

ASSESSMENT OF INDUSTRIAL ENERGY EFFICIENCY POTENTIAL IN THE BALTIC STATES

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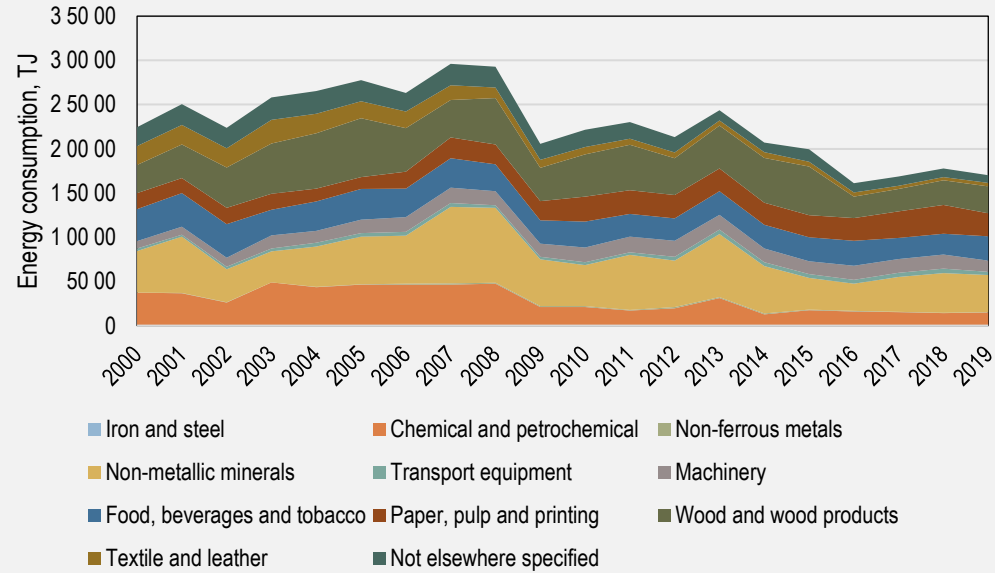
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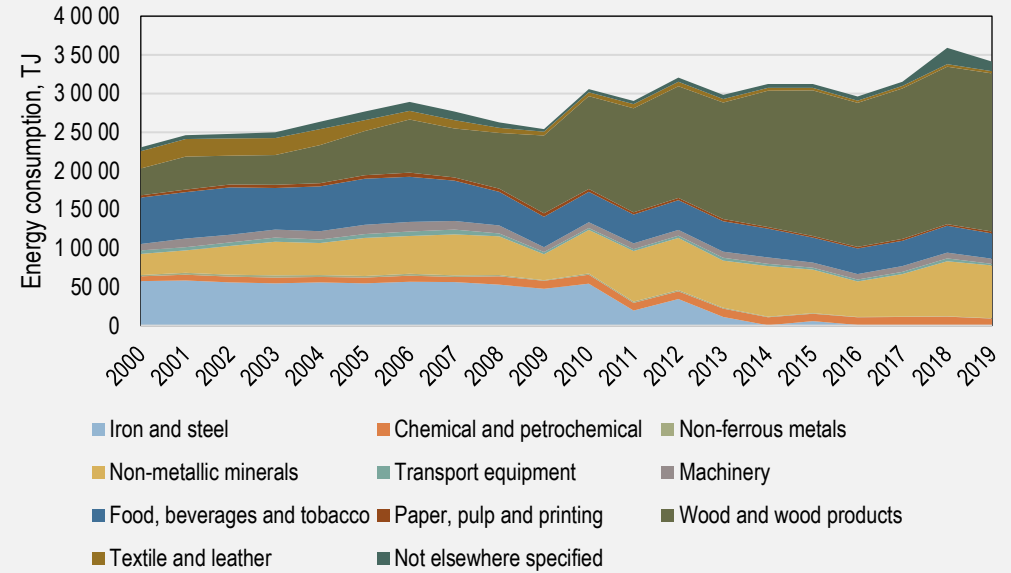
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HISTORICAL MANUFACTURING INDUSTRY ENERGY CONSUMPTION BY SUB-SECTOR IN THE BALTIC STATES AND EU-28

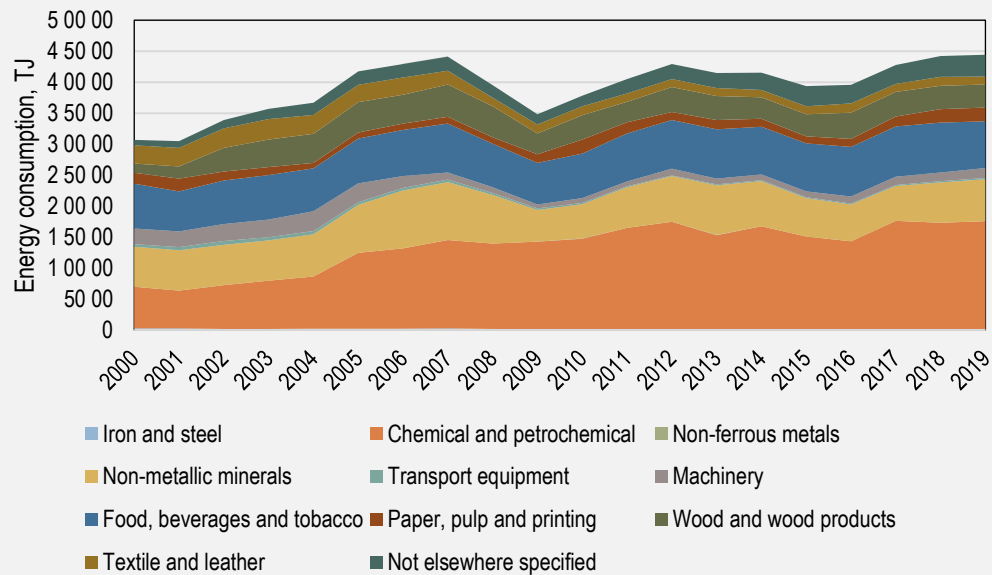
ESTONIA



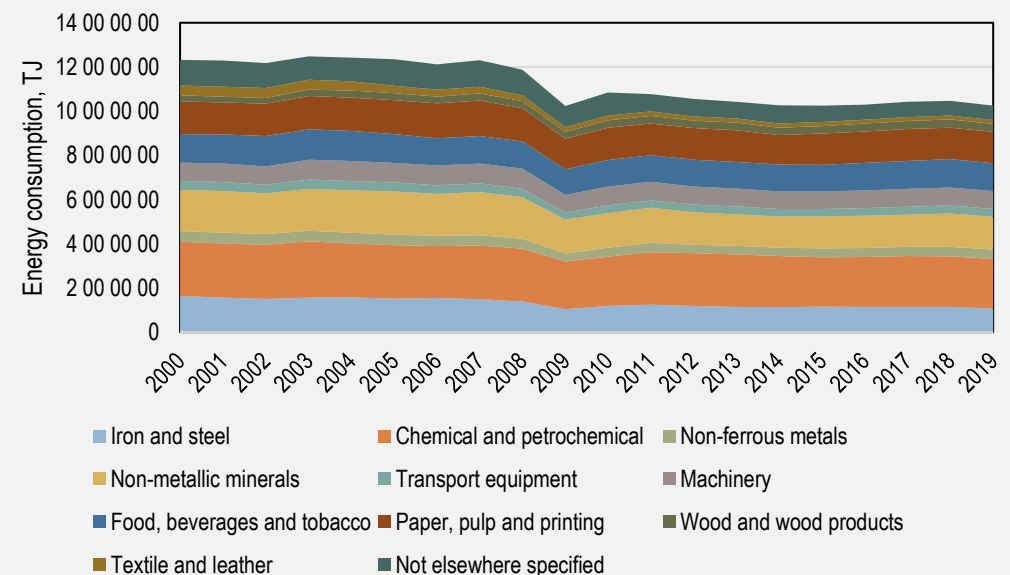
LATVIA



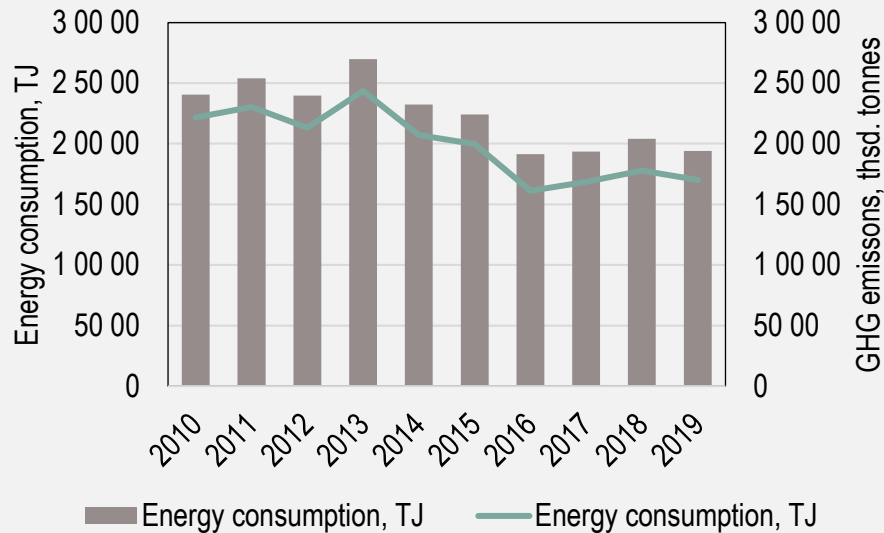
LITHUANIA



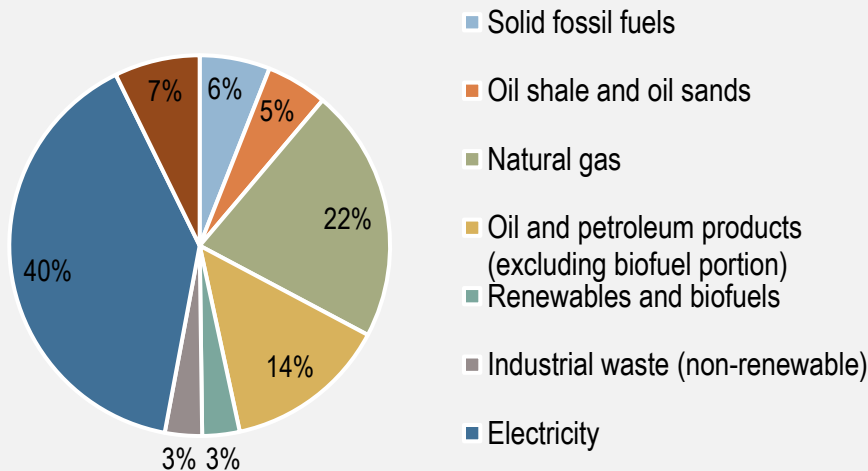
EU-28



MANUFACTURING INDUSTRY ENERGY CONSUMPTION OUTLOOK FOR ESTONIA



Energy mix in industry in 2019



Energy consumption: Total industry energy consumption in 2019 was equal to 17 008 TJ. Industry was the fourth largest energy consumer, after households, transport and services sectors. Final energy consumption decreased by 24% in the period from 2000 to 2019, and by 23% in the period from 2010 to 2019.

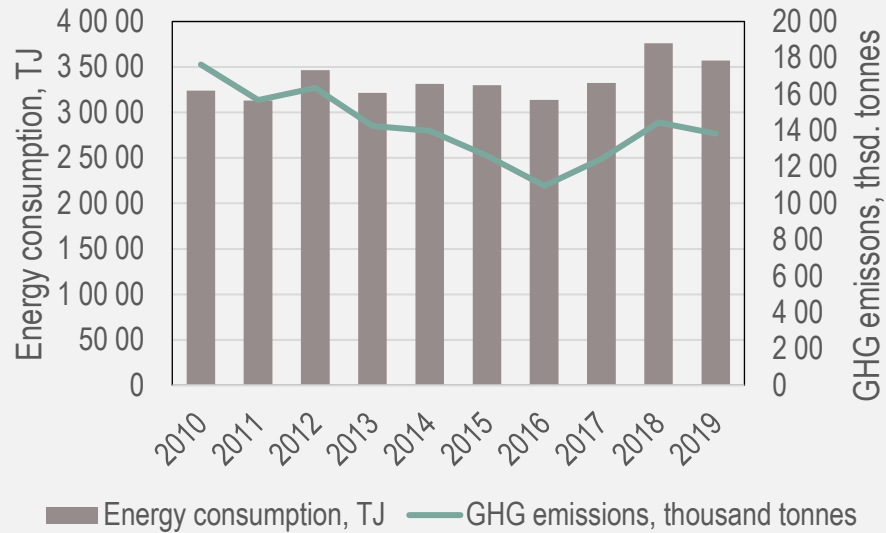
Energy mix: Electricity with 40% constituted the largest portion in total industrial energy mix, followed by natural gas (22%), oil and petroleum products (14%), and heat (7%).

Structure: Sub-sectors with the highest shares in total manufacturing energy consumption in 2019 were non-metallic minerals (25%), wood and wood products (18%), food, beverages and tobacco (16%) and paper, pulp and printing (15%) that consumed two thirds of total manufacturing industry energy end-use. All these sectors, except for food, beverages and tobacco sub-sector, significantly increased their share in total manufacturing industry energy consumption. While the share of chemical and petrochemical sub-sector in final manufacturing energy consumption decreased by 8 pp.

GHG emissions: In 2019 total amount of GHG emissions of Estonian manufacturing sector equaled 1 449 thousand tons emissions CO₂ equivalent. Total GHG emissions in the sector shows a downward trend. In the period from 2015 to 2019, total GHG emissions decreased by 39%.

Economic contribution: Manufacturing sector in 2019 generated 3 598 million EUR gross value added which consisted of 15% of total value added in the country. In 2019 manufacturing sector in Estonia employed 18% of total domestic employment.

MANUFACTURING INDUSTRY ENERGY CONSUMPTION OUTLOOK FOR LATVIA



Energy consumption: Total industry energy consumption in 2019 was equal to 35 698 TJ. Industry was the third largest energy consumer, after households, and transport sector. Final energy consumption increased by 48% in the period from 2000 to 2019, and by 10% in the period from 2010 to 2019.

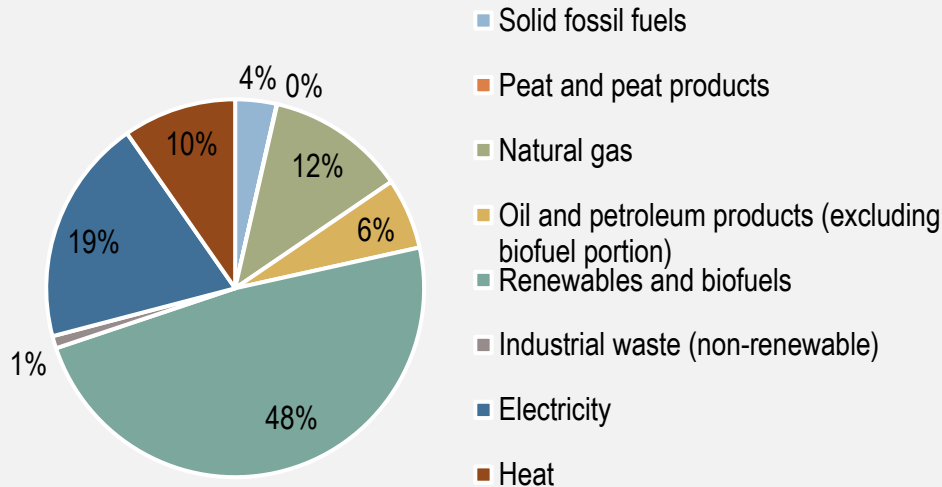
Energy mix: Renewables and biofuels (mostly wood products) with 48% constituted the largest portion in total manufacturing energy mix, followed by electricity (19%), natural gas (12%), and heat (10%).

Structure: Sub-sectors with the highest shares in total manufacturing energy consumption in 2019 were wood and wood products (59%), non-metallic minerals (20%), food, beverages and tobacco (9%) that consumed large majority or 88% of total manufacturing industry energy end-use. Latvian manufacturing sector experienced significant structural shift in the period from 2000 to 2019, since after bankruptcy of largest metal producer the share of iron and steel in total energy consumption decreased from 25% in 2000 to 0.13% in 2019. However, an enormous increase was reached by wood and wood products sector (44 pp) and non-metallic minerals sector (8 pp).

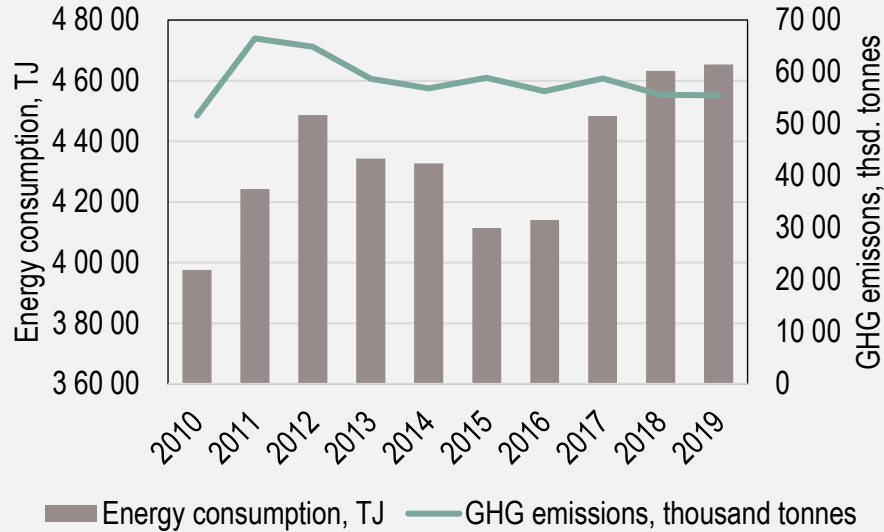
GHG emissions: In 2019 total amount of GHG emissions of Latvian manufacturing sector equaled 1 383 thousand tons emissions CO₂ equivalent. Total GHG emissions in the sector decreased by 22% in the period from 2010 to 2019.

Economic contribution: Manufacturing sector in 2019 generated 3 165 million EUR gross value added which consisted of 12% of total value added in the country. Manufacturing sector accounted for 43% of total exports in 2019 in Latvia. In 2019 manufacturing sector in Latvia employed 13% of total domestic employment.

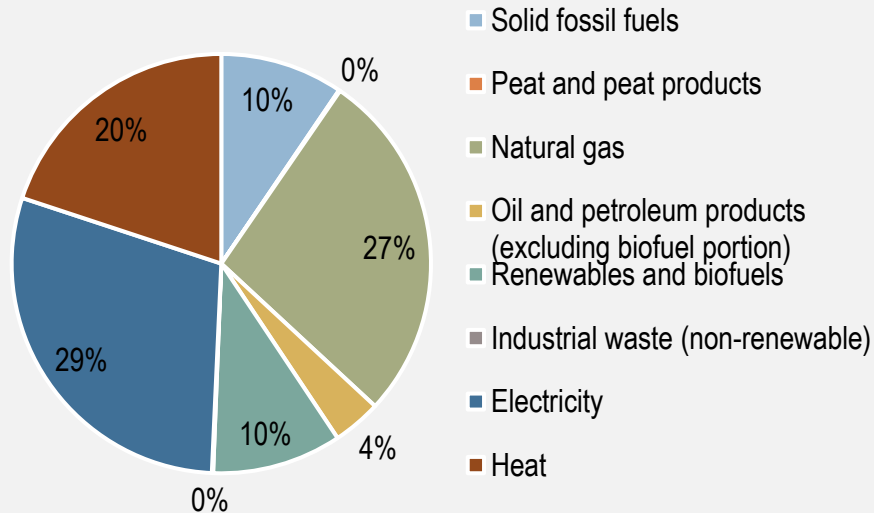
Energy mix in industry



MANUFACTURING INDUSTRY ENERGY CONSUMPTION OUTLOOK FOR LITHUANIA



Energy mix in industry



Energy consumption: Total industry energy consumption in 2019 was equal to 46 535 TJ. Industry was the third largest energy consumer, after households, and transport sector. Final energy consumption in industry increased by 42% in the period from 2000 to 2019, and by 17% in the period from 2010 to 2019.

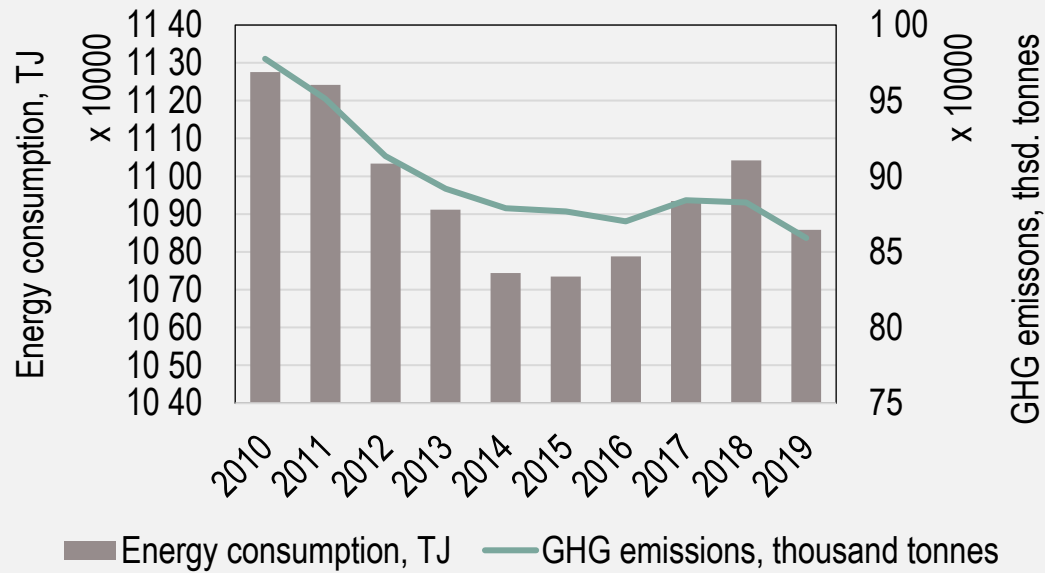
Energy mix: Electricity with 29% constituted the largest portion in total industrial energy mix, followed by natural gas (27%), heat (20%). renewables and biofuels and solid fossil fuels with 10% share of each.

Structure: Sub-sectors with the highest shares in total manufacturing energy consumption in 2019 were chemical and petrochemical (39%), food, beverages and tobacco (17%) and non-metallic minerals (15%) that consumed more than two thirds of total manufacturing industry energy end-use. A significant increase of total energy consumption was observed for chemical and petrochemical sub-sector that increase its share in total manufacturing energy end use by 17 pp in the period from 2000 to 2019. In contrast, food, beverages, and tabacoo, as well as non-metallic minerals sub-sectors decreased their share by 7pp and 6 pp respectively.

GHG emissions: In 2019 total amount of GHG emissions of Lithuanian manufacturing sector equaled 5 554 thousand tons emissions CO₂ equivalent. Total GHG emissions in the sector increased by 8% in the period from 2010 to 2019, however, since 2011 a downward trend in manufacturing GHG emissions is observed.

Economic contribution: Manufacturing sector in 2019 generated 7 863 million EUR gross value added which consisted of 18% of total value added in the Lithuania. Manufacturing sector accounted for 63% of total exports in 2019 in Lithuania. In 2019 Lithuanian manufacturing sector employed 16% of total domestic employment.

MANUFACTURING INDUSTRY ENERGY CONSUMPTION OUTLOOK FOR EU-28

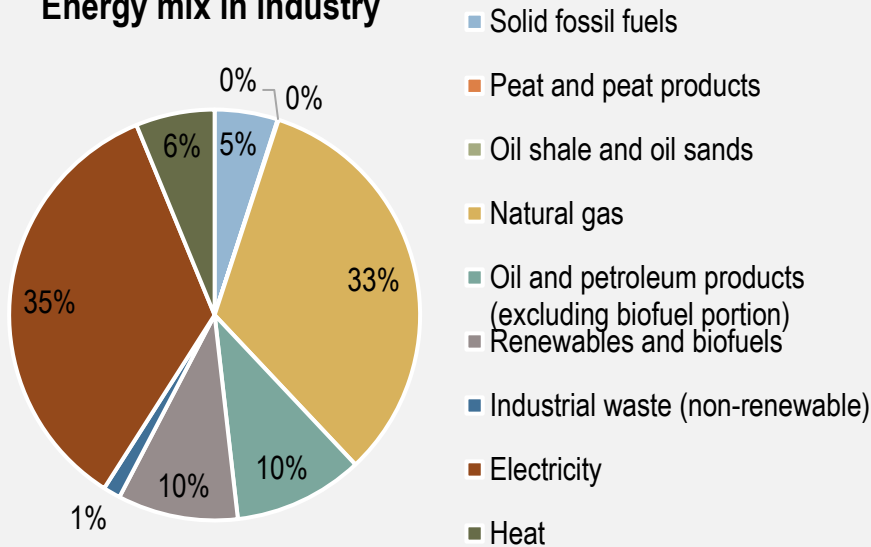


Energy consumption: Total industry energy consumption in 2019 in EU-28 was equal to 10857912 TJ. Industry was the third largest energy consumer, after households, and transport sector. Final energy consumption in industry decreased by 15% in the period from 2000 to 2019, and by 4% in the period from 2010 to 2019.

Energy mix: Electricity with 35% constituted the largest portion in total industrial energy mix, followed by natural gas (33%), renewables and biofuels and oil and petroleum products with 10% share of each.

Structure: Sub-sectors with the highest shares in total manufacturing energy consumption in 2019 were chemical and petrochemical (22%), non-metallic minerals (14%), paper, pulp and printing (14%), food, beverages and tobacco (12%) sectors that together consumed 62% of total manufacturing industry energy end-use. In the period from 2000 to 2019 all of these sectors, except for non-metallic minerals increased their share in total industrial energy end use. More specifically, chemical and petrochemical sector by 2 pp, paper, pulp and printing sector by 2 pp, food, beverages and tobacco sector by 1 pp.

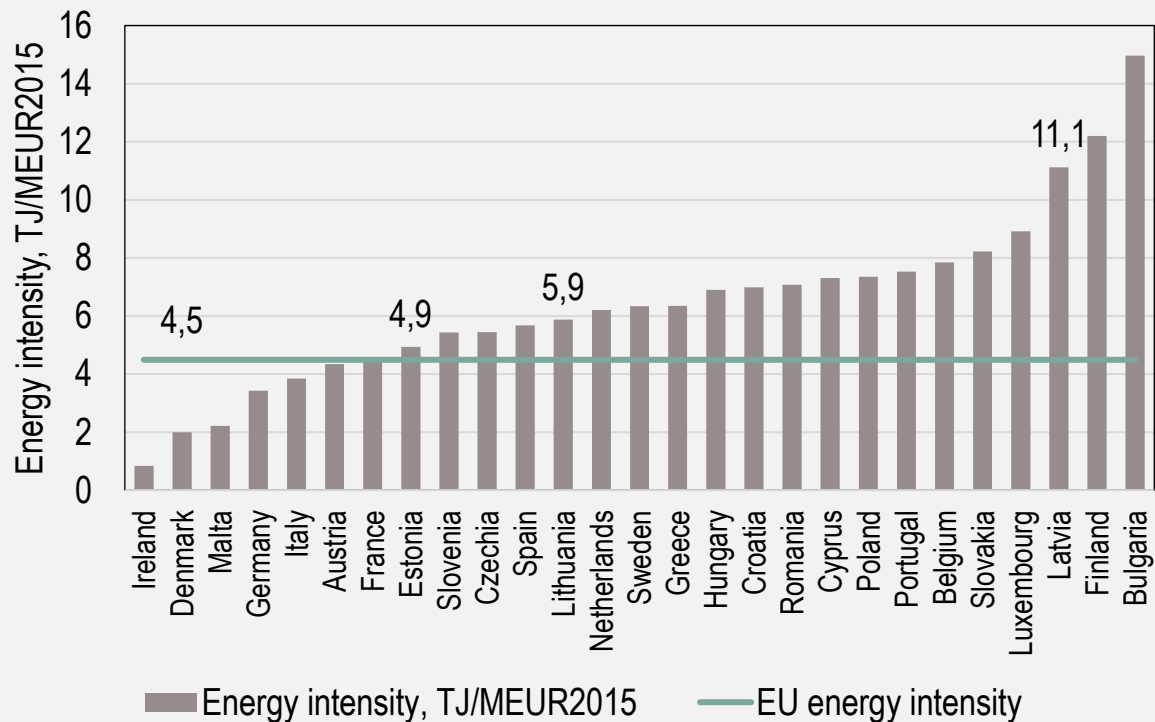
Energy mix in industry



GHG emissions: In 2019 total amount of GHG emissions in EU-28 manufacturing sector equaled 859 203 thousand tons emissions CO₂ equivalent. Total GHG emissions in the sector decreased by 12% in the period from 2010 to 2019.

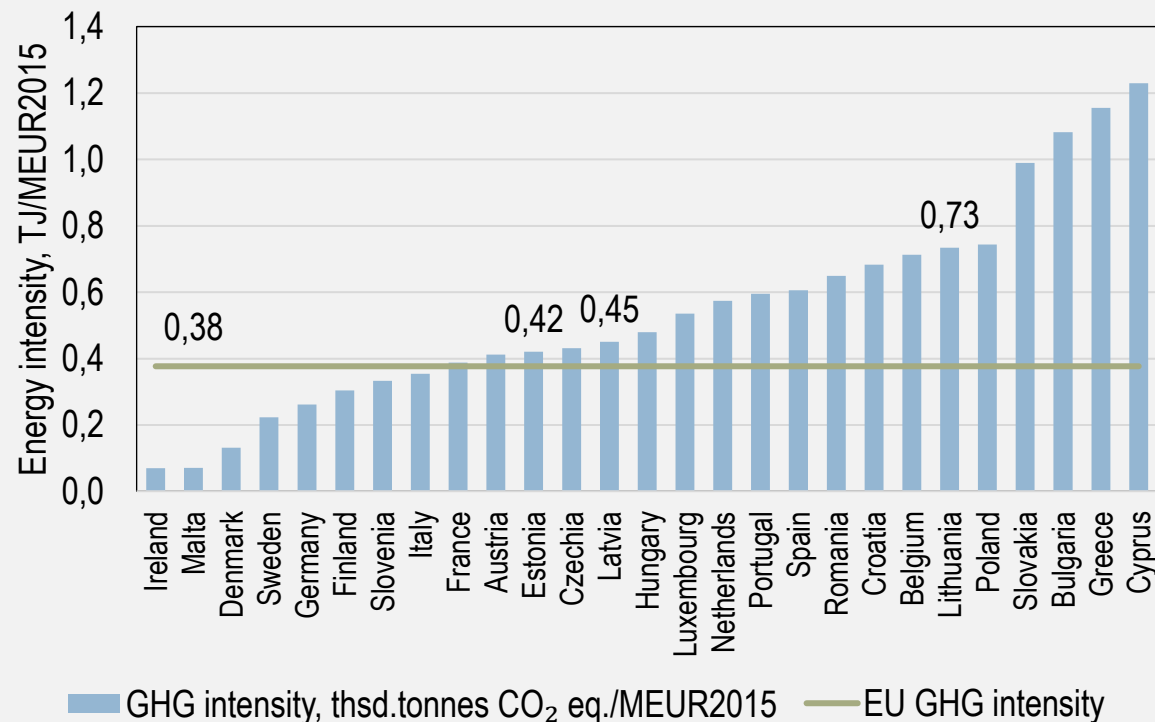
Economic contribution: Manufacturing sector in 2019 generated 2 289 312 million EUR gross value added which consisted of 16% of total value added in the EU-28. In 2019 manufacturing sector employed 14% of total employment in the EU-28.

MANUFACTURING ENERGY INTENSITY AND GHG EMISSION INTENSITY IN EU COUNTRIES



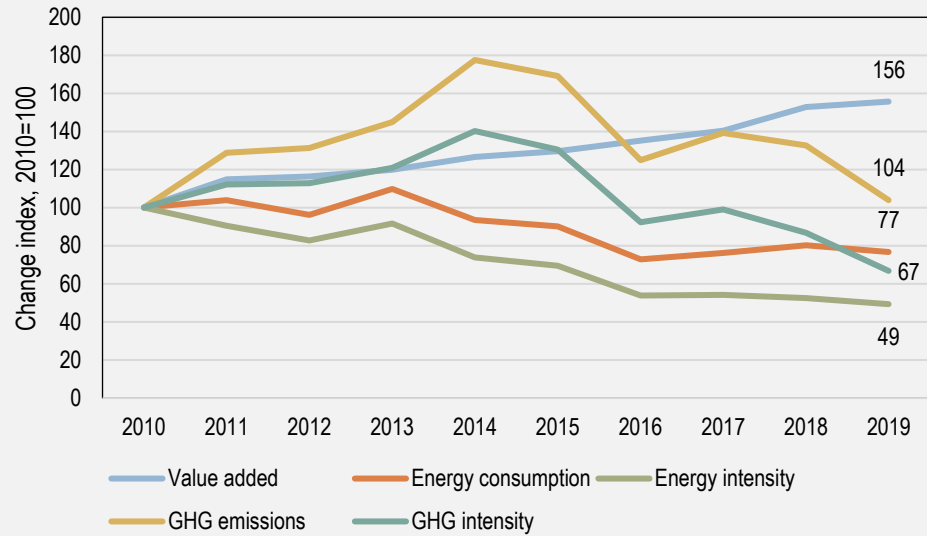
Emission intensity indicator is defined as the ratio between total produced GHG emissions in CO₂ equivalents in manufacturing sector and the value added at constant chain linked volumes EUR2015. The indicator represents the decarbonization level of manufacturing industry. Lower value indicates higher CO₂ productivity - ability to produce higher amount of value added with less generated emissions. In all three Baltic states manufacturing emission intensity is higher than EU total emission intensity. In Lithuania significantly higher manufacturing emission intensity is observed than in other Baltic states.

Energy intensity indicator is defined as the ratio between total consumed energy in manufacturing sector and the value added at constant chain linked volumes EUR2015. The indicator represents the amount of utilized energy to generate a unit of added value. Lower value indicates higher efficiency. In all three Baltic states manufacturing energy intensity is significantly higher than EU total energy intensity. In Latvia more than twice larger amounts of energy is used to produce one unit of goods. Estonia stands out with the lowest energy intensity among other Baltic states.

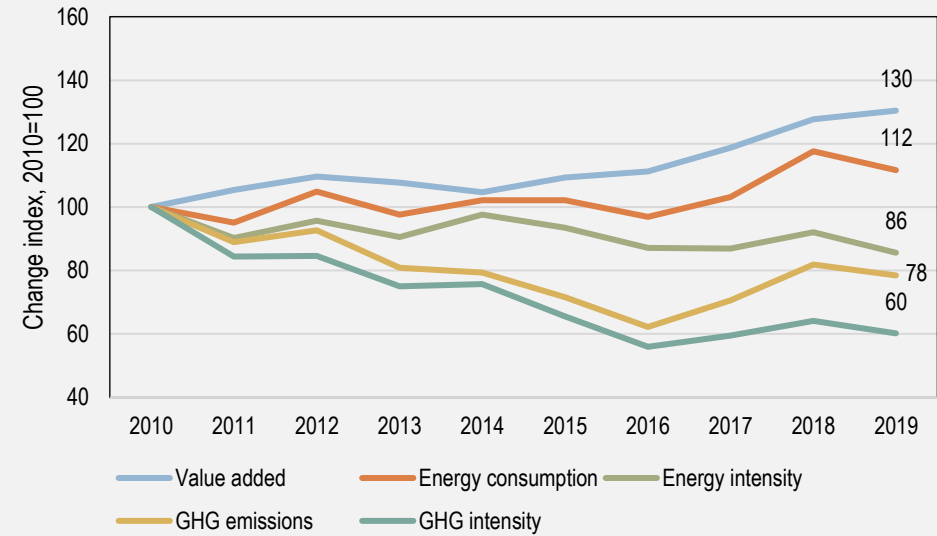


CHANGES IN MANUFACTURING ENERGY INTENSITY AND GHG EMISSION INTENSITY IN THE BALTIC STATES AND EU-28

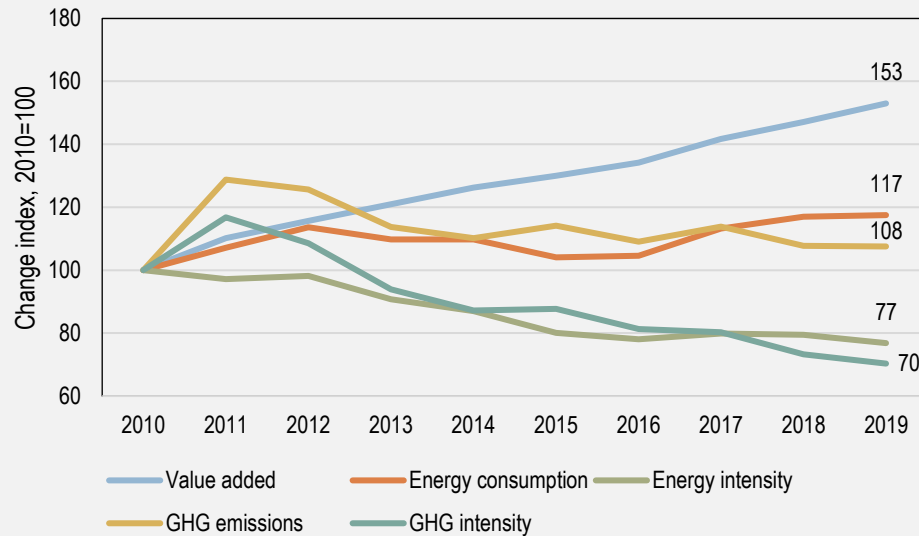
ESTONIA



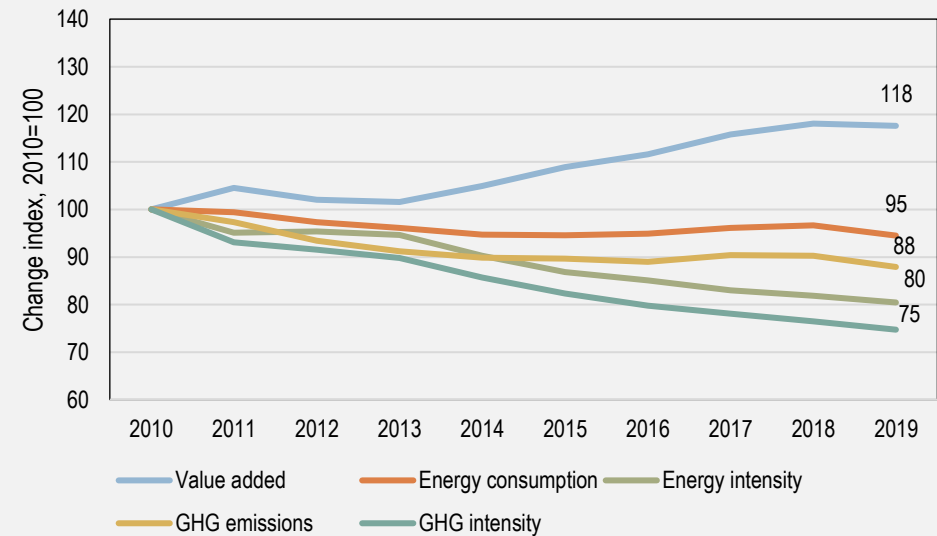
LATVIA



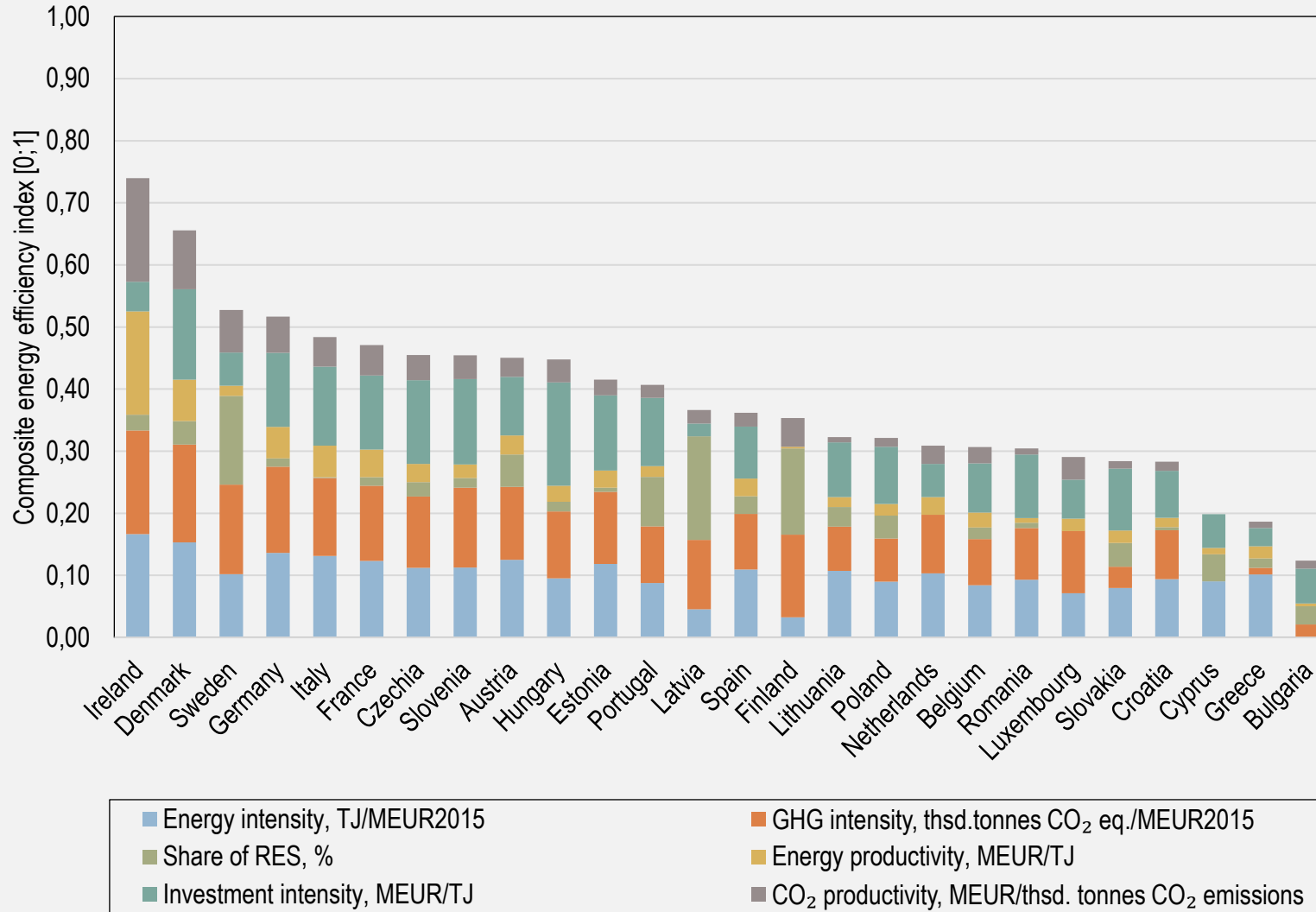
LITHUANIA



EU-28



COMPOSITE INDUSTRIAL ENERGY EFFICIENCY AND SUSTAINABILITY INDEX: CROSS-COUNTRY COMPARISON

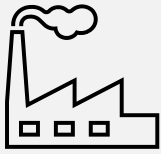


Research goal: Composite index methodology was applied to evaluate energy efficiency and sustainability level of manufacturing industry across EU countries.

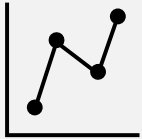
Method*: In total 6 indicators were selected to measure sustainability. In order to transform all the indicators into a common scale min-max data normalization was applied. The values were ranked in a range from 0 to 1, where 0 being the lowest and 1 the highest grade. Equal weights were assigned to all indicators. Final composite index was calculated by aggregating normalized and weighted indicators.

Main findings: The highest sustainability value was achieved for Ireland (0.74), Denmark (0.66), Sweden (0.53), Germany (0.52), and Italy (0.48). Estonia reported highest manufacturing industry sustainability score (0.42), while Lithuania the lowest (0.32) amongst Baltic states. Latvian manufacturing sector reached a value of 0.37. For all countries a significant energy efficiency potential can be identified.

*More information on composite sustainability index methodology can be found here: Dolge, K., Kubule, A., Blumberga, D. Composite Index for Energy Efficiency Evaluation of Industrial Sector: Sub-Sectoral Comparison. Environmental and Sustainability Indicators, 2020, Vol. 8, Article number 100062. ISSN 2665-9727. Available from: doi:10.1016/j.indic.2020.100062



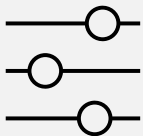
Structural comparison. In Estonia manufacturing energy consumption structure is more diversified compared to Latvia and Lithuania where three sectors consume largest majority of total manufacturing energy consumption. TOP3 most energy consuming sectors in Estonia are non-metallic minerals (25%), wood and wood products (18%), food, beverages and tobacco (16%) sectors. TOP3 most energy consuming sectors in Latvia are wood and wood products (59%), non-metallic minerals (20%), food, beverages and tobacco (9%) sectors. TOP3 most energy consuming sectors in Lithuania are chemical and petrochemical (22%), non-metallic minerals (14%), paper, pulp and printing (14%) sectors.



Energy consumption trend comparison. Estonia was the only country amongst Baltic states that managed to significantly decrease manufacturing energy consumption over past 10 years. Total industry energy consumption in Estonia decreased by 23% in the period from 2010 to 2019. Both Latvia and Lithuania reported total manufacturing energy consumption increase in the same period by 10% and 17% respectively. All three Baltic states managed to increase manufacturing energy efficiency in the period from 2010 to 2019 that is observed in the changes in manufacturing energy intensity. The most rapid improvement in manufacturing energy intensity was observed in Estonia.



Decarbonization trend comparison. Overall manufacturing energy mix in Latvia is more decarbonized compared to Estonia and Lithuania. In Latvia wood and wood products constitute the highest share (48%) in total energy balance. In 2019 in Lithuania renewables and biofuels represented 10% and in Estonia 3% in total manufacturing energy mix. The most noticeable improvements in GHG emission intensity was observed in Latvia. Latvia managed to decrease manufacturing industry GHG emission by 22% in the past 10 years. Estonia shows downward trend in manufacturing GHG emissions since 2014, however, no significant improvements in absolute emitted GHG emissions was observed in Lithuania. However, both Estonia and Lithuania indicated improvements in manufacturing GHG emission intensity in the period from 2010 to 2019.



Identification of energy efficiency potential. The assessment of energy intensity and emission intensity indicators show that there exist a significant energy efficiency potential in all three Baltic states countries. Benchmarking and composite sustainability index methodology could be applied to identify energy efficiency gaps for industry in all countries.