible for 46.2% of GDP and in 2014 drops until 25.2% due to the collapse of some important branches.

According to the National Statistical Institute, in 2016 the industry share of GDP was supposed to raise of 2.4%. After 11 month the raise was of only 1.6%. The main results of the Romanian industry at the end of 2016 were:

**Table 1: Industry share of GDP growth in Romania.**

| **Sector** | **Growth** |
|---|---|
| **Extractive industry** | +16.5% |
| **Manufacturing industry** | +2.5% |
| - **Manufacturing of Electric equipments** | +13.2% |
| - **Manufacturing of Road transport equipments** | +8.9% |
| - **Coke oproducts and oil processing products** | +7.3% |
| - **Furniture** | +6.7% |
| - **Tabacco products** | +4.6% |
| - **Food and beverage products** | +3.1% |
| - **Metal constructions** | +1.3% |
| - **Metallurgical industry** | -2.3% |
| - **Rubber and plastic articles** | -2.6% |
| - **Computers, electronic and optic equipments** | -4.0% |
| - **Manufacturing of chemical products and substances** | -4.5% |
| - **Clothing articles** | -5.7% |
| - **Pharmaceutical articles** | -5.9% |
| - **Repair and maintenance of cars and equipments** | -18.5% |
| - **Production and distribution of electricity, natural gas, water, etc** | -2.0% |

Until 1990 Romania has had a very high consuming industry, as production was more important than the energy consumption in the communism era, the price of the natural resources was low and paying for pollution was not even taken into consideration. After 1990, many of the Romanian industry units have been closed and never reopened. Thus the energy consumption in the industry and in Romania per total, decreased dramatically, but not only as a result of energy efficiency investments, but mainly as a result of industry shut down.

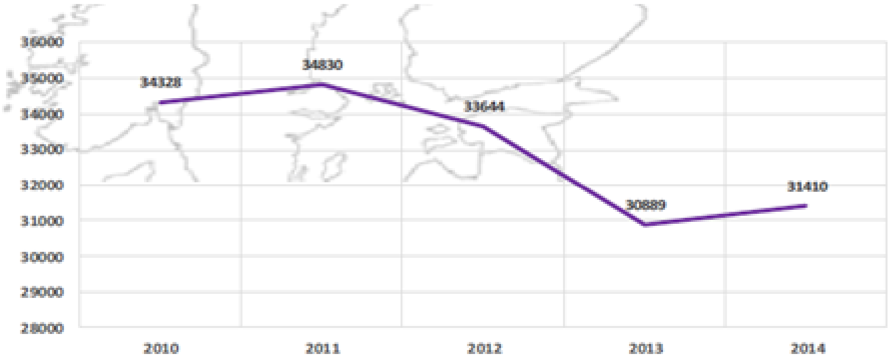



**Figure 1: The evolution of the primar energy consumption (ktoe).**

The primary energy consumption fell in 2013 of 2,755.00 ktoe (8.2%), in comparison with 2012, while the GDP raised of 3.4%

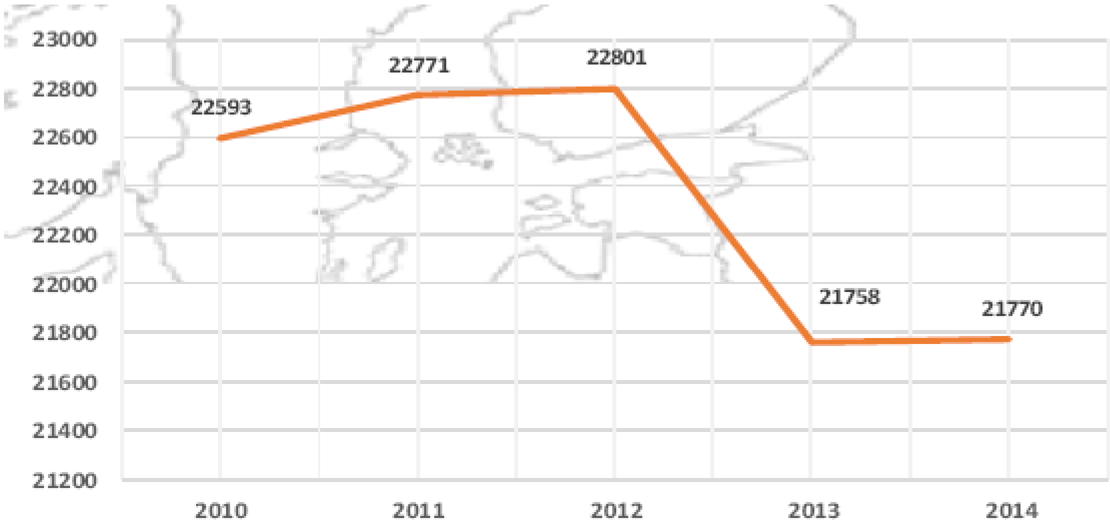



**Figure 2: The evolution of the final energy consumption (ktoe).**

The final energy consumption fell in 2013 of 1,043 ktoe (4.6%) in terms of GDP growth.

This reflects a raise of the energy efficiency in the final use sectors, due both to the measures of restructuration from the economy and to the energy efficiency programmes implemented. The fell of the final energy consumption led to a reduction of the primary energy consumption of 1.481 ktoe.

At the national level, in 2014, there were identified 713 final energy consumers with an annual energy consumption of more than 1,000 toe/year. They can be divided in:

- More than 50,000 toe/year - 40 (5.6%);
- Between (5,000-50,000) toe/year – 145 (20.33%);
- Between (1,000-5,000) toe/year 528 (74.07%).

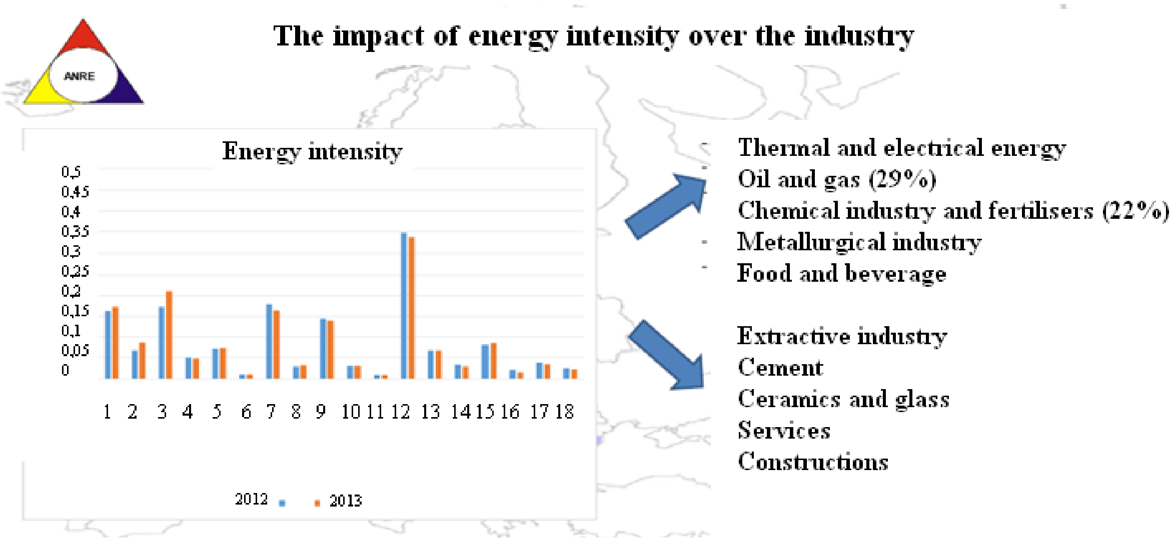



**Figure 3: Impact of energy intensity over the industry.**

Legend

| | |
|---|---|
| 1 Thermal and electrical energy | 10 Services |
| 2 Oil and gas | 11 Comerce |
| 3 Chemical industry and fertilisers | 12 Construction materialls |
| 4 Extractive industry | 13 Transports |
| 5 Metallurgical industry | 14 Machinery construction |
| 6 Vehicles | 15 Wood and paper industry |
| 7 Cement | 16 Electrical equipments |
| 8 Food and beverage | 17 Textile industry |
| 9 Ceramics and glass | 18 Consumer industry |

In five sectors (thermal and electrical energy, Oil and Gas, Chemical industry and fertilizers, Metallurgical industry, Food and beverage industry) there were increases of the energy intensity, as three of the sectors are big consumers; the biggest increases have been in the oil and gas sector (29%), chemical industry and fertilizers (22%), affecting 37% of the total consumption of the analyzed sectors.

In five sectors there has been a decrease of the consumption (Extractive industry, Cement, Ceramics and glass, Services, Constructions) and thus a decrease of the energy intensity.

In eight sectors the energy intensity remained the same.

**Table 2: Sectors final energy consumption in Romania.**

| **Sector group** | **Final energy consumption in 2013** [ktoe] |
|---|---|
| **Pulp, paper and print** | 373.420 |
| **Iron and steel** | 1,363.601 |
| **Non-metallic mineral** | 699.439 |

| | |
|---|---|
| **Chemical and pharmaceutical** | 1,402.442 |
| **Non-ferrous metal** | 418.750 |
| **Petroleum refineries** | 1,013.590 |
| **Food and beverage** | 330.540 |
| **Machinery** | 165.917 |
| **Total** | **4,755.12** |

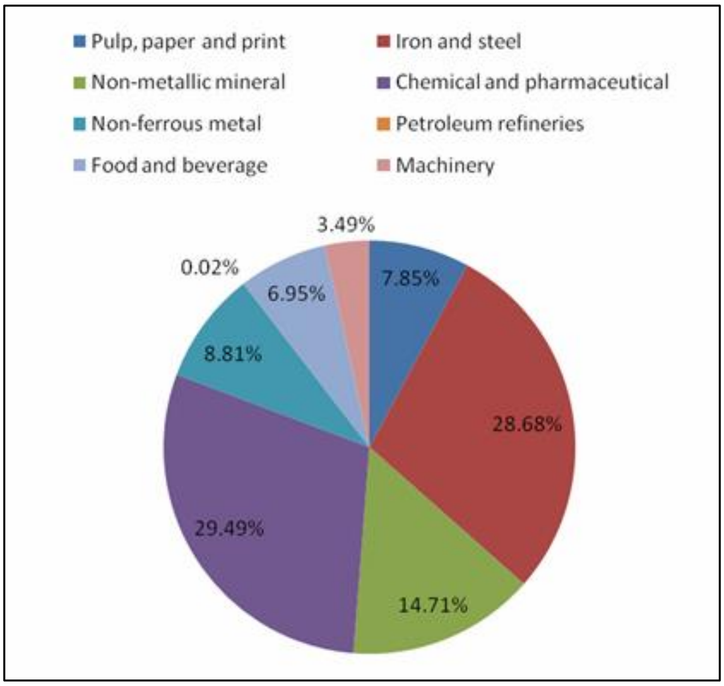



**Figure 4: Energy consumption share of the different sectors in Romania.**

# 2 Food and Beverage sector

The main processed agri-food products exported to world markets, are: cigars, meat and edible offal of poultry, sunflower oil, sugar, prepared foods, bakery products, pastries, biscuits, oil cakes and other residues from the extraction of fats, other prepared or preserved meat, offal or blood, soft drinks, cakes and other residues from the extraction of soybean oil, chocolate and other food preparations containing cocoa, honey.

The main imports include: pork meat, animal products preparations, miscellaneous edible preparations, meat and edible offal of poultry, bakery products, confectionery, biscuits, chocolate and preparations of cocoa, cheese and curd, refined sunflower oil, sugar, cigars, milk and cream, raw tobacco. They had a share of 35% in imports from international markets, as well as intra-EU zone.

Romania's agri-food products evolution in international markets reveals a commercial disadvantage compared to EU products, dependence on imports especially of processed products of animal origin, resulting low competitiveness of the processing sector as the main constraint in growing export earnings. Only tobacco and derivates of tobacco achieved an increasing positive trade balance, though food systematically in deficit.

The food and beverage sector from Romania with an annual turnover of about 11 billion euro, produces every year 8.72 million tonnes of products, out of which 13.8% are exported.

The local food and beverage sector is dominated by a number of 50 big companies, representing less than 1% of the total of about 8,400 on the market. The 50 big companies are responsible for more than 40% of the production and make a profit of more than 4 billion euro. The food and beverage sector represents 27% of the total agricultural production. More than 180,000 peoples are working in the sector, that is 11.6% of the total employees from the Romanian industry and 2.1% of the total Romanian working force.

The added value made by the food and beverage sector represents almost a quarter of the total added value of the manufacturing industry.

The Romanian sector of food and beverage is very interesting for the international companies because the price of products is close to the EU average and Romanians spend a big percent of their incomes on food and beverage.

Thus in 2013, Romanians used about 28.4 of their monthly incomes in order to buy food, compared with Hungary (15.6%), Poland (14.2%), Czech Republic (12%) or Germany (8.6%). The analysts from Roland Berger predict an increase of the food and beverage sector from Romania with 3-5% in the following 3 years.

According to the economist Cezar Mereuta (2014), the food and beverage sector represents one of the few sectors where the Romanain capital is more than 60%. The same source shows that the added value of the sector represents almoust 25% of the added value of the manufacturing industry.

The Romanian food and beverage market is the 7th in the EU in size and the 2nd in Eastern Europe after Poland. It is evaluated at a value of 25.9 billion euro, out of which 20.6 billion euros (79.5%) in retail and 5.3 billion euros (21.5%) in services.

The main parameter for statistical analysis of the sector are reported in the below table.

**Table 3: Key economic parameters for Romanian Food and Beverage sector.**

| Description | NACE (Group) | Number of enterprises [n] | No, of persons employed [n] | Turnover [mil €] | Value added [mil €] | Production value [mil €] |
|---|---|---|---|---|---|---|
| **Manufacture of food products** | **C10** | **7,888** | **163,911** | **9,050.3** | **1,410.1** | **8,083.3** |
| **Processing and preserving of meat and production of meat products** | C10.1 | 793 | 45,794 | 2,863.1 | 442.2 | 2,661.5 |
| **Processing and preserving of fish. crustaceans and molluscs** | C10.2 | 31 | 1,172 | 77.3 | 12.8 | 71.4 |
| **Processing and preserving of fruit and vegetables** | C10.3 | 284 | 5,478 | 426.6 | 82.7 | 369.6 |
| **Manufacture of vegetable and animal oils and fats** | C10.4 | 150 | 3,353 | 1,003.0 | 54.1 | 903.3 |
| **Manufacture of dairy products** | C10.5 | 525 | 14,105 | 971.5 | 144.3 | 817.5 |
| **Manufacture of grain mill products. starches and starch products** | C10.6 | 769 | 10,838 | 700.0 | 102.7 | 625.6 |
| **Manufacture of bakery and farinaceous products** | C10.7 | 4,586 | 68,139 | 1,329.4 | 357.1 | 1,247.0 |
| **Manufacture of other food products** | C10.8 | 616 | 12,582 | 1,274.0 | 168,4 | 990.6 |
| **Manufacture of prepared animal feeds** | C10.9 | 134 | 2,450 | 405.3 | 36.8 | 396.8 |
| **Manufacture of beverages** | **C11** | **678** | **20,565** | **2,165.6** | **582.4** | **2,253.7** |
| **Distilling. rectifying and blending of** | C11.01 | 116 | 1,827 | 101.9 | 18.4 | 99.8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **spirits** | | | | | | |
| **Manufacture of wine from grape** | C11.02 | 177 | 3,288 | 183.2 | 52.1 | 203.4 |
| **Manufacture of cider and other fruit wines** | C11.03 | 2 | 3 | N/A | N/A | N/A |
| **Manufacture of other non-distilled fermented beverages** | C11.04 | 13 | 69 | 3.8 | N/A | N/A |
| **Manufacture of beer** | C11.05 | 16 | 5,303 | 845.5 | 280.8 | 925.2 |
| **Manufacture of malt** | C11.06 | 2 | 41 | 44.11 | N/A | N/A |
| **Manufacture of soft drinks; production of mineral waters and other bottled waters** | C11.07 | 352 | 10,034 | 987.1 | 225.4 | 980 |

# 3 Pulp and Paper sector

About 5.2% of the EU employees from this industry are working in Romania. They are generating only 1.84% the annual turnover of the EU pulp and paper sector and only 1.68% of the value added.

In comparison with the general performance of the Romanian manufacturing industry, the paper sector has an acceptable position from the point of view of the added value/employee, with a level of 32.22% of the EU average.

In Romania the raw material for the paper industry is made 90% from recycled paper and 10% from imported cellulose.

The cellulose and paper industry is one of the examples of deindustrialization that took place in the transition period. In 1990, Romania produced about 1 million tonnes of cellulose and about 1 million ton of paper and cardboard. Today there are no cellulose factories, the last one was closed in 2009. Also, the paper industrial platforms from Braila, Busteni, Bacau, Turnu Severin, Dej, Cluj and Bistrita were closed.

The reduction of the production took place by stopping and decommissioning of outdated production capacities (physical and moral). Another factor was the increase of the energy prices (electricity and natural gas), as 30-35% of the cellulose price and 15-20% of the paper and paperboard prices consisted of energy price.

**Table 4: Key economic parameters for Romanian Pulp and Paper sector.**

| Description | NACE (Div) | NACE (Group) | Number of enterprises [n] | No. of persons employed [n] | Turnover [mil €] | Value added [mil €] | Production value [mil €] |
|---|---|---|---|---|---|---|---|
| **Manufacture of paper and paper products** | C17 | | 724 | 12,334 | 822 | 173.2 | 784.9 |
| **Manufacture of pulp, paper and paperboard** | | C17.1 | 46 | 1,275 | 124.3 | 28.5 | 115.1 |
| **Manufacture of articles of paper and paperboard** | | C17.2 | 678 | 11,059 | 697.7 | 144.8 | 669.8 |
| **Printing and reproduction of recorded media** | C18 | | 2,000 | 16,211 | 695.9 | N/A | N/A |
| **Printing and service** | | C18.1 | 1,915 | 15,884 | 679.2 | N/A | N/A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **activities related to printing** | | | | | | | |
| **Reproduction of recorded media** | | C18.2 | 85 | 327 | 16.7 | 5.3 | 16.1 |

# 4 Petroleum refineries sector

The maximum capacity of the Romanian refineries have been of 34 mil. tonnes/year in 10 refineries. Today only 3 are still in operation with a total capacity of 15 mil. tonnes/year.

The refining industry is very important as it generates an important working force on the horizontal level in the fields as design, equipment production, maintenance, etc.

In the comunist era the refineries system was made of a network of 10 units, with different concepts: Petromidia Navodari, Petrobrazi Ploiesti, Arpechim Pitesti, Petrotel Ploiesti, Rafo Onesti – big units and Astra Ploiesti, Vega Ploiesti, Steaua Romana Campina, Rafinaria Darmanesti and Surplacu de Barcau – units of smaller dimensions.

In 2014 Romania still had the biggest refining capacity in Eastern Europe with a bigger refining capacity than the internal market demand (286.27 thou barrel/day in comparison to a consumption of 284.69 thou barrel/day, in 2014, according to IHS Cera (2015).

In 2014 the production of oil and associated gases in liquid state (propane, butane, naphtha) was of 4.05 mt. The net import of oil was 6.67 mt (mainly from Kazakhstan and Russia, but also in small quantities from Azerbaidjan, Iraq, Lybia and Turkmenistan). Between 1990 and 2015, the oil imports have reached a minumim of 4.29 mt in 1999 and a maximum of 16.06 mt in 1990. In total, the refineries from Romania have processed 11.66 mt of oil and additives with the following structure of the oil products:

- 5.17 mt diesel oil;
- 3.06 mt petrol;
- 0.75 mt petcoke;
- 0.56 mt LPG;
- 0.46 mt asphalt;
- 0.38 mt kerosene;
- 0.32 mt heavy oil
- 0.28 mt naphtha;
- 0.75 mt refinery gas;
- 0.46 mt other refinery products (lubricants. etc.).

The oil products imports consisted of diesel oil (about 1 mt from Russia, Hungary and USA and low volumes from other countries) and asphalt (0.41 mt, mainly from Hungary, Serbia and Poland).

Romania remains an important exporter of oil products in the region, with a volume more than double than the ones of imports:

- Petrol: 1.73 mt;

- Diesel oil: 1.64 mt;
- Kerosen aviation: 0.22 mt;
- Heavy oil: 0.20 mt;
- LPG: 0.20 mt;
- Naphtha: 0.11 mt;
- Other refineries products: 0.51 mt.

The total consumption of oil products in Romania in 2014 was of 8.64 mt, out of which 0.81 mt non-energetic consumption (50% of which is represented by asphalt) and 7.81 mt energetic consumption.

The main parameters for statistical analysis are reported in the below table.

**Table 5: Key economic parameters for Romanian Petroleum refineries sector.**

| **Description** | **NACE** (Group) | **Number of enterprises** [n] | **No. of persons employed** [n] | **Turnover** [mil €] | **Value added** [mil €] | **Production value** [mil €] |
|---|---|---|---|---|---|---|
| **Manufacture of coke and refined petroleum products** | C19 | 42 | 2,516 | 4,323.3 | N/A | N/A |
| **Manufacture of coke oven products** | C19.1 | 9 | 50 | 2.2 | N/A | N/A |
| **Manufacture of refined petroleum products** | C19.2 | 33 | 2,466 | 4,321.1 | N/A | N/A |

# 5 Chemical sector

Before 1990 the sector was one of the largest in Eastern Europe as Romania enjoys substantial natural reserves, namely salt, sulphur, potassium, methane gas. After 1990 – one of the most affected – large state-owned production facilities had to be restructured and privatised due to: obsolete technology, high production costs and low productivity.

Economic contraction after 1990 and the low productivity led to decrease in demand for chemical products and loss of external markets, leading to a decrease in output, employment and fragmentation of the industry. in the end of 2007 93% of the companies were privately owned.

The chemical industry is highly heterogeneous, focused on petrochemicals, organic and inorganic chemicals, bulk drugs, agrochemicals, paints and dyes. Romania will remain an importer of chemicals in the coming years.

Together with the related impact on the demand for chemical products, this determined the closure, within one year and a half, of 22% of chemical producers and distributors that were active at the end of 2011 and the disappearance of 1,900 workplaces.

At the end of 2011, the chemical industry sector comprised over 4,000 companies, generating a total turnover of 10 billion € and employing up to 90,000 people. According to a Coface report, the chemical industry sector was estimated at about 10.5 billion euro at end of 2011. 22% fewer companies are operating in April 2013, compared with 2011.

The distribution of active companies in the Romanian chemical industry is a mature one, with 60% of companies being active on the market for more than seven years. These companies also have an important social and economic role in the chemical industry business and economic environment, generating:

- 82% of the total jobs in the sector
- 91% of total sector turnover
- 87% of the total value of debts and claims
- 89% of total actives
- More than 97% of the own capital

**Table 6: Overview of chemical industry production – out of total revenues in 2012.**

| Subsector | Share of the revenues |
| --- | --- |
| Basic chemicals | 15% |
| Paints, coatings, adhesive | 4% |
| Fertilizers, agri-chemicals | 8% |
| Plastics | 28% |

| | |
|---|---|
| Rubber products | 24% |
| Wholesale chemicals | 21% |

An increase of gas prices for industrial consumers could worsen the financial performance of the petrochemical sector that is highly reliant on gas, particularly for methanol and fertilizer production. Gas price in Romania is stil low, which is not sustainable due to pressure from the EU and the IMF to raise prices ahead of gas market deregulation.

On one hand, the estimated growth could be dismissed by lack of incentive for foreign investments. On the other hand, favorable trade market integration within EU regulatory framework would enable an increase of chemical products exports.

This context might be an interesting access point for cost-effective Romanian chemical industry companies, in their attempt to enter other European markets.

The main statistics parameter to be considered for the sector analysis are reported in the below table.

**Table 7: Key economic parameters for Romanian Chemical and Pharmaceutical sector.**

| **Description** | **NACE** (Group) | **Number of enterprises** [n] | **No, of persons employed** [n] | **Turnover** [mil €] | **Value added** [mil €] | **Production value** [mil €] |
|---|---|---|---|---|---|---|
| **Manufacture of chemicals and chemical products** | C20 | 864 | 28,876 | 2,261.5 | 566.6 | 2,269.4 |
| **Manufacture of basic chemicals. fertilisers and nitrogen compounds. plastics and synthetic rubber in primary forms** | C20.1 | 272 | 18,301 | 1,486.6 | 398.5 | 1,571.8 |
| **Manufacture of pesticides and other agrochemical products** | C20.2 | 17 | 362 | 66.6 | N/A | N/A |
| **Manufacture of paints. varnishes and similar coatings. printing ink and mastics** | C20.3 | 164 | 3,853 | 279.7 | 65.7 | 251.1 |
| **Manufacture of soap and detergents. cleaning and polishing preparations. perfumes and toilet preparations** | C20.4 | 235 | 3,195 | 164.5 | 59.4 | 162.8 |
| **Manufacture of other chemical products** | C20.5 | 167 | 2,090 | 153.5 | 13.2 | 136.6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacture of man-made fibres** | C20.6 | 9 | 1,075 | 110.6 | N/A | N/A |
| **Manufacture of basic pharmaceutical products and pharmaceutical preparations** | C21 | 137 | 9,054 | 777.8 | 284.8 | 706.5 |
| **Manufacture of basic pharmaceutical products** | C21.1 | 38 | 2,593 | 147.6 | 64.4 | 142.6 |
| **Manufacture of pharmaceutical preparations** | C21.2 | 99 | 6,461 | 630.2 | 220.4 | 563.9 |

# 6 Non-metallic minerals sector

The general statistic parameters for sector analysis are:

**Table 8: Key economic parameters for Romanian Non-metallic minerals sector.**

| Description | NACE (Group/Class) | Number of enterprises [n] | No, of persons employed [n] | Turnover [mil €] | Value added [mil €] | Production value [mil €] |
|---|---|---|---|---|---|---|
| **Manufacture of other non-metallic products** | C23 | 2,398 | 38,647 | 2,472.2 | 665.5 | 2,291.0 |
| **Manufacture of glass and glass products** | C23.1 | 429 | 6,474 | 271.5 | 70.4 | 252.8 |
| **Manufacture of refractory products** | C23.2 | 27 | 748 | 22.3 | 6.0 | 19.8 |
| **Manufacture of clay building materials** | C23.3 | 161 | 2,774 | 155.2 | 48.3 | 134.6 |
| **Manufacture of other porcelain and ceramic products** | C23.4 | 154 | 6,392 | 153.9 | 61.5 | 150.9 |
| **Manufacture of cement. lime and plaster** | C23.5 | 45 | 2,576 | 586.3 | 188.3 | 588.6 |
| **Manufacture of articles of concrete. cement and plaster** | C23.6 | 975 | 14,754 | 1,024.0 | 209.0 | 915.5 |
| **Cutting. shaping and finishing of stone** | C23.7 | 505 | 2,501 | 55.4 | 19.9 | 55.5 |
| **Manufacture of abrasive products and non-metallic** | C23.9 | 102 | 2,468 | 203.7 | 62.2 | 173.2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **mineral products n.e.c.** | | | | | | |

## 6.1 Glass industry

The glass industry in Romania has about 6,500 employees and natural gas represents about 40% of the production costs.

## 6.2 Cement industry

Romania is experiencing a relevant cement production and consumption as a result of investments in infrastructure and residential construction.

The cement industry is an industry were the direct costs with the energy represented 10% of the total production cost and the electricity represents 5% of the total production costs. Each ton of cement needs between 60 and 130 kg of heavy oil or equivalent, depending on the type of cement and fabrication process used, plus about 105 kWh of electricity. The industry can implement energy efficient measures by replacing energy used by waste or other types of energy (biomass). The availability of biomass can be a problem, as the electric energy sector and the transportation sector are strong competitors due to the support schemes for renewable resources. The active cement companies in Romania, are: Holcim (Switzerland); Heidelberg Cement (Germany); Lafarge (France). All 7 cement factories have also integrated the clinkers process:

In the cement ovens there can be processed many types of waste from various industries, such as sorted municipal waste and sludge from wastewater treatment plants.

The amount of sorted municipal waste and industrial co-processed in cement industry in Romania during 2004-2014 is approximately 2,000,000 tonnes.

# 7 Iron and Steel sector

The iron & steel industry in Romania is 100% private and the percentage of the foreign capital is about 80%. The industry was affected in the last years both by the decrease in market demand as well as the raise of the electricity prices (mainly due to the subsidies for the renewable power production) and gas prices.

**Table 9: Key economic parameters for Romanian Iron and Steel sector.**

| Description | NACE (Group) | NACE (Class) | No, of enterprises [n] | No, of persons employed [n] | Turnover [mil €] | Value added [mil €] | Production value [mil €] |
|---|---|---|---|---|---|---|---|
| **Manufacture of basic iron and steel and of ferro-alloys** | C24.1 | | 43 | 13,370 | 1,561.9 | 84.3 | 1,566.8 |
| **Manufacture of basic iron and steel and of ferro-alloys** | | C24.10 | 43 | 13,370 | 1,561.9 | 84.3 | 1,566.8 |
| **Manufacture of tubes. pipes. hollow profiles and related fittings. of steel** | C24.2 | | 32 | 5,666 | 899.3 | 199.3 | 888.6 |
| **Manufacture of tubes. pipes. hollow profiles and related fittings. of steel** | | C24.20 | 32 | 5,666 | 899.3 | 199.3 | 888.6 |
| **Manufacture of other products of first processing of steel** | C24.3 | | 100 | 2,479 | 210.8 | 43.0 | 205.2 |
| **Cold drawing of bars** | | C24.31 | 9 | 159 | 16.4 | 2.1 | 10.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Cold rolling of narrow strips** | | C24.32 | 9 | 944 | 42.7 | N/A | N/A |
| **Cold forming or folding** | | C24.33 | 78 | 755 | 93.7 | 11.6 | 88.9 |
| **Cold drawing of wire** | | C24.34 | 4 | 621 | 58.0 | N/A | N/A |
| **Casting of metals** | C24.5 | | 179 | 4,701 | 281.9 | 56.3 | 261.0 |
| **Casting of iron** | | C24.51 | 47 | 1,409 | 46.7 | 13.6 | 42.7 |
| **Casting of steel** | | C24.52 | 10 | 222 | 4.4 | N/A | N/A |

# 8 Other metals sector

Non-ferrous metals (NFM) sector is composed by the upstream base metal production (aluminium, copper, lead, zinc, tin) and precious metals production and the secondary processing and fabrication activities of light metals and other non-ferrous metals. They are used in many different sectors, especially automotive, aerospace, mechanical engineering, electronics, medical devices and construction. This is due to their thermal, electrical, magnetic and isolating characteristics and their recyclability and low specific weight.

The non-ferrous metals sector in Romania is represented mainly by the biggest aluminium producer in Central and Eastern Europe (except Russia). More than 80% of the production is traded on the international market through the London Metal Exchange and through direct long-term contracts with clients from 25 countries.

The main statistics parameter for Non-ferrous metals industry are reported in the below table:

**Table 10: Key economic parameters for Romanian Other metals sector.**

| **Description** | **NACE (Group)** | **NACE (Class)** | **Number of enterprises** [n] | **No, of persons employed** [n] | **Turnover** [mil €] | **Value added** [mil €] | **Production value** [mil €] |
|---|---|---|---|---|---|---|---|
| **Manufacture of basic precious and other non-ferrous metals** | C24.4 | | 63 | 5,380 | 814.3 | 114.0 | 848.8 |
| **Precious metal production** | - | C24.41 | 14 | 34 | 13.0 | N/A | N/A |
| **Aluminium production** | - | C24.42 | 30 | 4,730 | 755.1 | 96.9 | 777.9 |
| **Lead. zinc and tin production** | - | C24.43 | 7 | 292 | 12.8 | 14.4 | 25.1 |
| **Copper production** | - | C24.44 | 7 | 205 | 27.3 | N/A | N/A |
| **Other non-ferrous metal production** | - | C24.45 | 5 | 119 | 6.1 | N/A | N/A |
| **Processing of nuclear fuel** | - | C24.46 | 0 | 0 | 0 | 0 | 0 |
| **Casting of metals** | C24.5 | | 179 | 4.716 | 281,9 | 56.3 | 261.0 |
| **Casting of light** | - | C24.53 | 93 | 2,618 | 189.5 | 33.4 | 171.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **metals** | | | | | | | |
| **Casting of non-ferrous** | - | C24.54 | 29 | 462 | 41.3 | N/A | N/A |

# 9 Machinery sector

Contributing about 35% of total industrial output in the 1980s, machine building had become the largest industrial sector. Because of restrictions on imports, domestic industry was required to satisfy nearly 90% of the MS's machinery and equipment needs during the 1980s

Poor quality control, putting quantity before quality and lack of investments in up to date technology lead to the situation where in 1990, Romania had large capacity building facilities, but the quality of the end product was not satisfactory.

In order to join the EU and after than, Romania closed the unprofitable factories and welcomed foreign investments. The so called new industrialisation of the MS is represented by the investments made in order to refurbishment the factories that has been privatised and the so called green field investments (new facilities). This lead to the products of the machinery industry represented 45.8% of the total exports in the first nine months of 2015, with over 18.7 billion euro worth. The total volume of exports for this sector increased in the first nine months of 2015 as compared to the same period of the previous year by 9.66%.

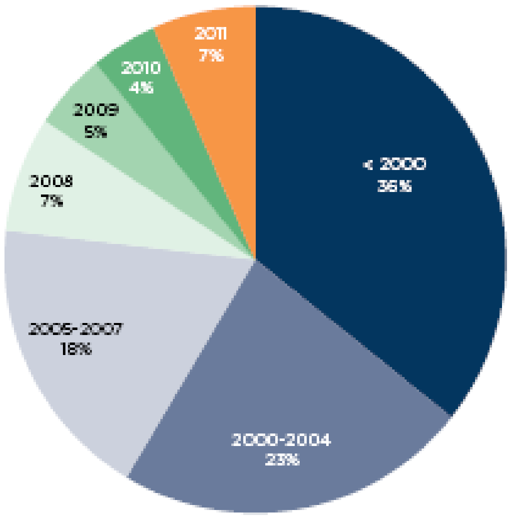



**Figure 5: Distribution of the companies depending on the year of establishment.**

The main parameters for statistical analysis of the sector are reported in the below table:

**Table 11: Key economic parameters for Romanian Machinery sector.**

| Description | NACE (Group) | Number of enterprises [n] | No of persons employed [n] | Turnover [mil €] | Value added [mil €] | Production value [mil €] |
|---|---|---|---|---|---|---|
| **Manufacture of fabricated metal products. except machinery and** | **C25** | 5,576 | 86,628 | 3,559.9 | 957.2 | 3,456.7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **equipment** | | | | | | |
| **Manufacture of structural metal products** | C25.1 | 3,164 | 39,808 | 1,524.7 | 377.1 | 1,485.2 |
| **Manufacture of tanks. reservoirs and containers of metal** | C25.2 | 116 | 3,870 | 134.2 | 47.4 | 138.5 |
| **Manufacture of steam generators. except central heating hot water boilers** | C25.3 | 15 | 1,232 | 24.5 | 8.1 | 21.1 |
| **Manufacture of weapons and ammunition** | C25.4 | N/A | N/A | N/A | N/A | N/A |
| **Forging. pressing. stamping and roll-forming of metal; powder metallurgy** | C25.5 | 168 | 3,952 | 296.2 | 61.6 | 264.6 |
| **Treatment and coating of metals; machining** | C25.6 | 1,166 | 15,832 | 714.6 | 207.9 | 715.6 |
| **Manufacture of cutlery. tools and general hardware** | C25.7 | 227 | 5,347 | 184.5 | 54.6 | 175.1 |
| **Manufacture of other fabricated metal products** | C25.9 | 720 | 16,587 | 681.2 | 200.7 | 656.7 |
| **Manufacture of computer. electronic and optical products** | C26 | 843 | 26,520 | 1,582.6 | 411.1 | 1,469.8 |
| **Manufacture of electronic components and boards** | C26.1 | 167 | 11,241 | 492.5 | 147.3 | 494.6 |
| **Manufacture of computers and peripheral equipment** | C26.2 | 248 | 2,934 | 381.4 | 42.1 | 353.4 |
| **Manufacture of communication equipment** | C26.3 | 70 | 3,429 | 230.8 | 56.0 | 216.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacture of consumer electronics** | C26.4 | 25 | 210 | 6.2 | N/A | N/A |
| **Manufacture of instruments and appliances for measuring. testing and navigation; watches and clocks** | C26.5 | 161 | 7,455 | 437.1 | 154.0 | 371.8 |
| **Manufacture of irradiation. electromedical and electrotherapeutic equipment** | C26.6 | 44 | 384 | 20.2 | 7.1 | 14.1 |
| **Manufacture of optical instruments and photographic equipment** | C26.7 | 127 | 856 | 14.1 | 4.9 | 13.3 |
| **Manufacture of magnetic and optical media** | C26.8 | 1 | 11 | 0.1 | N/A | N/A |
| **Manufacture of electrical equipment** | C27 | 612 | 36,949 | 2,893.8 | 546.4 | 2.758.1 |
| **Manufacture of electric motors. generators. transformers and electricity distribution and control apparatus** | C27.1 | 267 | 13,032 | 779.8 | 170.7 | 776.9 |
| **Manufacture of batteries and accumulators** | C27.2 | 3 | 754 | 79.3 | N/A | N/A |
| **Manufacture of wiring and wiring devices** | C27.3 | 59 | 5,430 | 863.3 | 95.5 | 787.7 |
| **Manufacture of electric lighting equipment** | C27.4 | 83 | 2245 | 103.9 | N/A | N/A |
| **Manufacture of domestic appliances** | C27.5 | 66 | 8,996 | 676.7 | 133.4 | 592.8 |
| **Manufacture of other electrical** | C27.9 | 134 | 6,492 | 417.8 | 94.5 | 418.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **equipment** | | | | | | |
| **Manufacture of machinery and equipment (not elsewhere classified)** | C28 | 1,272 | 54,325 | 2,776.2 | 892.2 | 2,714.6 |
| **Manufacture of general-purpose machinery** | C28.1 | 216 | 20,558 | 1,221.9 | 394.2 | 1,242.2 |
| **Manufacture of other general-purpose machinery** | C28.2 | 541 | 10,621 | 637.5 | 158.8 | 625.3 |
| **Manufacture of agricultural and forestry machinery** | C28.3 | 624 | 2,221 | 92.7 | 28.4 | 84.5 |
| **Manufacture of metal forming machinery and machine tools** | C28.4 | 143 | 4,287 | 141.5 | 62.5 | 147.6 |
| **Manufacture of other special-purpose machinery** | C28.9 | 308 | 16,638 | 682.6 | 248.3 | 615 |

# 10 Energy statistics

The Law 123/2012 of electric energy and natural gases established a calendar for the liberalisation of the prices. The Law represents the transposition into the national legislation of the European Directive 72/2009 and 73/2009 regarding the unified electric energy market and natural gases market.

The calendar for the liberalisation of the natural gas prices for non-household customers had 8 stages:

- 1st of December 2012: degree of convergence 35%, price from internal production 10.99 €/MWh, raise in the final price 5%;
- 1st of April 2013: degree of convergence 40%, price from internal production 12.51 €/MWh, raise in the final price 5%;
- 1st of July 2013: degree of convergence 47%, price from internal production 14.35 €/MWh, raise in the final price 5%;
- 1st of October 2013: degree of convergence 51%, price from internal production 15.46 €/MWh, raise in the final price 3%;
- 1st of January 2014: degree of convergence 55%, price from internal production 16.20 €/MWh, raise in the final price 4%;
- 1st of April 2014: degree of convergence 71%, price from internal production 20.12 €/MWh, raise in the final price 5%;
- 1st of July 2014: degree of convergence 91%, price from internal production 24.53 €/MWh, raise in the final price 5%;
- 1st of October 2014: degree of convergence 100%, price from internal production 26.78 €/MWh, raise in the final price 4%.

The calendar for the liberalisation of the electric energy prices for non-household customers had 6 stages:

- 1st of September 2012: 15%;
- 1st of January 2013: 30%;
- 1st of April 2013: 45%;
- 1 st of July 2013: 65%;
- 1 st of September 2013: 85%;
- 1 st of January 2014: 100%

## 10.1 Costs of different considered fuels

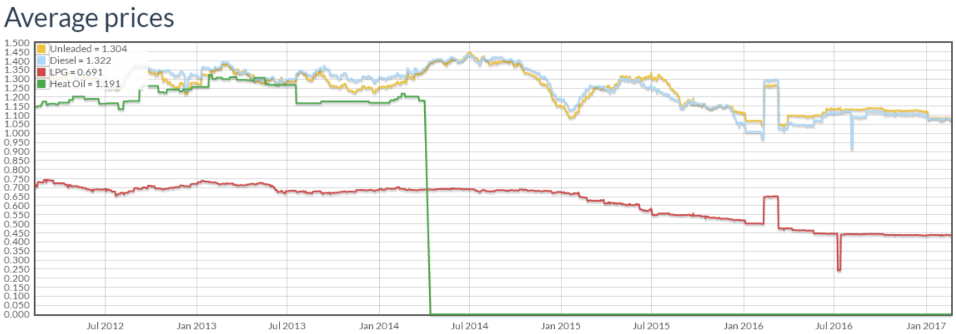
The price of electric energy and natural gas in Romania was differentiated for households and industry.

The tendency was to raise the prices by eliminating the subsidies (both for households and industry) but due to political reasons this process of liberalising the energy market was a very long process. As seen above, only in 2014 (7 years after the admission in the EU) Romania has liberalised the energy market for the non-household customers.

As Romania had and still has an important production of natural gas and is capable of producing its entire electric energy consumption, the government through legislative measures was able to control and impose the price of electric energy and natural gas.

| | Electricity prices | | | | | | Gas prices | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Households (1) | | | Industry (2) | | | Households (3) | | | Industry (4) | | |
| | 2013 | 2014 | 2015 | 2013 | 2014 | 2015 | 2013 | 2014 | 2015 | 2013 | 2014 | 2015 |
| EU-28 | 0.202 | 0.206 | 0.211 | 0.118 | 0.120 | 0.119 | 0.071 | 0.072 | 0.071 | 0.040 | 0.037 | 0.034 |
| Romania | 0.128 | 0.125 | 0.132 | 0.082 | 0.081 | 0.080 | 0.031 | 0.032 | 0.034 | 0.029 | 0.031 | 0.029 |

(1) Annual consumption: 2 500 kWh < consumption < 5 000 kWh.
(2) Annual consumption: 500 MWh < consumption < 2 000 MWh; excluding VAT
(3) Annual consumption: 20 GJ < consumption < 200 GJ.
(4) Annual consumption: 10 000 GJ < consumption < 100 000 GJ; excluding VAT.
(5) 2013: EA-17. 2014: EA-18. 2015: EA-19.




## 10.2 $CO_2$ emission data

The average $CO_2$ emission factors for Romania are reported in the table below.

**Table 12: $CO_2$ emission factors for Romania.**

| MS | Electricity specific factors [$gCO_2$/kWh] | IEA composite electricity/heat factors [$gCO_2$/kWh] | Difference [$gCO_2$/kWh] | Difference [%] |
|---|---|---|---|---|
| Romania | 1.069422796 | 0.4166456 | 0.65278 | 156.7% |