Slovak Environmental Agency
Banská Bystrica

Industry and its Impact on the Environment in the Slovak Republic 2009

Indicator Report

2010

Dipl. Eng. Juraj Vall

Contents

Foreword

Report Industry and its Impact on the Environment in the Slovak Republic as of 2009 is one of task outcomes listed in main task program of the Slovak Environmental Agency and Ministry of Environment of the Slovak Republic that is titled as Assess Effects of Selected Sectors in Economic Activities on Environment and Implementation of Environmental Aspects into Sectoral Policies. This has been already the third report. The first report was completed in 2005 and the second in 2007.

Within the task in 2005, sets of indicators and indicative sectors 'reports were completed for agriculture, forestry, transportation, energy, industry, and tourism. The reports, in full, assess a correlation between economical sector and environment through environmental indicators and are focused on key questions and issues. Document was submitted for comments within relevant resort, other resorts, and at routine daily meeting of Ministry of the Environment. Further work procedure was approved and adopted at the daily routine meeting. The Slovak Environmental Agency was instructed to proceed in the assessment through updating of indicators database in a year interval and summary sectoral reports in two-year intervals. At the same time, an obligation to publicize the indicators and reports on the webpage was laid: www.enviroportal.sk/sektor/.

The cover illustration: Viewing the ZSNP in Žiar nad Hronom from the sky; Author: Peter Borgula

Executive summary

What is the present state and direction of the Industry in the Slovak Republic?

Trends in Industry

- Share of mining and quarrying, manufacturing and electricity, gas, steam, and cold air supply on **turnover in industry** reduced in 2009 compared to the year 2000. The share of water supply (wastewater treatment and sewerage) and waste collection on turnover in the industry increased in 2009 compared to the 2000. *(Indicator Turnover in industry)*
- In 2009, 497 833 people in average **worked in the industry** and of it; 447 685 (89,9 %) in the manufacturing; 21 609 (4,3 %) in the water supply (wastewater treatment and sewerage), and waste collection; 20 505 (4,1 %) in the electricity, gas, steam and cold air supply, and 8 034 (1,6 %) in the mining and quarrying. In 2009, averaged accounting number of employees decreased by 15 % compared to the 2008 and by 9,6 % compared to the 2000. *(Indicator Number of employees in industry)*
- In 2009, the **highest labour productivity** on turnover in the industry was in the electricity, gas, steam and cold air supplies in the total amount of EUR 522 912,04; EUR 115 394,11 in the mining and quarrying; EUR 65 306,30 in the manufacturing; EUR 41 294,39 in the water supply (wastewater treatment and sewerage) and waste collection. *(Indicator Labour productivity in industry)*
- In 2009, **added value** prices in the industry **increased by** 159,8 % compared to the 1995 and reached the amount of EUR 14 696, 14 millions. *(Indicator Added value in industry)*
- Share of the industry on the **SR Gross Domestic Product** was 25,1 % in 1997 and increased to 35,3 % in 2009. *(Indicator Share of industry in the growth of the GDP)*
- From 2000 to 2008, **industrial production index** slightly **increased.** However through the year of 2009, the industrial production index **decreased by** 14, 6 %, which was by 16, 1 % in the manufacturing and 7,7 % in the electricity, gas, steam, and cold air supplies. *(Indicator Industrial production index)*
- In 1993, 57 722 of the **economic units** acted in the industry and their number increased to 78 108 (increase by 35,3 %) in December of 2009. *(Indicator Economic entities by legal forms in industry)*
- **Arrangement of industrial establishments** in individual regions of the Slovak Republic is unbalanced. In 2009, the most industrial establishments were in the Trenčín Region (425 enterprises) and the least industrial establishments were in the Košice Region (258 enterprises). *(Indicator Industrial enterprisers by regions)*
- In 2001, industry participated by 35,8 percent **on final energy consumption of fuels, electricity, and heat** within the national economics and the share of the industry reached the level of 36 % in 2008. In 2008, total consumption of solid fuels **decreased** by 17 % compared to the year of 1994 and reached the volume of 9 924 666 tons. *(Indicator Final energy consumption of fuels, energy, and heat in industry)*
- In 2008, **total liquid fuels consumption** in the industry **decrease**d by 67,3 % compared to the year of 1994 and reached the volume of 558 470 tons. *(Indicator Consumption of solid fuels in industry)*
- In 2008, **total gas consumption** in the industry **decreased** by 37,4 % compared to the year of 1994 and reached the volume of 2 859 982 m^3. *(Indicator Consumption of*

gaseous fuels in industry)

- **Electricity consumption** in 2008 was 16 556 336 MWh and **increased** by 17,6 % compared to the year of 1994. *(Indicator Consumption of electricity in industry)*
- In 2008, total **heat consumption** in the industry increased by 177,9 % compared to the 1994 and reached the volume of 293 060 386 GJ. *(Indicator Consumption of heat in industry)*

What is the Industry Impact on the Environment in the Slovak Republic?

Air

- From 1990 to 2008, aggregated greenhouse gas emissions from industrial processes had a slightly **increasing** trend. In 2008, emissions from the industrial processes increased by 6,3 % compared to the 1990 and decreased by 2, 5 % compared to the 2007. *(Indicator Greenhouse gases emissions from industrial processes)*
- CO emissions from the industry made up as much as 98,8 % of large-size and middle-size stationary sources in 2008 and emissions **increased** by 21,4 % compared to the 1998. *(Indicator CO emissions from industry)*
- SO_2 emissions from the industry made up as much as 99 % of large-size and middle-size stationary sources in 2008 and emissions **decreased** by 57,6 % compared to the 1998. *(Indicator SO_2 emissions from industry)*
- NO_x emissions from the industry made up as much as 99,1 % of large-size and middle-size stationary sources in 2008, and emissions **decreased** by 55 % compared to the 1998. *(Indicator NO_x emissions from industry)*
- Emissions of solid particle contaminants (SPC) from the industry made up as much as 93,5 % of large-size and middle-size stationary sources in 2008 and emissions **decreased** by 78,2 % compared to the 1998. *(Indicator Solid containment particles from industry)*
- Heavy metals emissions from the industry have a **decreasing** trend since 1990. *(Indicator Hard metal emissions from industry)*
- Emissions of non-methane volatile organic compounds (NM VOC) from the industry have a **decreasing** trend. *(Indicator Non-methane volatile organic compounds emissions from industry)*
- Emissions of persistent organic pollutants (POP_s) from the industry have a **fluctuant** trend since 1990. *(Indicator Persistent organic pollutants from industry)*

Water

- Abstraction of surface water by industry has a **decreasing** tendency. *(Indicator Abstraction of ground water in industry)*
- Abstraction of underground water by industry has a **decreasing** tendency. *(Indicator Abstraction of underground water in industry)*

Soil

- Agricultural soil loss for industrial construction purposes has an **increasing** trend. *(Indicator Soil loss due to industrial development)*

Waste

- The industry has been **the largest** producer of the waste for a long time. *(Indicator Waste generation in industry)*

Consequence – Quality of Working Environment, Occurrence of Sick Leave

- Number of sick leaves cases due to sickness and injury in industry **decreases.** *(Indicator Sick leave cases due to sickness and injuries in industry)*

Response – Environment Protection Costs

- Investing into the environmental protection in the industry has a **fluctuant** trend. *(Indicator Investments into environment protection in industry)*
- The amount of regular costs for the environmental protection in the industry has a **fluctuant** trend. *(Indicator Regular costs for environment protection in industry)*

Is the eco-efficiency of the Industry improving in the Slovak Republic?

- Environmental efficiency of the industry in relation to fuel consumption is characterized by a positive trend in the consumption of fuel wood, liquid fuels (heavy fuel oil), and solid fuels (brown coal and lignite, black coal, and coke). (Index 1997) *(Indicator Environment efficiency in terms of selected fuel consumption)*
- Environmental efficiency of the industry in relation to natural gas consumption is characterized by a **positive** trend. In relation to electricity consumption and heat consumption, it has a **slightly negative** and **negative** trend. (Index 1997) *(Indicator Environment efficiency in terms of gas, electricity, and heat consumption)*
- Environmental efficiency of the industry in relation to greenhouse gases emissions from industrial processes has a **slightly positive** trend (Index 1997). *(Indicator Environment efficiency of industry in terms of greenhouse gas emissions from industrial processes)*
- Environmental efficiency of the industry in relation to basic polluting substances (SO_2, NO_x, solid particle contaminants) generated by the industrial processes has a **positive** trend and in relation to CO emissions it has a **slightly negative trend** (Index 1998). *(Indicator Environment efficiency in terms of basic polluting substances from industry)*
- Environmental efficiency of the industry in relation to water usage in the industry has a **positive** trend (Index 2000*). (Indicator Environment efficiency in terms of water usage in industry)*
- Environmental efficiency of the industry in relation to volume of produced waste is characterized by a **positive trend** (Index 2000) [1] *(Indicator Environment efficiency of industry in terms of waste generated by industry)*

* As the Statistical Office of the Slovak Republic did not publish all industrial data to November 30, 2010 by Revised classification of the economical activities (SK NACE Rev. 2), some of indicators were still processed by sector classification of the economical activities (OKEČ) – Added Value in Industry and Share of Industry in the GDP.

1. Introduction

Indicator Report **Industry and its Impact on the Environment in the Slovak Republic as of 2009** is a third report and it is focusing on evaluation of the industry as the most important economic sector in Slovakia, and environment with its aspects, which are in the process of being implemented in the industrial policy.

Quality changes, which are running in the worldwide economics, are also reflected in an approach to industrial policy. Processes leading towards new economics and **globalization** started to make their presence felt in the world's economy in the 1990s. They were based on a wide spectral penetration of information and communication technologies into all spheres of society's life. In the globalized economic area, traditional industrial policy changed for competitiveness policy.

Integration of environmental policy into sectoral policies commenced at the European Council Summit in Cardiff in 1998. It represents an all-European process, in which environmental purposes and goals are reflected in the sectoral policies and which aims to provide a permanently sustainable development. Primary objective of this process is to ensure a shift from traditional approach in political practice, where environmental measures were completed only as a response to damage caused by activities of business sectors in the environment („end of pipe"), to policies with implemented preventive measures minimizing negative consequences to maximum possible extent.

Competitiveness – is an ability of national economics to provide high living standard and high employment to all countries habitants at permanently sustainable development. The competitiveness is an essential ambition of the European Union. At its meeting in Lisbon in spring of 2000, the European Council set itself a new strategic goal to become the most competitive economy in the world by 2010.

Since a spring summit of the European Council in 2005, each member state of the European Union has a responsibility to fulfil objectives of the Lisbon's strategy and guide the national economy toward higher competitiveness itself.

In its Communication from 2005, the European Commission set out for the first time **New Integrated Approach to Industrial Policy** based on a concrete work programme of horizontal and sectoral initiatives. This policy, which is an important pillar of the Lisbon strategy, is anchored in the EU's drive to ensure a well – functioning internal market as well as open and competitive markets across the world, and **respond to environmental challenges.** The European Commission endorsed the approach of this new industrial policy in its Communication in 2007 (Mid-Term Review of Industrial Policy – A Contribution to the EU's Growth and Jobs Strategy).

The main **role** of the EU industrial policy is to enforce an integration of permanently sustainable development with activities such as enterprise development and innovations that support competitive ability within the EU. The environmental challenges directly depend on an economical development. The main **task** of the industrial policy at EU level is to actively provide the right framework conditions for enterprise development and innovations.

An effective and functioning industrial policy in the EU must be based on coherent and coordinated efforts at national and European level as recognized in Article 157 of the EC Treaty. Many elements of major impact for the competitiveness of the European industry are set at national level.
Nevertheless, important challenges such as the creation of an open and competitive single market, but also the industrial policy respond to the energy and **climate change** agenda cannot, or only be insufficiently addressed at national level, and hence require action at the European level as well.

2. Methodology

The sector indicators report is based on a methodology implemented by the European Environment Agency, established in Copenhagen (EEA). It is a process; in which implementation of the environmental aspects into economic activities sectors and sector's impact on the environment is assessed through the indicators analyses. The evaluation process is focused on two stages:

1. Stage: Preparation and processing of a list of aggregated and individual indicators by D-P-S-I-R model;
2. Stage: Writing the indicators sector report.

The report uses **revised classification of economy activities** (SK NACE Rev. 2) as a methodological tool for a purpose of hierarchical classification of economy activities of legal enterprises in the domestic trade of the Slovak Republic by main branches of economy activities regardless of type of ownership and used technologies. The classification of economical activities according to the SK NACE Rev. 2 started to be exercised from January 1, 2008 (Public Notice of the Statistical Office of the Slovak Republic # 306/2007 Coll.).

B Category:	**Mining and Quarrying**
C Category:	**Manufacturing total, and of it:**
	CA – Production of food, drink and tobacco
	CB – Production of fabric, clothing, leather and leather products
	CC – Production of wooden and paper products, printing
	CD – Production of coke and refined oil products
	CE – Production of chemicals and chemical products
	CF – Production of basic pharmaceutical products and pharmaceutical preparations
	CG – Production of products made of rubber and plastic, and other non-metallic mineral products
	CH – Production of metals and steel structures except for machines and equipment
	CI – Production of computing, electronic, and optical products
	CJ – Manufacturing of electrical equipment
	CK – Manufacturing of machines and equipment nowhere else listed
	CL – Manufacturing of transportation means
	CM – Other production, repair, and installation of machines and equipment
D Category:	**Supply of electricity, gas, steam, and cold air**
E Category:	**Supply of water; cleaning and discharge of waste water, waste, and waste management service**

Chain of causal indicator links according to the DPSIR model is a methodological tool for integrated assessment of the environment. Within individual chain links, the aggregated and individual indicators are defined as following:

- **Driving forces (D)** – they are starting mechanisms of processes in a society and they initiate
- **Pressure (P)** with an negative impact on the environment (contamination, depletion of mineral sources) or a positive impact, which is an immediate cause of changes in the
- **State of the environment (S).** Deterioration of the environment's state - its elements usually cause a negative
- **Impact (I)** to human health, biodiversity, functions of eco-systems, and it logically leads to formulating of measures and tools concentrated on elimination or remedy of environmental damages in the last chain link- and it is
- **Response (R)**

The analyzed individual industry-environmental indicators of the Slovak Republic in the D-P-S-I-R structure are in detail available at the web page. It includes description of the indicator,

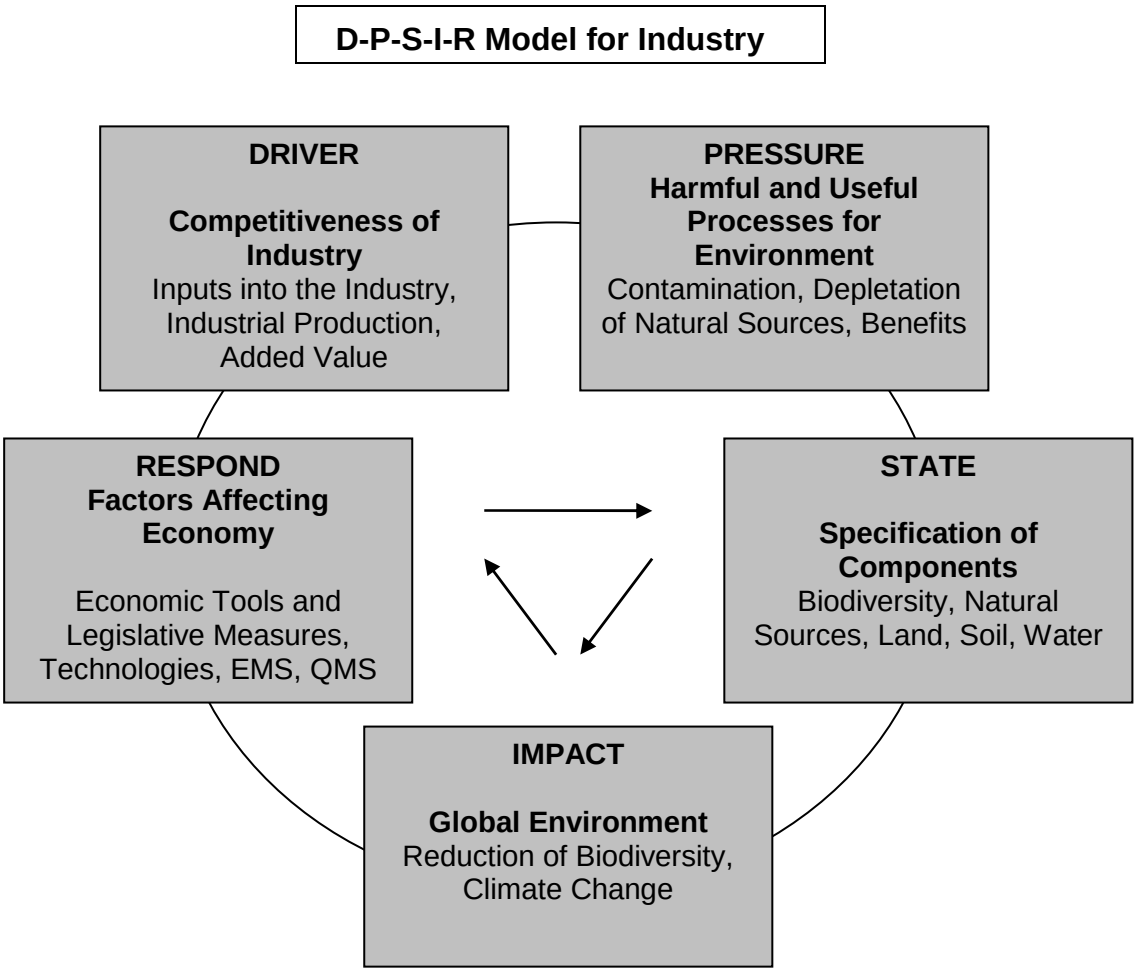
trend assessment, and identified political objectives in relation to indicator, international comparison, and reference to topics.

The set of environmental indicators, arranged by D-P-S-I-R model, serves as a theoretical base for preparation of **indicators sector report.** The main priority of the report is to understand **causal-consequential correlations** between an activity of human being and state of the environment by means of D-P-S-I-R causal chain link and in such way to offer an innovative view of the state and trend in the environment through the integrated assessment.

The indicators sector report is focused to answer four key political questions:

1. What is current status and trend of industry in the Slovak Republic?
2. What impact does industry have on environment in the Slovak Republic?
3. Is the eco-efficiency of the Industry improving in the Slovak Republic?
4. Do actual legislative and financial mechanisms support the implementation of environmental measures into industry in the Slovak Republic?

The D-P-S-I-R model for the power engineering is a simplified formulation of reality. There are more existing correlations and factors (e.g. social and economic), which have significant effects on the environment and they are not included within the model.

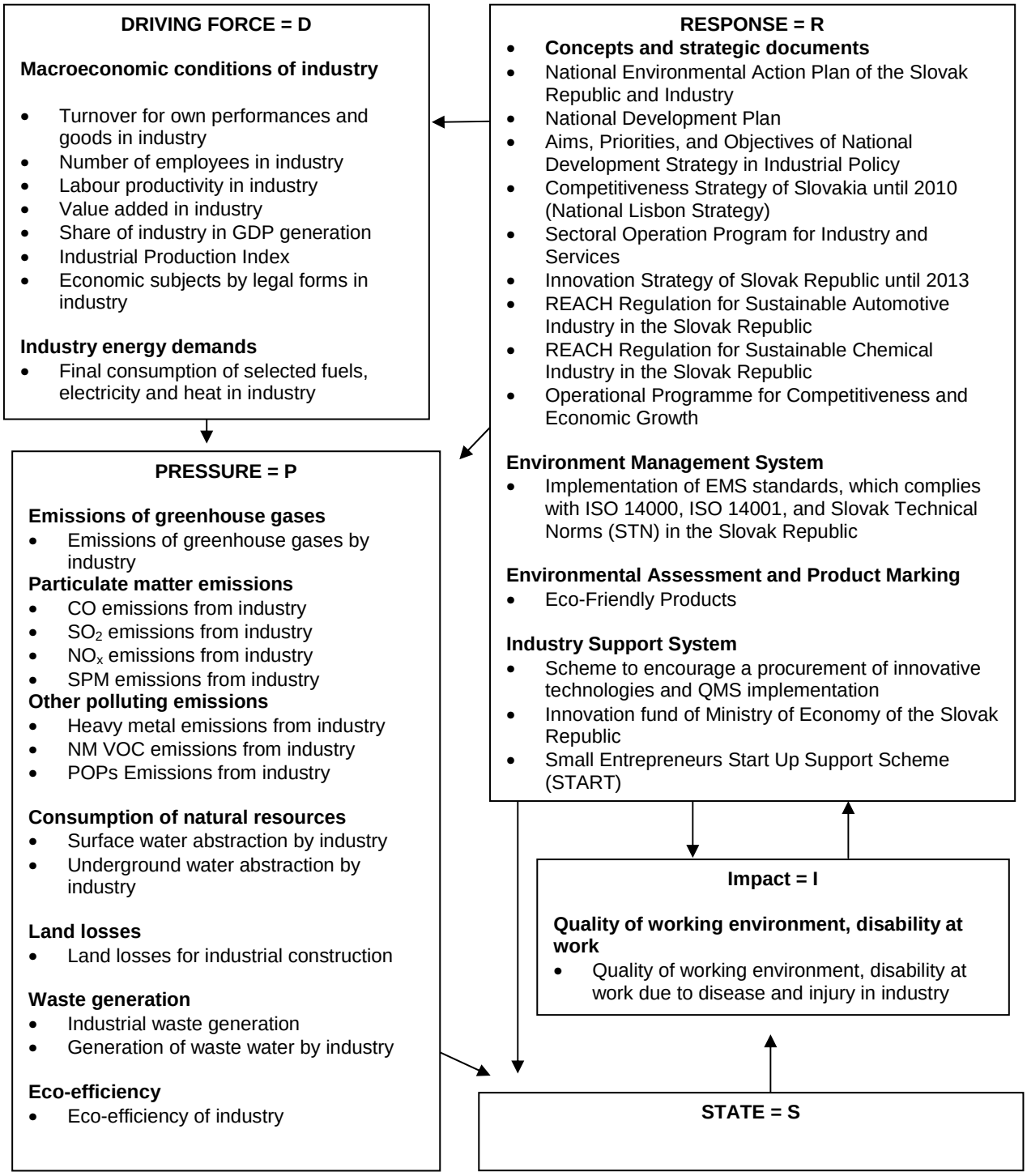


The list of aggregate and individual indicators in the industry under the DPSIR model

DPSIR reference	Aggregated indicators	No.	Individual indicators
Driving forces	**Macroeconomic conditions of industry**	1.	Turnover for own performances and goods in industry
		2.	Number of employees in industry
		3.	Labour productivity in industry
		4.	Value added in industry
		5.	Share of industry in GDP generation
		6.	Industrial Production Index
		7.	Economic subjects by legal forms in industry
		8.	Number of industrial enterprises in regions
	Industry energy demands	9.	Final consumption of selected fuels, electricity and heat in industry
	Consumption of selected fuels, electricity and heat in industry	10.	Consumption of solid fuels by industry
		11.	Consumption of liquid fuels by industry
		12.	Consumption of natural gas by industry
		13.	Consumption of electricity by industry
		14.	Consumption of heat by industry
Pressure	**Emissions of greenhouse gases**	15.	Emissions of greenhouse gases by industry
	Emissions of particulate matter emissions	16.	CO emissions from industry
		17.	SO_2 emissions from industry
		18.	NO_x emissions from industry
		19.	SPM emissions from industry
	Other polluting emissions	20.	Heavy metal emissions from industry
		21.	NM VOC emissions from industry
		22.	POPs Emissions from industry
	Consumption of natural resources	23.	Surface water abstraction by industry
		24.	Underground water abstraction by industry
	Land losses	25.	Land losses for industrial construction
	Waste generation	26.	Industrial waste generation
		27.	Generation of waste water by industry
	Eco-efficiency	28.	Eco-efficiency of industry with regard to consumption of selected fuels
		29.	Eco-efficiency of industry with regard to consumption of natural gas, electricity and heat
		30.	Eco-efficiency of industry with regard to emissions of greenhouse gas emissions from industrial processes
		31.	Eco-efficiency of industry with regard to particulate matter emissions
		32.	Eco-efficiency of industry with regard to water abstraction
		33.	Eco-efficiency of industry with regard to industrial waste generation
State	-		-
Impact	**Quality of working environment, disability at work**	34.	Disability at work due to disease and injury in industry
Responses	**Harmonisation of classification and labelling of chemical substances**	35.	Prohibited or strictly limited use of chemical substances
	Environmental protection expenditure	36.	Environmental investments by industry
		37.	Current environmental expenditure by industry
	Research, development and innovations	38.	Gross domestic expenditure on R&D by industry
		39.	Number of enterprises with innovation activity in industry
		40.	Innovation expenditure by industry

*D - driving force *P - pressure *S - state *I - impact *R - response

Chain of causal indicator links according to the DPSIR model in the sector of industry



3. Policy framework in EU

At present, the industrial policy of the European Union is interlinked to many other policies such as research and development policy, policy for educational development, competitiveness policy, or environment policy. Compared to policy for economic competition or agricultural policy, the industrial policy is much less developed. At the European level, this policy is not coordinated. Controlling powers for this area lay on relevant authorities within single members of the European Union.

The base of the European Union industrial policy is originated in the Treaty Establishing the European Community, in which its essential principles are defined. The European Union attempts to create favourable conditions for industrial development, and healthy competitiveness environment. Thereafter, it is up to industry and specific enterprises to utilize these options.

In the Treaty, the following four principles are defined:

- Accelerate the process of adaptation to industrial structural changes;
- Create an environment favourable for initiatives and business development within entire community;
- Encourage environment favourable for cooperation between enterprises;
- Maintain better utilization of potentials of innovative, research and technology development.

In general, steps to achieve these objectives are not depending on funding from the EU. The European Union endeavours to create legislative and institutional environment, which would be favourable for providing competitiveness of European enterprises as well as an effective system for the technical standardization. Furthermore, it tries to stimulate the European industry by a usage of new technologies and innovations focusing on quality strategy so it can better adapt to global economic. Where needed, the EU supports a restructuring the industry (defence, steelmaking industry, textile industry) or stimulates the competitiveness of new industrial branches (cosmic research, biotechnologies, and nanotechnologies). The important factors supporting the competitiveness of the European industry are a single market and competition policy of the European Union.

General industrial policy principles in the European Union were laid down in a document "**Industrial Policy in an Open and Competitive Environment: Guidelines for a Community Approach**" in October of 1990. Instruments of the industrial policy are to provide framework conditions enabling entrepreneurs and enterprises to overtake an initiative, use ideas and run an experience based business. An extraordinary attention is given to three factors of the industrial competitiveness: knowledge, innovations, and enterprising spirit.

In compliance with conclusions adopted at the Summit of the European Union in Goteborg in June of 2001, the Directorate – General for Enterprise and Industry in its **European Competitiveness Report** in 2002 determined a set of indicators which is to be used to asses environmental efficiency of the industry in the member states of the EU (COM [2002] 262). The European Commission issues reports on Environmental Impact of Industry once in two years. The document contains six environmental indicators related to industrial production:

- Manufacturing emissions of the acidifying gases;
- Emissions of ozone-precursors;
- Industrial greenhouse gas emissions;
- Production of ozone-depleting gases;

- Industrial energy consumption; and
- Industrial consumption of raw materials.

The commencement of the process to examine suitability and balance in the application of industrial policy in an enlarged Europe is considered to be Communication **Industrial Policy in an Enlarged Europe** (COM [2002] 714), which was adopted by the European Commission in December of 2002. In this Communication, the member states and candidates are challenged to examine industrial policies at the national level in a way to stimulate and maintain the competitiveness of the union.

In order to reduce an impact of climate changes and to meet commitments made in the context of the Kyoto Protocol with its validity from February 16, 2005, the European Union in 2003 adopted a **Directive Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community** (2003/87/EC). In October 2003, the European Commission proposed to implement a **REACH system** (**Registration – Evaluation – Authorization – Restriction of Chemicals** (COM [2003] 644). The REACH aims to improve protection of human health and environment from chemicals. Within the system, about 30 000 of 100 000 chemical substances used in the EU, will be revaluated and authorized. The European Parliament approved the REACH Regulation in 2006 and it became effective from June 1, 2007. The European Chemicals Agency was established in Helsinki and its main task is to authorize chemical products.

In **Report from the Commission to the Spring European Council** in 2004, it was stated that in spite of appreciable progress mainly in legislative field, not a sufficient synergy between some policies, especially in the field of environment, research, and economic competition was achieved. In addition, a priority to strengthen the competitiveness of European enterprises by means of applicable regulations and regulating reform (mainly in the industrial field), adoption of proposals within the Framework Services Directive, and Environmental Technologies Action Plan was determined for the year of 2004 (EC, 2004).

The **Environmental Technologies Action Plan for the European Union** represents an important tool for implementation of permanently sustainable development and achieving the Lisbon Strategy objectives. It is stated in the plan, that it is important to strengthen and utilize positive synergies between environment protection and competitiveness and to separate economic growth from degradation of the environment. The environmental technologies (all techniques and technologies, which are less harmful to the environment than their alternatives when used) are important tools for achieving the Lisbon Strategy objectives.

The EU Committee for Competitiveness adopted a Communication titled as **Fostering Structural Change: An Industrial Policy for an Enlarged Europe** (COM [2004] 274) of the European Commission from April 2004. At its meeting in September of 2004, the Committee stated that structural changes were needed to strengthen the European competitiveness and productivity growth. The member states and the European Commission were asked to create better framework conditions for the European enterprising sphere and implementation of specific recommendations; effective regulation, competitive internal market, availability of tools for firms, as well as policy to encourage research, innovations, and enterprising. The Committee identified several priority fields to improve competitiveness of European industry: trade policy, policy for competitiveness, policy for research and innovations, coherent policy, and environmental policy.

Main message of Ministers for Environment from the EU member states, who met in Maastricht in July of 2004, was a slogan "**Europe can improve its competitiveness by enforcing effective environmental policy**." The ministers approved some ideas to stimulate development of environmental innovations, which would contribute to improvement of the European industry competitiveness:

- Have an European system of "green" investments;

- Remove grants, which are ecologically – unfavourable;
- Force governments to use green criterion for public procurement, e.g. command to use water paint to paint governments buildings in the entire European Union;
- Enforce to use clean, noiseless, and economical vehicles by supporting intelligent technologies such as soot filters, etc.

In order to ensure permanently sustainable development, the European Union executes **integration of environmental aspects into European standardization** (Communication on integration of Environmental aspects in European standardization – COM [2004] 130). The standardization is considered to be a useful tool for environment protection. It relates to improvement of energy efficiency of electrical products and product recycling for example. In December of 2006, the European Committee for Electro-technical Standardization created CELENEC online database. This database enables a free access to information on environmental product aspects.

In December of 2004, the European Union commenced **European Technological Platform - MANU FUTURE**, which centres and coordinates all European initiatives relating to manufacturing and aims to ensure a long-time competitiveness of the manufacturing sector. This platform is one of technological programmes with a specific attribute of renovation, revival, and restructuring of traditional industrial sectors. Some other programmes relating to steel making industry, textile industry, and civil engineering are to be developed.

In October of 2005, the European Commission issued a Communication aiming to improve competitiveness of the European industry **(Implementing the Community Lisbon Programme: A Policy Framework to Strengthen EU Manufacturing – Towards a More Integrated Approach for Industrial Policy,** (COM [2005] 474). By means of new industrial policy, the European Union will be assisting the member states in their performance and aiming to encourage a strong and dynamic industrial base.

The Commission proposed seven activities focusing on individual sectors such as pharmaceutical, chemical, and sector for information and communication technologies. Furthermore, seven major cross-sectoral policy initiatives are announced in this Communication in order to address the common challenges across groupings of different industries and to reinforce the synergies between different policy areas in the light of competitiveness considerations.

- An intellectual property rights and counterfeiting initiative;
- High-level group on competitiveness, energy, and the environment (It will function as an advisory platform bringing together the members of the commission for the mentioned sectors. It is designed to examine the links between industrial, energy and environmental legislation and to ensure the coherence of individual initiatives, whilst improving both sustainability and competitiveness);
- External aspects of competitiveness and market access;
- New legislative simplification programme for motor vehicles, construction, and waste management;
- Activities to improve sectoral skills;
- Measures to manage economic restructuring in manufacturing;
- New integrated approach to industrial research and innovation.

Most of the initiatives are long - term projects that will be ongoing in the period from 2007 to 2009.

In November of 2005, the European Council for Competitiveness and Growth discussed a political framework to strengthen the manufacturing within the European Union – **Towards**

a more Integrated Approach for Industrial Policy. It was emphasized that industrial policy providing required structural changes in the manufacturing, would be a generator of outputs for knowledgeable economics as a part of revised Lisbon Strategy.

In 2007, the European Commission confirmed new industrial policy by issuing its Communication (COM [2007] 374), which included **Mid–Term Review of Industrial Policy** (A Contribution to the EU´ Growth and Job Strategy). In total, twenty-seven industrial branches were reviewed. In the Annex I of the Communication, the review of horizontal and sectoral initiatives with identified priorities for each branch is listed. As concerns space industry, the European Commission and the European Space Agency jointly developed European Space Policy. Within the **Global Monitoring for Environment and Security** (GMES[2]) initiative, the Europe will be provided with space-based environmental services enabling monitoring and control of climate change impacts.

Moreover, it is stated in the mid-term review of the industrial policy that the European Union **has to respond to new challenges** brought by globalization, technological and climate changes. All these put competitive pressure on the EU's economy to adjust a process that leads to resources being deployed where they add most value.

Based on Communication of the European Commission from 2005 about industrial policy, an **Expert's Group for Competitiveness, Energy, and Environment** was set up in 2005. In order to improve competitiveness and maintain permanently sustainable development as stated in Goteborg, the mandate of the mentioned group is to examine integration efforts of the EU on competitiveness (The Lisbon Agenda for Growth and Job Opportunities). The group is supposed to provide a statement to questions relating to energy green paper, reassessment of the EU's scheme on emission trading, implementation of thematically environmental strategies and progress toward eco-innovations. It is stated in the mid-term review of the industrial policy from 2007, that the mentioned group completed its task and has a significant contribution e.g. to discussions held during preparation of the EC's documents relating to power engineering and climate change, as well as permanently sustainable development of industrial policy.

The EU outlined the environment objectives in order **to improve energy efficiency, reduce greenhouses gas emissions** until 2020 by 20 % at least, and support the renewable energy sources. In the Communication "**An Energy Policy for Europe"** (COM [2007]1) of the European Commission, the quality objectives and tasks were determined.

In December of 2007, the European Commission adopted a Communication **"Towards an Improved Policy on Industrial Emissions"** (COM [2007] 843). The European Commission expects that a set of political measures and accompanied proposal of new complex directive on industrial emissions will help to improve operation and effectiveness of legal measures. That is achieved thanks to higher level of environment protection, administrative burden reduction, and minimizing deterioration of economic competition within the EU while the position of the European industry in the economic competition is not impaired.
In its Communication „**Raising Productivity Growth**: **Key Messages from the European Competitiveness Report 2007**, (COM [2007] 666)", the European Commission states that productivity is a key driver of the economy development. However, it is still lower compared to one created by the industry in the USA.
Communication on Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan (COM [2008] 397), adopted in 2008, is to contribute to better ecological performance of products, stimulation of demand on permanently sustainable products and production technologies as well as innovation support. It was proposed in the

[2] GMES (Global Monitoring for Environment and Security), the European Programme belongs to Directorate – General for Enterprise and Industry from 2005.

action plan to revise directives on eco-design, labelling of energy-using and other energy-related products and benchmarking and a directive on **Eco-Management and Audit Scheme** (EMAS). It was stated in the plan that a progress was achieved in an implementation in the field of environmental technologies as well as in methods of ecological innovation measuring. A system to verify environmental technologies at the European Union level will be implemented in order to provide a reliable verification. A third party will execute this verification as far as properties and potential impacts of new technologies on environment are concerned. By 2012, the European Commission will submit a review report on completion of the action plan and examine achieved results.

In December of 2008, the European Union endorsed a **climate and energy package** that aims to combat climate change. The EU bound itself to achieve a reduction in total emissions of at least 20% below 1990 levels. Within the mentioned package, a directive on greenhouse gas emissions allowance trading scheme of the Community was revised and amended. Furthermore, new directives on the geological storage of carbon dioxide and renewable energy sources were adopted.
More energy savings should be achieved by extending the application of directive on **eco-design for energy-using and energy-related products** in compliance with the Sustainable Consumption and Production and Sustainable Industry Policy Action Plan.

In December of 2008, the European Council approved **An European Economic Recovery Plan** (17271/08). Three new public-private partnerships are a part of the action plan. From 2010 to 2013, a total of €3.2 billion will be allocated for research through the three public-private partnerships, with half of the funds coming from industry and half from the European Commission through the 7th Framework Programme for Research and Development. The public-private partnerships relate to the following areas:

- **Factories of the Future** (€1,2 billion) – Increase the knowledge of small to medium businesses and use of the future technologies;
- **Energy-Efficient Buildings** (€1 billion) - Promote green technologies and development of energy-efficient systems and materials in the European buildings;
- **Green Cars** (€1 billion) - Emphasize the development of renewable and non-polluting energy sources, safety, and traffic fluidity.

In May of 2009, the European Competitiveness Council submitted a **Proposal of Conclusions on the Need for New Integrated Industrial Policy.** It emphasized a need for new industrial policy, priorities determination, and focus on opportunity search, creation of favourable framework conditions for a competitiveness growth, stimulation of employment and provision of information availability. A transformation to **eco-efficient economy** and effective utilization of coherent and structural funds were determined as ones of main priorities.

In November of 2009, the European Commission submitted a proposal for **Strategy – Europe 2020** to be annotated. The Strategy –Europe 2020 puts forward three priorities:

- Create values through an economy growth that is based on knowledge;
- Strengthen the position of citizens within inclusive societies;
- Promote efficient, competitive, and greener economy.

A new initiative **"Integrated Industrial Policy for the Globalization Era**" should be one of flagship initiatives of the future **Strategy – Europe**[3] **2020**.

[3] European Industrial Policy, Enviromagazín 4/2010, p. 6 - 8, Dipl. Eng. Juraj Vall

4. Development of Industrial Policy in the Slovak Republic

Prior 1998, Slovakia's industrial policy was conceived as an isolated part of economic policy with inadequate links to currency and fiscal policies. The perception of industrial policy at that period was based on traditional forms, which are characterized by direct interventions of the government in the development of sectors.

The breakthrough in the concept of industrial policy was due to recommendations of EU bodies to implement, during the pre-accession process, in countries striving to join the EU "**Action Programme to Strengthen the Competitiveness of European Industry"** (Council Decision # 96/413/EC). New philosophy of the approach to industrial policy, including institutional provision was laid down in a document **"Work-out of Industrial Policy of the European Union to the Conditions of the Slovak Republic**" which was adopted by Slovak Government's Resolution #761 of 8 September 1999.

The objectives of industrial policy implemented since 1999 are defined as follows:

- Reduce excess capacities of Slovakia's industries;
- In parallel, redirect production factors;
- Increase competitiveness of Slovakia's industries provided that the above-mentioned processes have been successfully implemented.

The low competitiveness of Slovakia's industry is connected with the low grade of research and development base and inadequate transformation of the structures of public (academic and university) sector of science and technology to assist the transfer of R&D knowledge to the business sector and of an innovative approach of the very business entities. The R&D expenditures in this sector decreased in 2000 to 40% of their 1989 level. The expenditures on research and development in the industrial sector reflect a decreasing trend in total R&D expenditures of the Slovak Republic. Since 1998, the expenditures have dropped and achieved 0,5 % of the GDP in 2009. In 1994, total R&D expenditures reached 0,9 % of the GDP.

The above-mentioned status is confirmed also in the **European Innovation Scoreboard 2009** (Comparative Analysis of Innovation Performance). In this publication, the EU member states fall into four country groups based on their innovation performance. The Slovak Republic, belonging to the third group, *is a moderate innovator*.

As stated in the recommendations of the OECD in the **Environmental Performance Review of the Slovak Republic in 2002**, "on several issues, the road towards environmental convergence with other European OECD countries will be a long one. " It is important to understand that exactly the environment protection will be the most financially demanding part at the implementation process of European standards into practise. However, it is a construction pillar of permanently sustainable development. Next OECD report on environmental performance of the Slovak Republic will be issued in 2011.

In connection with the European Commission's document „**Industrial Policy in an Enlarged Europe",** the Ministry of Economy of the Slovak Republic updated Slovakia's industrial policy on October 1, 2003. In the updated **Industrial Policy of the Slovak Republic in conformity with European Commission's Appeal in the Communication COM (2002) 714,** and based on systematic examination of possible development trends, and in-time responding to trends, and providing that educational development and sustainable growth of citizen's qualification is supported, Slovakia set up the following priorities:

- Systematic creation of an environment favourable for business, aiming at providing space for enriching the structure of the economy by adding new elements which are based on innovations, under the participation of all relevant structures and interest groups;
- Continuous development and expansion of the inventive backyard of the economy based on a transfer of knowledge from abroad and support of domestic science, research, and development;
- Systematic building of technological and information infrastructures enabling and supporting spreading of knowledge and innovations.

In March of 2004, the Slovakia's government approved "**Slovak Republic Position to the Lisbon Strategy**" (Government Decree #251/2004), including "**Position Document and Priorities of the Slovak Republic."** The material assesses an engagement of the Slovak Republic in the Lisbon Agenda and contains priorities of the Slovak Republic in connection with its fulfilment.

In 2004, the Ministry of Economy of the Slovak Republic prepared **Objectives, Priorities, and Targets in National Strategy for Industrial Policy.** It aims to improve environment efficiency of Slovakia's industry and consistently enforce principles for permanently sustainable development in the sector of industry. It is stated in the document, that environment investments in relation to fulfilling obligations under Act on Integrated Pollution Prevention and Control and usage of pre-accession and structural funds of the EU will be increased. By 2013, a burden of the Slovakia's economy on environment will be reduced but not totally eliminated.

In September of 2005, the **Organization for Economic Co-operation and Development** (OECD) evaluated Slovakia's economy and stated that efficiency of adopted reforms in taxies, social security, and employment field was significantly positive and visible. Slovakia may take advantage especially of high inflow of foreign investments. According to OECD representatives´ opinion, just investments oriented on export sectors are the main growth driver because bring more modern technologies and better business practices.

It is stated in the **programme proclamation from 2006** that the **government of the Slovak Republic** would provide development of operational program with a focus on supporting competitiveness in industry and services through innovations in such way that investment into research, development, and innovation processes would be stimulated. In addition, motivating conditions for a transfer of gained knowledge into business practice would be created. The main assignment of the SR Government in the field of industrial policy is to create short-term and long-term plans and measures to improve competitiveness. Industry that is more competitive will contribute to strong European industrial base while potential of very SR region is taken into consideration and increase in the goods and services provisions based on local sources is ensured.

In the document **Industrial Development as a Generator of Economic Growth and Competitiveness in the Slovak Republic**, developed by Ministry of Economy of the Slovak Republic in 2006, it is stated that Slovak Republic was significantly falling behind in application of High Tech technologies into products. At present, a fundamental pressure on innovative solutions of domestic producers is put especially in an automotive industry. Furthermore, it is stated in the document that activities focusing on growth and application of the latest knowledge (knowledge engineering) into practice become of vital importance for further progress in the Slovakia's economy. A progress in applicable research and development is a guarantee for future healthy economic growth and effective utilization of knowledge in Slovakia. The sustainable industrial development is conditioned by applicable research that should be mainly concentrated on problem solving in critical sectors of national economy.

A strategic objective of the document **Innovative Strategy of the Slovak Republic by 2013**, adopted by Slovakia's government on March 14, 2007, is to ensure that innovations are one of main tools for development of knowledge engineering and provision of high economic growth and to achieve the level of the most developed economies of the EU member states.

The SR government on July 4, 2007 adopted an **Energy Efficiency Strategy for the Slovak Republic.** It is an important document relating to industry as this sector belongs to the largest consumer of energy.

On 28 November 2007, the European Commission approved an **Operational Programme for the Slovak Republic,** entitled **Competitiveness, and Economic Growth.** The Ministry for Economy of the Slovak Republic was appointed as a managing authority. The measure 1.1 in the Priority Axis I is focused on supporting private sector, in which main stone innovations and technology transfer will solve a problem of energy intensiveness reduction, environmental impact reduction, and production efficiency increase. Those will help to improve competitiveness of the enterprises.

It is stated in the document **Pro-Export Policy of the Slovak Republic from 2007 to 2013** that Slovakia has to respond to any changes occurring within globalization process. At present when Slovakia's economy is open, an improvement in competitiveness toward outside is needed.

In 2007 in Slovakia, a share of overall foreign trade turnover on GDP was 173,2 % and a share of export on GDP was 86,4%. It emphasizes that foreign trade has a dominant position and Slovakia's production is highly depending on outside economic relations. It shows that a foreign trade policy with a focus on export support has an important position within economic strategy.

Because of global crises in 2009, it was necessary to solve problems relating to **regulation of gas supply** and its impact on Slovakia's electrical network. In addition, it was essential to adopt and complete measures to ensure the reliable operation of the electricity network. Furthermore in that year, a concept to control inflow of foreign investments in the context of global financial and economic crises was discussed.

In 2009, cash for clunkers program to **support an automotive industry** was presented. The rebates were a tool to increase consumption within Slovakia and to help largest car producers to increase their sale in Slovakia.

Preserving the permanently sustainable development in the Slovak Republic will be a costly process. In addition to investments for operating technologies, research and development, it will be as well necessary to invest into environment programs in order to meet obligations and achieve harmonization of the Slovak environment legislative with the European legislative. It is expected within integrated approximate strategy that €385,049 million yearly will be spent for the environment field during next 35 years. For example, the environment investments into the industrial area in 2011 were €82,985 million. The costs to harmonize the Slovakia's environment to the level of the European Union highly exceed the financial capability of enterprises and state's budget. We must take into account the fact, that after approving the regulation on REACH, it will be necessary to provide elimination of potential critical impacts resulting from system implementation especially in the sector of small and medium enterprises.

The Ministry of Economy of the Slovak Republic in cooperation with VÚSAPL a.s. Nitra developed a study **Impact of Proposed Chemical Legislative – REACH System- on Sustainability of Chemical Industry in the Slovak Republic** in December 2004 and a study **Impact of Proposed Chemical Legislative – REACH System – on Sustainability of Automotive Industry in the Slovak Republic** in October 2005. It is estimated that

manufacturers and importers in the chemical industry will have additional costs in the amount of €418,243 and €690,434 million for REACH implementation during next 11 years. The additional costs for the automotive industry manufacturers and importers will be €8,298 million.

Limited capacity of domestic market predestines the Slovak republic for an intensive cooperation with other countries and participation in international business. Faster turnover growth of foreign trade than GDP growth resulted in wider openness of the economy. When implementing **the industrial policy** of the Slovak republic, it is necessary to take into account that Slovakia's economy as a small and open economy is dependent on global processes that run within the worldwide economy. Therefore, it cannot be based on isolationism but on openness. The Slovak industrial policy has to be oriented on forcing the strategy of its open and competitive market. Tendency of a state to protect somebody from their competition by restricting it is not beneficial to either consumers or such protected industries and producers.

5. What is the present state and direction of the Industry in the Slovak Republic?

Share of mining and quarrying, manufacturing and electricity, gas, steam, and cold air supply on turnover in industrial production reduced in 2009 compared to the year 2000. The share of the water supply (wastewater treatment and sewerage) and waste collection on turnover in the industrial production increased in 2009 compared to the 2000.

It is necessary to take into account the fact that too high concentration on production of some commodities within industrial production at the time of global crises can create crises in relevant sector. For the Slovak Republic, it would mean that attention has to be paid to diversification of products determined especially for export. Higher diversification would mean a lower vulnerability.

Competitiveness of the Slovak industrial companies is dependent mainly on future development of their innovative capabilities. Entire innovative performance of Slovakia is very poor. It is necessary to invest into research, development, and innovations. Due to global financial crises, many development plans were not completed in 2009.

5.1. Macroeconomic Position of the Industry

In general, the structure of entities with respect to the various technological sectors remains unfavourable. The group of high-tech companies still includes as little as 2 percent of all processing industries entities. The share of high-tech enterprises on export of industrial goods was at the level of 3,7 percent in 2001. The group of companies with medium-high level technologies include 23%, and 27% of companies were classified as having medium-low level technologies. Up to 48% of industrial enterprises were classified with the group of low technologies. From this point of view, the internal restructuring process of Slovakia's industrial production has not been completed yet.

List of aggregated and individual indicators, which are relevant to define main trends in industry

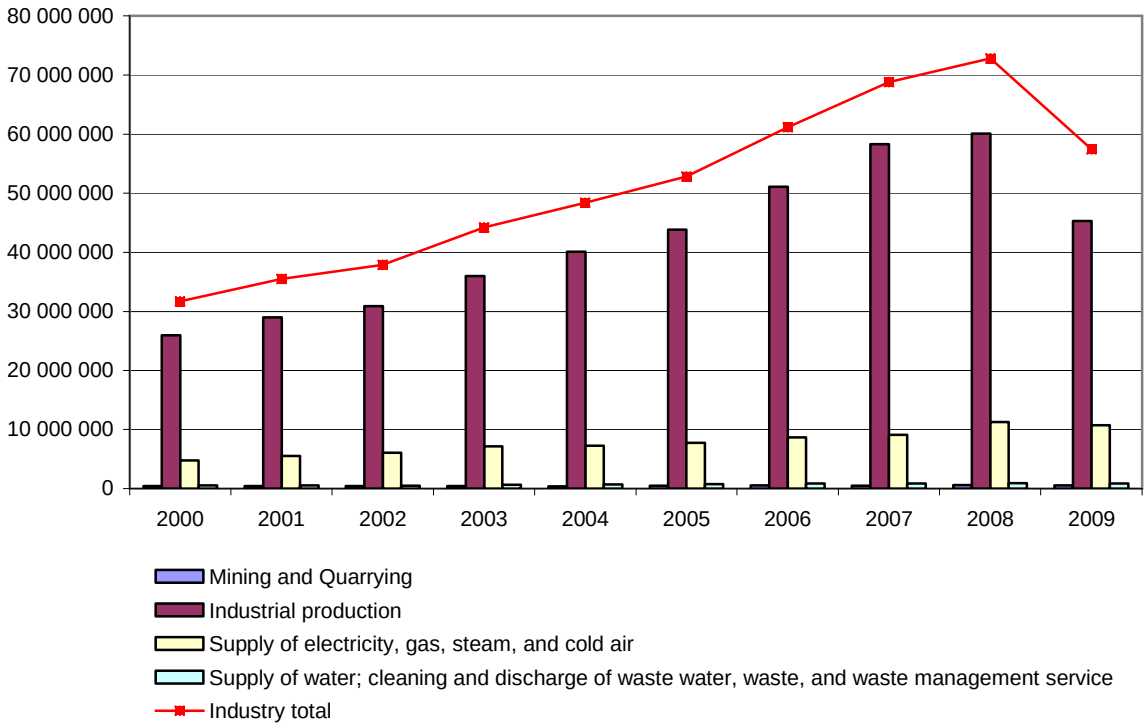
Sector	Position within DPSIR Structure	Aggregated indicator	Individual indicator
Industry	**Driving force**	Macroeconomic position of industry	Turnover in industry
			Number of employees in industry
			Labour productivity in industry
			Added value in industry
			Share of industry in the growth of the GDP
			Industrial production index
			Economic entities by legal forms in industry
			Industrial enterprisers by regions
		Energy intensiveness in industry	Final energy consumption of fuels, energy, and heat in industry
	Impact	Quality of working environment, occurrence of sick leave cases	Sick leave cases due to sickness and injuries in industry
	Respond	Environment protection	Investments into environment protection in industry
			Regular costs for environment protection in industry

*D – driving force *P – pressure *S – state
*I – impact *R – response

5.1.1. Turnover in Industry

Share of mining and quarrying, manufacturing and electricity, gas, steam, and cold air supply on turnover in industry reduced in 2009 compared to the year 2000. The share of the water supply (wastewater treatment and sewerage) and waste collection on turnover in the industry increased in 2009 compared to the 2000. Among industrial sectors in the monitored period, production of computing, electronic, and optical products significantly increased. In 2009, production of transportation means was 22,6% of turnover in industry (14% share in 2000), production of metal and metallic structures except for machines and equipment was 14,7 % (16,1% share in 2000) and production of computing, electronic and optical products was 13,6% (1,9% share in 2000). In 2009, turnover in industry achieved €57 446 956,60; from this €45 307 542,40 was turnover in manufacturing. In 2009 compared to 2008, turnover in industry declined by 18%. Share of manufacturing in 2009 on total turnover in industry was 78, 9%, supply of electricity, steam, gas, and cold air 18,7%, water supply (wastewater treatment and discharging management) and waste management and waste disposal services 1,6%, and mining and quarrying 0,9%.

Trend in Turnover from Industry by Economic Activity (EUR thousands, current p.)



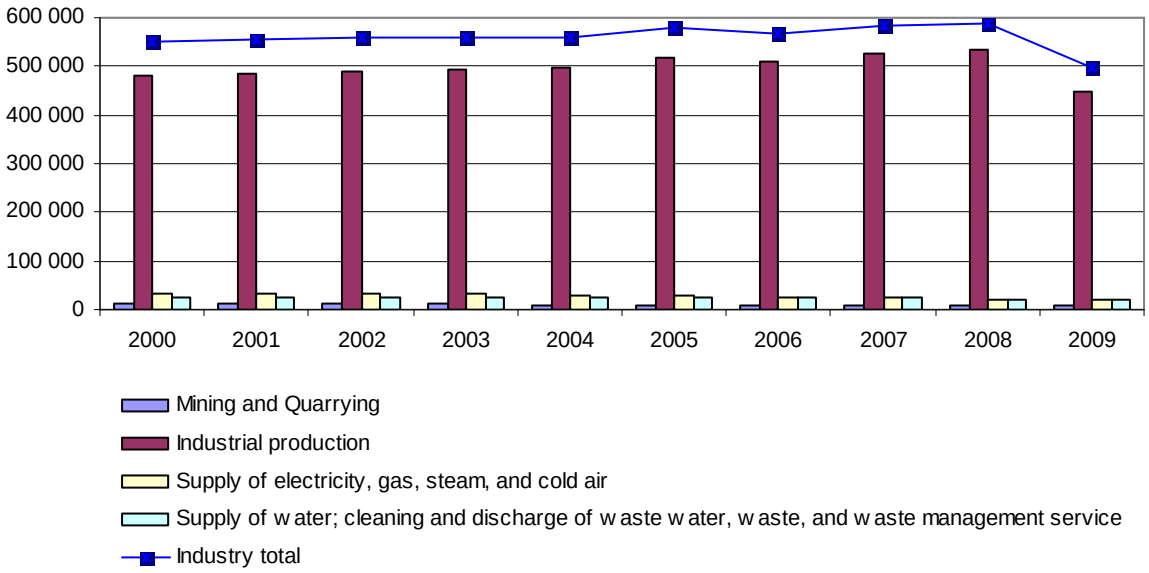
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator Turnover in industry

5.1.2. Number of Employees in Industry

In 2009, 497 833 people in average worked in the industry and of it; 447 685 (89,9 %) in the manufacturing; 21 609 (4, 3 %) in the water supply (wastewater treatment and sewerage), and waste collection; 20 505 (4, 1 %) in the electricity, gas, steam and cold air supplies, and 8 034 (1, 6 %) in the mining and quarrying. In 2009, averaged accounting number of employees decreased by 15 % compared to the 2008 and by 9,6 % compared to the 2000. In 2000, share of industry on averaged accounting number of people employed in national industry was 27,9 % and it decreased to 22,9% in 2009.

Trend in Averaged Accounting Number of Employees in Industry (People)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

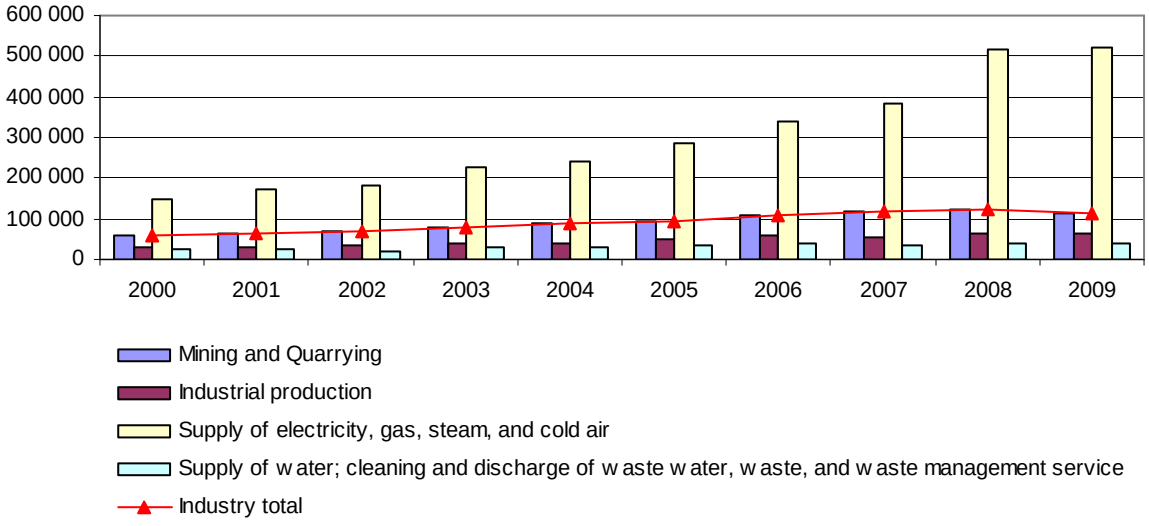
Indicator Number of Employees in Industry

5.1.3. Labour Productivity in Industry

In 2009, the highest labour productivity on turnover in industry was in electricity, gas, steam and cold air supplies in total amount of EUR 522 912,04; EUR 115 394,11 in mining and quarrying;

EUR 65 306,30 in manufacturing; EUR 41 294, 39 in water supply (wastewater treatment and sewerage) and waste collection. The labour productivity in industry decreased by 3,4 % compared to previous year and reached the value of EUR 115 394,11. The highest labour productivity in industry in 2009 was achieved in production of coke and refined oil products (CD), manufacturing of computing, electronic, and optical products (CI), and finally in manufacturing of transportation means (CL).

Trend in Labour Productivity in Industry (EUR)

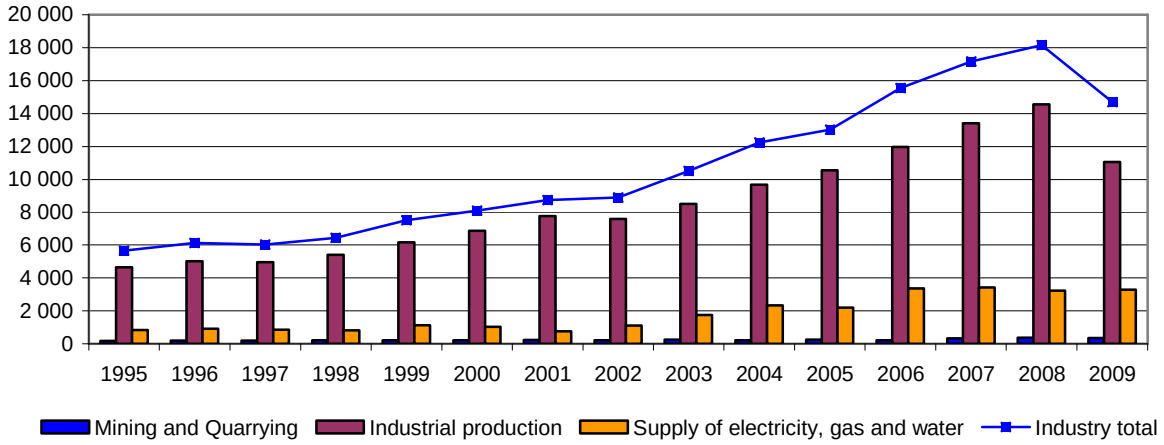


Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator Labour Productivity in Industry

5.1.4. Added Value Price in Industry [4]

In 2009, added - value price in industry increased by 159,8 % compared to the 1995 and reached the amount of EUR 14 696,14 millions. The added - value price in production of electricity, gas and water increased by 290,9 %, 138,6 % in manufacturing, and 95,5 % in raw material extracting.

Trend in Added Value Price in Individual Sectors of Industry (EUR millions, current p.)

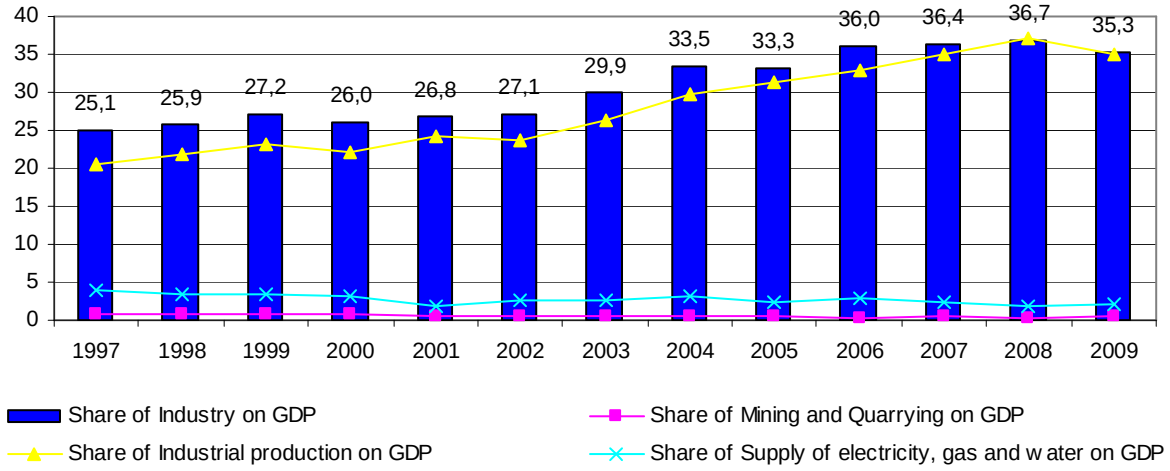


Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator *Added Value Price in Industry*

5.1.5. Share of Industry on GDP[5]

Share of industry on the SR Gross Domestic Product was 25,1 % in 1997 and increased to

Trend in Share of Industry on the Slovak Republic Domestic Gross Product Growth (constant p. 2000 in percentage)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator *Share of Industry on GDP*

[4] As the Statistical Office of the Slovak Republic did not publish all industrial data to November 30, 2010 by revised classification of the economical activities (SK NACE Rev. 2), some of the indicators were still processed by sector classification of the economical activities (OKEČ) – Added Value in Industry and Share of Industry in the GDP.

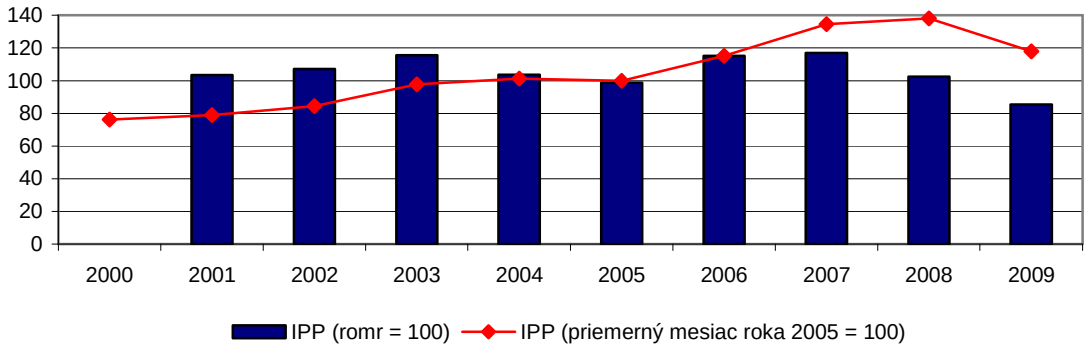
[5] As the Statistical Office of the Slovak Republic did not publish all industrial data to November 30, 2010 by revised classification of the economical activities (SK NACE Rev. 2), some of the indicators were still processed by sector classification of the economical activities (OKEČ) – Added Value in Industry and Share of Industry in the GDP.

35,3 % in 2009. In 1997, share of manufacturing on the SR GDP was 20,5 % and increased to 34,9 % in 2009. In 1997, share of production and supply of electricity, gas and water on the SR GDP was 3,9 % and decreased to 2% in 2008. Share of raw material extracting was at the level 0,8% in 1997 and decreased to 0,4% in 2008. The highest increase in the GDP growth had manufacturing of machines, electrical equipment and manufacturing of transportation means (DK, DL, and DM).

5.1.6. Industrial Production Index

From 2000 to 2008, industrial production index slightly increased. However through the year of 2009, the industrial production index decreased by 14,6 %, which was by 16,1 % in manufacturing and 7,7 % in electricity, gas, steam, and cold air supplies. On year-over-year basis, the highest fall of industrial production index within manufacturing was in manufacturing of transportation means (-27,3%), in manufacturing of machines and equipment nowhere else listed (-23,3 %), and in production of products made of rubber, plastic, and other non-metallic mineral products (-22,4%).

Trend in Industrial Production Index

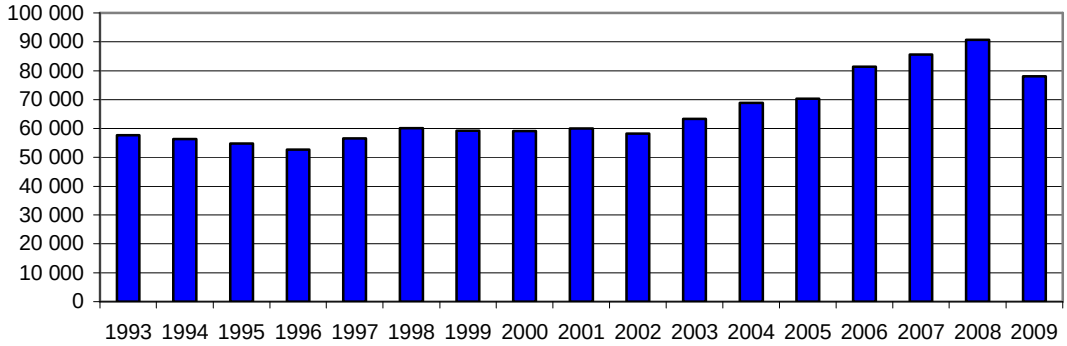


Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator *Industrial Production Index*

5.1.7. Economic Units by Legal Form in Industry

In 1993, 57 722 of the economic units acted in industry and their number increased to 78 108 (increase by 35,3 %) in December of 2009. In 2009, 76 134 units acted in manufacturing,

Trend in Economic Units Number in Industry



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

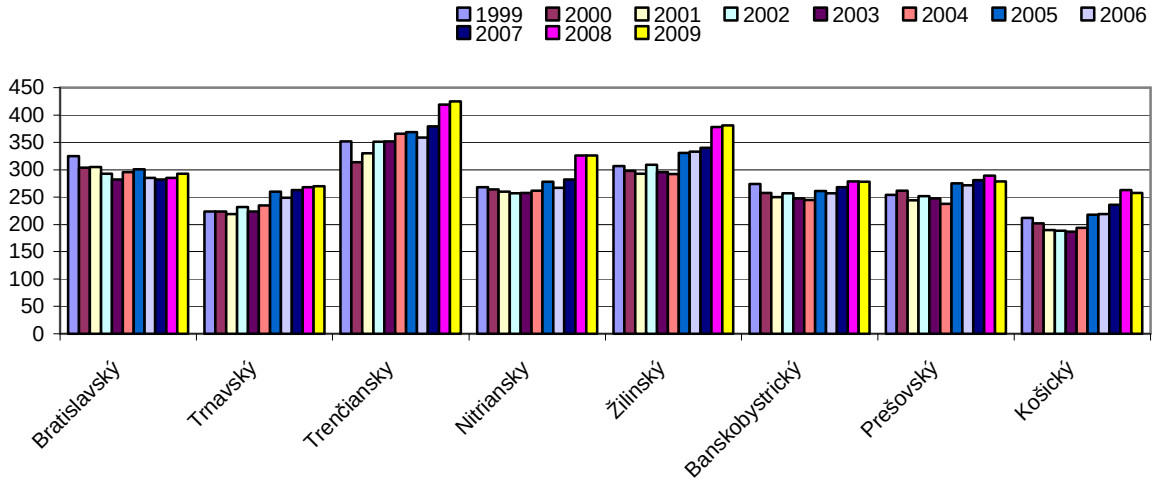
Indicator *Economic Units by Legal Form in Industry*

1 427 in water supply (waste water treatment and sewerage) and waste collection, 359 in supply of electricity, gas, steam, and cold air and 188 units in mining and quarrying.

5.1.8. Industrial Establishments by Regions

Arrangement of industrial establishments in individual regions of the Slovak Republic is unbalanced. In 2009, the most industrial establishments were in the Trenčín Region (425 enterprises) and the least industrial establishments were in the Košice Region (258 enterprises). In the monitored period, number of enterprises decreased in Bratislava Region and increased in the other regions. Totally in 2009, 2 510 industrial establishments were in the Slovak Republic and their number increased by 294 compared to the 1999.

Trend in Industrial Establishment's Number by Regions



Source: Statistical Office in the Slovak Republic – Yearbook of Industry; Processed by: Slovak Environmental Agency

Indicator *Industrial Establishments by Regions*

5.2. Energy Effectiveness of Industry

Only industry as an economic sector of the EU separated its economic and social development from energy consumption. (*EEA, Environmental signals 2002, Status during millennium*)

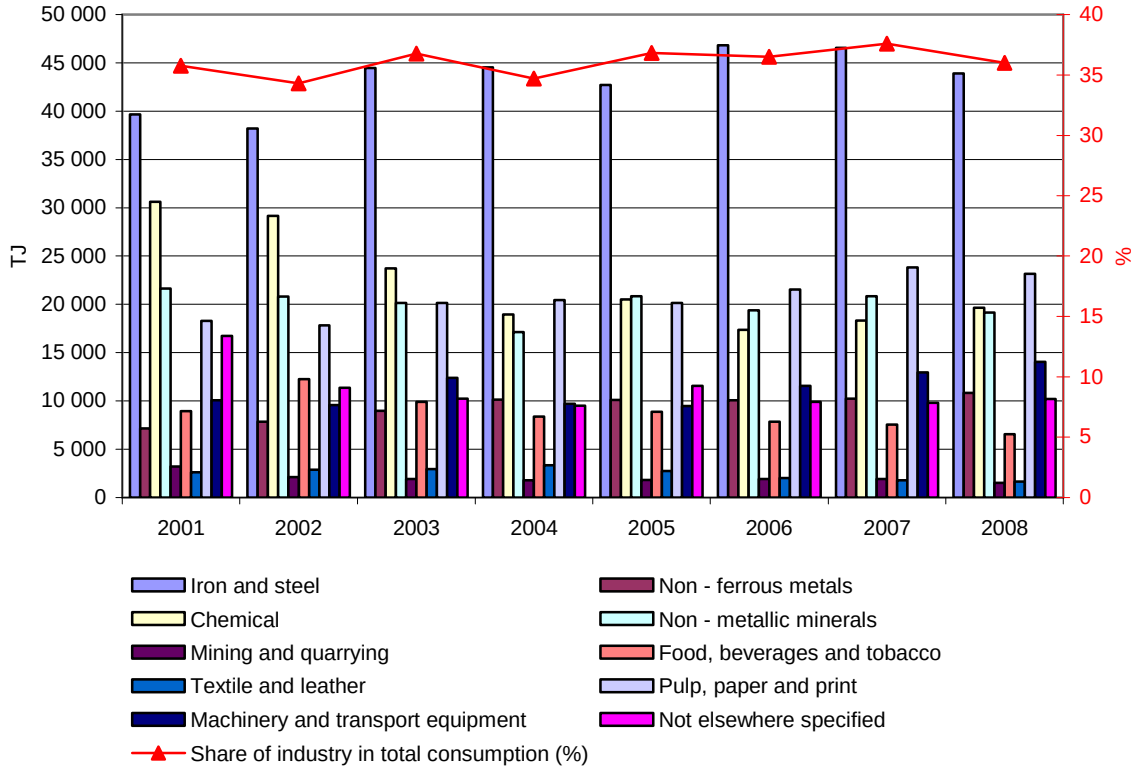
In 2008, the Slovak Republic within Visegrad Group had the highest share on final energy consumption in the industry. Slovakia's industry has a decrease in energy consumption due to restructuring process. It is not expected in coming years that any absolute decrease in total energy consumption would be achieved. However, it is estimated that energy efficiency on the GDP growth will be significantly reduced. There is a space for cost saving measures especially in manufacturing (chemical products, iron and steel making, cellulose production). More savings might be achieved by changing technological processes.

5.2.1. Final Consumption of Fuels, Energy, and Heat in Industry

In 2001, the industry participated by 35,8 percent on final energy consumption of fuels, electricity, and heat within the national economics and the share of the industry reached the level of 36 % in 2008. In 2008, share of iron and steel making industry on final energy consumption of fuels, electricity, and heat was 29,1 % and share of cellulose production,

paper industry and polygraphs was 15,4 %. In industry in 2008 compared to the 2001, a decrease by 5,2 % in final energy consumption of fuels, electricity, and heat was achieved.

Trend in Final Energy Consumption of Fuels, Electricity, and Heat in Industry (TJ)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

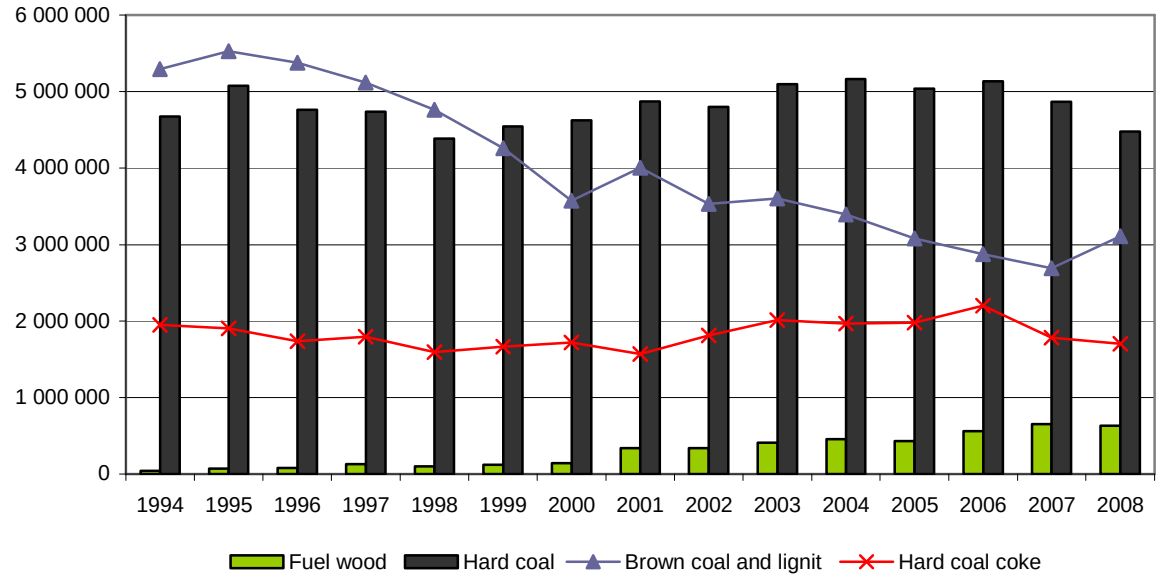
Indicator *Final Consumption of Fuels, Energy, and Heat in Industry*

5.3. Consumption of Selected Types of Fuels, Electricity and Heat in Industry

5.3.1. Consumption of Solid Fuels in Industry

In 2008, the total consumption of solid fuels decreased by 17 % compared to the year 1994 and reached the volume of 9 924 666 tons. In 2008, the share of black coal on the consumption of solid fuels was 45,1 %, brown coal and lignite 31,4 %, black coke 17,2 % and fuel wood 6,4 %.

Trend in Solid Fuels Consumption in Industry (tons)



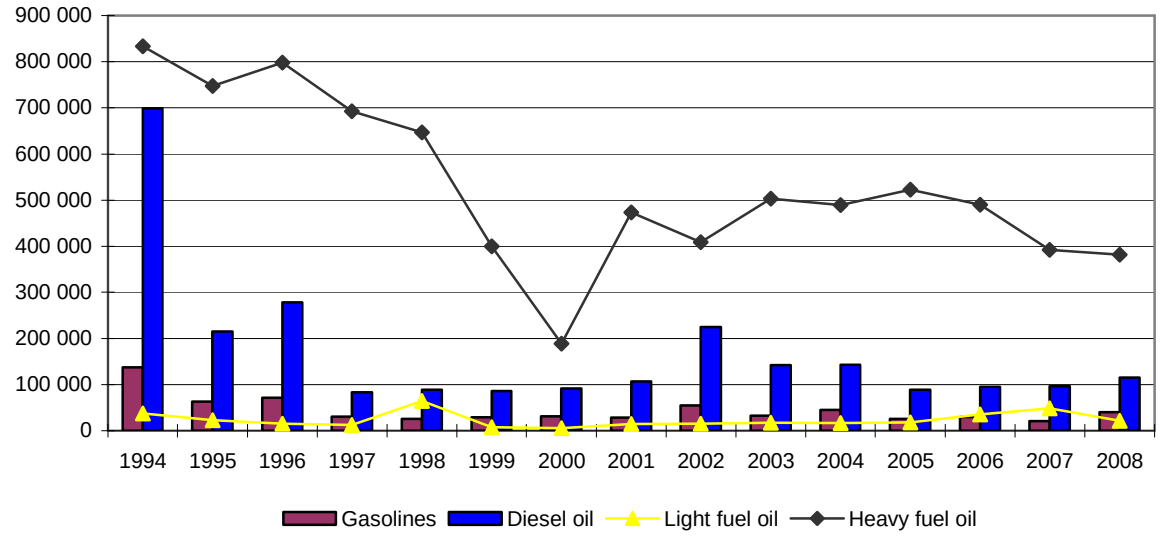
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator *Consumption of Solid Fuels in Industry*

5.3.2. Consumption of Liquid Fuels in Industry

In 2008, the total liquid fuels consumption in the industry decreased by 67, 3 % compared to the year 1994 and reached the volume of 558 470 tons. In 2008, the share of heavy fuel oil on the liquid fuel consumption was 68, 4 %, diesel oil 20, 5 %, light fuel oil 3,8 %, and gasoline 7,2 %.

Trend in Liquid Fuel Consumption in Industry (tons)



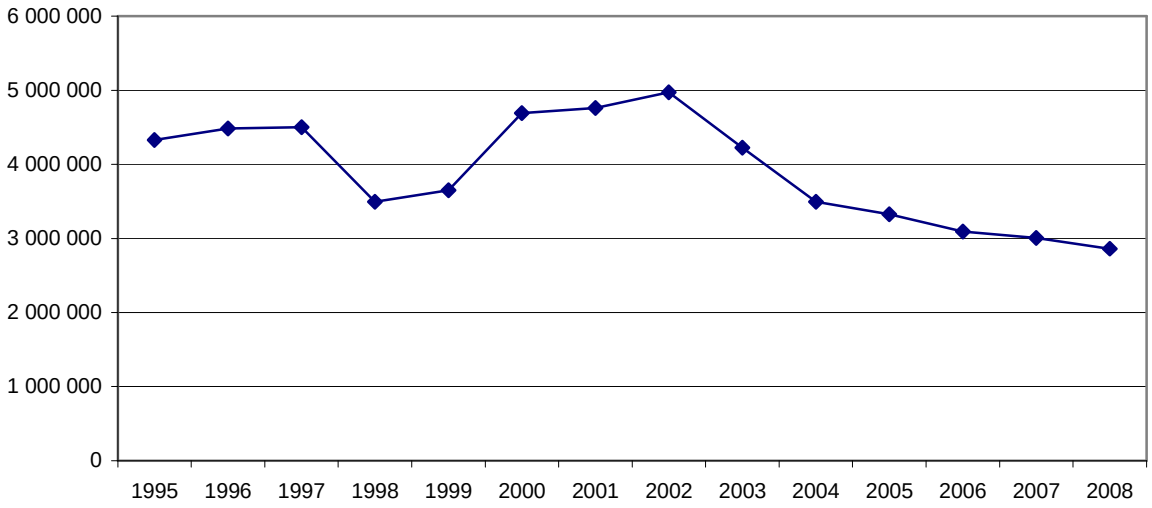
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator *Consumption of Liquid Fuels in Industry*

5.3.3. Consumption of Gaseous Fuel in Industry

In 2008, the total gas consumption in the industry decreased by 37,4 % compared to the year 1994 and reached the volume of 2 859 982 m^3.

Trend in Gaseous Fuel Consumption in Industry (thousand cubic meters)



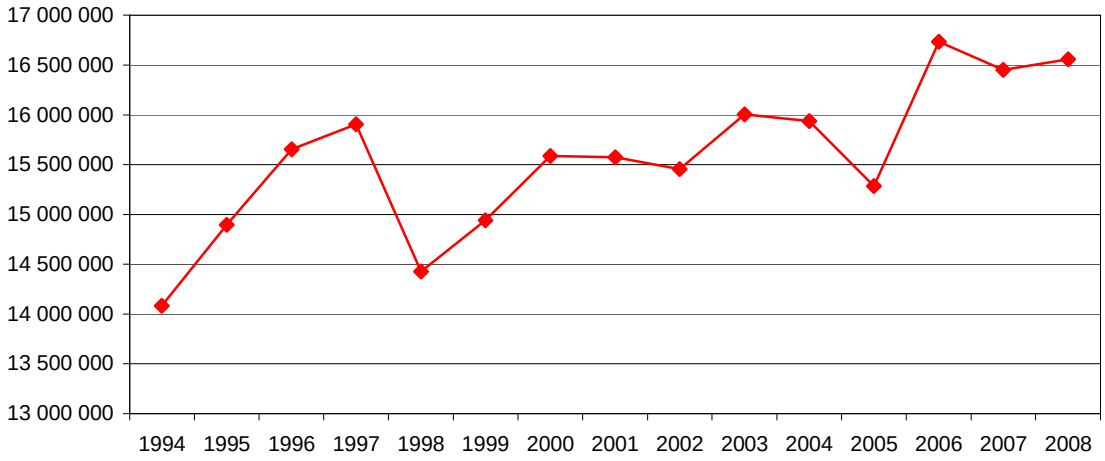
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator Consumption of Gaseous Fuel in Industry

5.3.4. Electricity Consumption in Industry

The electricity consumption in the industry has a fluctuant tendency. In 2008, the electricity consumption was 16 556 336 MWh and it increased by 17, 6 % compared to the year 1994.

Trend in Electricity Consumption in Industry (MWh)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator Electricity Consumption in Industry

5.3.5. Heat Consumption in Industry

In 2008, the total heat consumption in the industry increased by 177, 9 % compared to the year 1994 and reached the volume of 293 060 386 GJ.

Trend in Heat Consumption in Industry (GJ)

Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator Heat Consumption in Industry

6. What is the Industry Impact on the Environment in the Slovak Republic?

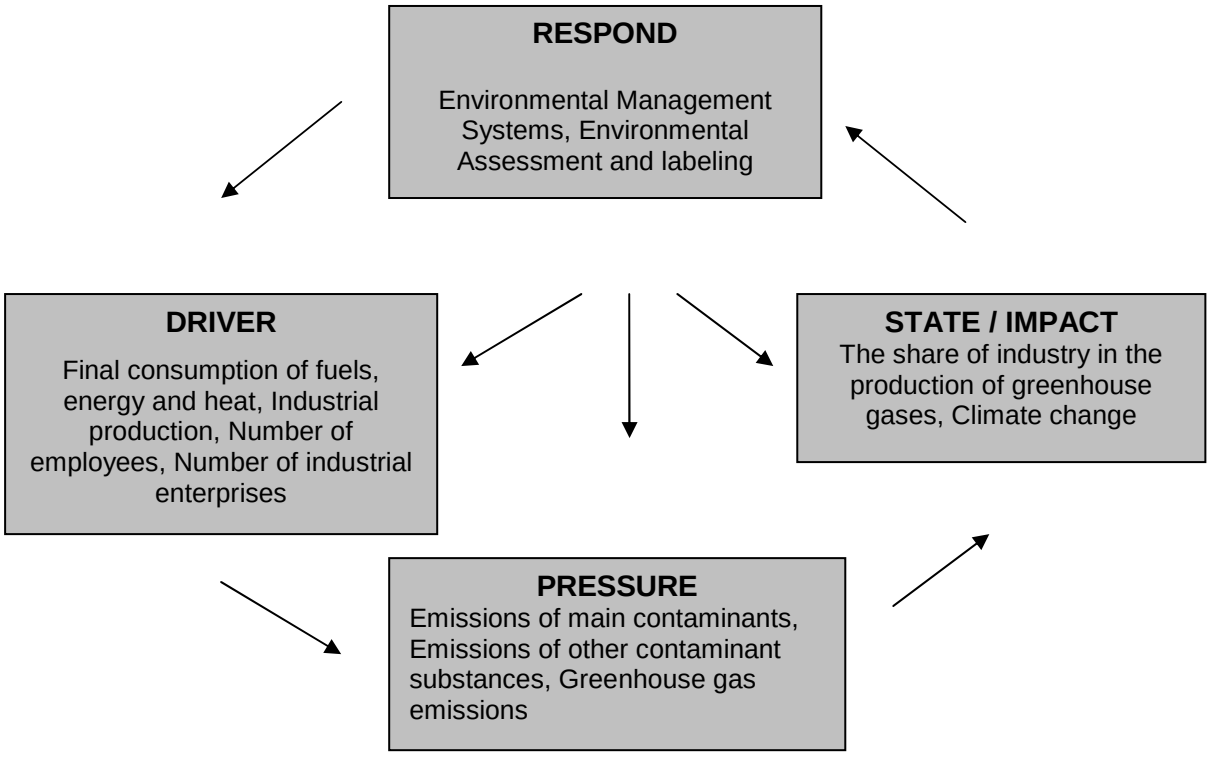
Trends of emissions from main polluting contaminants started to be separated from the gross domestic product in the Slovak Republic from 1992 to 1994. Since that time, this process is ongoing. The first reason for an absolute drop in the emissions from the polluting contaminants was a fall in the GDP, especially in the manufacturing. The other reasons were a shift from brown coal and crude oil to fossil fuels (natural gas) of high quality and implementation of developed technologies (separation of solid components and desulphurization). Decline in emissions from the heavy metals was also caused by closing obsolete metallurgical facilities, and implementing effective deducting and separating technologies. Abstraction of water by industry decreased due to regression and restructuring of the manufacturing. However, amount of waste generated by industry increased.

In forthcoming years, a bearer in improvement of technological level in the Slovakia's industry will be mechanical engineering and automotive industry as its part. Due to a decline in raw material and energy intensiveness of the manufacturing, also environmental burden in mining and energy industries will be reduced.

6.1. Air

Trend in emissions of heavy metals, greenhouse gas, non-methane volatile organic compounds, and persistent organic pollutants from the manufacturing is based on a balance of emissions from the manufacturing. Manufacturing is divided for industrial thermal processes (industrial power engineering, iron making, metalworking processes and copper production) and industrial non-thermal processes (petroleum refinery, coke production, steel making, hot rolled and cold rolled processes, aluminium production, industrial organic chemistry, and food industry).

Air, Air Quality and Climate Change in relation to Industry by D-P-S-I-R Model



List of Individual Indicators, which are Relevant to Characterize Impact of the Industry on Environment

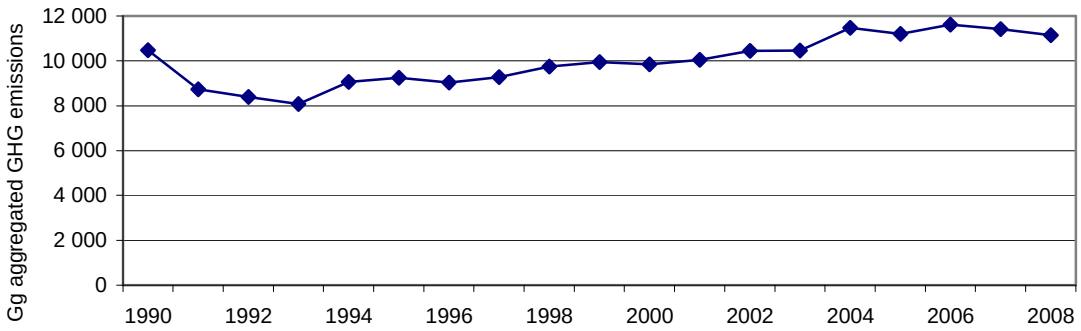
Position within DPSIR Structure	Individual Indicator
Driver	Final energy consumption of fuels, energy, and heat in industry
Pressure	Greenhouse gases emissions from industrial processes
	CO emissions from industry
	SO_2 emissions from industry
	NO_x emissions from industry
	Solid containment particles from industry
	Hard metal emissions from industry
	Non-methane volatile organic compounds emissions from industry
	Persistent organic pollutants from industry
	Abstraction of ground water in industry
	Abstraction of underground water in industry
	Generation of waste water in industry
Impact	Quality of working environment, occurrence of sick leave cases
Respond	Investments into environment protection in industry
	Regular costs for environment protection in industry

*D – driving force *P – pressure *S – state
*I – impact *R – response

6.1.1. Greenhouse Gas Emissions from Industrial Processes

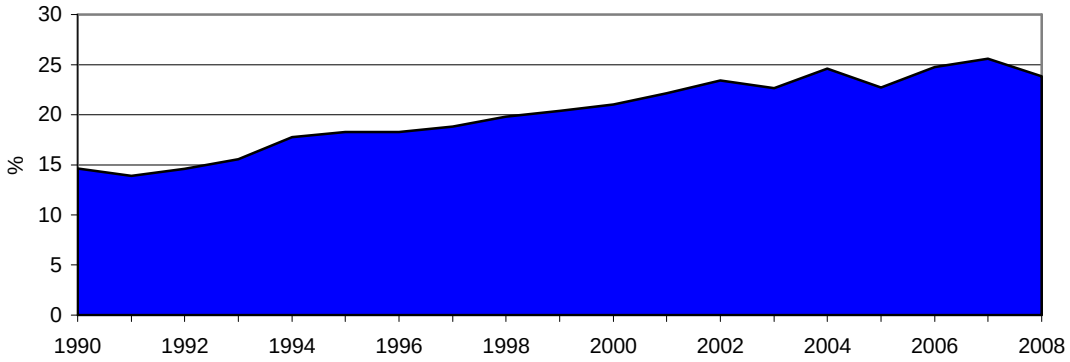
From 1990 to 2008, aggregated greenhouse gas emissions from industrial processes were showing a slightly increasing trend. In 2008, the emissions from the industrial processes increased by 6,3 % compared to the 1990 and decreased by 2,5 % compared to the 2007. In 2008, 23,8 % of total greenhouse gas emissions were generated during industrial processes.

Trend in Aggregated Greenhouse Gas Emissions from Industrial Processes (Gg $C0_2$ equivalent)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator Greenhouse Gas Emissions from Industrial Processes

Share of Greenhouse Gases Emissions from Industrial Processes on Greenhouse Gases Overall Emissions (without storage, i.e. changes in utilization of land and forestry)



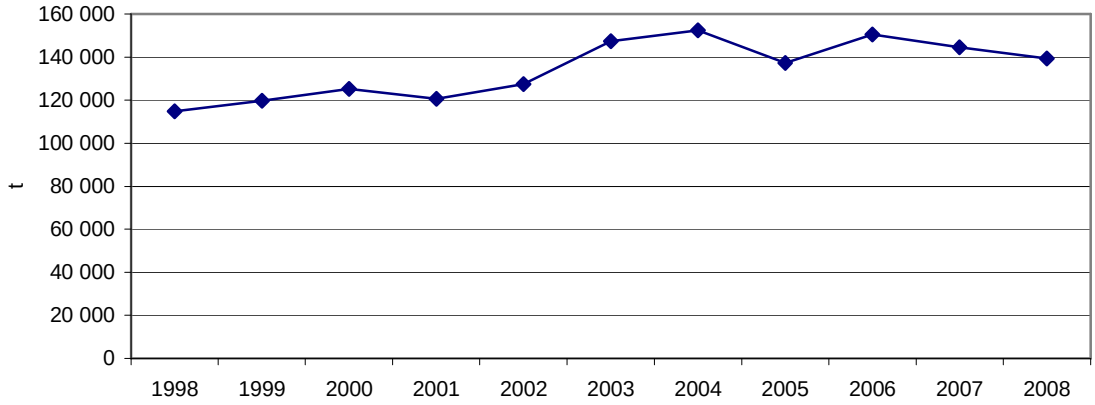
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator Greenhouse Gas Emissions from Industrial Processes

6.1.2. Emissions of Basic Polluting Substances from Industry - CO

Recently, basic substances emissions polluting the air, specifically SO_2 and NOx from industry have decreased. However, this decrease in NO_x resulted from a decrease of share of industry on overall emissions from these polluting substances. This unsatisfactory trend – increased emissions from industry is recorded for solid polluting substances and CO. Here, the emission increase is accompanied with an increase of shares of these basic polluting substances on overall emissions.

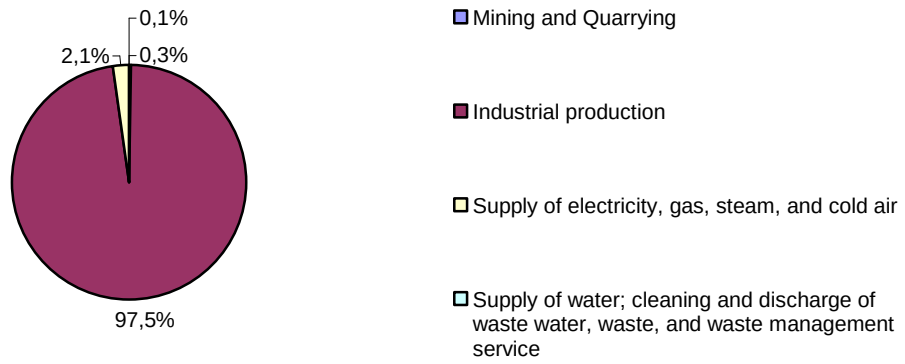
In 2008, CO emissions from the industry made up as much as 98,8 % share of large and middle-size stationary sources and **increased** by 21,4 % compared to the 1998. Manufacturing generated as much as 97, 5 % of industrial emissions in 2008. Within manufacturing, processing and production of metals (80,4 %) contributed mainly to this increasing trend. Fluctuating in the CO emissions from the large sources from 1998 to 2008 related with product volume as well as fuel consumption. In 2008, the CO emissions from the industry decreased by 3, 6 % compared to the previous year.

Trend in CO emissions from industry (tons)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator Emissions of Basic Polluting Substances from Industry - CO

Share of Industrial Sectors on CO Emissions from Industry in 2008 (%)



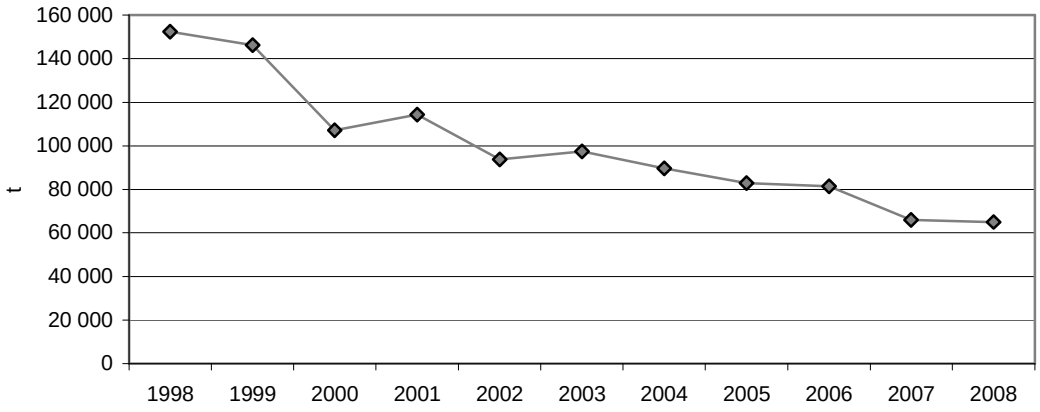
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Emissions of Basic Polluting Substances from Industry - CO*

6.1.3. Emissions of basic polluting substances from industry - SO_2

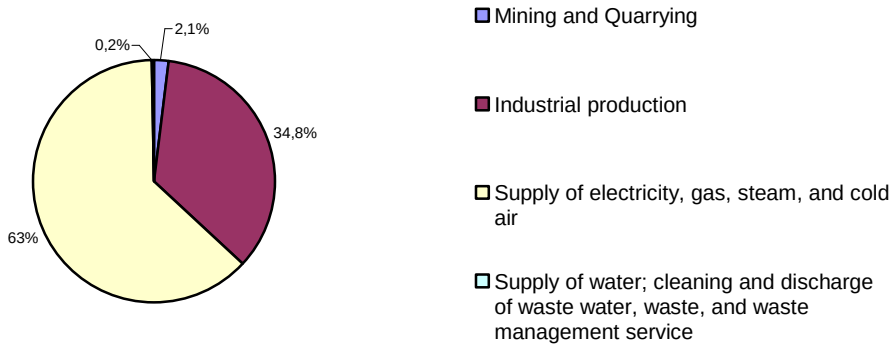
SO_2 emissions from the industry in 2008 made up as much as 99% of large and middle-size stationary sources and emissions **decreased** by 57, 6% compared to the 1998. Branch of supply of electricity, gas, steam, and cold air generated 63% of emissions from the industry in 2008. A decreasing trend in the SO_2 emissions was caused by lower consumption of brown and black coal, and heavy heating oil, usage of low-sulphur based heating oils, and installation of desulphurization facilities at large energy sources. In 2008, the SO_2 emissions from the industry decreased by 2,1 % compared to the 2007.

Trend in SO_2 emissions from industry (tones)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of basic polluting substances from industry - SO_2*

Share of industrial branches on SO_2 emissions from industry in 2008 (%)



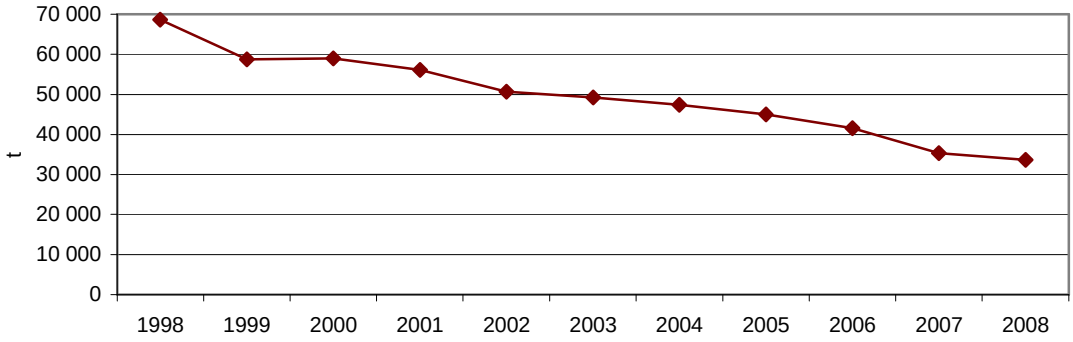
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Emissions of basic polluting substances from industry - SO_2*

6.1.4. Emissions of Basic Polluting Substances from Industry - NO_x

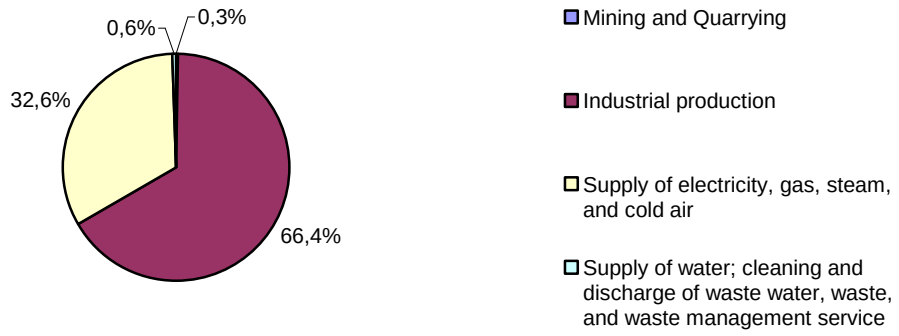
NO_x emissions from the industry in 2008 made up as much as 99,1 % of large and middle-size stationary sources and emissions **decreased** by 55% compared to the 1998. In 2008, manufacturing as a branch of the industry generated 66,4 % of emissions from the industry. A decreasing trend in the NO_x emissions related with decreased consumption of solid fuels. In years 2002 and 2003, denitrification of large energy blocks contributed to decreased emissions. In 2008, the NO_x emissions from the industry decreased by 4,5 % compared to the 2007.

Trend in NO_x emissions from industry (tons)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Basic Polluting Substances from Industry - NO_x*

Share of Industrial Branches on NO_x emissions from industry in 2008 (%)



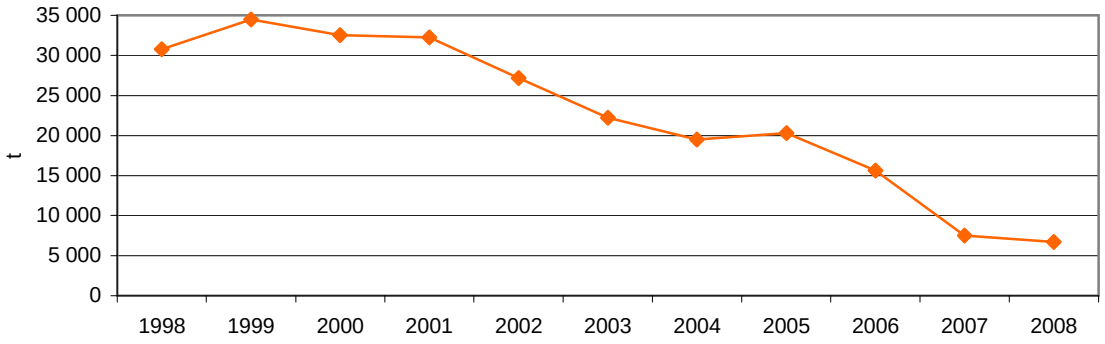
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Emissions of Basic Polluting Substances from Industry - NO_x*

6.1.5. Emissions of Basic Polluting Substances from Industry – Solid Particle Contaminants

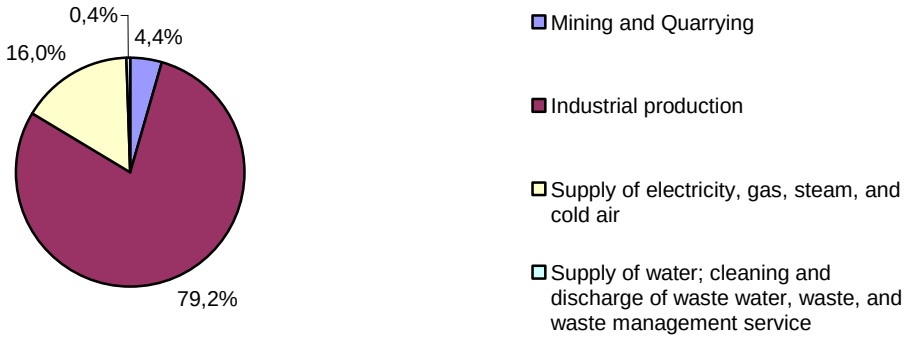
Solid particle contaminants emissions from the industry in 2008 made up as much as 93,5% of large and middle size stationary sources and emissions **decreased** by 78,2 % compared to the 1998. Manufacturing as a branch of the industry generated 79,2 % of emissions from the industry. A decrease in the solid particle contaminants emissions related with a changed fuel base in favour of refined fuels and installation of separating unit facilities or improving their performance. In 2008, the emissions of SPC decreased by 10,6 % compared to the 2007.

Trend in Emissions of SPC from Industry (tons)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Basic Polluting Substances from Industry – Solid Particle Contaminants*

Share of Industrial Branches on Solid Polluting Substances Emissions from Industry in 2008 (percentage)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Emissions of Basic Polluting Substances from Industry – Solid Particle Contaminants*

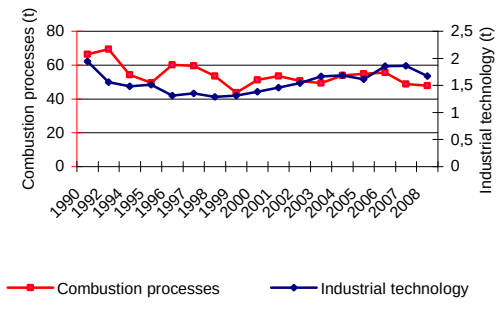
6.1.6. Heavy Metals Emissions from Industry

Trend in emissions of heavy metals is based on a balance of emissions from the manufacturing, which is divided for industrial thermal processes (industrial power engineering, iron making, metalworking processes, and copper production) and industrial non-thermal processes (petroleum refinery, coke production, steel making, hot rolled and cold rolled processes, aluminium production, industrial organic chemistry, and food industry).

Since 1990, heavy metals emissions from industry have had a decreasing trend. In 2008 compared to the 1990, only Cd emissions increased. A decreasing emission trend for the most of heavy metals is related with closing of some obsolete production facilities, extensive reconstruction of separating equipment, and changing of the used raw materials. In 2008 compared to the 2007, Cd, Hg, and Cu emissions generated during incinerating processes increased.

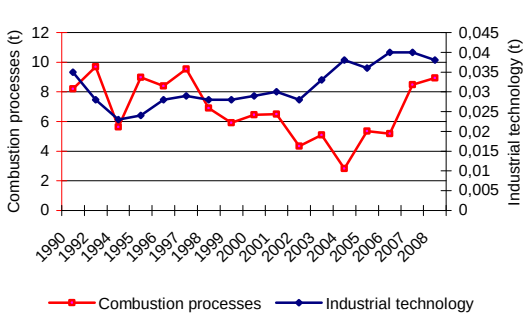
Trend in Emissions of Selected Heavy Metals from Industry (tons)

Pb



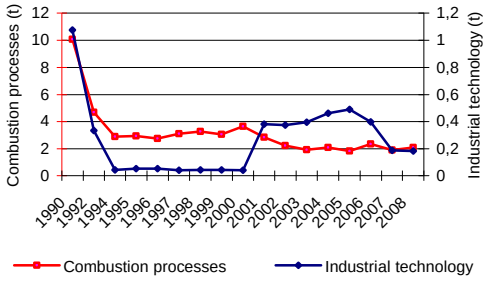
Source: SHMI

Cd



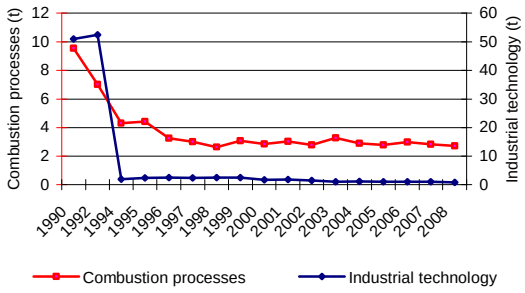
Source: SHMI

Hg



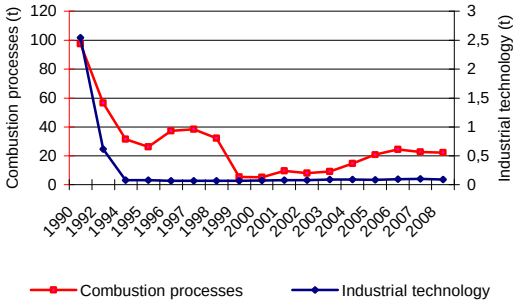
Source: SHMI

Cr



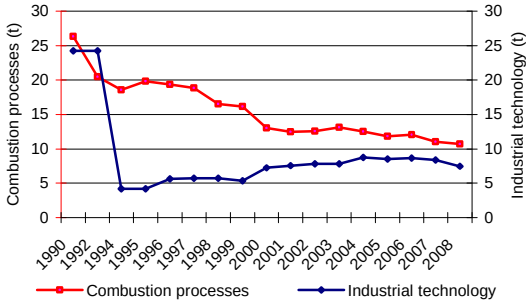
Source: SHMI

As



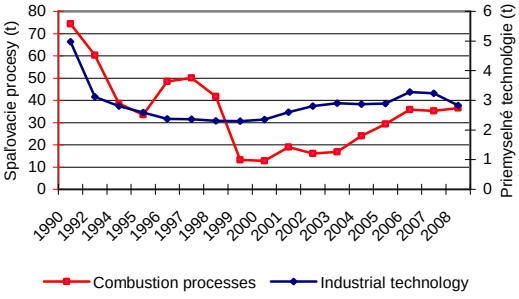
Source: SHMI

Ni



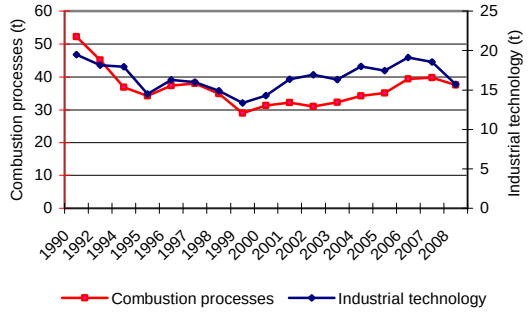
Source: SHMI

Cu



Source: SHMI

Zn



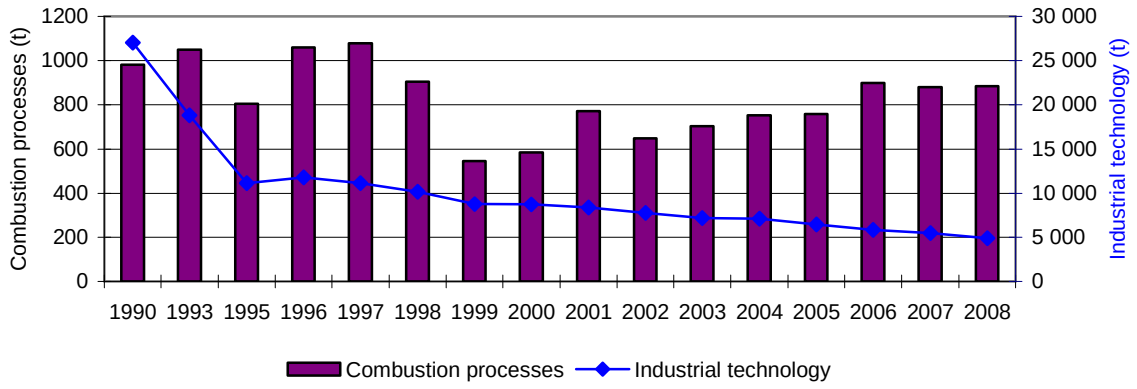
Source: SHMI

6.1.7. Emissions of Non-methane Volatile Organic Substances from Industry

Trend in emissions of non-methane volatile organic compounds (NM VOC) is based on a balance of emissions from the manufacturing. It is divided for industrial thermal processes (industrial power engineering, iron making, metalworking processes and copper production) and industrial non-thermal processes (petroleum refinery, coke production, steel making, hot rolled and cold rolled processes, aluminium production, industrial organic chemistry, and food industry).

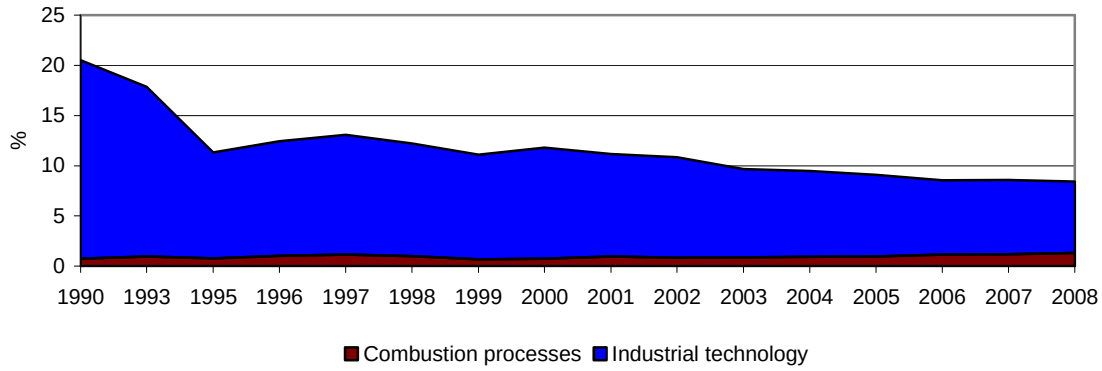
Since 1990, non-methane volatile organic substance emissions have decreased due to lower consumption of paints and gradual implementation of low-solvent paints, extended application of measures in the sector of oil refinery and fuel distribution, gasification of incinerators. In 2008, the industrial technologies and incinerating processes generated 7,2 % and 1,3 % of overall emissions of non-methane volatile organic compounds.

Trend in Emissions of NM VOC from industry (tons)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Non-methane Volatile Organic Substances from Industry*

Share of NM VOC Emissions from Industry on Overall NM VOC Emissions of (%)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

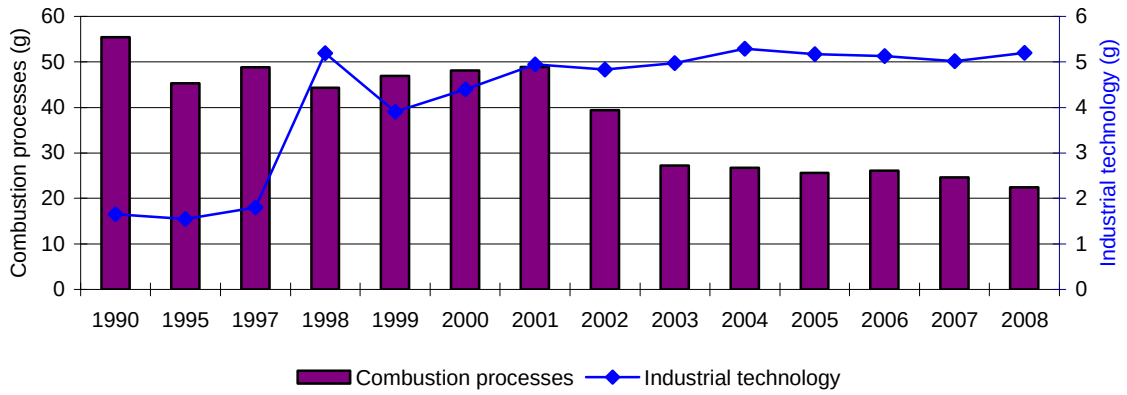
Indicator *Emissions of Non-methane Volatile Organic Substances from Industry*

6.1.8. Emissions of Persistent Organic Substances from Industry

Trend in emissions of persistent organic pollutants (POPs) from industry is based on a balance of emissions from manufacturing. It is divided for industrial thermal processes (industrial power engineering, iron making, metalworking processes and copper production) and industrial non-thermal processes (petroleum refinery, coke production, steel making, hot rolled and cold rolled processes, aluminium production, industrial organic chemistry, and food industry).

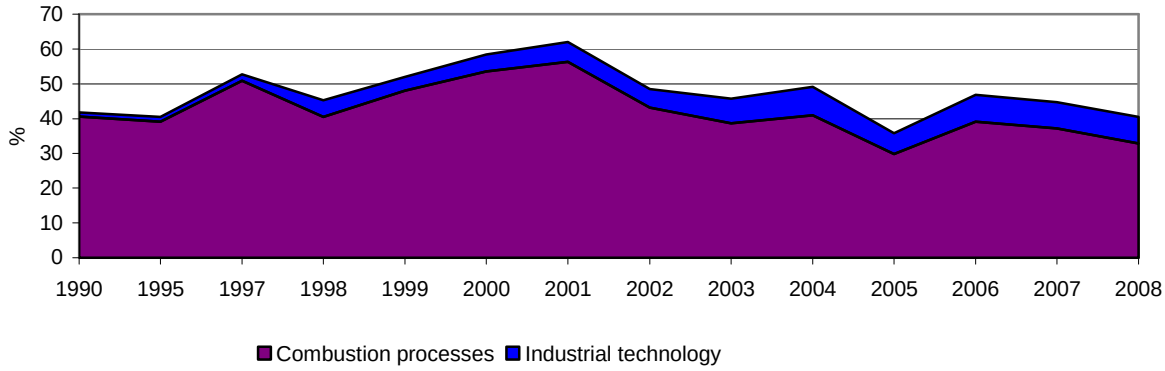
Since 1990, persistent organic pollutants emissions have mostly had a decreasing trend. Recently, the trend has been fluctuating. A decline was caused mainly by reduction in the sector of metal processing. The decline in polycyclic aromatic hydrocarbons (PAH) is related with modernization of aluminium production technologies (usage of pre-burnt anodes), installation of thermal destruction system at production of carbonic materials, and changed technology in wood preservation. From 2003 to 2005, emissions of poly-chlorinated dioxin and furan (PCDD/PCDF) from incineration processes decreased due to changed separators in ferrous ores agglomeration.

Trend in PCDD/PCDF[6] Emissions from Industry (g)



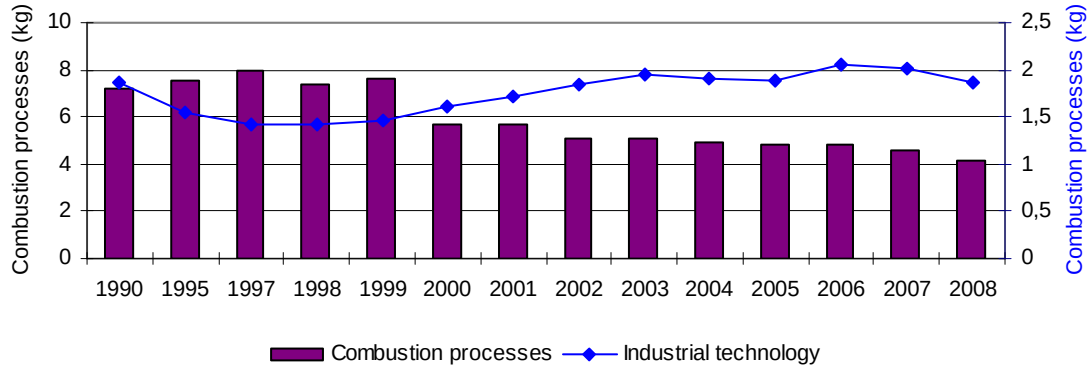
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Persistent Organic Substances from Industry*

Share of Industry on Overall Emissions of PCDD/PCDF (%)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Persistent Organic Substances from Industry*

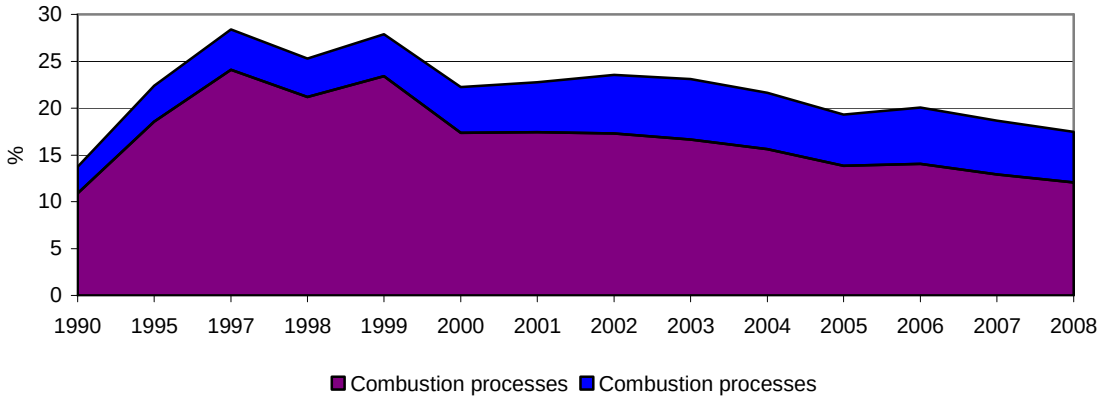
Trend in Emissions of Polychlorinated Biphenyl (PCB) from Industry (kg)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Persistent Organic Substances from Industry*

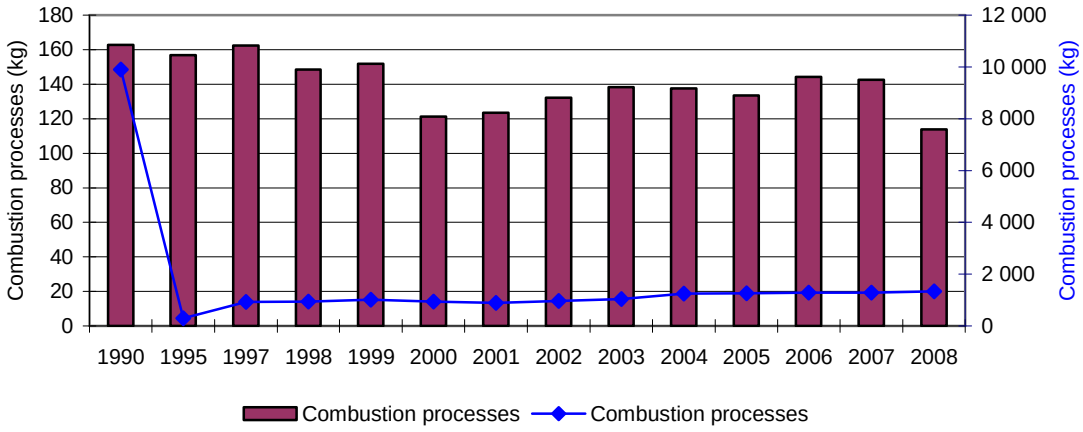
[6] PCDD - Polychlorinated dibenzodioxins, PCDF - Polychlorinated dibenzofurans are expressed as I-TEQ. I-TEQ is calculated from values for 2,3,7,8 – substituted PCDD and PCDF congenets while I-TEF is used by NATO/CCMS(1988)

Share of Industry on Overall Emissions of PCB (%)



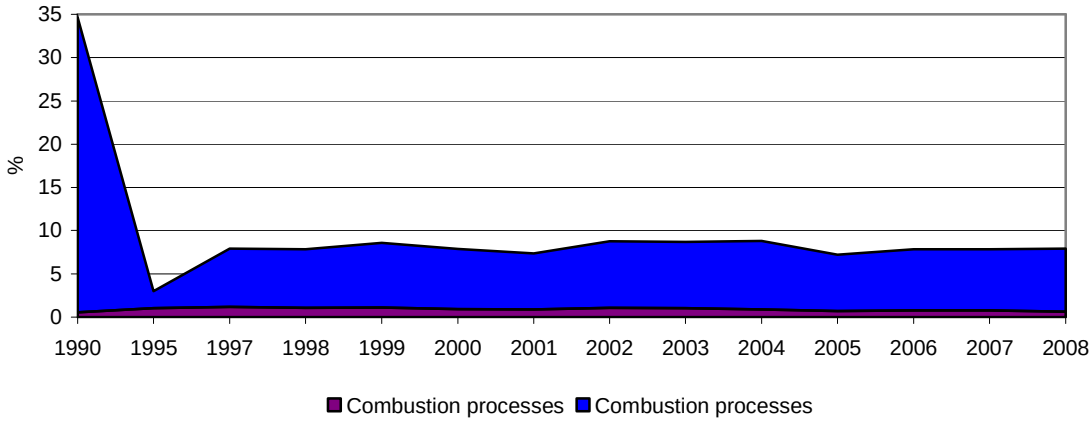
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Persistent Organic Substances from Industry*

Trend in Emissions of Polycyclic Aromatic Hydrocarbons (PAH) from Industry (kg)



Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency
Indicator *Emissions of Persistent Organic Substances from Industry*

Share of Industry on Overall Emissions of PAH (%)



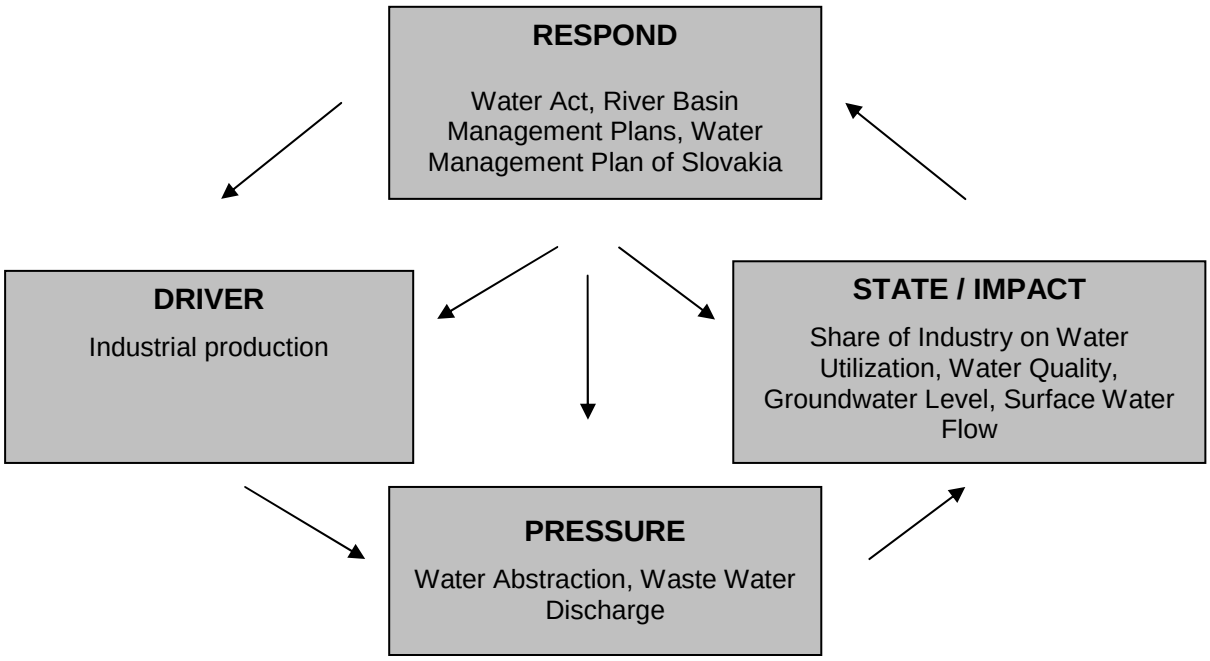
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Emissions of Persistent Organic Substances from Industry*

6.2. Water

Some industrial sectors such as pulp and paper industry, and mining industry consume too much water. Manufacturing is a driver in the industry. Pressure of the industry on water sources is felt especially by water abstraction for industrial purposes. It concerns the abstraction of surface water that represents a higher portion, as well as underground water.

Utilization of Water in Industry by D-P-S-I-R Model



List of Individual Indicators, which are Relevant to Define Utilization of Water by Industry

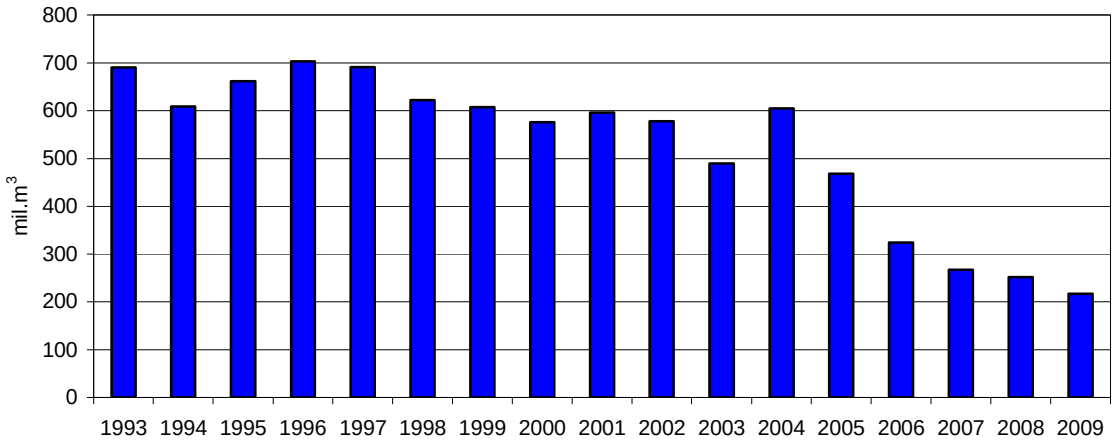
Position within DPSIR Structure	Individual Indicator
Driver	Industrial production
Pressure	Abstraction of ground water in industry
	Abstraction of underground water in industry
	Generation of waste water in industry
State / Impact	The share of industry of water use
	Water quality
	Groundwater level
	The flow of surface water
Respond	Water Act
	River Basin Management Plans
	Water Management Plan of Slovakia
	Investments into environment protection in industry
	Regular costs for environment protection in industry

*D – driving force *P – pressure *S – state
*I – impact *R – response

6.2.1. Surface Water Abstraction in Industry

Since 1993, abstraction of surface water by industry has been showing a decreasing trend. In 2009 compared to the 1993, the abstraction of surface water by industry decreased by 22,6 % and industry generated as much as 77,4 % share on overall abstraction. In the 1990s, decreased abstraction of surface and underground water by industry was caused by a drop and restructuring of industrial production.

Trend in Abstraction of Surface Water in Industry (mil. m^3)



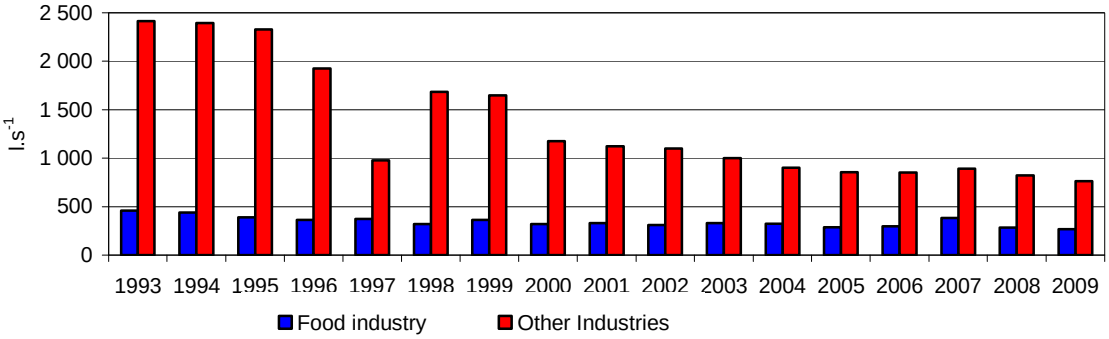
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Surface Water Abstraction in Industry*

6.2.2. Abstraction of Underground Water by Industry

Trend in abstraction of underground water by industry has been showing a tendency similar to one in abstraction of surface water. In 2009 compared to the 1993, the abstraction of underground water decreased by 41,6 % in food industry and by 68,4 % in other industries.

Trend in Abstraction of Underground Water in Industry (ls^{-1})



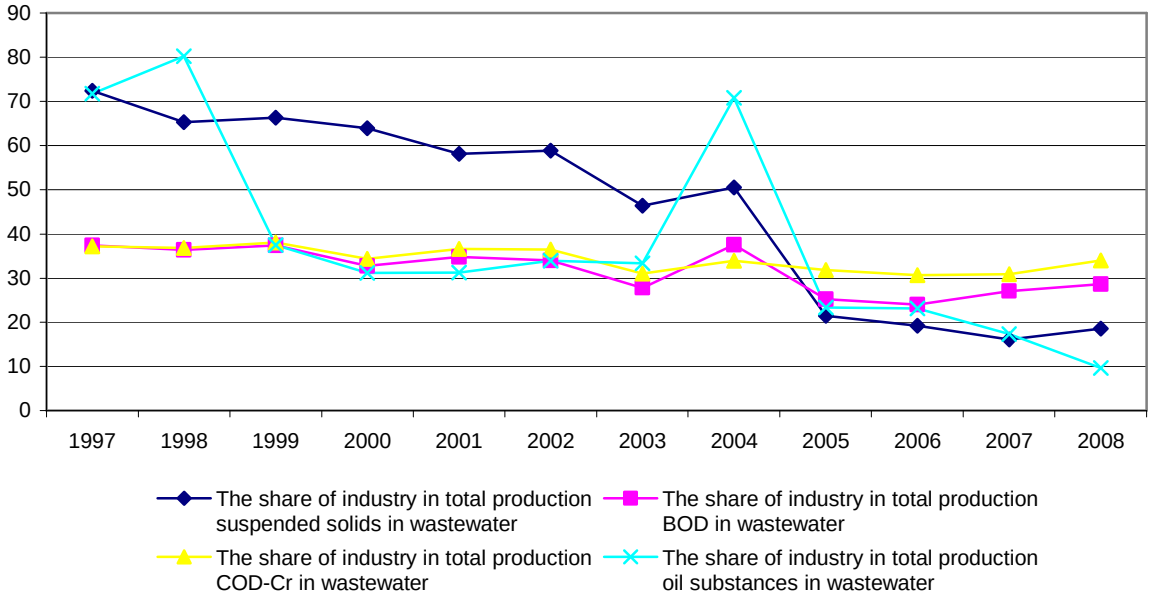
Source: Slovak Hydrometeorological Institute; Processed by: Slovak Environmental Agency

Indicator *Abstraction of Underground Water by Industry*

6.2.3. Generation of Waste Water in Industry

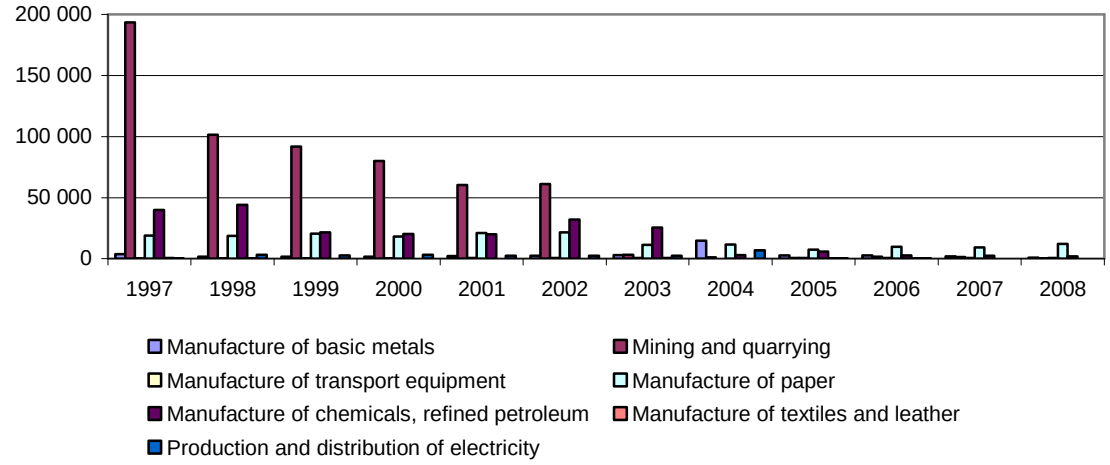
In 2008, the industry generated 9,6 % of overall oil substances in waste water (decrease by 62,1 % compared to the 1997), 18,5 % of overall insoluble substances (decrease by 56, 9 % compared to the 1997), 28,7 % of total biochemical oxygen demand (decrease by 8,8 % compared to the 1997), and 34% of total chemical oxygen demand (decrease by 3,2 % compared to the 1997). In 2008, the share of discharged waste water from the industry was 37,5 of overall volume of treated waste water discharged into water courses.

Share of Industry on Overall Generation of Waste Water (%)



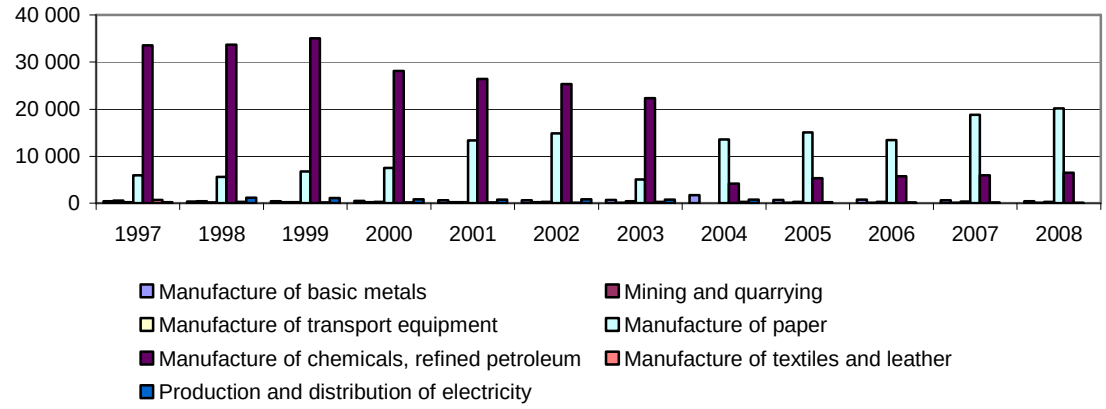
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator *Generation of Waste Water in Industry*

Trend in produced waste water by industry – insoluble substances (tons per year)



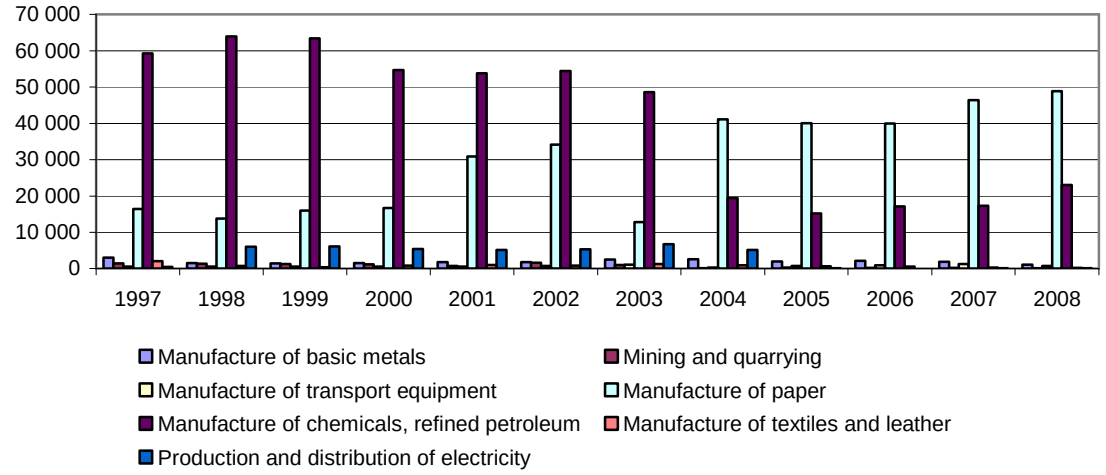
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator *Generation of Waste Water in Industry*

Trend in Generation of Waste Water by Industry – BOD (tons per year)



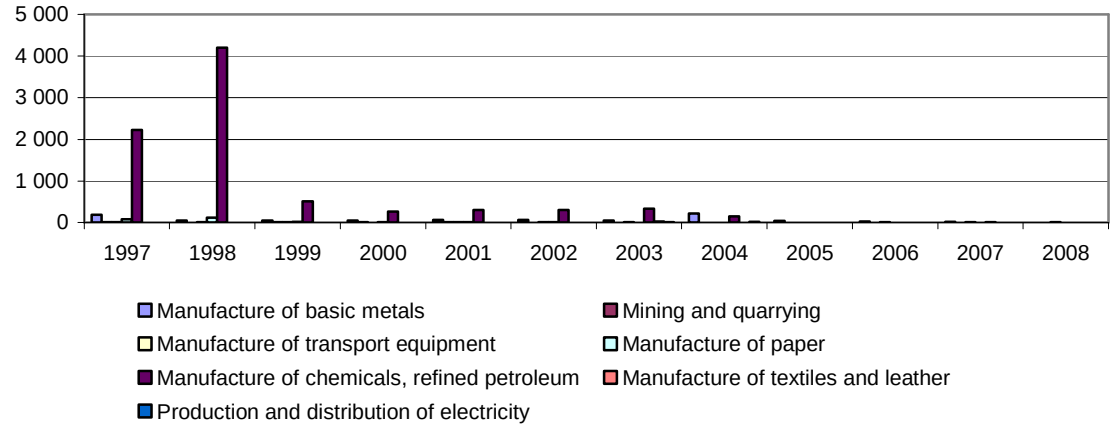
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator *Generation of Waste Water in Industry*

Trend in Generation of Waste Water by Industry - COD_{Cr} (tons per year)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency
Indicator *Generation of Waste Water in Industry*

Trend in Generation of Waste Water by Industry – Oil Substances (tons per year)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator *Generation of Waste Water in Industry*

6.3. Soil

Agricultural soil and forest soil funds are irreparable part of our environment and are a national wealth of the country. Protection of the agricultural and forest land, improvement in maintenance of soil fund as well as consolidation of complicated ownership relations to lands are regulated under several legal norms and directives such as Slovak National Council Act #307/1992 Coll. on the protection of agricultural soil resources, Act #326/2005 Coll. on forests, and SR National Council Act #180/199 Coll. on certain measures concerning settlement of ownership title to land act. The state uses data of land-registry office to progressively execute functions related with protection and revitalization of agriculture soil fund.

List of individual indicators, which are relevant to define utilization of soil

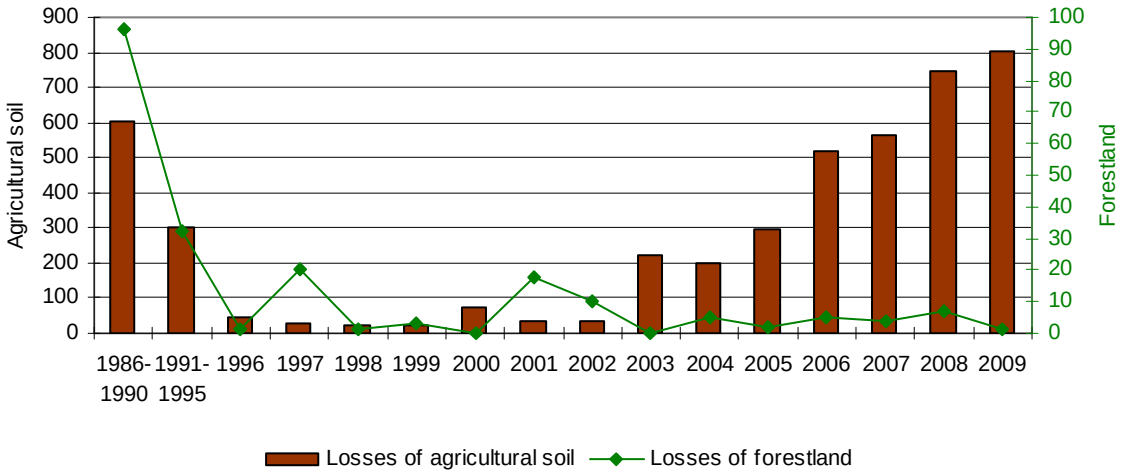
Position within DPSIR Structure	Individual Indicator
Driver	Industrial production index
Pressure	Soil loss due to industrial development
State / Impact	
Respond	Law on protection and use of agricultural land
	Investments into environment protection in industry
	Regular costs for environment protection in industry

*D – driving force *P – pressure *S – state
*I – impact *R – response

6.3.1. Soil Loss for Industrial Construction Purposes

The highest losses of agricultural soil for industrial construction purposes were recorded in 2009 (805 hectares). The highest losses in forestland for industrial construction purposes were recorded in 1997 (20 hectares). Agricultural soil loss for industrial construction purposes has an increasing trend since 2004. In 2009, the agricultural soil loss and forest land loss for industrial construction purposes were 805 hectares and 1 hectare.

Trend in soil loss for industrial construction purposes (hectare)



Source: Geodesy, Cartography and Cadastre of the Slovak Republic; Processed by: Slovak Environmental Agency

Indicator Soil Loss for Industrial Construction Purposes

6.4. Waste

List of individual indicators, which are relevant to define generation of waste in industry

Position within DPSIR Structure	Individual Indicator
Driver	Industrial production index
Pressure	Waste generation in industry
Respond	Waste Act
	Investments into environment protection in industry
	Regular costs for environment protection in industry

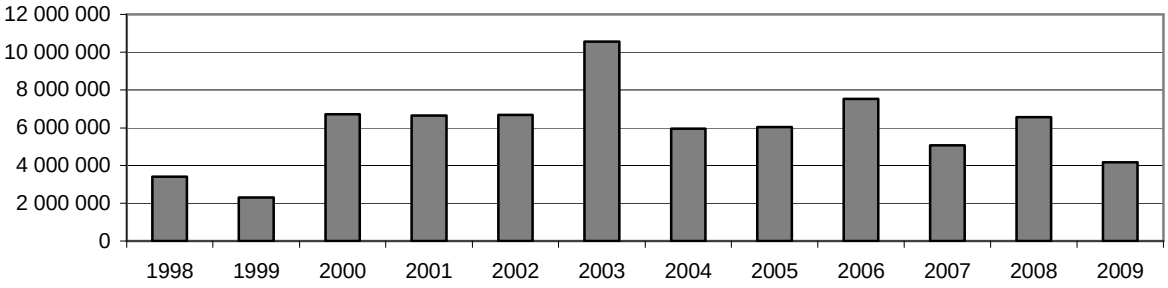
*D – driving force *P – pressure *S – state
*I – impact *R – response

6.4.1. Waste Generation in Industry

The industry has been the largest producer of the waste for a long time. It is a significant consumer of non-renewable natural sources, and negatively affects components of environment by generation of hazardous waste.

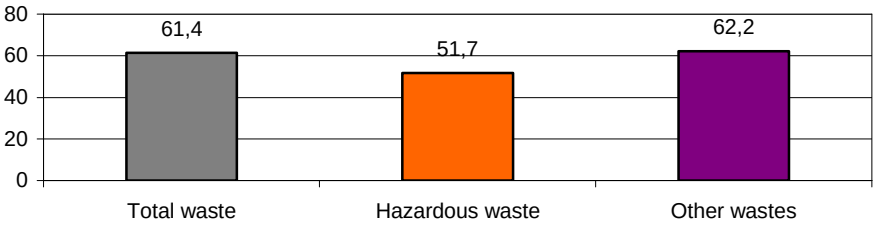
In 2009, the industry produced 4 164 479 tons of waste (61,4 % share on overall waste production) and from it; 250 763 tons of hazardous waste and 3 913 715 tons of other waste.

Trend in waste generation in industry (tons)



Source: SEA; Processed by: Slovak Environmental Agency
Indicator *Waste Generation in Industry*

Share of industry on overall volume of waste produced in 2009 (%)



Source: SEA; Processed by: Slovak Environmental Agency

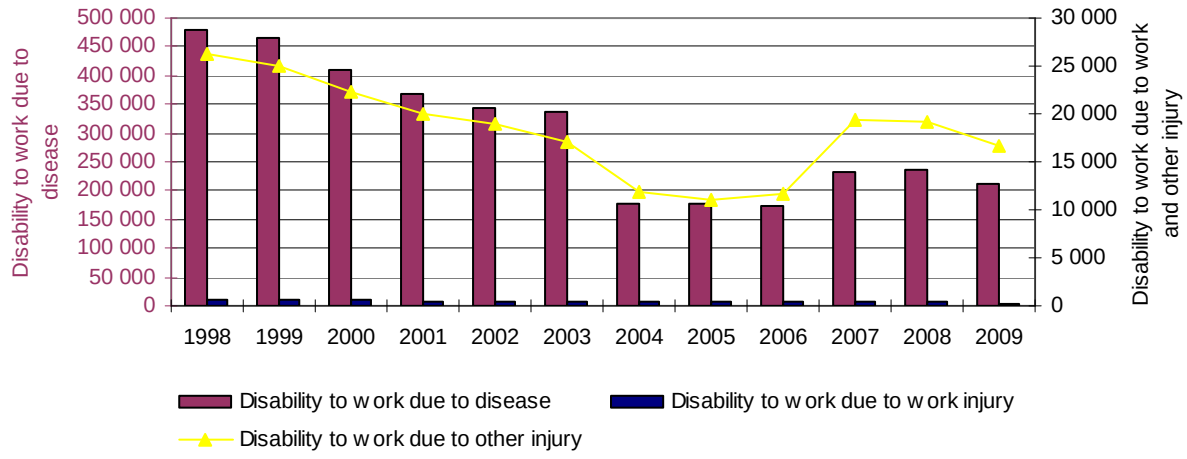
Indicator *Waste Generation in Industry*

6.5. Consequence – Quality of Environment, Occurrence Sick Leaves Cases

6.5.1. Sick Leaves Cases due to Sickness and Injury in Industry

In 2009, the number of sick leaves cases due to sickness and injury in the industry decreased by 55% compared to the 1998 and the total number was 232 943 cases. The number of sick leaves cases due to injury in the industry was 4 407 in 2009. The average sick leave rate due to occupational injury decreased from 0,207 % in 1998 to 0,118 % in 2009.

Trend in sick leave cases due to sickness and injury in industry (number of cases)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

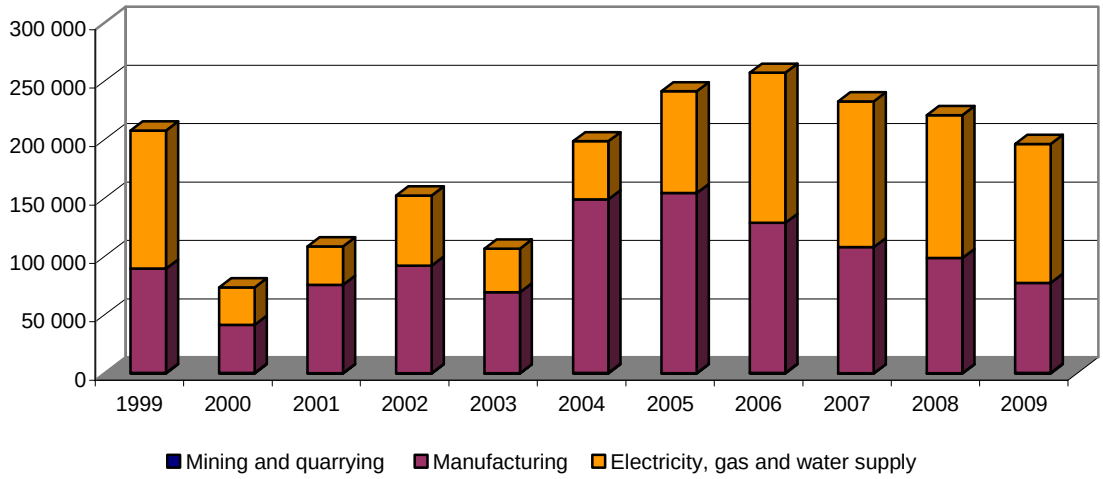
Indicator *Sick Leaves Cases due to Sickness and Injury in Industry*

6.6. Respond – Environment Protection Costs

6.6.1. Investment to Protect Environment in Industry

Investing into the environmental protection in the industry has a fluctuant trend. In 2009, the investment for environment protection reached the volume of EUR 196 419, 36 thous.. The 39,2 percent of investments were spent for manufacturing, 60,6 % for production of electricity, gas and water, and 0,2 % for mining and quarrying of minerals.

Trend in investments for protection of environment in industry (EUR thousands)



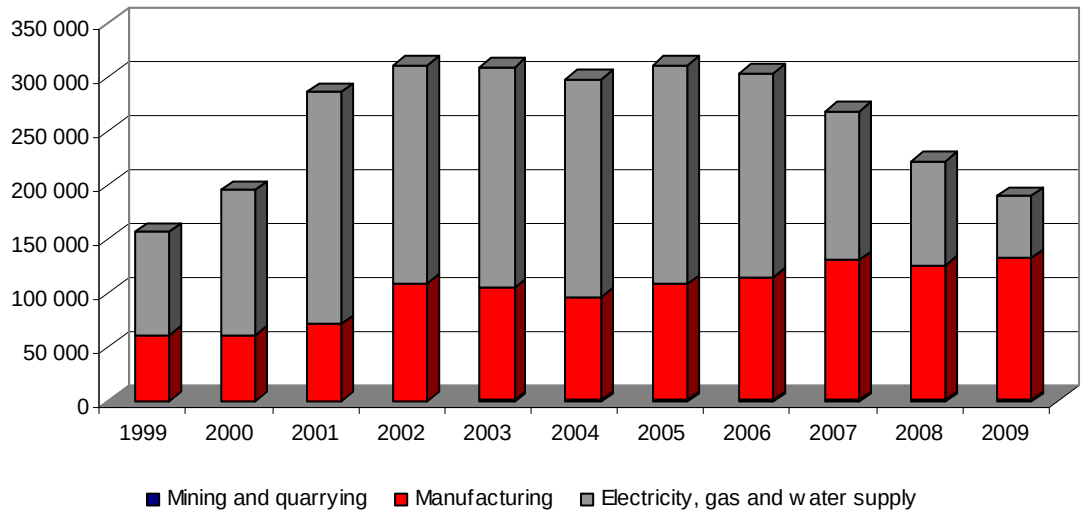
Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator *Investment to Protect Environment in Industry*

6.6.2. Regular Costs for Environment Protection in Industry

The amount of regular costs for the environmental protection in the industry has a **fluctuant** trend. In 2009, the regular costs for environment protection reached the sum of EUR 189 514,79 thous. The 30 percent of the costs were from the production of electricity, gas and water, 69,3 % from manufacturing, and 0,7 % from mining and quarrying of minerals.

Trend in regular costs for environment protection in industry (EUR thousands)



Source: Statistical Office in the Slovak Republic – Slovstat; Processed by: Slovak Environmental Agency

Indicator *Regular Costs for Environment Protection in Industry*

7. Is the eco-efficiency of the Industry improving in the Slovak Republic?

Environmental efficiency is a relation between an economic activity and negative influences of this activity on environment. The main goal of the permanently sustainable development is to separate or interrupt this connection.

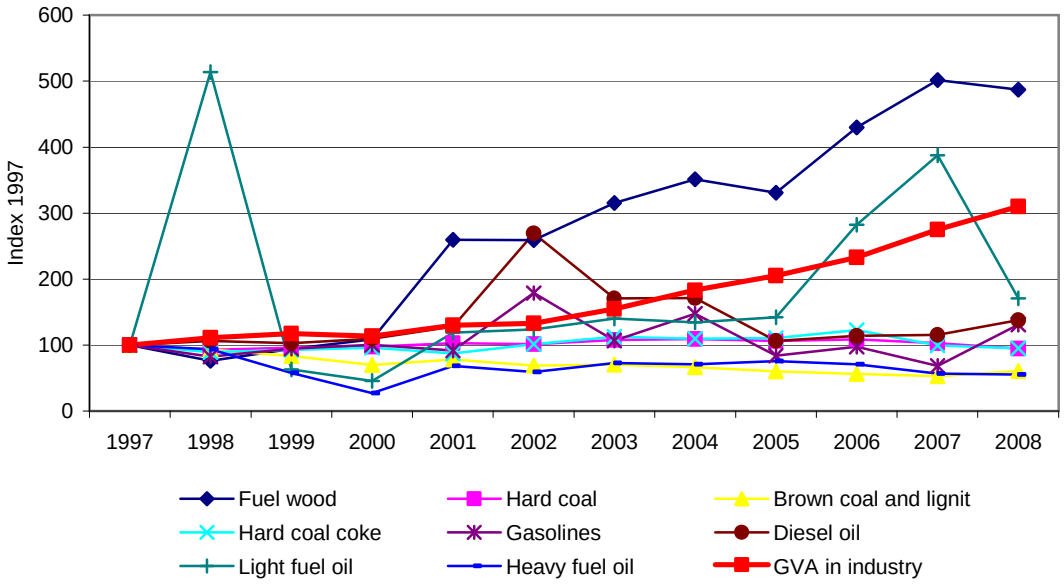
The success in implementation of environmental policy into sectors might be characterized by correlative dependence between economic indicators of relevant sector (expressed by indicators of the GDP –Gross Domestic Product, or GVA - Gross Value Added) and negative influences of this sector on environment (e.g. trend in emissions of substances polluting air and water, exploitation of natural sources, energy, etc). These influences are a reflection of environmental efficiency or environmental efficiency of relevant sector. Roughly, the relevant sector of the economy activity becomes environmentally effective if its economic growth is ensured while its negative influences on environment are minimized. It is not expected, that environmental efficiency of the industry will run through any significant breakthrough which would signal straighter implementation of environmental aspects.

The environmental efficiency of the industry, in regard of a slow restructuring of the industry, insufficient implementation of new and more progressive technologies as well as ongoing raw and energy intensiveness, is still low.

7.1. Environmental Efficiency of Industry in relation to Consumption of Selected Fuel Types

Environmental efficiency of the industry in relation of fuel consumption is characterized by a positive trend in the consumption of fuel wood, liquid fuels (heavy fuel oil), and solid fuels (brown coal and lignite, black coal, and coke). The slightly positive trend in environmental efficiency was shown in diesel oil and light burning oil. Lower consumption of some solid fuels contributed to reduction of emissions of selected polluting substances.

Environmental efficiency of industry in relation to consumption of selected fuels types



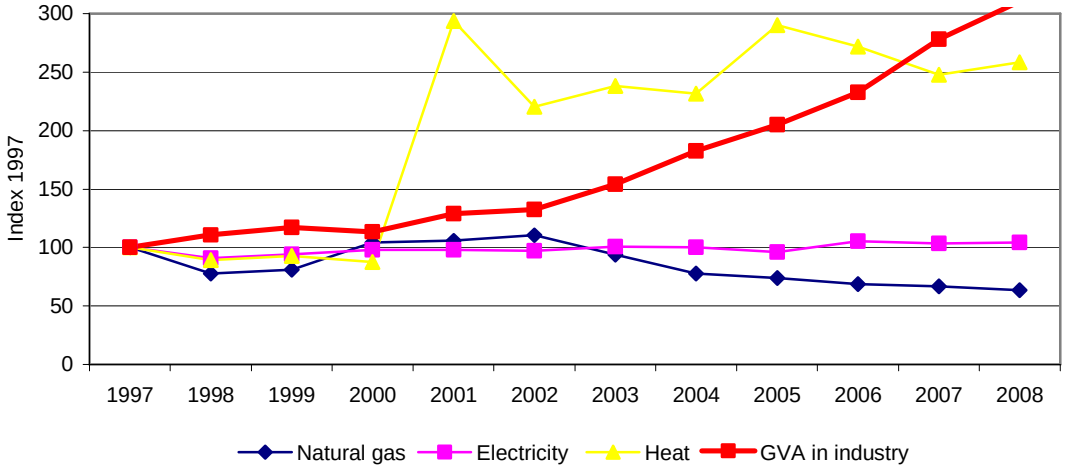
Source: Statistical Office in the Slovak Republic; Processed by: Slovak Environmental Agency

Indicator *Environmental efficiency of industry in relation to consumption of selected fuels types*

7.2. Environmental Efficiency of Industry in relation to Consumption of Gas, Electricity, and Heat

Environmental efficiency of the industry in relation to natural gas consumption is characterized by a positive trend. In relation to electricity consumption and heat consumption, it has a slightly negative and negative trend.

Environmental efficiency of the industry in relation to consumption of gas, electricity, and heat



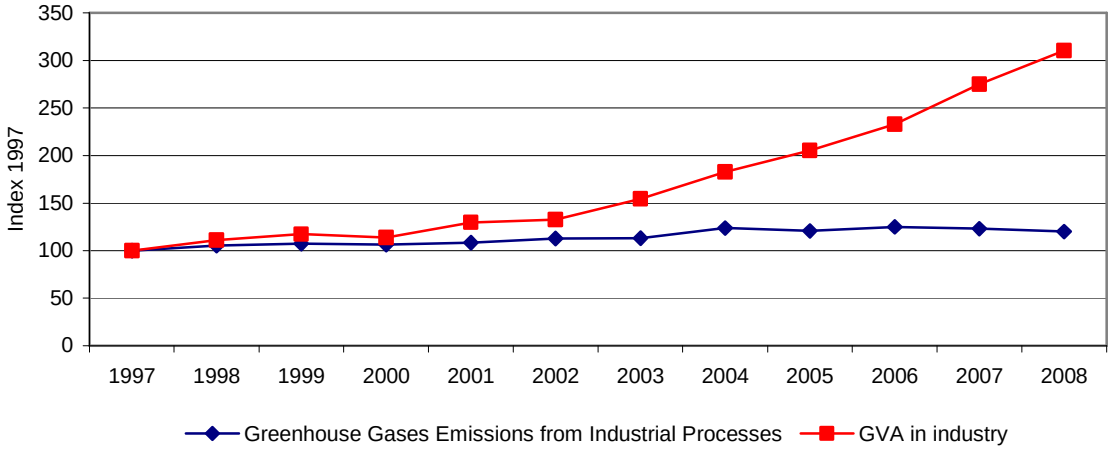
Source: Statistical Office in the Slovak Republic; Processed by: Slovak Environmental Agency

Indicator *Environmental efficiency of the industry in relation to consumption of gas, electricity, and heat*

7.3. Environmental Efficiency of Industry in relation to Greenhouse Gases Emissions from Industrial Processes

Environmental efficiency of the industry in relation to greenhouse gases emissions from industrial processes has a slightly positive trend.

Environmental efficiency of the industry in relation to emissions of greenhouse gases from industrial processes



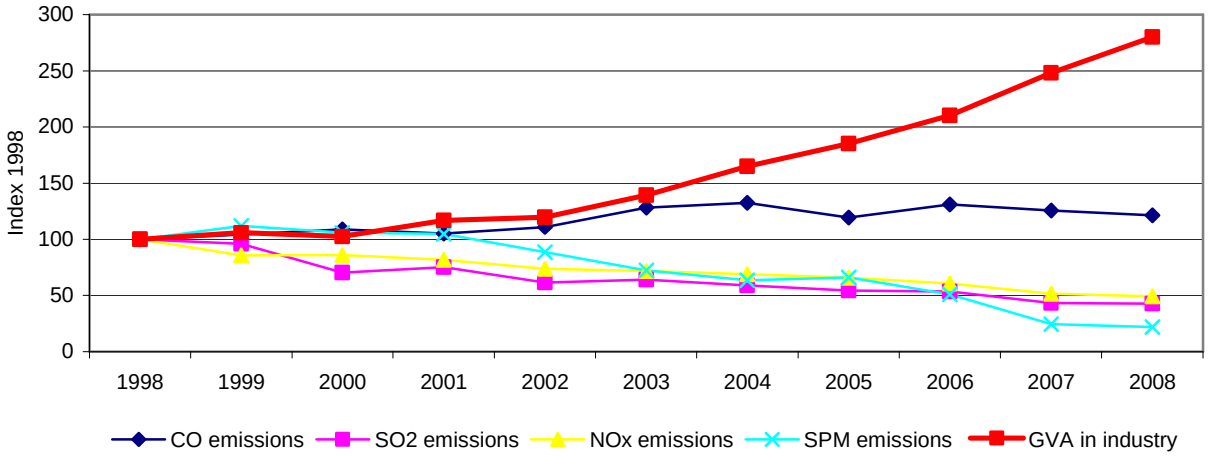
Source: Statistical Office in the Slovak Republic, SHMI; Processed by: Slovak Environmental Agency

Indicator *Environmental efficiency of the industry in relation to emissions of greenhouse gases from industrial processes*

7.4. Environmental Efficiency of Industry in relation to Basic Polluting Substances from Industry

Environmental efficiency of the industry in relation to basic polluting substances (SO_2, NO_x, solid particle contaminants) generated by the industrial processes has a positive trend and in relation to CO emissions it has a slightly negative trend.

Environmental efficiency of the industry in relation to basic polluting substances from industry



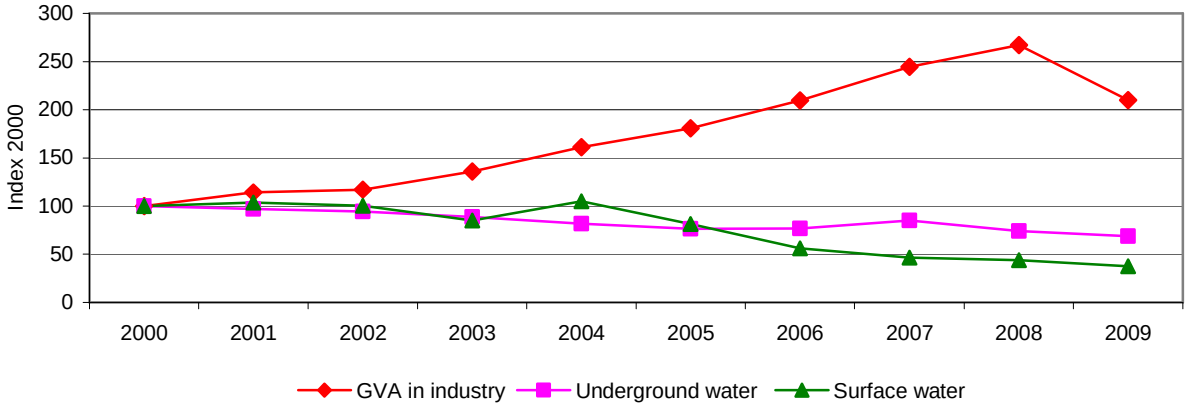
Source: Statistical Office in the Slovak Republic, SHMI; Processed by: Slovak Environmental Agency

Indicator *Environmental efficiency of the industry in relation to basic polluting substances from industry*

7.5. Environmental Efficiency of Industry in relation to Water Usage in Industry

Environmental efficiency of the industry in relation to water usage in the industry has a positive trend.

Environmental Efficiency of Industry in relation to Water Usage in Industry



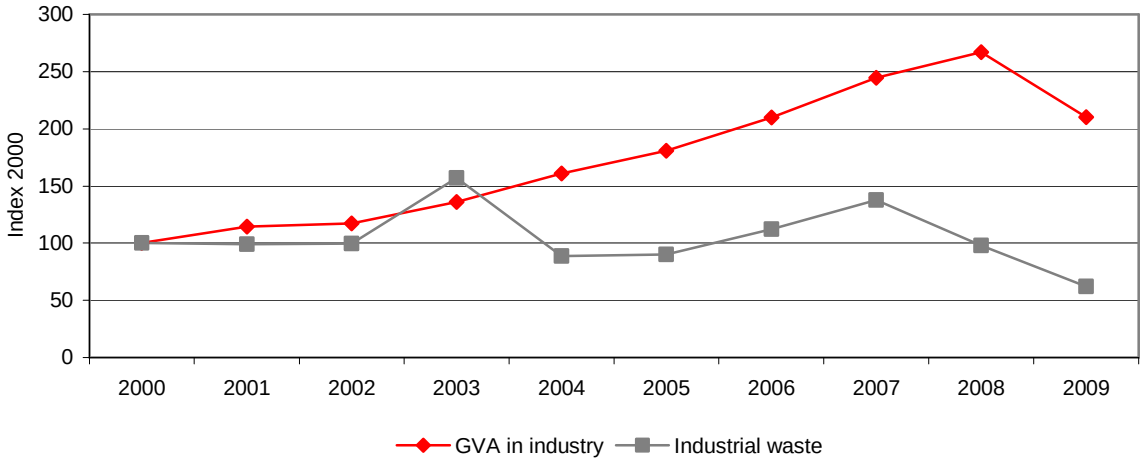
Source: Statistical Office in the Slovak Republic, SHMI; Processed by: Slovak Environmental Agency

Indicator *Environmental Efficiency of Industry in relation to Water Usage in Industry*

7.6. Environmental Efficiency of Industry in relation to Volume of Produced Waste in Industry

Environmental efficiency of the industry in relation to volume of produced waste is characterized by a positive trend.

Environmental Efficiency of Industry in relation to Volume of Produced Waste in Industry



Source: Statistical Office in the Slovak Republic, SHMI; Processed by: Slovak Environmental Agency
Indicator Environmental Efficiency of Industry in relation to Volume of Produced Waste in Industry

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Abbreviations

BOD	Biological Oxygen Demand
Cd, Hg, and Cu	Cadmium, mercury, copper
CO	Carbon monoxide
COD_{Cr}	Chemical Oxygen Demand by Dichromate
Coll	Collection of Law
COM	Communication
EC	European Commission
EEA	European Environmental Agency
EMAS	Eco-Management and Audit Scheme
EMS	Environment Management System
EU	European Union
EUR	Euro (currency)
g	gram
GAV	Gross Added Value
GDP	Gross Domestic Product
GJ	Giga-joule
GMES	Global Monitoring for Environment and Security
ISO	International Organization for Standardization
kg	kilogram
m^3	Cubic meter
MWh	Megawatt hour
NATO/CCMS	North Atlantic Treaty Organization /Committee on the Challenges of Modern Society
NM VOC	Non-methane Volatile Organic Compounds
NO_x	Nitrogen oxides
OECD	Organization for Economic Cooperation and Development
OKEČ	Branch Classification of Economic Activities
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychloride Biphenyl
PCDD/PCDF	Polychlorinated dibenzodioxins/ Polychlorinated dibenzofurans
POPs	Persistent Organic Pollutants
QMS	Quality Management System
REACH	Registration – Evaluation – Authorization – Restriction of Chemicals
R&D	Research and Development
SK NACE Rev. 2	Statistical Classification of Economic Activities in the European Community, Revision 2 from 2008
SO_2	Sulphur dioxide
SPC	Solid Particle Contaminants
SR	Slovak Republic
STN	Slovak Technical Norm
t	ton