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EMBASSY OF DENMARK



Danish Energy Agency

VIETNAMESE INDUSTRIAL STRUCTURE



Vietnam – Denmark
Energy Partnership programme (DEPP3)

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ABBREVIATIONS

DE3	: Development Engagement 3
EE	: Energy Efficiency
ES	: Energy Savings
FDI	: Foreign Direct Investment
FTA	: Free Trade Agreement
GDP	: Gross Domestic Product
GHG	: Green house gas
GSO	: General Statistics Office of Vietnam
IIP	: Index of Industrial Production
NDC	: Nationally determined contribution
PP	: Polypropylene
PE	: Polyetylen
TFEC	: Total final energy consumption
TOE	: Tấn dầu quy đổi
VNEEP3	: Vietnam National Energy Efficiency Program Period 2019-2030
WTO	: World Trade Organization

FOREWORD

Viet Nam has quite a comprehensive policy on the promotion of energy efficiency (EE) and energy savings (ES), particularly with regard to large energy intensive industries. However, recent reviews of the impact of the law and policies have shown that there still remains a potential for improving energy efficiency in the industrial sector.

Development Engagement 3 (DE3) focuses on the possibilities to improve the low carbon development in the industrial sector in order to further contribute to reducing Viet Nam's energy consumption and CO₂ emissions. The work of the DE3 will furthermore be carried out with a focus on its contribution to the achievement of:

- The obligations in the Nationally Determined Contribution (NDC) of Viet Nam to the Paris Agreement,
- The goals in the national energy development strategy until 2030 (Resolution 55),
- Other relevant strategic EE and ES targets of Viet Nam,
- The specific and relevant goals and targets within EE and ES in VNEEP3.

In that context, the focus of Output 3 in 2021 is to initiate the development of cross-cutting EE technology catalogue for industries and technical guideline for the plastic industry subsector and ensure that it covers a specific need for information and guidance in this specific Vietnamese industrial sector. Hereto the aim is that any developed technical catalogues and guidelines are disseminated, and their application status is assessed at provincial level.

This report is part of a group of reports assessing the overall structure of Vietnam's industry, including assessing the current state of energy use, emissions, technology status, estimating energy savings potential, reducing emissions and national impact analysis compared with national target and policies. This report focuses on assessing the structure, level of energy consumption and greenhouse gas emissions in the industrial sub-sectors of Vietnam.

Within the scope of task, the consulting team conducts research, synthesizes and reference available reports and research results. Data sources are fully and unambiguously cited.

1 INDUSTRIAL STRUCTURE

1.1 THE GENERAL DEVELOPMENT IN INDUSTRIAL STRUCTURE SINCE 2011

For the last 10 years, Vietnam has experienced a general restructuring between sub-sectors in the industry. During the 2010s the industrial sector in Vietnam has undertaken a shift towards rapidly increasing the share of the processing and manufacturing industries, reducing the share of the mining industry. Especially there has been a large growth in the sub-industries with high added value and high export value.

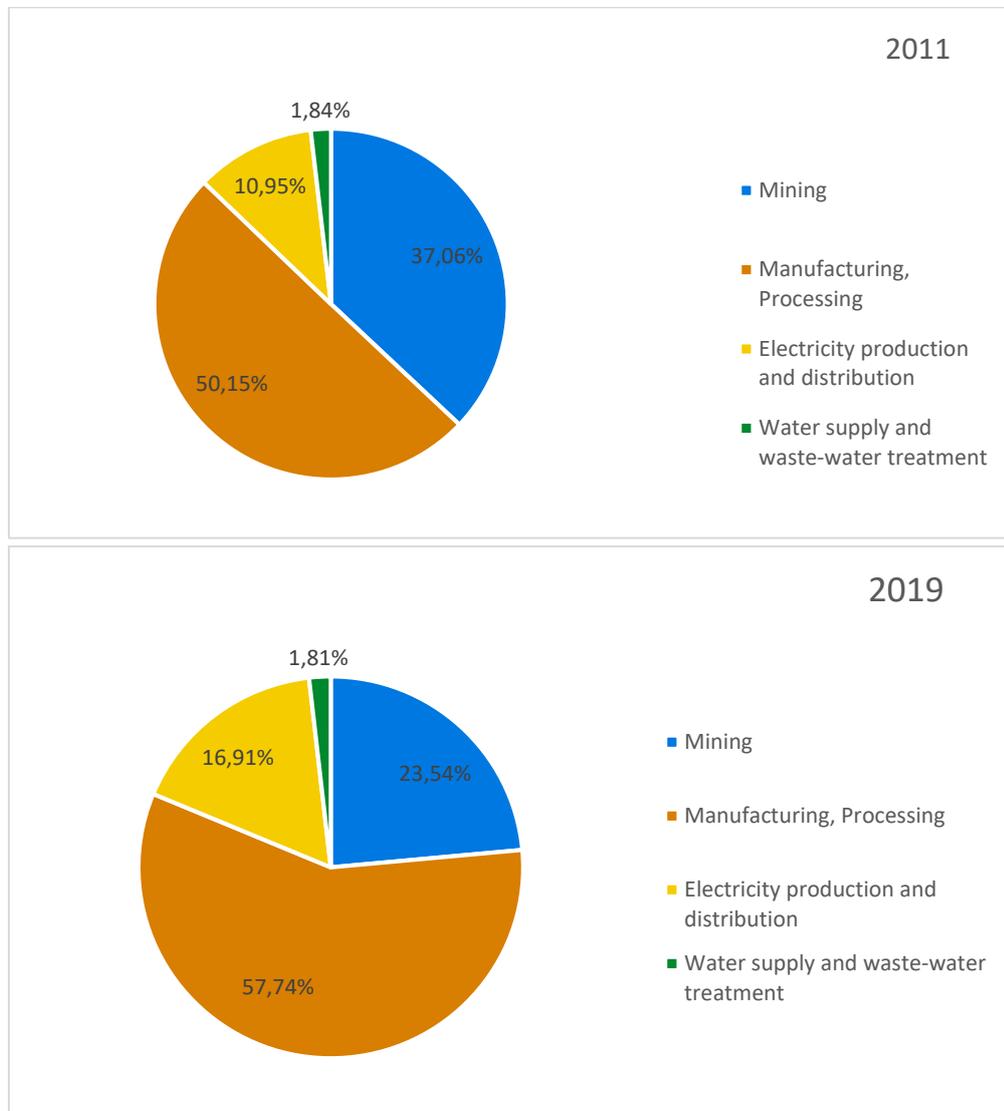


Figure 1: GDP by sub-sectors in 2011 and 2019

From 2011 to 2019, the average GDP growth rate of the industrial sector was 14.76% per year. In which the manufacturing subsector the highest proportion, 57.74% in 2019 along with an average growth rate is 18.67% per year.

In the period 2016-2020 the share of the added value of the processing and manufacturing sub-sector accounted for 56.9% of the total added value in the industrial sector. This was an even higher growth rate than in the previous 5 years period - increased by 8.8% compared to the period 2011-2015. The mining industry accounted for 24.9% of the added value in 2016-2020, which was a reduction of 13% compared to 2011-2015. The electricity production and distribution industry accounted for 16.3% in 2016-2020, which was an increase of 4.1% compared to 2011-2015. The industrial sector for water supply and waste management and treatment accounted for 1.9% of the total added value in 2016-2020, which was an increasing share of 0.1%.

Thus, there was a continuous growth in the processing and manufacturing industries and the share of value-added in GDP was the highest among industries and increased continuously over the years in the period 2016-2020. In 2016 -2020, the share of added value in the processing and manufacturing subsector of GDP accounted for 14.27%, 15.33% in 2017, 16% in 2018, 16.48% in 2019, and 16.7% in 2020.

A great contribution to this increased share of GDP is the steady growth of the steel, textile, food, footwear, and electrical equipment industries that Vietnam has experienced during the period. Especially, the manufacturing of electronic products, computers, and optical products has increased due to attracting a large number of foreign investment capital, which is one of the main factors affecting the process of an internal restructuring of the industry in Vietnam.

1.1.1. THE GROWTH RATE OF THE ADDED VALUE OF THE MAJOR SUB-SECTORS IN THE INDUSTRY

Overall, from 2011 to 2020 the industrial sector has experienced a steady increase the added value. The average growth rate of this period was 8.14% per year. In 2016, the added value of the industry increased by 4.65%; in 2017 increased by 13.48%; in 2018 increased by 8.79%, and in 2019 by 8.86%. Particularly in 2020, the Covid-19 epidemic had a negative impact on all sectors of the economy, the added value of the industry only increased by 0.54%, which is the lowest rate in the 2011-2020 period. In general, the industry average growth rate of value-added in the period 2016-2020 reached 7.16% per year, lower than the growth rate of 7.64%/year in the previous period. From 2016-to 2019 processing and manufacturing subsectors had a high growth rate and were the main contributor to the growth rate of the industry. The added value of the processing and manufacturing sector increased by 11.87%, 19.48%, 15.52%, and 12.24% in 2016, 2017, 2018, and 2019 respectively. In 2020, due to the effect of the covid19 pandemic, the growth rate of this subsector was 5.59%, which was the lowest rate in the period 2011-2020. Meanwhile, the growth rate of the added value of the mining industry decreased sharply, consistent to reduce the dependence of economic growth on mining minerals and natural resources towards the goal of sustainable development.

Table 1: The growth rate of the industrial sub-sectors in 2011-2020

	2011-2015	2016	2017	2018	2019	2020	Average
Mining	11.72%	-9.27%	2.30%	9.17%	-0.60%	-13.89%	2.74%
Manufacturing and Processing	13.67%	11.87%	19.48%	15.52%	12.24%	5.59%	18.30%
Electricity production and distribution	26.62%	12.83%	15.12%	15.34%	16.21%	2.55%	26.87%
Water supply and waste-water treatment	14.51%	9.21%	10.22%	8.66%	10.63%	8.30%	14.76%
Total	14.38%	4.65%	13.48%	13.65%	9.52%	0.54%	13.41%

(Source: Data in www.gso.gov.vn)

1.1.2. PRODUCTION OUTPUTS OF SOME MAJOR INDUSTRIAL SUB-SECTORS

From 2016 to 2019 industrial production grew positively. The average growth of the Index of Industrial Production (IIP) in the period 2016-2019 by 9.5%.

Table 2. Index of Industrial Production (IIP) in 2016-2020¹

Unit: %

Year	Mining	Manufacturing, Processing	Electricity production and distribution	Water supply and waste-water treatment	Total
2016	93.2	111.3	111.5	108	107.4
2017	95.9	114.7	109.6	107.1	111.3
2018	97.8	112.2	110.0	106.4	110.1
2019	100.9	110.4	108.5	106.1	109.1
Preliminary 2020	92.5	104.8	103.1	104.2	103.3
Average 2011-2015	103.4	108.0	110.9	107.7	107.2
Average 2016-2020	96.0	110.6	108.5	106.4	108.2

In 2020, the Covid-19 epidemic had a negative impact on industrial production, disrupted the supply chain of materials, and narrowed import and export markets. Thus, the IIP only increased by 3.3% and was a low growth rate. On average in the period 2016-2020, the IIP increased by 8.2% per year, which

¹ General stastic Office, 2021, "Proceedings of statistic analysis and forecasting 2020"

was higher than the average IIP in the period 2011-2015 when the IPP reached an average of 7.2% per year.

The major sub-sectors of the industry with high IIP growth rates that have contributed to the general positive growth of the industry are described below:

- **Metal Industry**

The metal industry maintained a high growth momentum with an average growth rate of 21.5% per year in the period 2016-2020, of which in 2016 it increased by 17.9%; in 2017 increased by 22.1%; in 2018 increased by 25%; in 2019 increased by 28.7% and in 2020 by 14.3%. Some corporations/manufacturing companies have made great contributions to the growth of the metal industry such as Formosa Group, which went into production in 2017 and continued to expand its production scale in 2018. Hoa Phat Group put into operation a rolled steel production of about 600 thousand tons in August 2018. Hoa Sen Group put into operation equipment for cold rolling, galvanizing/cold galvanizing, and color plating with a capacity of 350 thousand tons. Tung Ho company installed a production line of 600 thousand tons of construction steel in the last 6 months of 2018. In 2019, crude steel production output was 3.4 times higher than that in 2016, while rolled steel and section steel increased by 1.5 times.

- **Electronic Industry**

The Electronic Industry - manufacturing of electronic products, computers, optical products, etc - is the industry that accounts for the largest proportion of the industries and has developed strongly in the past 10 years as a result of the process of economic integration, import, and increase foreign direct investments. Although the IIP of the Electronics industry achieved a high growth rate, the growth rate was uneven year by year in the period: in 2016 it increased by 12.5%; in 2017 increased by 35.2%; in 2018 increased by 10.7%; in 2019 increased by 1.8%; in 2020 it is expected to increase by 12%, on average in the period 2016-2020, it is expected to increase by 13.9 % per year. In 2020, the export of electronic products, computers, and components increased by 22.8% compared to the previous year, mainly because FDI enterprises still account for a large share of production and export due to their mastery of technology. Vietnam gradually becomes a factory for manufacturing and assembling components for electronic products of many international corporations such as Samsung, LG, Canon, and Toshiba.

- **Beverage industry**

The beverage industry develops at a fast rate, meeting a growing domestic consumption demand and contributing to export turnover. In the period 2016-2020, on average, the beverage industry's IIP increased by 5.8% per year; in which 2016 increased by 10.4%; in 2017 increased by 6.1%; in 2018 increased by 7.9%; in 2019 increased by 10.5%; in 2020 alone, a decrease of 5.1% due to the double impact of the Covid-19 epidemic and the Government's Decree No. 100/2019/ND-CP dated December 30, 2019, stipulating administrative sanctions in the field of road traffic. Ministries and railways have had an indirect impact on the alcoholic beverage industry. Currently, many domestic enterprises have high competitiveness, leading the market in producing products to meet domestic demand such as Vietnam Dairy Products Joint Stock Company (Vinamilk), TH Joint Stock Company, and Nutifood nutrition food joint stock company. However, for the small and medium-sized enterprises, there are still many difficulties with technical barriers from the market, a small volume of goods, and high logistics costs that increase commodity product prices. In addition, changes in consumer behavior and negative impacts from the Covid-19 epidemic require businesses to develop production and business strategies to suit the new situation.

- **Textile Industry**

In the last 10 years the textile industry has made positive progress with an average growth rate of IIP by 12.5% per year in the period 2016-2019, of which in 2016 it increased by 16.9%; in 2017 increased by 9.8%; in 2018 increased by 12.5% and in 2019 increased by 10.9%. The apparel industry is one of the spearhead industries in Vietnam. Over the years, it has always developed strongly and made efforts to participate in the international integration process. On average, in the period 2016-2019, the IIP of the apparel industry increased by 8.8%/year, of which in 2018 achieved the highest growth rate of 10.9%. Some apparel brands are confirmed in the domestic and foreign markets such as Garment 10, Viet Tien Garment, Dong Xuan Knitting, Thai Tuan, and An Phuoc. These brands do not only stand firm in the domestic market but also help Vietnam's apparel industry establish its name in foreign markets. In 2020, the textile, footwear, handbag, and apparel industries are the industries there was most negatively affected and prolonged by the Covid-19 epidemic. Textile industry IIP decreased by 0.5%; the Apparel manufacturing industry decreased by 4.9% due to the Covid-19 epidemic narrowing the consumption market for garment products. Demand for textile products dropped sharply as consumers around the world focused on household items. This caused Vietnamese textile and apparel enterprises to face many

difficulties and find ways to survive and develop in the new context. The average growth rate of the textile industry in the period 2016-2020 is 9.8% per year, the apparel manufacturing industry is 5.9% per year, much lower than the average growth rates of 14.5% per year and 8.8 % per year for the period 2012-2015.

- **Chemical industry**

The Chemical industry plays an important role in the economic development of Vietnam, providing input materials for production and consumption such as fertilizers, paints and printing ink, plant protection drugs, and detergents washing. Production of the chemical industry is still mainly focused on state-owned companies under the Vietnam Chemical Group. In addition, in the trend of market opening, the participation of the FDI sector is increasing with large investment projects such as the polypropylene factory project and the underground storage of liquefied petroleum gas with a capacity of 240,000. tons in the Ba Ria - Vung Tau province. The Long Son petrochemical complex project is invested by Long Son Petrochemical Company Limited (LSP) with an estimated total investment of 5.4 billion USD to produce PP and PE products. Nghi Son Refinery and Petrochemical Complex Project with the capacity to process 10 million tons of crude oil yearly with LPG, 92/95 gasoline, diesel, Jet A1, petrochemical products Benzene, PXYlene, Polypropylen,e and sulfur with a total investment of over 9 billion USD. In the period 2016-2020, the chemical and chemical product manufacturing industry increased by an average of 5.8%/year, of which in 2016 it increased by 1.4%; in 2017 increased by 6.2%; in 2018 increased by 8.2%; in 2019 increased by 6.4% and in 2020 by 6.7%.

- **Pharmaceutical industry**

The production of drugs, pharmaceuticals, and medicinal herbs achieved good growth in the period 2016-2020, providing many pharmaceutical products to ensure the improvement of public health in general, including 'protection against the Covid-19 epidemic. In 2016, the pharmaceutical industry IIP index increased by 2.7%; in 2017 increased by 8.1%; in 2018 increased by 19.5%; in 2019 decreased by 2.3%. Particularly, 2020 achieved the highest growth rate in the 2016-2020 period with 21.8% because of the special situation related to the Covid-19 epidemic. In general, the average growth rate of IIP in the period 2016-2020 is 9.6% per year, which was higher than the average growth rate of 5.5% per year in the period 2011-2015.

- **Power production and distribution industry**

The production and distribution of power have an increasingly stable growth rate due to the need to expand industrial production and daily life. In the past period, the electricity industry, mainly Electricity of Vietnam (EVN), has ensured sufficient electricity supply for socio-economic development and people's needs. The electricity sector's IIP index in the 2016-2020 period increased on average by 8.5% per year, of which in 2016 it increased by 11.5%; in 2017 increased by 9.6%; in 2018 increased by 10%; in 2019 increased by 8.5%; 2020 the lowest increase in the period with 3.1%. During this period, the production and business efficiency of the Power production industry was enhanced by restructuring the Power production industry. Accordingly, the operation of the power production industry is transformed according to the market mechanism, enhancing publicity, transparency, and competition. In addition, other energy industries are increasingly developing and, many power projects including coal power, gas power, hydropower, and wind power have been put into operation, meeting the demand.

- **Water and waste industry**

The water supply industry, water management, and treatment of waste and wastewater is an essential utility industry with high stability. In the period 2016-2020 this industry had a yearly average increase of 6.4%. However, this growth rate of IIP tended to decrease in the period: in 2016 it increased by 8%; in 2017 increased by 7.1%; in 2018 increased by 6.4%; in 2019 increased by 6.1%, and in 2020 by 4.2%; The demand for clean water is increasing due to the rapid urbanization and thus are also the treatment of waste and wastewater sector.

- **Mining industry**

In recent years the mining industry has made great contributions to the State budget, creating resources for national development. However, the growth of the Mining industry continuously decreased due to the policy of restricting crude oil exploitation and coal mining to reduce the dependence of economic growth on mineral resources. For the period 2016-2020 the IIP of the mining industry decreased by 4% per year on average, of which in 2016 it decreased by 6.8%, in 2017 decreased by 4.1%, in 2018 decreased by 2.2%, in 2019 increased by 0.9%, in 2020 decreased by 7.5%. This decrease has had a significant effect on industry growth over the past five years but underlines the restructuring of the economic growth model in Vietnam based on more high-tech industries.

1.2. OUTLOOK FOR THE FUTURE DEVELOPMENT

Shortly, the megatrends in the development of the Vietnamese industry, especially the processing and manufacturing industries, are expected to undertake great development because Viet Nam has the opportunity to participate more and more deeply in the global value chain.

The recent change in the global value chain has put Vietnam in a more important position as a production country. Previously, some East Asian countries such as Japan and South Korea chose China and ASEAN countries as production bases for export to the US and Japan. However, China is gradually becoming a consumption market instead of a producer, and Vietnam has the opportunity to become a production base for exports to the US, Western Europe, Japan, and China.

Along with joining a series of free trade agreements in the past, Vietnam has proven its priority choice. Accordingly, Vietnam mainly performs the assembly and processing stages from imported raw materials and semi-finished products, then exports to consumer markets such as the US, Europe, China, and Japan. However, this will be a process of rearranging resources and restructuring the industry chain globally, as well as in Vietnam.

1.2.1. LONG TERM VISION, STRATEGY, AND TARGET TOWARDS 2030

In the longer term, the Government of Vietnam has decided on a strategy for the development of the industry as well as defined targets for the overall industrial development as well as targets for several central industrial sub-sectors².

By 2045 it is the vision that Vietnam will become a modern industrialized country.

In order to fulfill the strategy and targets for the development of the industry in Vietnam, the target for 2030 is that Vietnam will complete the target of industrialization and modernization. This includes that Vietnam aims to become an industrialized country. The target is for Vietnam for being in the top 3 leading countries in the ASEAN region in industry, in which several industries are internationally competitive and deeply involved in the global value chain.

1.2.2. TARGETS FOR INDUSTRIAL DEVELOPMENT TOWARDS 2030

The targets for 2030 for the development of the industrial sector are set out by the Government of Vietnam. The central targets are:

- Industry's share of GDP shall reach more than 40% in total, for the processing and manufacturing industry the share of the GDP should be about 30%, of which the manufacturing industry is over 20%.
- The share of the value of high-tech industrial products in the processing and manufacturing industries shall reach at least 45%.
- The growth rate of industrial added value shall reach an average of over 8.5% per year, of which the added value of the processing and manufacturing industry shall reach an average growth rate of over 10% per year.
- The growth rate of industrial labor productivity shall reach an average of 7.5% per year.
- The Industrial Competitiveness Performance Index (CIP) is among the top three countries in ASEAN.
- More than 70% labor force is occupied in the industrial sector and service sector.
- Building a number of industrial clusters, and multinational corporations with the international competitive capacity

1.2.3 TARGETS FOR SPECIFIC SUB-SECTORS TOWARDS 2030

On top of the overall targets and strategy towards 2030, more specific requirements are decided for different sub-sectors. The specific solutions and targets for the sub-sectors will support the overall targets and develop Vietnam's industries.

The specific solutions and targets for different sub-sectors are as follows:

- **Mining industry**

The mineral market is facing many difficulties due to the influence of the Sino-US trade war because the products are mainly raw products with low added value, mainly exported to the Chinese market. Therefore, it is necessary to strengthen the planning and effective use of mineral resources with large reserves and higher production value. This will make it possible for the mining industry to contribute to GDP growth and serve the processing and manufacturing industries in Vietnam. Special attention should be brought to the following:

- Continue to develop and complete planning on exploration, exploitation, processing, and use of minerals in the direction of serving mineral processing projects with higher added value.

² Resolution 23-NQ/TW, 2018

- Support early study and develop basic requirements on technical criteria, technology, and the scale of processing capacities of minerals, mainly serving the Vietnamese state management of minerals.
- Complete the review of the implementation of two bauxite pilot projects to support proposals for orientations and policies for the development of Vietnam's bauxite industry.
- Remove obstacles and difficulties in titanium projects. Almost obstacles relevant to the protest of residents.

- **Metal industry**

To develop the metal industry towards 2030, special attention should be brought to the following:

- The coordination with relevant stakeholders should be continued. This should support the study of the possibility of applying trade remedies by WTO regulations and signed FTAs to protect Vietnam's steel industry against competitive pressure of products, imported steel products etc.
- Support Formosa to overcome difficulties and obstacles after environmental incidents (boosting the compensation to residents) to ensure that the steel production quickly returns to operation at full capacity. This will support the chain of supporting industries to the steel production as well as improve the added value of steel products of the Formosa Ha Tinh project.
- Promote key steel projects to be implemented as planned: e.g. the Nghi Son Steel Project of Nghi Son Steel Joint Stock Company and Quang Ngai Steel Complex Project of Hoa Phat Group.
- Direct and coordinate with enterprises to actively monitor domestic and foreign market information to gain appropriate production and business plans and thus ensure a balance of the number of raw materials and supplies for production.
- Submit the results of the two pilot bauxite projects to Government for comments on the planning of bauxite industrial development in the period 2021-2030 and the vision of 2050.

- **Mechanical engineering³**

The Mechanical engineering industry should be developed with special attention to the following:

- Formulate the Government of Vietnam's Decree on the development of key mechanical industries to have policies to support enterprises in the mechanical-electronic industry according to the 2014 Investment Law.
- Promote the association of enterprises in the industry to meet the export target of 40% of sector production in 2030 and 45% in 2035

- **Electronic industry**

In Vietnam, the electronics industry has impressively developed since 2010, which has been proved by its achievements in manufacturing. However, despite the high rates of gross output and export revenue, there are still several problems, such as low value-added, inconsistent structure, import dependence for production, lack of unified government control, quality of labor, etc., which require specific analysis and relevant solutions. So that it is necessary to pay special attention to developing several different measures to ensure the targets towards 2030. Especially the following areas could be mentioned:

- Develop measures to protect the market for consumer electronics (e.g. defensive taxes, technical barriers, anti-commercial fraud, fake, and smuggled goods) and by this supporting Vietnamese businesses by creating opportunities for the enterprises to develop and play a leading role in the domestic electronics market, especially in household electrical and electronic products.
- Continue to support Samsung's assembly activities in Vietnam by coordinating with Samsung on how to implement a system of domestic suppliers to supply complete product assembly activities.

- **Automotive manufacturing and assembly industry**

Vietnam's automotive industry is growing rapidly and has been doing so continuously in recent years. On average, the growth of the automobile market has been 20-30 percent annually, beating the projected numbers made by Vietnam's Ministry of Industry and Trade

- Taking advantage of market opportunities due to issued policies, focusing on supporting to accelerate large projects of automobile production and assembly of large enterprises such as Toyota and Mitsubishi.
- Introduce policies to attract investment from multinational corporations to invest in Vietnam, especially focusing on brands and car models that are not available in the ASEAN region. This should create favorable conditions for investors to invest in large-scale projects in Vietnam. By 2030 it is expected that this will lead to a situation where domestic enterprises are deeply involved in the multinational automobile production chain.

³ Decision 319/QĐ-TTg "strategy on development of mechanical sector to 2025 vision 2035"

- Coordinate with relevant stakeholders to study and amend the application of excise tax on cars with 9 seats or less in the direction of not levying an excise tax on the value created in the country. The aim of this is to reduce production costs, lower costs, and improve the competitiveness of domestic cars compared to imported cars.
- Support to promote production projects of large corporations such as Truong Hai Automobile Joint Stock Company (Thaco), Thanh Cong Group Joint Stock Company, Vinfast, and other projects. These are good signals for the increase in the output of domestic manufactured and assembled cars shortly.
- Building a pilot supply chain for the automotive industry for domestic and foreign automobile manufacturers and assemblers.

- **Textile industry**

The garment and textile industry is one of the key industries in Vietnam with the second-largest export turnover in the country. In 2019, the industry's export value contributed 16 percent of the total GDP. In the past five years, the textile industry has continuously grown at an average rate of 17 percent annually

The target towards 2030 for the Textile industry is to ensure that the content of the industrial revolution 4.0 and the signed FTAs are exploited. These targets should be reached by the following measures:

- Develop and complete the Development Strategy of the Textile and Leather Industry in Vietnam, meeting the requirements of industry management in the context of the industrial revolution 4.0⁴
- Implement activities to attract and support investment in the field of textile dyeing, and promote support for dyeing technology to promote the development of the textile industry and raw materials through the construction of industrial parks. Thereby ensuring the principle of the origin of domestic textile and garment products will support the possibilities to make the most of opportunities from signed FTAs.

- **Supported industry**

Building five technical centers to support industrial development (technical centers) according to Articles 17 and 19 of the Law on supporting small and medium-sized enterprises, operating under the self-control mechanism, and self-balancing operating expenses according to the provisions of law. form of public-private partnership PPP, socialization, or state budget in medium-term investment capital for the period 2016-2021 and 2021-2025 in Hanoi, Ho Chi Minh City (Ho Chi Minh City high-tech park). Ho Chi Minh City SHTP) and other localities; The Centers will support enterprises in capacity building, act as technical centers, share machines, provide business improvement services, connect customers, manufacturer test, measure inspection, product quality certification, consulting, and technology transfer for supporting industry enterprises.

Strengthening international cooperation in the development of supporting industries to expand markets and improve the capacity of supporting industry enterprises.

- **Pulp and Paper Industry**

It is necessary to develop policies to encourage the collection of domestic waste paper, simplifying procedures for importing the collection of waste paper. The policies should include measures to support investment capital, information, and communication on the fact of production with less environmental pollution for projects on production of packaging paper in general and production of packaging paper from OCC materials (old cartons) in particular.

Target to 2025: meet the 75% to 80% of domestic demand, reducing the share of imported pulp and paper

⁴ Notification 404/TB-VPCP, 12/2020

2. ENERGY CONSUMPTION AND RELATED GHG EMISSIONS

2.1. ENERGY CONSUMPTION IN THE INDUSTRY

In the period 2016-2019, the total final energy consumption (TFEC) in Vietnam grew strongly by an average of 9.3% per year, reaching 64,543 KTOE in 2019. Due to the impact of the Covid-19 pandemic businesses in most sectors such as industry, transportation, and commercial services stopped working for a longer period or had their operations interrupted. This affected the TFEC in 2020. Thus in 2020 compared to 2019 the growth of the TFEC only increased by 2.28%, reaching 66,014 KTOE.

For industry, in the period 2016-2019 total final energy consumption increased by 16.04% per year, reaching 30,685 KTOE in 2019. The industry accounts for 47.54% of TFEC. In 2020 TFEC in the industry increased by 14.25% compared to 2019, reaching a value of 35,057 KTOE and accounting for 53.11% of the TFEC.

Table 3 below shows the different types of energy consumed by industries in the period 2016-2020.

Table 3: The total final energy consumption of Viet Nam industry sector in the period 2016-2020⁵

Unit: KTOE

Type of energy	2016	2017	2018	2019	2020
Coal	7,324	7,969	12,356	14,486	19,453
Oil products	1,785	1,614	1,593	1,602	1,518
Natural gas	700	763	752	727	757
Biomass	3,523	3,726	3,971	4,101	3,168
Electricity	7,383	8,219	9,102	9,769	10,161
Total	20,715	22,291	27,774	30,685	35,057

Coal is by far the type of energy in the industry that has increased most rapidly. In 2020 the consumption of coal has increased nearly three times more than in 2016. This makes coal the main energy type used in industry. In 2016 and 2017 coal and electricity were the two types of energy that the industry consumed equally and accounted for the highest share of about 35% of the energy consumption each. From 2018 to 2020, coal consumption increased dramatically, so the share of coal consumption was the largest of all types of energy accounting for 55.49% in 2020, while the share of electricity consumption ranked second accounting for 28.98% in 2020. Natural gas is the energy with the lowest share, about 2%.

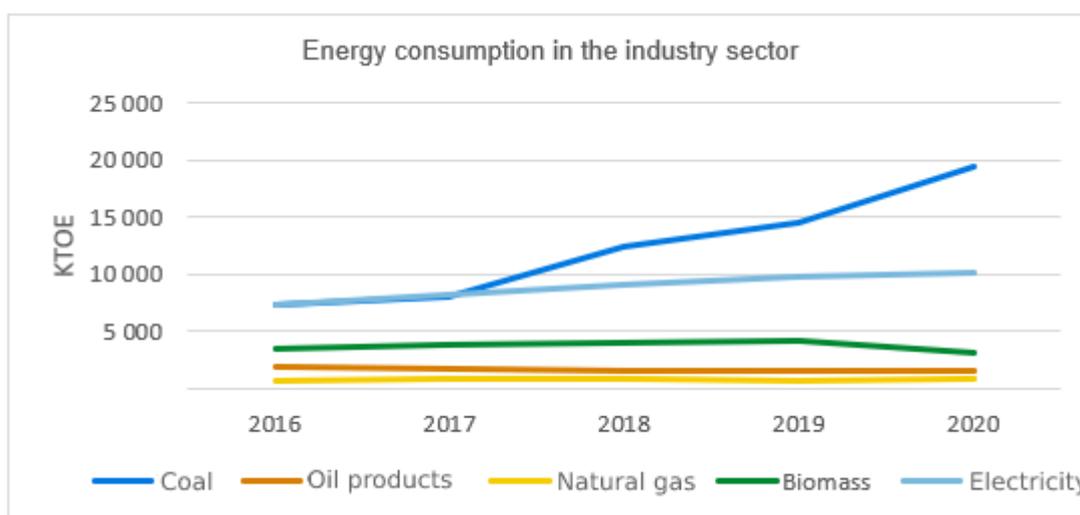


Figure 1. Energy consumption in industry 2016-2020

As shown in Figure 1, in 2017 coal consumption increased by 8.8% compared to 2016. In the period 2017-2020, coal consumption increased more than in the previous period with an average of about 48%

⁵ National energy efficiency program, 2021, "Vietnam Energy Statistic 2020"

per year. In the period 2016-2019, the electricity consumption in the industry increased by an average of 10.77% but in 2020 only increased by 4% compared to 2019.

In the period 2016-to 2019, the biomass consumption in the industry increased by an average of 5.5% per year, but in 2020 it decreased by 22.75% compared to 2019.

Consumption of oil and natural gas products in the industry has remained largely unchanged.

2.1.1. TOTAL ENERGY CONSUMPTION IN THE INDUSTRY

Industry in Vietnam is a rapidly growing consumer of energy. Industry accounts for 54% of final energy demand in 2020, a share that has quadrupled since 2000, and industry now account for nearly 60% of electricity consumption. Total final consumption could, according to Vietnam Energy outlook (VEO), grow over three and half times by 2050.

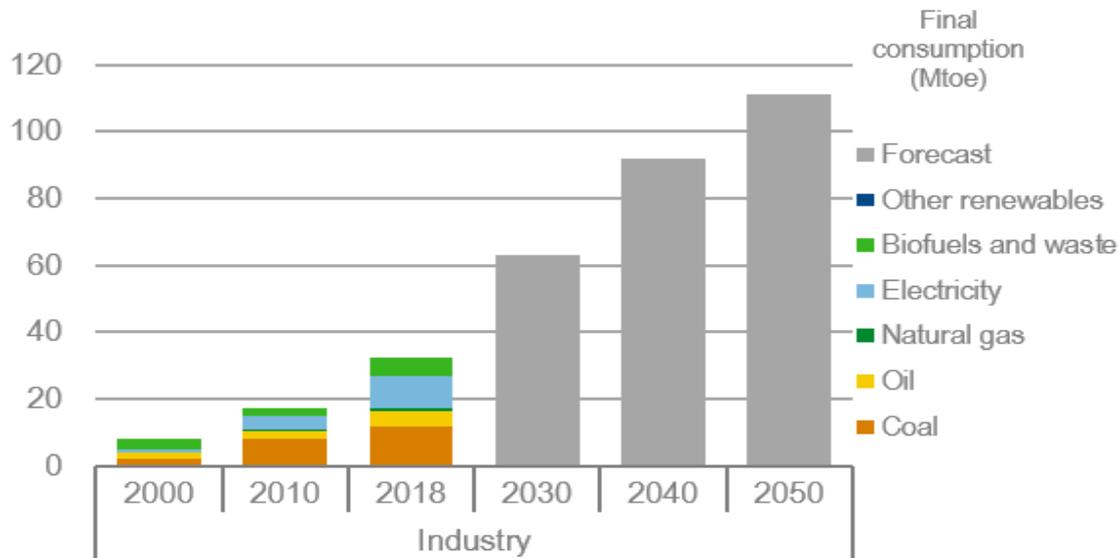


Figure 2: Actual and expected growth in industrial energy consumption (source: OECD 2021a)

While the manufacture of basic metals, mineral products, and chemicals are the largest energy-consuming subsectors, other sectors like textiles, food products, and plastics are also significant energy consumers. Furthermore, the number of enterprises varies significantly between subsectors, making a sector-based approach very relevant in some subsectors, but less in others. This is illustrated by the charts below.

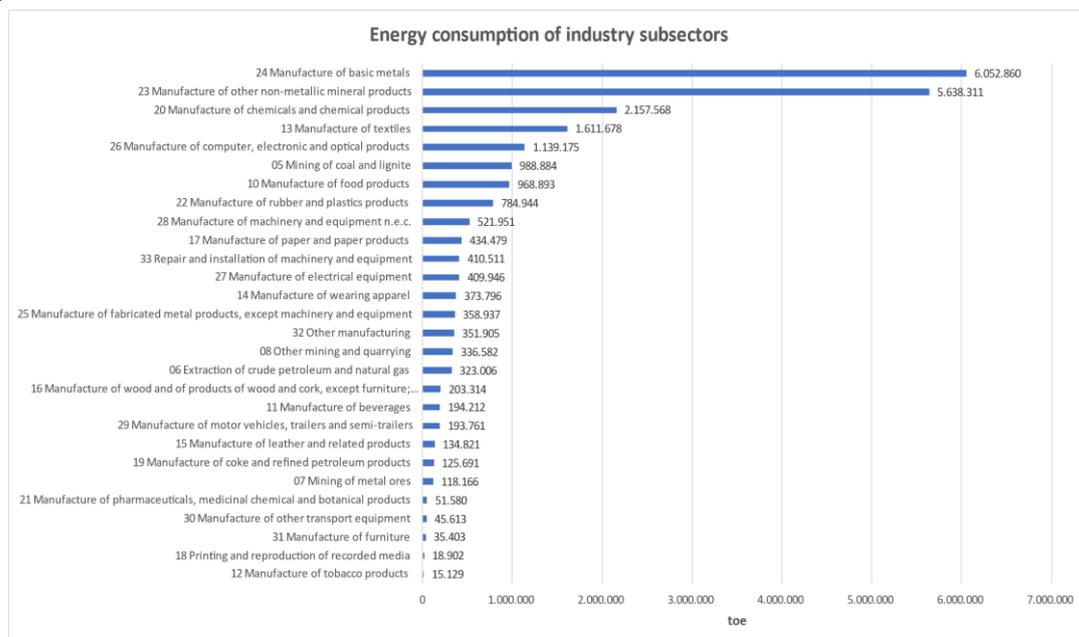


Figure 3: DEU energy consumption 2019 by industry subsector (source: DEU reporting to MOIT)

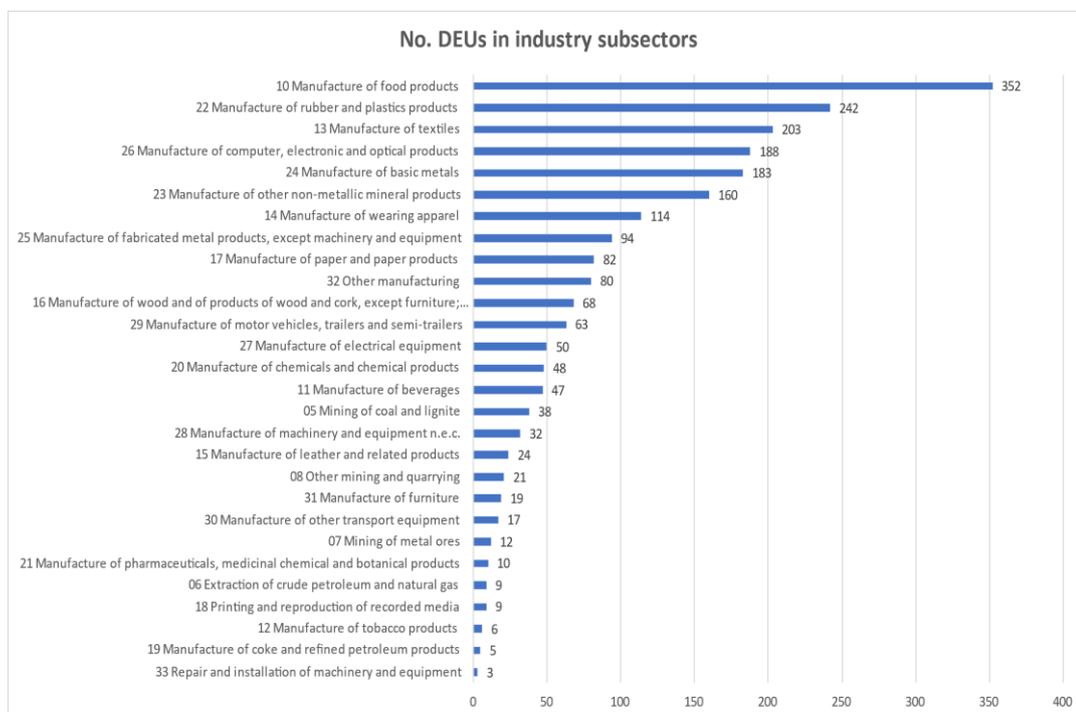


Figure 4: Number of DEUs 2019 by industry subsector (source: DEU reporting to MOIT)

2.1.2. ENERGY CONSUMPTION BY SUB-SECTOR

In the period 2016-2020, energy consumption in the industry increases from 20,715KTOE in 2016 to 35,057KTOE in 2020 with an average growth rate of about 17% per year. The single largest contributing sub-sector was the Production of non-metallic mineral products. The energy consumption of this sub-sector accounts for the highest share of energy consumption (27.15% in 2016 and 35.87% in 2020) and increases rapidly over the years. Followed by the metal industry, the textile industry, and the food and beverage industry which also had an increase in energy consumption in the period. Therefore, the share of the energy consumption of these sub-sectors tends to decrease.

Table 4: Energy consumption in the industrial sub-sector in the period 2016-2020⁶

Unit: KTOE

Sub-sector	2016	2017	2018	2019	2020
Mining	1,034	1,116	1,352	1,358	1,459
Food, beverage and tobacco processing	2,272	2,450	2,699	3,079	3,071
Textile	2,943	3,019	3,867	4,176	4,226
Wood and products from wood	302	350	405	441	435
Pulp and paper	663	843	1,402	1,507	1,599
Chemical production	1,498	1,352	1,874	2,049	2,212
Metal production	3,324	3,523	3,758	3,905	4,050
Manufacturing machinery and equipment	890	1,129	1,223	1,239	1,226
Manufacturing products from other non-metallic minerals	5,625	6,251	8,516	9,731	12,576
Producing motor vehicles	126	146	153	166	160
Construction	775	644	646	637	586
Other industrial subsectors	1,263	1,468	1,879	2,396	3,458
Total	20,715	22,291	27,774	30,685	35,057

⁶ National energy efficiency program, 2021, "Vietnam Energy Statistic 2020"

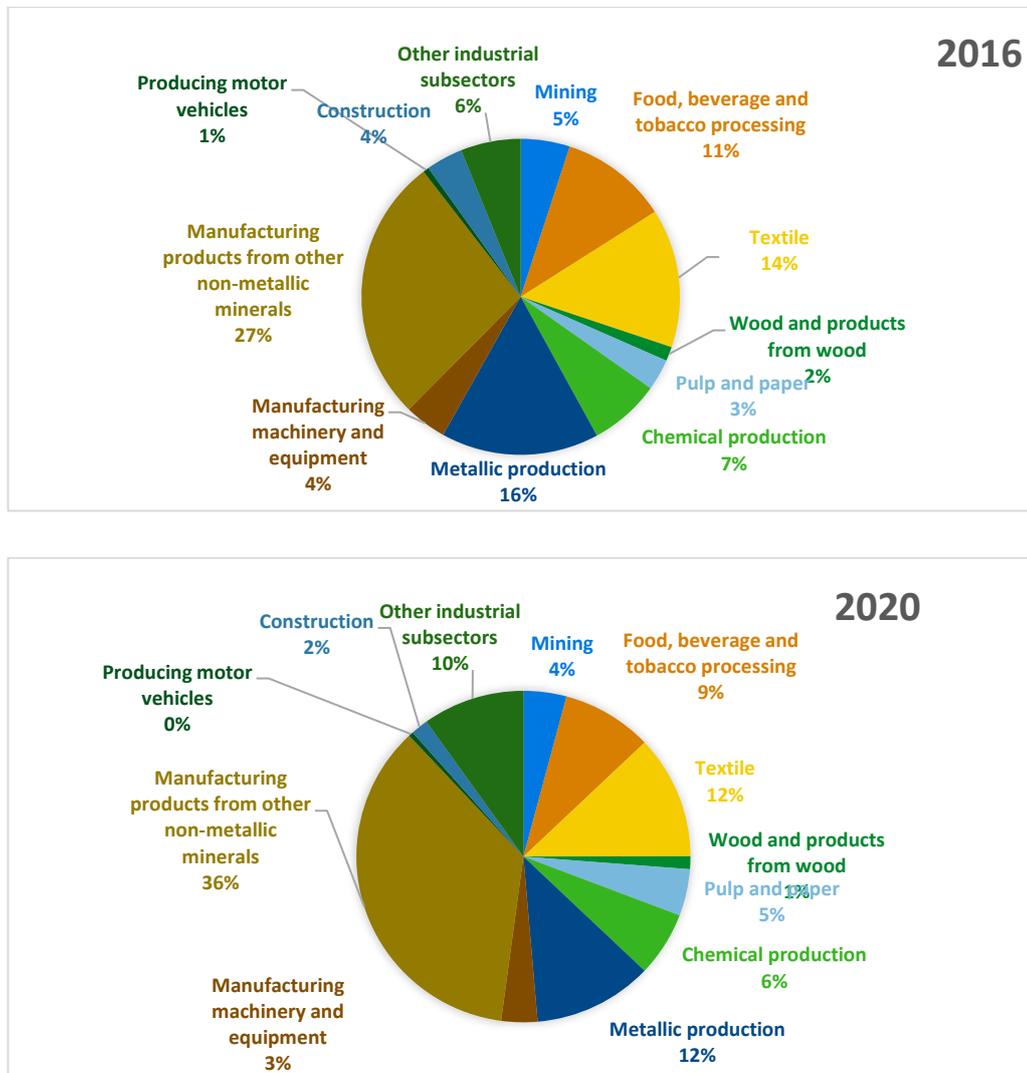


Figure 5: Energy consumption by sub-sector in 2016 and 2020

2.2. EMISSION

Scope 1 emissions are direct GHG emissions from operations in which they have an equity interest.

Scope 2 emissions are indirect emissions from the generation of purchased energy at these operations

Scope 3 emissions are indirect GHG emissions generated as a result of activities undertaken either upstream or downstream of industry operations.

So in this report, we only focus on calculation emissions by scope 1 and scope 2. Although emission by scope 3 is the panorama picture of emissions from the extraction to the consumption, it's difficult to estimate emissions of the downstream industry operation due to a lack of data.

2.2.1. SCOPE 1 EMISSIONS

The scope emissions are divided by the emissions from the different types of fuel consumption

Emission by coal consumption in the industrial subsector

From coal consumption data of sub-industries and coal use emission coefficient of 98.3tCO₂/TJ (IPCC2006), the volume of emissions generated by the industry is determined in Table 5. The number of emissions of coal consumption in the industry sector reached about 81 million tons in 2020, nearly triple that of 2016.

Table 5: Emission by coal consumption in the industrial subsector in 2016-2020

unit: ton CO₂

Subsector	2016	2017	2018	2019	2020
Mining	307,444	866,228	1,518,228	1,761,140	2,364,955
Food, beverage and tobacco processing	1,342,020	1,420,126	2,205,451	3,015,249	4,049,313
Textile	3,198,887	2,923,214	5,315,015	6,162,767	8,274,895
Wood and products from wood	1,952	2,440	3,899	4,654	6,120
Pulp and paper	666,130	,880,868	2,273,686	2,635,587	3,540,088
Chemical production	1,769,026	1,405,485	2,843,935	3,296,933	4,426,335
Metallic production	3,118,365	2,791,450	3,813,846	4,418,772	5,934,422
Manufacturing machinery and equipment	5,124	5,856	8,529	9,798	13,220
Manufacturing products from other non-metallic minerals	18,022,102	20,384,415	29,443,381	34,343,462	46,119,077
Producing motor vehicles	7,808	9,272	2,437	2,939	3,917
Construction	68,321	53,682	116,974	134,719	181,166
Other industrial subsectors	1,647,024	2,066,746	3,326,454	3,855,403	5,177,930
Total	30,154,203	32,809,782	50,871,837	59,641,423	80,091,440

Emission by oil products in the industrial subsector

The emission rate of diesel oil (DO) is 74,1tCO₂/TJ, the emission rate of fuel oil (FO) is 77,4tCO₂/TJ and LPG is 64,2tCO₂/TJ (IPCC 2006). Carbon dioxide emission from oil products has experienced a gradual decrease and reached about 4,5 million tons of CO₂ in 2020. The emission as below

Table 6: Emission by oil production-consumption in the industrial subsector in 2016-2020

Unit: ton CO₂

Subsector	2016	2017	2018	2019	2020
Mining	1,142,596	863,419	832,376	826,627	702,668
Food, beverage and tobacco processing	313,509	261,637	228,263	224,575	218,986
Textile	155,756	146,984	165,106	167,819	152,948
Wood and products from wood	66,207	69,917	67,251	67,325	56,973
Pulp and paper	104,256	76,865	59,255	60,767	54,995
Chemical production	222,118	201,683	256,292	252,858	273,267
Metallic production	413,205	481,743	455,074	462,523	486,989
Manufacturing machinery and equipment	274,036	406,528	401,304	17,558	425,467
Manufacturing products from other non-metallic minerals	703,527	652,344	681,411	674 523	742,367
Producing motor vehicles	197,263	246,158	229,193	239,875	234,573
Construction	1,730,251	1,319,205	1,288,405	1,281,485	1,090,289
Other industrial subsectors	89,044	126,930	109,429	09,270	102,247
Total	5,411,768	4,853,414	4,773,360	4,785,204	4,541,768

Emission by natural gas consumption in the industry

Using the emission rate of natural gas is 15,3tCO₂/PJ, the CO₂ emit by consumption of natural gas in the industrial subsector rose steadily from 2016 to 2020 and reached nearly 1,8 million tons.

Table 7: Emission by natural gas consumption in the industrial subsector in 2016-2020

Unit: ton CO₂

Subsector	2016	2017	2018	2019	2020
Mining					
Food, beverage and tobacco processing	25,381	25,396	44,491	40,237	42,314
Textile	8,460	5,503	10,169	9,106	10,579
Wood and products from wood					
Pulp and paper	5,922	7,831	11,652	10,589	10,579
Chemical production	653,565	653,959	677,956	720,029	748,961
Metallic production	492,818	577,770	586,856	533,668	554,316
Manufacturing machinery and equipment	29,611	38,095	52,965	46,590	48,661
Manufacturing products from other non-metallic minerals	414,559	469,835	349,571	317,660	330,051
Producing motor vehicles	13,114	13,968	27,542	25,413	27,504
Construction	1,269	212	424		
Other industrial subsectors	635	847	5,932	5,506	6,347
Total	1,645,334	1,793,415	1,767,559	1,708,797	1,779,312

2.2.2. SCOPE 2 AND 3 EMISSION

Scope 2: emission from producing the electricity used in the industry

The grid emission of electricity is calculated by the Ministry of resources and Environment in 2019 as equal to 0.8458 tons CO₂/MWh. Carbon dioxide emissions from of generation electricity increased gradually and reached about 100 million tons in 2020.

Table 8: Emission by electricity consumption in the industrial subsector in 2016-2020

Unit: ton CO₂

Subsector	2016	2017	2018	2019	2020
Mining	5,738,753	6,071,998	6,938,943	6,444,150	6,402,706
Food, beverage, and tobacco processing	13,311,200	14,076,649	15,003,646	15,839,297	14,737,219
Textile	9,710,630	10,727,281	12,042,500	12,937,357	11,337,103
Wood and products from wood	2,730,242	3,179,362	3,724,903	4,085,214	4,051,382
Pulp and paper	2,269,281	2,451,974	2,693,027	2,813,131	2,820,743
Chemical production	963,366	1,068,245	1,199,344	1,612,941	1,877,676
Metallic production	11,024,157	12,972,035	14,707,616	14,834,486	14,569,751
Manufacturing machinery and equipment	7,615,583	9,439,974	10,337,368	10,454,088	10,302,690
Manufacturing products from other non-metallic minerals	8,171,274	8,611,936	9,643,812	10,034,571	9,638,737
Producing motor vehicles	488,872	513,401	597,981	690,173	640,271

Subsector	2016	2017	2018	2019	2020
Construction	1,899,667	1,949,569	1,903,896	1,797,325	1,806,629
Other industrial subsectors	8,127,292	8,986,625	10,068,403	13,870,274	21,134,850
Total	72,050,319	80,049,049	88,861,440	95,413,006	99,319,757

Total CO2 emissions from the final energy consumption in the industrial sub-sectors from 2016-to 2020 are shown in the table below

Table 9: Total CO2 emission from fuel consumption in the industrial subsector from 2016-to 2020

Unit: ton CO2

Subsector	2016	2017	2018	2019	2020
Mining	7,188,793	7,801,645	9,289,547	9,031,917	9,470,330
Food, beverage, and tobacco processing	14,992,110	15,783,808	17,481,852	19,119,357	19,047,832
Textile	13,073,732	13,802,982	17,532,791	19,277,048	19,775,525
Wood and products from wood	2,798,402	3,251,719	3,796,053	4,157,193	4,114,476
Pulp and paper	3,045,589	3,417,538	5,037,620	5,520,073	6,426,405
Chemical production	3,608,075	3,329,373	4,977,528	5,882,761	7,326,239
Metallic production	15,048,546	16,822,997	19,563,392	20,249,450	21,545,477
Manufacturing machinery and equipment	7,924,354	9,890,453	10,800,166	10,928,034	10,790,038
Manufacturing products from other non-metallic minerals	27,311,462	30,118,530	40,118,175	45,370,216	56,830,232
Producing motor vehicles	707,057	782,799	857,153	958,400	906,265
Construction	3,699,508	3,322,668	3,309,698	3,213,529	3,078,084
Other industrial subsectors	9,863,995	11,181,148	13,510,219	17,840,454	26,421,374
Total	109,261,624	119,505,660	146,274,195	161,548,431	185,732,277

The data shows a trend in a gradual increase of CO2 emissions from industry. From 2016-to 2020 the CO2 emission from energy consumption in the industry in Vietnam has nearly doubled due to the development of the industry.