SLOVAK ENVIRONMENT AGENCY

MINISTRY OF ENVIRONMENT OF THE SLOVAK REPUBLIC

ARE THE SECTORS OF THE ECONOMY OF THE SLOVAK REPUBLIC BECOMING GREENER?

Sector indicator report

Banská Bystrica

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Foreword

The idea accepted for years that ecology and economy are standing against each other is increasingly showing up as short-sighted. The exact opposite is the truth. The sound economic growth and effective environmental protection can and have to go hand in hand. The green economy is thus the only responsible answer to the key question of the present day – how to keep the favourable environment for us and all coming after us. It is not necessary to point out that the clock is showing five minutes to twelve.

The main features of the green economy include increasing productivity and efficiency of utilization of natural resources and at the same time the pollution reduction. The economy oriented in this way is not only the option any more, but inevitability. Either from the perspective of using up natural resources or the environmental deterioration and the related negative impact on human health. At the same time, it is also the condition for reducing consequences of climate change on the society, including keeping food and energy security.

At the international scale as well as at the level of the Slovak Republic, more strategic and conceptual documents and the subsequent legislative measures have been adopted representing the framework for implementing branch reforms. Gradually, institutional, regulation and financial mechanisms and systems necessary for the transition to the green economy have been gradually created and implemented.

The sector indicator report called “Are the sectors of the economy of the Slovak Republic becoming greener?“ issued by the Ministry of Environment of the Slovak Republic in co-operation with the Slovak Environment Agency presents the assessment of the state of selected sectors of the economy from the perspective of their impact on the environment and the level of utilization of natural resources. It also presents the development from the perspective of separating the environmental pressure of the sector from its economic growth. At the same time, it also points out to the spheres requiring a higher attention to the restriction of their negative impact so that the Slovak Republic is able to ensure the meeting of adopted obligations and targets in the sphere of sustainable development, the environmental care and the transition to the low-carbon and circular economy.

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1. Introduction

We are living in the quickly changing world. The number of inhabitants in the Earth has been increasing considerably; it has grown approximately four times during the last century and it will continue to grow further. Requirements for utilization and accessibility of natural resources are growing, the global competition for them has been intensifying. Requirements for energy are increasing; transport has been increasing considerably, there are changes in the landscape utilization. At the same time, consequences of global phenomena are manifesting themselves, such as biodiversity loss and climate change. The quality of environment is becoming more and more important factor impacting inhabitants' health.

- *Ensure healthy life and increase its quality for everybody, regardless their age.*
- *Enforce permanent, inclusive and sustainable economic growth, full and productive employment and dignified work for everybody.*
- *Ensure the sustainable consumption and production.*
- *Take immediate measures aimed at fighting climate change and its impacts.*

These are examples of targets with which the world society represented by the United Nations (UN) reacts to the development of conditions at the global level that we can unambiguously interconnect with the changing environment. The aforementioned targets are part of the **Agenda 2030 for Sustainable Development** approved at the UN Summit in 2015 determining the general framework for countries of the world for eliminating poverty and achieving the sustainable development by 2030.

At the UN General Assembly, the resolution "Transforming our world: The 2030 Agenda for Sustainable Development" was adopted on 25 September 2015. Seventeen targets for the sustainable development and 169 related partial targets (intentions) were adopted. The new agenda is based on the Millennium Development Targets (Agenda 21) and is aimed at completing what has not been accomplished yet.

In 2016, the European Union also reacted to adopting the Agenda 2030 by adopting the document called "Next steps for sustainable European future – European action for sustainability and by declaring the commitment to achieve the sustainable development".

The European Union is fully determined to be a pioneer in implementing the Programme 2030 and meet targets of the sustainable development, together with its member states in accordance with the subsidiarity principle. The Programme 2030 will further strengthen the joint approach between the EU external activity and its other policies and cohesion among the EU financial instruments. Next steps for sustainable European future – European action for sustainability.

The important support for fulfilling these targets is implementing the document **Europe 2020: A strategy for smart, sustainable and inclusive growth**. Through this document, the EU enforces the sustainable growth by developing a more competitive, low-carbon economy using resources efficiently and sustainably. Its flagship initiative "A Resource-Efficient Europe" sets itself the aim of supporting the transition towards the economy efficiently using all resources, completely separates the economic growth from resources and energy utilization and from its impacts on the environment, reduces greenhouse gas emissions, increases competitiveness by effectiveness and introducing innovations.

Therefore, the EU approved the support of the transition to the green economy and strive for full separation of the economic growth from the environmental deterioration. For the transformation for the inclusive green economy, it is necessary to include environmental issues in the other policies more widely, for example in the energy sector, transport, agriculture, fishing, trade, economy and industry, research and innovations, employment, development, foreign affairs, security, education and professional vocational training sectors as well as the social and tourism policies sectors in order to create the cohesive, mutually interconnected approach.

In order to decrease impacts on the environment resulting from policies and activities of the other sectors, and achieve the targets related to the environment and the climate, it is inevitable to include environmental issues in all respective areas of policies. The Seventh Environment Action Programme of the Union to 2020 "Living Well, Within the Limits of Our Planet".

The Seventh Environment Action Programme (the 7th EAP) defines the Priority Objective 2: Create a resource-efficient, low-carbon, green and competitive economy.

Within this target, in order to transform the EU into a resource-efficient, green, competitive, low-carbon economy, the EU shall undertake to:

- *Fulfil targets in the area of climate and energy sector, cutting greenhouse gas emissions.*
- *Considerably decrease the total impact of all main sectors of the economy on the environment.*
- *Introduce structural changes in production, technologies and innovations as well as in consumption patterns, decrease the total impact of production and consumption on the environment.*
- *Handle wastes as resources, reduce the quantity of waste production and store only residual waste.*
- *Prevent lack of water in the EU.*

The improvement of inclusion of the environmental issues and policy cohesion are addressed in the **Priority Objective 7**. This objective states that even if including aspects of the environmental protection into the other EU policies and activities have already been demanded from 1997, the overall condition of the environment in Europe shows that the progress so far – even if praiseworthy in some spheres – is not sufficient for reversing all unfavourable trends. Achieving many priority objectives of the 7th EAP will request even more effective integration of aspects concerning the environment and the climate into the other policies as well as more cohesive, mutually interconnected political approaches brining more advantages.

In its **policy statement**, the Government of the Slovak Republic claimed its responsibility for the proactive fulfilment of obligations and targets in the sphere of sustainable development and the environment accepted at the international level and at the same time it undertook to implement the European environmental legislation and fulfilling the targets defined in the 7th EAP.

The starting point for activities of the Government of the Slovak Republic represents the framework of the stable development of the society of the Slovak Republic with flexible reacting to opportunities and threats of the external environment, in order to ensure the economic, social and environmental development of Slovakia and deepen social cohesion, decrease regional differences, strengthen the active role of the state and fight against corruption with the increase in the quality of services of the public sector provided to citizens. The policy statement of the Government of the Slovak Republic for the years of 2016 – 2020

The Government has also undertaken to fluently continue in the support of the economic, social and environmental development of the country. The eco-efficiency of the development of the **manufacturing** is declared as an element that will play an important role in searching for the balance of the economic, social, political and environmental development of the Slovak Republic. When developing the new industrial policy, provision of subsidies to energy-demanding sectors is not considered, but the support of introducing innovations reducing energetic, material and emission demands.

In the **energy policy** as a part of the economic policy, the Government considers its main target to be the balanced approach among its three pillars: security, competitiveness and sustainability, in order to ensure safe, sustainable and price-affordable supply of all types of energy. In accordance with its national and state interests, Slovakia has set itself the aim to contribute to building the Energy Union with the emphasis on increasing its energy security and competitiveness, such as synergies between the energy policy and the policy of climate change.

The Government has adopted the obligation to support the transition to the **circular economy** ensuring rational utilization of resources, energy efficiency and decreasing environmental impacts.

In the **transport** sector, key declared priorities include the support of public passenger transport as the most favourable for the environment and, at the same time, one of the safest manners of transport, the plan to reduce the load of the road network, take measures for transferring goods from the road transport to the railway transport, reduce impacts of the transport on the environment and on citizens living near the main routes.

The intended support of the efficient utilization of the **agricultural land fund** will create conditions for its protection against unjustified confiscations of land for non-agricultural activities. The Government perceives **forest** as an integral part of the rural environment where it is necessary to farm according to the principles of the sustainable development in order to ensure the permanent distribution of the other functions of forests beneficial to the society. The wood-processing industry is an important factor of the domestic employment in regions, therefore it is inevitable to support the policy of felling and final processing of the Slovak wood by local producers in order to prevent inappropriate exporting of not processed wooden matter abroad, whereby it will create the value added for the Slovak wood-processing industry.

The Government has undertaken to support ecologisation and economy of the **forest production** and farming of forests close to the nature as a part of the sophisticated forest economy as well as the purposeful care of forests.

The intention of the Government in **tourism** will be increasing its competitiveness related to the creation of jobs. The Government will reassess the possibility of adopting more flexible forms for the seasonal character of tourism.

In the **environment** sector, the basic target was defined to create suitable preconditions for the gradual transition to a competitive resource-efficient and low-carbon economy. For fulfilling this target, it is necessary to focus on the support of efficient utilization of resources, cutting greenhouse gas emissions and adjusting to the climate change, protection, conserving and enhancing eco systems, biodiversity and natural capital; as well as the protection against negative environmental impacts on human health and strengthening implementation of the environmental legislation.

In the sphere of supporting **resource-efficient utilization of resrouces**, assumptions for the transition to the competitive circular economy will be mainly created via the targeted support of implementation of existing and by developing innovative economic instruments. The active

support will be provided for focusing on the whole life cycle of products and services with the emphasis on rational and effective utilization of resources, product design, sustainable production and consumption and their further use.

The publication **Are the sectors of the economy of the Slovak Republic becoming greener?** assesses the development in some selected sectors of the economy that can be considered, with regard to their character, to be the most important from the perspective of their impact on the environment and utilization of resources. They are the following sectors:

manufacturing

energy

transport

agriculture

forest economy

tourism

The objective of the assessment is to point out to what is the progress in the development in the aforementioned sectors relating to decreasing the negative influencing of the environment and more effective utilization of resources where achieved trends are positive and where at present Slovakia has “weaknesses” on the way of its transition to a low-carbon, green and competitive economy.

2. Methodology

When drawing up this publication, the methodology developed by the Organisation for Economic Co-operation and Development (OECD) was used in the process of indicator assessment of implementation of environmental aspects in some selected sectors and their impact on the environment.

Evaluation process consists of the following two phases:

1. formation and drawing up a complex of indicators according to the P-S-R (Pressure-State-Response) chain,
2. drawing up the sector indicator report.

The causal P-S-R chain represents the methodological instrument of the integrated assessment of the environment used for describing interactions of human activities and the environment.

Within the individual parts of this chain, the following indicators are assessed characterising:

- **pressure (P)** on the environment in the negative (contamination, using up natural resources) or positive sense that is influenced by the social and economic development of the society. This is an immediate cause of changes in
- **state of the environment (S)**. Deterioration of the state of the environment and its parts leads to
- **response (R)** – formulating and adopting measures and instruments in the society aimed at eliminating or remedying damages in the environment.

Based on the P-S-R chain, the indicators are divided into the following three groups describing:

- sector trends important for the environment,
- interactions of the sector and the environment,
- the related economic and political reactions of the society.

Based on the revision of the Slovak Environment Agency (SEA) indicators, the following complexes of sector indicators were formed in 2015 that were used for assessments in the report:

15 15 17 18 14 13

The selection of the individual indicators is done dynamically while using continuous analyses, reports and indicators of international organisations, mainly the European Environment Agency (EEA), OECD, EUROSTAT as well as with regard to national needs or requirements.

The different accessibility of data has manifested itself in various time series in respect of the individual indicators. If no data are available for the manufacturing, the sector of industry is assessed. Also in the case of agriculture where no data are available for agriculture, the whole sector of agriculture is assessed. The SEA sector indicators drawn up in detail are accessible at the Enviroportal website (http://www.enviroportal.sk/indicatory-sektorove). When preparing and assessing, tables, graphs and maps made of data of departmental and extra-departmental organisations and their databases, available statistical yearbooks, evaluation reports, and any other relevant information systems are used.

A complex of indicators in accordance with the P-S-R chain provides the theoretical base for drawing up the so-called indicator sector reports the priority objective of which is to learn cause-consequence relations among activities performed in the individual sectors and the state of the environment, evaluate their development and directing as well as the response of the society to facts ascertained. The P-S-R chain for the given sector used in the individual indicator reports is a simplified expression of the reality. There are other relations and factors (e.g. social and economic) considerably influencing the environment that are not fully included in the chain.

Indicator sector reports are focused on answering the following four key questions:

- How are the environmental principles and targets releted to the sector implemented into the strategic documents?
- What is the state and directing of the sector in relation to the environment?
- What are interactions of the sector and the environment?
- What is the response of the society to mitigating or compensating negative consequences of the sector on the environment?

Similarly as indicators, reports are accessible at the Enviroportal website (http://www.enviroportal.sk/spravy/sektorove-spravy).

Reports as well as this publication cover the time horizon of the years of 2000 – 2015. In some cases, the time horizon is different especially for the reason of different availability of data.

In order to evaluate directing of the sector towards the sustainable growth, the decoupling method is used, i.e. separating the impact of the economic growth in the sector from its negative environmental impact and utilization of resources.

The target of decoupling is to interrupt dependency between the negative impact of the given sector on the environment and its economic performance. The environmental negative impact can be expressed e.g. as the production of greenhouse gas emissions and other pollutants, production of waste and waste water, utilization of natural resources and energy, etc. The economic performance is the most frequently expressed in the form of gross domestic product (GDP) or gross value added (GVA). Decoupling can be relative or absolute. In the case of relative decoupling, performance is increasing more quickly than the environmental pressure that is increasing more slowly or is stagnating. In the case of absolute decoupling, performance is increasing with the simultaneous decrease in the environmental pressure (pollution and utilization of resources are decreasing).
The signal of successfulness of implementing the environmental principles into the sectors is achieving absolute decoupling. Decoupling does not occur when the environmental pressure is growing so rapidly or even more rapidly than the economic performance.

The publication is compiled of the most important information and findings in the individual indicator sector reports.

MANUFACTURING

List of the sector indicators in manufacturing

Trends of the sector relevant for the environment
◀ Industrial production index in manufacturing
◀ Share of manufacturing in GDP
◀ Final energy consumption in manufacturing
Interactions of the sector with the environment (demands of the sector in respect of resources and impacts of the sector on the environment)
◀ Water consumption in the industry
◀ Land take for the industrial construction
◀ Emissions of main pollutants from manufacturing
◀ Greenhouse gas emissions from industrial processes and use of products
◀ Polluting with industrial waste water
◀ Origin of wastes from manufacturing
Political, economic and social aspects
◀ Expenditures of research and development in manufacturing
◀ Costs of the environmental protection in manufacturing
◀ Environmental labelling of products in manufacturing

- System of environmental management in manufacturing
- Assessment of impacts of proposed activities on the environment in manufacturing
- Integrated prevention and control of the environmental pollution in manufacturing

According to the Statistical Classification of Economic Activities (SK NACE Rev. 2), the manufacturing is included in the Section C – Manufacturing.

It consists of the following divisions:

10 – Manufacture of food products
11 – Manufacture of beverages
12 – Manufacture of tobacco products
13 – Manufacture of textiles
14 – Manufacture of wearing apparel
15 – Manufacture of leather and related products
16 – Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17 – Manufacture of paper and paper products
18 – Printing and reproduction of recorded media
19 – Manufacture of coke and refined petroleum products
20 – Manufacture of chemicals and chemical products
21 – Manufacture of basic pharmaceutical products and pharmaceutical preparations
22 – Manufacture of rubber and plastic products
23 – Manufacture of other non-metallic mineral products
24 – Manufacture of basic metals
25 – Manufacture of fabricated metal products, except machinery and equipment
26 – Manufacture of computer, electronic and optical products
27 – Manufacture of electrical equipment
28 – Manufacture of machinery and equipment n.e.c.
29 – Manufacture of motor vehicles, trailers and semi-trailers
30 – Manufacture of other transport equipment
31 – Manufacture of furniture
32 – Other manufacturing
33 – Repair and installation of machinery and equipment

3.1. Summary assessment of the development in the sector of manufacturing

What is the state and directing of manufacturing in relation to the environment?

The industrial production index in manufacturing was increasing in 2008 – 2015 (the average month of the year of 2010 = 100). The index fell only in 2009 due to the economic crisis.

The share of manufacturing in GDP in 2000 – 2008 was higher than in 2009 – 2014 affected by the economic crisis. In 2015, the share of manufacturing in GDP was higher than in 2008.

The final energy consumption (FEC) had a fluctuating course in some selected spheres of manufacturing in 2001 – 2015. However, FEC was lower in the period after the economic crisis (2009 – 2015) than in the period before the crisis.

What are interactions of manufacturing and the environment?

Impact of manufacturing on the environment

Compared to 2008, emissions of the main pollutants SO_2, NO_x from manufacturing decreased until 2014 and CO emissions increased. PM_{10} and $PM_{2.5}$ emissions and NMVOC emissions from manufacturing also decreased. PCDD/PCDF emissions from industrial processes and PAH emissions increased. Emissions of heavy metals from industrial processes As, Cr, Cu, Ni, Se and Zn increased and Pb, Cd and Hg emissions decreased.

Greenhouse gas emissions from industrial processes and use of products decreased in 2014 compared to 1990, however, they increased compared to 2000. The share of industrial processes and use of products in total greenhouse gas emissions also increased compared to 1990 and 2000.

Pollution with industrial waste water in 2006 – 2015 decreased.
The biggest decrease in pollution was recorded in the indicator of biochemical oxygen demand (BOD_5). The biggest share in the total pollution with industrial waste water was reached by the indicator chemical oxygen demand by potassium dichromate (COD_{Cr}).

The production of waste from manufacturing decreased in 2008 – 2015. The share of quantity of produced waste in manufacturing in the total quantity of waste produced in the sector of the economy also decreased.

Demands of manufacturing in respect of resources

Water consumption decreased in the industry in 2000 – 2015. It concerned consumption of surface water, consumption of groundwater for the food industry and for the other industries. The share of the industry in total consumption of surface water and the share of the other industries in the total consumption of groundwater also decreased. The share of the food industry in the total consumption of groundwater had a fluctuating development, however, the share in the total consumption increased in 2015 compared to 2000.

Land take for the industrial construction in 2000 – 2015 saw a fluctuating trend. The biggest losses of agricultural land were recorded in 2009 and the biggest losses of forest land were recorded in 2001.

Development of decoupling in manufacturing

The development of decoupling in manufacturing with respect to emissions of main pollutants had a positive trend. In the case of SO_2, $PM_{2.5}$, PM_{10} and NO_X emissions absolute decoupling was achieved, in the case of CO emissions relative decoupling was achieved. In the case of greenhouse gas emissions from industrial processes and use of products, relative decoupling was achieved. In the case of industrial waste water and in the production of waste, absolute decoupling was achieved.

The development of decoupling in the industry with respect to water consumption and final energy consumption in some selected spheres of manufacturing had a positive trend and absolute decoupling was achieved.

What is the response of the society to mitigating or compensating negative consequences of manufacturing on the environment?

Expenditures of research and development in manufacturing increased in 2006 – 2015. The share of expenditures of research and development in manufacturing in the total expenditures of research and development also increased.

Costs of the environmental protection in manufacturing increased in 2015 compared to 2000. The share of costs in manufacturing in the total costs of the environmental protection decreased.

3.2. How are the environmental principles and targets related to manufacturing implemented into the strategic documents?

3.2.1. Implementation of environmental principles and targets related to manufacturing into the strategic documents at the EU level (the most important documents)

2002	***The Sixth Environment Action Programme of the EU "Environment 2010: Our Future, Our Choice"*** Target – ensuring the high level of the environmental protection while taking into consideration a variety of conditions in the individual regions of the Community and achieving weakening of the relation between the economic growth and environmental pressures caused by this growth. The key priority objectives in relation to the manufacturing were 1st Priority: Climate change, and 4th Priority: Natural resources and waste.
2004	***The European Environmental Technologies Action Plan (ETAP)*** Target – supporting the development and use of environmental technologies and improving the EU competitiveness in this sphere.

2005	***Implementing the Community Lisbon Programme: A Policy Framework to Strengthen EU Manufacturing – Towards a More Integrated Approach for Industrial Policy*** The integrated approach for industrial policy was defined for the first time based on a specific working programme of inter-branch and branch initiatives, including the environment.
2006	***Renewed EU Sustainable Develompent Strategy (EU SDS)*** The overall objective of the renewed EU SDS was determining and developing measures that would enable the EU to achieve the continuous improvement of the quality of life of both current and future generations by creating sustainable communities able to use resources efficiently and manage them and use the potential for both ecological and social innovations of the economy, thus ensuring prosperity, environmental protection and social cohesion.
2007	***Mid-term Review of Industrial Policy – A Contribution to the EU's Growth and Job Strategy*** Confirmation of the framework of the integrated approach defined in 2005, because it enabled the industry to react appropriately to challenges related to globalization and climate change.
2007	***Towards an Improved Policy on Industrial Emissions*** Setting a complex of political measures and the proposal for new coherent directive of industrial emissions for improving efficiency and effectiveness of legal regulations due to achieving a high level of the environmental protection, reducing administrative burden and minimizing violation of the economic competition in the EU without disturbing the position of the European industry in the economic competition.
2008	***Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan*** Adopting the integrated package of measures aimed at supporting more sustainable consumption and production with the increasing competitiveness of the EU economy. The Action Plan was accompanied by proposals for revising the directives on eco design and energy labelling as well as by proposals for revising the Regulation on the EU Ecolabel and the EMAS Regulation (the Eco-Management and Audit Scheme).
2008	***The Raw Material Initiative: Meeting our Critical Needs for Growth and Jobs in Europe*** Target – ensuring the same conditions of access to resources in third countries, improved general conditions for raw material mining within the EU and lower consumption of primary raw materials through higher resource efficiency and enforcement of recycling.

2010	***Europe 2020: A European Strategy for Smart, Sustainable and Inclusive Growth*** The strategy basis includes three mutually complementary priorities: – Smart growth: creating a knowledge- and innovation-based economy. – Sustainable growth: supporting a greener and competitive resource-efficient economy. – Inclusive growth: supporting an economy with a high employment rate that will ensure social and territorial cohesion. Out of the targets adopted for the EU by 2020, the following ones are mainly relevant for the sphere of the manufacturing: – increase in the employment rate of citizens aged 20 to 60 years to 74%, – increase in the R&D investment level to 3% of GDP, – decrease in greenhouse gas emissions of 20% (or up to 30% on condition of a wider global agreement) compared to 1990, – obtaining 20% energy from renewable sources, – achieving 20% increase in energy efficiency. The Strategy has brought seven flagship initiatives; while out of them the especially important initiatives from the perspective of an increase in competitiveness of the EU industry are: The Innovation Union, Digital Agenda for Europe, A resource-Efficient Europe, Industrial Policy for the Globalisation Era, and Agenda for New Skills and Jobs.
2011	***Roadmap to a Resource-Efficient Europe*** Defining targets that will have to be achieved to ensure efficient utilization of resources and sustainable growth and measures aimed at their achieving.
2011	***Industrial Policy: Reinforcing Competitiveness*** Defining requirements for deep structural reforms as well as cohesive and coordinated policies of the member states in order to achieve increased economic and industrial competitiveness of the EU for the support of long-term sustainable growth.
2011	***A Roadmap for Moving to a Competitive Low Carbon Economy in 2050*** Defining milestones to 2050, the plan of possible measures aimed at their achieving (cutting greenhouse gas emissions to 2050 of 80%), including measures in industrial sectors.
2012	***A Stronger European Industry for Growth and Economic Recovery – Industrial Policy Communication Update*** Support of investment in innovations with the focus on six priority areas with a big potential (advanced manufacturing technologies for clean production, basic supporting technologies of bio production, sustainable industrial and construction policy and raw materials, clean vehicles and vessels and smart networks).
2012	***CARS 2020: An Action Plan for a Competitive and Sustainable Automotive Industry in Europe*** Target – support competitiveness and sustainability of this sector. It was the first specific example of applying the updated vision for the industrial policy within the branch framework, i.e. in the automotive industry.
2012	***A Blueprint to Safegurad Europe's Water Resources*** Target – ensuring sustainability of all activities that have the impact on water, and thus ensuring accessibility of high quality water for sustainable and fair water utilization. It contains the requirement to integrate to a larger extent the policy targets in the water management into the sector policies.

2013	***Action Plan for a Competitive and Sustainable Steel Industry in Europe*** Taking measures aimed at ensuring the competitive and sustainable steel industry, so that it is able to solve structural problems faced and competed by steel products that are very important for the other key European sectors.
2013	***The Seventh Environmental Action Programme of the Union to 2020 "Living Well, Within the Limits of Our Planet"*** The key feature of the Programme is the protection and improvement of natural capital, support of better utilization of current resources and accelerated transition to the low-carbon economy. The Programme is to support the sustainable growth, creating new jobs, and thus create from the EU a healthier and better place for living. The key priority objectives in relation to the manufacturing are: Priority Objective 2: Creating from the Union a resource-efficient, low-carbon, green and competitive economy in the whole Union. Priority Objective 7: Improving involvement of environmental issues and policy cohesion.
2014	***For a European Industrial Renaissance*** Focusing on averting the decline in the industry, attracting new investment, creating a better business environment and recognising the central importance of the industry for creating jobs and growth.
2014	***Green Action Plan for Small- and Medium-Sized Enterprises (SMEs): Enabling SMEs to Turn Environmental Challenges into Business Opportunities*** Target – contributing to reindustrialisation of Europe by supporting the development of enterprises while taking into consideration the environmental protection in all European regions, in particular with respect to the fact that there are considerable differences in efficient resource utilization between both sectors and the member states.
2014	***EU 2030 Climate and Energy Package*** Bridging the targets 20-20-20 with the vision of the low-carbon economy in 2050. Achieving a cutting of greenhouse gas emissions to 2030 by 40% compared to 1990, an increase in the share of RES in the energy mix of the EU to 27% (the target is binding only at the EU level), reducing energy consumption by 27% (the non-binding target) and the new target is to increase interconnection of energy networks of the member states to 15%. In addition, the framework includes the key reform of the EU Emissions Trading System.
2015	***EU Action plan for the Circular Economy*** Target – stimulating the transition of Europe to the circular economy that will strengthen the global competitiveness, sustainable economic growth and creation of new jobs.

3.2.2. Implementation of environmental principles and targets related to manufacturing into the strategic documents at the SR level (the most important documents)

1999	***Elaborating the Industrial Policy of the European Union into the Conditions of the Slovak Republic*** Defining targets of the industrial policy in order to reduce excessive capacities of the Slovak industry and increasing the competitive ability of the industry.

2000	***Energy Policy of the Slovak Republic*** Defining the framework for the path of energy sector changes based on the following three pillars: – preparation for integration into the EU internal market, – security of energy supplying, – sustainable development.
2001	***National Sustainable Development Strategy*** Setting priorities and targets of the sustainable development, Strategic Objective 21. Restructuring, modernization and recovery of the manufacturing.
2003	***Concept of Utilization of Renewable Energy Sources (RES)*** Creating the basic framework for the development of RES utilization in the Slovak Republic.
2004	***Intentions, priorities and targets of the National Development Strategy (NSTUR) in the Industrial Policy*** Increasing the environmental efficiency of the industry in the Slovak Republic and thorough enforcement of the principles of sustainable development in the sector of the industry.
2005	***Action Plan for the Sustainable Development of the Slovak Republic for 2005 – 2010*** Defining main targets, including industrial activities concretized for the individual sectors. They include measurable indicators, deadlines, determination of responsibility for their fulfilment and methods of their financing.
2005	***National Programme for Development of Biofuels*** Defining indicative targets expressed by reference values for the period of 2006 – 2010, creating stimulation economic and legislative conditions for meeting the indicative targets specified in the Directive No. 2003/30/EC of the European Parliament and of the Council on the Promotion of the use of Biofuels or Other Renewable Fuels in Transport.
2006	***Energy Policy of the Slovak Republic*** Creating the framework for further directing of the development of electric power industry, thermal energy sector, gas industry, mining, crude oil processing and transport, coal mining and utilization of renewable energy sources.
2006	***Concept of Water Management Policy to 2015*** The strategic objective to 2015: 3.1 Increasing the quality of care of water resources and the related water management infrastructure, including fulfilment of the EU legal regulations. The qualitative protection of surface water: – focusing on solving the most important sources of point pollution caused by public sewerage systems and industrial pollution sources, – restricting production of waste water and pollutants contained therein directly in their producers' place, – reassessment of the current discharge of industrial and municipal waste water in order to prepare measures aimed at ensuring the compliance with the criteria for the protection against discharge of dangerous substances according to the EU regulations.
2007	***Innovation Strategy of the Slovak Republic for 2007 – 2013*** Achieving that innovations become one of the main instruments of the development of knowledge-based economy and ensuring the high economic growth of the Slovak Republic.

2007	***Concept of Energy Efficiency*** In the final consumption of all types of energy, the industry has the dominant position. However, applying effective manufacturing and procedures is assumed, whereby energy intensity for the GDP formation will be reduced substantially. The biggest potential of absolute savings is hidden in the manufacturing industry (chemistry, iron and steel, cellulose), but its use demands considerable investment as it concerns a change in technological processes.
2007	***National Programme of Cutting Emissions of Basic Pollutants to 2010*** Target – defining instruments for ensuring the compliance with national emission ceilings specified for the Slovak Republic, both cross-sectionally and for the individual sectors, including the industry.
2008	***Biomass Action Plan for 2008 – 2013*** Defining measures aimed at implementation of targets in the sphere of biomass use that should have had a considerably positive impact on the environment and should have contributed to the improvement of the quality of climatic conditions, cutting greenhouse gases and diversification of energy sources with increasing energy security.
2009	***Water Plan of the Slovak Republic*** Defining the framework of environmental targets enabling the sustainable water management tp 2015 for: – surface water bodies, – underground water bodies.
2010	***National Renewable Energy Action Plan*** Defining national targets for the share of energy from renewable sources consumed in transport and in the sectors of electricity, heat and cold generation in 2020 and measures aimed at their ensuring. Analysing the impact on the other non-energy sectors (e.g. the manufacturing) and interaction with them.
2010	***Position of the Slovak Republic towards the National Targets of Europe 2020 Strategy*** Defining tasks related to the national targets of the Slovak Republic towards the Europe 2020 strategy.
2012	***Strategy of the Ministry of Economy of the Slovak Republic for the period from 2012 to 2016*** Creating stable conditions for sustainable economic growth, improving the business environment, supporting competitiveness of the Slovak economy and ensuring the stable raw material and energy base for the industry and services.
2012	***Assessment of Possibilities of Directing and Conditions of the Development of the Manufacturing in the Slovak Republic after 2013*** Increasing awareness of the most important needs of the industry and enabling stimulation of directing of the future development of the Slovak industry.
2013	***Innovation Strategy of the Slovak Republic for 2014 – 2020*** Improving the ability of commercialization and adopting innovations and technologies and including Slovakia among successful industrial countries of the 21st century.
2013	***Measures in the Economic Policy Aimed at Supporting the Economic Growth*** Supporting energy efficiency of the economy, renewable energy resources, creation of new jobs and including small- and medium-sized enterprises into multinational research networks.

2013	***Research and Innovation Strategy for Smart Specialisation of the Slovak Republic*** Deepening the integration and embodiment of key industrial sectors that increase the local value added through co-operation of local supply chains and by supporting their mutual networking. Increasing research for the economic growth by means of global excellence and local relevance. Creating a dynamic, open and inclusive innovative society as one of the assumptions for increasing the quality of life, increasing the quality of human resources for innovative Slovakia.
2013	***Waste Prevention Programme of the Slovak Republic for 2014 – 2018*** Target – shifting from material evaluation to waste prevention. Measures in the sphere of package waste, an increase in their material efficiency and in the sphere of dangerous waste prevention are mainly relevant.
2014	***Updated National Strategy for the Protection of Biodiversity by 2020*** Defining targets valid cross-sectionally for all sectors. The most important intentions of the strategy from the perspective of the manufacturing include: – ensuring integration of the biodiversity protection into strategies, planning and decision-making processes in various sectors, – improving co-operation of environmental and sector policies for measures aimed at reducing the ecological trace in accordance with the international co-operation and support of upbringing, education and research in this sphere.
2014	***Action Plan for a Competitive and Sustainable Steel Industry in the Slovak Republic*** Analysing the possibility of support for the competitive steel industry, contributing to keeping the competitive ability and sustainability of the steel sector, and defining real and achievable targets in this sphere.
2014	***Energy Policy of the Slovak Republic*** Reflecting to the development of the energy policy in the EU. Defining the main targets and priorities of the energy sector by 2035 with the outlook to 2050 in order to fulfil the strategic target, i.e. achieving the competitive low-carbon energy sector ensuring safe, reliable and effective supplies of all forms of energy for reasonable prices, while taking into account the customers' protection and sustainable development. Utilization and further extension of the energy audit system and implementation of measures identified in these audits will considerably influence reduction of the energy consumption in the industry.
2014	***Adaptation Strategy of the Slovak Republic on Adverse Impacts of Climate Change*** Target – among other things, proposing a complex of appropriate proactive adaptation measures and mechanism for their implementation within sector policies, including the energy sector and its infrastructure, development strategies and action plans at all levels of the process.
2015	***Water Plan of the Slovak Republic*** Defining the framework of environmental targets enabling the long-term sustainable water management by 2021 for: – surface water bodies, – underground water bodies, and measures in relation to the individual sectors of the economy for their achieving.

2015	***Programme of Waste Management in the Slovak Republic for 2016 – 2020*** The main objective of the waste management of the Slovak Republic by 2020 is minimizing negative effects of waste origin and handling on human health and the environment. For its fulfilment, it is necessary – among other things – to implement the principle of extended responsibility of manufacturers for the following reserved products: electrical equipment, batteries and accumulators, packages, vehicles, tyres and non-package products, introducing the support for using materials obtained from recycled waste for the manufacture of products and improving market conditions for these materials. The Programme also defines targets and measures for biologically decomposable industrial waste as well as flows of waste and package waste.

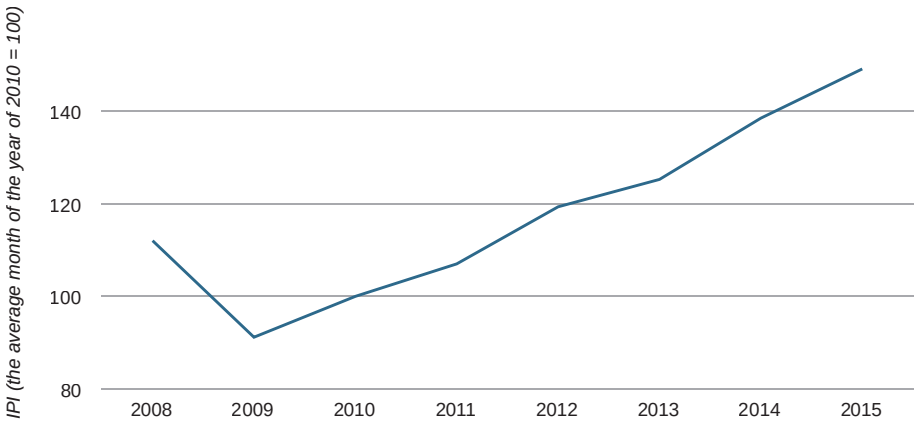
3.3. What is the state and directing of manufacturing in relation to the environment?

The current trends in manufacturing are characterized by the new generation in the sphere of industrial automation, smart production, research and innovations that will be characteristic of the fourth industrial revolution, currently named as Industry 4.0. The objective of the aforementioned trends will be reducing both material and energy demands of the manufacturing as well as reduce its negative impact on the environment. The state and directing of manufacturing is characterized in relation to the environment based on indicators from the group "trends of the sector relevant for the environment".

3.3.1. Industrial production index in manufacturing

The industrial production index in manufacturing increased by 36.8% in 2015 compared to 2008. The increase in the production in manufacturing in 2015 compared to 2014 was especially influenced by growth in the manufacture of coke and refined petroleum products of 19.6%, the manufacture of electrical equipment of 15.5%; in the other manufacture, repair and installation of machinery and equipment of 10.6%, in the manufacture of transport equipment of 10.3%, and in the manufacture of rubber and plastic products and other non-metallic mineral products of 10.2%. The manufacture decreased only in the manufacture of computer, electronic and optical products (by 9.1%) and in the manufacture of textiles, wearing apparel, leather and related products (by 0.4%).

Development of the industrial production index (IPI) in manufacturing

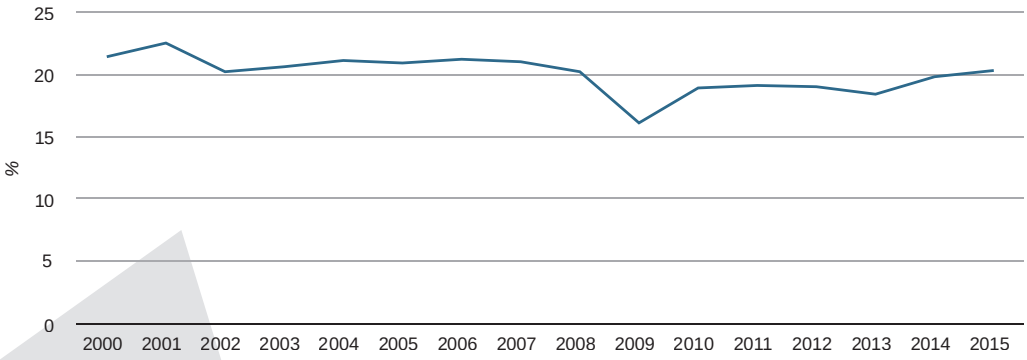


Source: SO SR

3.3.2. Share of manufacturing in GDP formation

The share of the manufacturing in GDP reached 21.4% in 2000 and decreased to 20.3% in 2015. The biggest decrease in the share of manufacturing in GDP was recorded in 2009 when the share in GDP decreased to 16.1%.

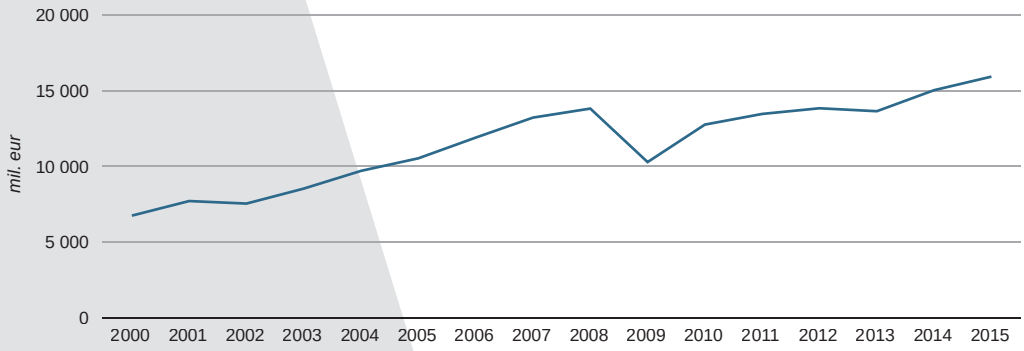
Development of the share of manufacturing in GDP formation



Source: SO SR

GDP in manufacturing reached EUR 15,940.84 million in 2015 and it increased by 136.2% compared to 2000. In the evaluated period, GDP in manufacturing recorded year-on-year decreases in 2002, 2009 and 2013. The biggest decrease in the GDP growth in the manufacturing was reached in 2009 when it decreased down to 25.6% compared to the previous year (in the economy of the Slovak Republic, the decrease of 6.6% was recorded).

Development of GDP in manufacturing (at current prices)



Source: SO SR

3.3.3. Final energy consumption in manufacturing

The main targets concerning an increase in energy efficiency in manufacturing include reduction of energy demands of the manufacturing process. Further, they include measures aimed at improving thermal and technical properties of production halls, operational and administration and manufacturing buildings and energy management.

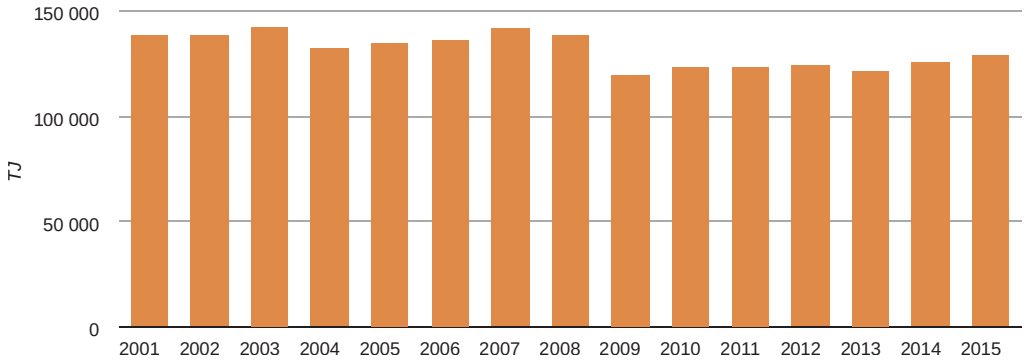
The final energy consumption in manufacturing (iron and steel production, metallurgy of non-ferrous metals, chemical industry, non-ferrous mineral products, food products, beverages

and tobacco products, textiles and leather, cellulose, paper industry and printing, mechanical engineering, and transport equipment) saw a decreasing trend in the evaluated period and it reached 129,199 TJ in 2015. In 2015, the final energy consumption in the manufacturing decreased by 7% compared to 2001.

The biggest decrease in the final energy consumption in manufacturing was recorded in the manufacture of textiles and leather, in the chemical industry and in the manufacture of food products, beverages, and tobacco products.

In 2015, the iron and steel production (31.8%) represented the biggest share in the final energy consumption in manufacturing. In 2001, the manufacturing participated in the final energy consumption with 31.3% within the national economy and its share increased to 33.7% in 2015.

Development of the final energy consumption in manufacturing



Source: SO SR

3.4. What are interactions of manufacturing and the environment?

The manufacturing influences the individual components of the environment, especially with emissions of pollutants into the air, water, soil and rock environment, by consequences of breakdowns, production of industrial waste and confiscation of land. Mutual interactions of the manufacturing and the environment are characterized based on the indicators from the group of interactions of the sector with the environment.

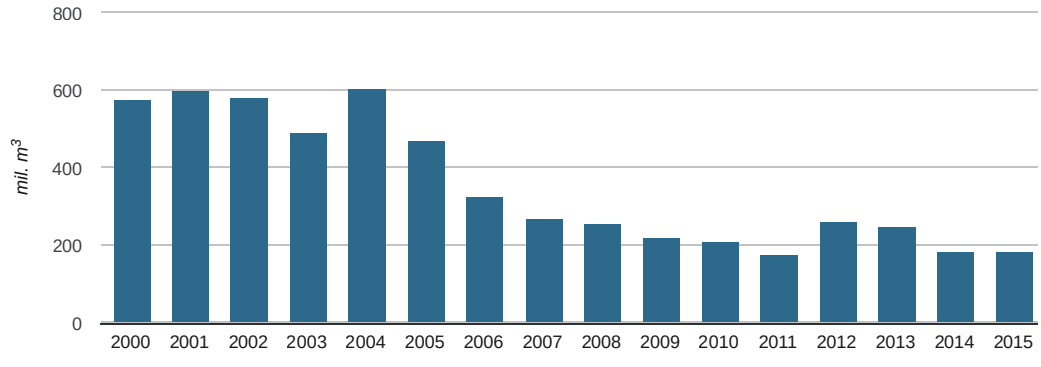
3.4.1. Demands of manufacturing in respect of resources

As far as demands of the manufacturing in respect of resources are concerned, the consumption of both surface and underground water in the industry and losses of land for the industrial construction are monitored.

3.4.1.1. Water consumption in the industry

Consumption of surface water by the industry saw a decreasing trend. In 2015, it decreased by 68.2% compared to 2000.

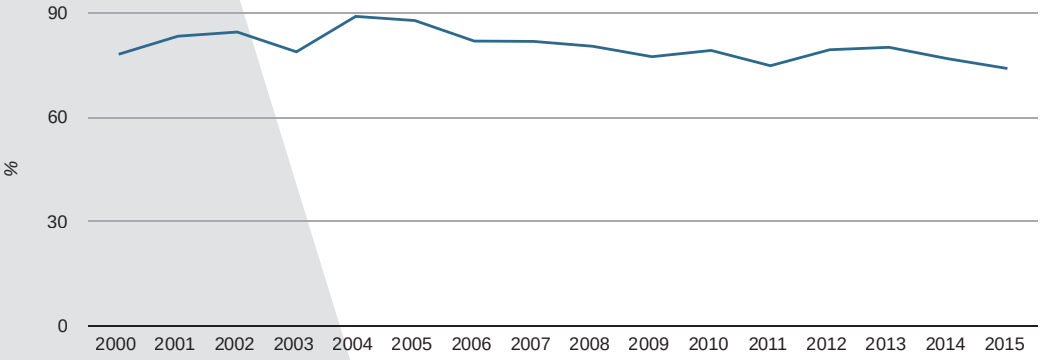
Development of consumption of surface water in the industry



Source: SHMI

The share of the industry in the total consumption of surface water decrease from 78.1% in 2000 to 74% in 2015.

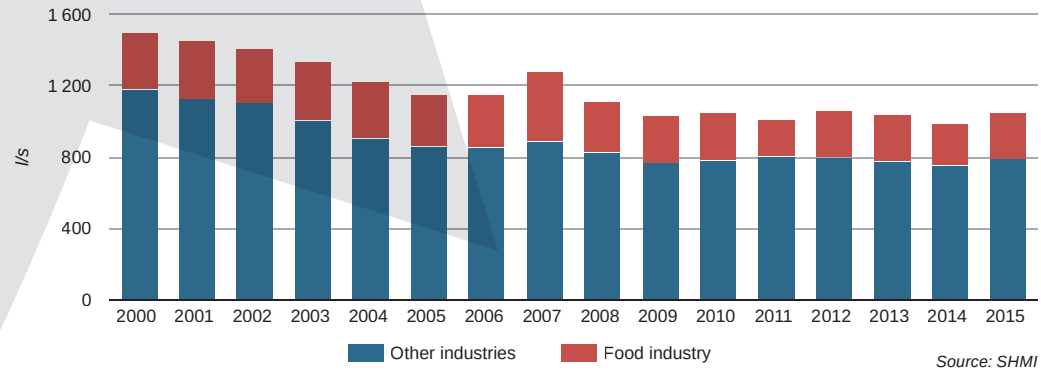
Share of the industry in surface water consumption



Source: SHMI

Underground water consumption for the food industry saw a fluctuating trend and a decrease for the other industries. In 2015, compared to 2000, there was a decrease in groundwater consumption for the food industry of 19.5% and of 33.1% for the other industries.

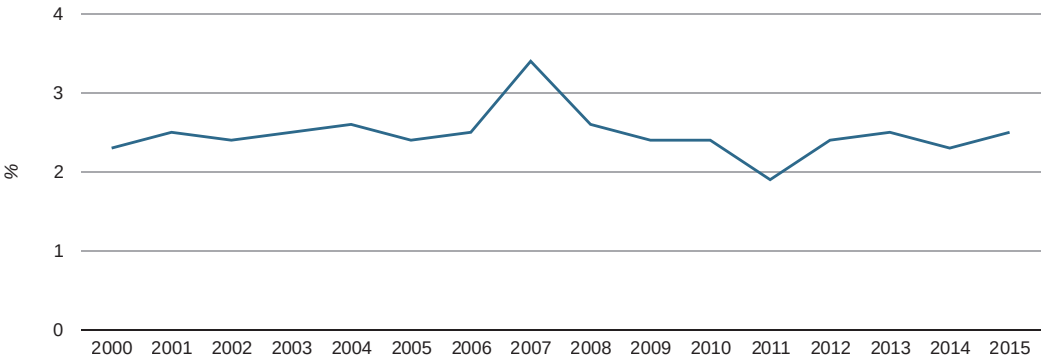
Development of consumption of groundwater in the industry



Source: SHMI

The share of consumption of groundwater in the food industry in the total consumption reached 2.5% in 2015. In 2000, the share was 2.3%.

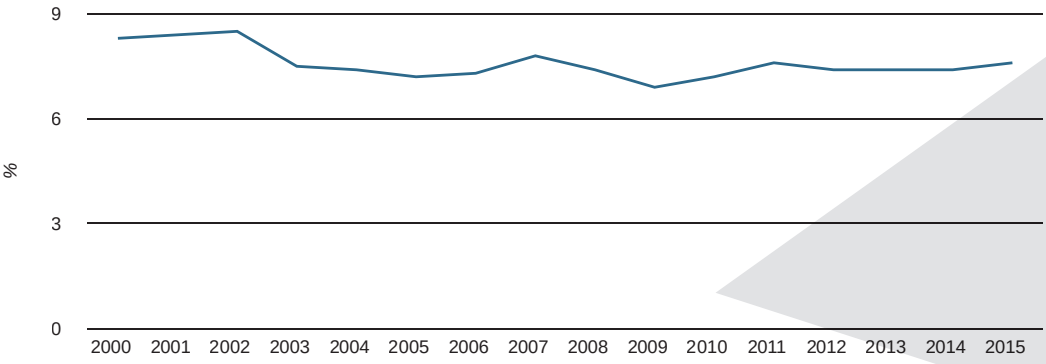
Share of the food industry in consumption of groundwater



Source: SHMI

The share of consumption of groundwater for the other industries in the total consumption decreased from 8.3% in 2000 to 7.6% in 2015.

Share of the other industries in consumption of groundwater

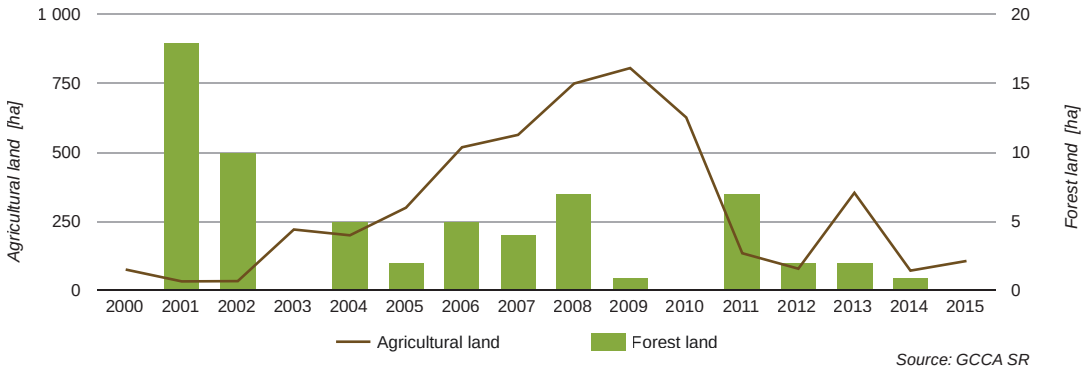


Source: SHMI

3.4.1.2. Land take for the industrial construction

The biggest land take of agricultural land for the industrial construction were recorded in 2009 (805 ha). On forest lands, the biggest land take for the industrial construction were recorded in 2001 (18 ha). In 2015, land take of agricultural land for the industrial construction were 106 ha and there were no land take of forest land.

Development of losses of land for the industrial construction



Source: GCCA SR

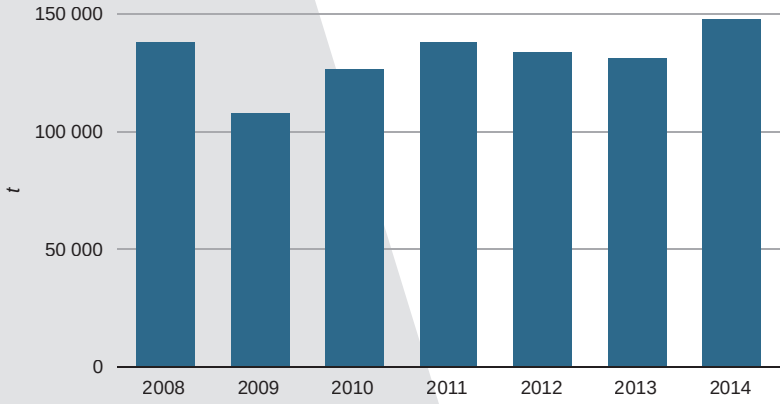
3.4.2. Impact of manufacturing on the environment

The impact of manufacturing on the environment mainly manifests itself by emissions of main pollutants, greenhouse gas emissions, pollution by waste water and waste formation.

3.4.2.1. Emissions of main pollutants from manufacturing

CO emissions from manufacturing in 2014 accounted for 65.7% share in the total emissions and an increase in emissions of 7.5% was recorded compared to 2008.

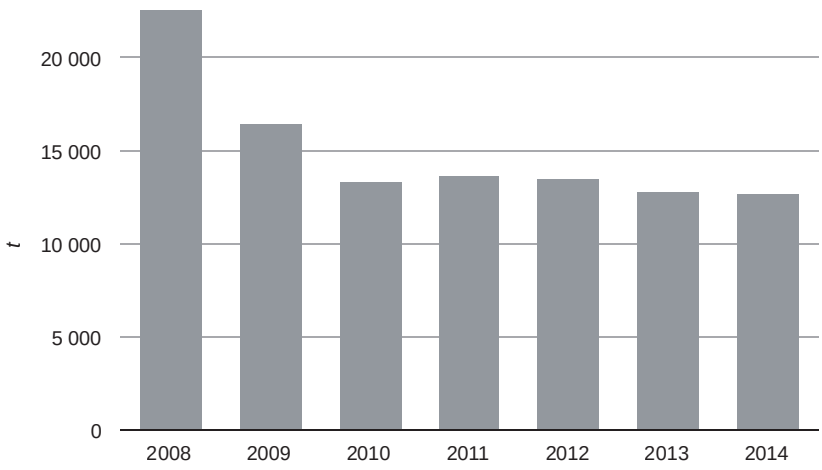
Development of CO emissions from manufacturing



Source: SHMI
Note: Emissions established as of 30 September 2015

SO_2 emissions from manufacturing in 2014 accounted for 28% share in the total emissions and a decrease in emissions of 44% was recorded compared to 2008.

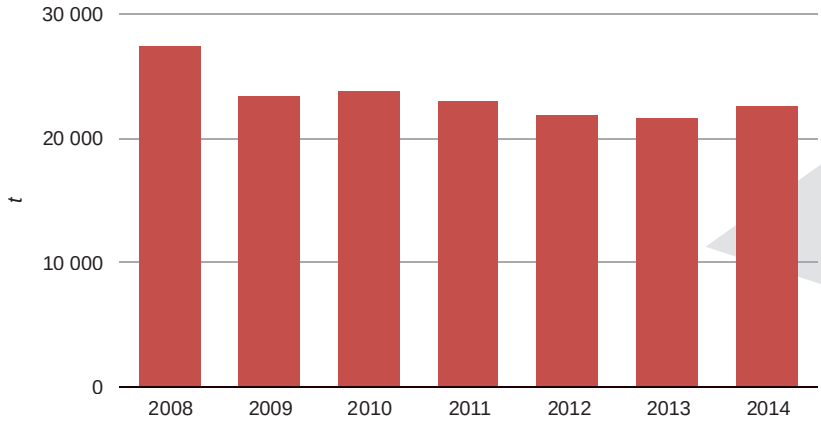
Development of SO_2 emissions from manufacturing



Source: SHMI
Note: Emissions established as of 30 September 2015

NO_x emissions from manufacturing in 2014 represented 26.7% share in the total emissions and a decrease in emissions of 17.6% was recorded compared to 2008.

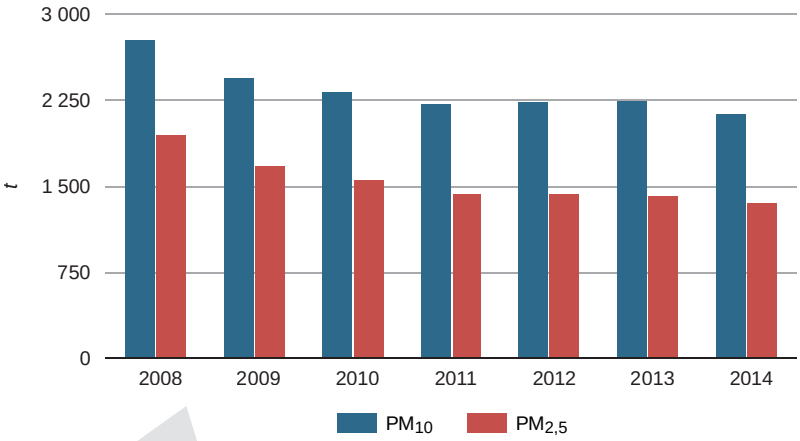
Development of NO_x emissions from manufacturing



Source: SHMI
Note: Emissions established as of 30 September 2015

PM_{10} emissions from manufacturing in 2014 represented 5.8% share in the total emissions and a decrease in emissions of 23.1% was recorded compared to 2008. $PM_{2.5}$ emissions from manufacturing in 2014 represented 4.5% share in the total emissions and a decrease in emissions of 30.1% was recorded compared to 2008.

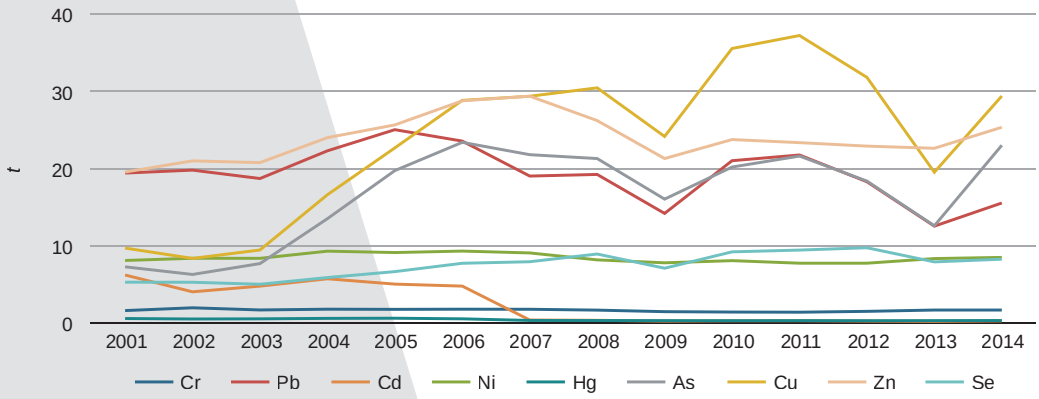
Development of PM_{10} and $PM_{2.5}$ emissions from manufacturing



Source: SHMI
Note: Emissions established as of 30 September 2015

In 2014, compared to 2001, there was an increase in heavy metal emissions from industrial processes in the case of As, Cr, Cu, Ni, Se and Zn; there was a decrease for Pb, Cd and Hg.

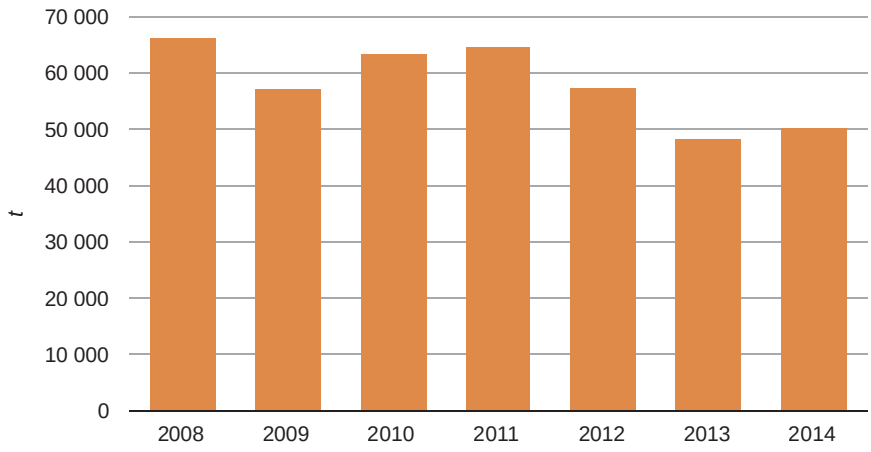
Development of heavy metal emissions from industrial processes



Source: SHMI

Emissions of non-methane volatile organic substances (NMVOC) from the manufacturing in 2014 represented 58% share in emissions related to economic activities in the economy and a decrease in emissions of 24.1% was recorded compared to 2008.

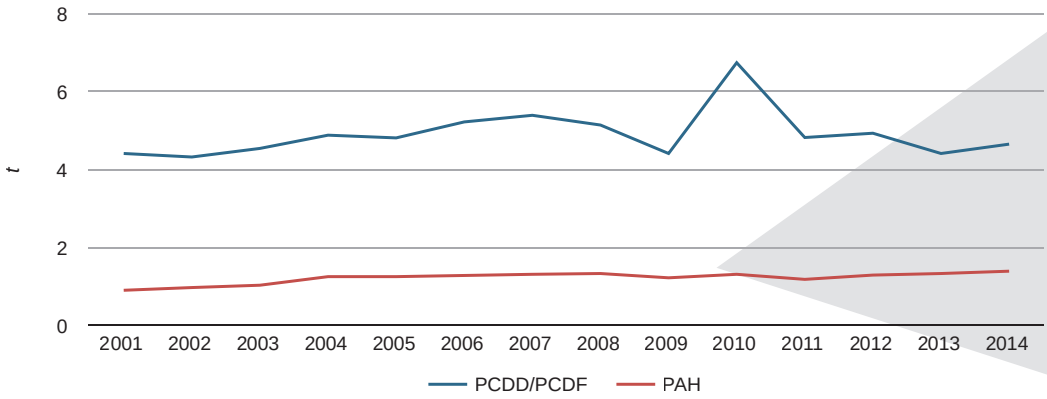
Development of emissions of non-methane volatile organic substances (NMVOC) from manufacturing



Source: SHMI

Emissions of persistent organic pollutants (POPs) from industrial processes have an increasing trend. Emissions of polychlorinated dibenzodioxins and dibenzofurans (PCDD/PCDF) increased by 5.6% in the evaluated period and emissions of polycyclic aromatic hydrocarbons (PAHs) increased by 55%.

Development of emissions of persistent organic substances (POPs) from industrial processes



Source: SHMI

3.4.2.2. Greenhouse gas emissions from industrial processes and use of products

The sector of industrial processes and use of products is the second most important sector participating in the total greenhouse gas emissions. Emissions in this sector come mainly from technological processes in mineral materials processing, from the chemical industry, from the steel and iron production, and from the use of products.

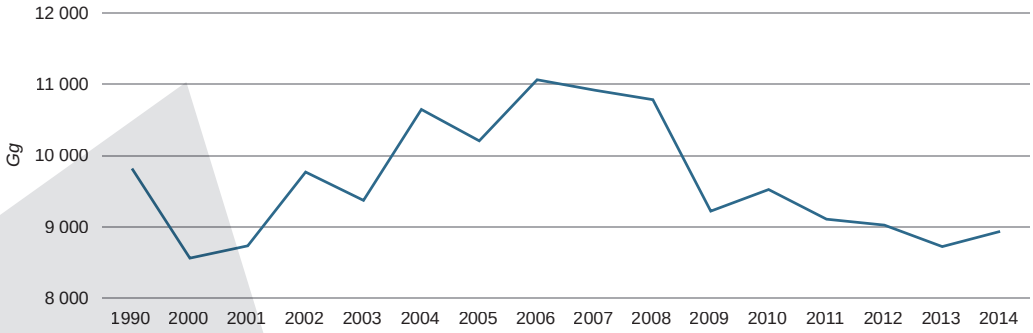
A decrease in emissions from technological processes is financially demanding and largely

limited with technology itself, because the creation of emissions is directly dependent on the volume of production. Therefore, the space for emission decreasing can be found mainly in the energy part of the production.

Aggregated greenhouse gas emissions from industrial processes and use of products had a fluctuating trend. In 2014, they decreased by 9% compared to 1992 and they increased by 4.4% compared to 2000.

In 1990, industrial processes and use of products participated in the total greenhouse gas emissions with 13.2%, and their share increased to 22% in 2014.

Development of greenhouse gas emissions from industrial processes and use of products

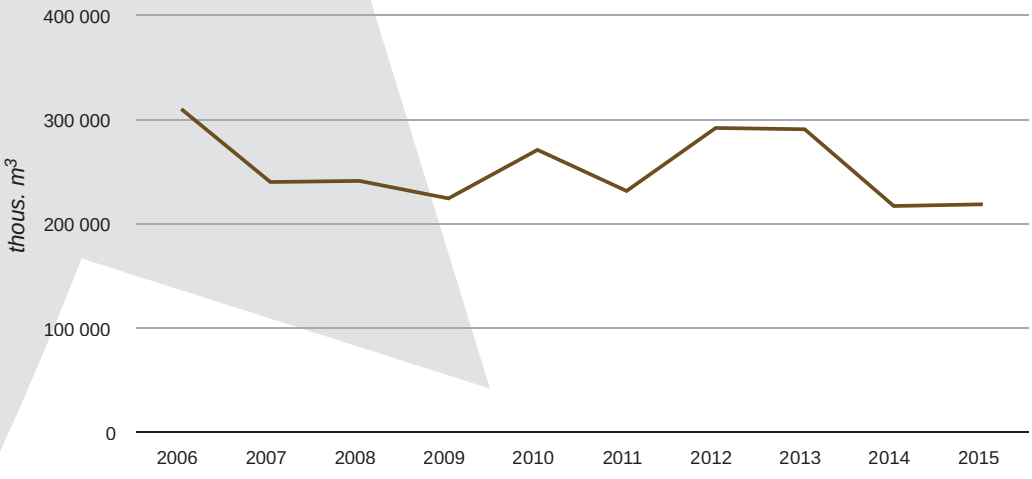


Source: SHMI
Note: Emissions established as of 15 June 2016

3.4.2.3. Pollution with industrial waste water

Another component of the environment considerably influenced by the industry is water. Pollution with industrial waste water has a fluctuating trend and there was a decrease of discharged quantity of 29.5% in 2015 compared to 2006.

Development of discharged quantity of industrial waste water



Source: SHMI

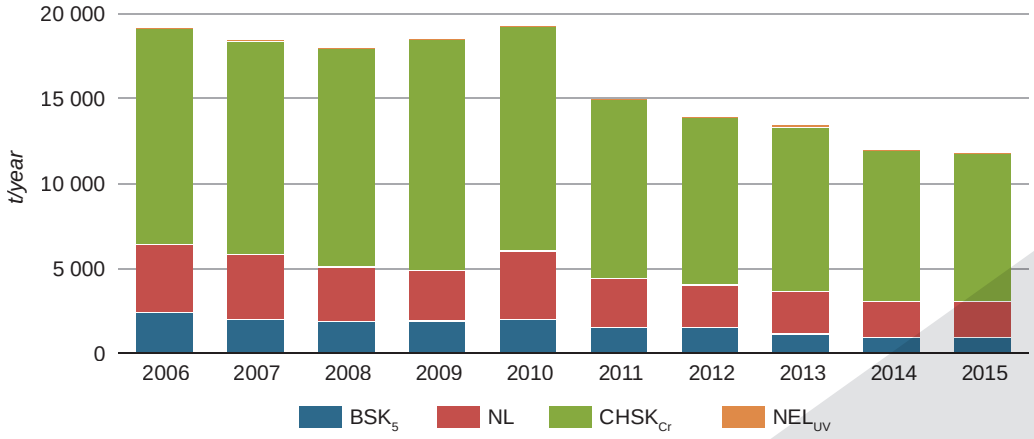
The production of pollutants in industrial waste water has a decreasing trend from the perspective of BOD_5 (biochemical oxygen demand after 5 days), and there was a decrease of 61.3% in 2015 compared to 2006.

The production of pollutants in industrial waste water has a decreasing trend from the perspective of COD_{Cr} (chemical oxygen demand by potassium dichromate), and there was a decrease of 31.7% in 2015 compared to 2006.

The production of pollutants in industrial waste water has a decreasing trend from the perspective of NE_{Luv} (non-polar extractable substances), and it decreased by 57.7% in 2015 compared to 2006.

In terms of COD_{Cr} (chemical oxygen demand by potassium dichromate), the indicator of waste water contamination reached the biggest share in the total pollution with industrial waste water in 2015 and its share was 73.8%.

Development of pollution with industrial waste water according to the pollution indicators

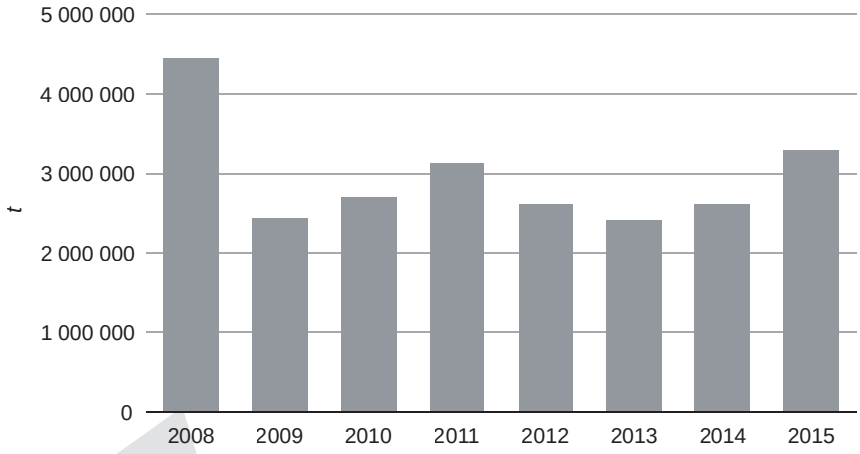


Source: SHMI

3.4.2.4. Origin of waste from manufacturing

In 2015, 3,298,830 tons of waste were produced in manufacturing, of which 219,615 tons of hazardous waste and 3,079,215 tons of non-hazardous wastes. In 2015, there was a decrease in produced waste of 26.2% compared to 2008.

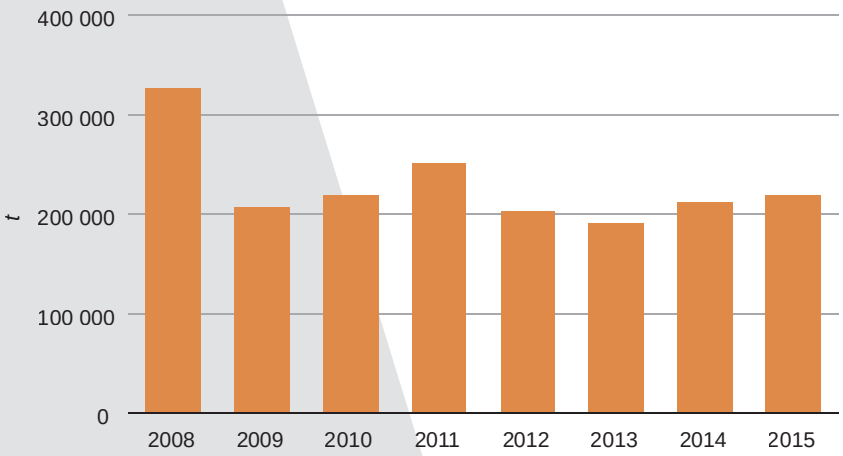
Development of quantity of produced waste in manufacturing



Source: ME SR

In 2015, there was a decrease of 32.8% in the creation of hazardous waste in manufacturing compared to 2008.

Development of quantity of hazardous waste in manufacturing



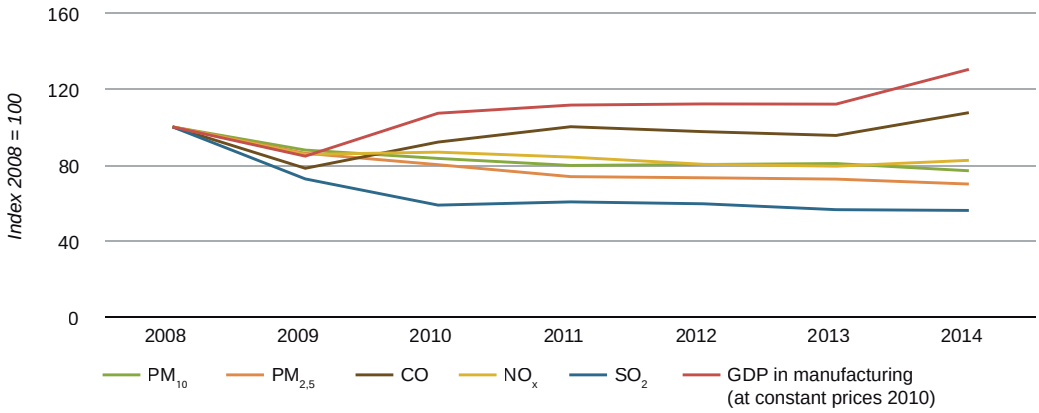
Source: ME SR

In 2015, manufacturing participated with 54.4% in the creation of hazardous waste and in the creation of non-hazardous wastes in the sector of the economy with 37.2%.

3.4.3. Development of decoupling in manufacturing

The development of decoupling in manufacturing with respect to emissions of main pollutants has a positive trend. In the case of SO_2, $PM_{2.5}$, PM_{10} and NO_X emissions absolute decoupling was achieved, in the case of CO emissions relative decoupling was achieved.

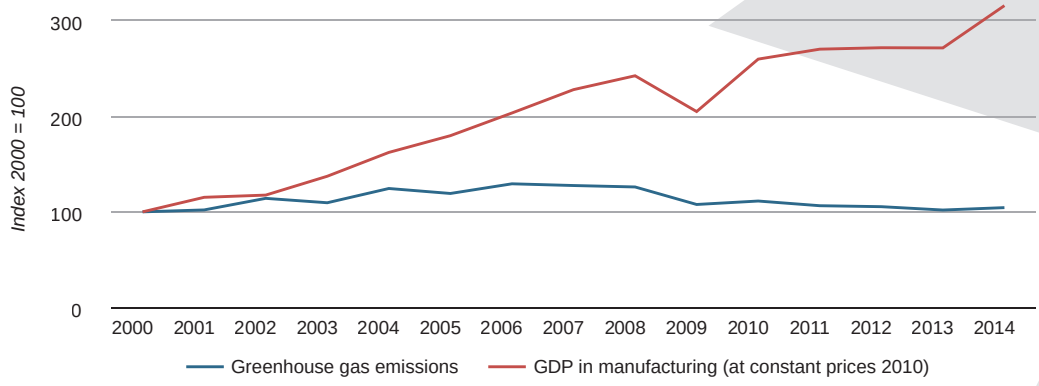
Development of decoupling in manufacturing with respect to emissions of main pollutants



Source: SO SR, SHMI

The development of decoupling in manufacturing has relative decoupling with respect to greenhouse gas emissions from industrial processes and use of products.

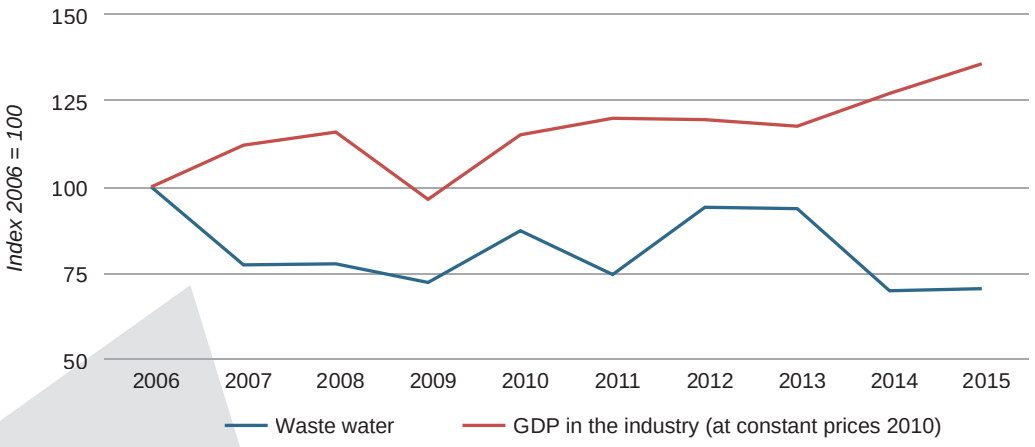
Development of decoupling in manufacturing with respect to greenhouse gas emissions from industrial processes and use of products



Source: SO SR, SHMI

The development of decoupling in the industry has a positive trend with respect to the discharged quantity of industrial waste water (absolute decoupling).

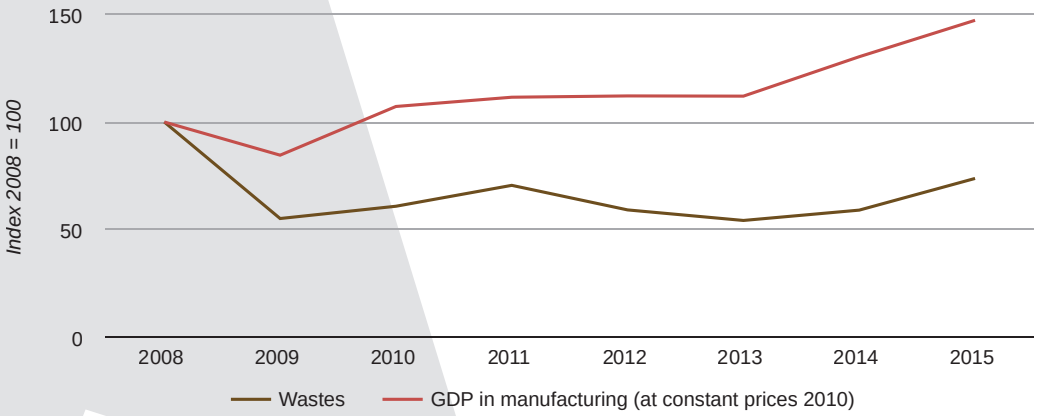
Development of decoupling in the industry with respect to the discharged quantity of industrial waste water



Source: SO SR, SHMI

The development of decoupling in manufacturing has a positive trend with respect to the quantity of produced wastes (absolute decoupling).

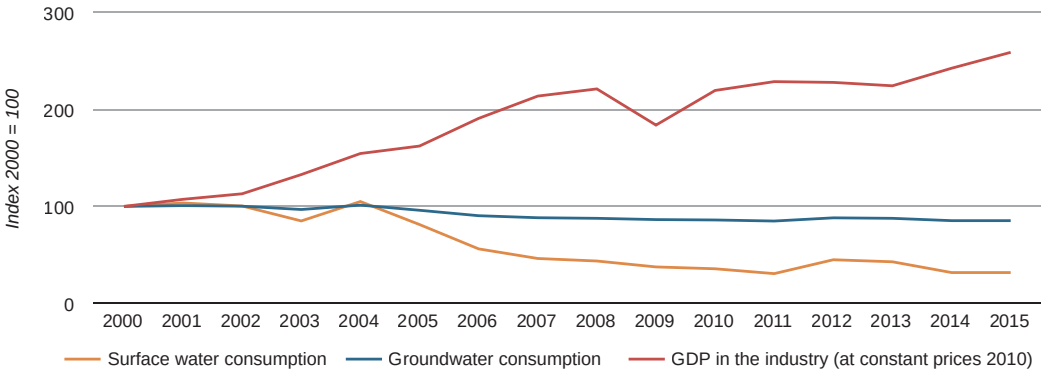
Development of decoupling in manufacturing with respect to the quantity of produced wastes



Source: SO SR, MoE SR

The development of decoupling in the industry reached absolute decoupling with respect to surface water consumption and has a better development than decoupling concerning consumption of groundwater that also reached absolute decoupling.

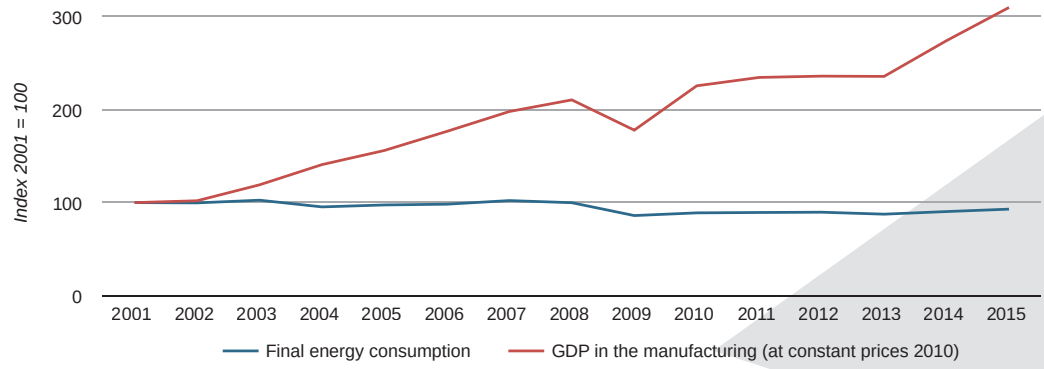
Development of decoupling in the industry with respect to water consumption



Source: SO SR, SHMI

The development of decoupling in the manufacturing reached a positive trend with respect to the final energy consumption (FEC) in some selected spheres (absolute decoupling).

Development of decoupling in the manufacturing with respect to FEC in some selected spheres



Source: SO SR

3.5. What is the response of the society to mitigating or compensating negative consequences of manufacturing on the environment?

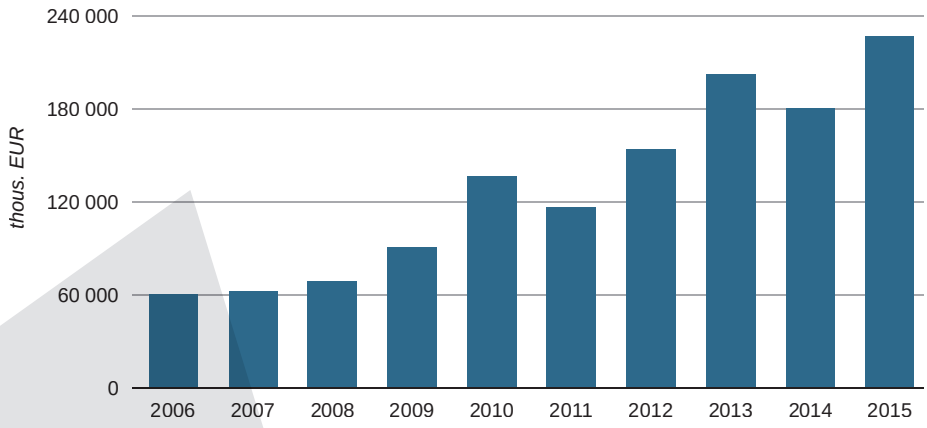
The society can mitigate or compensate negative impacts of manufacturing on the environment by increasing expenditures of research and development in the sphere of manufacturing or by increasing costs of the environmental protection.

The response of the society to mitigating or compensating negative consequences of manufacturing on the environment is described based on the indicators from the group of political, economic and social aspects.

3.5.1. Expenditures of research and development in manufacturing

In 2015, expenditures of research and development in manufacturing reached EUR 227,490.76 thousand and increased by 271.5% compared to 2006.

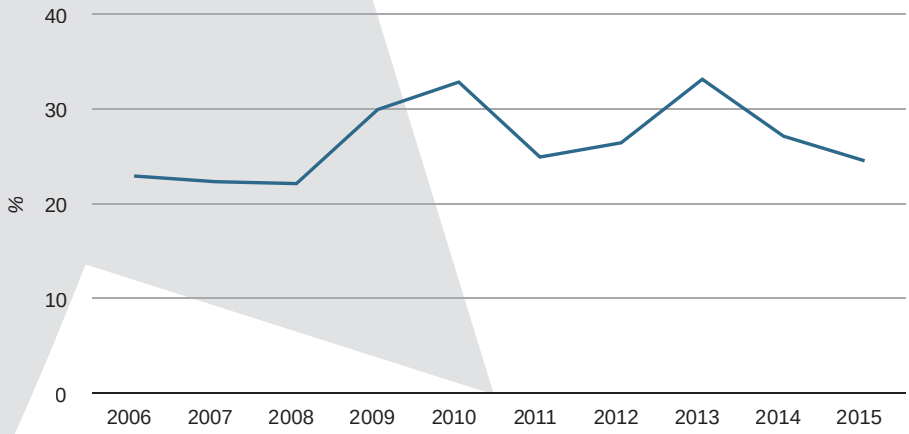
Development of expenditures of research and development in manufacturing



Source: SO SR

The share of expenditures of research and development in manufacturing has a fluctuating trend in the total expenditures of research and development. Expenditures in the manufacturing reached 22.9% share in 2006 and their share increased to 24.5% in 2015.

Development of the share of expenditures of research and development in manufacturing in the total expenditures

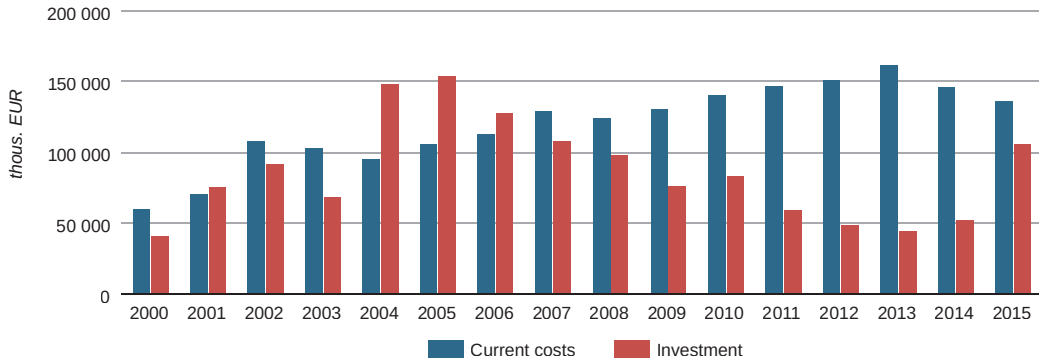


Source: SO SR

3.5.2. Costs of the environmental protection in manufacturing

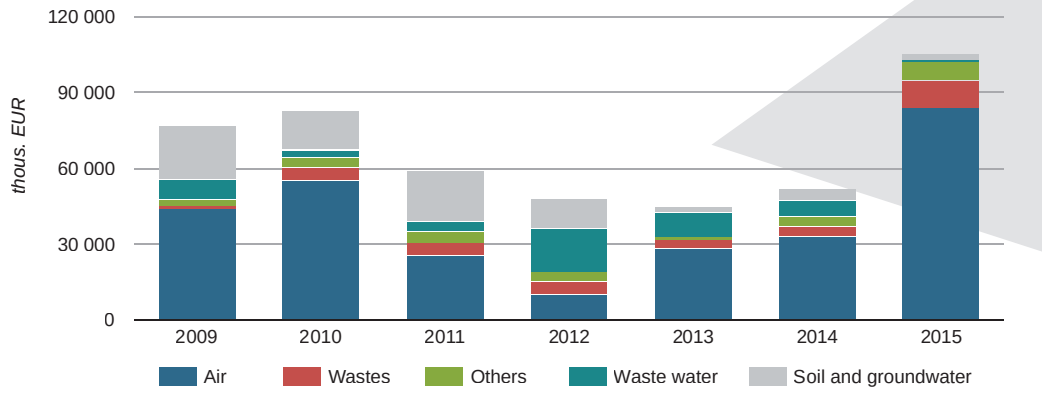
The total costs of the environmental protection in manufacturing are the total sum of current and investment costs of enterprises with 20 employees and more. The costs of the environmental protection in manufacturing have been growing and in 2015 they reached EUR 242,755.37 thousand, and there was an increase in costs of 138.6% compared to 2000. In 2000, investment accounted for 40.5% of costs of the environmental protection in manufacturing and their share increased to 43.6% in 2015. In 2000, costs of the environmental protection in manufacturing accounted for 33.2% share in the total company costs and in 2015 their share decreased to 25.2%.

Development of costs of the environmental protection in manufacturing



Source: SO SR

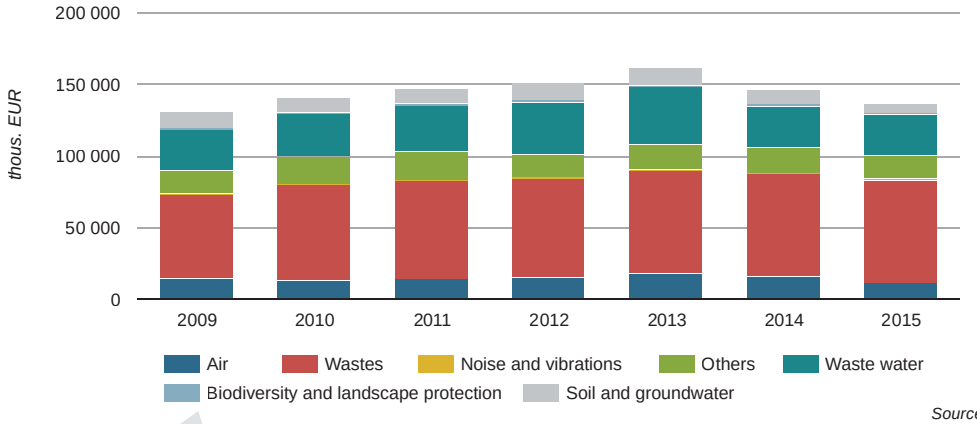
Development of investment for the environmental protection in manufacturing



Source: SO SR

As part of investment for the environmental protection in manufacturing, in 2015 the biggest growth was reached by investment of waste handling (887.3%) compared to 2009 and in 2015 the biggest share was reached by investment for the air protection (79.3%).

Development of current costs of the environmental protection in manufacturing



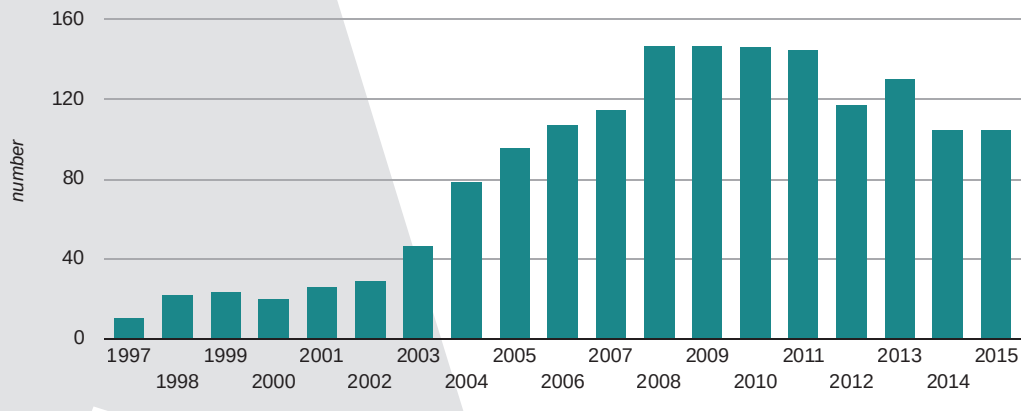
Source: SO SR

As part of current costs of the environmental protection, the biggest growth was reached by costs of waste handling (22.8%) and the biggest share in 2015 was reached by costs of waste handling (53%).

3.5.3. Environmental labelling of products in manufacturing

The environmentally friendly product (EFP) is awarded by the Ministry of Environment of the Slovak Republic based on the Act No 469/2002 Coll. on Environmental Product Labelling, as amended, to such products that have fulfilled the environmental criteria.

Number of products with the right to use the label EFP

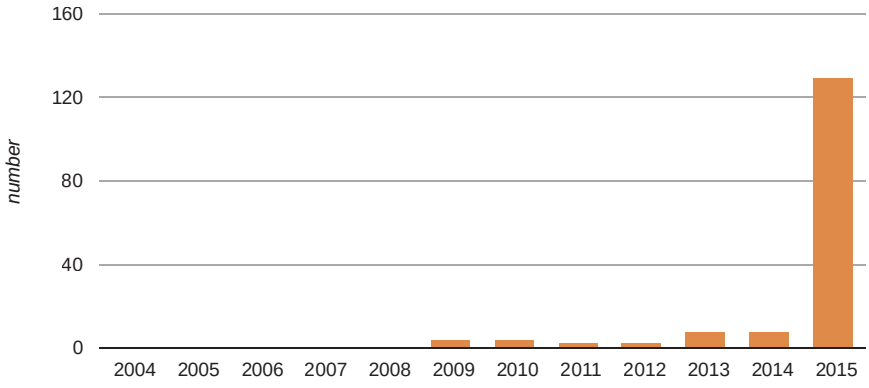


Source: SEA

In total, 248 products have been assessed and awarded with the label Environmentally friendly product since 1997 in the Slovak Republic. The biggest total number of products with the right to use the national environmental label EFP – 147 was recorded in 2008 and 2009.

Upon the Slovak Republic's joining the EU in 2004, the possibility originated for applicants based on the Regulation No. 1980/2000 of the European Parliament and of the Council, later revised and replaced by the currently valid Regulation No. 66/2010 of the European Parliament and of the Council, on the EU Ecolabel, to get the European ecolabel for products. Environmental criteria for defined groups of products for awarding the Environmental label of the European Union (EU Ecolabel) are issued in the form of the European Commission's decisions.

Number of products with the right to use the Ecolabel of the European Union



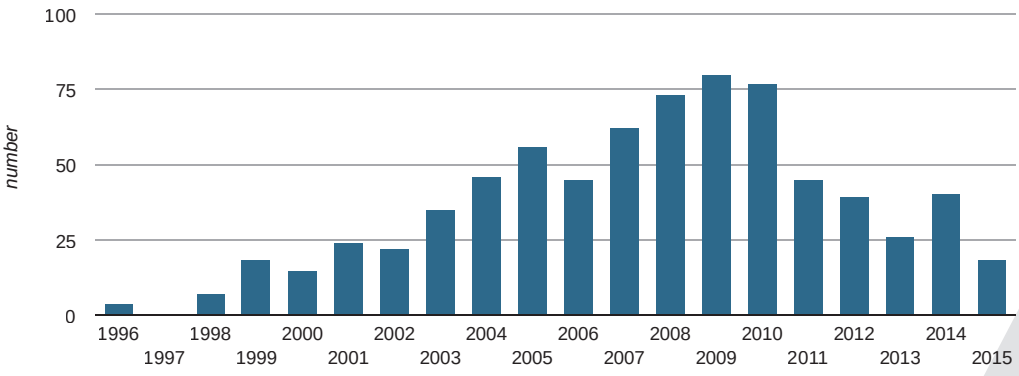
Source: SEA

In total, 157 products have been assessed and awarded since 2004. In 2015, growth was recorded when the right to use the EU Ecolabel was awarded to 129 products.

3.5.4. Environmental management system in manufacturing

The Environmental Management System (EMS) according to the international standard ISO 14001, granted to organisations in the manufacturing, is the confirmation of efficiency of the system in the system of environmental management.

Development of the annual increase in organisations with the certified EMS according to the standard ISO 14001 in manufacturing

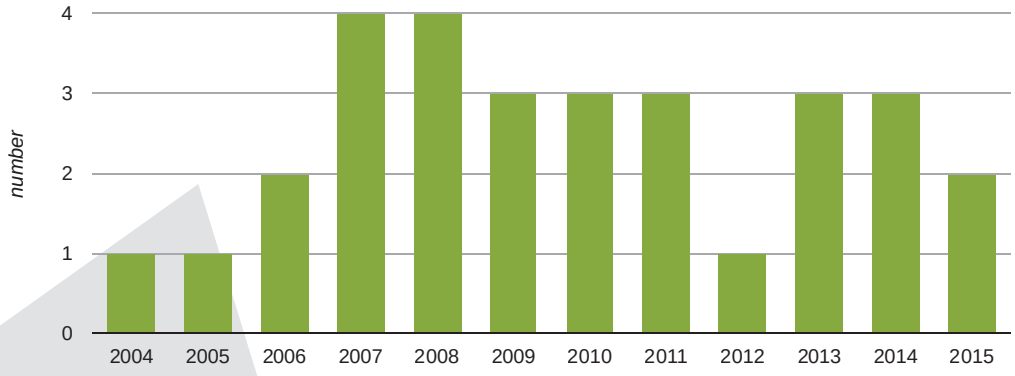


Source: SEA

In 2015, there were 18 new organisations with the introduced and certified EMS. The total number of registered organisations in manufacturing with the certified EMS according to the standard ISO 14001 increased to 732 from 1996.

EMAS (the European Eco-Management and Audit Scheme) is determined by the Regulation (EC) No. 1221/2009 of the European Parliament and of the Council, on the Voluntary Participation by Organisations in a Community Eco-Management and Audit Scheme.

Number of registered organisations in the EMAS scheme in manufacturing



Source: SEA

In 2015, there were two organisations from manufacturing in the national register EMAS.

3.5.5. Assessment of impacts of proposed activities on the environment in manufacturing

At present, in Slovakia there is the process of assessment of impacts of proposed activities before decision on their placement or before their permit legislatively regulated by the Act No. 24/2006 Coll. on Environmental Impact Assessment and on Amendments to Certain Acts.

In accordance with Annex No. 8 of the Act, manufacturing is included in more tables divided by the type of the industry. For the purposes of processing statistical information, activities have been selected in such way so that they correspond to the Statistical Classification of Economic Activities (SK NACE Rev 2) for all divisions included in the Section C – Manufacturing.

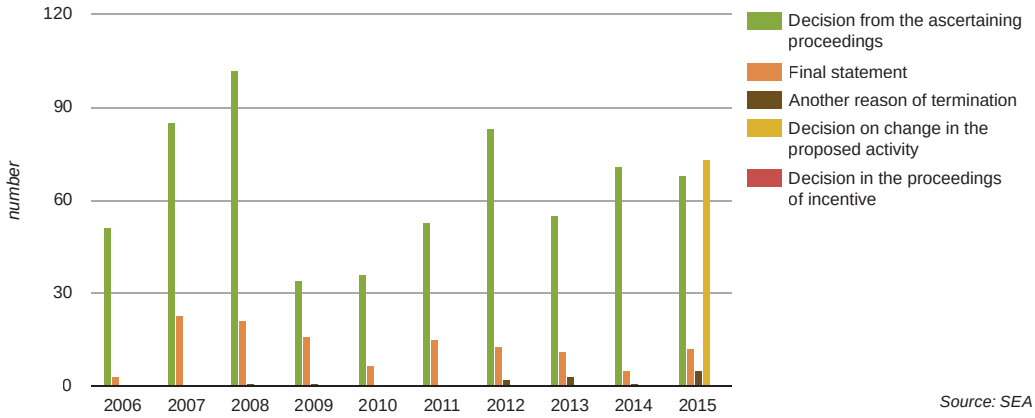
Activities subject to the EIA process have been changed, supplemented and modified in the aforementioned industrial sectors both from the perspective of types of activities and from the perspective of limits defined for obligatory assessment and ascertaining proceedings.

For the period since the date when the Act came into effect, the following number of activities has been evaluated in the individual sectors of the industry in the EIA process:

- metallurgical industry – 112 activities,
- chemical, pharmaceutical and petrochemical industry – 113 activities,
- wood-processing, cellulose and paper manufacturing – 21 activities,
- industry of building materials – 78 activities,
- engineering and electrical engineering industries – 280 activities,

- other industrial sectors – 326 activities,
- food industry – 351 activities.

Overview of the number of activities with the completed EIA process according to the individual types of proceedings in the sector of manufacturing



Source: SEA

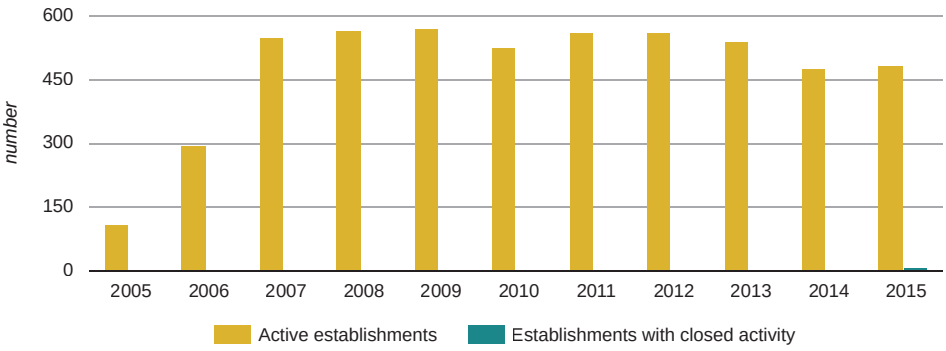
3.5.6. Integrated prevention and control of the environmental pollution in manufacturing

The integrated prevention and control of the environmental pollution is addressed in the Act No. 39/2013 Coll. on Integrated Pollution Prevention and Control and on Amendments to Certain Acts, as amended (the Act on IPPC). The implementing regulation for the Act on IPPC is the Decree of the Ministry of Environment of the Slovak Republic No. 11/2016 Coll. that came into effect on 1 January 2016.

The integrated permitting is proceeding in which conditions for performing activities in the existing and new establishments are permitted and determined in a coordinated way in order to guarantee the effective integrated protection of the environmental components and keep the rate of the environmental pollution within the standards of the quality of the environment.

In 2015, 482 establishments were active in the sector of manufacturing and six integrated permittings for establishments were withdrawn for the reason of termination of their activity or decreased capacity, and thus withdrawing from the effect of this Act.

Number of establishments of IPPC in manufacturing



Source: SIE

3.6. List of used literature

1. Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee. Industrial Policy in an Enlarged Europe (COM/2002/714)
2. Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee. Environmental Technologies Action Plan (COM/2004/38)
3. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Integration of Environmental Aspects into European Standardisation (COM/2004/130)
4. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Fostering structural change: an industrial policy for an enlarged Europe (COM/2004/274)
5. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Nanosciences and nanotechnologies: An action plan for Europe 2005 – 2009 (COM/2005/243)
6. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Implementing the Community Lisbon Programme: A policy framework to strengthen EU manufacturing – towards a more integrated approach for industrial policy (COM/2005/474)
7. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. An Energy Policy for Europe (COM/2007/1)
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9. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Raising productivity growth: key messages from the European Competitiveness Report 2007 (COM/2007/666)
10. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Towards an improved policy on industrial emissions (COM/2007/843)
11. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Regulatory aspects of nanomaterials (COM/2008/366)
12. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan (COM/2008/397)
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16. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. EUROPE 2020 A strategy for smart, sustainable and inclusive growth (COM/2010/2020)
17. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Europe 2020 Flagship Initiative – Innovation Union (COM/2010/546)
18. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. An Integrated Industrial Policy for

the Globalisation Era – Putting Competitiveness and Sustainability at Centre Stage (COM/2010/614)
19. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. A Resource-Efficient Europe (COM/2011/21)
20. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Roadmap to a Resource-Efficient Europe (COM/2011/571)
21. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. Industrial Policy: Reinforcing Competitiveness (COM/2011/642)
22. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee. A Stronger European Industry for Growth and Economic Recovery – Industrial Policy Communication Update (COM/2012/582)
23. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. CARS 2020: Action Plan for a competitive and sustainable automotive industry in Europe (COM/2012/636)
24. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Action Plan for a competitive and sustainable steel industry in Europe (COM/2013/407)
25. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. For a European Industrial Renaissance (COM/2014/14)
26. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Towards a circular economy: A zero waste programme for Europe (COM/2014/398)
27. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Green Action Plan for SMEs: Enabling SMEs to turn environmental challenges into business opportunities (COM/2014/440)
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ENERGY

List of the sector indicators in energy

Trends of the sector relevant for the environment
◀ Energy sources balance
◀ Electricity generation and consumption
◀ Final energy consumption
◀ Energy intensity of the economy of the Slovak Republic
Interactions of the sector with the environment (demands of the sector in respect of resources and impacts of the sector on the environment)
◀ Greenhouse gas emissions from energy
◀ Emissions of main pollutants from energy
◀ Waste water from energy
◀ Wastes from energy
◀ Radioactive waste

Political, economic and social aspects
◀ Renewable energy sources
◀ Electricity and natural gas price
◀ Costs of the environmental protection in energy
◀ Tax on energy
◀ Assessment of impacts of proposed activities on the environment in energy
◀ Integrated prevention and control of the environmental pollution in energy

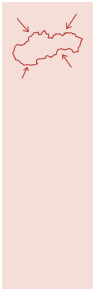
According to the Statistical Classification of Economic Activities (SK NACE Rev. 2), energy is included in the Section D – Electricity, gas, steam and cold air supply.

It consists of the following division:
35 – Electricity, gas, steam and cold air supply.

Emissions from the energy are made up of emissions from the sector of electricity, gas, steam and cold air supply – the Section D according to SK NACE classification and emissions from household heating and cooling.

4.1. Summary assessment of the development in the energy sector

What is the state and directing of the energy sector in relation to the environment?



The Slovak Republic is one of the countries with high import dependence, importing most primary energy sources (PES). The domestic PESs include biomass, brown coal and water energy, while wood had the biggest share from among the domestic PESs in 2015. From the perspective of the structure of used PESs, the Slovak Republic had the balanced share of the individual sources in 2015. In total, the gross inland energy consumption decreased, with slight fluctuations, in the period from 2001 to 2015. The development of the structure of the individual sources is characteristic of decreased consumption of gas, solid fuels and nuclear fuel. On the contrary, the gross inland consumption of renewable energy sources (RES) increased considerably in the same period.

In the monitored period of 2000 – 2015, the electricity and heat generation decreased. In 2015, the Slovak Republic had the low-carbon mix of electricity sources, as the share of zero-emission production accounted for approximately three quarters of the total production. More than a half of electricity generated in 2015 came from nuclear power plants. Out of fuels, natural gas, brown and black coal were most used for the heat generation. Out of RESs, wood and wooden waste had the highest representation.

The trend of the final energy consumption (FEC) development in the period of 2001 – 2015 points out to the progress accomplished with decreasing the final energy consumption that had a decreasing trend in the monitored period. FEC of solid fuels, gasous fuels and heat decreased most considerably. FEC of liquid fuels increased and electricity consumption also increased slightly. The positive feature is a considerable increase in FEC of renewable sources and waste. In spite of the decrease, gas fuels had the biggest share in the total FEC in 2015.

From among the sectors, the sector of industry had the biggest share in FEC in 2015, followed by the sectors of transport, households and commercial and public services. The sector of agriculture participated in FEC only minimally. For the whole monitored period of 2001 – 2015, FEC had a decreasing trend in all sectors, except for the sector of transport. In the recent years, a decrease in FEC has also been recorded in this sector.

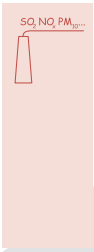
Since 2001, there was a decrease in the energy intensity (EI) of the economy of the Slovak Republic that decreased approximately by a half as of 2015. In spite of the favourable development, the Slovak Republic had the seventh highest EI from among the EU 28 countries in 2015.

The development of energy intensity in the individual sectors according to the final energy consumption was overall positive in 2001 – 2015. EI had a decreasing trend in the sectors of agriculture, industry and households. The increase in EI in this period was in the sector of transport, with the maximum in 2006. In the recent years, there has been a decrease in ED also in the sector of transport.

What are interactions of the energy sector and the environment?

Impact of the energy sector on the environment

Compared to 1990, greenhouse gas emissions from energy as of 2014 decreased by more than a half. Most emissions came from combustion and transformation of fossil fuels. The share of emissions from large and medium sources decreased; combustion of fossil fuels in households remains a problem. In spite of this considerable decrease, nearly a half of the total greenhouse gas emissions was connected with energy in 2014.



In the Slovak Republic, a positive trend of gradual reduction of the main pollutants released into the air from energy has been persisting. In 2008 – 2014, the positive trend was achieved in the case of SO_2, NO_X emissions from the sector of electricity, gas, steam and cold air supply (the Section D according to SK NACE classification) as well as from households, in the case of PM_{10} and $PM_{2.5}$ emissions from the Section D and CO and NMVOC emissions from households. In the case of POPs emissions, there was a decreasing trend in the monitored period of 2001 – 2014 achieved in the case of PCDD/PCDF emissions. From 2000 to 2014, emissions of all heavy metals except for Cd decreased.

In the period of 2006 – 2014, the electricity industry participated most in the total volume of waste water from energy. The quantity of waste water had a decreasing trend, except for the years when it was influenced by the power station Vojany. The quantity of waste water from the heat production industry alternated, the decrease in its volume in the last two years is positive.

From 2008 to 2015, the production of waste from energy sector decreased nearly by a half. The share of energy in the total waste production was less than 6% in 2015. The non-hazardous wastes have the dominant position in the spere of wastes.

In 2000 – 2015, there was a considerable decrease in the production of solid radioactive waste from the nuclear power plant (PP) Jaslovské Bohunice and liquid radioactive waste from both nuclear power plants. The increase occurred in the case of solid waste from PP Mochovce.

What is the response of the society to mitigating or compensating negative consequences of energy sector on the environment?

In 2006 – 2014, the total share of energy from renewable sources (RES) increased that was a result of growth of the gross total consumption of RES.
The share of energy from RES also increased in all sectors – electricity, heat and cold production and in transport. From among RESs, water energy (electricity production) and biomass (heat and cold production) had the dominant position. In the sector of transport, biodiesel had the dominant position.

The price of electricity for households was increasing from 2004 and it increased nearly by a quarter until 2015. The same increasing trend was also in respect of the price of natural gas for households that was nearly 100% higher in 2015 than in 2004.

In 2009 – 2015, the total costs of the environmental protection did not have an unambiguous course in energy. There was a considerable increase in 2014 when they reached their maximum in the whole monitored period. In 2015, they decreased by more than a half, while investment had the dominant position among financial means.

4.2. How are the environmental principles and targets related to energy implemented into the strategic documents?

4.2.1. Implementation of environmental principles and targets related to energy into the strategic documents at the EU level (the most important documents)

2002	***The Sixth Environmental Action Programme of the EU "Environment 2010: Our Future, Our Choice"*** Target – ensuring the high level of the environmental protection while taking into consideration a variety of conditions in the individual regions of the Community and achieving weakening of the relation between the economic growth and environmental pressures caused by this growth The key priority objectives in relation to the energy sector were: Priority Objective 1: Climate change Priority Objective 4: Natural resources and waste
2002	***European energy policy, European Energy Efficiency Action Plan*** Strengthening the integration of environmental aspects into the energy policy.
2004	***The EU Environmental Technologies Action Plan*** Target – supporting the development and using environmental technologies and improving competitiveness of the EU in this sphere.
2006	***Renewed EU Sustainable Develompent Strategy (EU SDS)*** The overall objective of the renewed EU SDS was determining and developing measures that would enable the EU to achieve the continuous improvement of the quality of life of both current and future generations by creating sustainable communities able to use resources efficiently and manage them and use the potential for both ecological and social innovations of the economy, thus ensuring prosperity, environmental protection and social cohesion.
2007	***Energy Policy for Europe*** The main objectives of the European energy policy were fighting against the climate change, limiting the EU external vulnerability by importing hydrocarbons and supporting growth and employment, hereby secure energy for a reasonable price should have been provided to consumers.
2007	***European Strategic Energy Technology Plan (SET-Plan) Towards a low-carbon future*** The strategic plan for accelerating the development and introducing cost-effective low-carbon technologies. This plan contained measures concerning planning, implementation, sources and international co-operation in the sphere of energy technologies.

2008	***Climate and Energy Package*** Setting a complex of measures aimed at reducing the impact of the EU activities on global warming and ensuring reliable and sufficient energy supplies. In this complex, the EU accepted the commitment to reduce by 2020 (compared to 1990) greenhouse gas emissions by 20%, reach the EU energy savings of 20%, reach 20% share of energy from RES sources in the gross final energy consumption and reach 10% representation of biofuels in transport by 2020. The package includes a complex of more documents drawn up by the EC and devoted to energy sector and environmental issues: The roadmap for renewable energy sources, The Report of progress in the sphere of biofuels, The Report of progress in the sphere of renewable sources of electricity, Perspectives for the internal gas and electricity market, Reviewing of the European gas industry and electricity sector, Plan of priority connections, Sustainable energy generation from fossil fuels, Towards the European Strategic Plan for Energetic Technologies, Nuclear Clarifying Programme, Limiting the Global Climate Change to 2 degrees Celsius.
2008	***Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan*** Adopting the integrated package of measures for the support of more sustainable consumption and production with increasing competitiveness of the EU economy. The action plan was accompanied by proposals for revising the Eco-design Directve and the Energy Labelling Directive as well as by proposals for revision of the Regulation on the Ecolabel and the Regulation on EMAS (the Eco-Management and Audit Scheme).
2010	***Europe 2020: A strategy for Smart, Sustainable and Inclusive Growth*** The basic of the strategy includes three mutually completing priorities: – Smart growth: creating a knowledge- and innovation-based economy. – Sustainable growth: supporting of a greener and competitive resource-efficient economy. – Inclusive growth: supporting of an economy with a high employment rate that will ensure social and territorial cohesion. Out of the targets adopted for the EU by 2020, the following ones are mainly relevant for the sphere of energy sector: – increase in the R&D investment level to 3% of GDP, – decrease in greenhouse gas emissions of 20% (or up to 30% on condition of a wider global agreement) compared to 1990, – obtaining 20% energy from renewable sources, – achieving a 20% increase in energy effeciency The Strategy has brought seven flagship initiatives, while out of them the especially important initiatives from the perspective of increased competitiveness of the EU energy industry are: The Innovation Union, Digital Agenda for Europe, A Resource-Efficient Europe, and New Skills for New Jobs.
2010	***Energy 2020: Strategy for competitive, sustainable and secure energy*** Defining of five priorities: increasing of energy efficiency, completing the construction of the whole-European integrated energy market, increasing rights of consumers and energy security level, extending the leading position of the EU in the sphere of energy technologies and innovations and strengthening the external size of the EU energy market.

2011	***Roadmap to a Resource-Efficient Europe*** Specification of targets that will have to be achieved for ensuring the effective resource utilization.
2011	***Energy Roadmap 2050*** Comparing various scenarios of decarbonising of the energy system and methods of ensuring energy supplies and competitiveness by 2050.
2011	***Roadmap for Transforming the EU into a Competitive, Low-Carbon Economy by 2050*** Defining milestones by 2050, the plan of possible measures for their achieving (decreasing of greenhouse gas emissions by 2050 of 80%), including measures in the energy sector.
2012	***Renewable Energy: A major player in the European energy market*** Defining the spheres where it is necessary to increase intensity of efforts by 2020 in order to increase further energy generation from the EU renewable sources by 2030 as well as in the following years, so that technologies of renewable energy sources are less costly, more competitive and finally market-oriented, and to provide stimuli for investing in energy from renewable sources.
2012	***Blueprint to Safeguard Europe's Water Resources*** Target – ensuring sustainability of all activities that have the impact on water, and thus ensuring accessibility of high-quality water for its sustainable and fair utilization. It contains the requirement to include more largely targets of the policy in water management in the sector policies.
2013	***The Seventh Environmental Action Programme of the Union to 2020 "Living Well, Within the Limits of Our Planet"*** The key feature of the Programme is the protection and improvement of natural capital, supporting improved utilization of current resources and accelerated transition to the low-carbon economy. The Programme is to support the sustainable growth, creating new jobs, and thus create from the EU a healthier and better place for living. The key priority objective in relation to the energy sector is: Priority Objective 2: Creating from the Union a resource-efficient, low-carbon, green and competitive economy. Priority Objective 7: Improving involvement of environmental issues and policy cohesion.
2014	***Green Action Plan for Small- and Medium-Sized Enterprises (SMEs): Enabling SMEs to Turn Environmental Challenges into Business Opportunities*** Target – contributing to reindustrialisation of Europe by supporting the development of enterprises while taking into consideration the environmental protection in all European regions, in particular with respect to the fact that there are considerable differences in the efficient resource utilization between both sectors and the member states.
2014	***EU 2030 Climate and Energy Package*** Bridging the targets 20-20-20 with the vision of the low-carbon economy in 2050. Achieving cutting greenhouse gas emissions by 2030 by 40% compared to 1990, an increase in the share of RES in the energy mix of the EU to 27% (the target is binding only at the EU level), reducing energy consumption by 27% (the non-binding target) and the new target is to increase interconnection of energy networks of the member states to 15%. In addition, the framework includes the key reform of the EU Emissions Trading System.

2014	***European Energy Security Strategy*** Defining a series of specific measures aimed at increasing the EU resistance and reducing its dependence on energy import.
2015	***Action Plan for the Circular Economy*** Target – stimulating the transition of Europe to the circular economy that will strengthen the global competitiveness, sustainable economic growth and the creaton of new jobs.
2015	***Energy Union Package*** Target – introducing the new approach in the energy sector with the emphasis on the consumer, initiating a new concept of the European electricity market, updating the system of energy efficiency labelling and reviewing the EU Emissions Trading System. It consists of more communications. One of them is A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy that represents the vision for the future and unifies more spheres of the policy into one comprehensive strategy. It also includes The Action Plan with the list of planned measures of the Commission for 2015 and 2016. Other adopted documents in the package are communications: Achieving the rate of interconnection of energy networks at 10% – preparation of the European electrical networks for 2020 and The Paris Protocol – the concept of fighting global climate change by 2020.

4.2.2. Implementation of environmental principles and targets related to energy into the strategic documents at the SR level (the most important documents)

2000	***Energy Policy of the Slovak Republic*** Defining the framework for the path of energy sector changes based on the following three pillars: – preparation for integration into the EU internal market, – security of energy supplying, – sustainable development.
2001	***National Strategy for Sustainable Development*** Setting priorities and targets of the sustainable development, Strategic Objective 24. Decreasing of energy and raw material intensity and increasing of efficiency of the economy of the SR.
2003	***Concept of Utilization of Renewable Energy Sources (RES)*** Creating the basic framework for the development of RES utilization in the Slovak Republic.
2005	***The National Biofuel Development Programme*** Defining indicative targets expressed by reference values for the period of 2006 – 2010, creating stimulation economic and legislative conditions for meeting the indicative targets specified in the Directive No. 2003/30/EC of the European Parliament and of the Council on the promotion of the use of biofuels or other renewables in transport.
2005	***Action Plan for Sustainable Development of the Slovak Republic for 2005 – 2010*** Defining main targets, including the energy sector, concretized for the individual sectors. They included measurable indicators, deadlines, determination of responsibility for their fulfilment and methods of their financing.

2006	***Energy Policy of the Slovak Republic*** Creating the framework for further directing of the development of electricity industry, thermal energy sector, gas industry, mining, crude oil processing and transport, coal mining and utilization of renewable energy sources.
2006	***Concept of Water Management Policy until 2015*** The strategic objective by 2015: 3.1 Increasing the quality of care of water resources and the related water management infrastructure, including fulfilment of the EU legal regulations. The qualitative protection of surface water: – focusing on solving the most important sources of point pollution caused by public sewerage systems and industrial pollution sources, – restricting production of waste water and pollutants contained therein directly in their producers' place, – reassessment of the current discharge of industrial and municipal waste water in order to prepare measures aimed at ensuring the compliance with the criteria for the protection against discharge of dangerous substances according to the EU regulations.
2007	***Strategy for a Higher Utilization of Renewable Energy Sources in the Slovak Republic*** Stock-taking of potentials of the individual RES, outlining possibilities of using commercially introduced technologies, proposal of targets in the sphere of electricity generation (without big hydroelectric power stations) and heat generation from RES by 2010 and 2015, and measures aimed at their achieving.
2007	***Concept of Energy Efficiency*** Stock-taking of the current knowledge of potentials of energy savings in the individual sectors, identification of barriers, defining strategic objectives and priorities, defining energy-saving measures, arranging of the individual steps directed at achieving defined targets and ensuring implementation of proposed measures. Main objectives: – achieving a gradual reduction of energy intensity to the level of the average of the original 15 member states of the EU, – achieving the total national indicative target of energy savings for the individual years, – improving efficiency of equipment in the sphere of thermal energy and electricity generation and decreasing energy losses during energy transfer, transport, and distribution.
2007	***Energy Efficiency Action Plan for 2008 – 2010 (the 1st AP)*** Quantifying targets, defining measures and determining mechanisms for ensuring implementation of proposed measures and their monitoring.
2007	***National Programme of Cutting Emissions of Basic Pollutants to 2010*** Target – defining instruments for ensuring the compliance with national emission ceilings specified for the Slovak Republic, both cross-sectionally and for the individual sectors, including the energy sector.
2008	***Biomass Action Plan for 2008 – 2013*** Defining measures aimed at implementation of targets in the sphere of biomass use that should have had a considerably positive impact on the environment and should have contributed to increasing the quality of climatic conditions, cutting greenhouse gases and diversification of energy resources with increasing energy security.

2008	***Energy Security Strategy of the Slovak Republic*** Targets – achieving the competitive energy sector ensuring secure, reliable and effective supplies of all forms of energy for reasonable prices, while taking into account the customers' protection, environmental protection, sustainable development, security of energy supplying and technical security.
2009	***Water Plan of the Slovak Republic*** Defining the framework of environmental targets enablihg the sustainable water management to 2015 for: – surface water bodies, – underground water bodies.
2010	***National Renewable Energy Action Plan*** Defining national targets for the share of energy from renewable sources consumed in transport and in the sectors of electricity, heat and cold generation in 2020 and measures aimed at their ensuring.
2011	***Concept of Utilizing the Hydropower Potential of Water Courses of the Slovak Republic till 2030*** Mapping potentially environmentally admissible possibilities of further utilization of water courses and fulfilling targets in the sphere of electricity generation from renewables.
2011	***Energy Efficiency Action Plan for 2011 – 2013 (the 2nd AP)*** Defing the second transitional indicative target of energy savings in the Slovak Republic for the period of the next three consecutive years, defining measures and financial and legal instruments for achieving the target of energy savings.
2013	***Concept of Development of Electricity Generation from Small Renewable Energy Sources in the Slovak Republic*** Specifying the comprehensive approach to both legislative and possible financial support for the development of small energy sources that are intended especially for covering the own consumption of households without any negative impact on the stability of distribution systems and with the effect of financial savings for operators of small sources as well as for distribution companies.
2013	***Strategy for PM_{10} reduction*** Target – achieving and keeping the good air quality in the whole territory of the Slovak Republic, i.e. such air quality that does not threaten human health and the environment based on the current scientific knowledge. Such measures are defined for achieving this target concerning mainly the local heating, transport and farming on the agricultural land.
2014	***Updated National Biodiversity Strategy up to 2020*** Defining targets valid cross-sectionally for all sectors. The most important intentions of the strategy from the perspective of energy include: – ensuring integration of the protection of biodiversity into strategies, planning and decision-making processes in various sectors, – improving co-operation of environmental and sector policies for measures aimed at reducing the ecological trace in accordance with the international co-operation and support of upbringing, education and research in this sphere.
2014	***Energy Efficiency Action Plan for 2014 – 2016 (the 3rd AP)*** Evaluating targets and measures for energy efficiency in accordance with the previous plans, defining new and continuing measures of energy efficiency for the next period of 2014 – 2016 with the outlook to 2020.

2014	***Energy Policy of the Slovak Republic*** Reflecting to the development of the energy policy in the EU. Defining the main targets and priorities of the energy sector to 2035 with the outlook to 2050 in order to fulfil the strategic target, i.e. achieving the competitive low-carbon energy sector ensuring safe, reliable and effective supplies of all forms of energy for reasonable prices, while taking into account the customers' protection and sustainable development.
2014	***Adaptation Strategy of the Slovak Republic on Adverse Impacts of Climate Change*** Target – among other things, proposing a complex of appropriate proactive adaptation measures and mechanism for their implementation within sector policies, including the energy sector and its infrastructure, development strategies and action plans at all levels of the process.
2015	***Water Plan of the Slovak Republic*** Defining the framework of environmental targets enabling the long-term sustainable water management until 2021 for: – surface water bodies, – underground water bodies, and measures in relation to the individual sectors of the economy for achieving them.
2015	***Programme of Waste Management in the Slovak Republic for 2016 – 2020*** The main objective of the waste management of the Slovak Republic to 2020 is minimizing negative effects of waste origin and handling on human health and the environment. For its fulfilment, it is necessary – among other things – to implement the principle of extended responsibility of manufacturers for the following reserved products: electrical equipment, batteries and accumulators, packages, vehicles, tyres and non-package products, introducing the support for using materials obtained from recycled waste for the manufacture of products and improving market conditions for these materials. The Programme also defines targets and measures for biologically decomposable industrial waste as well as flows of waste and package waste.

4.3. What is the state and directing of energy in relation to the environment?

Energy generation and consumption have a considerable impact on the environment. Reducing energy consumption by introducing various saving measures and increasing energy efficiency as well as a change in the composition of primary energy resources have a crucial impact on cutting greenhouse gas emissions and improving the air quality. At the same time, it also contributes to reducing the impact in the other spheres (e.g. health, using up resources, etc.).

The energy sector development is focused on optimizing the energy mix from the perspective of energy security while achieving the highest possible energy efficiency and thorough environmental protection. The emphasis is put on efficient energy sources utilization and low-carbon technologies, such as renewables and nuclear energy.

The basic targets and frameworks of the energy sector development in the SR in the long-term outlook were defined until 2014 by the Energy Policy of the SR of 2000 and mainly by the Energy Policy of the SR of 2006 that stated that ensuring the maximal economic growth under the conditions of the sustainable development is conditioned by the reliability of energy supplies with the optimal costs and adequate environmental protection.

The Energy Policy of 2006 stated directing for the development of the electricity industry, thermal energy sector, gas industry, mining, crude oil processing and transport, coal mining and utilization of renewable energy sources. It defined the following three targets:

1. ensuring with the maximal efficiency safe and reliable supplies of all forms of energy in the requested quantity and quality,
2. reducing energy intensity,
3. ensuring self-sufficiency of electricity generation that will cover demand on the economically effective principle.

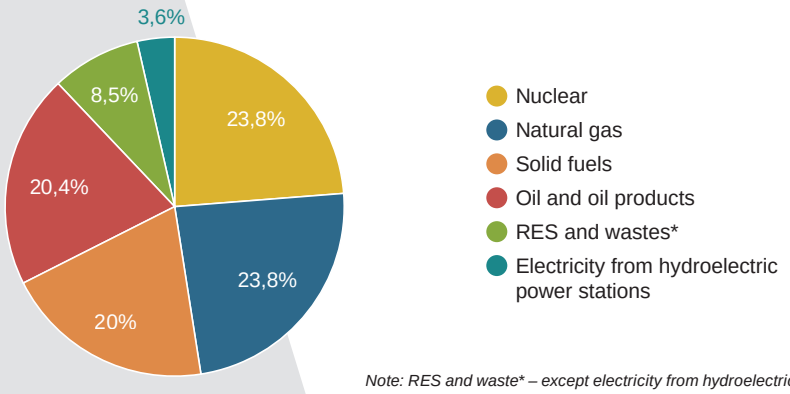
The state and directing of the energy in relation to the environment is characterized by indicators from the group “trends of the sector relevant for the environment”.

4.3.1. Energy sources balance

From the perspective of natural conditions and current technological possibilities of the country, the Slovak Republic is poor in primary energy sources (PES). The SR imports nearly 90% of PES (including nuclear fuel). Domestic resources of fossil fuels include brown coal and lignite. In the case of liquid and gaseous energy sources, the domestic production accounts only for approximately 4%. Out of renewable energy sources (RES), biomass and water energy participate most in the primary production.

From the perspective of the structure of used PES, the SR has a balanced share of the individual energy sources in the gross inland consumption (GIC), the so-called energy mix, that was in 2015 as follows: nuclear fuel 23.8%, natural gas 23.8%, crude oil and oil products 20.4%, solid fuels 20.0%, and renewables (including waste and electricity generated at hydroelectric power stations) 12.1%.

Energy mix in 2015



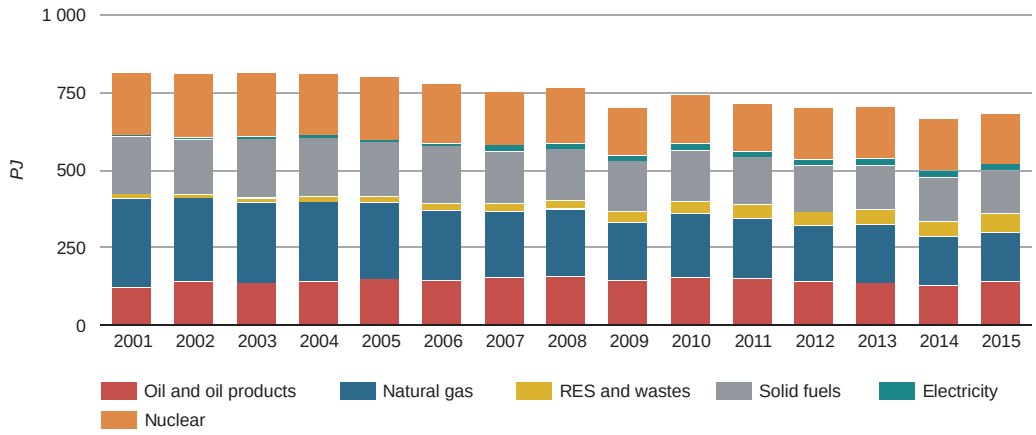
Source: SO SR
Note: RES and waste – except electricity from hydroelectric power stations*

The gross inland energy consumption includes the primary production (brown coal, lignite, crude oil, natural gas, heat and electricity) in the Slovak Republic and it is adjusted for recovered products, import – export balance and stock depletion. It also includes the import – export balance and depletion of stocks, such as black coal, coke, briquettes, crude oil, petrol, light and heavy heating oils, paraffin, coke gas, blast furnace gas, and other solid, liquid and gaseous fuels.

For the period of 2001 – 2015, GIC saw a decrease of approximately 16.1% with small fluctuations. In 2015, it reached the value of 683,408 TJ.

The gross inland consumption of natural gas decreased most considerably (42.8%) in the monitored period. The solid fuel consumption also has a decreasing trend in the long run and it was decreasing gradually by 26.2% in the monitored period. The decreasing trend was also seen in the gross inland consumption of nuclear fuel that fell by 19.1% for the whole period. The opposite trend was seen for the gross inland consumption of oil and oil products that increased by 11.3% for the same period. The gross inland consumption of renewable energy sources increased considerably (including waste and electricity generated at hydroelectric power stations) increased more than four times. Biomass (heat generation) and water energy (electricity generation) had the dominant position.

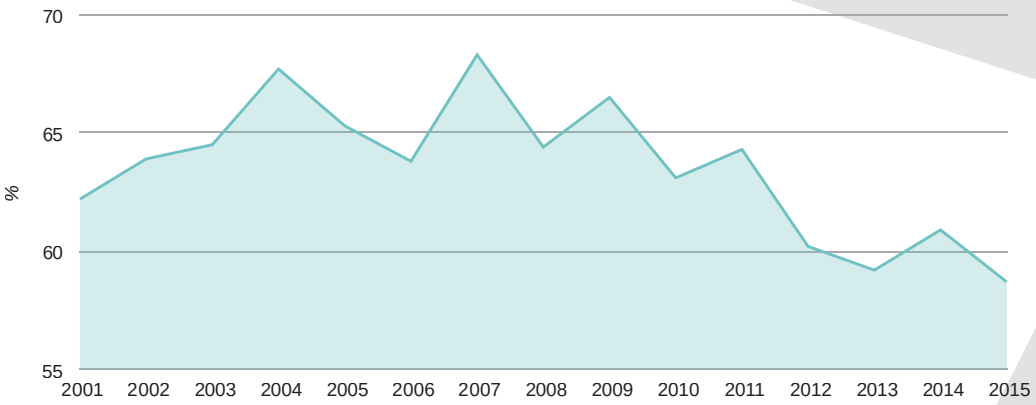
Development of gross inland energy consumption



Source: SO SR

The GIC decrease was considerably due to the industry restructuring in the 1990s, the development of sectors with a higher value added, introducing new modern technologies with lower energy demands, but also thermal insulation of buildings, exchanging appliances for low-energy ones, as well as increased savings due to the price deregulation.

Development of the Slovak Republic's energy dependance



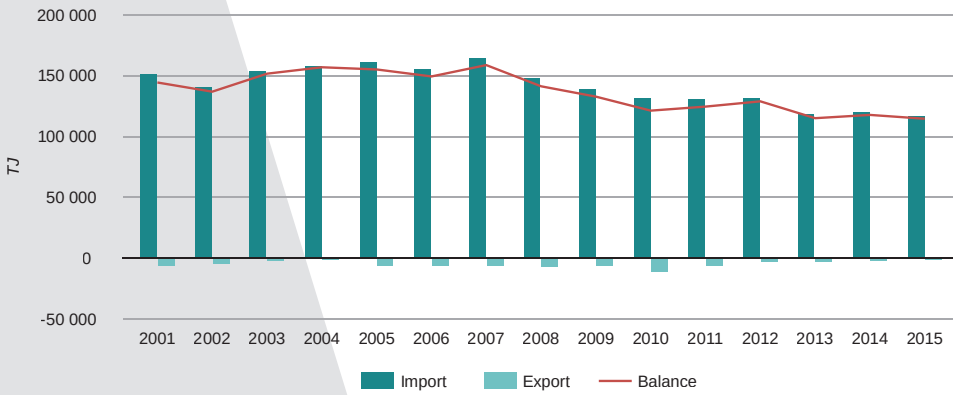
Source: Eurostat

Meeting energy needs of the society is one of key factors for the economy functioning of each country. Slovakia is a country with high import dependency and it has to import most necessary energy sources to meet its domestic needs. This is also the reason why a considerable attention is paid to energy security issues in the Slovak Republic. In the monitored period of 2001 – 2015, its energy dependency ranged from 55 to 70%. In 2015, its level reached 58.7%, while nuclear energy is considered to be the domestic energy source.

Solid fuels

The total solid fuel consumption has a long-term decreasing trend. At present, domestic brown coal accounts for approximately 80% of consumption of brown coal necessary for the electricity and heat generation. It plays an important role in ensuring security of electricity supplies. The remaining quantity of brown coal and all black coal are ensured by importing. In brown coal mining, a gradual decrease is supposed, and brown coal mining cannot be considered to be sufficient from the long-term perspective for meeting needs of electricity and heat generation.

Development of solid fuels import and export



Source: SO SR

Natural gas

The natural gas consumption has been gradually decreasing in the recent years. The considerable decrease was recorded in a year-on-year comparison in 2014 when the consumption decreased from 5.1 billion m^3 (2013) to approximately 4.3 billion m^3 (2014). The decrease in the natural gas consumption was mainly influenced by the winter character – winter this year was one of the warmest ones. In 2015, the consumption increased to nearly 4.8 billion m^3. The domestic mining participated approximately with 2% in this consumption. The remaining natural gas was imported from the Russian Federation. In total, 55.8 billion m^3 of gas was transported via the Slovak transport network in 2015.

Development of natural gas import and export

Source: SO SR

Liquid fuels

In 2014, the Slovak Republic imported approximately 5.48 million tons of oil. This volume (up to 6 million tons per year) is guaranteed based on the long-term international contract with the Russian Federation. The domestic mining participates in the oil consumption with less than 2%. For the period until the end of 2015, the Slovak Republic maintains emergency stocks of oil and products made of it at the level of 97 days.

Development of liquid fuels import and export

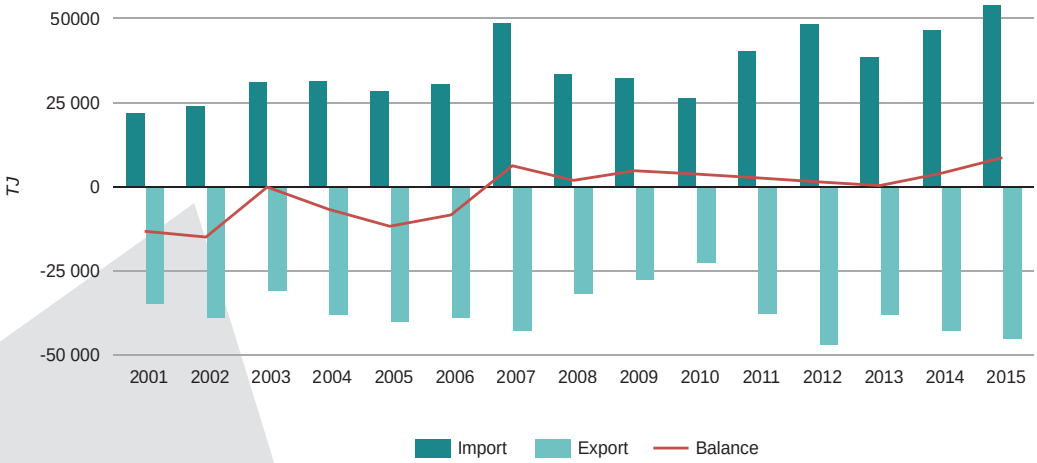
Source: SO SR

Electricity

After the construction of two blocks of the nuclear power plant (NPP) Mochovce was completed in 1998 and 2000, the Slovak Republic became self-sufficient in electricity supplies. Electricity generation exceeded its consumption and the SR was an electricity exporter from 2001 to 2006. After NPP V1 Jaslovské Bohunice was shut down in 2006, the SR became dependent on electricity import at the end of 2006. Electricity import was partially decreased due to the economic and financial crisis after 2008, which manifested itself by reducing the requirements of consumers for electricity supplies. After several power plants were put into operation and mainly by increasing the installed capacity of NPP V2 Jaslovské Bohunice and NPP Mochovce 1 and 2 in the following years, the annual electricity generation increased each year and import gradually decreased.

In 2015, electricity import increased by 1,287 GWh in a year-on-year comparison. Compared to the last three years, electricity import increased considerably. The balance of 8,596 TJ to the benefit of import in 2015 was caused by market reasons and not for the reason of insufficiency of electricity sources in the territory of the SR. The Slovak Republic is expected to become an electricity exporter again after the construction of the blocks of NPP Mochovce 3 and 4 is completed.

Development of electricity import and export



Source: SO SR

Nuclear fuel

At present, nearly 56% of electricity is generated at nuclear power plants. Nuclear fuel supplies are ensured by long-term contracts from the Russian Federation. In connection with using nuclear fuel for electricity generation, the key issue is to solve storage of burnt-up nuclear fuel as well as the issue of liquidation of nuclear power facilities shut down. When solving these issues, the Slovak Republic proceeds in accordance with the EU policy.

4.3.2. Electricity and heat generation

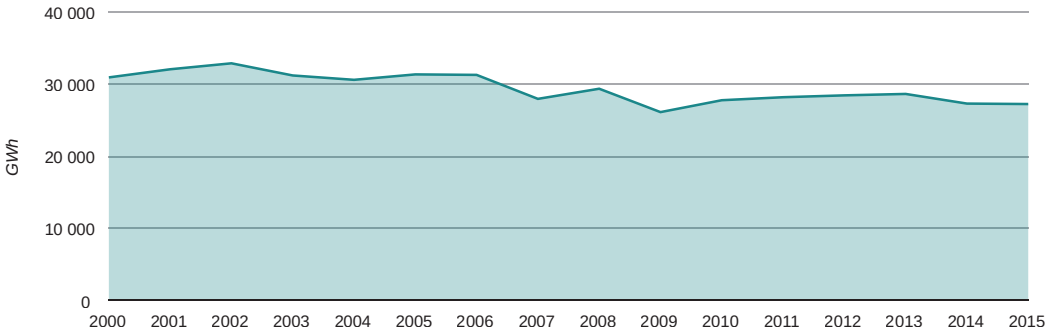
The living standard of citizens in the Slovak Republic as well as achieving its comparable level with advanced countries of the EU are influenced, among other things, by a sufficient quantity of electricity and heat for a price that will ensure not only competitiveness of its economy, but also its availability for citizens.

Electricity

With respect to the optimal structure of the production base being built on a long-term basis and well-built distribution system, electricity supplying in the Slovak Republic is reliable, with the minimal occurrence of failures that would threaten security of electricity supplying.

Electricity has a specific position among energy sources. This position results from the fact that the growth of its generation and consumption do not need to be accompanied by a negative impact on the environment, as in the case of the other types of fuels and energy. Electricity can be considered to be clean if it is generated and consumed with high efficiency, if it replaces energy generation from combustion of low-energy fuels or if it is generated from renewable energy sources.

Development of electricity generation

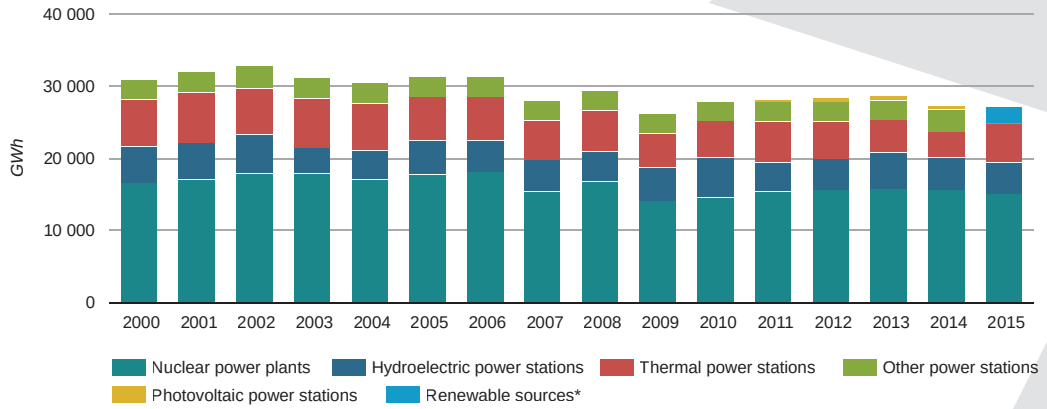


Source: SEPS, a. s.

In 2015, 27,191 GWh of electricity were generated in the Slovak Republic. In 2001 – 2015, electricity generation decreased by approximately 15.0%. The decrease was a result of shutdown of NPP V1 Jaslovské Bohunice and other blocks at thermal power stations. The Slovak Republic had already the low-carbon mix of electricity generation resources in 2015, as the share of zero-emissions production fluctuated at the level of more than 80%.

In 2015, the biggest share in electricity generation was represented by nuclear power plants (55.7%), also in spite of their lower generation compared to 2014. They were followed by thermal power stations (19.3%), hydroelectric power stations (16.0%), sources using renewable sources (8.8%), any other electricity sources (0.3%). In 2015, a half of generated electricity from renewable sources was from biomass (50.2%); bio gas and photovoltaic power stations had the identical share in generation - 24.7%. The decrease in generation of hydroelectric power stations in 2015 was not dramatic and electricity generation at hydroelectric power stations was on the average level for the whole year of 2015.
In the long-term run, electricity generation at thermal power stations has been gradually decreasing in the Slovak Republic and the importance of nuclear energy and energy from RES has been growing.

Development of electricity generation by source

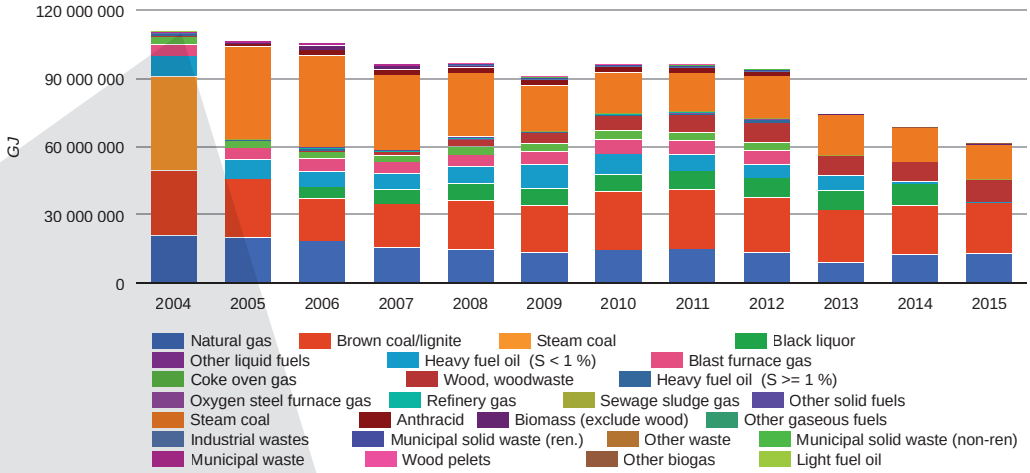


Source: SEPS, a. s.
Note: In 2015, categories were reclassified: the category of renewable sources includes photovoltaic power stations, biomass, and biogas.

Heat

Heat generation, supplying and consumption are an important part of the Slovak energy sector. Heat is generated at CHP plants (manufacturing units for combined power and heat generation) and heating plants (manufacturing units only for heat generation). Out of fuels, natural gas (heating plants, CHP plants), brown coal (heating plants) and black coal (heating plants) were mostly used for heat generation in the Slovak Republic. Out of renewable sources, wood and wooden waste (CHP plants, heating plants) were largely used. Slovakia is characterized by a developed system of the central heat supplying covering more than 54% of the total need of heat. For the last 20 years, heat generation and supplying from the central heat supplying systems have considerably decreased, mainly for the reason of applying the energy efficiency policy in the housing and municipal sphere, in services as well as in the industry.

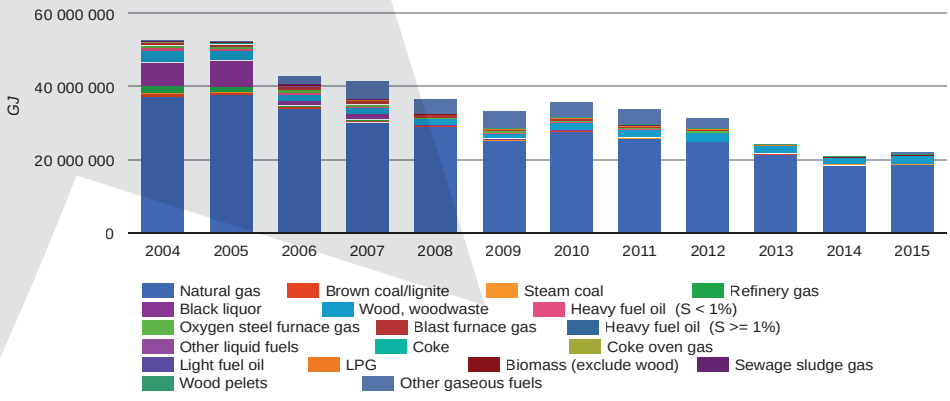
Development of heat generation from fuels at CHP plants



Source: SO SR

In the medium- and long-term outlook, the development of the thermal energy sector of Slovakia will focus on higher utilization of renewable sources, in particular biomass and geothermal energy; more considerable utilization of solar collectors is also assumed.

Development of heat generation from fuels at heat only plants



Source: SO SR

4.3.3. Energy consumption and efficiency

The type and extent of the impact on the environment connected with energy consumption (e.g. greenhouse gas emissions, air pollution, etc.) depend on used energy sources and the total quantity of energy consumed. One of the ways how to reduce this impact is using less energy. It can be achieved either by decreasing demand for energy services (need of heat, electricity, passenger or freight transport, etc.), or by using energy in a more efficient way with the emphasis on energy savings (by consuming less energy per unit of activity).

Energy efficiency is one of the main factors in meeting long-term energy and climate targets. It is considered to be the most cost effective means for reducing greenhouse gas emissions and other pollutants, improving energy security and competitiveness as well as the way for achieving advantages for citizens in the form of energy savings.

In the energy environment of the SR, the strategic and legislative framework has been set for increasing energy efficiency. We can state that adopted measures start bringing their first results. The Slovak Republic will further make efforts to continue in the European trend of the creating and implementing of packages of measures aimed at increasing energy efficiency. In accordance with the Energy Security Strategy of the SR (2008) that defines the procedure for setting targets after 2016, the target of savings by 2020 of 11% of the average final energy consumption in 2001 – 2005 was set in the National Programme of Reforms for 2011 – 2014.

The Third Energy Efficiency Action Plan for 2014 – 2016 with the outlook to 2020 takes into account the requirements of the Directive 2012/27/EU of the European Parliament and of the Council on Energy Efficiency. One of them was the duty to express the national indicative target of energy efficiency and evaluating measures of energy efficiency in the form of absolute value of the primary energy consumption (PEC) and the absolute value of the final energy consumption (FEC) in 2020.

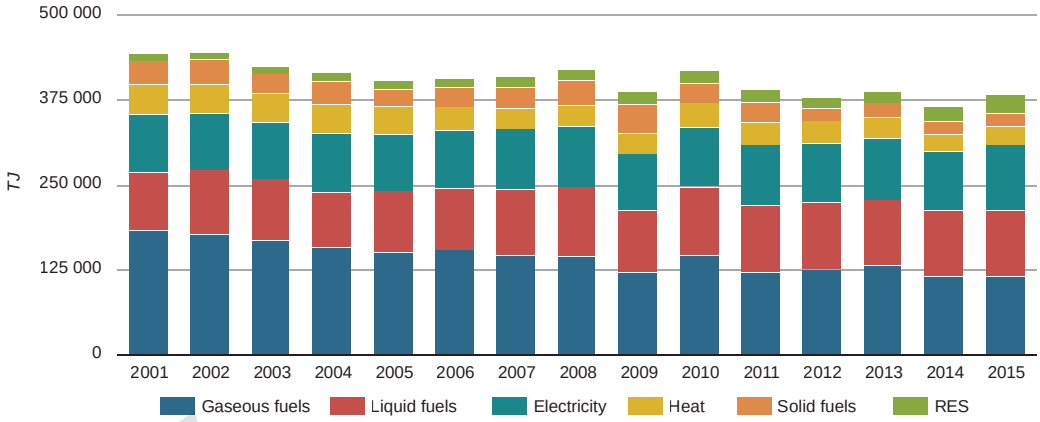
Final energy consumption

In general, the final energy consumption represents the energy balance of the given region that expresses the quantity of energy entering (measured before entry) appliances in which it is used for the final benefit, but not for generation of another form of energy.
The final energy consumption represents the final consumption after deducting the final non-energy consumption.

The final energy consumption in the Slovak Republic had a decreasing course from 2001 to 2015 with slight fluctuations. In 2015, the final energy consumption reached 382,904 TJ and it decreased by approximately 13.8% compared to 2001.

The structure of the used fuel base is varied, gaseous and liquid fuels prevail. In the period of 2001 – 2015, the final energy consumption of solid fuels decreased most considerably the share of which was at the level of 4.8% of the total FEC in 2015. There was also the decreasing trend for gaseous fuels that had, in spite of that, the biggest share in FEC (30.4%) and heat with 7.4% share in 2015. On the contrary, the most considerable increase in the monitored period was seen in the final energy consumption of renewables and wastes that increased during the monitored period more than twice with the share of 7.2% in 2015. A slighter increasing trend was achieved in liquid fuels with the share of 25.3% in 2015. In the monitored period, the final electricity consumption also increased, the share of which was 24.9% in 2015.

Development of the final energy consumption of fuels and energy



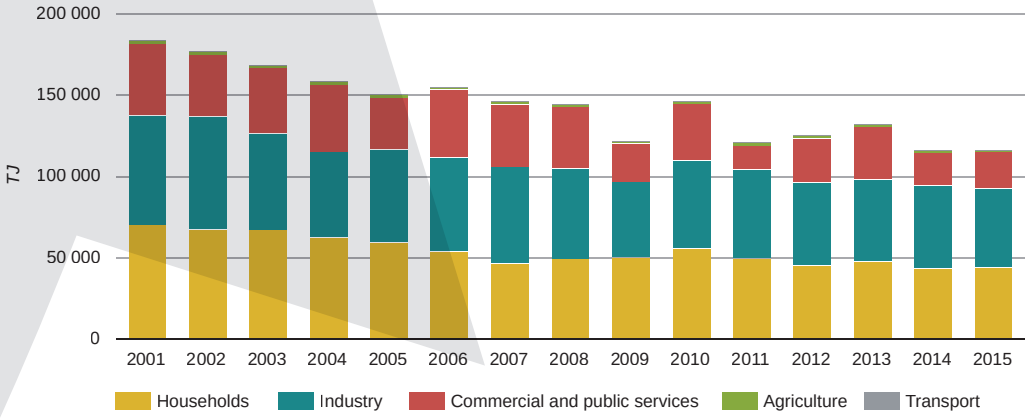
Source: SO SR

Gaseous fuels

The final energy consumption of gaseous fuels decreased in the period of 2001 – 2015 from 183,590 TJ in 2001 to 116,323 TJ in 2015 (36.6%). The highest consumption of gaseous fuels in 2015 was in the sector of industry (42.2%), followed by the sectors of households (37.8%) and commercial and public services (18.9%). The sectors of agriculture and transport participated in FEC of gaseous fuels in 2015 only minimally (0.8% and 0.3%, respectively).

For the whole monitored period of 2001 – 2015, FEC of gaseous fuels increased only in the sector of transport (more than 1.5-times). FEC of gaseous fuels in the other sectors had a decreasing trend in the monitored period. The most considerable decrease was seen in the sector of agriculture (52.1%), followed by the sector of commercial and public services (49.9%) and the sector of households (37.2%). The smallest decrease of FEC of gaseous fuels was seen in the sector of industry (27.2%).

Development of final energy consumption of gaseous fuels in the sectors of the economy



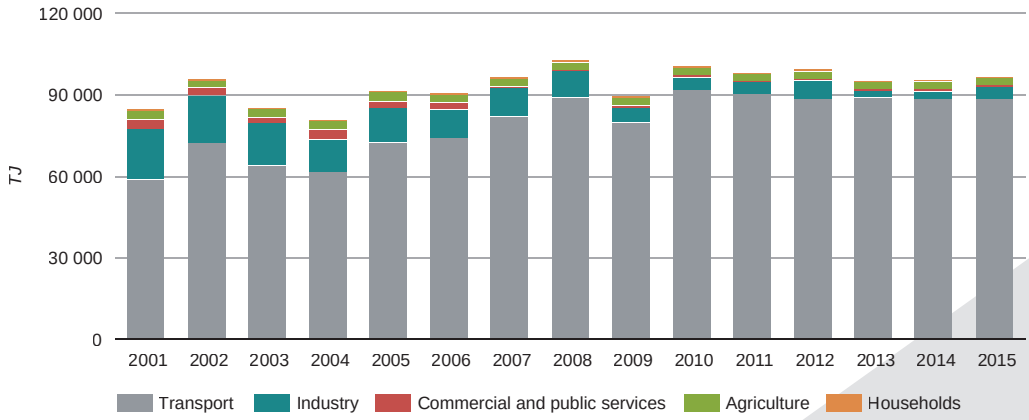
Source: SO SR

Liquid fuels

The final energy consumption of liquid fuels had an increasing trend (14.2%) in the period of 2001 – 2015 and it increased from 84,691 TJ in 2001 to 96,675 TJ in 2015. From among the monitored sectors, the sector of transport has the dominant position in the total FEC of liquid fuels, its share was 91.4% in 2015. The shares of the sectors of agriculture and industry were up to 5% (2.9% and 4.9%, respectively). The shares of the sectors of commercial and public services (0.59%) and households (0.19%) were only minimal.

For this reason, the development of FEC of liquid fuels is a reflection of the development of FEC of liquid fuels in the sector of transport. It increased by 50.7% in 2001 – 2015. FEC in the other sectors decreased in this period. The smallest decrease was seen in the sector of agriculture (oil consumption) (13.0%). A considerable decrease in FEC was seen in the sectors of commercial and public services and industry (83.3% and 74.8%, respectively). A slightly lower decrease was reached in the sector of households where FEC of liquid fuels decreased by 66.7% (use of propane-butane).

Development of the final energy consumption of liquid fuels in the sectors of the economy



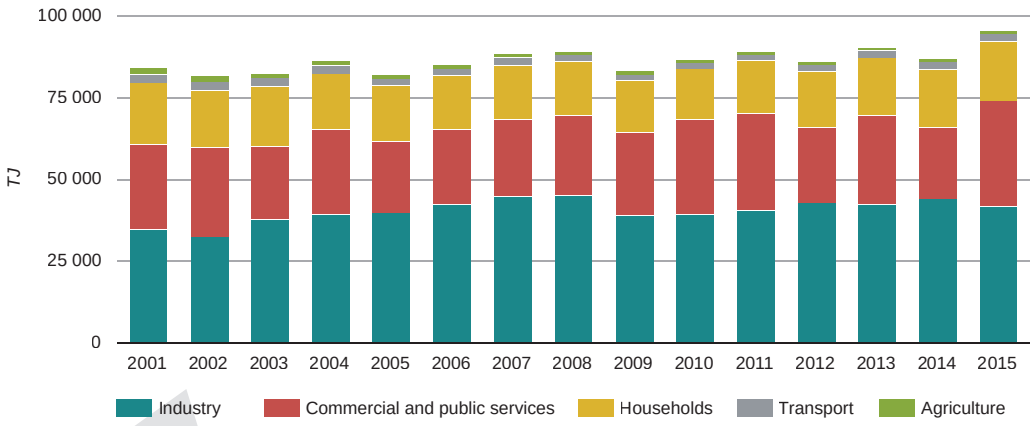
Source: SO SR

Electricity

The final energy consumption of electricity had more or less a balanced course in 2001 – 2015 with a 13.4% increase (increase from 84,186 TJ in 2001 to 95,458 TJ in 2015). In 2015, the biggest share of FEC of electricity from among the sectors was seen in the industry (43.8%), followed by two sectors: commercial and public services (34.0%) and households (19.0%). In 2015, minimal shares - only 2.3% and 1.0% - were seen in the sectors of transport and agriculture.

In the monitored period, there was an increase in FEC in the sector of commercial and public services (25.4%) and industry (19.9%). FEC decreased most considerably in the sector of agriculture (50.3%). The decrease in FEC was also achieved in the other sectors. In the sector of transport, FEC of electricity decreased by 21.5% and in the sector of households by 3.6%.

Development of the final energy consumption of electricity in the sectors of the economy

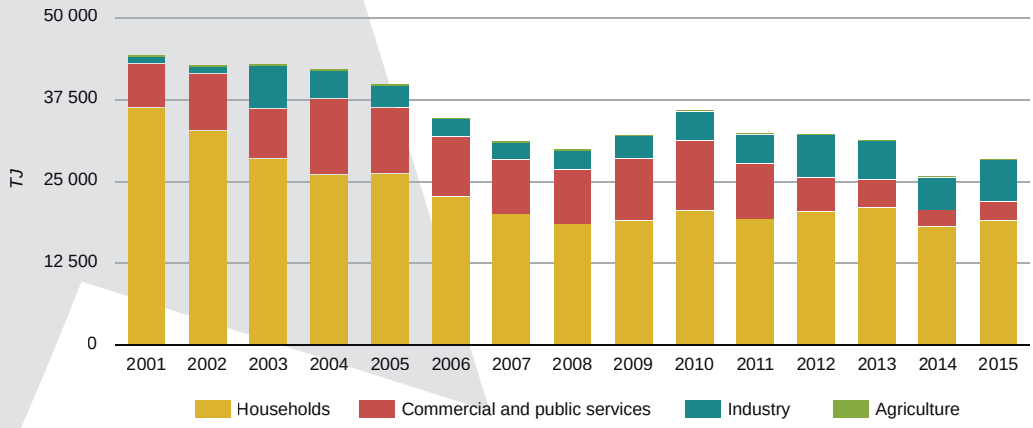


Source: SO SR

Heat

In the period of 2001 – 2015, the final energy consumption of heat decreased from 44,303 TJ in 2001 to 28,406 in 2015 (35.9%). In 2015, the biggest share in FEC of heat was seen in the sector of households (67.4%), in spite of a decrease in the heat consumption in this sector in the horizon of 2001 – 2015 (47.3%). In 2015, the sector of industry (22.1%) was in the second place with a considerable increase in 2001 – 2015 (more than sixfold increase). The sector of commercial and public services with its 10.3% share was in the third place. In 2001 – 2015, FEC of heat in this sector decreased by 57.2%. The lowest share, only 0.2%, was seen in the sector of agriculture in 2015, with a decrease in FEC of heat in this sector for the same period of 80.8%.

Development of the final energy consumption of heat in the sectors of the economy

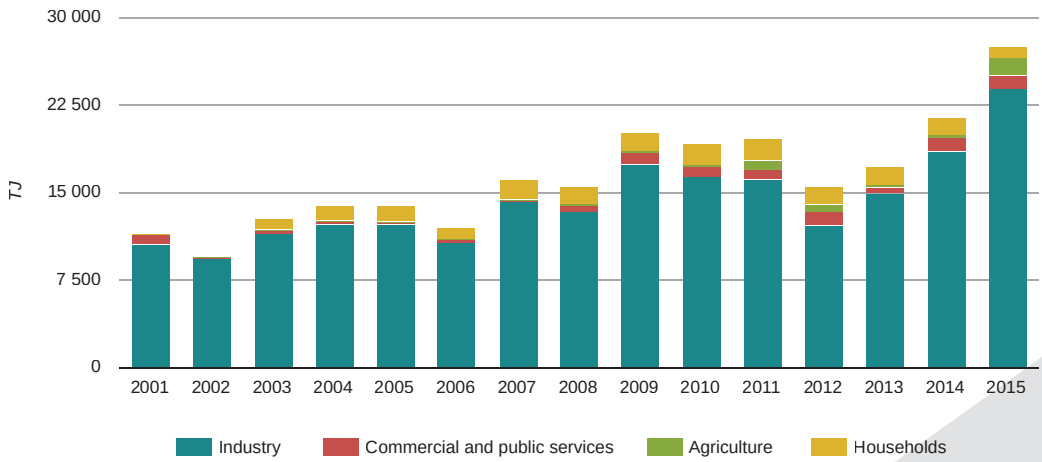


Source: SO SR

Renewables and wastes

In 2001 – 2015, a considerable increase in the final energy consumption of renewable sources and wastes was recorded, from 11,443 TJ in 2001 to 27,596 TJ in 2015 (141.2%). The biggest share in the consumption was seen in the sector of industry (86.3%), in which the final consumption of RES and wastes increased in the monitored period by 125.6% (in particular use of wood). The share of the sector of agriculture in 2015 was at the level of 5.5% with a considerable increase from 2001. It was followed by the sector of commercial and public services that participated in FEC of RES and wastes with 4.6% in 2015 with an increase in the period of 2001 – 2015 of 52.8%. The lowest share (3.7%) was recorded in the sector of households where the consumption of RES and wastes was increasing also in the long term.

Development of the final energy consumption of RES and wastes in the sectors of the economy



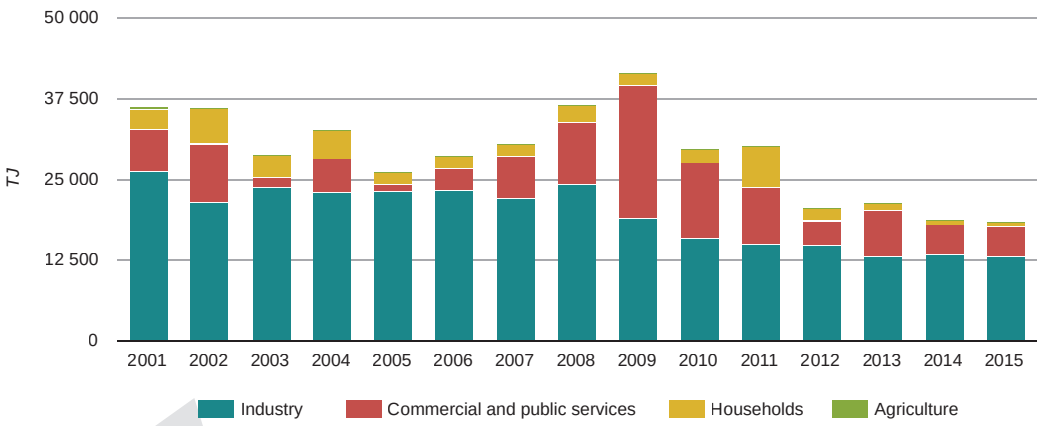
Source: SO SR

Solid fuels

The lowest share in the final energy consumption in 2015 was seen in solid fuels. Their final energy consumption decreased in the period of 2001 – 2015 from 36,159 TJ in 2001 to 18,446 TJ in 2015 (49.0%).

In 2015, the biggest share in this consumption was seen in the sector of industry (71.2%), followed by the sectors of commercial and public services (24.7%) and households (4.1%). In 2015, the share of agriculture was only minimal (0.06%). FEC of solid fuels in the period of 2001 - 2015 decreased in all monitored sectors (agriculture: decreased of 94.4%, households: decrease of 76.6%, industry: decrease of 50.2%, and commercial and public services: decrease of 29.1%).

Development of the final energy consumption of solid fuels in the sectors of the economy

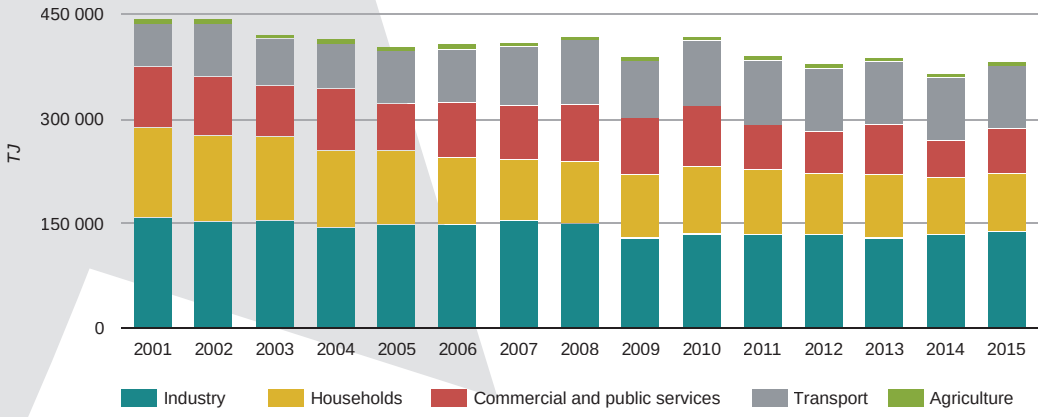


Source: SO SR

Development of the final energy consumption in the sectors of the economy of the SR

In 2015, from among the sectors the biggest share in the final energy consumption was seen in the industry with 36.2%, followed by the sectors: transport (23.7%), households (21.7%) and commercial and public services (16.7%). The lowest share, only 1.6%, was seen in the sector of agriculture. For the whole monitored period of 2001 – 2015, the increasing trend was recorded in the sector of transport (47.6%). From 2001, FEC in the other sectors had a decreasing trend in the other sectors, with slight fluctuations (households: decrease of 35.5%, commercial and public services: a decrease of 27.0%, agriculture: a decrease of 18.1%, and industry: a decrease of 12.7%).

Development of the final energy consumption in the sectors of the economy



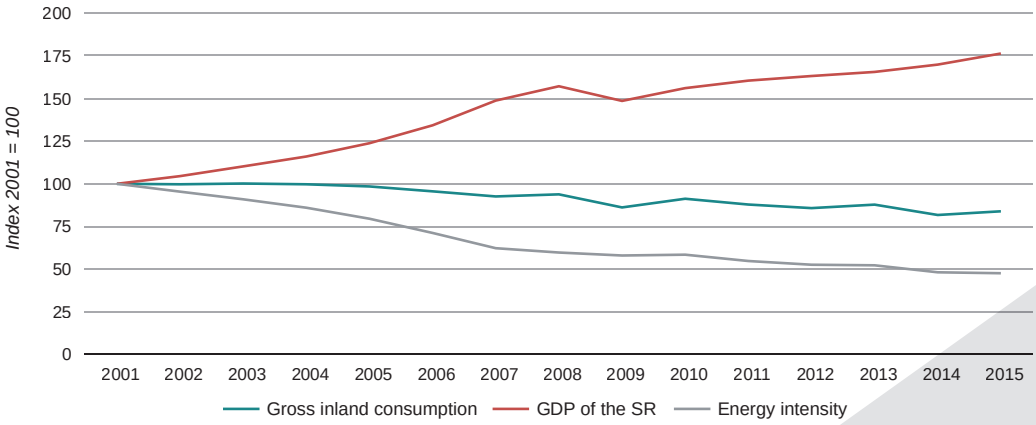
Source: SO SR

4.3.4. Energy intensity

Energy intensity (EI) is an important economic indicator. It measures energy consumption of the economy and its total energy efficiency. It characterizes demands placed by the given sector of the economy on the energy consumption. Energy intensity is an expression of the share of energy consumption and the value of GDP (at constant prices 2010).

The ideal case is when the energy consumption is decreasing with the simultaneous growth of GDP when the economic growth is separated from the resource consumption, the so-called absolute decoupling. In spite of the traditional structure of the Slovak industry with the prevalence of the industry characterized by high energy intensity and the resulting position of the SR as part of the comparison with the other member states of the EU 28, the Slovak Republic recorded a considerable decrease in energy intensity.

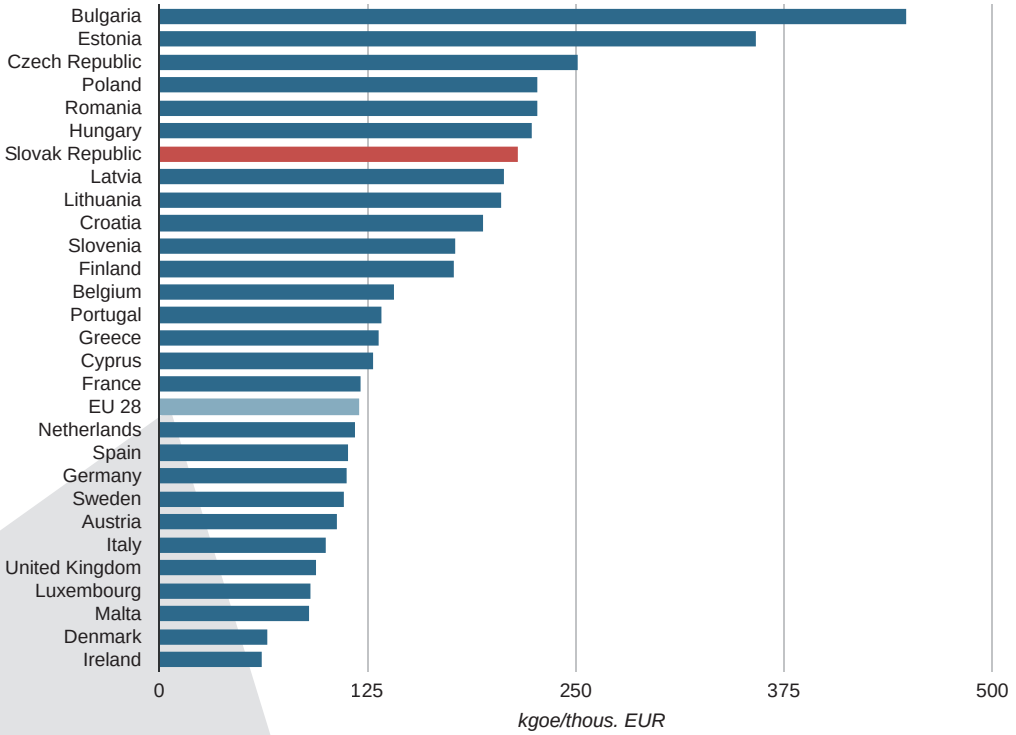
Development of energy intensity, gross inland energy consumption and GDP (at constant prices 2010)



Source: SO SR

From 2001 energy intensity of the economy of the SR was decreasing and it fells approximately by 52.5% until 2015. This positive trend is a result of GDP growth expressed at constant prices 2010 that increased by approximately 76.4% for the same period, and a decrease in the gross inland energy consumption that decreased, on the contrary, by 16.1% for the monitored period. In spite of the favourable trend, in 2015 the SR had the seventh highest energy intensity in the EU 28.

International comparison of energy intensity for 2015



Zdroj: Eurostat

The favourable trend of decreasing energy intensity is mainly a result of GDP growth and the total decrease in the gross inland energy consumption, as a consequence of transformation of the economy, phase-out or even stopping of some obsolete, energy- and raw-material demanding productions of the so-called heavy industry, relative recovery of advanced types of the industrial manufacture relating to the inflow of foreign investment to the economy of the SR, by thermal insulation of buildings and savings in households. A decrease in 2009 was also affected by the economic crisis.

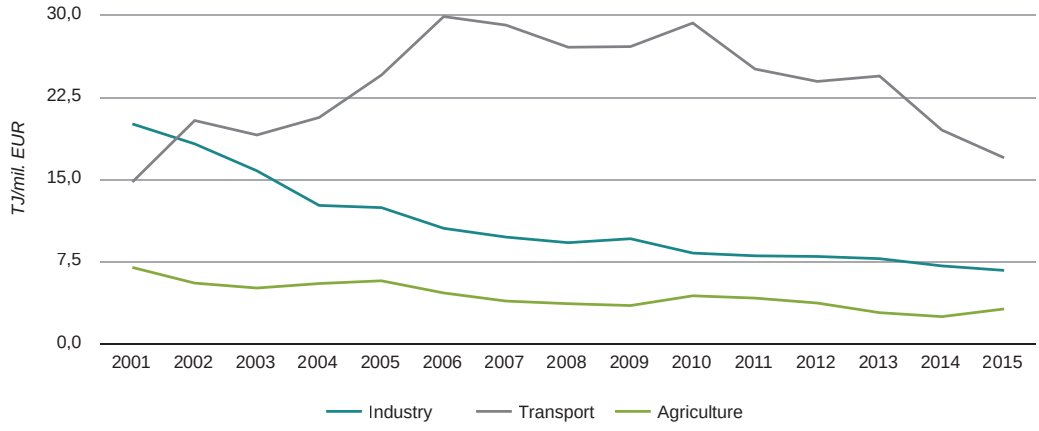
Energy intensity of the final energy consumption in some selected sectors of the economy

The development of energy intensity in some selected sectors according to the energy consumption is positive in general. Energy intensity for the sectors of industry, transport and agriculture are calculated as a ratio of consumed energy (the final energy consumption in the industry, transport and agriculture) and GDP formed in a specific sector. For citizens, energy demands are expressed as a ratio of energy consumption by citizens (FEC of households) and the number of inhabitants. Therefore, GDP is the driving force in the sectors of industry, transport and agriculture and the number of inhabitants in the sector of households.

Energy intensity in some selected sectors of the SR according to the final energy consumption had a decreasing trend from 2001 to 2015 in the sector of industry (66.6%), agriculture (54.2%) and in the sector of households (36.0%). Energy demands in the sector of

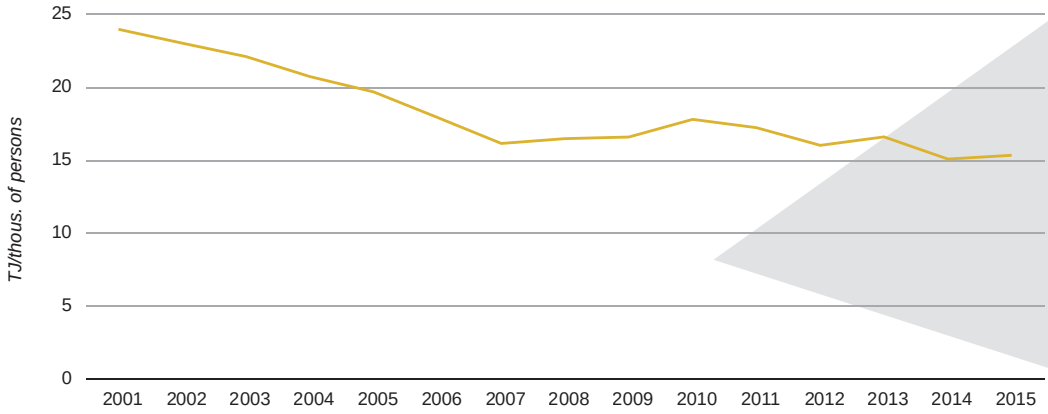
transport had an increasing trend (14.9%) in the same period with the maximum in 2006. Since 2010, energy demands have also been gradually decreasing in this sector.

Development of energy intensity in the sectors of the economy



Source: SO SR
Note: GDP (at constant prices 2010)

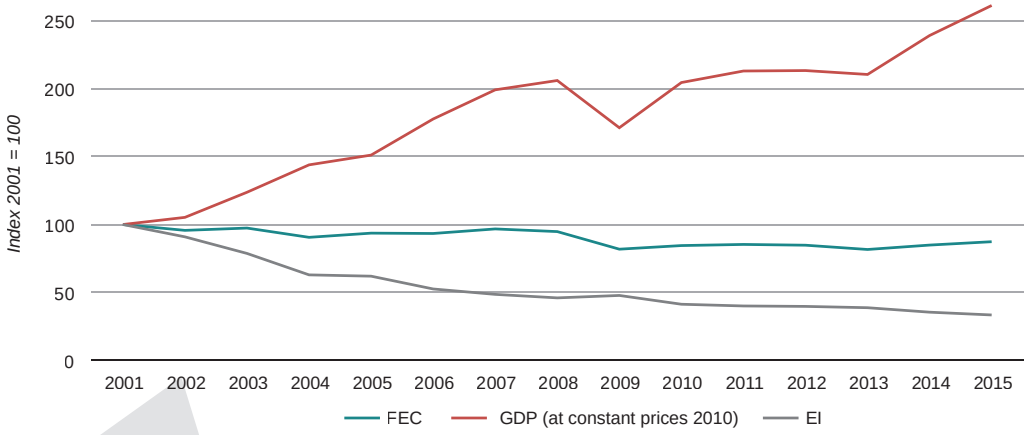
Development of energy intensity in the sector of households



Source: SO SR

In the sector of industry, energy intensity decreased by 66.5% in 2001 – 2015 with the simultaneous growth of the driving force (GDP at constant prices 2010 from the industry) that increased for the monitored period by 161.2%. The final energy consumption in the sector of industry decreased by approximately 12.6% in the same period; the economic crisis was reflected in a 13.6% year-on-year decrease in FEC in 2008 – 2009. The positive decreasing trend of energy intensity in the sector also continued in 2015 in spite of the fact that in 2015 there was a year-on-year increase in both GDP (9.2%) and FEC (2.9%).

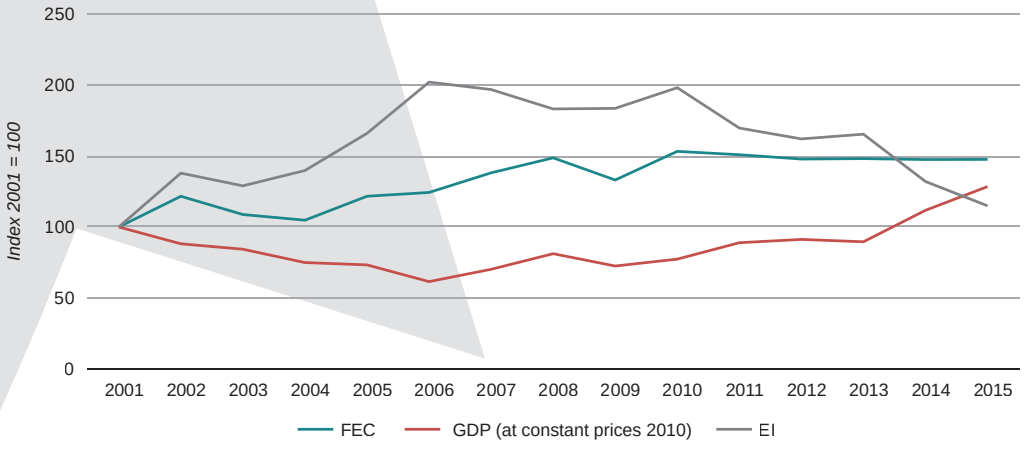
Development of energy intensity, final energy consumption and GDP (at constant prices 2010) in the industry



Source: SO SR

In the period of 2001 – 2015, the sector of transport saw alternately both positive and negative directing – energy intensity increased three times and decreased three times, with their maxima in 2002, 2006 and 2010, while a decrease in 2009 was a result of the impact of the economic crisis (a decrease in both GDP and FEC of the sector). In the monitored period of 2001 – 2015, an increasing trend was recorded as for GDP that increased by 28.5%, as well as with for final energy consumption of the sector of transport (an increase in the fuel consumption), that increased by 47.6% for the same period.
Energy intensity of the sector of transport in this period had an overall negative trend and it increased by 14.9% for the whole period. The positive development of intensity in the recent years is a result of the development of the driving force – GDP of the sector that has been increasing for the last four years, while FEC in the sector of transport has been decreasing or has been approximately at the same level in the recent years.

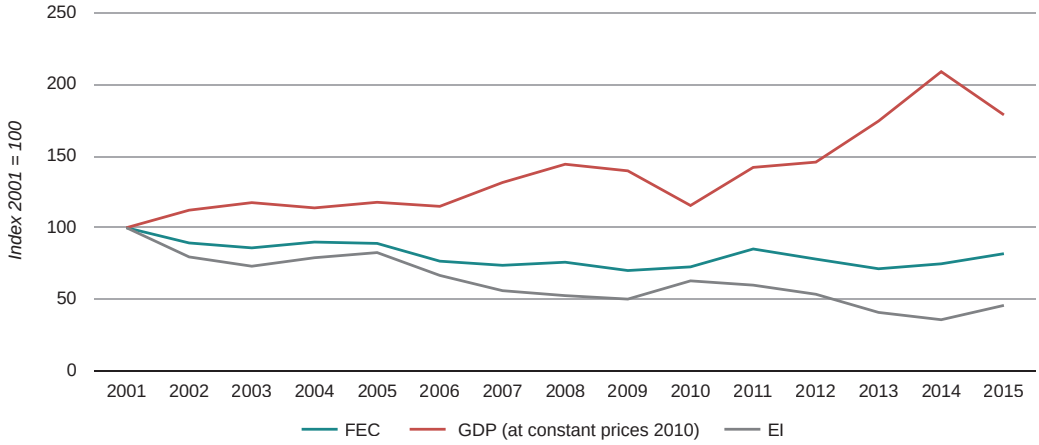
Development of energy intensity, final energy consumption and GDP (at constant prices 2010) in the transport



Source: SO SR

In the sector of agriculture, energy intensity decreased in the period of 2001 – 2015 by 54.2% as a result of GDP growth (78.7%) and FEC decrease (18.1%). In 2011 – 2014, there was the so-called absolute decouplingu in this sector when the curves of the economic growth (GDP) and consumption (FEC) were split.

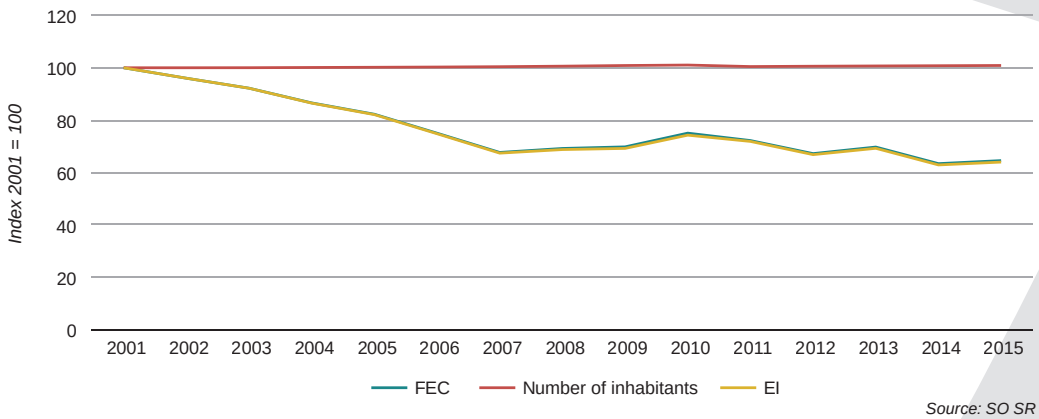
Development of energy intensity, final energy consumption and GDP (at constant prices 2010) in agriculture



Source: SO SR

Energy intensity of the sector of households recorded a slightly decreasing trend until 2007. From 2007, however, energy intensity in this sector started growing slowly. In 2011, the increasing trend stopped and intensity started decreasing again. In the period of 2001 – 2015, intensity decreased by approximately 36.0%, final energy consumption of households decreased by 35.5%, and the number of inhabitants increased only minimally (0.9%). When the number of inhabitants has been changing only minimally, energy intensity have been mirroring the curve of the final energy consumption. Thus, the increasing or decreasing trend of energy intensity is influenced mainly by the increasing or decreasing tendency of the electricity consumption in households.

Development of energy intensity, final energy consumption and GDP (at constant prices 2010) in households



Source: SO SR

4.4. What are interactions of energy and the environment?

Energy is one of the sectors considerably polluting the environment. The quantity of energy and the impact of energy on the environment are in the direct proportion, therefore the most appropriate measure aimed at decreasing the negative impact on the environment appears to be rationalization of demand for energy, optimizing energy mix and energy savings on the side of both generation and consumption.

The most important impacts of energy on the enviornment include greenhouse gas emissions, emissions of pollutants, production of waste water, wastes and radioactive waste.

Mutual interactions of energy and the environment are characterized based on the indicators from the group of interactions of the sector with the environment.

4.4.1. Impact of energy on the environment

Energy is one of the sectors considerably influencing the environment throughout its chain, starting from energy generation through its transfer and distribution up to the final consumption, in particular in a negative sense. Households also have a big share in this negative impact.

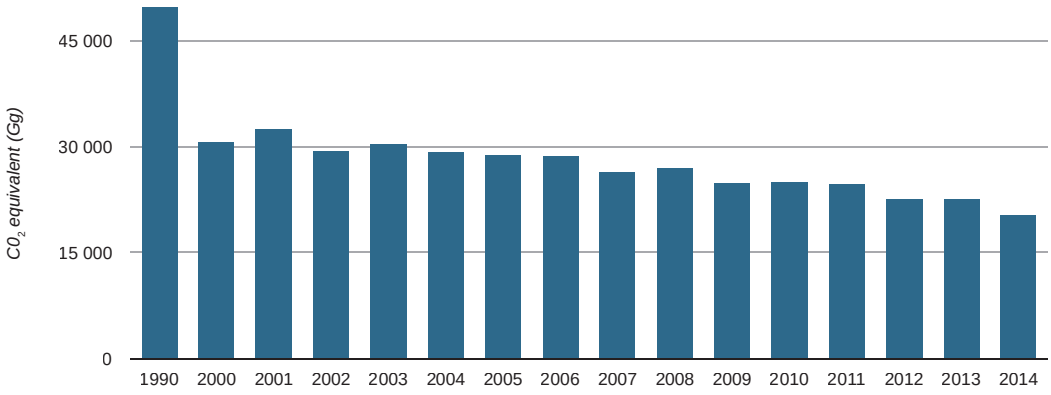
The component of the environment the most influenced by the energy generation and consumption is the air. In energy, the biggest share of greenhouse gas emissions originates that are caused by human activities. Energy is also an important contributor of emissions of other pollutants, in particular of sulphur dioxide, nitrogen oxide, carbon monoxide, PM_{10} and $PM_{2.5}$ emissions, emissions of non-methane volatile organic substances, persistent organic pollutants and heavy metals.
The impact of energy on water manifests itself in many spheres. Energy influences the quality of water and participates in water pollution that is connected in particular with the electricity generation in manufacturing facilities.

The most waste originates in the sphere of electricity generation, transfer and distribution, followed by steam supplies and cold air distribution; and the lowest share in waste origination is contributed to gas generation and gaseous fuel distribution via pipelines. Electricity generation at nuclear power plants is connected with radioactive waste production.

4.4.1.1. Greenhouse gas emissions from energy

Energy is the sector with the biggest share of greenhouse gas emissions. In 2014, the quantity of greenhouse gas emissions from energy reached the value of 20,496.3 Gg CO_2 of equivalent, which represented 50.4% of the total greenhouse gas emissions in the Slovak Republic (without including emissions from the sector Land use, Land-use change and forestry (LULUCF)).

Development of greenhouse gas emissions from energy



Source: SO SR
Note: emissions included as of 15 May 2016

In 2014, nearly 93% of greenhouse gas emissions in energy came from combustion and transformation of fossil fuels.

In total, greenhouse gas emissions from energy decreased by 58.8% as of 2014 compared to the initial condition in 1990 (without including the sector LULUCF). The share of emissions from large and small resources decreased. The problematic sphere where it is not possible to regulate efficiently the increase in greenhouse gas emissions is combustion of fossil fuels in households.

A considerable decrease in the creation of greenhouse gas emissions from energy is a result of the total decrease in the industrial manufacture, due to a change in the fuel base to the benefit of clean fuels and fuels with better qualitative features, using new, more efficient technologies, a decrease in the energy consumption in energy intensive sectors as well as a positive impact of direct and indirect legislative measures.

The EU energy policy is closely connected with the climate change policy and cutting greenhouse gas emissions is one of its main targets. The fundamental international legal instrument for searching for global solutions of climate change issues is the United Nations Framework Convention on Climate Change adopted in Rio de Janeiro in 1992. The Kyoto Protocol for the United Nations Framework Convention on Climate Change (hereinafter referred to as the “KP”) was approved in 1997 and became the legal instrument for implementation of adopted targets within global cutting of greenhouse gas emissions. The Slovak Republic ratified KP on 31 May 2002 and adopted the reduction target to decrease greenhouse gas emissions by 8% compared to the 1990 level in the first obligatory period (2008 - 2012) and keep them subsequently at the same level till 2012. The Slovak Republic has fulfilled the set targets successfully so far.

International negotiations on the level of reduction targets for the second obligatory period already started in 2005. At the same time, efforts intensified for approving a new, global agreement on wider co-operation of countries in meeting the environmental target to cut greenhouse gas emissions. At the Copenhagen Climate Change Conference in 2009, no binding agreement was approved that could help achieving progress and increasing efforts in cutting greenhouse gas emissions. A wide set of decisions were approved as late as in Doha.

The most important provision of the KP Amendment, from the perspective of its practical implementation and obligations for the SR, include:

- confirmation of the 8-year second obligatory period of the KP starting on 1 January 2013 and ending on 31 December 2020 (identical with the time schedule of the climate and energy package of the EU),
- a reduction obligations of the SR for the second period of KP are the same as our targets of cutting emissions until 2020 according to the climate and energy package.

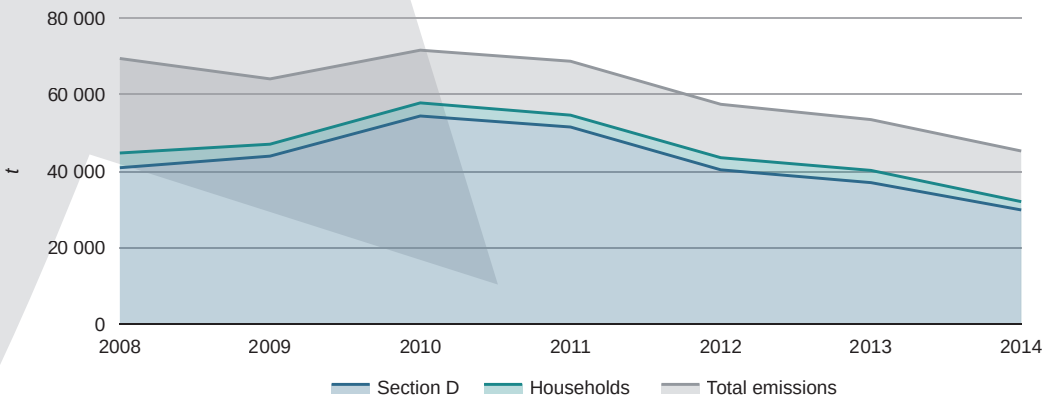
At the United Nations Paris Climate Change Conference (2015), representatives of 196 countries agreed that they want to keep global warming considerably below 2 °C and approach as close as possible the value even half a degree lower. In November 2016, after meeting the conditions (ratification by at least of 55 countries that will produce together minimally 55% of total greenhouse gas emissions), the Paris Convention came into force and it is to replace the Kyoto Protocol by 2020. The European Union has undertaken to cut greenhouse gas emissions till 2030 by minimally 40%.

4.4.1.2. Emissions of main pollutants from energy

In addition to greenhouse gas emissions, electricity and heat generation is accompanied, on the basis of fossil fuels, by the production of the so-called indirect greenhouse gas emissions: sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and other pollutants: PM_{10} and $PM_{2.5}$ emissions, emissions of non-methane volatile organic compounds (NMVOC), emissions of persistent organic pollutants (POPs), specifically PCDD/PCDF, PCB, PAH and heavy metals (Pb, As, Cr, Cu, Hg, Cd, Ni, Se, Zn). Emissions from energy include emissions from the sector of electricity, gas, steam and cold air supplies – the Section D according to the SK NACE classification and emissions from household heating and cooling.

SO_2 emissions from the sector of electricity, gas, steam and cold air supplies (the Section D) had an unbalanced course in the period of 2008 – 2014 with the maximum in 2010 and the minimum in 2014. Compared to 2008, SO_2 emissions were by 27.0% lower in 2014. SO_2 emissions from households in the period of 2008 – 2014 had a decreasing trend with a fluctuation in 2010, and they decreased by 43.6% for the whole period. In spite of the achieved progress, in 2014 the Section D participated with nearly 66% in the total SO_2

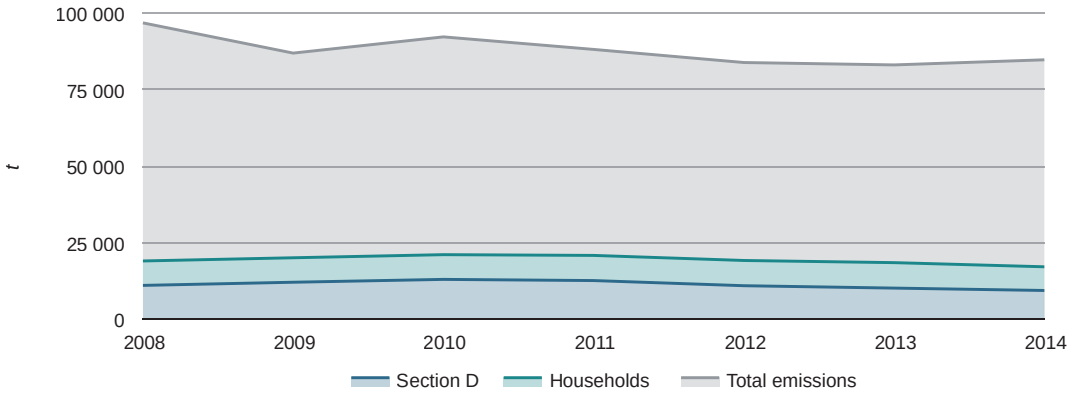
Development of the quantity of SO_2 emissions from energy in relation to the total SO_2 emissions



Source: SHMI

In 2008 – 2014, a decrease of NO_x emissions by 15.1% was achieved in the sector of electricity, gas, steam and cold air supplies. A slightly decreasing trend was achieved for NO_x emissions from households that decreased by 3.0% in the monitored period. The share of NO_x emissions from the Section D in the total NO_x emissions in 2014 was 11.0% and of emissions from households it was 9.1%.

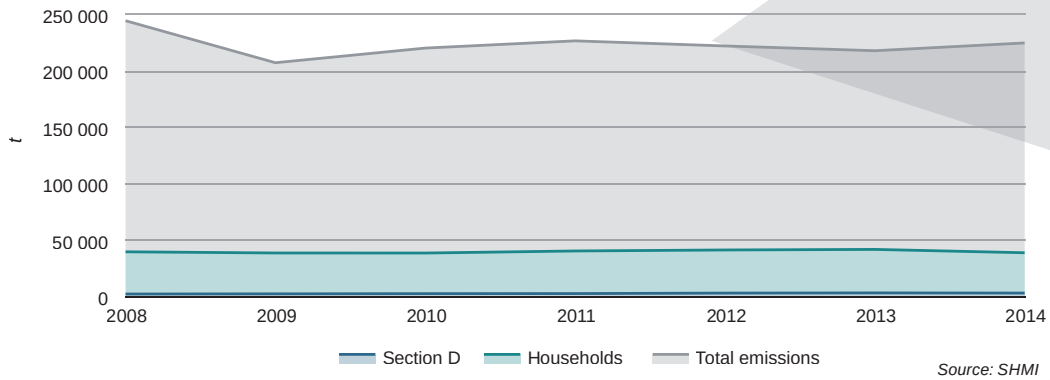
Development of the quantity of NO_x emissions from energy in relation to the total NO_x emissions



Source: SHMI

In the period of 2008 – 2014, CO emissions had an increasing trend in the sector of electricity, gas, steam and cold air supplies. Until 2014, these emissions increased by 29.0%. Emissions from households for the same period had a slightly increasing trend with a more considerable year-on-year decrease as of 2015 when they were approximately 4.5% lower than in 2008. In 2014, the Section D participated with 1.6% and households with 15.9% in the total CO emissions. The development of CO emissions is largely influenced by the development of steel and iron production in the establishment of the company U. S. Steel., s. r. o, Košice, and by wood combustion in households.

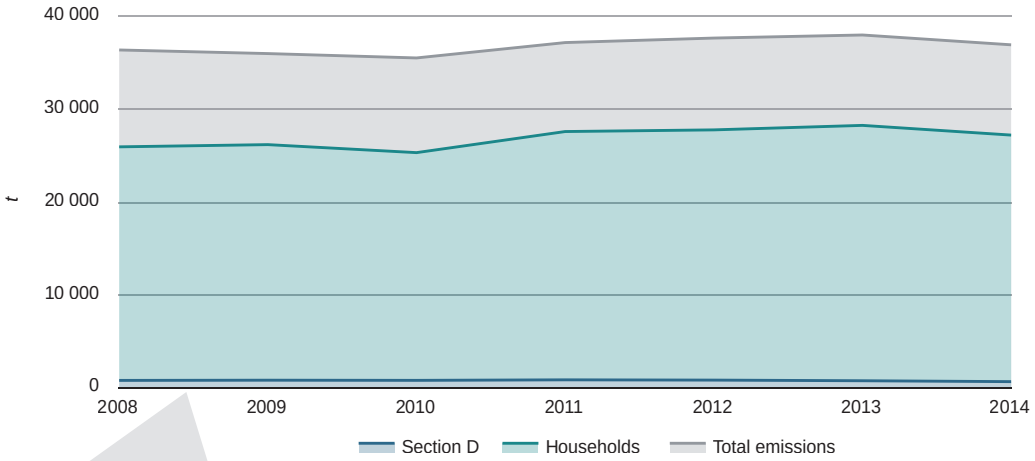
Development of the quantity of CO emissions from energy in relation to the total CO emissions



Source: SHMI

As far as PM_{10} emissions are concerned, a decreasing trend was recorded in the period of 2008 – 2014 only for emissions from the sector of electricity, gas and cold air supplies (16.8%). PM_{10} emissions from households had an increasing trend (5.6%).

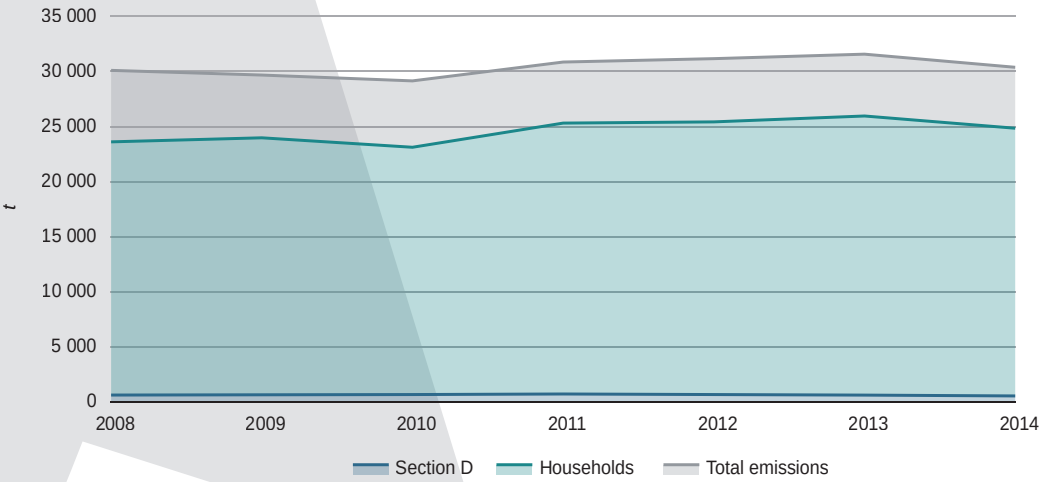
Development of the quantity of PM_{10} emissions from energy in relation to the total PM_{10} emissions



Source: SHMI

The same trend was also seen for $PM_{2.5}$ emissions where a decrease was recorded for the same period 2008 – 2014 from the Section D (12.5%), and on the contrary an increase in emissions from households (5.7%). In 2014, PM_{10} emissions from households accounted for up to 71.9% and $PM_{2.5}$ emissions accounted for nearly 80% of the total PM_{10} and $PM_{2.5}$ emissions.

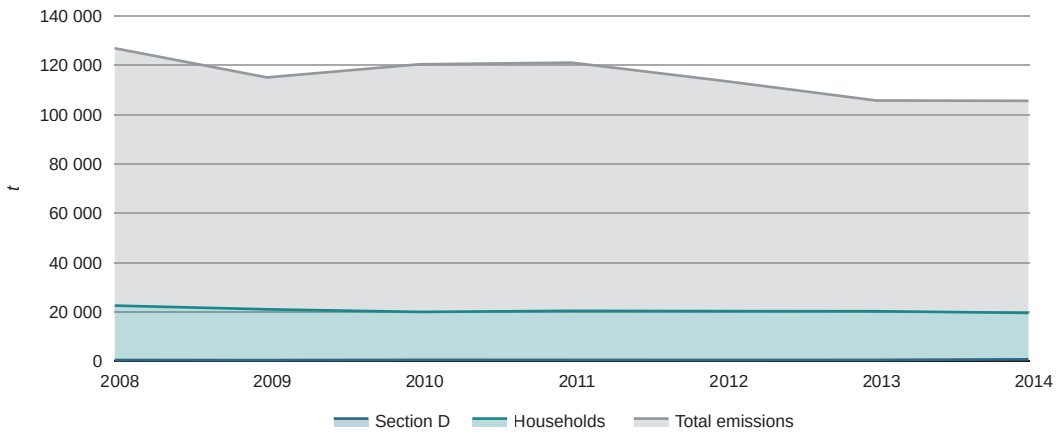
Development of the quantity of $PM_{2.5}$ emissions from energy in relation to the total $PM_{2.5}$ emissions



Source: SHMI

In 2008 – 2014, emissions of non-methane volatile organic substances (NMVOC) had an increasing trend from the Section D (60.7%) and a decreasing trend from households (14.8%).

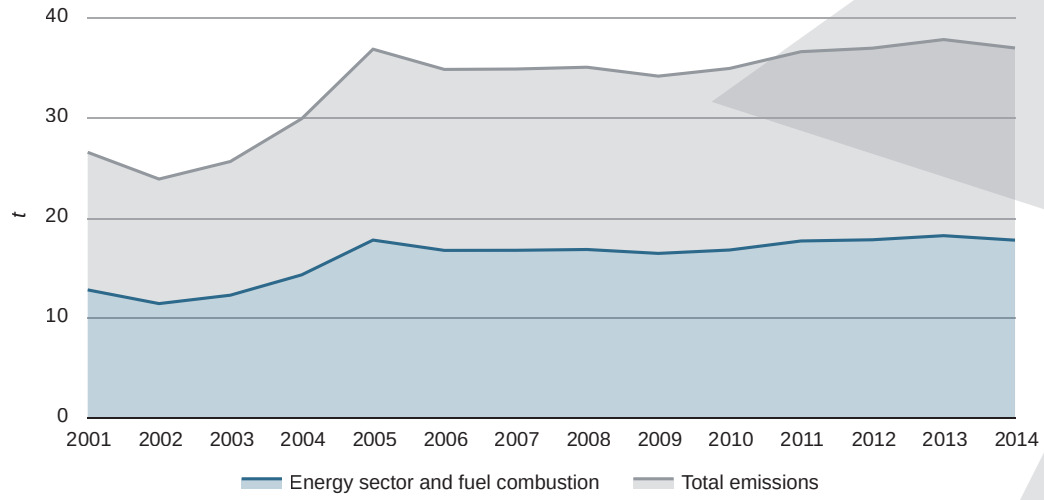
Development of the quantity of NMVOC emissions from energy in relation to the total NMVOC emissions



Source: SHMI

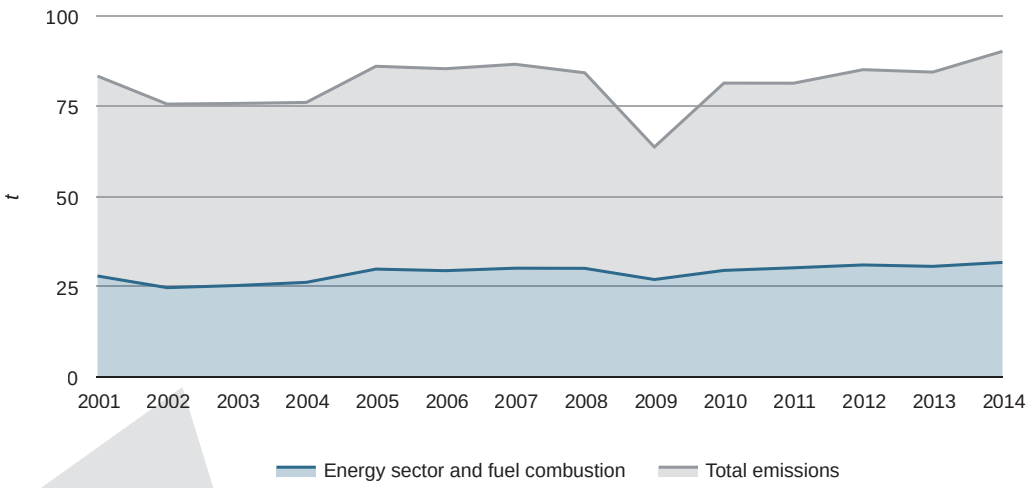
In the case of emissions of persistent organic pollutants (POPs), a decrease in PCDD/PCDF emissions was achieved (by 44.7%) from the energy sector and fuel combustion, in the period of 2001 – 2014; on the contrary, both PCB and PAH emissions increased (PCB by 13.5%, PAH by 38.7%) in the given period. The share of PAH emissions in the total PAH emissions in 2014 was nearly 93%. The increased wood consumption contributed to that (heating of households). In 2014, this sector also participated considerably in the total PCDD/PCDF (73.7%) and PCB (54.1%) emissions.

Development of the quantity of PAH emissions from energy in relation to the total PAH emissions



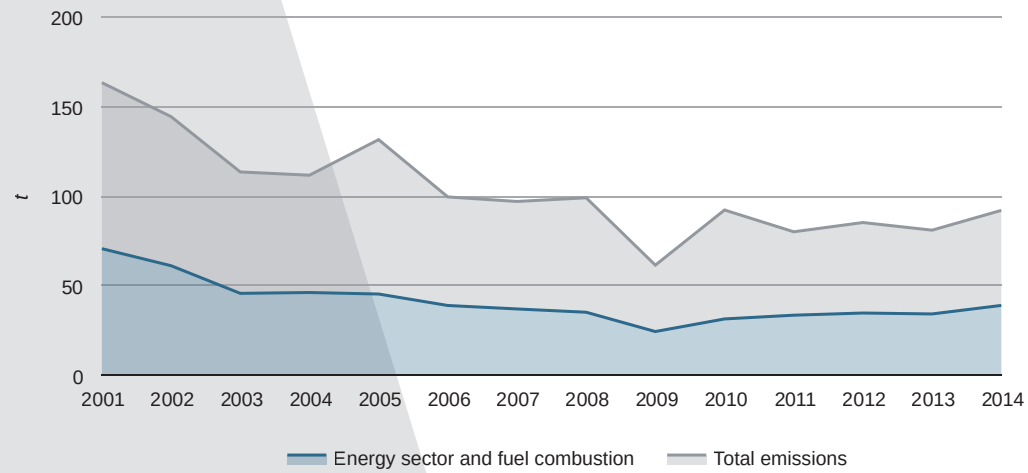
Source: SHMI

Development of the quantity of PCB emissions from energy in relation to the total PCB emissions



Source: SHMI

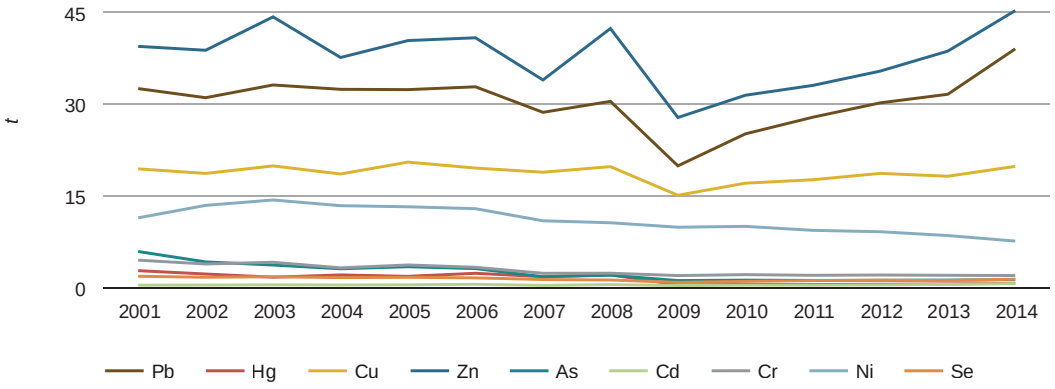
Development of the quantity of PCDD/PCDF emissions from energy in relation to the total PCDD/ PCDF emissions



Source: SHMI

Emissions of heavy metals (HM) in the period of 2000 – 2014 from the Section D had a decreasing trend for all heavy metals (Pb, Hg, Cu, Zn, As, Cr, Ni, Se) except for Cd, where emissions increased by 30.2% in the monitored period.

Development of the quantity of heavy metals emissions from energy



Source: SHMI

In 2014, out of heavy metals, Zn with 45.3% and Pb with 39.1% had the biggest share in the energy sector.

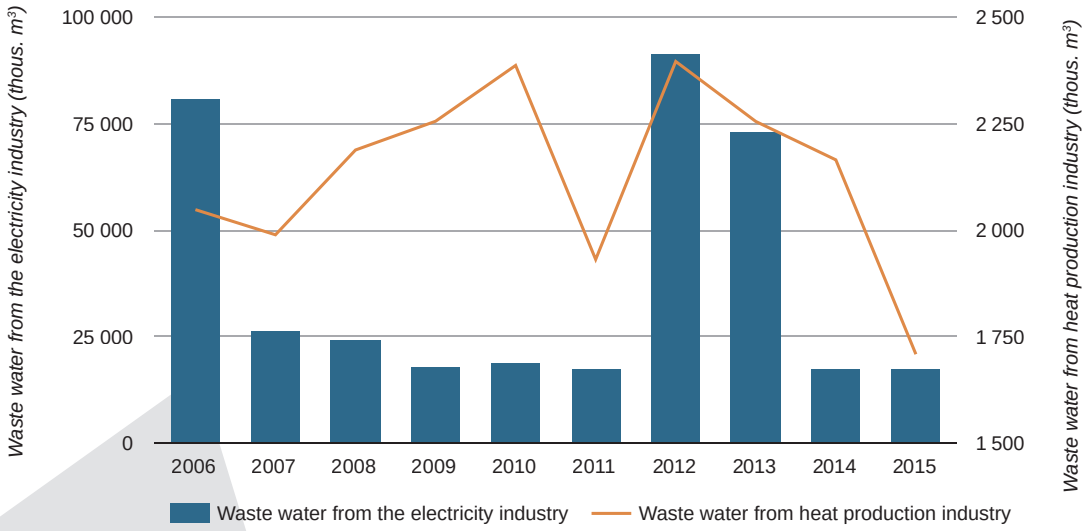
In the medium- and long-term time horizon, a positive trend of a gradual reduction of pollutants released into the air from the energy sector has been preserved in Slovakia. This decrease is a result of a gradual reduction of the share of the electricity and heat generation from power stations combusting fossil fuels, with a simultaneous increase in using reconstructed sources with progressive fluid technologies of combustion and reliable operation of technologies for cleaning of combustion products, a change in the fuel composition and using fuels with better quality features.
The compliance with the emission limits determined by the valid air protection legislation in the SR fully harmonized with the emission limit values accepted in the EU legislation that have to be met by facilities combusting fossil fuels has its share in cutting emissions.

4.4.1.3. Waste water from energy

The electricity industry (electricity generation and distribution) participated most in the total volume of discharged waste water from the energy. From 2006 to 2011, the quantity of waste water from the electricity industry decreased. In 2012 and 2013, the trend of the quantity of waste water was influenced by the power station Vojany that first changed in 2012 the method of cooling from the circulation cooling to the flow cooling, which resulted in a considerable increase in not cleaned waste water. In 2014, the power station again returned to the circulation cooling, which was reflected in a considerable reduction of waste water in the given year as well as in 2015, and the volume of waste water in 2015 was nearly at the level of 2014. In 2015, cleaned water prevailed in waste water from the electricity industry.

The volume of waste water from the heat production industry (steam and hot water generation and distribution) in the period of 2006 – 2015 has an ambiguous course. The positive feature is a decrease in the quantity of waste water in the last three years. In 2015, cleaned water prevailed.

Development of the volume of discharged waste water from energy



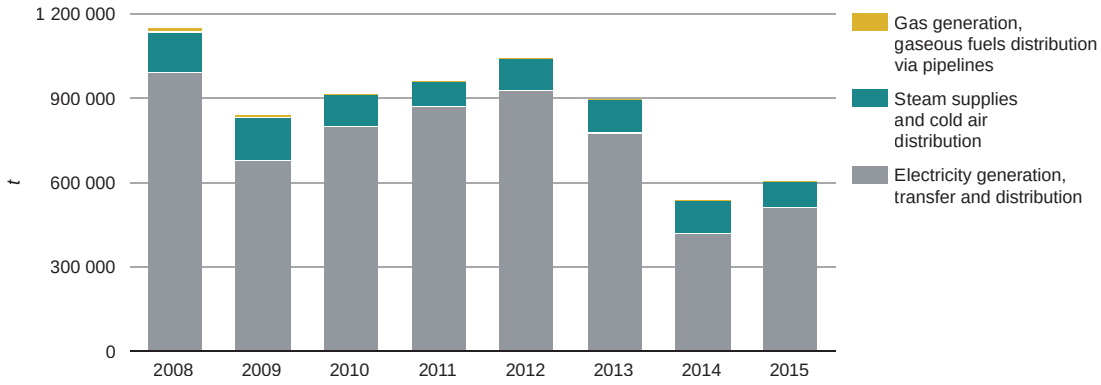
Source: SHMI

Waste water produced by power stations has mainly the character of water from technological and cooling processes, sewage water participate in waste water to a lesser extent. Waste water from technologies are contaminated chemically, in the case of nuclear power plants in the primary circle also in a radio chemical way. In the case of water used for cooling, thermal pollution mainly occurs. Pollution of sewage waste water is predominantly biological. These waters are cleaned in mechanical and biological waste water treatment plants.

4.4.1.4. Waste from energy

In 2015, energy (the Section D – the sector of electricity, gas, steam and cold air supplies) produced 605,605.6 tons of waste placed on the market. From 2008, the waste production decreased nearly by a half (47.4%). This decrease is due to a considerable year-on-year decrease in 2014 (40.2%) that was influenced by a decrease in the production of fly ash which can be related to the institute of ”by-product“ in accordance with the Act No. 223/2001 Coll. on Wastes and on Amendments to Certain Acts.

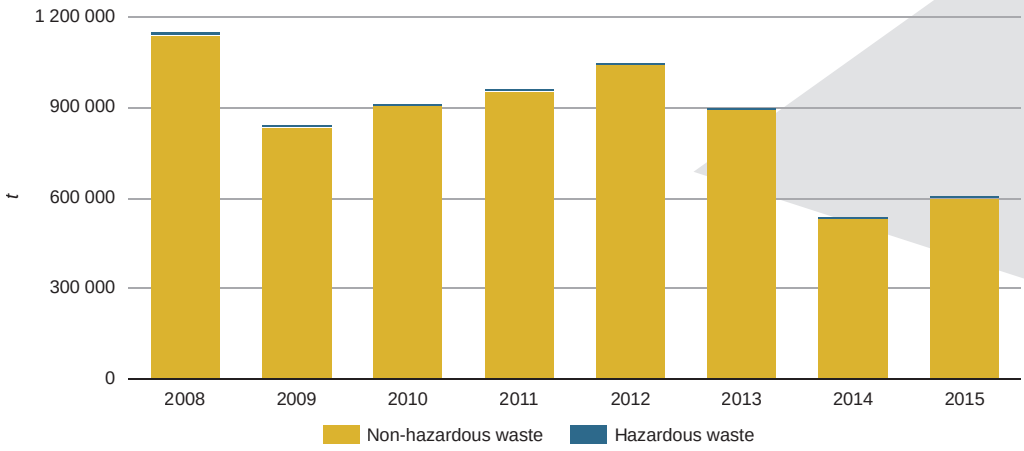
Development of production of wastes from energy according to SK NACE Rev. 2



Source: MoE SR

Wastes from energy originate mainly during combustion of coal in the form of ash, debris, slag, and fly ash. In the gas industry, more than 50 types of waste are handled originating both in the operational activities (such as repairs and maintenance of gas pipelines, repairs and maintenance of buildings and technological equipment, disposal of technological equipment, cleaning of the transit system, etc.), as well as from servicing and supporting activities (transport, administration, cleaning of water management works, etc.).

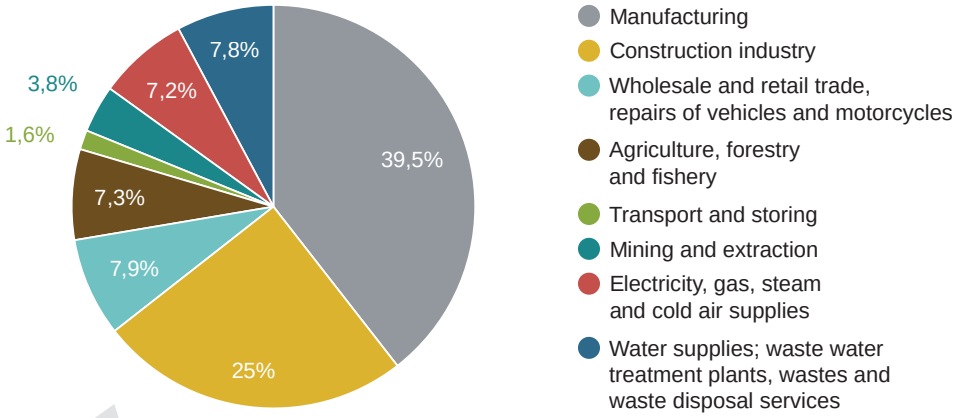
Development of production of wastes in energy according to the wastes category



Source: MoE SR

The wastes production as of 2015 increased by 12.8% in a year-on-year comparison. According to the economic activity classification, in 2015 this Section accounted for 5.7% share in the total wastes production.

Origin of wastes according to NACE in 2015



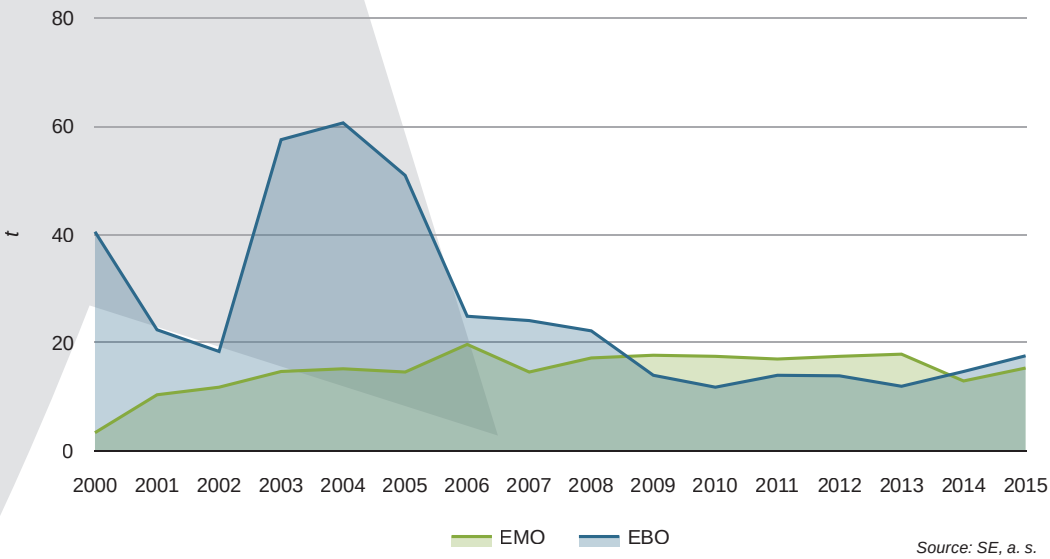
Source: MoE SR

4.4.1.5. Radioactive waste

At present, nuclear power plants (NPP) represent the most important source of electricity generation in the electrification system. An inevitable consequence of the electricity generation at NPPs is the production of radioactive waste (RAW) in both solid and liquid forms.

The production of solid RAW had an increasing trend in the period of 2000 – 2015 at NPP Mochovce (NPP EMO) where it increased nearly three times from 3.4 tons in 2000 to 15.3 tons in 2015. On the contrary, at NPP Jaslovské Bohunice (NPP EBO) a decreasing trend was achieved for the same period and the production of solid RAW deceased by 56.5% from 2000 to 2015.

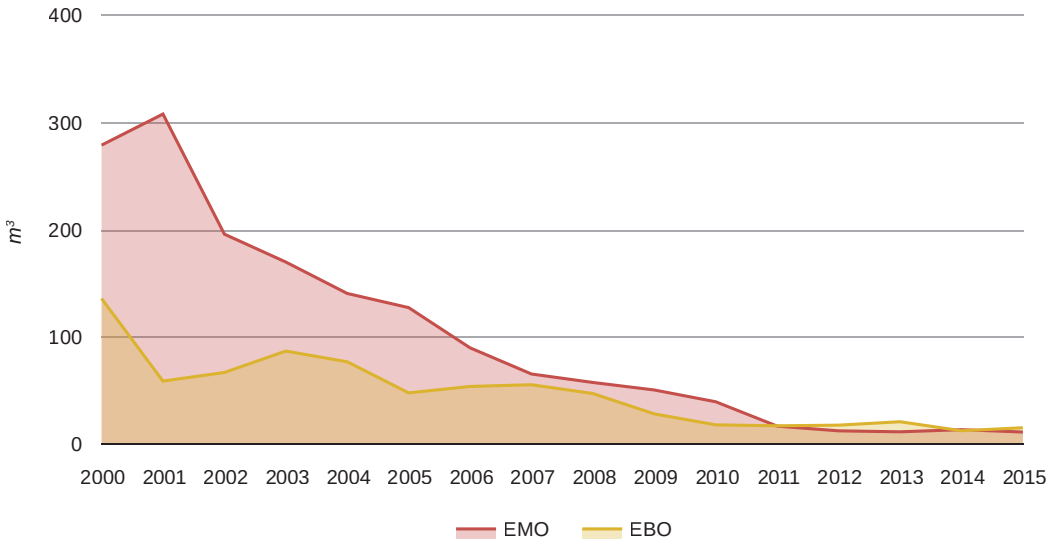
Development of solid radioactive waste



Source: SE, a. s.

At the same period, the production of liquid RAW at both power stations decreased considerably. At NPP EMO, nearly a 25-times decrease was achieved when the production of liquid RAW decreased from 279.0 m^3 in 2000 to 11.5 m^3 in 2015 and at NPP EBO there was a nearly 10-times decrease with a loss of production from 136.0 m^3 in 2000 to 15.5 m^3 in 2015.

Development of liquid radioactive waste



Source: SE, a. s.
Note: Volume of liquid RAW in m^3 adjusted for the content of boric acid 120g/kg

Reduction in the volume of radioactive waste decreases requirements for their storage, transport and placing, and thus minimizes the impact of the nuclear facility on the environment.

4.5. What is the response of the society to mitigating or compensating negative consequences of energy on the environment?

In order to achieve the main targets of the energy policy, both at the EU level and the SR level, various supporting mechanisms are being adopted. Ones of them are adopted political measures for the support of using renewable sources. Other very frequently used instruments are various economic instruments (costs, investment, etc.) and adopted legislation with limits for pollution. In energy, important instruments are energy prices themselves: electricity and gas prices that can have both a negative and positive impact on consumption, demand or energy efficiency.

The response of the society to mitigating or compensating negative consequences of the energy sector on the environment is described based on the indicators from the group of political, economic and social aspects.

4.5.1. Renewable energy sources

Renewable energy sources (RES) are the second of the main instruments that are to lead the EU to fulfilling its three basic targets of the energy policy. An increase in the RES share in the electricity and heat generation results in a decrease in fossil fuel consumption, which contributes subsequently to cutting emissions of pollutants and greenhouse gases. Therefore, they are an important factor for decarbonising of the sector of electricity and heat generation. In addition to their environmental contribution, using them also increases self-sufficeincy and energy security as well as diversification of energy supplies which decreases dependency of the country on non-stable crude oil and natural gas prices as energy generated from them comes from the own territory.

On the other side, using RES brings, except for the aforementioned advantages, also certain risks. The most important risk results from the nature of these sources. The electricity generation from solar and wind energy is characterized by fluctuation of generation that influences negatively safety and reliability of operation of the electrification system. Another risk is a considerable increase in the electricity price. In addition to these risks, there are also environmental negative impacts unfavourably influencing the landscape appearance, the impact on habitats and ecosystems, watercourses, etc. These negative impacts can be minimized by the careful selection of the place and considering all possible negative impacts of the given technology using RES. The positive aspects of using RES overweigh negative aspects and using RES is one of the priorities of the energy policy of the SR.

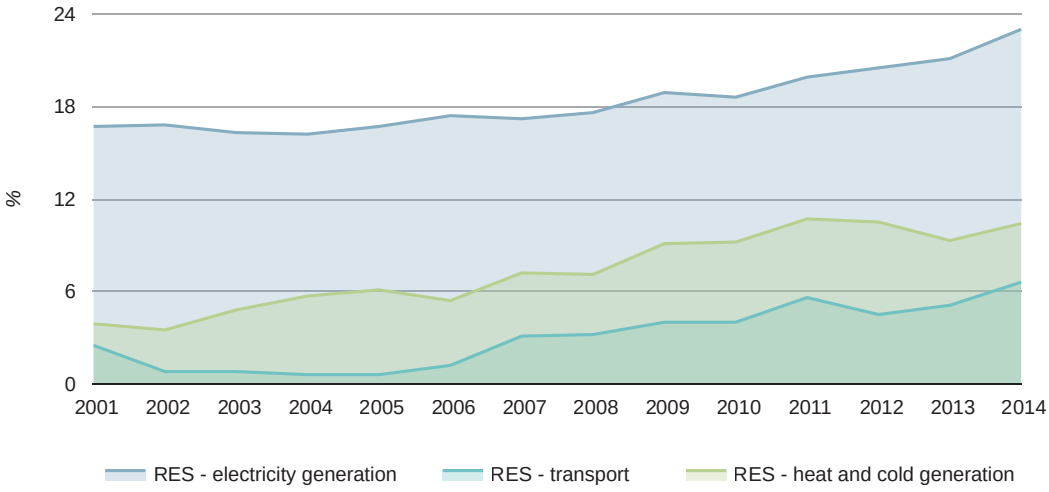
The EU as well as the SR pay a high attention to the development of using energy from renewables. The Commission has submitted more documents in order to strengthen RES using. In 2008, the EU adopted the climate and energy package that represents a complex of regulations. The EU undertakes there, among other things, to increase the RES share in the final energy consumption in the EU by 20% until 2020. It also includes the commitment to increase the share of biofuels in transport to 10%. Similarly, the target to increase the share of renewable energy sources in the final energy consumption by 20% is one of the five targets of the Europe 2020 Strategy of 2010.

The EU Directive on the promotion of the use of energy from renewable energy sources determined mandatory national targets for the total share of energy from RES in the gross final energy consumption for the individual states of the EU. The member states had the duty to prepare national action plans for energy from RES where they set their national targets for the share of energy from RES in three sectors: electricity generation, heat and cold generation, and transport.

According to the National Action Plan for Renewable Energy Sources, the total national target of the SR is to increase using renewable energy sources in a ratio to the gross final energy consumption from 6.7% in 2005 to 14% in 2020, which represents 1,572 ktoe (66 PJ) of energy from RES in 2020. In the sector of electricity generation, the SR has undertaken to achieve the target of 24% of electricity generated from RES, in the sector of heat and cold generation the 14.6% share and the 10% share in transport by 2020. According to the approved action plan, Slovakia should concentrate especially on biomass use.

The share of energy from RES has been gradually growing and for the whole monitored period of 2001 – 2015 the share increased from 6.4% in 2001 to 12.7% in 2014. The share of energy from RES increased in all sectors for the period of 2001 – 2014. In 2014, the share of energy from RES of 23.0% was achieved in the sector of electricity generation, 10.4% in the sector of heat and cold generation, and 6.6% in the sector of transport.

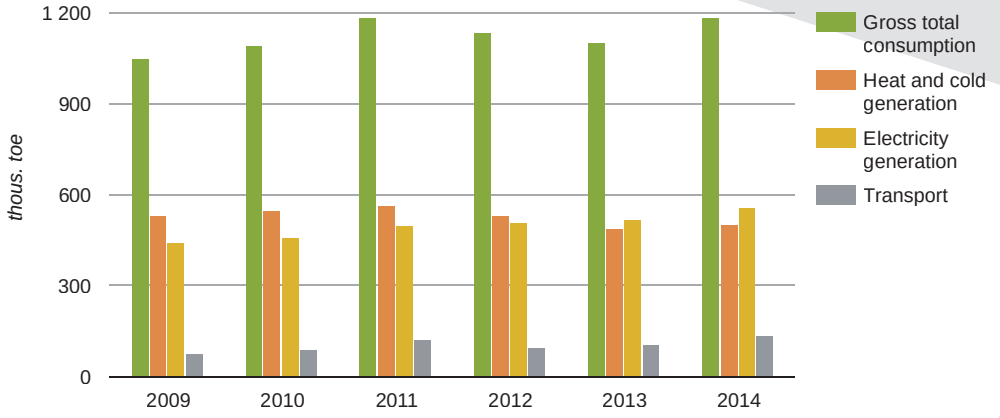
Development of the share of energy from RES by sectors



Source: SO SR, ME SR

As it is a share, growing share no always mirrors the real increase in energy from RES expressed as the gross total consumption of RES or the gross final consumption of RES in the case of the share of energy from RES in the sectors. The growth of the total share from RES in the last five years was a result of the growth of the gross total consumption of RES that increased by 13.3% in the period of 2009 – 2014. As the growth of shares in the sector of electricity generation from RES and in transport was caused by an increase in the gross final consumption of electricity from RES (26.5%) and the gross final consumption of RES in transport (77.9%), the growth of the share in the sector of heat and cold generation was not influenced by the growth of the gross final consumption of RES in this sector. It had a varied course in the monitored period and it decreased by 5.3% from 2009 as of 2009.

Development of the gross total consumption of RER and gross final consumption of RES in the sectors

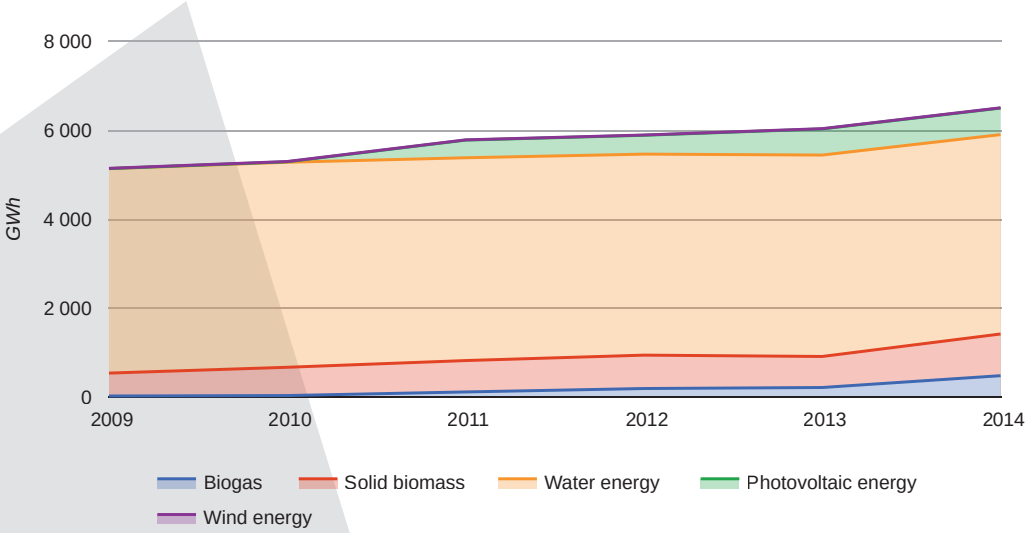


Source: SO SR, ME SR

In 2014, 6,505 GWh of electricity were produced from RES. This quantity corresponds to the 23.0% share in the total electricity generation.

In order to support the electricity generation from RES, the Act No. 309/2009 Coll. on the promotion of renewable energy sources and highly efficient cogeneration, was passed in the Slovak Republic in 2009. This Act improved the electricity market functioning in the sphere of RES and created a stable business environment. It ensured long-term guarantee of state purchasing prices for 15 years and, at the same time, it also defined directing in the electricity generation from RES, as it made more favourable the construction of small and decentralized facilities. The Act also guarantees preferential electricity transfer and distribution from RES. Since 2014, with a change in legislation, the process of connecting a small source up to 10 kW has been simplified considerably for households covering a large part of their energy consumption with electricity generated.

Development of the electricity generation from renewables



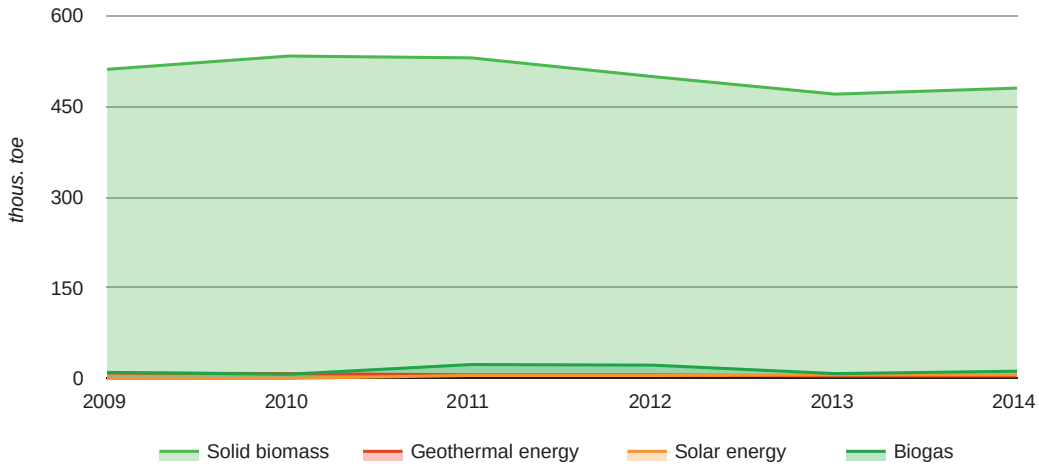
Source: SO SR, ME SR

The main electricity resource from RES includes hydroelectric power stations. In the recent years, thanks to the support of renewable sources, the share of the other types of RES has also started increasing, which resulted in an increase in a variety of RES used, especially an increase in the number of photovoltaic power stations in 2010 and 2011. In 2014, the biggest share of electricity generation from RES related to hydroelectric power stations (68.9%), followed by solid biomass (14.4%), solar photovoltaic power stations (9.2%), biogas (7.4%), and wind power stations (0.1%). The biggest share occurred in using solar energy that has occurred in the recent years.

In the sector of heat generation from RES, biomass (95.6%) had the dominant position and its technical potential predetermines it also for developing its energy potential most. The shares of the other RES in the heat generation were minimal – biogas (2.4%), solar energy (1.2%) and geothermal energy (0.8%). The SR has a developed system of central supplying with heat, which creates preconditions for using RES, in particular biomass, biomethane, and geothermal energy and gradual replacement of the natural gas consumption by heating.

At present, geothermal energy is used only for heating of buildings, and in spite of a big quantity of geothermal springs in the territory of the SR no higher boom of geothermal power stations is expected until 2020. Biomethane use has a big potential that is the most universal renewable source. It is possible to use it in the electricity industry, heat production industry, and transport.

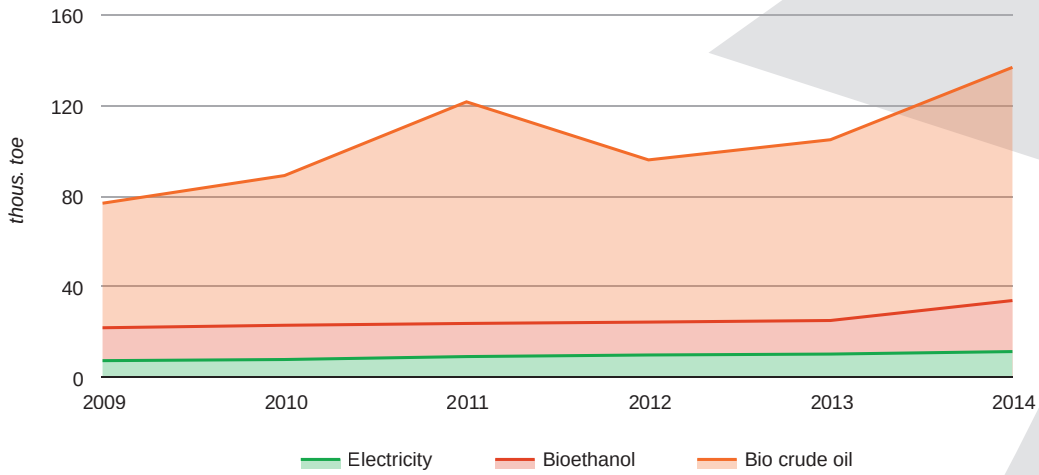
Development of heat and cold generation from renewables



Source: SO SR, ME SR

The share of RES in the sector of transport had an increasing trend in 2001 – 2014 and it increased from 2.5% in 2001 to 6.6% in 2014. The most important share has bio crude oil, its share was 75.2% in 2014.

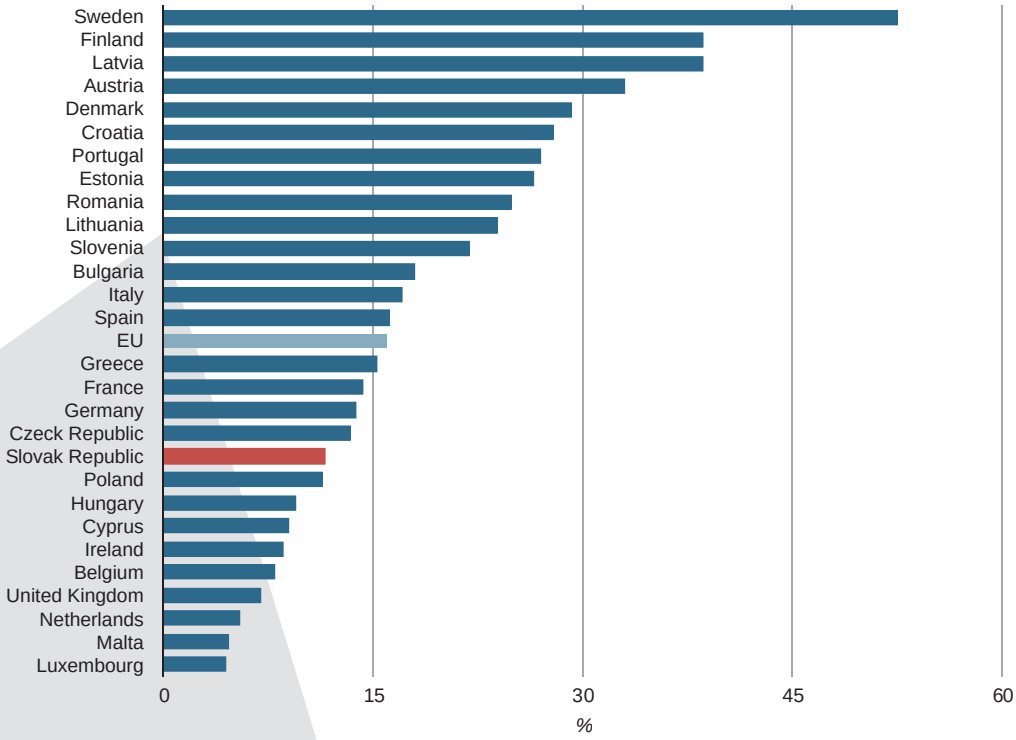
Renewables in the sector of transport



Source: SO SR, ME SR

Even if technologies using RES per unit of installed capacity demand more investment than conventional ones, compared to them investment in RES show themselves as more advantageous, when we also include external costs in the calculation connected with use of energy from fossil fuels (damaging of the environment).

International comparison of the share of energy from RES in 2014



Source: Eurostat

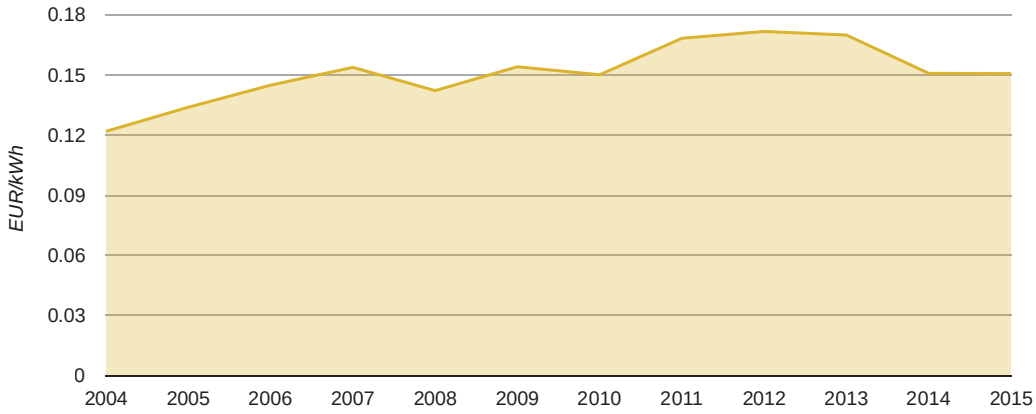
4.5.2. Prices of energy for households

From the perspective of the energy market functioning, the current period can be characterized as a combination of consequences of the world financial and economic crises and gradual liberalization. In the recent years, the number of alternative electricity suppliers to the Slovak market has increased and a year-on-year increase in the number of citizens, who have changed their electricity suppliers, habe been recorded, whereby the competitive environment is established. Until 2003, the energy prices were deformed by cross subsidies that were fully withdrawn in 2004 for all categories of suppliers. In the recent years, there are new actors in the gas supply market, which is a positive fact for the development of gas market competitiveness and transparency in the Slovak Republic.

Electricity

The electricity price for households has been increasing since 2004, except for the years of 2008, 2010 and the last years of 2013 – 2015. In the period of 2004 – 2015, the growth of the electricity price increased in total by approximately 23.6% to the value of EUR 0.15/kWh in 2015.

Development of the electricity price for households



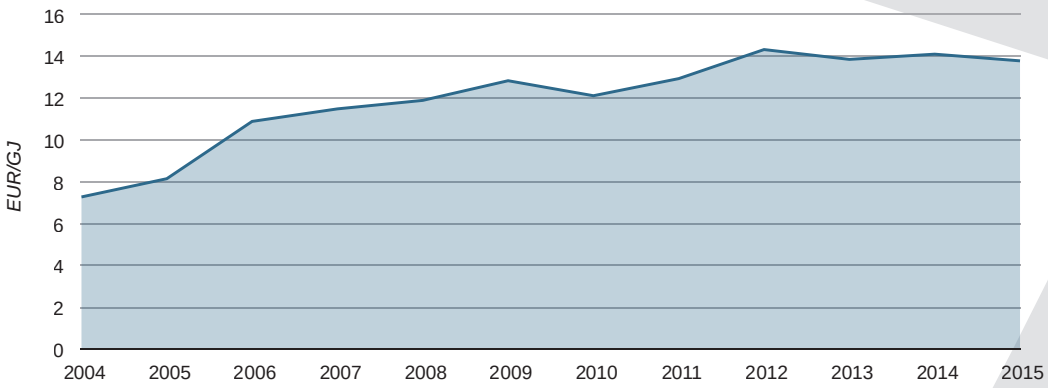
Source: Eurostat

The electricity price in the Slovak Republic mirrors the development in the European markets. An increase in the price was influenced by more aspects, such as the support of electricity generation from renewable sources (in particular photovoltaic sources), an increase in VAT from 19 to 20% or introducing the fee for payment to the National Nuclear Fund with burnt-up nuclear fuel and radioactive waste. The end electricity price is made up of the price of electricity purchased that is set for households by the regulatory authority, other regulated items and the payment to the national nuclear fund. Electricity purchased, mirroring trends mainly in the German market, is purchased at the energy exchanges. The regulated items relating to the network fees participate in the end electricity price with nearly 50%.

Natural gas

The natural gas price also influences considerably household expenditures, as this commodity is extensively used in Slovakia for heating. The natural gas price for households has had an increasing trend for the last ten years, and, in 2015, it had a nearly double value than in 2004 (an increase of 89.6%), and it reached the value of EUR 13.8/GJ.

Development of the gas price for households



Source: Eurostat

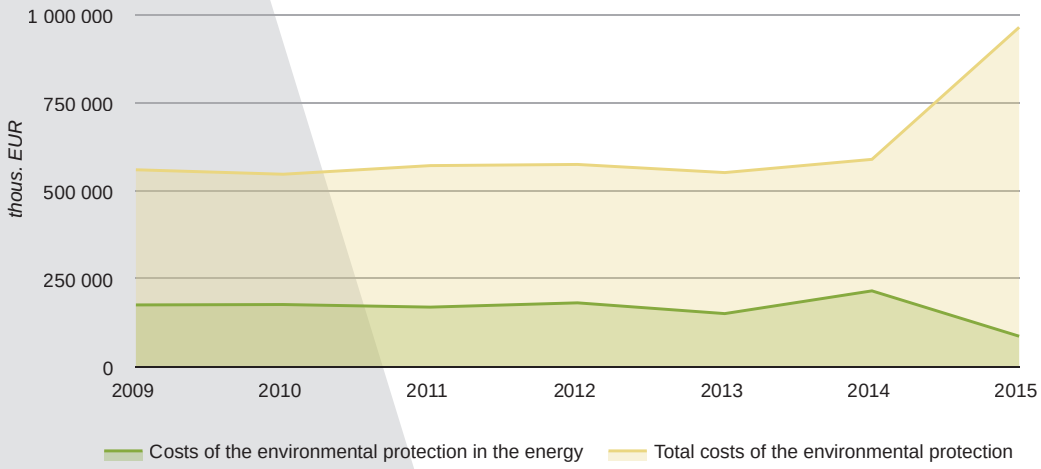
The price of gas supplies for households is determined by the Regulatory Office for Network Industries and it consists of the price of commodities and fees for regulated services (e.g. distribution, transport). For the Slovak market, the prices on the Austrian CEGH Gas Exchange and the Energy Exchange in Leipzig, Germany (EEX), are decisive. The market natural gas price is influenced by more factors, the most important of them are the development of prices for crude oil, light and heavy heating oil, as well as the exchange rate of EUR/USD as crude oil and products made of it are traded in the American dollars (USD) in the international market.

4.5.3. Costs of the environmental protection in energy

The costs of the environmental protection in energy consist of the costs of the environmental protection from enterprises with 20 employees and more. The total sum of costs of the environmental protection is the total sum of investment and current costs of enterprises.

In 2009 – 2015, the total costs spent for the environmental protection in energy had an ambiguous trend, while for the whole monitored period they had the highest level in 2014 (EUR 215,722 thousand). In 2015, costs decreased by approximately 60% (EUR 86,993 thousand) in a year-on-year comparison.

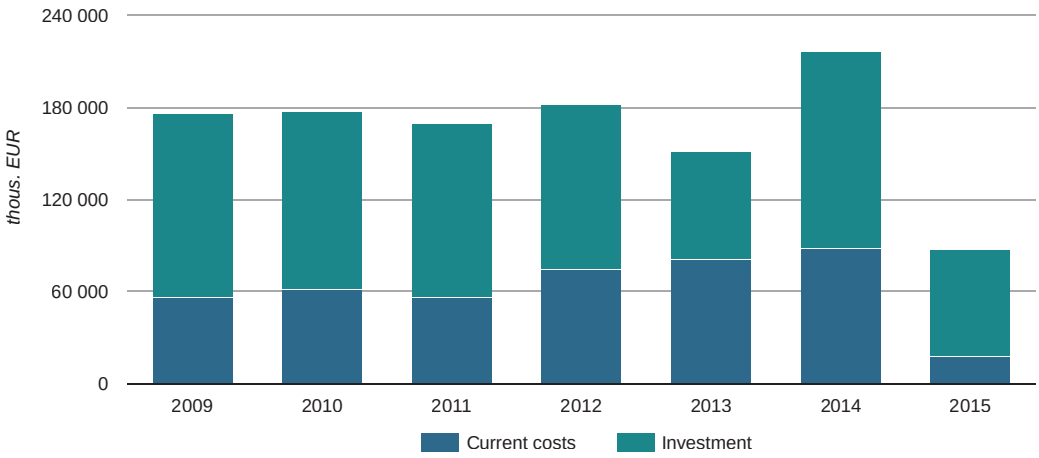
Development of costs of the environmental protection in energy and the total costs of the environmental protection



Source: SO SR

The share of costs spent in energy for the environmental protection in the total costs of the environmental protection in enterprises together was 9.0% in 2015. Out of funds spent for the environmental protection in energy in 2015, approximately 80.3% was investment and approximately 19.7% were current costs. The volume of investment in 2015 was the lowest for the whole period of 2009 – 2015 (EUR 69,813 thousand). The most investment was used in 2014, when they reached the amount of EUR 127,800 thousand. The current costs were also the lowest in 2015 for the whole monitored period, when their amount was only around EUR 17,180 thousand.

Development of costs for the environmental protection in energy



Source: SO SR

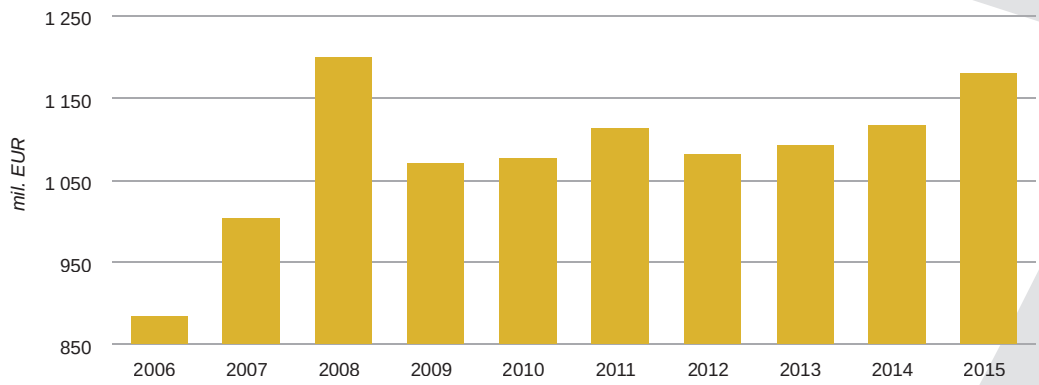
4.5.4. Tax on energy

Generally, the tax is defined as a mandatory tax, determined by law, usually as a repeated payment made by natural persons and legal entities to the state in the specified amount and defined date. It is collected by the state, municipalities, or any other publicly-owned entities.

The tax on energy is one of taxes with the environmental aspect, which is a tax the tax base of which is made up of a physical unit (or replacement of a physical unit) of something which has a negative impact on the environment. In the Slovak Republic, the tax on energy includes: tax on mineral oils, tax on electricity, tax on coal, tax on natural gas, tax on placement of nuclear facility, tax on payments for storing gases and liquids.

In 2015, the tax on energy reached EUR 1,181.25 million and it increased by 33.3% compared to 2006. In 2015, the share of the tax on energy in GDP reached 1.5% of GDP and it decreased by 0.45% compared to 2006. The share of the tax on energy in the total tax incomes in 2015 reached 4.67% and it decreased by 1.99% compared to 2006.

Development of the tax on energy



Source: SO SR

4.5.5. Assessment of impacts of proposed activities on the environment in energy

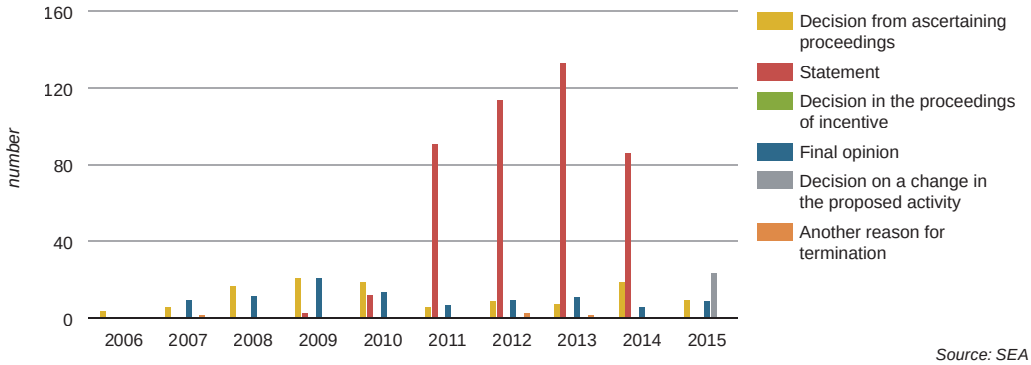
At present, in Slovakia the process of assessment of impacts of proposed activities before decision on their placement or before their permit is legislatively regulated by the Act No. 24/2006 Coll. on Environmental Impact Assessment and on Amendments to Certain Acts.

In accordance with Annex No. 8 of the Act, energy (the energy industry sector) is included in Table No 2. Energy industry – currently with 18 items of activities, buildings or facilities that are subject to the EIA process. Activities that are subject to the EIA process have been changed, supplemented and modified in energy, mainly from the perspective of limits defined for obligatory assessment and ascertaining proceedings.

The representation of the individual items of activities assessed in energy from 2006 to 2015 was as follows:

- 1 EIA process for surface storage of fossil fuels,
- 1 facility for handling radioactive waste, including its storage, unless they are included under any other items,
- 1 facility designed for production or enrichment of nuclear fuel and research facilities for production,
- 2 EIA processes for storage facilities (planned for more than 10 years) of burnt-up nuclear fuel or radioactive waste on a place different from the place where it was produced,
- 7 activities included under the item of facilities for processing, modification and storing of medium- and low-active waste from operation and putting of nuclear power plants and using of radionuclides out of operation,
- 6 activities assigned to the item of geothermal power stations and heating plants,
- 10 activities classified as industrial facilities for electricity generation from water energy (hydroelectric power stations),
- 17 EIA processes for activities of aboveground and underground power transmission lines,
- 22 activities classified as distance gas mains with pipelines with inner diameter or pressure,
- 34 EIA processes regarding facilities for using wind for energy generation (wind power stations),
- 41 activities classified under thermal power stations and other facilities for combustion with thermal power,
- 73 EIA processes for facilities – industrial facilities for steam, gas and hot water conduction,
- 89 EIA processes for any other industrial facilities for electricity, steam and hot water generation,
- 411 EIA processes for activities defined as nuclear power plants and other facilities with nuclear reactors (except for research facilities for production and conversion of fission and enriched materials the maximal thermal power of which does not exceed 1 kW of constant thermal power), inclusive.

Overview of the number of activities with the terminated EIA process by individual types of proceedings conducted in energy



Source: SEA

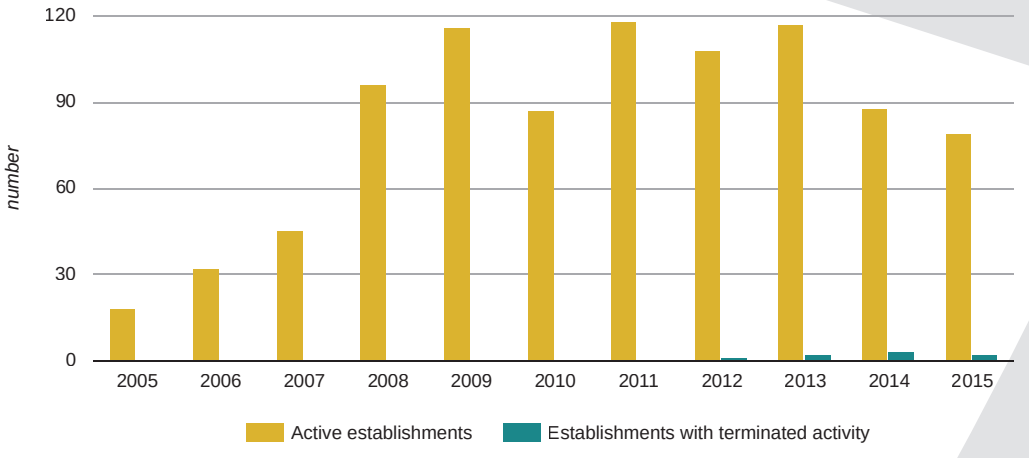
4.5.6. Integrated prevention and control of the environmental pollution in energy

The integrated environmental pollution prevention and control is solved by the Act No. 39/2013 Coll. on Integrated Pollution Prevention and Control and On Amendments to Certain Acts, as amended (the Act on IEPPC). The implementing regulation for the Act on IEPPC is the Decree of the Ministry of Environment of the Slovak Republic No 11/2016 Coll. that came into effect on 1 January 2016.

The integrated permit is a proceeding with which conditions for performing activities in the existing and new establishments are permitted and determined in a coordinated way in order to guarantee the effective integrated protection of the environmental components and keep the rate of environmental pollution in the environment quality standards.

In 2015, in energy there were 79 active establishments and two integrated permits for establishments were withdrawn for the reason of activity termination or capacity reduction, and thus the elimination from the force of this Act.

Number of establishments IPKZ in energy



Source: SIE

4.6. List of used literature

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TRANSPORT

List of the sector indicators in transport

Trends of the sector relevant for the environment
◀ Number of transported passengers and transport performance in passenger transport
◀ Quantity of transported goods and transport performance in freight transport
◀ Length of transport infrastructure
◀ Size of vehicle fleet according to transport types
◀ Final energy consumption in transport
◀ Use of ecological fuels in transport
Interactions of the sector with the environment (demands of the sector in respect of resources and impacts of the sector on the environment)
◀ Greenhouse gas emissions from transport
◀ Emissions of main pollutants from transport
◀ Confiscation of land by transport infrastructure
◀ Wastes from transport
◀ Noise load of inhabitants
◀ Number of accidents and number of killed and injured persons due to traffic

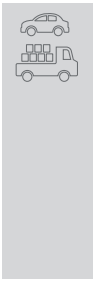
Political, economic and social aspects
◀ Subsidies of the state to the sphere of public transport
◀ Fuel prices and taxes on fuel prices
◀ Costs of the environmental protection in transport
◀ Tax on transport
◀ Assessment of impacts of proposed activities on the environment in transport

According to the Statistical Classification of Economic Activities (SK NACE Rev. 2), the transport is included in the Section H – Transportation and storage.

It consists of the following divisions:
49 – Land transport and transport via pipelines
50 – Water transport
51 – Air transport
52 – Warehousing and support activities for transportation
53 – Postal and courier activities

5.1. Summary assessment of the development in the sector of transport

What is the state and directing of transport in relation to the environment?



In the number of transported passengers and transport performance in the passenger transport, a decreasing trend was recorded, except for the individual car transport that recorded year-on-year increases in the monitored period of 2000 – 2015. The biggest share in transportation of passengers in the passenger transport related to the individual motorism, followed by the public road transport, public transport and rail transport. The number of transported goods by the freight transport had a decreasing trend with a considerable decrease after 2008. Performance in the freight transport started growing in the monitored period of 2000 – 2015, in spite of a fluctuating character after 2008. Road freight transport, followed by railway transport and water transport, had the biggest shares in the number of transported goods.

The current condition of the transport infrastructure is characterized by a dense network of roads, but with a low share of motorways and expressways, as well as by a relatively dense network of railways, airports of various character, inland water transport of an international importance – the Danube river.

A considerable increase in the number of means of transport in the period of 2000 – 2015 was seen in the road transport only; in the case of other types of transport the number of means of transport was decreasing, while the most considerable decrease was recorded in the air transportation.

The final energy consumption in the transport increased in the period of 2001 – 2015. The biggest share in fuel consumption related to the road transport; electricity consumption prevailed in the railway transport.

In spite of its fluctuating trend, the consumption of ecological fuels LPG (liquefied petroleum gas) and CNG (compressed natural gas) saw an increase in the monitored period of 2000 – 2014.

What are interactions of transport and the environment?

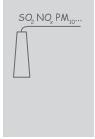
Demands of transport in respect of resources

In 2015, losses of land in connection with building the transport infrastructure were at the level of 0.55% of the total area of the Slovak Republic. The increase in the area of land confiscated by the transport infrastructure was recorded for the road and railway infrastructure.

Impact of transport on the environment

The development of greenhouse gas emissions is influenced by the environmentally-unfriendly road transport, and for the time being their total growth is not stabilized in the sector of transport. In 2000 – 2014, there was an increase in CO_2 emissions; N_2O emissions were approximately at the same level, and CH_4 emissions saw a decrease.

The wastes production in 2005 – 2015 had a fluctuating character with recorded year-on-year increases and decreases. The biggest number of old vehicles was processed in 2009, and it had a fluctuating trend after this year.



Transport also participates in the production of basic pollutants and heavy metals. CO, SO_2 and NMVOC emissions from transport in the monitored period saw a decrease, SP and NO_X emissions – in spite of their fluctuating character – saw an increase. Copper, lead and zinc had the biggest share in heavy metal emissions in the sector of transport.

The number of accidents fluctuated in the period of 2000 – 2008, and after 2009 they decreased considerably which was influenced by some legislative changes. There was also a decrease in the number of killed and injured persons. The number of accidents in the railway transport increased slightly since 2010.

What is the response of the society to mitigating or compensating negative consequences of transport on the environment?

Subsidies from the state budget had an increasing trend until 2009 and a fluctuating character after this year. In 2012, the biggest subsidies were given to the railway transport; the lowest amount of funds was intended for the public transport.

In the monitored period of 2000 – 2015, a considerable fluctuating trend was recorded for the average prices of motor fuels. Prices of diesel oil and petrol increased until 2008, and they decreased considerably after this year as a consequence of the economic crisis. After 2009, they were increasing repeatedly until 2012, and they were already decreasing in a year-on-year comparison after this year. LPG prices decreased considerably in 2006 – 2009; after this year they were increasing until 2012, and they remained at the same level after 2012.

Costs of the environmental protection in transport had a fluctuating trend in the monitored period of 2009 – 2014, they were at the lowest level in 2014.

5.2. How are the environmental principles and targets related to transport implemented into the strategic documents?

5.2.1. Implementation of environmental principles and targets related to transport into strategic documents at the EU level (the most important documents)

2001	***White Paper: European transport policy for 2010*** The policy defined the requirement of a more radical shift towards the ecologically responsible transport policy as a way of adjusting to uneven growth in various types of transport, overload of transport on European roads and railways and an extending reach of pollution.

2002	***The Sixth Environment Action Programme of the EU "Environment 2010: Our Future, Our Choice"*** Target – ensuring the high level of the environmental protection while taking into consideration a variety of conditions in the individual regions of the Community and achieving weakening of the relation between the economic growth and environmental pressures caused by this growth. The key priority objectives in relation to transport were: 1st Priority Objective: Climate change 3rd Priority Objective: Environment, health and quality of life
2006	***Renewed EU Sustainable Development Strategy*** The overall objective of the renewed EU SDS was determining and developing measures that would enable the EU to achieve the permanent improvement of the quality of life of both current and future generations by creating sustainable communities able to use resources efficiently and manage them and use the potential for both ecological and social innovations of the economy, thus ensuring prosperity, environmental protection, and social cohesion.
2007	***European Strategic Energy Technology Plan (SET Plan) - Towards a low carbon future*** The strategic plan for accelerating the development and introducing cost-effective low carbon technologies. As key technological challenges were classified: the use of bio fuels of the second generation and introducing to the market more effective systems for energy transformation and final use, among other thinks, also in transport.
2008	***Climate Energy package*** Setting of a complex of measures aimed at reducing the impact of the EU activities on global warming and ensuring reliable and sufficient energy supplies. In this complex, the EU accepted the commitment to reduce(compared to 1990) greenhouse gas emissions by 20%, reach the EU energy savings of 20%, reach 20% share of energy from RES in the gross final energy consumption and reach 10% representation of biofuels in transport to 2020.
2010	***Europe 2020: A European Strategy for Smart, Sustainable and Inclusive Growth*** The strategy basis includes three mutually complementary priorities: – Smart growth: creating a knowledge- and innovation-based economy. – Sustainable growth: supporting a greener and competitive resource-efficient economy. – Inclusive growth: supporting an economy with a high employment rate that will ensure social and territorial cohesion. Out of the targets adopted for the EU to 2020, the following ones are mainly relevant for the sphere of transport: – cutting greenhouse gas emissions by 20% (or up to 30% on condition of a wider global agreement) compared to level from 1990, – obtaining 20% energy from renewable sources, – achieving 20% increase in energy effeciency. The Strategy has brought seven flagship initiatives; while out of them the especially important initiatives from the perspective transport development in the EU are the following initiatives: Innovation Union and A Resource Efficient Europe.

2011	***Roadmap to a Resource Efficient Europe*** Specification of targets that will have to be achieved for ensuring the effective resources utilization.
2011	***White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system (Transport 2050)*** Defining targets and initiatives for their achieving for a competitive and resource efficient transport system, achieving a cut of greenhouse gas emissions of 60% in the context of expanding transport and mobility support and environmentally-friendly urban transport and commuting.
2011	***A Roadmap for Moving to a Competitive Low Carbon Economy in 2050*** Defining milestones to 2050, the plan of possible measures for their achieving (decreasing greenhouse gas emissions of 80% to 2050), including measures of the sustainable mobility.
2011	***Renewable Energy: A major player in the European energy market*** Defining the spheres where it is necessary to increase intensity of efforts to 2020 in order to increase energy generation from the EU renewable sources further to 2030 as well as in the following years, so that technologies of renewable energy sources are less costly, more competitive and finally market-oriented, and so that stimuli for investing in energy from renewable sources are provided.
2012	***A Blueprint to Safeguard Europe's Water Resources*** Target – ensuring sustainability of all activities that have the impact on water, and thereby ensuring accessibility of high quality water for its sustainable and fair water utilization. It contains the requirement to integrate to a larger extent the policy targets in the water management into the sector policies.
2013	***The Seventh Environmental Action Programme of the Union to 2020 "Living Well, Within the Limits of Our Planet"*** The key feature of the Programme is the protection and improvement of natural capital, support of better utilization of current resources and accelerated transition to a low-carbon economy. The Programme is to support the sustainable growth and creating new jobs, and thus create from the EU a healthier and better place for living. The key Priority Objectives in relation to transport are: Priority Objective 1: Protection, preserving and improving the Union's natural capital, Priority Objective 2: Create from the EU a resource efficient, low carbon, green and competitive economy. Priority Objective 7: Improving involvement of environmental issues and policy cohesion.

2014	***EU 2030 Climate Energy package*** Bridging the targets 20-20-20 with the vision of the low-carbon economy in 2050. Achieving a cutting of greenhouse gas emissions to 2030 by 40% compared to 1990, an increase in the share of RES in the energy mix of the EU to 27% (the target is binding only at the EU level), reducing energy consumption by 27% (the non-binding target) and the new target is to increase interconnection of energy networks of the member states to 15%. In addition, the framework includes the key reform of the EU Emissions Trading System.
2015	***A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*** The requirement for acceleration of introducing energy efficiency and decarbonising in transport, its gradual transition to alternative fuels and integration of energy and transport systems.

5.2.2. Implementation of environmental principles and targets related to transport into the strategic documents at the SR level (the most important documents)

2000	***Water Transport Development Concept of the Slovak Republic*** Defining five fundamental problem groups. In the Group III. Ecological, security and qualitative preconditions for the water transport development, the environmental protection is elaborated in more detail against pollution from operational processes of water transport, i.e. no pollution of water and subsequently of soil and air. The concept was updated in 2003 and 2004.
2001	***National Sustainable Develompent Strategy*** Setting priorities and targets of the sustainable development, Strategic Objective 22. Improvement of transport and technical infrastructure, tourism development.
2001	***Air Transportation Development Concept of the Slovak Republic*** Ensuring the sustainable development of mobility, i.e. a long-term ensuring of increasing air transportation services in the required quality is understood, with the simultaneous regulation of the impact on the environment.
2001	***Combined Transport Development Concept*** Defining the potential for combined transport, proposing leading of combined transport lines and necessary infrastructure for their operation, especially of combined transport terminals and their facilities.
2003	***Concept of Utilization of Renewable Energy Sources (RES)*** Creating the basic framework for the development of RES utilization in the Slovak Republic.
2005	***Action Plan for the Sustainable Development in the Slovak Republic for 2005 – 2010*** Defining main targets, including transport, concretized for the individual sectors. They include measurable indicators, deadlines, determination of responsibility for their fulfilment and methods of their financing.
2005	***National Programme for Development of Biofuels*** Defining indicative targets expressed by reference values for the period of 2006 – 2010, creating stimulation economic and legislative conditions for meeting the indicative targets specified in the Directive No. 2003/30/EC of the European Parliament and of the Council on the Promotion of the use of Biofuels or Other Renewable Fuels in Transport.

2005	***Transport Policy of the Slovak Republic to 2015*** Ensuring the sustainable development of mobility, perceived as long-term ensuring of permanently increasing transport needs of the society (transportation of cargo and persons) in the requested time and quality with the simultaneous decreasing negative impacts of transport on the environment.
2005	***Competitiveness Strategy for the Slovak Republic to 2010*** Acceleration of modernization and development of the high-quality transport infrastructure in the whole territory of the Slovak Republic.
2006	***Energy Policy of the Slovak Republic*** Creating the framework for further directing of the development of electric power industry, thermal energy sector, gas industry, mining, crude oil processing and transport, coal mining, and utilization of renewable energy sources.
2007	***Energy Efficiency Action Plan for 2008 – 2010 (the 1st AP)*** Quantifying targets, defining measures and determining mechanisms for ensuring implementation of proposed measures and their monitoring.
2007	***National Programme of Cutting Emissions of Basic Pollutants to 2010*** Target – defining instruments for ensuring the compliance with national emission ceilings specified for the Slovak Republic, both cross-sectionally and for the individual sectors (transport, industry, energy sector, agriculture).
2008	***Development of public passenger transport before individual transport*** In the sphere of public transport, the targets are as follows: (1) keeping and increasing the share of public passenger transport in the total volume of transported persons; (2) interconnecting less developed regions (municipalities) with centres of economic activities; (3) restricting growth of harmful gas emissions from transport in accordance with international commitments.
2010	***National Renewable Energy Action Plan*** Defining national targets for the share of energy from RES consumed in transport and in the sectors of electricity, heat and cold generation in 2020 and steps aimed at their ensuring.
2010	***Strategy of Development of Transport of the Slovak Republic to 2020*** Defining visions, targets, priorities and measures in the sphere of transport development in four basic spheres: (a) building and modernising the transport infrastructure; (b) ensuring a balanced development of transport services; (c) rights and duties of transport users; (d) decreasing the impact of transport on the environment.
2011	***Energy Efficiency Action Plan for 2011 – 2013 (the 2nd AP)*** Defining the second transitional indicative target of energy savings in the Slovak Republic for the period of the next three consecutive years, defining measures and financial and legal instruments for achieving the target of energy savings.
2012	***National Environmental and Health Action Plan for the Slovak Republic IV. (NEHAP IV.)*** Defining measures aimed at the air protection, and from the perspective of the sector of transport measures concern improvement of transport accessibility of regions, modernization of railway lines, building intermodal transport with the aim to contribute to reducing respiratory illnesses caused by the polluted air.
2013	***PM_{10} Reduction Strategy*** Target – achieving and maintaining the good air quality in the whole territory of the Slovak Republic, i.e. such air quality that does not threaten human health and the environment based on the current scientific knowledge. Such measures are defined for achieving this target that concern mainly the local heating, transport and farming on the agricultural land.

2013	***National Strategy of Development of Cycling Transport and Cycle Touring in the Slovak Republic*** Recognising cycling transport as an equivalent type of transport, its integration with the other types of transport and improvement of perceiving cyclists as rightful participants of road transport.
2014	***Energy Efficiency Action Plan for 2014 – 2016 (the 3rd AP)*** Evaluating targets and measures for energy efficiency in accordance with the previous plans, defining new and continuing measures of energy efficiency for the following period of 2014 – 2016 with the outlook to 2020.
2014	***Energy Policy of the Slovak Republic*** Reflecting to the development of the energy policy in the EU. Defining the main targets and priorities of the energy sector to 2035 with the outlook to 2050; for the sphere of transport: defining targets leading to ecologisation of transport, using environmentally more favourable types of transport and biofuels.
2014	***Adaptation Strategy of the Slovak Republic on Adverse Impacts of Climate Change*** Target – among other things, proposing a complex of suitable proactive adaptation measures and mechanism for their implementation in the sector policies, including transport, development strategies and action plans at all levels of the process.
2014	***The Strategic plan for the Development of Transport Infrastructure of the Slovak Republic by 2020*** Supporting high-quality, effective and safe transport with the simultaneous minimizing of its environmental impacts (reduction of emission production, as well as decreasing negative impacts on the other components of the environment).
2014	***The Strategy of Development of Public Passenger and Non-motorized Transport in the Slovak Republic by 2020*** Implementing 56 measures for increasing activities of public passenger transport towards individual car transport negatively affecting the air considerably more.
2014	***Action plan for implementation of measures resulting from the updated National Strategy for Biodiversity Protection by 2020*** Ensuring long-term mapping and monitoring elements of biodiversity – monitoring land confiscation by the transport infrastructure, monitoring sections of roads with frequent collisions with animals.
2015	***Strategy of the development of electromobility in the Slovak Republic and its impact on the national economy of the Slovak Republic*** Enforcing electromobility as one of the instruments for reducing the air pollution around junctions, including acoustic noise caused by transport, with a positive impact on human health and the environment.
2015	***Programme of Waste Management in the Slovak Republic for 2016 – 2020*** The main objective of the waste management of the SR to 2020 is minimizing negative effects of waste origin and handling on human health and the environment. For its fulfilment, it is necessary - among other things - to implement the principle of extended responsibility of manufacturers for the following reserved products: electrical equipment, batteries and accumulators, packages, vehicles, tyres and non-package products, introducing the support for using materials obtained from recycled waste for the manufacture of products and improving market conditions for these materials.

5.3. What is the state and directing of transport in relation to the environment?

Transport is one of key factors of the development of each modern society, while it is not a target in itself, but it is a means for the economic development. The impact of transport on the economy is reflected directly in the individual industries manufacturing means of transport; in the building industry by constructing the transport infrastructure and indirectly in all industries manufacturing raw materials, fuels, semi-finished products, components and equipment for transport. The impact of transport on the economic development currently manifests itself in the Slovak Republic in particular by the growth of building industry outputs, caused by building motorways, maintaining the road network and rebuilding the main railway routes of international importance to higher operational speeds. Transport affects the environment negatively in two basic aspects: construction of the transport infrastructure and in terms of harmful impacts from traffic. Increasing volumes of transport result in an increased pressure on the environment, in particular in relation to the climate change and loss of biological variety. The positive aspect is that technological improvement ensures reducing the air pollution from the road transport in spite of the transport volume growth.

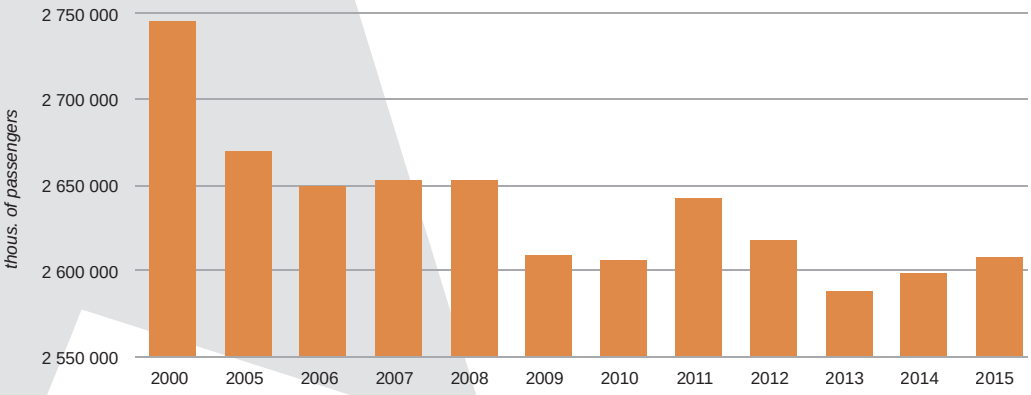
The state and directing of transport in relation to the environment is characterized based on indicators from the group of trends of the sector relevant for the environment.

5.3.1. Number of transported passengers and transport performance in passenger transport

During the monitored period of 2000–2015, the number of transported passengers in passenger transport (including individual transport) had a fluctuating trend with the average annual movement of 2,600,000 thousand passengers, while the biggest number of transported passengers was reached in 2000.

After 2008, the number of transported passengers fluctuated until 2015, with a more considerable increase in 2011. In 2015, it decreased by 5.1% compared to 2000.

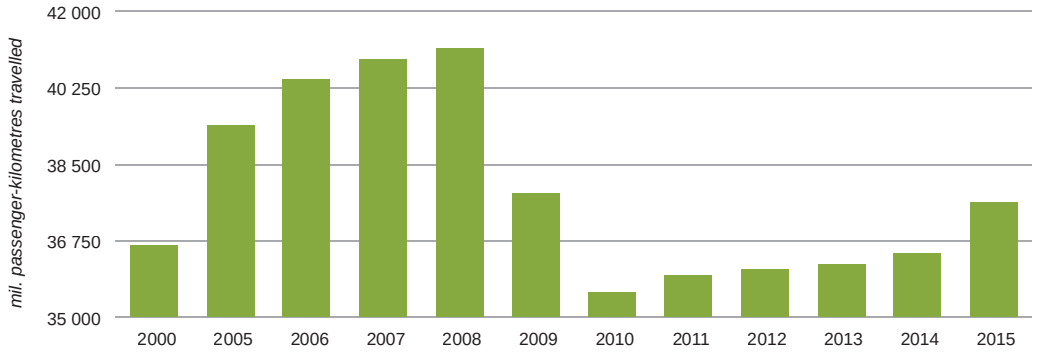
Number of transported passengers in passenger transport



Source: SO SR

The total transport performance in passenger transport in 2000–2015 had a fluctuating trend, while increases were recorded until 2008, and they started decreasing after this year. Transport performance in passenger transport reached their lowest value in 2010, and in 2011–2015 they started gradually increasing and fluctuated around 37,300 million passenger-kilometres travelled.

Transport performance in passenger transport

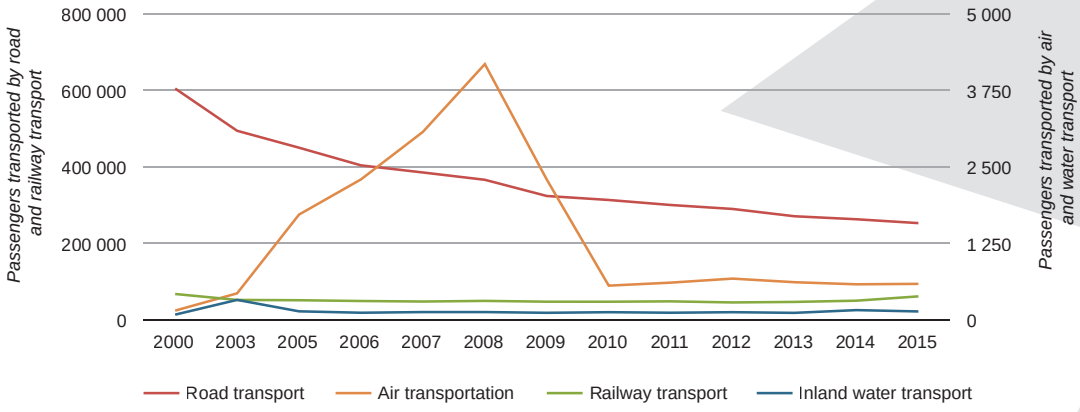


Source: SO SR

Transport of passengers and transport performance by the individual types of transport

Since 2000, the development of transport of passengers by public road transport has seen a long-term year-on-year decrease. In 2015, transport of passengers in the road transport decreased by 58.3% compared to 2000. Minimal year-on-year increases and decreases have also been seen in railway passenger transport. In 2015, its number of transported passengers decreased by 9.4% compared to 2000, in spite of a year-on-year increase of 22.9%. The number of passengers transported by water transport increased by 65.0% in 2015 compared to 2000. In the monitored period of 2000–2015, the number of passengers transported by the passenger air transportation increased (from 146 thousand in 2000 to 583 thousand in 2015). The biggest number of passengers transported by the air transportation was recorded in 2008; after this year the number of transported passengers decreased due to the economic crisis and bankruptcy of some airlines.

Development of transport of passengers by road, railway, water and air transportation

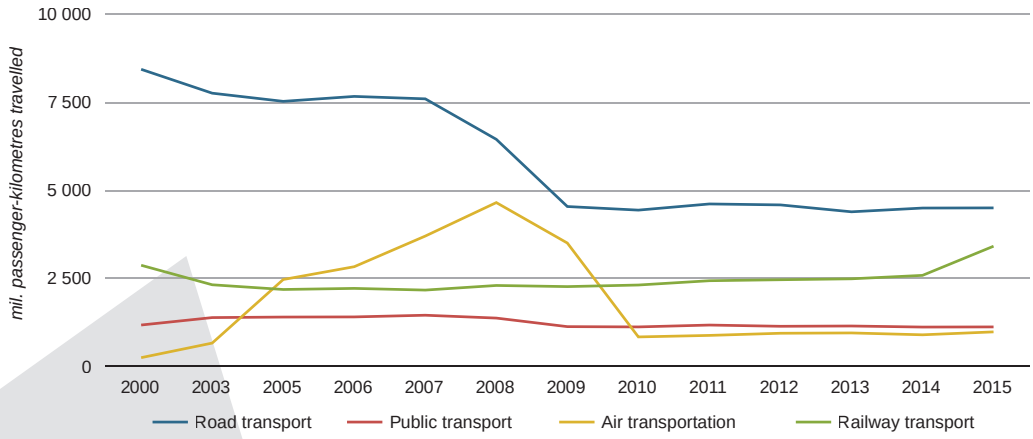


Source: SO SR

Transport performance of road passenger transport in the monitored period of 2000–2015 decreased by 46.7%. A more considerable decrease was seen in 2007–2009, and after this year performance fluctuate approximately at the level of 4,500 million passenger-kilometres travelled, with the minimal year-on-year increases and decreases. Performance of the railway

transport by 2015 increased by 18.9% compared to 2000. A more considerable long-term increase in transport performance was seen in passenger air transportation until 2008; after this year performance decreased, and from 2010 they reached only minimal year-on-year increases.

Development of transport performance in passenger transport by the mode of transport

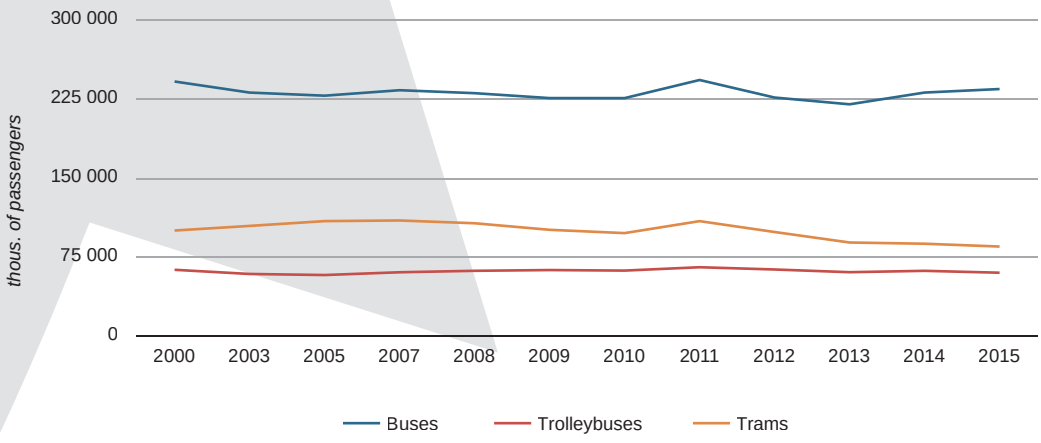


Source: SO SR

Passengers transported by city public transport

In terms of the number of passengers transported by the city public transport (CPT), a fluctuating character has continued. In transport enterprises, there was a decrease of 6.2% in the number of transported passengers in the period of 2000–2015. The leading place in transport of passengers has been maintained by the bus transport, followed by the trams and trolleybus transport. From 2010, transport performance in transport of passengers by CPT fluctuated at the level of 1,100 million passenger-kilometres travelled.

Development of the number of passengers transported by public transport

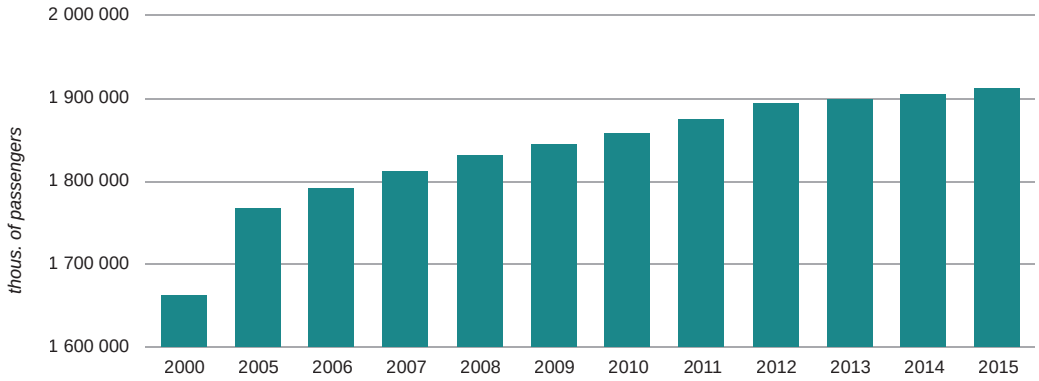


Source: SO SR

Passenger transported by individual car transport

In addition to the public transport, individual car transport, which was increasing in a year-on-year comparison, also participates in meeting transport needs. In the monitored period of 2000–2015, the number of passengers transported by individual transport increased by 14.9% and transport performance by 15.1%.

Number of passengers transported by individual passenger transport



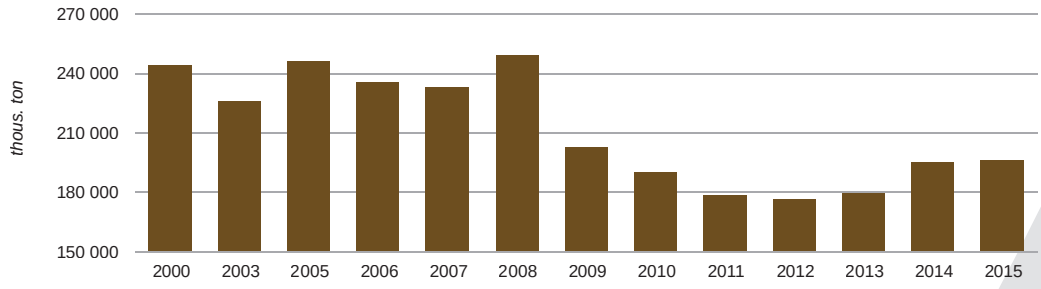
Source: SO SR

5.3.2. Quantity of transported goods and performance in freight transport

In the transport sector, the road freight transport has the biggest market share in the quantity of transported goods. This share has been growing due to its higher quality services (higher flexibility, reliability, speed of supplies, lower requirements for goods packaging and less probability of goods damaging).

During the monitored period of 2000–2015, the quantity of transported goods had a fluctuating character. In 2000–2008, there were minimal increases and decreases in the quantity of transported goods. More considerable decreases after 2008 were a consequence of the economic crisis. A decrease in the quantity of transported goods in 2015 compared to 2000 was 19.9%.

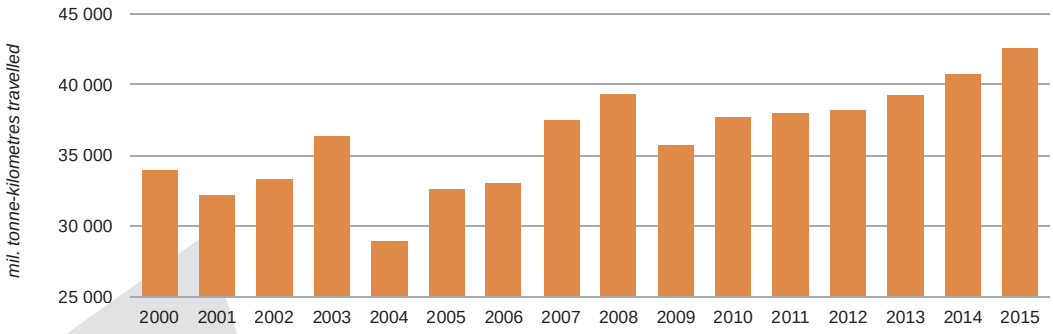
Quantity of transported goods in freight transport



Source: SO SR

Transport performance in freight transport had a fluctuating character in the monitored period of 2000–2015, while their lowest value was reached in 2004. After 2008, transport performance had an increasing trend, and in 2015 they exceeded the value of 42,000 million tonne-kilometres travelled. An increase in transport performance was 25.4% compared to 2000–2015.

Transport performance in the freight transport

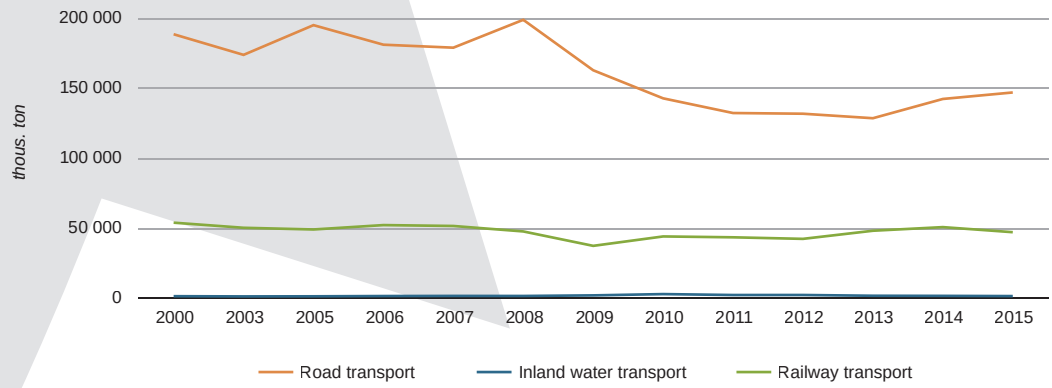


Source: SO SR

Transport of goods and transport performance in freight transport by the mode of transport

The biggest quantity of transported goods is performed by road freight transport. In the monitored period of 2000–2015, road transport decreased by 22.1%, while considerable year-on-year decreases were seen after 2008. A decrease in 2008–2011 was caused by the deepening global economic crisis in all areas. Railway freight transport for transportation of goods has maintained a balanced character throughout the monitored period, and in 2015 there was a decrease of 12.6% compared to 2000. In the monitored period of 2000–2010, water transport saw a considerable increase (of 100%), but after this year it started decreasing, and in 2015 it was at the level of 2006.

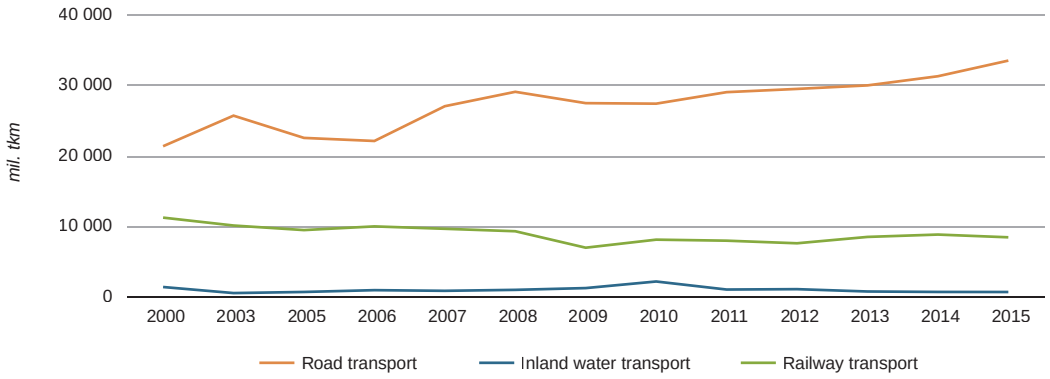
Development of goods transportation by freight transport by the mode of transport



Source: SO SR

In the case of transport performance of road freight transport in the period of 2000–2015, these represented an increase of 56.8%, with year-on-year decreases and increases. Transport performance of water freight transport saw considerable fluctuations in 2002 (a decrease) and in 2010 (a considerable increase). After 2010, transport performance had a decreasing trend that continued until 2015. Performance of water freight transport in 2015 were at the level of 2005. On the contrary, transport performance of railway freight transport were approximately at the same level throughout the monitored period of 2000 – 2015, in spite of a year-on-year decrease in 2009. In the period of 2009 – 2015, they fluctuated at the level of 8,500 million tonne-kilometres travelled.

Development of transport performance in freight transport by the mode of transport



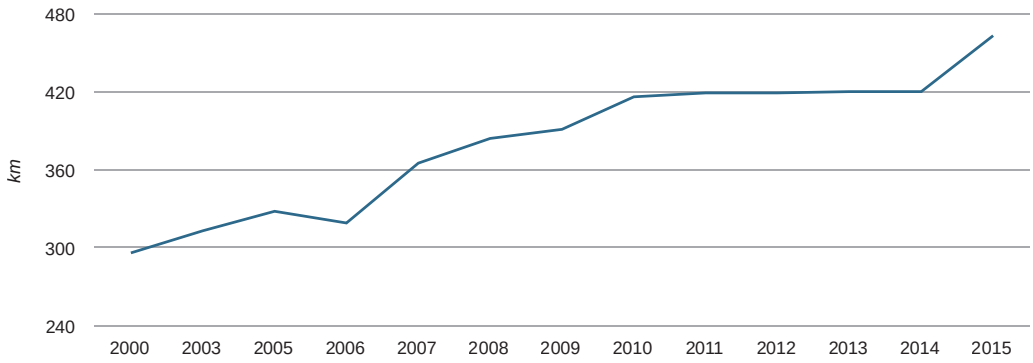
Source: SO SR

5.3.3. Length of transport infrastructure

The priority of the transport policy of the SR in the sphere of the road infrastructure development is completing the construction of the transport infrastructure classified as TEN-T. Ensuring a proportionate development of motorways and expressways in the context with the considered international road routes in relation to implemented cross-border interconnections with the neighbouring countries will result in including the road network of the SR in the single European transport system. The current condition of the road infrastructure is characterized by a relatively dense network of roads, but with a low share of motorways and expressways, while the existing road capacity is exceeded especially on the main international road connections.

The transport network of the SR in 2015 was made up of 18,005 km roads and motorways, of which motorways accounted for 463 km. For the period of 10 years, the length of motorways in the Slovak Republic increased by approximately 70%. The biggest increase in the length of motorways was recorded in 2007.

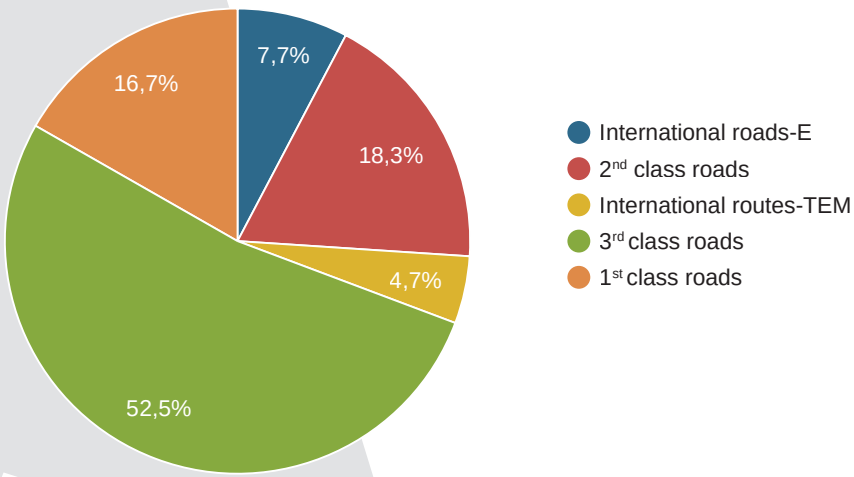
Development of motorways length



Source: SO SR

The biggest share by the categories of roads in the Slovak Republic in 2015 was held by the 3rd class roads (52.6%) and the 2nd class roads (18.3%), which have an importance for transport among regions and districts. The 1st class roads had a slightly increasing tendency and accounted for 16.7%. The network of the European roads E in Slovakia includes 11 road routes and represented the share of 7.7%, and the share of the network of trans-European main highways TEM was 4.7%.

Share of length of the individual categories of roads in 2015



Source: SRA

The railway transport infrastructure is characterized by a relatively high density of the network, but with obsolete technology. In 2015, the length of railway tracks was 3,626 km, of which electrified railway tracks were 1,587 km long.

With respect to the area of the country, the air transportation infrastructure is made up of a relatively dense network of airports of a various character, while the highest importance have airports with the statute of an international public airport (8 airports). In the SR, 27 airports were operated in 2015, of which 14 public airports and 13 non-public airports.

The water transport infrastructure plays an important role in intermodal transport systems in inland, but mainly in international transport relations of the unified network of the European inland watercourses and on the world's seas.

At present, the inland water transport of the SR is performed on the monitored watercourses of the River Danube (the European watercourse of an international importance) and the River Váh (the national watercourse of an international importance, as it is a feeder of the River Danube) of the length of 213.2 km, the length of artificial channels reaches 38.5 km.

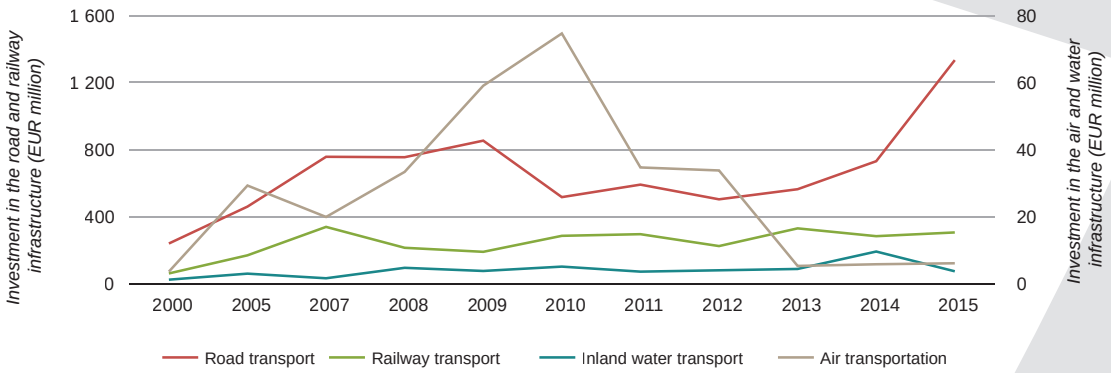
In 2015, 9 terminals of combined transport were active.

Investment expenditures for the transport infrastructure

At present, the level of expenditures spent for the transport infrastructure in the developed EU countries represents approximately 2% of GDP, while these expenditures are approximately at the level of 1.5% of GDP in the Slovak Republic.

Throughout the whole monitored period of 2000–2015, the biggest amount of investment was intended for the road infrastructure development. In 2015, a year-on-year increase of 82.5% was recorded, and the investment amount reached EUR 1,334.8 million. In the period of 2000–2015, investment channelled to the railway infrastructure had a fluctuating character, and from 2007 they fluctuated at the level of EUR 300 million. In 2015, investments in the railway infrastructure decreased by 7.9% compared to 2014, and they made up not even a quarter of investment channelled to the road infrastructure. Investment in the air infrastructure increased in 2005–2010, while the highest value was recorded in 2010 – EUR 74.7 million. After this year, there was a considerable decrease, and in 2014 and 2015 they were at the level of EUR 6 million. The lowest amount was invested in the water infrastructure, which was only EUR 3.7 million in 2015.

Investment expenditures for the transport infrastructure



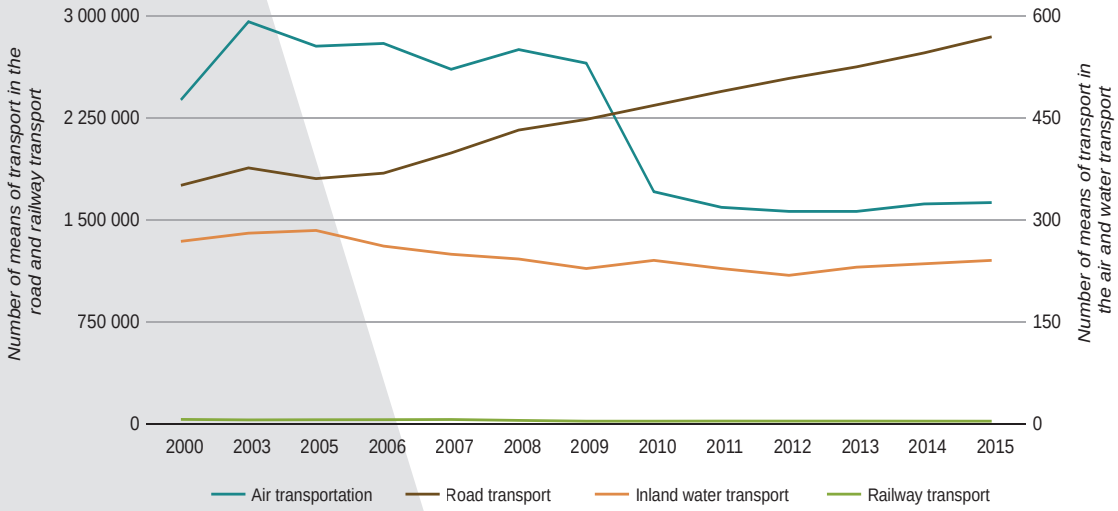
Source: SO SR

5.3.4. Size of the vehicle fleet by the mode of transport

At present, the car industry is producing motor vehicles that are being equipped with more and more perfect technologies. The development of motor vehicles in the Slovak Republic has brought about several positive changes in the sphere of passenger motor vehicles, such as an increase in the number of vehicles equipped with catalytic converters with high energy efficiency, a decrease in consumption and CO_2 emissions, with which reduction of vehicle weight and decrease in motor capacities are also closely connected. Energy-driven and hybrid vehicles have also appeared on the market.

In the monitored period of 2000–2015, the number of means of transport increased only in the road transport, which was 62.3%. Numbers of means of transport in the railway and water transport (environmentally most appropriate types of transport for transportation of persons and goods) decreased. In 2015, this decrease in the railway transport was 42.3% compared to 2000. A more considerable decrease in the number of means of transport in the railway transport was recorded after 2008, while after 2011 their number started growing, and in 2015 their number was approximately at the level of 2010. In spite of a fluctuating trend in the water transport, the decrease in the number of means of transport was 24.3% in 2015 compared to 2000. In this period, the number of aircrafts decreased by 31.8%.

Development of the size of the vehicle fleet by the mode of transport



Source: SO SR

Size of the vehicle fleet in the road transport

The number of road motor vehicles has been increasing in all categories of road vehicles. In 2015, the total number of motor vehicles increased by 1,091,969 pcs compared to 2000. The most important increase in the number of road motor vehicles was seen in 2015 in the category of trucks and vans (a 147% increase compared to 2000) and passenger cars (a 60% increase compared to 2000). A decrease was recorded only in the category of buses – 18.1%, and from 2012 their number fluctuated at the level of 8,800 pcs.

Vehicle fleet replacement was going in a favourable direction that mainly concerned vehicles in the road freight transport, where the percentage representation of newer motor vehicles was permanently increasing, and in 2015 their share was 5%. In 2015, more than 51% of

vehicles were older than 11 years (2005 and older), and 37% of vehicles was at the age from 6 to 10 years. Vehicles of the bus public transport have still been showing a low level of vehicle fleet replacement.

In 2015, 46% of buses were older than 11 years (2005 and older), and buses of the age from 6 to 10 years represented 33% of their total number.

The biggest problem related to an increase in the number of passenger motor vehicles in the road transport is the fact that public types of transport are not able to compete largely with the individual car transport in transportation of persons. Out of the total number of passenger cars, in 2015 there were 12% cars below 2 years of the age, 17% from 3 to 5 years, 24% from 6 to 10 years, and up to 47% of cars were older than 11 years (2005 and more). According to the type of energy consumed in 2015, up to 58% of the total number of cars had petrol engines, and 42% of cars had diesel engines.

Size of the vehicle fleet in the railway transport

The condition of the vehicle fleet in the railway transport exceeds operational needs of the railways. A serious problem of the vehicle fleet of the railway transport is its both technical and moral obsoleteness related to a high age structure of driving vehicles, freight wagons as well as passenger wagons, which is related to more than 70% of vehicles. They have a high failure rate, high costs of operation and maintenance, while they do not meet requirements laid on security and culture of travelling. Some types of mobile means, especially wagons for transportation of persons, are already beyond the limit of physical lifetime and are morally worn down.

In the monitored period of 2000 – 2015, numbers of means of transport in the railway transport decreased approximately to a half. In the monitored period of 2000 – 2015, the number of locomotives had a decreasing trend, while this decrease was 21.2% compared to 2000. Freight wagons saw a more considerable decrease; their number decreased nearly to a half in 2015 compared to 2000. A decrease was also seen for passenger wagons, which was 41% compared to 2000. In the monitored period of 2000 – 2015, minimal year-on-year decreases were also registered for motor wagons.

Size of the vehicle fleet in the water transport

The ship fleet in the water transport is largely satisfactory only for the Danube navigation. In the case of inland navigation in the sphere of means of transport – vessels, there is unambiguous unification of vessels in terms of their length, width, draught and load bearing capacity to the corresponding European modules.

The numbers of vessels in the inland water transport were also recording year-on-year decreases from 2000. In the monitored period of 2000 – 2015, freight boats recorded a decrease of 34.8%; towboats were around 32 pcs. An increase was only recorded for passenger ships, while in 2000 there were 9 pcs registered; in 2015 there were already 16 pcs of them.

Size of the vehicle fleet in the air transportation

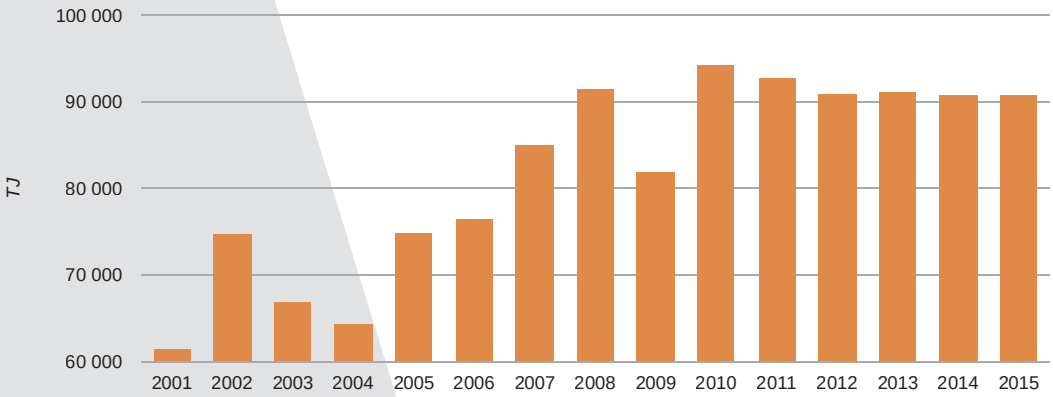
After 2009, the total number of registered civil aircrafts decreased, which was caused by the continuing economic crisis as well as by a decrease in the number of passengers due to the termination of activities of two important airline carriers. In 2015, 318 pcs of aircrafts with weight up to 9,000 kg were registered.

5.3.5. Final energy consumption in the sector of transport

The sector of transport is one of important factors of energy problems and problems of the environment as it is one of the largest consumers of fossil energy sources. Energy demands of the road freight transport, in relation to the transported volume of goods, take into consideration economic and social conditions of the society development. A change in the stability of economic links is reflected there, these are subsequently reflected in the use of journeys. The approved Directive (2009/28/EC) on the promotion of the use of energy from renewable energy sources includes targets for each member state of the EU, i.e. to achieve a 10% share of energy from renewable sources in the sector of transport by 2020. At present, this share in the Slovak Republic is approximately 5%.

In the monitored period of 2001–2015, the final energy consumption in the sector of transport increased by 48%, in spite of its fluctuating character. In 2015, the final energy consumption was at the level of the previous year. The final energy consumption of liquid fuels had the biggest share in energy consumption in the sector of transport in the final energy consumption (98%). The share of the final energy consumption of solid fuels, gaseous fuels and electricity was low.

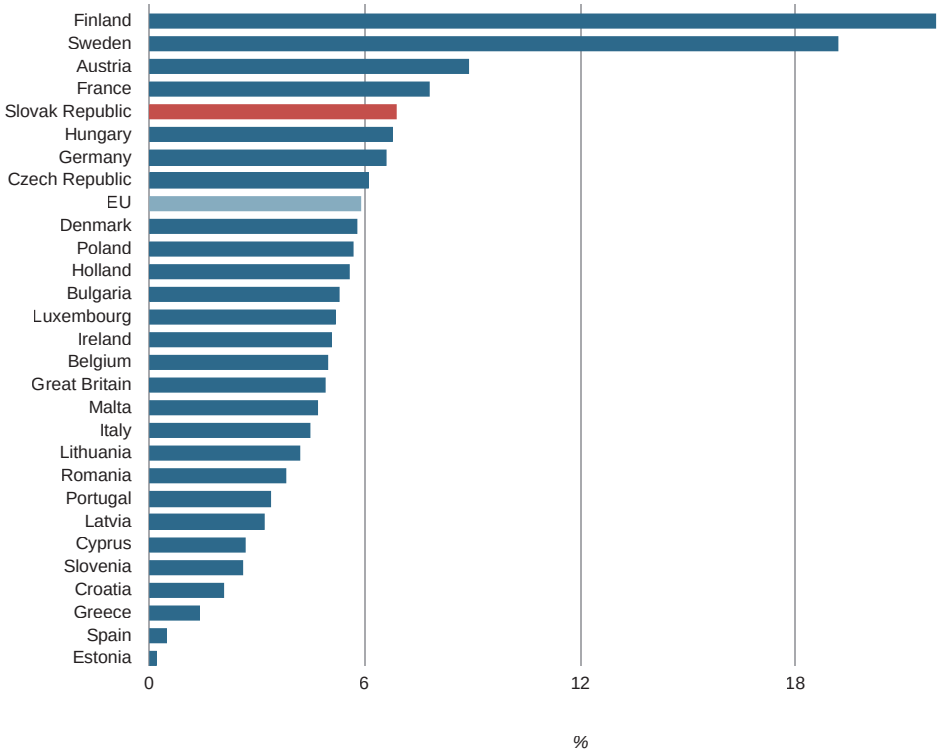
Final energy consumption in the sector of transport



Source: SO SR

The biggest share in the fuel and electricity consumption in the sector of transport related to the road transport where an increase in propellant consumption can be seen (petrol and diesel oil) of more than 30% compared to 2000. In 2015, the consumption in the road transport was as follows: petrol and diesel oil of 86%, electricity of 11%, and gas of 3%. The opposite trend can be seen in the railway transport where electricity consumption of 92% prevailed in 2015, while diesel oil consumption was only 8%. The other types of transport (air and water transport) participated in the final fuel and electricity consumption minimally.

Share of energy from renewable sources in propellant consumption in transport in some selected states in 2014



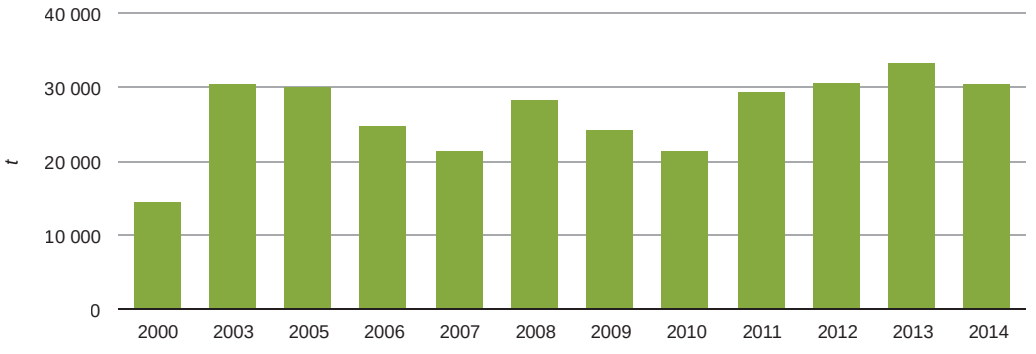
Source: Eurostat

5.3.6. Use of ecological fuels in transport

Motor fuels – liquefied petroleum gas, liquefied propane-butane (LPG), and compressed natural gas (CNG) have represented for the time being, from the short-term or medium-term perspective, a certain alternative to motor petrol and diesel oil as cheaper and environmentally more favourable propellants. The development of gas installation (equipping passenger cars with petrol engines with devices enabling LPG combustion) results in improvement of environmental parameters of the passenger vehicle fleet.

In the monitored period of 2000–2014, consumption of alternative fuel LPG (propane-butane) had a fluctuating character, and in 2014 it increased to 109% compared to 2000. A considerable decrease of approximately 25% was seen in 2005–2007 and 2008–2010. After 2010, LPG consumption recorded an increase.

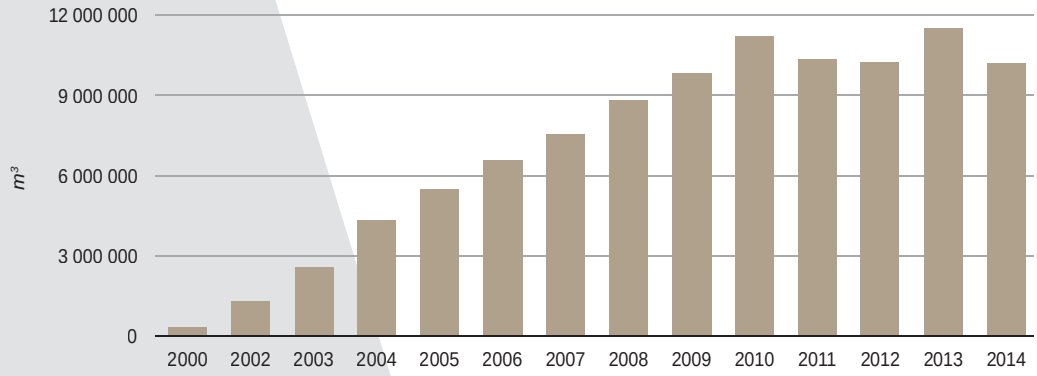
Development of LPG consumption in transport



Source: TRI, joint-stock company

Data on CNG consumption testify of a multiple increase in consumption of this propellant between 2000 and 2014, in spite of decreases in 2011 and 2012. Consumption of CNG as a propellant was 327,770 m^3 in 2000, and it reached 10,197,132 m^3 in 2014.

Development of CNG consumption in transport



Source: TRI, joint-stock company

5.4. What are interactions of transport and the environment?

The evaluation of the environmental impact of transport includes a number of elements with which transport has an impact on its surroundings, i.e. inanimate items, such as soil, air, buildings as well as on live organisms, flora, fauna, and mainly on human beings. Transport produces mainly emissions polluting the air, causes a higher noise level and occupies land with its infrastructure. There is a big number of accidents, mainly in the road transport, that are reflected in human and material losses as well as congestions that manifest themselves in loss of time.

Mutual interactions of transport and the environment are characterized based on the indicators from the group of interactions of the sector with the environment.

5.4.1. Demands of transport in respect of resources

Confiscation of land by the transport infrastructure

In 2014, land confiscation by the transport infrastructure accounted for 0.55% of the total area of the SR, while the biggest share of land confiscation by the transport infrastructure related to the road transport with its share of 0.3%, followed by railway transport with the share of 0.2%. The share of air and water transport was very low.

In 2014, an increase in the area of land confiscated by the road transport infrastructure was 15.7534 ha (0.1%). The total area of roadways was 13,945.63 ha in 2014. When determining the area of land confiscated by the road transport infrastructure, the area of roadway of motorways, motorway feeder roads, expressways, feeder roads for expressways, the 1st class roads, the 2nd class roads and the 3rd class roads were taken into consideration.

In 2014, the area of land confiscated by the railway infrastructure was 11,727.26 ha, which is an increase of 0.9% (105.19 ha) compared to 2013. However, this change in the area of land does not represent a real increase in land confiscation. It occurred in connection with the proprietary arrangement of land areas under the transport infrastructure and due to securing land areas for the purposes of infrastructure modernization (modernization of tracks – corridors). Confiscation of land by the air infrastructure was 1,533.4 ha in 2014, which is an increase of 18.8 ha (1.3%) compared to 2013.

In the development of the area of land confiscated by the water infrastructure, no important changes were recorded, and from 2008 the area has been 185.07 ha.

5.4.2. Impact of transport on the environment

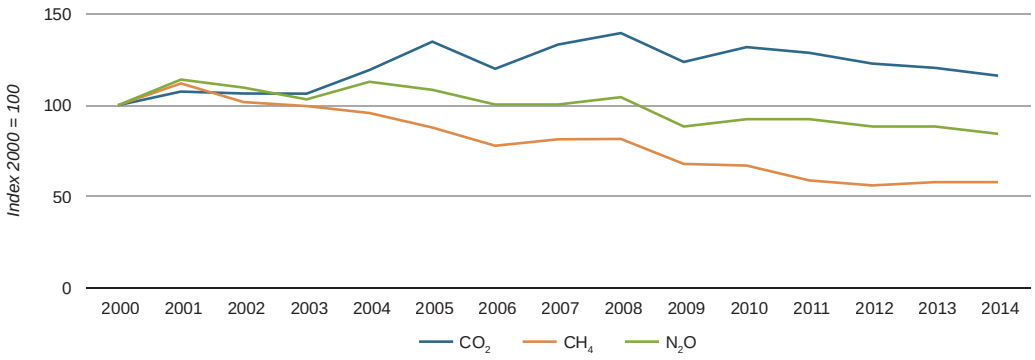
Transport in relation to the environment is a source of emissions (either of basic pollutants or greenhouse gases), noise and vibrations, it produces pressure on land and influences the area arrangement, causes health and security risks. The air pollution with emissions contributes considerably to the global worldwide environmental problems, such as the climate change. The sector of transport is one of important actors of energy problems and problems of the environment, as it is one of the biggest consumers of fossil energy sources.

5.4.2.1. Greenhouse gas emissions from transport

The development of the production of greenhouse gas emissions from transport is influenced by the unfavourable road transport (especially by the individual car transport), mainly by an increase in its transport outputs and propellant consumption.

In the monitored period of 2000–2014, in spite of their fluctuating character, CO_2 emissions developed unfavourably. Throughout the monitored period, CH_4 and N_2O emissions decreased. CO_2 emissions increased by 16.2% in this period, in spite of year-on-year increases and decreases. In the monitored period, N_2O emissions decreased by 15.7%, in spite of a more considerable increase in 2004. The most positive development was seen for CH_4 emissions; their decrease was 42.1% in 2014 compared to 2000.

Development of greenhouse gas emissions from transport



Source: SHMI

In terms of the individual types of transport, it is possible to state that the total greenhouse gas emissions from transport are mirroring emissions from road transport. In the monitored period of 2000–2014, CO_2 emissions from this type of transport increased by 55.1%, CH_4 emissions decreased by 34.3%, and N_2O emissions got to the level of 2000. In the railway transport, greenhouse gas emissions had the same course, and in 2014 – in spite of a year-on-year increase - they accounted for a half of emissions of 2000. The biggest fluctuation in greenhouse gas emissions were seen in the air transportation. The increase was registered in 2000–2008, and after 2008 emissions decreased considerably and in 2009–2014 they were approximately at the level of 2000. CO_2 emissions in water transport recorded a multiple increase in 2010–2014.

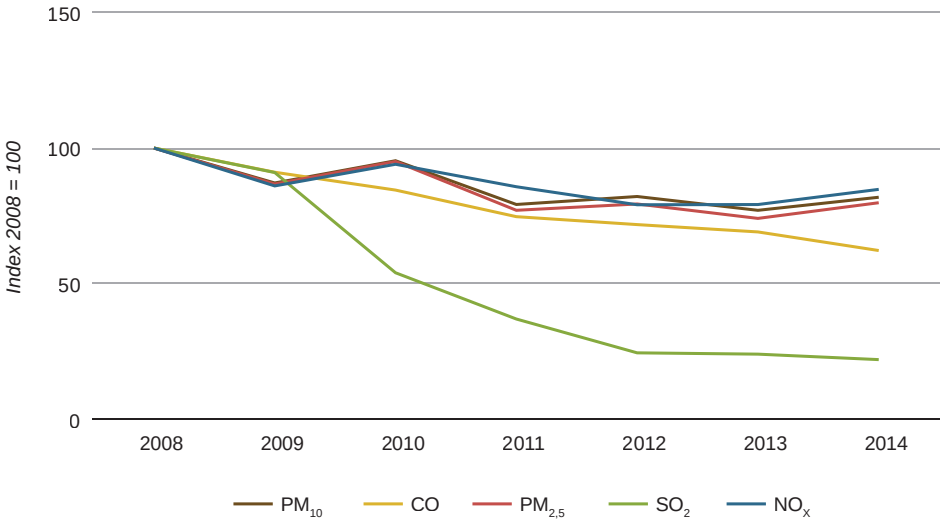
5.4.2.2. Emissions of main pollutants from transport

Transport also participated in the production of main pollutant emissions (SP, SO_2, CO, NO_X and NMVOC) and the production of heavy metal emissions (Cu, Pb, Zn). Since 1990, the SR has been performing the regular annual complex stocktaking of the production of emissions of some selected pollutants that also includes the annual stocktaking of the operation of road, railway, water and air transportation. For determining the quantity of production of the individual monitored harmful substances, the CORINAIR methodology is applied, used in the EU countries, whose special programme product COPERT is intended for stocktaking of the annual production of emissions from the road transport. In 2008, COPERT IV started to be used in processing emissions from the road transport, and all values of emissions from 2000 were recalculated according to this programme.

In the monitored period of 2008–2014, main pollutants emissions saw a decrease – CO emissions of 37.8% and NMVOC of 35.5%, SO_2 emissions of 78.21%, SP (solid pollutants) emissions of 20%, and NO_X emissions of 15.3%.

The following shares were important in the total emissions of reviewed pollutants in 2014: 6.9% share of transport in CO emissions, 34.1% share of NO_X, and 2.7% share of NMVOC. In the total emissions in 2014, solid pollutants (SP) participated with 3.7% and SO_2 emissions with 0.08%. The share of non-exhaust emissions of PM_{10} and $PM_{2.5}$, making up a large part of the total emissions of PM_{10} and $PM_{2.5}$ from vehicles, was 3.7% of $PM_{2.5}$ and 3.9% of PM_{10}.

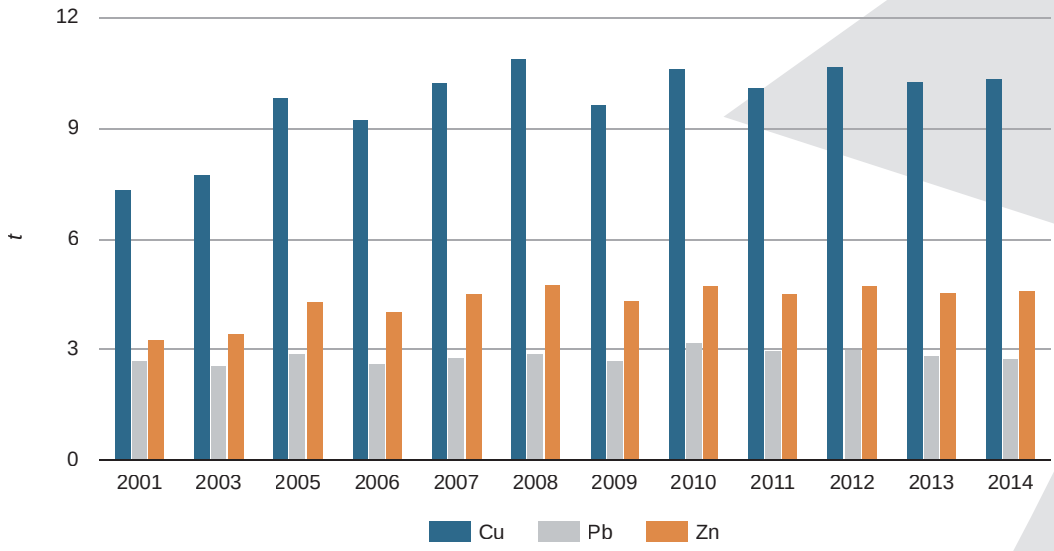
Development of emissions of main pollutants from transport



Source: SHMI

In the monitored period of 2001–2014, heavy metal emissions had a fluctuating character with minimal year-on-year increases and decreases. The share of transport in the total heavy metal emissions is approximately 7.8%, while in 2014 the biggest share in heavy metal emissions produced by transport related to copper – 20.9%, zinc – 6.4%, and lead – 4.8%.

Balance of heavy metal emissions in the sector of transport



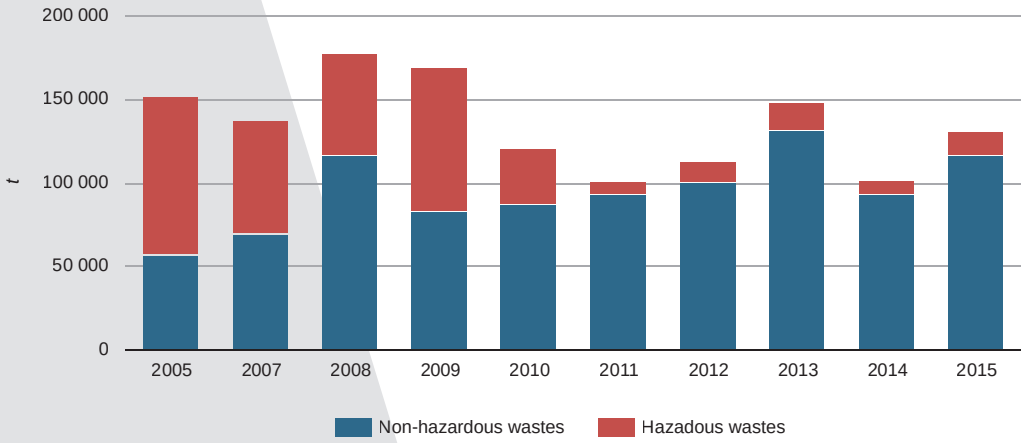
Source: SHMI

5.4.2.3. Waste from transport

The sector of transport is one of important (although small in comparison with the other economic sectors) sources of waste origination, of which many types have dangerous properties. In the sector of transport and communications, 130,144 tonnes of waste were produced in 2015, of which 13,596 tonnes were hazardous wastes and 116,548 tonnes were non-hazardous wastes. The total volume of produced wastes decreased by 14.1% compared to 2005.

Waste produced by transport with a negative impact on the environment includes waste from petroleum products (lubricants, propellants), affecting the pollution of soil and surface water unfavourably. A considerable part of waste from discarded means of transport is waste from discarded road motor vehicles and trailers. Analyses of the waste composition show that waste from discarded road vehicles mainly consists of ferrous metals (65 – 80%), non-ferrous metals (6 – 6.5%), tyres (4 – 5%); ferrous metals (88 – 90%), non-ferrous metals (5.6 – 8.2%), accumulators (1.5 – 4%) prevail in waste from discarded rail vehicles. With respect to the type of waste (metal, municipal waste of various types of products from crude oil, sediments from waste water treatment plants, contaminated soil, etc.), the production of waste in the railway transport is solved by recycling, combustion or storing at waste dumps.

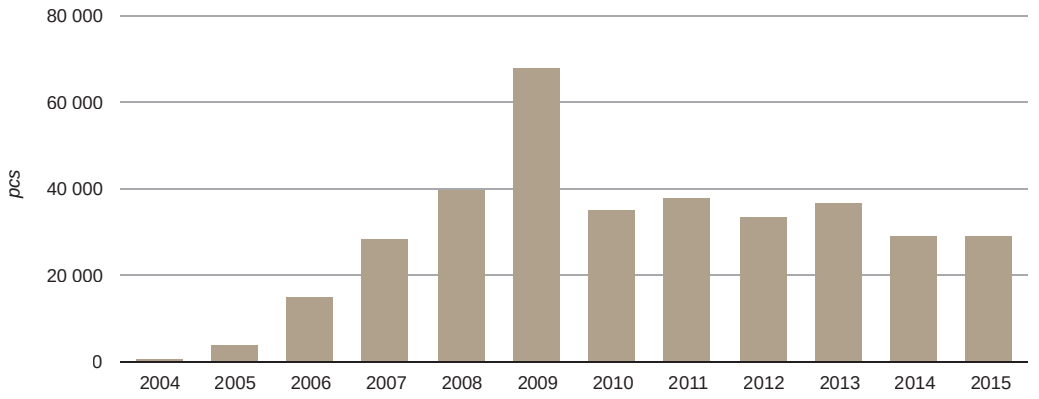
Development of the production of waste in the sector of transport and communications



Source: MoE SR

In the monitored period of 2004–2015, the number of processed old vehicles was increasing in a year-on-year comparison until 2009, when up to 67,795 pieces were processed. After this year, it had already a fluctuating trend with a decrease in 2015, while around 35,000 pieces of old vehicles is processed on average each year. In 2015, collection and processing of old vehicles were carried out by 37 processing entities to whom the authorisation was awarded for processing old vehicles.

Development of old vehicle processing



Source: MoE SR

5.4.2.4. Noise load of inhabitants

The Directive 2002/49/EC of the European Parliament and of the Council concerning assessment and management of environmental noise requires drawing up of noise maps, and Act No 2/2005 Coll. on noise assessment and control in the external environment was passed on its initiative. In accordance with the purpose of the aforementioned Directive, noise from road transport, railway transport, air transportation and industrial activities of large-area noise sources in the territory are monitored in regular 5-year intervals.

Based on the evaluation of conflict plans, in 2011 the following numbers of inhabitants were living in sections of the 1st class roads administered by the Slovak Road Administration (SRA): 84,700 inhabitants with the exceeded action value L_{den} = 60 dB; 108,400 inhabitants with the exceeded action value L_{night} = 50 dB; 43,600 inhabitants with the exceeded action value L_{den} = 65 dB, 60,300 inhabitants with the exceeded action value L_{night} = 55 dB.

Based on the evaluation of conflict plans, in 2011 the following numbers of inhabitants were living around motorways and expressways administered by the National Motorway Company (NMC, Inc.): 16,900 inhabitants with the exceeded action value L_{den} = 60 dB, 31,700 inhabitants with the exceeded action value L_{night} = 50 dB; 3,800 inhabitants with the exceeded action value L_{den} = 65 dB, 6,700 inhabitants with the exceeded action value L_{night} = 55 dB.

By evaluating conflict plans, in 2011 it was ascertained in the Bratislava agglomeration that out of the total number of 494,546 inhabitants, the following number of inhabitants were living as follows: 64,000 inhabitants in flats with the exceeded action value of the noise indicator L_{den} = 65 dB from transport on roads, 23,900 inhabitants from transport on railways, and 200 inhabitants from transport at the M. R. Štefánik Airport. With the exceeded action value L_{night} = 55 dB, 50,800 inhabitants were living from transport on roads, 34,900 inhabitants from railway transport, and no inhabitant is exposed to air transportation.

Based on the evaluation of conflict plans, in 2011 the following number out of the total number of 231,917 inhabitants were living in the Košice agglomeration (registered for permanent residence): 16,300 inhabitants with the exceeded action value of the noise indicator L_{den} = 65 dB from transport on roads and 2,000 inhabitants from transport on railways. With the exceeded action value L_{night} = 55 dB, 16,700 inhabitants were living from transport on roads and 4,400 inhabitants from the railway transport.

When planning a new transport infrastructure, noise studies are conducted in order to minimize noise load of inhabitants, and sound barrier walls are built. In 2013, NMC, Inc., registered 78 sound barrier walls on motorways, which were 44,033.2 m long, and 29 sound barrier walls on fast highways, which were 19,003.8 m long. In 2014, NMC, Inc.,constructed sound barrier walls that were 184 m long.

In the case of SRA, administering the 1st class roads, in 2011–2015 sound barrier walls were built, which were 1,217.6 m long. In 2014–2015, one construction was carried out on which sound barrier walls were built, i.e. the construction of Road I/75 Galanta – bypass, the 3rd structure, which was 648.0 m long.

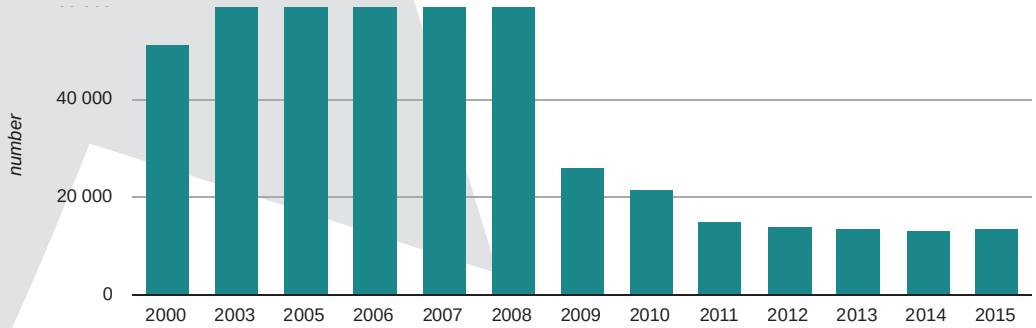
In the railway transport in 2013–2014, 7,751.5 m of sound barrier walls were constructed on modernized routes.

5.4.2.5. Number of accidents and number of killed and injured persons due to traffic operation

Direct impacts immediately affecting the human population and all components of the environment also include the transport accident rate. The transport accident rate in extravilan sections is mainly connected with the car transport. In intravilans, the pedestrian transport has also a considerable share. With the increased transport accident rate, direct costs related to elimination of damages are not the only ones growing, but there are also costs of the medical care. The risk of environmental accidents also increases, in particular in the areas with worsened transport conditions (mountain crossings) and areas that are important from the biological and hydrologic perspective (protected territories, protected water management areas).

In the monitored period of 2000–2008, the number of accidents had a fluctuating character and fluctuated at the level of 60,000 accidents each year. Since 2009, the number of accidents has seen a decreasing trend (due to legislative changes), and by 2015 it decreased by 47.8%. A decrease was also recorded in the number of killed persons and persons with both light and severe injuries. More legislative changes, modification of the Highway Code and making sanctions stricter for their breach as well as legislation regulating safety of vehicles also contributed to the decrease in the number of accidents.
The number and occurrence of accidents is influenced considerably by the quality of transport infrastructure. The number of accidents in the railway transport in 2009–2015 fluctuated at the level of approximately 90 accidents per year.

Number of traffic accidents



Source: SO SR
Note: After 2009, there was a change in methodology

Deterioration of the water quality and fire rate

In connection with accidents, there is mainly leakage of crude oil substances (diesel oil and oils) into the surroundings of transport road, from where leaked substances can subsequently get into a watercourse or the rock environment where they can cause pollution of underground water. Road transport have the biggest share in extraordinary deterioration of water.

In 2015, there were 122 cases of extraordinary deterioration of water (EDW), of which 40 (32.8%) were caused by transport, among which three by railway transport and 37 by road transport, while 18 were caused by the Slovak carriers and haulers. Such EDW are much more dangerous if they occur in protective zones of waterworks sources of groundwater, natural healing sources, natural sources of mineral water or watercourses.

A considerable risk factor in the environment is also the fire rate. In 2015, there were 1,185 fires in the sector of transport with direct material damages amounting to EUR 5,583 thousand, in which 10 persons were killed and 22 persons were injured.

5.5. What is the response of the society to mitigating or compensating negative consequences of transport on the environment?

High requirements are laid on transport in terms of high quality and quick ensuring of transportation of persons and goods. In spite of the development of information and communication technologies, growth of the inhabitants' ability to move and growth of costs, conditioned by growth of economic activities and growth of the standard of living of inhabitants, continues to be obvious. Demands of solving theoretical and practical problems of transport efficiency results in the requirement to pay attention to efficiency issues also in the individual stages or parts of the chain in transport research – development – use.

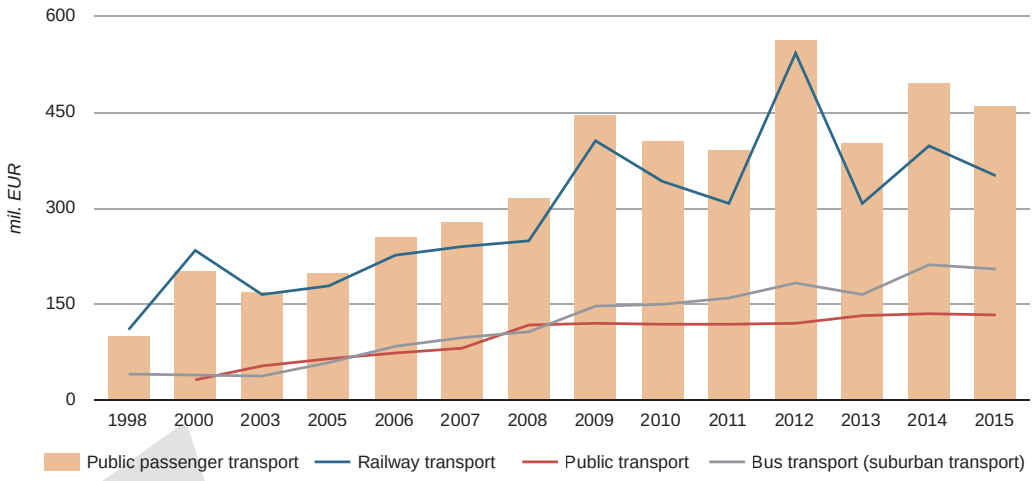
The response of the society to mitigating or compensating negative consequences of transport on the environment is described on the basis of the indicators from the group of political, economic and social aspects.

5.5.1. Subsidies of the state to the sphere of public passenger transport

With respect to a continuing lack of funds in the state budget of the SR, it is inevitable to adopt the procedure that is based on the professional methodology based on economic foundations for providing subsidies to the public passenger transport. However, subsidies received by carriers from the state budget for compensation for losses from implementation of outputs in the public interest are insufficient for the provided extent of outputs, and they are deepening, from year to year, the bad economic situation of carriers. The extent of the network and transport possibilities of the line bus transport and railways passenger transport are fundamentally influenced by financial possibilities of public budgets. From the perspective of financing the regular public passenger transport it is necessary to meet the principle of subsidizing of only outputs concluded under contracts in the public interest.

In the monitored period of 2000–2015, subsidies from the state budget were increasing until 2012, and after this year they had a fluctuating character. In 2012, the highest amount of subsidies was provided EUR 563.74 million. For the whole period, subsidies from the state budget increased by 119.5% by 2015. In 2012, funds growing most considerably, or most funds from the state budget were channelled to the railway public passenger transport (subsidies increased by 123% compared to 2000). The lowest amount of funds were recorded in 2012, intended for PT, but, still, these subsidies were many times higher than in 2000. In 2015, subsidies recorded a year-on-year decrease and reached to the level of 2010.

Development of subsidies from the state budget to the public transport



Source: SO SR

5.5.2. Fuel prices and taxes on fuel

Long-term trends of the crude oil market in the Slovak Republic did not change in 2015 in terms of the demand structure. The total demand was mainly concentrated on diesel oil and petrol. The LPG market maintained the character of the marginal market, in spite of the exemption from the excise tax of 2008.

The development of the average prices of motor fuels saw an increase of 13% in 2015 compared to 2000, in spite of a fluctuating trend in the monitored period of 2000–2015. Prices of diesel oil and petrol increased until 2008. A more considerable decrease in prices was recorded in 2009 as a consequence of the economic crisis, and after this year prices were again increasing until 2012, when they reached their highest value. In 2009–2012, prices of motor fuels increased by approximately 39.2%, while they have been recording year-on-year decreases since 2012. A decrease in prices in 2012–2015 was approximately of 18%.

The sign of the year 2010 was a strike of car carriers at the beginning of the year and a subsequent decrease in the excise tax on crude oil of 9 cents. In 2011, VAT increased to 20%, the contribution to emergency crude oil supplies was added, and the zero excise tax on bio components in fuel was cancelled, which was also generally reflected in the fuel prices.

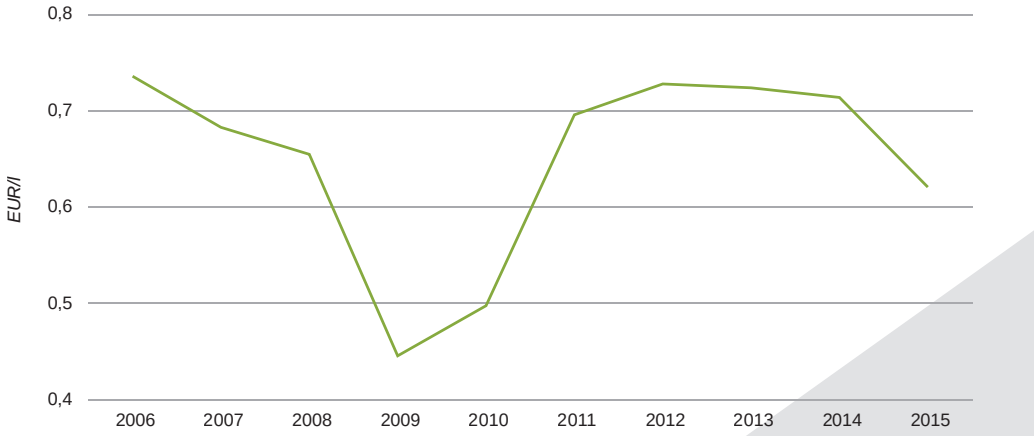
At present, taxation of fuels and excise taxes on mineral oils is regulated in Act No 98/2004 Coll. on excise tax on mineral oil. In the event of reflecting an increase in the tax rate into the propellant and fuel prices, it is also possible to expect an increase in goods and services prices, into which propellant and fuel prices are reflected.

The LPG prices fluctuated at the level of EUR 0.710/l, while a more considerable decrease in the price was recorded in 2008–2010, when they were at the level of EUR 0.40–0.60/l. In 2015, the LPG price decreased to EUR 0.621/l.

Development of the average prices of motor fuels in the Slovak Republic

Source: SO SR

Development of the LPG average prices



Source: SO SR

5.5.3. Costs of the environmental protection in transport

In the monitored period of 2009–2015, costs of enterprises for the environmental protection in transport recorded considerable year-on-year increases and decreases, and in 2015 they reached EUR 5,013 thousand only. They were made up of both investment and current costs.

In 2015, the costs of the environmental protection in transport accounted only for 0.85% of the total costs spent for the environmental protection, while they were 7.8% in 2009.

In the monitored period of 2009–2015, investment in the environmental protection had a fluctuating character, while their highest value was recorded in 2009 – EUR 34,258 thousand. In 2015, investment in the environmental protection was approximately at the level of 2014.

In the monitored period of 2009–2013, current costs of the environmental protection fluctuated at the level of EUR 12,000 thousand. In 2015, they reached the value of EUR 2,392 thousand only.

Costs of the environmental protection in transport and total costs of enterprises in the environmental protection industry

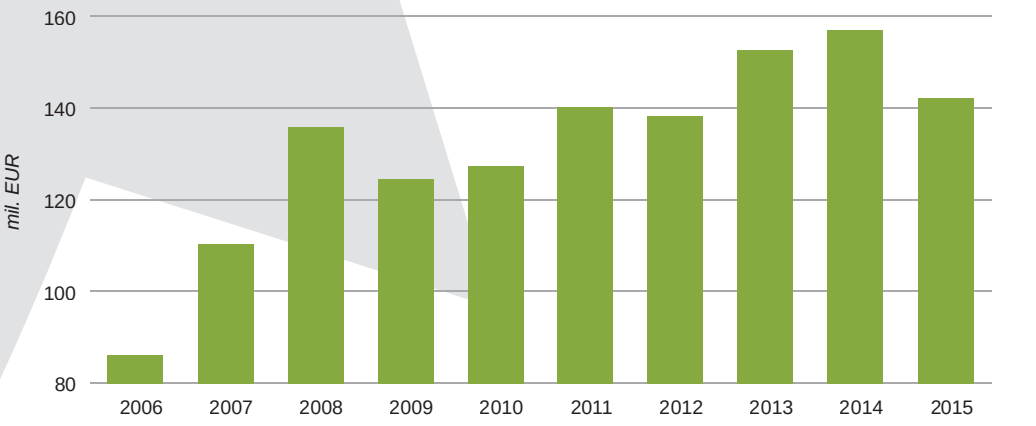
Source: SO SR

5.5.4. Tax on transport

The tax on transport is one of the taxes with an environmental aspect, which is a tax, the tax base of which is made up of a physical unit (or a replacement of a physical unit) of something which has a negative impact on the environment. According to the Regulation of the European Parliament and of the Council (EU), taxes with the environmental aspect are made up of taxes on energy products, taxes on transport, taxes on pollution, and taxes on resources. In more EU countries, including the SR, fees are applied instead of some taxes with the environmental aspect.

In 2015, the tax on transport reached the amount of EUR 142.34 million and in comparison with 2006 it increased by 65.1%. The share of the tax on transport in GDP reached 0.2% of GDP in 2015, and it decreased by 0.01% in comparison with 2006. The share of the tax on transport in the total tax incomes reached 0.6% in 2015, and it decreased by 0.09% in comparison with 2006.

Development of tax on transport



Source: SO SR

5.5.5. Assessment of impacts of proposed activities on the environment in transport

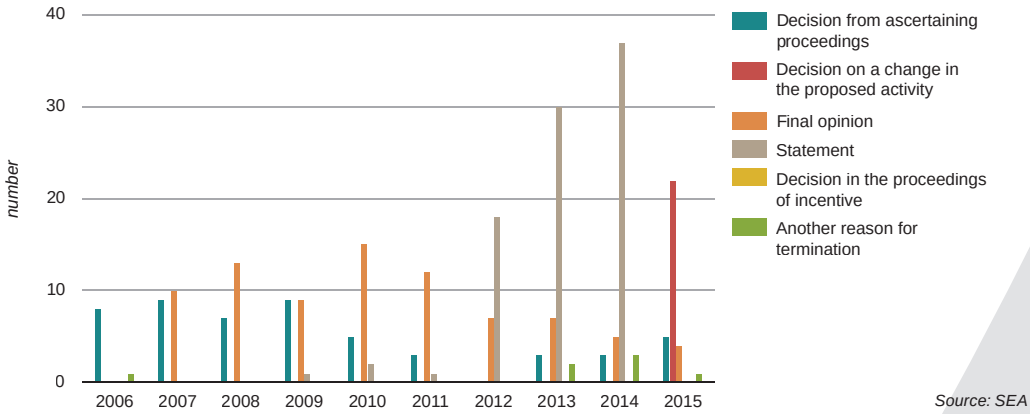
At present in Slovakia, there is the process of assessment of impacts of proposed activities before decision on their placement or before their permit is legislatively regulated by the Act No 24/2006 Coll. on environmental impact assessment and on amendments to certain acts.

In accordance with Annex No 8 of the Act, the sector of transport is assessed on the basis of Table No 13 Transport and telecommunications – with 16 items of activities, buildings and facilities, of which 13 address transport, transport structures (item Nos 13.1 to 13.13).

From 2006 to 2015, the following construction structures, buildings and facilities were assessed by the individual items of activities in the EIA process:

- 1 activity included under trade ports, wharfs for loading and unloading that are fixed to land, and external ports (except for railway landing stages),
- 1 activity included in the item for parking stations (railway yards),
- 2 activities classified as locomotive and wagon depots,
- 3 inland watercourses and ports, including port facilities for inland water transport,
- 12 activities classified as railway stations, terminals a) passenger b) mixed (freight + passenger) c) establishing d) freight, transshipment points of combined transport e) container transshipment points f) border crossing,
- 14 activities classified as the item of activities of construction of airports with the main taking-off and landing tracks,
- 18 activities classified for construction of aboveground and underground railways,
- 19 EIA processes regarding electric tracks, suspension tracks or similar tracks of a special kind and trolleybus tracks,
- 28 activities classified as activities of construction of road bridges (on the 1st and the 2nd class roads) and railway bridges,
- 38 activities classified as the 1st and the 2nd class roads and reconstruction or extension of the existing 1st and 2nd class road connected with a change in the category inclusive,
- 139 EIA processes according to the item- motorways and fast highways, including buildings.

Overview of the number of activities with the terminated EIA process according to the type of proceedings conducted in the sector of transport



Source: SEA

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AGRICULTURE

List of the sector indicators in agriculture

Trends of the sector relevant for the environment
◀ Structure of agricultural land use
◀ Vegetable and livestock production
◀ Consumption of commercial fertilizers and pesticides
◀ Final energy consumption in agriculture
◀ Share of agriculture in GDP formation
Interactions of the sector with the environment (demands of the sector in respect of resources and impacts of the sector on the environment)
◀ Water consumption in agriculture
◀ Balance of nitrogen and phosphorus in agricultural land
◀ Waste water from agriculture
◀ Waste from agriculture
◀ Soil reaction of agricultural land
◀ Erosion of agricultural lands
◀ Greenhouse gas emissions from agriculture
◀ Emissions of main pollutants from agriculture

Political, economic and social aspects
◀ Ecological agricultural production
◀ Costs of the environmental protection in agriculture
◀ Payments for agricultural land confiscation
◀ Assessment of impacts of proposed activities on the environment in agriculture
◀ Integrated prevention and control of the environmental pollution in agriculture

According to the Statistical Classification of Economic Activities (SK NACE Rev. 2), agriculture is included in the Section A – Agriculture, forestry and fishing.

It is included in the following division:
01 – Crop and animal production, hunting and related service activities

6.1. Summary assessment of the development in the sector of agriculture

What is the state and directing of the agriculture in relation to the environment?

Since 2000, the area of agricultural land has been continually decreasing, including arable land, mainly for the benefit of built-up areas.

In comparison of 2000–2015, a decrease in all monitored breeding species of animals was recorded. In the given period, the production of most agricultural crop plants had an increasing trend, except for potatoes and perennial fodder, which contributed to an increase in commercial fertilizers and pesticide consumption in the recent years. The biggest consumption was consumption of nitrogen fertilizers and – as far as pesticides are concerned – of herbicides.

The development of the final energy consumption of fuels, electricity and heat in agriculture recorded a decreasing trend in 2001–2015.

What are interactions of agriculture and the environment?

Demands of agriculture in respect of resources

Surface water consumption makes up a larger part of water used in agriculture, while their total volume decreased in 2000–2015.

Impact of agriculture on the environment

Due to an increase in fertilization with nitrogen fertilizers, a positive balance of nitrogen on agricultural lands was recorded in 2007–2015.

From 2004, the quantity of waste water discharged from agriculture decreased, except for some years, also in spite of growing vegetable production.

The total production of waste from agriculture had a fluctuating character from 2005.

Comparing results of the monitoring cycle (2000–2005) of the agrochemical soil testing and the last terminated cycle (2006–2011) points out to the fact that even if the share of soil with a mildly acid soil reaction decreased, the share of soil with an acid soil reaction increased.

Due to incorrect farming, there can be erosions of agricultural land. In the Slovak Republic, agricultural lands are potentially threatened by water erosion of various intensity. Wind erosion is not a serious problem in our country, soil light in terms of granularity is usually threatened by it.

Even in spite of the fact that greenhouse gas emissions from agriculture have recorded an increasing trend in the recent years, their value has decreased since 2000.

In 2008–2014, the total NH_3 emissions from agriculture recorded mainly a fluctuating trend.

Development of decoupling in the agriculture

From 2000 to 2015, absolute decoupling was largely achieved or relative decoupling for greenhouse gas emissions, discharged waste water and GDP of agriculture, which we can consider to be a positive trend. As far as the other monitored indicators are concerned, such as waste, ammonia emissions and water consumption in agriculture, it is difficult to speak of decoupling, as due to frequent changes in their trend many times there were periods without reaching decoupling.

What is the response of the society to mitigating or compensating negative consequences of agriculture on the environment?

In 2000–2015, the area of land in the ecological agricultural production recorded an increasing trend, except for some years, when it decreased slightly.

Costs of the environmental protection in agriculture decreased compared to 2009–2015.

Payments for agricultural land confiscation for the purpose of its use mainly for non-agricultural purposes in 2009–2015 recorded a fluctuating trend, while they were at a higher level in 2015 than in 2009.

6.2. How are the environmental principles and targets related to agriculture implemented into the strategic documents?

6.2.1. Implementation of environmental principles and targets related to agriculture into the strategic documents at the EU level (the most important documents)

1999	***Agenda 2000*** Publishing 20 documents with respect to the reform of the single agricultural policy and cohesion of the economic and social policies so that it is adaptable after the Union extension to the environment, legislation simplification, efficiency of the structural funds and the Cohesion Fund.
2002	***The Sixth Environmental Action Programme of the EU "Environment 2010: Our Future, Our Choice"*** Target – ensuring the high level of the environmental protection while taking into consideration a variety of conditions in the individual regions of the Community and achieving weakening of the relation between the economic growth and environmental pressures caused by this growth. The key priority objectives in relation to agriculture were: 1st Priority: Climate change, and 4th Priority: Natural resources and waste.

2002	***Towards a thematic strategy on soil protection, Towards a thematic strategy on the sustainable use of pesticides*** Elaboration of targets and taking measures in relation to the Sixth Environmental Action Programme in the sphere of soil protection and sustainable use of pesticides.
2003	***Mid-term reform of the EU's Common Agricultural Policy (CAP)*** Interrupting the connection between subsidies and production. Farmers receive support under the condition that they farm agricultural land and meet the standards relating to food safety, the environmental protection, animals' health, and good living conditions.
2004	***Action plan for organic food and farming*** Defining importance of the task of this form of agriculture and steps for its application.
2005	***Rural Development Policy 2007 – 2013*** (Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development) The EU's Rural Development Policy, which is the second pillar of the CAP (the Common Agricultural Policy), strives to create a coherent and sustainable framework for the rural area development. In accordance with this Regulation, the rural development policy was focused on the following three themes (thematic axes) in 2007 to 2013: – improvement of competitiveness of the sector of agriculture and forest management, – improvement of the environment and landscape, – improvement of the quality of life in rural areas and the support of rural farming diversification.
2006	***Renewed EU sustainable development strategy*** The overall objective of the renewed STUR EU was determining and developing measures that would enable the EU to achieve the permanent improvement of the quality of life of both current and future generations by creating sustainable communities able to use resources efficiently and manage them and use the potential for both ecological and social innovation of the economy, thus ensuring prosperity, environmental protection and social cohesion.
2010	***Europe 2020: Strategy for smart, sustainable and inclusive growth*** The strategy basis includes three mutually complementary priorities: – Smart growth: creating a knowledge- and innovation-based economy. – Sustainable growth: supporting a greener and competitive resource-efficient economy. – Inclusive growth: supporting an economy with a high employment rate that will ensure social and territorial cohesion. The Strategy has brought seven flagship initiatives; while the especially important initiatives out of them from the perspective of increased competitiveness and sustainability of the EU agriculture are: Innovation Union, A Resource-Efficient Europe, and New Skills for New Jobs.
2011	***Roadmap to a Resource Efficient Europe*** Specification of targets that will have to be achieved for ensuring the effective resource utilization.
2011	***Energy Roadmap 2050*** Comparing various scenarios of decarbonising of the energy system and methods of ensuring energy supplies and competitiveness by 2050, including the use of biomass as a renewable energy source.

2011	***Roadmap for moving to a competitive low-carbon economy in 2050*** Defining milestones by 2050, the plan of possible measures for their achieving (decreasing greenhouse gas emissions by 2050 of 80%), including measures concerning sustainable methods of increasing productivity and land use.
2011	***Our life insurance, our natural capital: an EU biodiversity strategy to 2020*** Target – reversing biodiversity loss and speeding up the EU's transition towards a resource-efficient and green economy. It includes six targets, while the following targets are mainly relevant for agriculture: 3, 4, 5 – strengthening a favourable contribution of agriculture and forest management to decreasing key pressures on biodiversity in the EU.
2012	***Renewable Energy: a major player in the European energy market*** Defining the spheres where it is necessary to increase intensity of efforts by 2020 in order to increase further energy generation from the EU renewable sources by 2030 as well as in the following years, so that technologies of renewable energy sources are less expensive, more competitive and finally market-oriented, and stimuli are provided for investing in energy from renewable sources. Renewable sources also include biomass, the production of which has a direct impact on agriculture.
2012	***Blueprint to safeguard Europe's water resources*** Target – ensuring sustainability of all activities that have the impact on water, and thus ensuring accessibility of high-quality water for its sustainable and fair utilization. It contains the requirement to include more largely the policy targets in water management in the sector policies.
2013	***Political agreement on new direction for Common Agricultural Policy (CAP)*** Long-term strategic targets: – supporting competitiveness of agriculture, – ensuring sustainable management with natural resources and measures in the sphere of climate, – achieving balanced territorial development of rural farms and communities, including creation and maintaining jobs. The CAP in relation to the environment: All member states, all territories and all farmers will contribute to solving the challenge, i.e. sustainability and fighting against the climate change, by means of simple measures with an apparent positive reach. In 2014 to 2020, more than EUR 100 billion is invested in order to help agriculture to face challenges concerning the quality of soil, water, biodiversity, and climate change: – "Greening": 30% of direct payments will be linked to three environmentally-friendly farming practices: crop diversification, maintaining permanent grassland and conserving 5%, and later 7% of areas of ecological interest as from 2018 or other measures considered to have equivalent favourable environmental benefits. – At least 30% of the rural development programmes' budget will have to be allocated to agri-environmental measures, support for biological farming or projects associated with environmentally friendly investment or innovation measures. – Agri-environmental measures will be stepped up to be complementary greening practices. These programmes will have to set and meet higher environmental protection targets (guarantee against double funding).

2013	***The Seventh Environmental Action Programme of the Union to 2020 "Living Well, Within the Limits of Our Planet"*** The key feature of the Programme is the protection and improvement of natural capital, support of better utilization of current resources and accelerated transition to a low-carbon economy. The Programme is to support the sustainable growth, creating new jobs, and thus make the EU a healthier and better place for living. The key Priority Objectives in relation to agriculture are: Priority Objective 1: Protection, preserving and improving the Union's natural capital. Priority Objective 2: Make the EU a resource-efficient, low-carbon, green and competitive economy. Priority Objective 6: Ensuring investment in the policy in the sphere of the environment and climate and solving environmental externalities. Priority Objective 7: Improving involvement of environmental issues and policy cohesion.
2013	***Rural Development Policy 2014 – 2020*** (Regulation of the European Parliament and of the Council (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005) Three long-term strategic targets: – supporting competitiveness of agriculture, – ensuring sustainable management with natural resources and measures in the sphere of climate, – achieving balanced territorial development of rural farms and communities, including creation and maintaining jobs.
2014	***Green Action Plan for Small- and Medium-Sized Enterprises (SMEs): Enabling SMEs to turn environmental challenges into business opportunities*** Target – contributing to reindustrialisation of Europe by supporting the development of enterprises while taking into consideration the environmental protection in all European regions, in particular with respect to the fact that there are considerable differences in efficient resource utilization between both sectors and the member states.
2014	***New climate-energy package by 2030*** Bridging the targets 20-20-20 with the vision of the low-carbon economy in 2050. Achieving cutting greenhouse gas emissions by 2030 by 40% compared to 1990, an increase in the share of RES in the energy mix of the EU to 27% (the target is binding only at the EU level), reducing energy consumption by 27% (the non-binding target) and the new target is to increase interconnection of energy networks of the member states to 15%. In addition, the framework includes the key reform of the EU Emissions Trading System.
2014	***Action Plan for the Future of the Organic Production in the EU*** Together with forthcoming changes in the legislative framework, the ambition of the action plan is the support of this sector's growth, in particular by examining new medium- and long-term possibilities of solving challenges in the sphere of supply and demand. The action plan contributes to meeting targets defined in the Strategy Europe 2020 and the CAP. With respect to the fact that the general target of the ecological production is the environmental protection, the action plan also contributes to the fulfilment of targets of the Seventh Environmental Action Programme.

6.2.2. Implementation of environmental principles and targets related to agriculture into the strategic documents at the SR level (the most important documents)

2001	***National sustainable development strategy*** Setting priorities and targets of the sustainable development. Strategic objectives: 20. Development of integrated model of farming, 24. Decreasing energy and raw material demands and increasing efficiency of the economy of the SR, 25. Decreasing the share of using non-renewable natural resources with rational use of renewable resources, 26. Reducing the environmental burden of the environment, 27. Mitigating consequences of the global climate change, the ozone layer depletion and natural disasters, 28. Improving the quality of the environment in regions.
2001	***Principles of the State Land Policy*** Declaring the access of the state to land and defining the principles for its protection and use.
2003	***Mid-term concept of the agricultural policy for 2004 – 2006: Agriculture*** Defining long-term strategic objectives: 3. Supporting the function of agriculture in the protection and preserving natural resources (in particular, soil and water), maintaining biodiversity and cultural values of the landscape, maintaining settlement and infrastructure of the rural area and in creating other non-commodity outputs for the benefit of the whole society, 4. Preserving agricultural use of land in areas with unfavourable production conditions to such extent so that it fulfils its landscape-forming, environmental and social functions, 5. Ensuring the permanent viability of the rural areas in the complex of their economic, settlement, environmental and recreational functions.
2003	***Concept of using renewable energy sources (RES)*** Creating the basic framework for the development of RES utilization in the Slovak Republic.
2004	***Concept of using agricultural and forest biomass for energy purposes*** Balancing possibilities of agricultural biomass for direct use in the agricultural production as well as submitting proposals for using biomass in the production of electrical and thermal energy.
2005	***Action plan of the sustainable development in the Slovak Republic for 2005 – 2010*** Defining main targets, including agriculture, concretized for the individual sectors. They include measurable indicators, deadlines, determination of responsibility for their fulfilment and methods of their financing.
2005	***National programme of biofuels development*** Defining indicative targets expressed by reference values for the period of 2006–2010, creating stimulation economic and legislative conditions for meeting the indicative targets specified in Directive No 2003/30/EC of the European Parliament and of the Council on the promotion of the use of biofuels or other renewable fuels in transport.

2006	***Energy Policy of the Slovak Republic*** Creating the framework for further direction of the development of electricity industry, thermal energy sector, gas industry, mining, crude oil processing and transport, coal mining and utilization of renewable energy sources.
2006	***Concept of water management policy by 2015*** The strategic objective by 2015: 3.1 Increasing the quality of care of water resources and the related water management infrastructure, including fulfilment of the EU legal regulations. The qualitative protection of surface water: – focusing on solving the most important sources of point pollution caused by public sewerage systems and industrial pollution sources, – restricting production of waste water and pollutants contained therein directly in their producers' place, – reassessment of the current discharge of industrial and municipal waste water in order to prepare measures aimed at ensuring the compliance with the criteria for the protection against discharge of dangerous substances according to the EU regulations, – addressing the protection against pollution with nitrates in cooperation with farmers.
2007	***Concept of agricultural development for 2007 – 2013 – part Agriculture*** The basic long-term target: Strengthening functionality and stability of the rural areas by developing agriculture in all production conditions of Slovakia with rational use, protection and renewal of natural resources, maintaining the cultural landscape and settlement of the rural area.
2007	***Rural Development Programme of the SR 2007 – 2013*** The programme document for drawing funds from the European Agricultural Fund for Rural Development (EAFRD) for 2007–2013. The main priorities also included improvement of the environment and landscape.
2007	***Energy Efficiency Action Plan for 2008 – 2010 (the 1st AP)*** Quantifying targets, defining measures and determining mechanisms for ensuring implementation of proposed measures and their monitoring.
2007	***National programme of cutting emissions of basic pollutants by 2010*** Defining instruments for ensuring the compliance with national emission ceilings specified for the Slovak Republic, both cross-sectionally and for the individual sectors, including agriculture.
2008	***Action plan of biomass use for 2008 – 2013*** Defining measures aimed at implementation of targets in the sphere of biomass use that should have had a considerably positive impact on the environment and should have contributed to the improvement of the quality of climatic conditions, cutting greenhouse gases and diversification of energy resources with increasing energy security.
2009	***Long-term strategy of using agricultural and non-agricultural crops for industrial purposes*** Mapping the possibility to use both agricultural and non-agricultural crops in Slovakia for industrial use minimally by 2015.

2009	***Water plan of Slovakia*** Defining the framework of environmental targets enabling the long-term sustainable water management for: – surface water units, – underground water units, – protected territories dependent on water and measures aimed at their achieving.
2010	***National Action Plan for Energy from RES*** Defining national targets for the share of energy from RES consumed in transport and in the sectors of electricity, heat and cold generation in 2020 and steps aimed at their ensuring.
2011	***Energy Efficiency Action Plan for 2011 – 2013 (the 2nd AP)*** Defining the second transitional indicative target of energy savings in the Slovak Republic for the period of the next three consecutive years, defining measures and financial and legal instruments for achieving the target of energy savings.
2013	***Concept of electricity generation development from small renewable energy sources in the Slovak Republic*** Specifying the comprehensive approach to both legislative and possible financial support for the development of small energy sources that are intended especially for covering the consumption of households without any negative impact on the stability of distribution systems and with the effect of financial savings for operators of small resources as well as for distribution companies.
2013	***Concept of agricultural development of the SR for 2013 – 2020*** Promotion of effective resource utilization in the interest of smart, sustainable and inclusive growth of agriculture and rural areas.
2013	***Strategy for PM_{10} reduction*** Target – achieving and maintaining the good air quality in the whole territory of the Slovak Republic, i.e. such air quality that does not threaten human health and the environment based on the current scientific knowledge. Such measures are defined for achieving this target that concern mainly the local heating, transport and farming on the agricultural land.
2014	***Action plan of agricultural development of the SR for 2014 – 2020*** Specifying the efficient complex of instruments and measures, among other things also for stopping loss of agricultural land, while with its content it completes the Concept of agricultural development of the SR for 2013–2020.
2014	***Rural Development Programme of the SR 2014 – 2020*** The programme document for drawing funds from the European Agricultural Fund for Rural Development (EAFRD) for 2014–2020 by means of a complex of measures grouped around six priorities of the rural development. The strategic focus of the priorities in relation to the environment: Priority 4: Renewal, preserving and strengthening ecosystems that are related to agriculture and forest management. Priority 5: Promotion of effective resource utilization and support of transition to a low-carbon economy resistant to the climate change in the sector of agriculture, food processing industry and forest management.
2014	***Energy Efficiency Action Plan for 2014 – 2016 (the 3rd AP)*** Evaluating targets and measures for energy efficiency in accordance with the previous plans, defining new and continuing measures of energy efficiency for the following period of 2014–2016 with the outlook to 2020.

2014	***Energy Policy of the SR*** Reflecting to the development of the energy policy in the EU. Defining the main targets and priorities of the energy sector by 2035 with the outlook to 2050 in order to fulfil the strategic target, i.e. achieving the competitive low-carbon energy sector ensuring safe, reliable and effective supplies of all forms of energy for reasonable prices, while taking into account the customers' protection and sustainable development.
2014	**Adaptation Strategy of the Slovak Republic on Adverse Impacts of Climate Change** Target – among other things, proposing a complex of appropriate proactive adaptation measures and mechanism for their implementation within sector policies, including agriculture, development strategies and action plans at all levels of the process.
2014	***Updated National strategy of biodiversity up to 2020*** Key target – stopping biodiversity loss and degradation of ecosystems and their services in the Slovak Republic by 2020, ensuring renewal of biodiversity and ecosystems to an appropriate extent and increasing our contribution to stopping biodiversity loss at the global scale. Target C.4 By 2020 implementing measures of the common agricultural policy that are favourable for biodiversity, on all agriculturally used areas in order to improve quantifiably the condition of the protection of species and biotopes.
2014	***Action plan for implementation of measures resulting from the updated National strategy of biodiversity protection by 2020*** Defining 167 tasks contributing to the fulfilment of 6 tasks or 33 measures of the aforementioned national strategy. Sphere C Biodiversity protection in the state policy of agriculture, forest management and fishery management: – Measure C.4.1 Implementing measures with a positive effect on biodiversity, species, biotopes and protected territories with the aim to maximize the contribution of farmers to the biodiversity protection at the national level, – Measure C.4.2 Supporting areas with traditional mosaic ways of farming of the agricultural landscape, especially in historically differentiated landscape types of Slovakia, – Measure C.4.3 Identifying species and biotopes dependent on the method of farming and preparation and implementation of specific measures with the support of specified European funds for improving the condition of their protection, – Measure E.8.1 Ensuring improvement of instruments for biodiversity protection, removing contradicting policies and provisions in acts, harmful stimuli and strengthening supporting measures of integration and positive motivation for the biodiversity protection in all sectors.
2015	***Water plan of Slovakia*** Defining the framework of environmental targets enabling the long-term sustainable water management for: – surface water units, – groundwater units, – protected territories dependent on water, including measures aimed at their achieving.
2015	***Programme of water management in the Slovak Republic for 2016 – 2020*** The main target of waste management of the SR by 2020 is minimizing negative effects of waste origin and handling on human health and the environment.

6.3. What is the state and directing of agriculture in relation to the environment?

Agriculture is an important part of the national economy of the state. Farming is performed on nearly a half of the territory of Slovakia, and it is the human activity occupying the largest territory of the SR. The situation in the Slovak agriculture is considerably influenced by scientific and technical progress as well as the political and economic situation in the country. By means of indicators characterizing the main trends in agriculture, it is possible to characterize the condition and development of agriculture in Slovakia.

The further direction of agriculture, mainly in relation to the environment, is considerably influenced by the EU's Common Agricultural Policy (CAP) that went through a major reform in 2013, which was also reflected in adopting national strategic documents.
The main target of the new Slovak Rural Development Programme for the 2014 – 2020 period is creating conditions for the sustainable agricultural development. An increased emphasis will be laid especially on improving the condition of the environment and landscape in accordance with introducing new environmentally-friendly farming practices, efficient resource utilization, mitigating the climate changes and adapting to the climate, increasing the quality of life in rural areas, rural farming diversification, improving competitiveness of the agri-food sector by innovations, increasing production effectiveness and quality while keeping the principles of ecologisation of farming in the rural areas.

The state and directing of agriculture in relation to the environment is characterized based on the indicators from the group of trends of the sector relevant for the environment.

6.3.1. Structure of agricultural land use

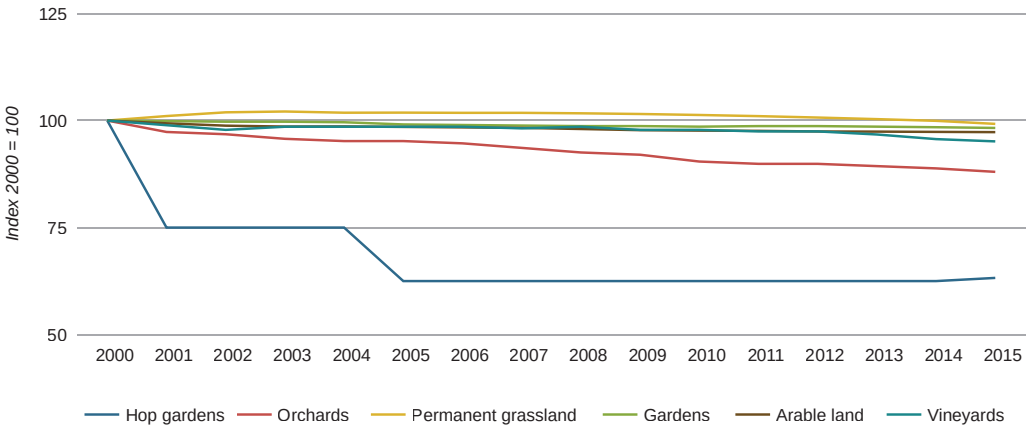
In 2015, the total area of agricultural land in the Slovak Republic was 2,389,616 ha. The biggest part of this area was made up of arable land (59.1%) and permanent grassland (35.9%). On the contrary, the lowest share was related to hop gardens (0.02%), orchards (0.7%), vineyards (1.1%), and gardens (3.2%). In 2000 – 2015, the area of agricultural land decreased by 2.1% (-51,051 ha), while the area of all types of agricultural lands decreased.

Structure of agricultural land (AL) as of 31 December 2015

Land type	Area (ha)	Share in AL (%)
Agricultural land, total	2 389 616	100,00
Arable land	1 411 294	59,07
Hop gardens	511	0,02
Vineyards	26 359	1,10
Gardens	76 287	3,19
Orchards	16 565	0,69
Permanent grassland	858 601	35,93
Total area of the SR	4 903 459	–

Source: GCCA SR

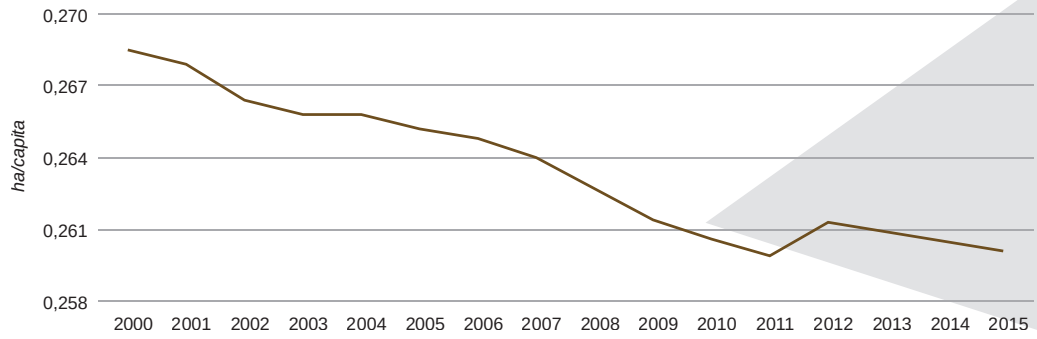
Development of agricultural land structure



Source: GCCA SR

Arable land is a part of the agricultural land fund. The area of arable land per capita was 0.269 ha in 2000 and 0.2601 ha in 2015. This decreasing trend is mainly negative from the environmental perspective if it concerns taking arable land off from the agricultural land fund and subsequent removing to the category of built-up areas.

Development of the area of arable land per capita

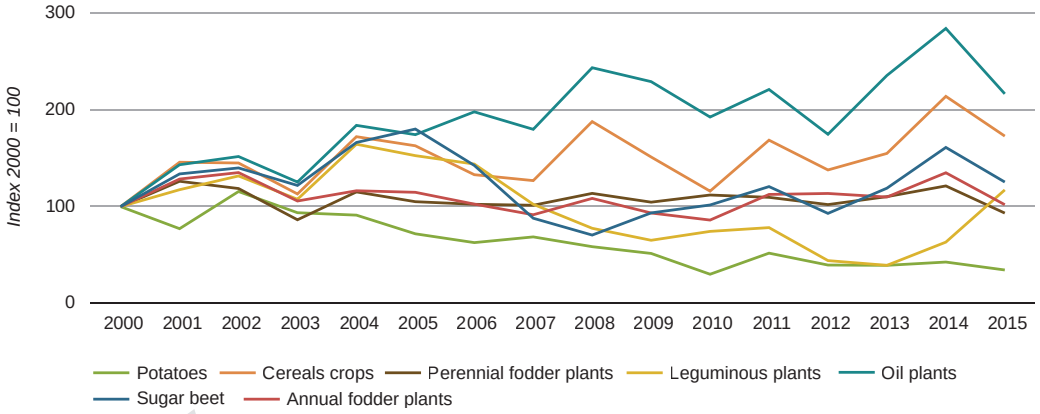


Source: GCCA SR

6.3.2. Vegetable and livestock production

In 2000 – 2015, the production of most agricultural crop plants recorded an increasing trend. A considerable increase was seen mainly in oil plants (116.6%, i.e. +303,033 tonnes) and in cereal crops (72.9%, i.e. +1,604,365 tonnes). On the contrary, the production of potatoes decreased by 65.5% (-274,217 tonnes) and the production of perennial fodder plants by 6.7% (-41,400 tonnes) in the given period.

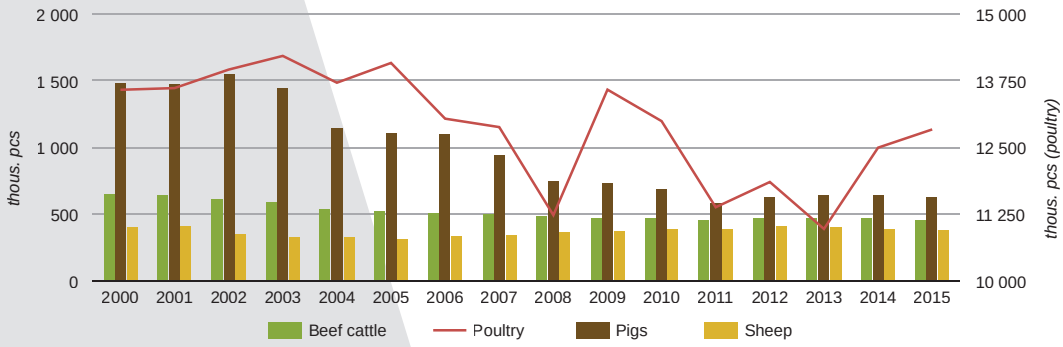
Development of yield of agricultural crop plants



Source: SO SR

In 2000 – 2015, numbers of farm animals recorded decrease in most bred species. In the given period, the number of beef cattle decreased by 29.1%, of pigs by 56.2%, of poultry by 5.5%, and of sheep by 4.3%.

Development of the number of farm animals

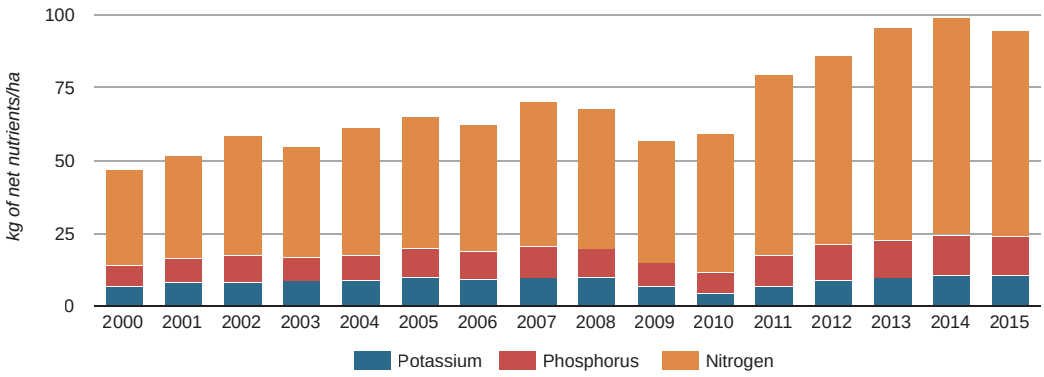


Source: SO SR

6.3.3. Consumption of commercial fertilizers and pesticides

In 2015, the commercial fertilizer consumption in the agricultural production was 94.53 kg of net nutrients per hectare (kg of net nutrients/ha) of agricultural land. In 2000 – 2015, the commercial fertilizer consumption had an increasing trend, with smaller deviations, while the nitrogen fertilizer consumption increased by more than 111.9% (+37.27 kg of net nutrients/ha), the phosphorus fertilizer consumption by 89.6% (+6.45 kg of net nutrients/ha), and the potassium fertilizer consumption by 58.6% (+3.81 kg of net nutrients/ha).

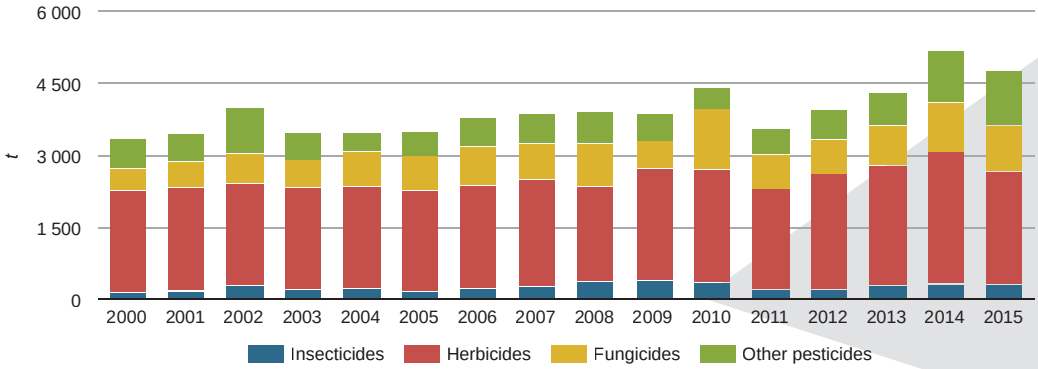
Development of commercial fertilizer consumption per 1 ha of agricultural land



Source: CCTIA

The pesticide consumption in 2015 was 4 773.2 tonnes. From 2000, the pesticide consumption had an increasing course with small deviations in some years. In the individual groups of pesticides, there was an increase in comparison with 2000 and 2015, while the total pesticide consumption increased by 42.6% in the given period.

Development of the pesticide consumption by groups

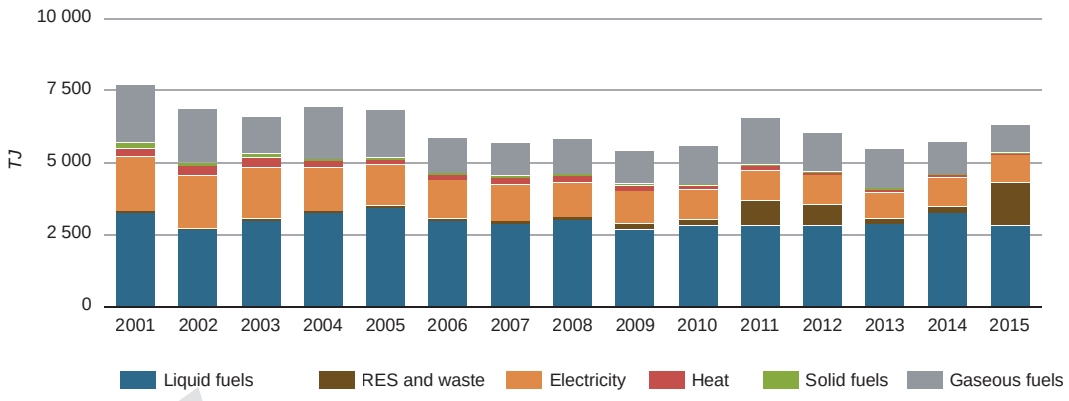


Source: SO SR

6.3.4. Final energy consumption in agriculture

The Final Energy Consumption (FEC) in the sector of agriculture was 6,297 TJ in 2015, which represented 1.6% of the final energy consumption in the Slovak Republic. FEC in the sector of agriculture had predominantly a decreasing course from 2001 to 2015, while the Final Energy Consumption of the following decreased most considerably in the given period: solid fuels (by 94.4%), heat (by 80.8%), electricity (by 50.3%) and gaseous fuels (by 52.1%). A decrease (even more moderate) was also achieved in liquid fuels. On the contrary, the Final Energy Consumption of RES and waste recorded a considerable increase in the given sector in the monitored period.

Development of the Final Energy Consumption of fuels, electricity and heat in agriculture

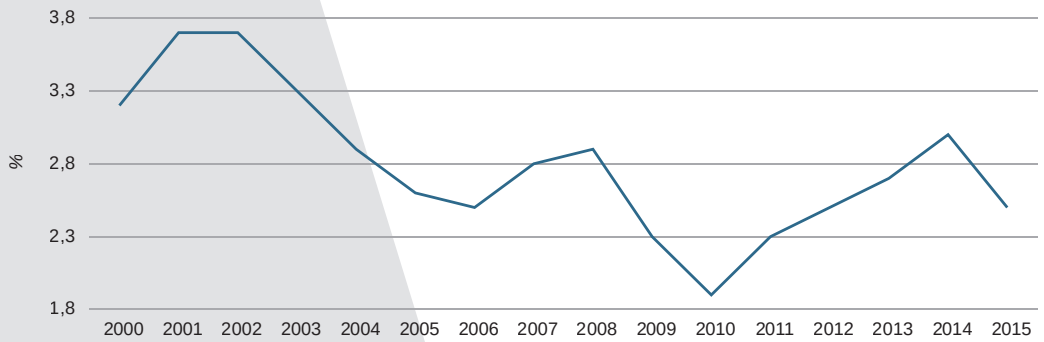


Source: SO SR

6.3.5. Share of agriculture in GDP formation

In 2015, the share of agriculture in the gross domestic product (GDP) of the country was 2.5%. From 2000 to 2015, this share saw a fluctuating trend, while it decreased by 0.7% in the given period.

Share of agriculture in GDP formation



Source: SO SR

6.4. What are interactions of agriculture and the environment?

The following chapter deals with mutual interactions of agriculture and the environment. On one side, the sustainable agriculture is directly dependent on natural resources and their quality, on the other side, agricultural activities represent risks reflected in the quality of the individual components of the environment, such as water, soil, and the air.

Mutual interactions of agriculture and the environment are characterized based on the indicators from the group of interactions of the sector with the environment.

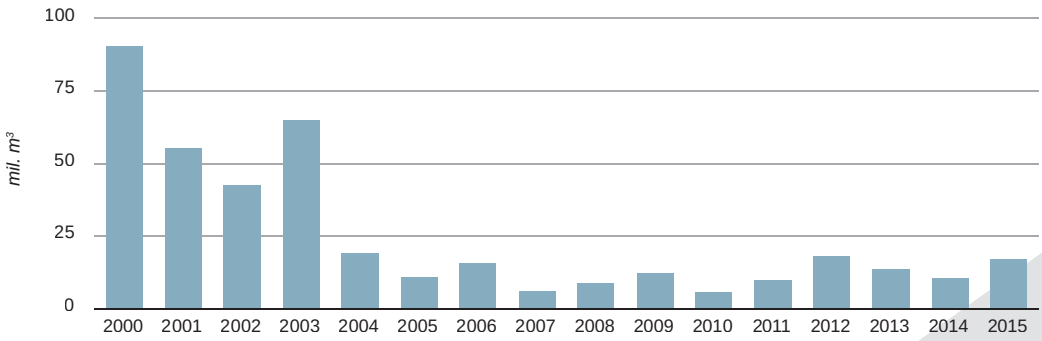
6.4.1. Demands of agriculture in respect of resources

Demands of agriculture in respect of water resources manifest themselves by using water for agricultural purposes. It includes surface water consumption making up a larger part of water used in agriculture and underground water.

6.4.1.1. Water consumption in agriculture

In 2015, the share of surface water used in agriculture was 7% of the total surface water consumption in the Slovak Republic, while 17.27 million m^3 of surface water were consumed in agriculture in the given year, which was a decrease of 76.78% compared to 2000. The highest surface water consumption in agriculture is for the purposes of irrigation that depends on the extent and time distribution of natural precipitation in the vegetation period. Only a small percentage of surface water utilization is intended for other purposes.

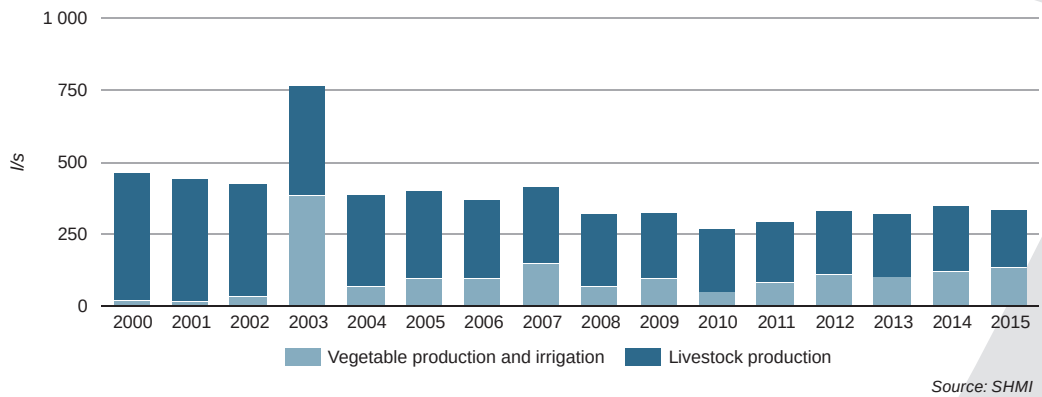
Development of using surface water for irrigation



Source: SHMI
Note: Since 2005, data have been taken from the database of the Summary Water Records

In 2015, the share of underground water used in agriculture was 3.2% of the total underground water consumption in the Slovak Republic. In this year, the underground water consumption in agriculture decreased by 28.06% compared to 2000 to 334.5 l. s^{-1}.

Development of using underground water in agriculture



Source: SHMI

6.4.2. Impact of agriculture on the environment

Processes of intensification and specialization of agriculture considerably contribute to acceleration of environmental problems. In spite of the fact that farmers realize the necessity of the good quality of the environmental components for healthy and effective growing of crop plants and successful breeding of animals, agriculture also impacts negatively and participates in deterioration of their quality.

High concentration of agricultural activities can represent both a point and global resource of water sources pollution. Risks for the water quality include surpluses of nutrients supplied into soil by agricultural activities, waste as well as waste water discharged from agriculture.

Agriculture contributes to the air pollution as well as to the ongoing climate change. It is the biggest producer of ammonia (more than 96% of the total quantity produced in the Slovak Republic). It contributes to the greenhouse gas production, mainly of methane, nitrous oxide; and to a lesser extent of carbon dioxide, and halogen hydrocarbons. On the other hand, agriculture participates in catching of carbon dioxide and its subsequent storing in the form of organic carbon in soil.

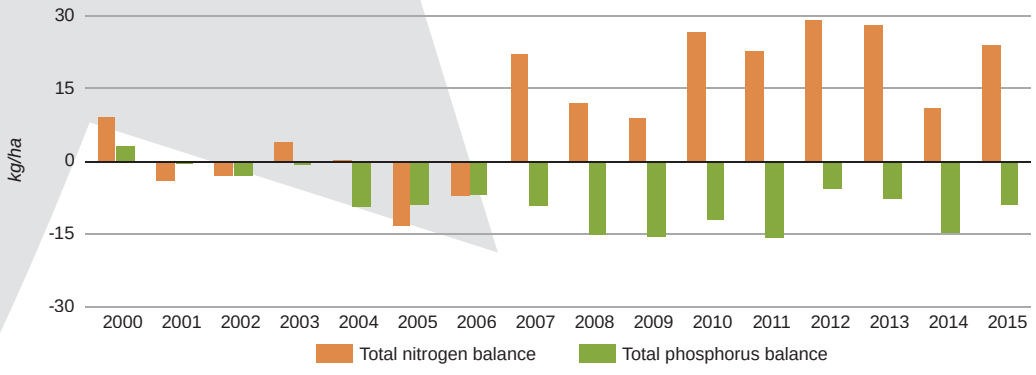
Soil is a non-renewable natural resource that is a necessary precondition of the agriculture functioning. The decisive soil functions include biomass generation, filtration, neutralization, transport and transformation of substances, in particular in the processes of the environmental protection. The quality of agricultural land is influenced by farming systems, which can lead to its degradation processes with incorrect procedures.

The indicators of soil reaction and agricultural land erosion represent risks caused by agricultural activities being reflected in the soil quality. A quick climate change can cause instability of most agricultural and forest ecosystems. The occurrence of sudden intensive storm precipitation in combination with longer periods of droughts considerably impact the occurrence of erosion.

6.4.2.1. Balance of nitrogen and phosphorus in agricultural land

The weight balance of nutrients expresses the difference between the quantity of nutrients supplied into agricultural land and the quantity of nutrients taken away by crop. In 2000 – 2006, the nitrogen balance in agricultural land was mostly balanced. After 2007, its value started to grow, while it was 24.34 kg/ha in 2015. The phosphorus balance in 2000 – 2015 mostly reached negative values, and it was -8.93 kg/ha of agricultural land in 2015.

Total balance of nitrogen and phosphorus in agricultural lands of the SR

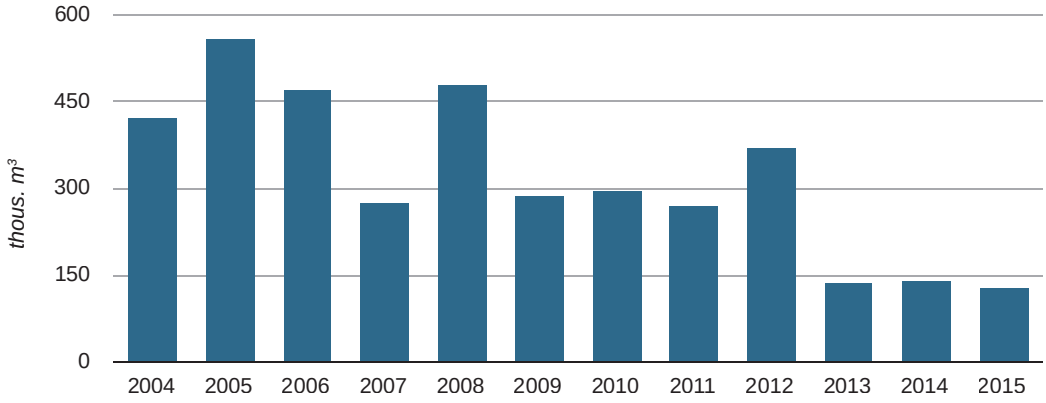


Source: CCTIA

6.4.2.2. Waste water from agriculture

Waste water from agricultural activities represents waste water from vegetable and animal production. It includes excrements of animals; residua of pesticides, artificial fertilizers, nitrates, phosphates. From 2004, the quantity of waste water from agriculture was decreasing, except for some years, when their increased values were recorded.
In 2015, the total amount of 130,217 m^3 of waste water related to agricultural activities were discharged.

Quantities of waste water discharged from agriculture

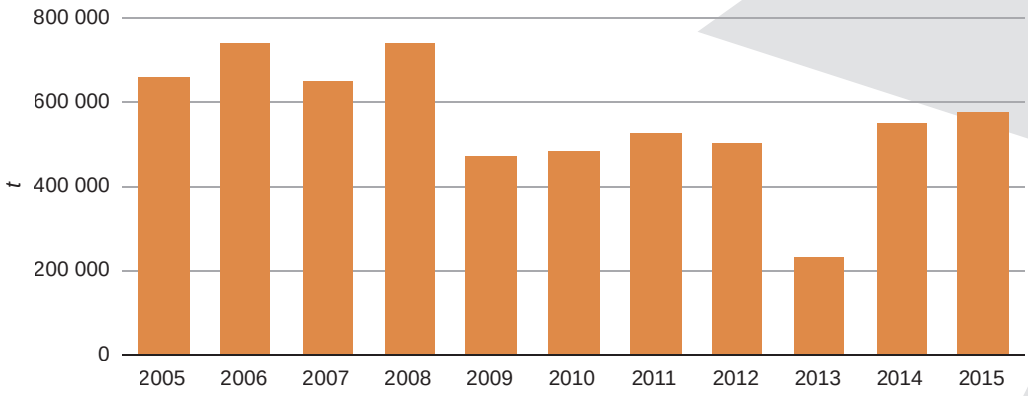


Source: SHMI

6.4.2.3. Waste from agriculture

In 2005 - 2015, the total production of waste from agriculture had a fluctuating character, and when comparing these years, its volume decreased by 12.5%. In 2015, 578,466.92 tonnes of non-hazardous and hazardous waste were produced from agriculture.

Development of quantity of waste produced by agricultural activities



Source: MoE SR

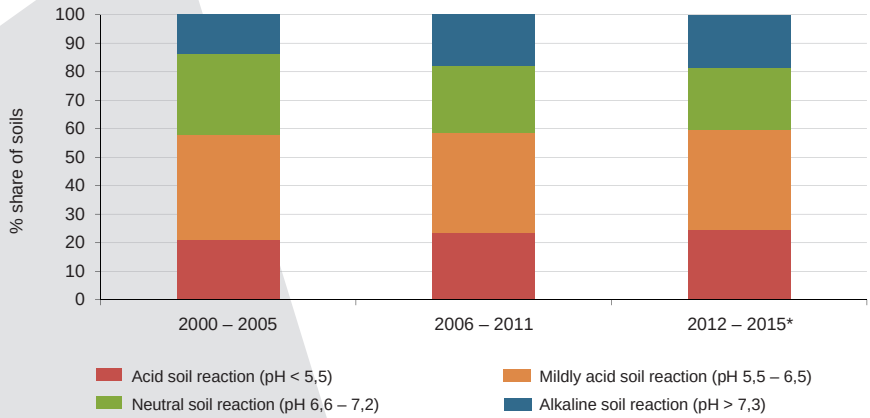
Note: A decrease in the production of waste from agriculture in 2013 was probably caused by including a new provision in section 1 (2) a) of Act No 223/2001 Coll. on waste pursuant to which manure, straw or other natural non-hazardous agricultural or forest material used in farming, forestry or for the production of energy from this material through processes or methods which do not harm the environment or endanger human health have been excluded from the force of the Act on Waste, on the basis of which some persons creating waste failed to include this waste in their reports automatically. However, in many cases it could be the incorrect application of the provision in question, which caused repeated increases in these wastes in 2014.

6.4.2.4. Soil reaction of agricultural land

The spread of soil reaction in agricultural lands is wide and variable in the individual types and subtypes of soils. The soil reaction determines, both directly and indirectly, living conditions for plants and soil microorganisms. It is an indicator of a lot of other important chemical and physical and chemical and indirectly also biological properties of soils, and it conditions largely the ability of trace elements in soils to move. From the perspective of the environmental protection, an increase in areas with an acid soil reaction has an unfavourable connection with an increased mobility of heavy metals in soil.

Even if the share of soil with a mildly acid soil reaction decreased when comparing results of the monitoring cycle (2000 – 2005) of the agrochemical soil testing and the last terminated cycle (2006 – 2011), the share of soil with an acid soil reaction increased by 2.2%.
Partial values processed for the last monitoring cycle (2012 – 2015) indicate that the share of agricultural soil with an acid soil reaction continues to increase.

Distribution of agricultural lands of the SR by soil reaction



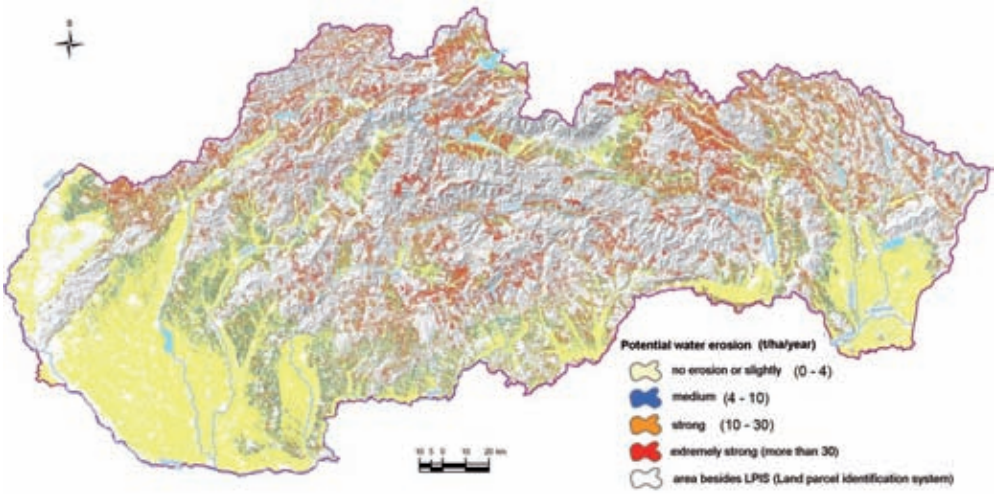
Source: CCTIA
*Note: * partial values – statistically processed years of 2012 – 2015*

6.4.2.5. Erosion of agricultural lands

Soil erosion is one of the important soil degradation processes largely participating in decreasing its quality. The surface, most fertile layer of agricultural land is on the decrease, and thus nutrients, humus (soil organic matter) and decrease in the microbial activity are decreasing. The long-term, intensive impact of erosion processes on soil can even result in complete take-away of fine soil, which finally means decline of soil as such.

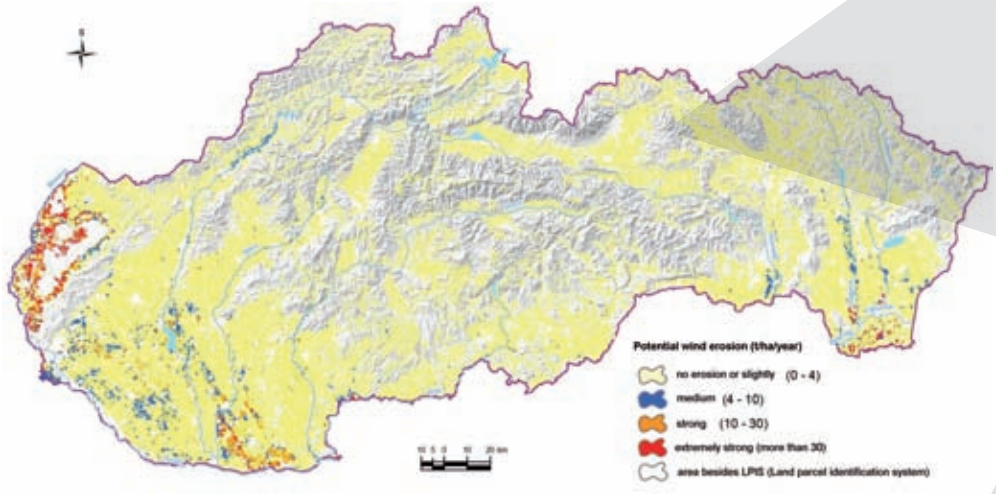
In Slovakia, manifestations of water erosion of various intensity dominate. In 2015, 38.8% (770,388 ha) of agricultural lands were potentially threatened by water erosion. Compared to water erosion, wind erosion is not a serious problem and in the given year 6.9% (137,002 ha) of agricultural lands were potentially threatened. Agricultural land threatened by high and extreme potential water erosion can mainly be found on distinct slopes of mountain and submontane areas.

Potential water erosion on agricultural land in 2015



Source: NAFC - SSCRI

Potential wind erosion on agricultural land in 2015



Source: NAFC - SSCRI

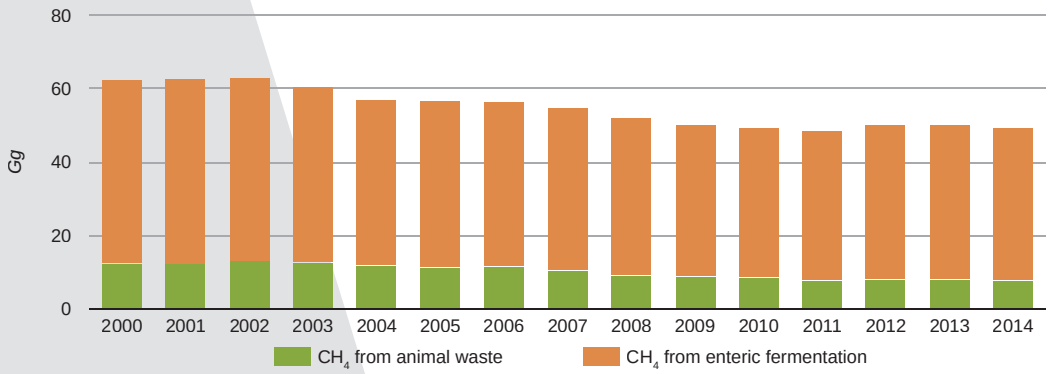
6.4.2.6. Greenhouse gas emissions from agriculture

Agriculture participates in greenhouse gas emissions, mainly methane (CH_4) and nitrous oxide (N_2O). In 2014, emissions produced by agriculture, expressed by CO_2 equivalent, represented an equivalent of only 8% of all greenhouse gas emissions in the Slovak Republic (without including the sector LULUCF), whereby it can be stated that agriculture is only a smaller producer of greenhouse gas emissions.

In 2000 – 2014, greenhouse gas emissions from agriculture were maintained at approximately the same level with small deviations in some years. Compared to 2000, greenhouse gas emissions from agriculture expressed with a CO_2 equivalent decreased by 8.1%.

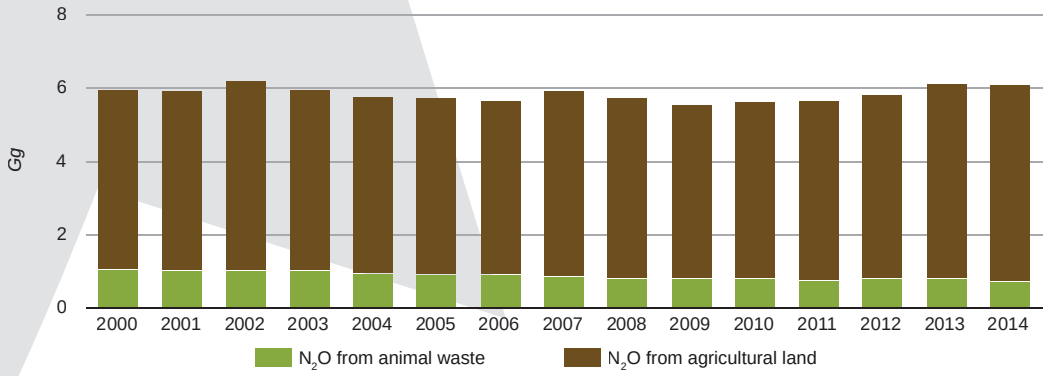
The biggest producers of methane (CH_4) include animal production – factory farming of beef cattle and pigs. Methane arises as a direct product of metabolism in herbivores (enteric fermentation) and as a product of eliminating animal excrements.
The share of agriculture in the total creation of methane was predominantly decreasing from 2000 with respect to reduction of numbers of farm animals. In 2014, 49.45 Gg of methane were produced from agriculture.

Development of methane emissions from agriculture



Source: SHMI
Note: Emissions established as of 15 May 2016

Development of nitrous oxide emissions from agriculture



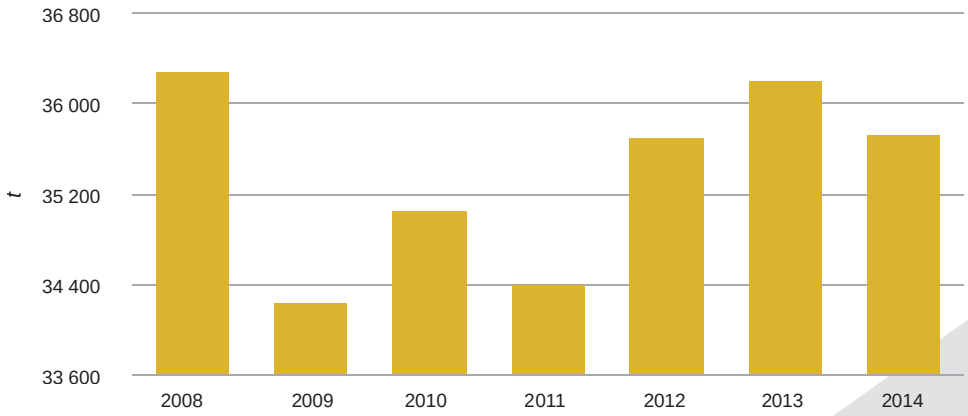
Source: SHMI
Note: Emissions established as of 15 May 2016

The main source of nitrous oxide (N_2O) is vegetable production – surpluses of mineral nitrogen in soil (a consequence of intensive fertilization) and unfavourable air regime of soils (thickening of soils). The nitrous oxide production from agriculture had mostly a balanced course after 2000. In 2014, 6.1 Gg of nitrous oxide were produced from agriculture.

6.4.2.7. Emissions of main pollutants from agriculture

Agriculture (growing of crop plants and breeding of animals, hunting and the related service activities) is the biggest producer of ammonia (NH_3) out of all sectors. The total ammonia emissions in agriculture consist of emissions from the animal production and lands used for agriculture. The decisive ammonia producer is the animal production – breeding of farm animals, mainly its intensive form. In 2008 – 2014, NH_3 emissions from agriculture saw a fluctuating trend, while 35,732.5 tonnes of ammonia were produced in 2014, which accounted for 96.7% of the total ammonia emissions in the Slovak Republic.

Development of NH3 emissions from agriculture



Source: SHMI

CO emissions from agriculture accounted for 0.07% share in the total CO emissions in 2014 and in comparison with 2008 their increase of 141.4% was recorded. In 2014, 165.95 tonnes of CO emissions were produced from agriculture.

SO_2 emissions from agriculture accounted for 0.2% share in the total SO_2 emissions in 2014, and in comparison with 2008 their increase of 358% was recorded. In 2014, 107.31 tonnes of SO_2 emissions were produced from agriculture.

NO_x emissions from agriculture accounted for 4% share in the total NO_x emissions in 2014 and in comparison with 2008 their increase of 42% was recorded. In 2014, 3,401.85 tonnes of NO_x emissions were produced from agriculture.

In 2014, emissions of non-methane volatile organic compounds (NMVOC) from agriculture accounted for 18.8% share in the total NMVOC emissions, and compared to 2008 their increase of 0.8% was recorded. In 2014, 19,814.81 tonnes of NMVOC emissions were produced from agriculture.

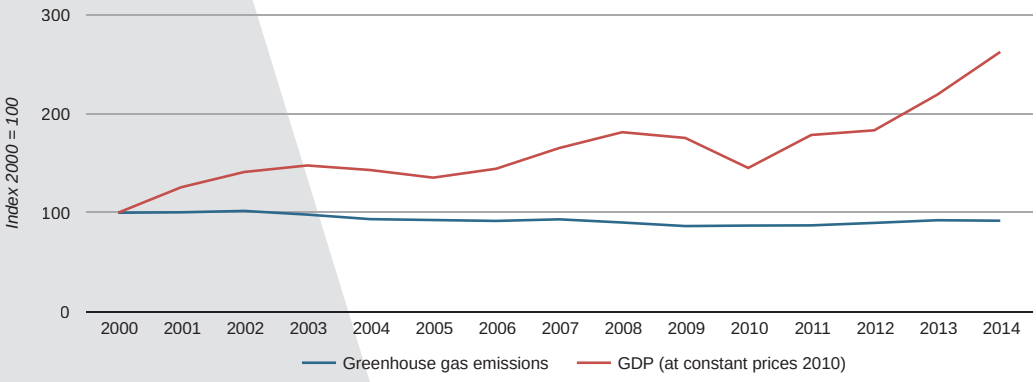
PM_{10} emissions from agriculture accounted for 8.6% share in the total PM_{10} emissions in 2014, and they increased by 10.5% compared to 2008. In 2014, 3,154.63 tonnes of PM_{10} emissions were produced from agriculture. $PM_{2.5}$ emissions from agriculture in 2014 accounted for 0.9% share in the total $PM_{2.5}$ emissions, and compared to 2008 they increased by 20.1%. In 2014, 272.54 tonnes of $PM_{2.5}$ emissions were produced from agriculture.

6.4.3. Development of decoupling in the sector of agriculture

Successfulness of implementing the environmental policy in agriculture is characterized by decoupling, i.e. splitting curves of the gross domestic product of agriculture and of the given environmental indicator with negative consequences for the environment.

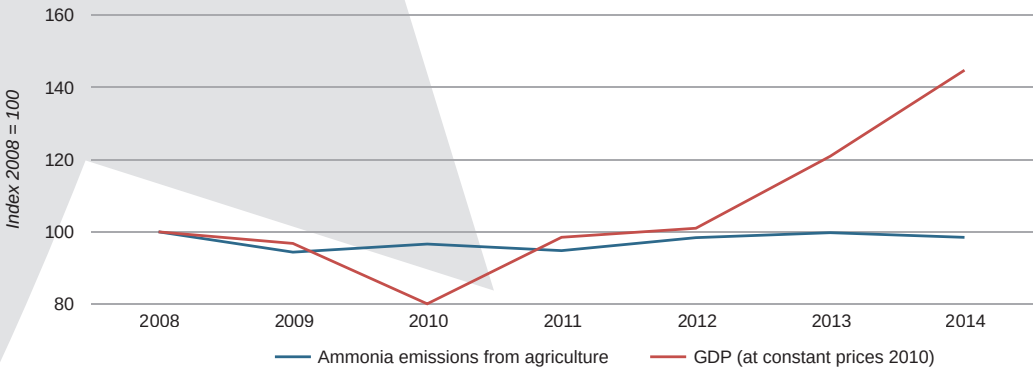
In 2000 – 2009, absolute decoupling of greenhouse gas emissions and GDP of agriculture was largely achieved. This positive effect was mainly caused by a decrease in emissions, in particular due to decreasing numbers of farm animals. There was no decoupling of the monitored indicators in 2009 – 2010, and from 2010 their relative decoupling was recorded only due to a repeated increase in greenhouse gas emissions from agriculture.

Development of decoupling of greenhouse gas emissions from agriculture and GDP of agriculture



Source: SHMI, SO SR

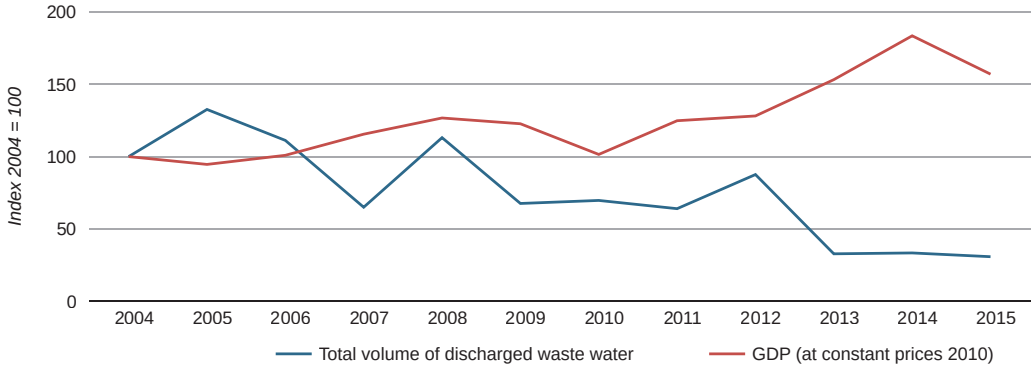
Development of decoupling of ammonia emissions from agriculture and GDP of agriculture



Source: SHMI, SO SR

With respect to an uneven course of curves of the monitored indicators in 2008 – 2012, it is difficult to speak of their mutual decoupling. Relative decoupling was achieved since 2012 and absolute decoupling of ammonia emissions was achieved in the last monitored year from agriculture and GDP of agriculture.

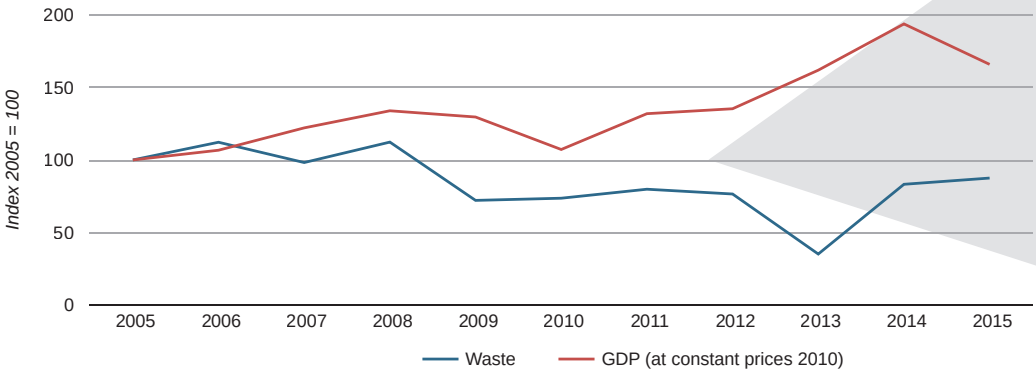
Development of decoupling of the total volume of discharged waste water from agriculture and GDP



Source: SHMI, SO SR

In 2004 – 2015, relative or absolute decoupling of the monitored indicators was achieved, except for the years when GDP of agriculture was decreasing.

Development of decoupling of the total volume of waste produced from agriculture and GDP

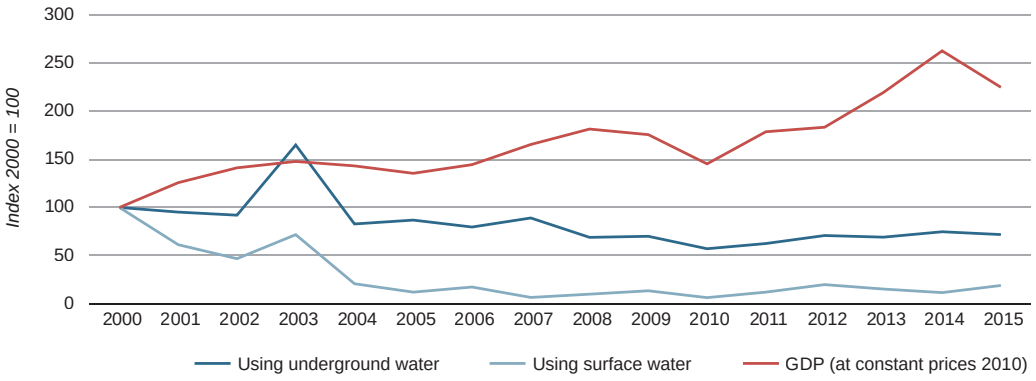


Source: MoE, SO SR

Note: A decrease in the production of waste from agriculture in 2013 was probably caused by including a new provision in section 1 (2) a) of Act No 223/2001 Coll. on waste pursuant to which manure, straw or other natural non-hazardous agricultural or forest material used in farming, forestry or for the production of energy from this material through processes or methods which do not harm the environment or endanger human health have been excluded from the force of the Act on Waste, on the basis of which some persons creating waste failed to include this waste in their reports automatically. However, in many cases it could be the incorrect application of the provision in question, which caused a repeated increase in these wastes in 2014.

In 2005 – 2015, with respect to an uneven course of curves of the total volume of waste produced from agriculture and GDP of agriculture, it is difficult to speak of decoupling.

Development of decoupling of using water in agriculture and GDP of agriculture



Source: SHMI, SO SR

When comparing economic and environmental indicators of using underground and surface water, such periods alternate when their relative or absolute decoupling occurs. The exception to this positive development only includes the years when GDP of agriculture was decreasing.

6.5. What is the response of the society to mitigating or compensating negative consequences of agriculture on the environment?

Mitigating negative impacts of agriculture on the environment is supported by introducing agri-environmental measures, financial compensations and funds spent for the environmental protection.

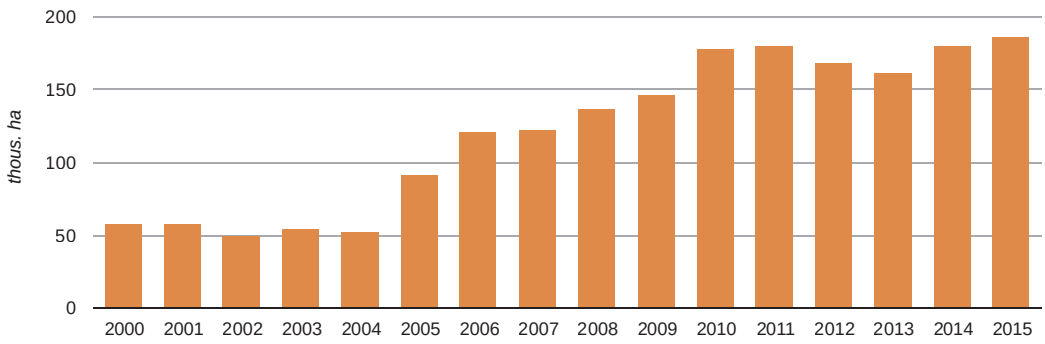
The response of the society to mitigating or compensating negative consequences of agriculture on the environment is described on the basis of the indicators from the group of political, economic and social aspects.

6.5.1. Ecological agricultural production

One of the targets of the Common Agricultural Policy is supporting agricultural procedures beneficial for the climate and environment. By not using chemical products for the protection of plants, by restricting the use of allowed fertilizers and following multi-species sowing procedures, the ecological agricultural production considerably contributes to meeting these targets. It contributes positively to maintaining employment in the rural areas, ensures the production of local bio products and bio foods.

In 2015, the total number of 416 entities farming on the area of 186,483 ha of agricultural land were registered in the ecological agricultural production system in the Slovak Republic. In 2000 – 2015, the area of land with such farming recorded an increasing trend and it increased by 128,143 ha in the given period.

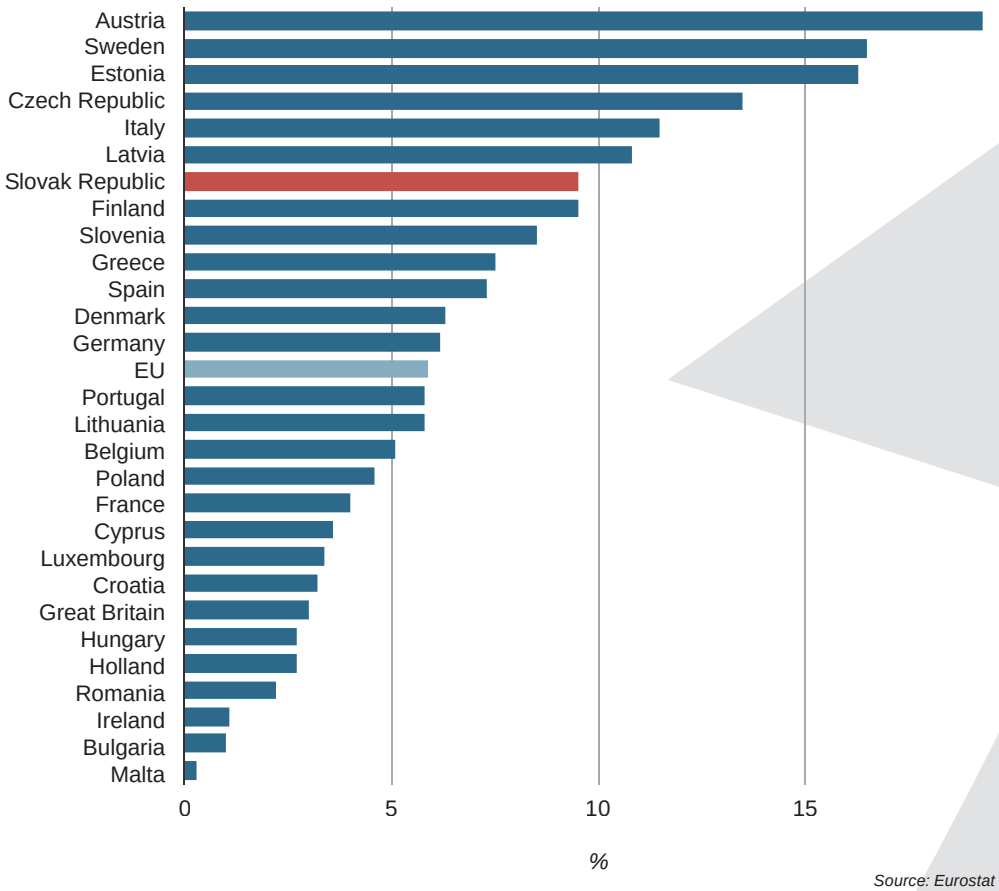
Development of agricultural land area in the ecological agricultural production



Source: CCTIA

In comparison with the other EU countries conducted in 2014, Slovakia is in the seventh place in terms of the share of land with farming in the ecological agricultural production.

International comparison of the share of land area in the ecological agricultural production in 2015

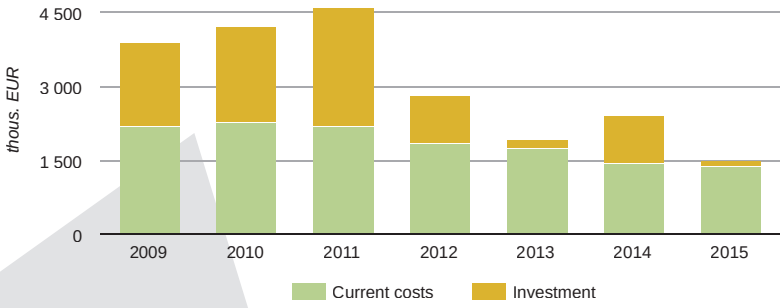


Source: Eurostat

6.5.2. Costs of the environmental protection in agriculture

The total costs of the environmental protection in agriculture are the total sum of current and investment costs of enterprises with 20 employees and more. The costs of the environmental protection in agriculture had an increasing trend in 2009 – 2011; it started decreasing after 2011 and it was EUR 1,500 thousand in 2015.

Costs of the environmental protection in agriculture



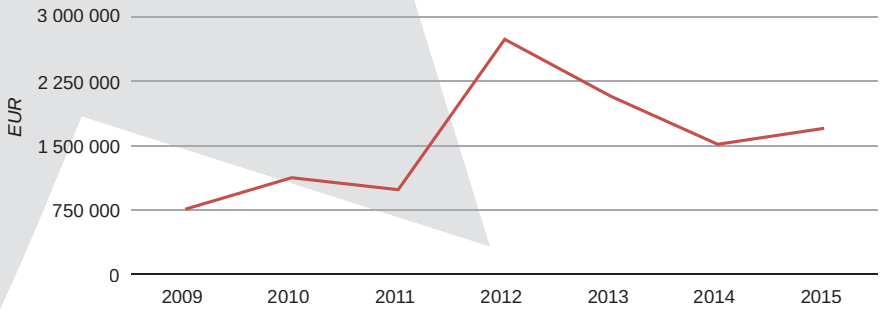
Source: SO SR

6.5.3. Payments for agricultural land confiscation

The anthropogenic pressure on soil causes agricultural land losses, especially for the purposes of construction, which is a negative phenomenon from the environmental perspective. Payments for agricultural land confiscation for the purpose of its use mainly for non-agricultural purposes were introduced from January 2009 by the amendment of Act No. 220/2004 Coll.

The payments for permanent and temporary confiscation of agricultural land were largely increasing from 2009 to 2012 when they saw a decrease, and their total value was EUR 1,698,000 in 2015.

Development of payments for agricultural land confiscation



Source: MARD SR

6.5.4. Assessment of impacts of proposed activities on the environment in agriculture

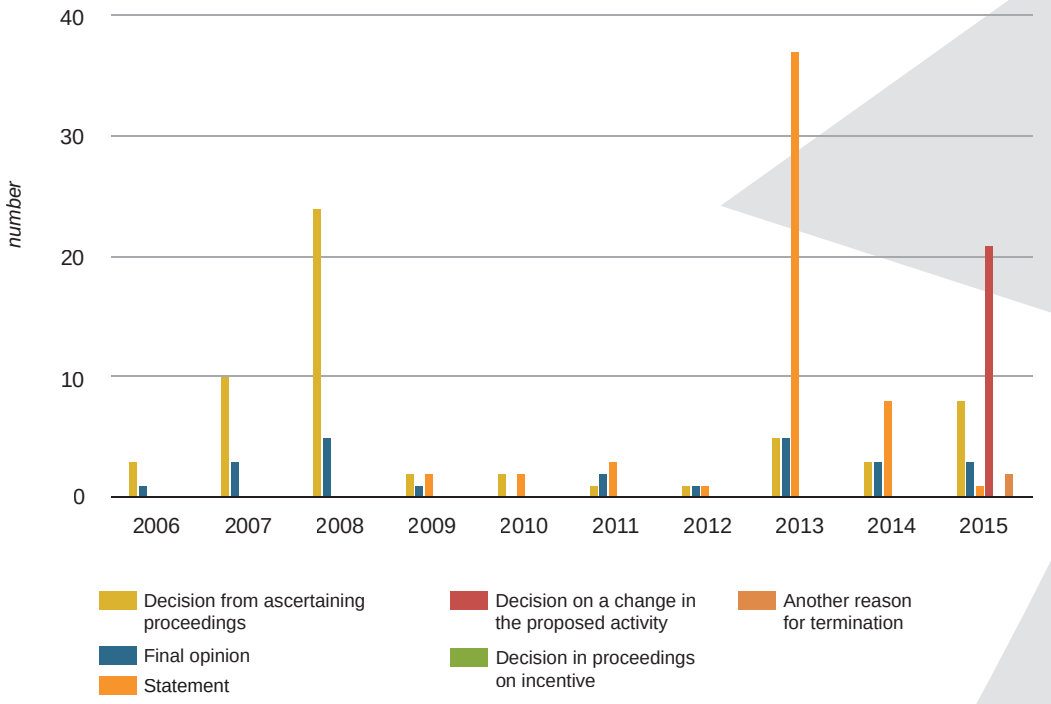
At present, in Slovakia the process of assessment of impacts of proposed activities before decision on their placement or before their permit is legislatively regulated by Act No 24/2006 Coll. on environmental impact assessment and on amendments to certain acts.

Assessment of activities, facilities and buildings in the sector of agriculture is carried out according to Annex No 8 of the Act, Table No 11. Agricultural and forest production. The table includes nine items of activities subject to the EIA process out of which three items deal with the agricultural production – the activities registered under Nos 11.1, 11.4 and 11.8. These items were changed and modified from 2006, in particular in terms of limits defined for ascertaining proceedings and obligatory assessment.

The representation of the individual items of activities assessed from 2006 to 2015 was as follows:

- 1 EIA process for Proposals for using not cultivated or semi-natural areas for intensive agricultural purposes,
- 14 EIA processes for buildings for storing pesticides, liquid and suspended artificial fertilizers,
- 174 activities included in the item – facilities for intensive animal production, including depots of by-products with the capacity of a) farm animals, b) pigs, c) poultry.

Overview of the number of activities with the terminated EIA process by individual types of proceedings in the sector of agriculture



Source: SEA

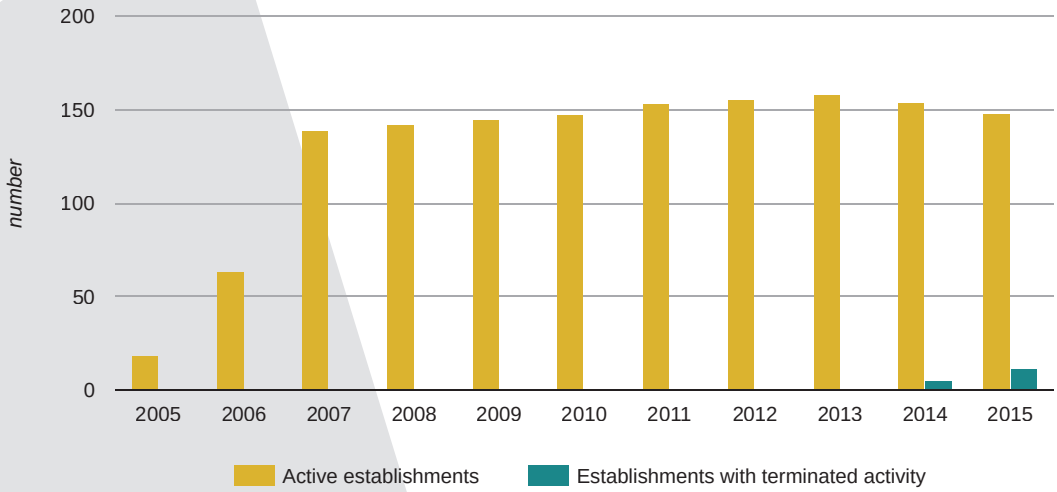
6.5.5. Integrated prevention and control of the environmental pollution in agriculture

The integrated prevention and control of the environmental pollution is addressed in Act No 39/2013 Coll. on integrated environmental pollution prevention and control and on amendments to certain acts, as subsequently amended (the Act on IEPPC).
The implementing regulation for the Act on IEPPC is the Decree of the Ministry of Environment of the Slovak Republic No 11/2016 Coll. that came into effect on 1 January 2016.

The integrated permit is proceedings with which conditions for performing activities in the existing and new establishments are permitted and determined in a coordinated way in order to guarantee the effective integrated protection of the environmental components and keep the rate of environmental pollution in the environment quality standards.

In 2015, in the sector of agriculture there were 148 active establishments and 12 integrated permits for establishments were withdrawn for the reason of activity termination or capacity reduction, and thus the elimination from the force of this Act.

Number of establishments IEPPC in agriculture



Source: SIE

6.6. List of used literature

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5. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Towards a Thematic Strategy for Soil Protection (COM/2002/179 final)
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FOREST MANAGEMENT

List of the sector indicators in forest management

Trends of the sector relevant for the environment
◀ Share of forest management in GDP formation
◀ Trend in area of forest land
◀ Forest damage
◀ Forest health
◀ Timber felling
Interaction of the sector with the environment (demands of the sector in respect of resources and impacts of the sector on the environment)
◀ Forest categorization
◀ Carbon sequestration by forest ecosystems
◀ Sustainable forest management
◀ Spring stock and hunting of game
◀ Forests and protected areas

Political, economic and social aspects
◀ Forest certification
◀ Costs of the environmental protection in forest management
◀ Payments for the exclusion of forest land
◀ Compensations for restricted forest management

According to the Statistical Classification of Economic Activities (SK NACE Rev. 2), the forest management is included in the Section A – Agriculture, forestry and fishing.

It is included in the following division:
02 – Forestry and felling

The sector report also includes the sub-chapter regarding spring stock and hunting of game, which is included in SK NACE Rev. 2 in the Division 01 – Crop and animal production, hunting and related service activities; Group 01.7 – Hunting, trapping and related service activities.

7.1. Summary assessment of the development in the sector of forest management

What is the state and directing of forest management in relation to the environment?

The share of forest management in GDP formation has been under 1% for a long time. From 2010, a gradual slight increase was recorded. When taking into consideration benefits of functions of forests and the wood-processing industry beneficial to the society in GDP of the economy of the SR (which is not currently included), it would represent, however, approximately a triple of the current share.

The forest land area as well as timber land have been slightly increasing for a long time, in which mainly afforestation of agriculturally not used lands, transfer of agricultural lands covered with forest trees (the so-called white areas) as well as gradual harmonization of the current numbers with the numbers registered in the Land Registry and in the forest management programmes participate.

Abiotic harmful agents with the dominant wind effect largely participated in forest damaging; irregular fluctuations in damaging were recorded for these agents. Out of biotic harmful agents, the most important group included bark beetles (in particular spruce bark beetle), with a gradual increase in their occurrence and harmful effect from 2000, with the culmination in 2009.

The situation in damaging of covers by bark beetles and wood borers, however, can still be generally described as very unfavourable, and since 2004 it has represented the most serious problem in the forest protection, while spruce is the most endangered tree species.

Out of anthropogenic agents, the pollutants damaging was the most considerable that was, however, decreasing from 2002, even if the impact of pollutants load of forest land from the past continued. A high share in anthropogenic damaging of forests also related to thefts of wood or forest fires the main cause of which is usually the public as well as burning off grass on agricultural lands.

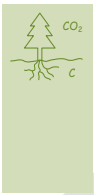
The forest health characterized by the defoliation rate continued to be considered as unfavourable, while it was still worse than the pan-European average. In coniferous tree species, it was already possible to observe from 1996 the stabilization of the forest health, but in broad-leaved trees there was deterioration. The most damaged tree species were oak and pine trees, the least damaged tree species were beech and hornbeam. The improvement of the health condition of fir tree in the last six years was recorded. The areas with the long-term worst forest health for a long time in Slovakia remain the regions of Kysuce, Orava and the Spiš-Tatra area that are related to massive decomposition of spruce forest covers.

Felling had an increasing trend in the long run which mainly resulted from a large extent of accidental felling due to effects of harmful agents, but also from the gradual transfer of the presently abnormally represented age levels to the age of felling maturity. Until 2011, it exceeded the acceptable felling, but subsequently its volume was decreasing. In 2014, however, it again increased due to the wind calamity Žofia of 15 May 2014.

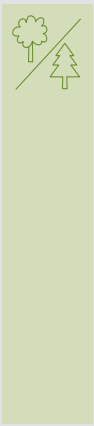
What are interactions of forest management and the environment?

Impact of forest management on the environment

The most represented category of forests were production forests followed by protection forests, and the lowest representation related to special purpose forests (SPF). As part of forest categorization, there was again an increase from 2000, after the previous decrease, in the area of production forests at detriment of SPF. The area of protection forests has been stabilized approximately since 2005.



The share of forest management in the production of CO_2 that gets into the air mainly when forest areas are converted into arable land was negligible. On the contrary, forest covers largely participated in captures of atmospheric CO_2. Forests of the temperate zone have a considerable potential of CO_2 binding. After 2000, a gradual increase in carbon stock in forest ecosystems continued, which was a consequence of extension of the afforested area and mainly increase in hectare stock of wood matter.



The share of felling in the annual increment could still be evaluated as sustainable, as felling was lower than its annual total current increment (TCI). However, it should not be felled more than 60% of the TCI volume. From 2000, this share increased, while from 2004 it exceeded the aforementioned recommended value permanently. The increase was mainly related to implementation of excessive incidental felling caused by calamities. Growing stock in forests of the SR have been continually increasing, while stock of broad-leaved species have exceeded stock of coniferous trees already since 1994. The share of natural regeneration of forest covers was approximately a third of their total regeneration as of 2015, which meant an increase compared to 2000. However, it stagnated in a fluctuated way from 2004. In forests of the SR, tree species composition generally prevailed, suitable from the stand and ecological perspective, i.e. a favourable and varied species structure. The gradual decrease in the area representation of coniferous trees versus broad-leaved trees was positive, whereby we are gradually approaching the target tree species composition.

The spring stock of hoofed game were stabilized in 2012 or their unfavourable increase in the last years was stopped, yet their numbers were again increasing subsequently. The permanently decreasing numbers of roe deer was alarming, and the numbers of small game were also further decreasing. Numbers of large predators was assessed as stable according to statistics, with a positive trend of their population.

In the total area of forests, protected areas (including territories of NATURA 2000) occupied more than a half of the total area of forest land. In forests, interests of foresters collide with interests of environmentalists in many places, and thus there is detriment to forest management from restricted forest management annually in a high amount.

What is the response of the society to mitigating or compensating negative consequences of forest management on the environment?

The forest certification in the Slovak Republic is carried out by means of two most wide-spread schemes in Europe – PEFC and FSC. The total area of certified forests has increased since 2007. However, their area development had a fluctuating character, in the last years it was possible to state their stabilized area.

From 2009, there was a rapid decrease in costs of forestry of the environmental protection.

From 2008, there was a considerable decrease in payments for the exclusion of forest properties from the land register, which is a positive trend from the environmental perspective. However, the share of made payments decreased considerably.

From 2003, there was a considerable increase in compensations for restricted forest management, in spite of this they were implemented to a limited extent only. They were mainly applied for the reason of nature and landscape protection, in particular in the zones of the 5th and the 4th protection level, in the zones of the 2nd and the 3rd protection level they were applied only to a limited extent.

7.2. How are the environmental principles and targets related to forestry implemented into the strategic documents?

7.2.1. Implementation of environmental principles and targets related to forestry into the strategic documents at the EU level (the most important documents)

1999	***Common Forestry Strategy for the EU*** (Resolution of the Council of the EU No 1999/C56/01 on a Forestry Strategy for the EU) The Resolution had two main parts where the first part defined the general framework and the second one was focused, among other things, on measures aimed at the forest protection (pollutants, forest fires), biodiversity issues and NATURA 2000, climate change and forest certification.
2002	***Forest Focus Programme*** Target – monitoring European forests and environmental interactions in order to protect forests of the Community against pollutants and forest fires. The attention was also paid to the development of new activities concerning the evaluation of the impact of climate change on forest ecosystems and activities related to including measures related to forests into the already existing EU strategies on biodiversity, binding of carbon, and land/soil protection.

2005	***Rural development policy 2007 – 2013*** (Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development) The EU's rural development policy that is the second pillar of the CAP (the Common Agricultural Policy) tries to create a coherent and sustainable framework for the rural area development. In accordance with this Regulation, the rural development policy focused on the following three themes (thematic axes) in 2007 – 2013: – improvement of competitiveness of the sector of agriculture and forest management, – improvement of the environment and landscape, – improvement of the quality of life in rural areas and the support of rural farming diversification.
2006	***EU Forest Action Plan for 2007 – 2011*** Target – supporting and improving the sustainable economy in forests and their multifunctional task. When drawing up the Action Plan, the Commission and the member states created the common vision of forestry and the contribution of forests and forestry to the modern society. Forests for the society – long-term multifunctional forestry satisfying both current and future social needs.
2006	***Renewed EU Sustainable Development Strategy (EU SDS)*** The overall objective of the renewed EU SDS was determining and developing measures that would enable the EU to achieve the permanent improvement of the quality of life of both current and future generations by creating sustainable communities able to use resources efficiently and manage them and use the potential for both ecological and social innovation of the economy, thus ensuring prosperity, environmental protection and social cohesion.
2006	***EU Biodiversity Action Plan by 2010*** The Action Plan was adopted in the interest of acceleration of progress and increase intensity of efforts spent for solving the issue of biodiversity loss that was defined by the target of the EU of 2001 to halt biodiversity loss in the EU by 2010. It represented the detailed working plan including measures aimed at achieving the specified target. It proposed ten priority targets dealing with the most important habitats and species: events in a wider landscape and the sea environment, the regional development more compatible with the nature; decreasing impacts of invasion species; supporting biodiversity in the international development; decreasing negative impacts in the international trade; adjusting to the climate change and improving the knowledge base.
2010	***Green Paper on Forest Protection and Information in the European Union – Preparation of forests for the climate change*** Defining main challenges concerning forests and forest management in the EU, preferably from the perspective of the forest protection issues and implementation of the related information systems.

2010	***Europe 2020: A strategy for smart, sustainable and inclusive growth*** The strategy basis includes three mutually complementary priorities: – Smart growth: creating a knowledge- and innovation-based economy. – Sustainable growth: supporting a more ecological and competitive resource-efficient economy. – Inclusive growth: supporting an economy with a high employment rate that will ensure social and territorial cohesion. The Strategy has brought seven flagship initiatives; while out of them the especially important initiative from the perspective of increased effectiveness of forest management and sustainable forest use is the initiative a Resource-Efficient Europe.
2011	***Roadmap to a Resource-Efficient Europe*** Specification of targets that will have to be achieved for ensuring the effective resource utilization, including preserving natural capital and providing ecosystem services.
2011	***Energy Roadmap 2050*** Comparing various scenarios of decarbonising of the energy system and methods of ensuring energy supplies and competitiveness by 2050, including the use of biomass as a renewable energy source.
2011	***Roadmap for transforming the EU into a competitive, low-carbon economy in 2050*** Defining milestones by 2050, the plan of possible measures for their achieving (decreasing greenhouse gas emissions by 2050 of 80%), including measures concerning sustainable methods of increasing productivity of land use.
2011	***Our life insurance, our natural capital: an EU Biodiversity Strategy to 2020*** Target – reversing biodiversity loss and speeding up the EU's transition towards a resource-efficient and green economy. It includes six targets, while the following targets are mainly relevant for agriculture: 3, 4, 5 – strengthening a favourable contribution of agriculture and forest management to decreasing key pressures on biodiversity in the EU.
2012	***Renewable energy sources: important energy market player*** Defining the spheres where it is necessary to increase intensity of efforts by 2020 in order to increase further energy generation from the EU renewable sources by 2030 as well as in the following years, so that technologies of renewable energy sources are less costly, more competitive and finally market-oriented, and to provide stimuli for investing in energy from renewable sources. Renewable sources also include biomass the production of which has a direct impact on forest management.
2012	***Concept for the protection of Europe's water resources*** Target – ensuring sustainability of all activities that have the impact on water, and thus ensuring accessibility of high-quality water for its sustainable and fair utilization. It contains the requirement to include more largely the policy targets in water management into the sector policies.
2013	***New Forest Strategy: for forests and the forest-based sector*** Target – supporting coordination and coherence of forest and forest-related policies considerably influencing practical management in forests in the member states. They are mainly political areas focused on the rural development, biodiversity protection, fighting the climate change, support the use of renewable energy sources and raw-material base for the industry (green economy).

2013	***The Seventh Environmental Action Programme of the Union to 2020 "Living well, within the limits of our planet"*** The key feature of the Programme is the protection and improvement of natural capital, support of better utilization of current resources and accelerated transition to a low-carbon economy. The Programme is to support the sustainable growth, creating new jobs, and thus create from the EU a healthier and better place for living. The key priority objectives in relation to forest management are: Priority Objective 1: Protection, preserving and improving the Union's natural capital. Priority Objective 9: Increasing the EU's efficiency in solving international environmental and climate-related issues.
2013	***Rural development policy 2014 – 2020*** (Regulation of the European Parliament and of the Council (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005) Three long-term strategic targets: – supporting competitiveness of agriculture, – ensuring sustainable management with natural resources and measures in the sphere of climate, – achieving balanced territorial development of rural farms and communities, including creation and maintaining jobs. The EU's common priorities in the sphere of forestry include: – supporting transfer of knowledge and innovations in forest management, – promoting the sustainable forest management, – renewing, preserving and strengthening ecosystems related to forest management, – promoting efficient resource utilization and supporting transition to a low-carbon economy resilient towards the climate changes in the sector of forest management.

The biggest and most important share in creating and taking crucial political decisions (in the form of declarations and resolutions) forming the forest development and strategic direction of forestry in Europe have the Ministerial Conferences on the Protection of Forests in Europe (at present called Forest Europe). The last conference was

7th Ministerial Conference (Madrid, 2015)
The Conference's participants adopted:

- The Declaration "25 years together promoting Sustainable Forest Management in Europe" (the signatory countries commit themselves therein to strengthening the task of forests and their sustainable management in addressing global challenges, such as the SD agenda after 2015, including development targets, fighting the climate change, biodiversity protection and fighting dessert enlargement),
- Resolution 1 "Forest sector in the centre of Green Economy" (it speaks of enhancing the role of forest management and the wood processing industry in the transition of the society to the so-called green economy and of further enhancing the social aspects of sustainable forest management by promoting green jobs, education and social inclusion in forestry),
- Resolution 2 "Protection of forests in a changing environment" (it confirms the crucial task of the protective functions of forests).

7.2.2. Implementation of environmental principles and targets related to forestry into the strategic documents at the SR level (the most important documents)

2000	***Forest policy concept by 2005*** Focusing on forestry stabilization in Slovakia, arrangement of forest ownership, administration, management, and protection.
2001	***National Sustainable Development Strategy*** Setting priorities and targets of the sustainable development, Strategic Objective 20. Development of an Integrated Agricultural Planning Model.
2003	***Concept of utilization of Renewable Energy Resources (RER)*** Creating the basic framework for the development of RER utilization in in the Slovak Republic.
2003	***Medium-term concept of the agricultural policy for 2004 – 2006: Forest management*** Defining long-term strategic objectives of forestry based on global interests of the mankind that are focused on preserving, effective protection and improvement of forests in the supranational and global conception, while one of the targets was ensuring forest management according to the principles of the sustainable management.
2005	***Action Plan for Sustainable Development of the Slovak Republic 2005 – 2010*** Defining main targets, including forest protection, concretized for the individual sectors. They include measurable indicators, deadlines, determination of responsibility for their fulfilment and methods of their financing.
2006	***Energy Policy of the Slovak Republic*** Creating the framework for further directing of the development of electricity industry, thermal energy sector, gas industry, mining, crude oil processing and transport, coal mining and utilization of renewable energy resources.
2007	***Concept of Agricultural Development for 2007 – 2013 – part Forest management*** The basic long-term target – ensuring the sustainable forest management based on the appropriate use of their economic, ecological and social functions for the development of the society and in particular rural areas. Three main targets of forest management policy resulted from it and were formulated for the respective years: – increasing the economic viability of the multifunctional forestry and the sustainable use of forest products, goods, and services (economic targets), – maintaining and improving the forest health, vitality and resilience of forest ecosystems and increasing biological diversity (ecological targets), – contributing of forests and forestry to the improvement of the quality of life by maintaining and improving their social and cultural aspects (social targets).
2007	***National Forest Programme of the Slovak Republic*** Defining five strategic targets: Supporting ecological forest management; Improving and protecting the environment; Improving the quality of life; Increasing long-term competitiveness; and Strengthening co-operation, coordination and communication and 18 priorities.

2007	***Rural Development Programme of the SR 2007 – 2013*** Defining priorities for the period of 2007 – 2013: – Increasing competitiveness of agriculture and forest management. – Improving the environment and landscape. – Quality of life in rural areas and rural economy diversification. – Approach ”Leader“. Recognizing the important task of the forest sector in the rural areas and specific forest measures have been regrouped and modernized in order to support better the integration of forestry in the rural development.
2007	***Energy Efficiency Action Plan for 2008 – 2010 (the 1st AP)*** Quantifying targets, defining measures and determining mechanisms for ensuring implementation of proposed measures and their monitoring.
2008	***Indicative Action Plan of the National Forest Programme of the Slovak Republic*** Elaborating the programme targets and defining measures.
2008	***Forestry Development Strategy*** Elaborating 18 priorities of the National Forest Programme of the SR.
2008	***Biomass Action Plan for 2008 – 2013*** Defining measures aimed at implementation of targets in the sphere of biomass use that should have had a considerably positive impact on the environment and should have contributed to the improvement of the quality of climatic conditions, cutting greenhouse gases and diversification of energy resources with increasing energy security.
2010	***National Renewable Energy Action Plan*** Defining national targets for the share of energy from RES consumed in transport and in the sectors of electricity, heat and cold generation in 2020 and steps aimed at their ensuring.
2011	***Energy Efficiency Action Plan for 2011 – 2013 (the 2nd AP)*** Defining the second transitional indicative target of energy savings in the Slovak Republic for the period of the next three consecutive years, defining measures and financial and legal instruments for achieving the target of energy savings.
2013	***National Programme of Wood Utilization of the SR*** Defining the framework for solving issues of the forestry and wood-processing sector and focusing on consequences of the world economic and financial crises, influences and impacts of the climate change on forest ecosystems, their stability, tree species composition and wood matter production. Shifting the forestry and wood-processing complex to the position when it will ensure the rural area development by increased utilization of the local renewable raw material – by creating the value added for products made of wood and by offering new jobs.
2013	***Concept of Development of Electricity Generation from small renewable energy sources in the Slovak Republic*** Specifying the comprehensive approach to both legislative and possible financial support for the development of small energy sources that are intended especially for covering the consumption of households without any negative impact on the stability of distribution systems and with the effect of financial savings for operators of small resources as well as for distribution companies.

2013	***Concept of Agricultural Development of the SR for 2013 – 2020*** Focusing in the sphere of forest management on fulfilment of the strategic target of ensuring the sustainable forest management based on the appropriate use of their economic, ecological and social functions (multifunctional task of forests) for the development of the society, in particular of rural areas, and for the effective utilization of wood as an ecological and renewable raw material. It also point out to the necessity of improving coordination, communication and co-operation in all spheres and sectors relating to the forest sector.
2014	***Agricultural Development Action Plan of the SR for 2014 – 2020*** Completing the Concept of agricultural development and in the sector of forest management specifying the effective complex of instruments and measures for the sustainable forest management.
2014	***Action Plan of the National Programme for Wood Potential Utilization of the Slovak Republic*** The detailed elaboration of the framework measures of the National Programme into 66 measures with fulfilment in 2014 – 2020.
2014	***Rural Development Programme of the Slovak Republic 2014 – 2020*** The Programme is a document of the national character on the basis of which assistance from the European Agricultural Fund for Rural Development (EAFRD) in the programming period of 2014 – 2020 will be provided by means of a complex of measures grouped aroud 6 priorities of the rural development. It contributes to the agricultural development so that is is more balanced in terms of territory and environment, more resilient towards the climate change, competitive and innovative. It also contributes to the rural development and sustainable management of natural resources. The strategic priorities are, among other things, regeneration, preserving and strengthening of ecosystems that are related to agriculture and forest management as well as promotion of effective resource utilization and support of transition to a low-carbon economy resistant to the climate change in the sector of agriculture, food processing industry and forest management.
2014	***Energy Efficiency Action Plan for 2014 – 2016 (the 3rd AP)*** Evaluating targets and measures for energy efficiency in accordance with the previous plans, defining new and continuing measures of energy efficiency for the following period of 2014 – 2016 with the outlook to 2020.
2014	***Energy Policy of the Slovak Republic*** Reflecting to the development of the energy policy in the EU. Defining the main targets and priorities of the energy sector by 2035 with the outlook to 2050 in order to fulfil the strategic target, i.e. achieving the competitive low-carbon energy sector ensuring safe, reliable and effective supplies of all forms of energy for reasonable prices, while taking into account the customers' protection and sustainable development.
2014	***Adaptation Strategy of the Slovak Republic on Adverse Impacts of Climate Change*** Target – among other things, proposing a complex of appropriate proactive adaptation measures and mechanism for their implementation within sector policies, including forestry, development strategies and action plans at all levels of the process. In forest management, adaptation measures should be preferably implemented in the spheres of forest and change in tree species composition, silviculture and using sources of reproductive material, felling activities and modifications of mature periods, forest protection and monitoring, in forest research and in any other specific measures.

2014	***Updated National Biodiversity Strategy up to 2020*** Target – creating the political framework for stopping the trend of biodiversity loss and speeding up the SR's transition towards a green economy that is able to use natural genetic resources more efficiently in accordance with the Strategy Europe 2020. In relation to forests, the most important targets include: – Target B.3 Ensuring preserving and strengthening ecosystems and their services by 2020 by means of establishment of the green infrastructure and regeneration of at least 15% of degradable ecosystems. – Target C.5 When implementing forest management programmes, implementing measurable improvement of the conservation status of species and habitats that are dependent on the suitable forest environment or on which forest management has a crucial impact, and measurable improvement in the sphere of providing ecosystem services in accordance with the sustainable forest management in comparison with the reference scenario of the EU (2010). – Target D.7 Ensuring mitigation of negative impacts of invasion species on biodiversity and ecosystems in Slovakia by 2020.
2014	***Action Plan for implementation of measures resulting from the Updated National Biodiversity Strategy up to 2020*** The Action Plan includes 167 tasks contributing to the fulfilment of 6 targets or 33 measures of the aforementioned National Strategy. In relation to forests, the most important measures are as follows: Sphere C Biodiversity protection in the state policy of agriculture, forest management and fishery management: – Measure C.5.1 Ensuring preserving the area of primeval forests and natural forests, preventing further fragmentation and supporting forest regeneration, while compensation mechanisms are created for covering loss from management and preferring alternative methods of using forests with a high value added. – Measure C.5.2 Integrating measures concerning biodiversity into the forest management programmes, also in connection with integration of the forest management programmes and protected area management programmes. – Measure C.5.3 Ensuring implementation of the Protocol on Sustainable Forest Management to the Carpathian Convention. – Measure E.8.1 Ensuring improvement of instruments for biodiversity protection, removing contradicting policies and provisions in acts, harmful stimuli and strengthening supporting measures of integration and positive motivation for the biodiversity protection in all sectors.
2015	***Action Plan of the National Forest Programme of the SR for 2015 – 2020*** It continues in the content and structure of the NFP SR and its First Action Plan. It elaborates 5 strategic targets of the NFP SR and 39 updated framework targets at the measure level.

7.3. What is the state and directing of forest management in relation to the environment?

Forest management (FM) is a wide sector of human activities dealing with preserving and improving forests and using their benefits in favour of their owners and the society. FM has its important specifics – it must respect natural relations and it must ensure its long-term development for successful functioning.

Forests have not only a high economic potential in the landscape, but they are also the most important component of the environment, an irreplaceable stabilizer of the landscape balance, and therefore they also have multiple landscape-ecological, cultural, social and environmental importance. They are one of the most varied and widespread ecosystems in the world. Forests are a resource of wood, they provide recreational possibilities and environment for wild plants and animals; they protect water and soil resources and capture pollution. They support employment and traditional using as well as biological diversity. Forests and forestry are one of the main pillars of the sustainable development of the society, in particular rural areas. Nevertheless, wood – the main current product of the FM production activity, is a domestic, renewable and ecologically "clean" raw material. With its nearly 40% coverage by forests, the Slovak Republic is one of more forested countries in Europe. Positive aspects of forestry in the Slovak Republic also include: the continuously increasing area of forests, stabilization of the non-state sector of forest management, all forests on forest lands are cultivated according to the valid forest management programmes and they are accessible to the public without any difference in the ownership.

On the other hand, at present the existential problem of forestry is raising funds for its needs in order to ensure the fulfilment of all economic, environmental (ecological) and social functions of forests. Money is received basically from the sale of wood only, and positive externalities (functions beneficial to the society) provided by forests to the society have not been included in the economic processes yet. Together with the other crucial problems, such as negative impacts of the financial and economic crisis, the continuing minimal political support, low social acceptance as well as with serious threatens that are represented in forestry by opposing ideologies of strong to extreme economism; and on the other side of extreme environmentalism, forestry faces a crisis and at the same time a challenge of the form of its future existence or justification of the necessity to direct towards functionally integrated, multi-purpose sustainable forest management.

In addition to the aforementioned problems, negative aspects of forestry mainly include:

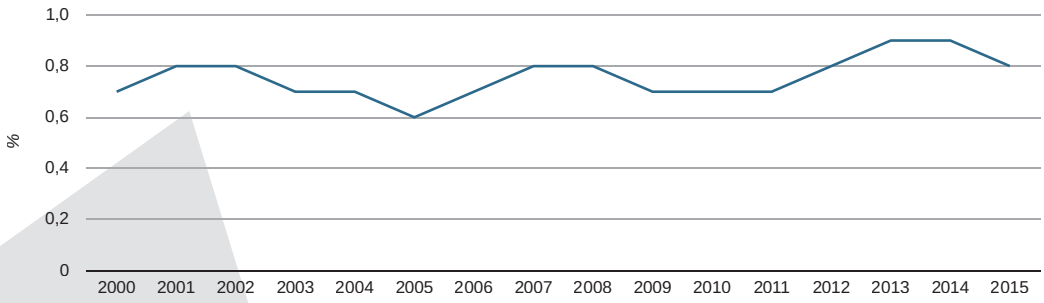
- High extent of incidental felling (salvage felling timber),
- Massive decomposition of spruce forest covers,
- Continuing impact of immission load of forest land from the past,
- Anticipated negative impacts of the climate change on forest ecosystems,
- Obsolete and worn out technical equipment in mechanized activities.

The state and directing of forest management in relation to the environment is characterized based on the indicators from the group of trends of the sector relevant for the environment.

7.3.1. Share of forest management in GDP formation

The share of forest management in the GDP formation in the Slovak Republic has been below 1% for a long time, which is a relatively low share. It has increased by 0.27% since 2010 and it was 0.8% in 2015. When taking into consideration benefits of functions of forests beneficial to the society (introducing payments for ecosystem services of the forest) and the wood-processing industry in GDP of the economy of the SR (which is not currently included) it would be, however, around 3%.

Trend in the share of forest management in GDP formation of the SR

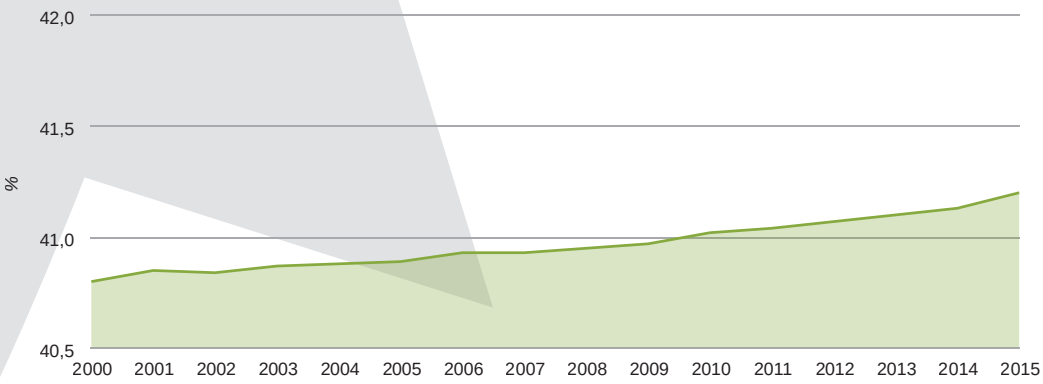


Source: SO SR

7.3.2. Trend in area of forest land

Forests are ones of the most varied and widespread ecosystems in the world. However, afforestation of the territory of the country does not have to be directly connected with its sustainable or non-sustainable development. The forest land area is relatively stable in Slovakia and it was approximately 41% of the total area of the country in 2015. Compared to 2000, it increased by 18,863 ha (0.9%) to the current 2,020,116 ha. Afforestation of agriculturally not used lands, transfer of agricultural lands covered with forest tree species (the so-called white areas), as well as gradual harmonization of the current numbers with the numbers registered in the Land Registry and in the forest management programmes mainly participate in a gradual increase in the forest land area.

Trend in forest coverage in Slovakia



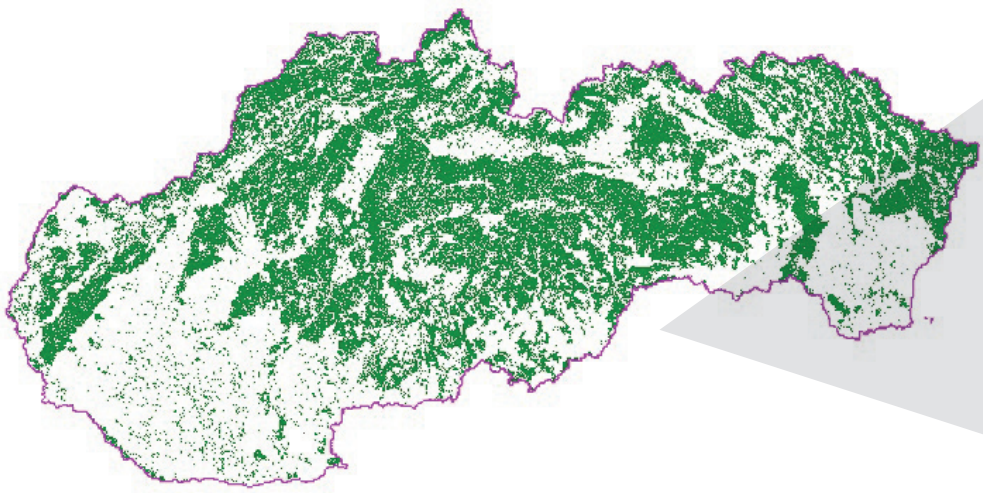
Source: GCCA SR

In south-western Slovakia, the forest coverage does not even reach 10%, in basins only 10 – 15%, but in north-eastern and northern Slovakia it reaches more than 50%. The regions with the largest forest coverage as of 2015 in the Slovak Republic were as follows:

	Forest coverage (%)		Forest coverage (%)
PLA Vihorlat	95	NP Low Tatras (NAPANT)	74
PLA Ponitrie	93	Tatra National Park (TANAP)	73
PLA Malé Karpaty	89	CHKO Štiavnické vrchy	72
PLA Poľana	84	NP Slovenský kras	72
NP Poloniny	80	PLA Kysuce	71
NP Veľká Fatra	79	PLA Biele Karpaty	67
PLA Strážovské vrchy	78	PLA Cerová vrchovina	63
PLA Východné Karpaty	77	NP Malá Fatra	61
NP Slovenský raj	77	PLA Horná Orava	57
NP Muránska planina	76	PLA Dunajské luhy	52

Source: MoE SR
Note: NPs including their buffer zones

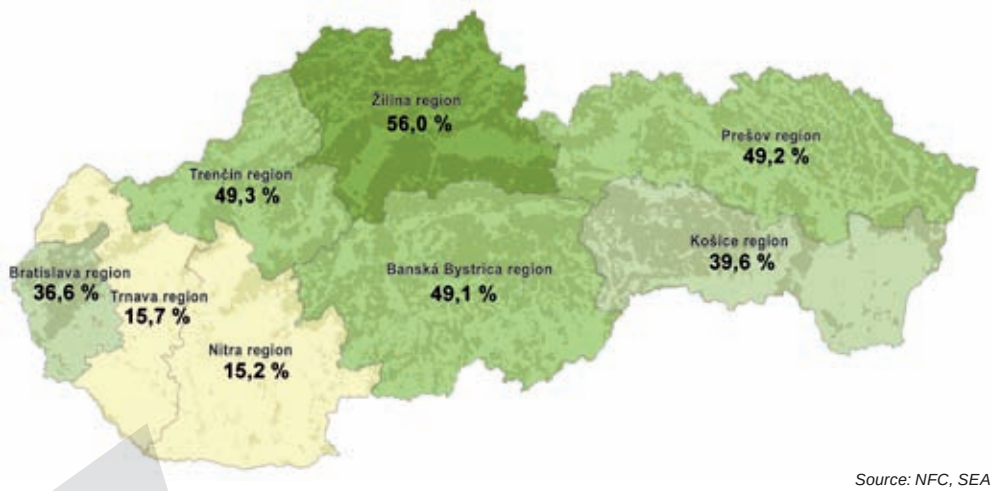
Forest coverage of Slovakia



Written by: SEA

From among the regions of the Slovak Republic, the most afforested region is the region of Žilina, followed by the regions of Trenčín, Prešov and Banska Bystrica; and the least afforested regions are the regions of Nitra and Trnava.

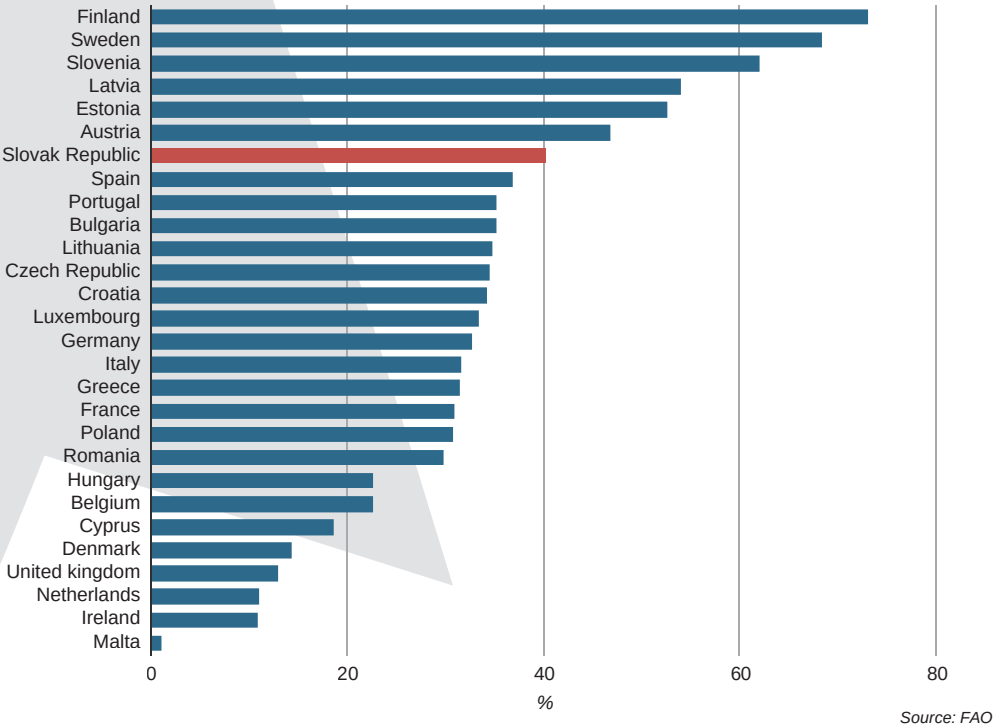
Forest coverage of the SR regions as of 2013



Source: NFC, SEA

The forest land area does not provide, however, information on the real vegetation area, as the forest land (FL) also include such lands that are not covered with tree species (forest warehouses, roads, functional areas, forest nurseries as well as lands above the upper boundary of tree vegetation – top grassy parts of high mountains). For these reasons, the timber area is also provided, i.e. the information on the real forest area, and that differs from the FL area. As of 2015, timber land (TL) was 1,942,567 ha, while its area increased by approximately 21.2 thousand ha from 2000.

International comparison of the forest coverage of the EU states in 2015



Source: FAO

The Slovak Republic is one of the European countries with the high forest coverage. A higher forest coverage can only be found (outside the EU) in Belarus (42%), Bosnia and Herzegovina (43%), Liechtenstein (43%), and the Russian Federation (49%); and (in the EU) in Austria (47%), Estonia (52%), Latvia (54%), Slovenia (62%), Sweden (69%), and Finland (73%).

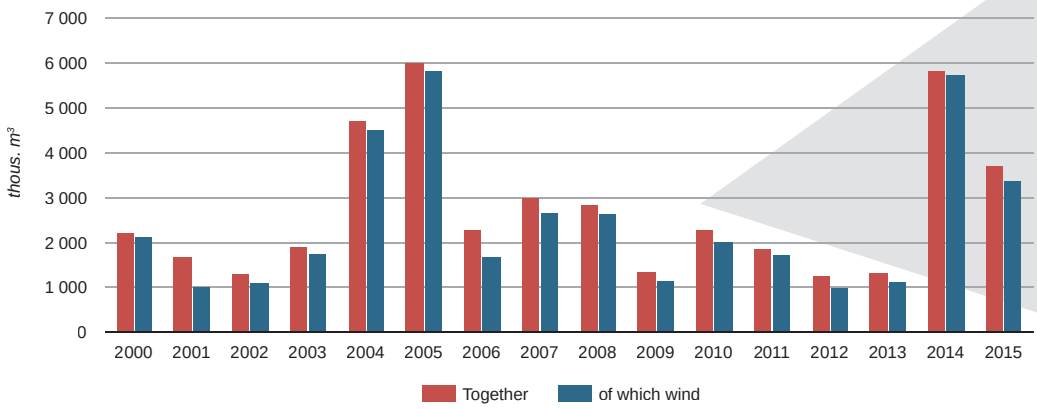
Arrangement of the structure of forest ownership in Slovakia

The structure of forests (timber land) by ownership and utilization has been constantly changing, as the arrangement of ownership and utilization of forests has not been finished yet in accordance with the restitution acts. As of 2015, 358,743 ha of timber land were registered in Slovakia, the ownership of which has not been identified (18.5% of the total area of timber land). As of 2015, 39.8% (773,801 ha) of timber land were owned by the state, while the state used up to 53.3%. From 2000, the area of forests used by state organisations decreased. Non-state FM entities own and manage private, community, church, municipal forests and forests of agricultural co-operatives. Solving the ownership relations to forest land still represents an important challenge and task of FM, mainly of the state sector management of which of non-state not handed over forests cost considerable funds.

7.3.3. Forest damage

Abiotic harmful agents (wind, snow, draughts, glazed frost, and others) predominantly participate in forest damage. As a consequence, 3,715,495 m^3 of wood matter were damaged in 2015. In total, the share of wind in abiotic harmful agents was up to 91.1%. In the long run, however, we can state irregular fluctuations in damages by wind. A considerable increase was also recorded in 2004 – 2005; it was connected with the wind calamity in the Tatra Mountains in November 2004 (in the area of approximately 12,600 ha).

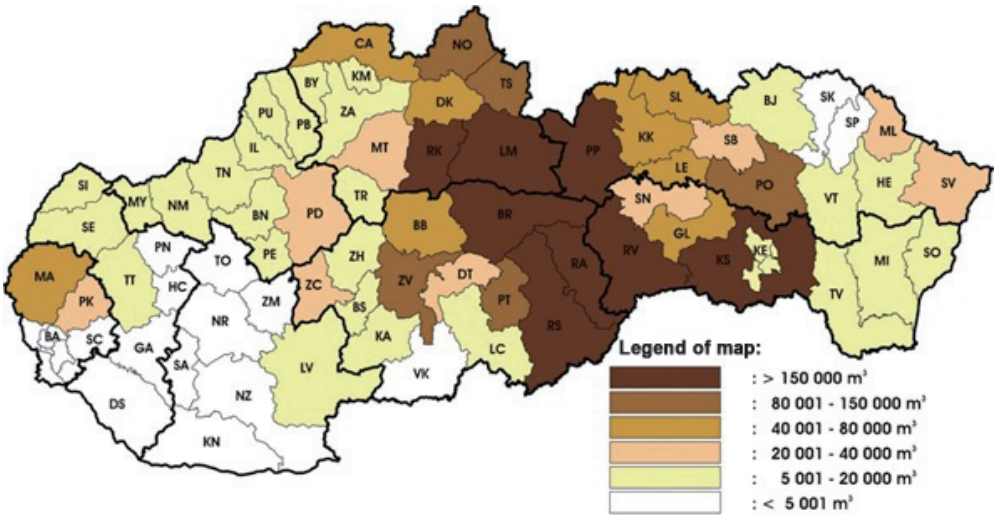
Trend in forest damage by abiotic agents



Source: NFC

In 2015, the following forest covers were damaged most: in the districts of Rimavská Sobota (332 thousand m^3), Poprad (304 thousand m^3), Liptovský Mikuláš (296 thousand m^3), Revúca (290 thousand m^3), Rožňava (252 thousand m^3), and Brezno (219 thousand m^3).

Damage of coniferous and broad-leaved trees by abiotic agents (2015)

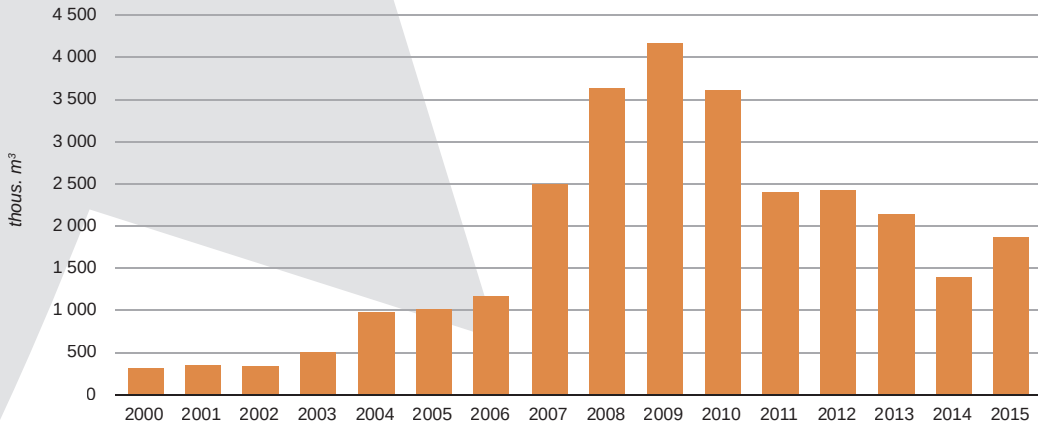


Source: FPS – NFC

The occurrence of abiotic agents and their consequences for forest covers cannot be forecast more exactly. The extent of forest damaging mainly depends on meteorological phenomena. In a longer-term horizon, we can forecast that damages will rather be growing, while spruce covers are mainly liable to damage. With respect to this fact, it is necessary to reassess the current approaches and measures aimed at increasing resilience of forest covers towards these harmful agents and implement measures aimed at improving the current situation.

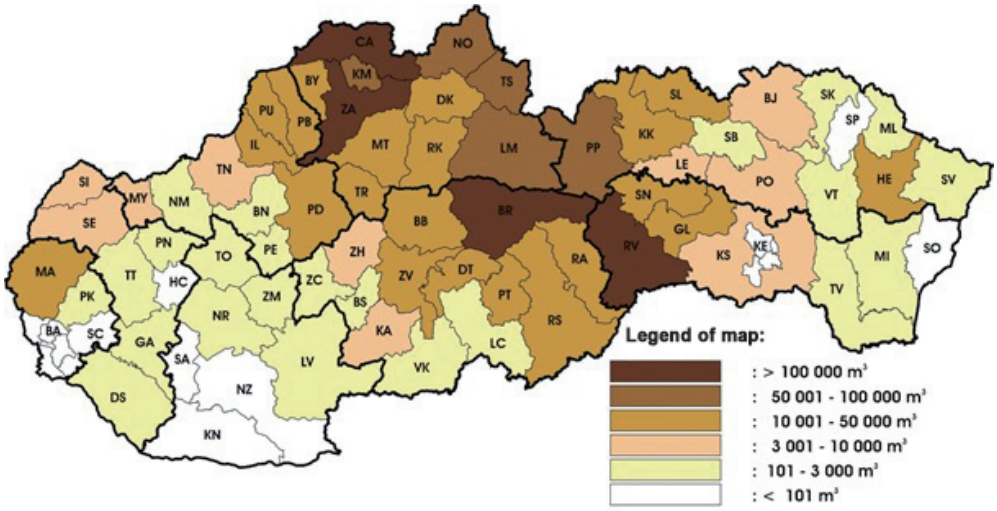
Out of biotic harmful agents, the most important group includes bark beetles that saw a gradual increase from 2000 (324.4 thousand m³ of damaged wood matter) of their occurrence and harmful effects (mainly connected with the wind calamity in November 2004), with its culmination in 2009. After 2009, there was already a decrease in the bark beetle calamity until 2014, while as of 2015 it increased again to 1,869.3 thousand m³ of damaged wood matter. Most of that related to spruce bark beetle (*Ips typographus*). The situation in damaging of covers by bark beetles and wood borers can still be generally called as very unfavourable.

Trend in forest damage by bark beetles and wood borers



Source: NFC

Damage of coniferous and broad-leaved trees by bark beetles and wood borers (2015)



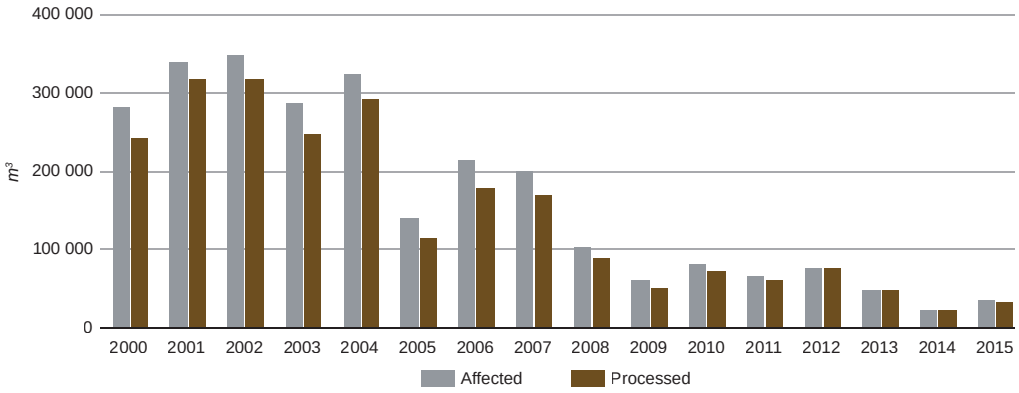
Source: FPS - NFC

Illnesses of tree species of the fungus origin (phytopathogenic microorganisms: decays, tracheomycosis, and others) are becoming more important. Out of them, the most important problems in spruce forests are caused by spruce Dark Honey Fungus and in broad-leaved covers by tracheomycosis illnesses of oak forests. Phytopathogenic organisms damaged 142,791 m³ of wood matter in total, while the regions with the biggest volume of performed incidental felling damaged by pathogenic fungi included Čadca (51 thousand m³), Námestovo (21 thousand m³), and Tvrdošín (19 thousand m³).

Other pests include leaf-eating and sucking insects which damage broad-leaved and coniferous tree species, but no major activity of this pest has been recorded in the recent years. Other harmful agents also include game species. In 2015, damage of covers by game was recorded in the volume of 10,380 m³, of which the prevailing share was bark browsing and peeling.

Out of anthropogenic agents damaging forests, the most important are immissions. Immission damage of forests has been decreasing since 2002, which is also connected with the decrease in the development of emissions of basic pollutants (mainly SO_2 and NO_x). The volume of immission damage of forests stabilized from 2009, and it was decreasing again from 2012. As of 2015, it once again increased in a year-to-year comparison to 35,132 m³ of damaged wood matter (a decrease of 87.6% compared to 2000). It is also reflected in a considerable decrease in incidental felling due to immissions (34 thousand m³ of salvaged calamitous timber as of 2015) that decreased by 86.4% compared to 2000.

Trend in covers damage by immissions

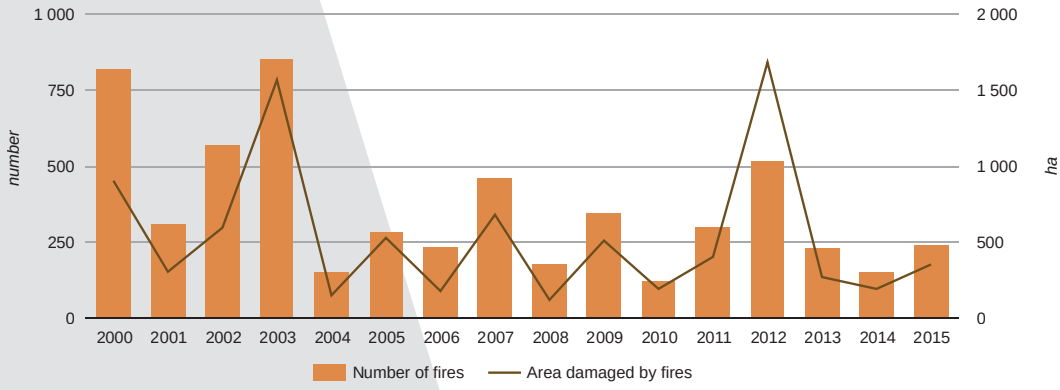


Source: NFC

A high share in anthropogenic damage of forests could also be seen in wood stealing (28.3%).

In 2015, 242 forest fires were registered in the Slovak Republic with the total burnt down area of 353 ha and the direct calculated damage of EUR 367.37 thousand. In 1999 – 2014, 5 982 forest fires were registered with the total burnt down area of 8,834 ha. In the long-term perspective, the main cause of forest fires (up to 53%) was the public (in particular negligence, tourists, children below 15 years, starting fires outdoors). The second most frequent cause is burning off grass on agricultural land (25%).

Fires in forests of the Slovak Republic



Source: NFC

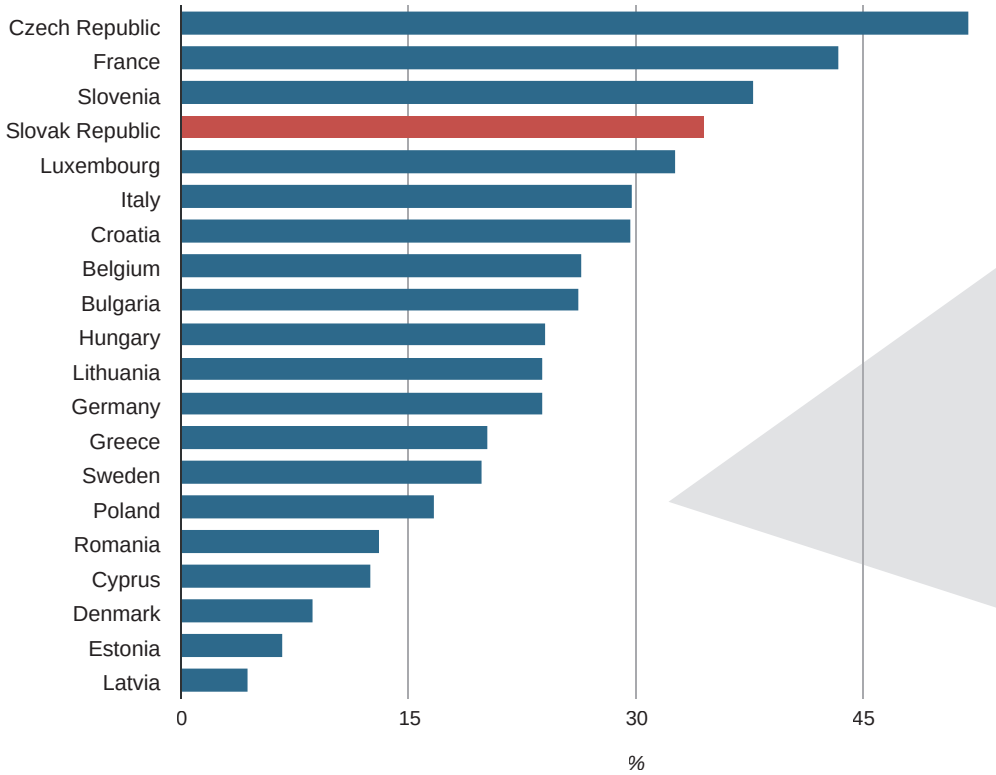
However, the most appropriate summary indicator of forest damage is the volume of incidental felling. It is still high (also in spite of its fluctuating trend) and limits possibilities of planned forest management which perspectively creates further danger of forest damage, mainly by abiotic agents and subsequently by biotic agents.

7.3.4. Forest health

The forest health in Slovakia, characterized by the defoliation rate, can still be considered to be unfavourable, while it continues to be worse than the pan-European average. In the group of coniferous trees, we can observe stabilization of the forest health from 1996, but deterioration could be seen in broad-leaved trees.

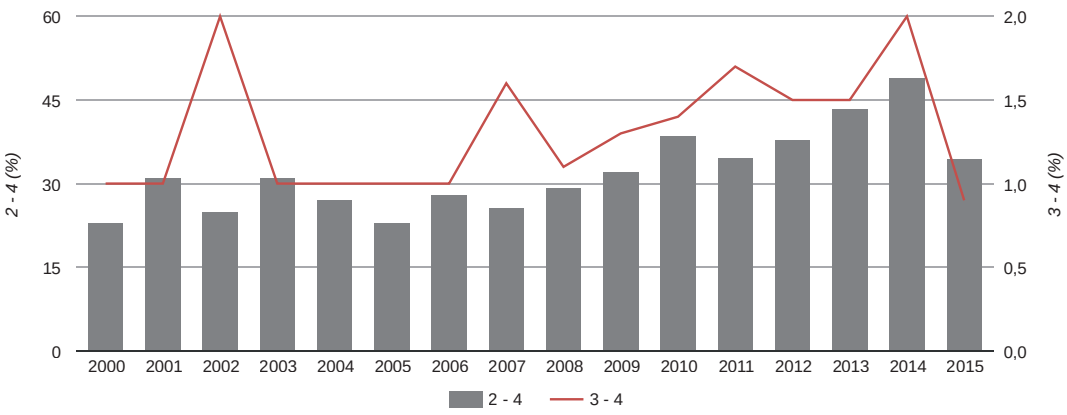
From 2000, it is possible to state the fluctuating, but at the same time increasing trend in forest damage with its culmination in 2014 (an increase in the degrees 2 – 4, i.e. with defoliation higher than 25%, it reached 26.1%). In 2015, it improved considerably, while the share of damage decreased to the current 34.5%. The unfavourable development is mainly due to deterioration of the condition of broad-leaved trees that reached the highest damage in 2014 for the whole monitored period (i.e. from 1987).

International comparison of defoliation of trees (2 – 4) in 2015



Source: 2016 Technical Report of ICP Forests

Trend in the defoliation rate of the tree greenery



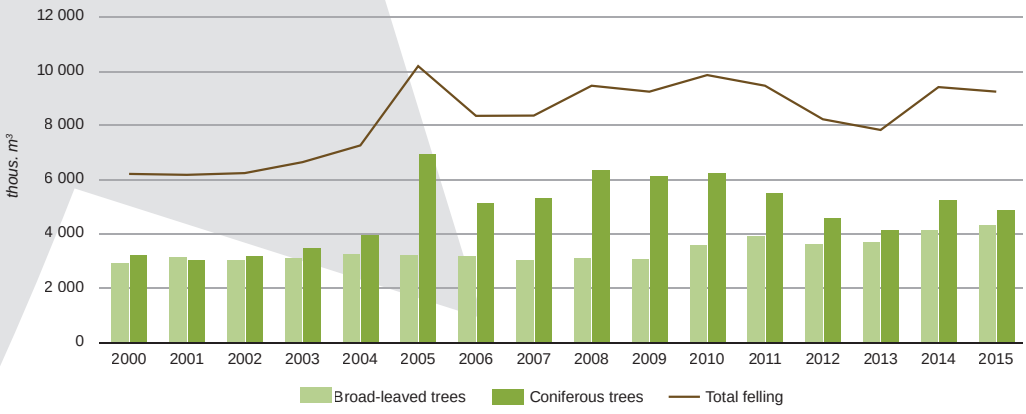
Source: NFC
Note: 2 – medium defoliated (26 – 60%); 3 – highly defoliated (61 – 99%); 4 – dying and dead trees (100%)

The most damaged tree species are oak (also in spite of the year-on-year improvement of its condition) and pine tree (with a deteriorating trend); the least damaged are beech and hornbeam (while, however, in 2013 – 2014 the deteriorating health condition of these tree species was also recorded). The stabilization of the health condition of spruce was recorded, and in the recent six years also the improvement of the health condition of fir. The areas with the long-term worst forest health in Slovakia remain the areas of Kysuce, Orava and the Spiš-Tatra area.

7.3.5. Timber felling

Felling in forests of the SR has a long-term growing trend, which results mainly from the large extent of incidental felling (57% of the total felling in 2015) due to effects of harmful agents. From 2000, the felling volume increased continuously by 48.7%. After 2010, however, the felling volume was decreasing, but it again increased in 2014 due to the wind calamity (Žofia) on 15 May 2014 that affected mainly central Slovakia – the upper part of Orava, the mountains of Slovenské Rudohorie, the highlands of Revúcka Vrchovina, but its occurrence was in the whole territory of Slovakia, from the mountains of Malé Karpaty up to Poloniny. The felling volume in 2015 reached 9,248.6 thousand m^3 (of which 53% of coniferous wood).

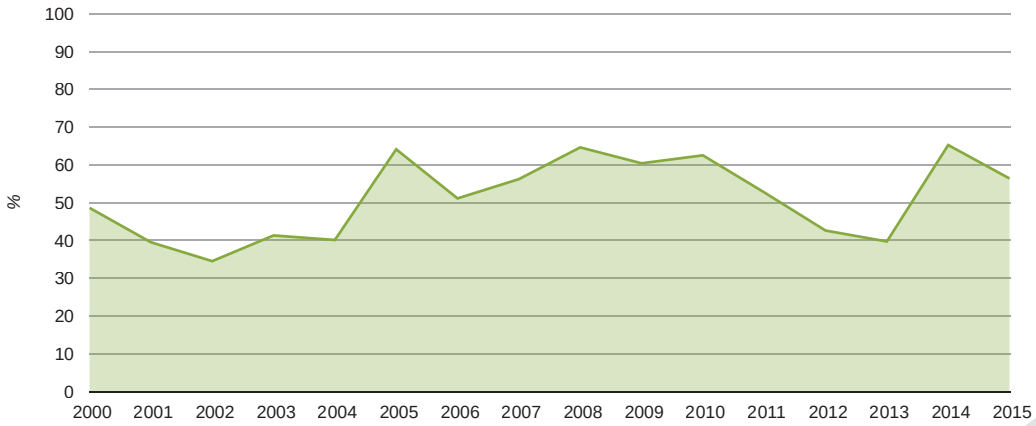
Trend in total felling



Source: NFC
Note: Fluctuation of the felling volume in 2005 was a consequence of the wind calamity in 2004

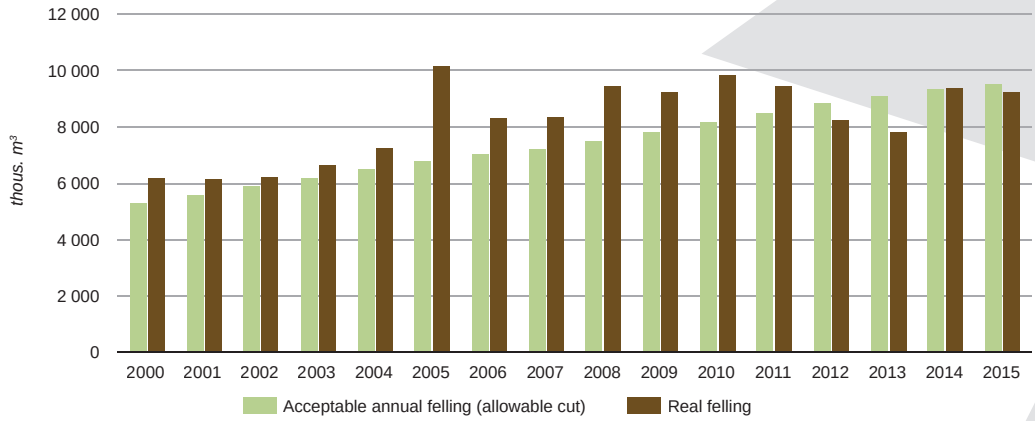
In the following years or decades, there will be the transfer of the currently above-average represented age groups (both in terms of area and volume of growing stock) up to the age of felling maturity, which assumes gradual increasing the volume of the total felling in the following period with the expected culmination around 2030. After 2030, possibilities of felling will gradually start decreasing, which results mainly from the current insufficient representation of covers at the age below 50 or 60 years, and therefore it is necessary to modify (decrease) at present the allowable cut (i.e. acceptable felling) so that even representation is achieved, if possible, of the age degrees (which is, however, influenced by incidental felling). The implementation of annual planned intentional improvement and regeneration felling is complicated by incidental felling with which the annual volume of total felling is exceeded that is planned in the valid forest management programmes.

Trend in the share of incidental felling in the total felling



Spurce: NFC

Trend in acceptable and real felling



Source: NFC

Note: The acceptable felling (allowable cut) is the quantity of wood that can be felled from forests without disturbing its yield eveness. Therefore, the allowable cut is a sort of standard for comparing whether it is felled much or less in the forest.

7.4. What are interactions of forest management and the environment?

Forests are poly-functional and serve for economic, social and environmental purposes. The importance of forests as a basic component of the natural and landscape environment has been and will be growing. They are and will be playing an important role in mitigating consequences of the climate change and other environmental services. Therefore, soil-protection and water-management functions of forest covers (their positive effects in regulating discharge flow of watercourses, water retention), as well as their irreplaceable function in terms of the nature and landscape protection will be further strengthened (they provide habitats for both animals and plants, shelter, substrate or food to many specialized kinds of organisms). Nearly a quarter of the afforested area of the EU is protected under the NATURA 2000 network, a large part of the rest is the home for species protected pursuant to the EU legal regulations in the sphere of nature protection. Forests also provide extensive social benefits, including benefits for human health, leisure time, and tourism. The health and recreational functions of forests will also be strengthened (they create a special forest microclimate, produce oxygen). By the gradual ecologisation of FM, the compliance between production and functions of forests beneficial to the public will be ensured.

Mutual interactions of forest management and the environment are characterized based on the indicators in the group of interactions of the sector with the environment.

7.4.1. Impact of forest management on the environment

From the fundamental perspective it is not very relevant to speak of the impact of forest management on the environment in a negative sense (as it is justified in any other economic sectors) with respect to its specific position. This mainly results from the fact that the main organic production media in the forest production is a forest that is, however, a complex ecological system made up and influenced by a number of natural agents that is basically one of the environmental and landscape components. Forest ecosystems play a key role and have an irreplaceable place in creating and protecting the environment in the landscape and in keeping the ecological stability of the territory. Management of forests is subjected or related to this fact, and therefore it is linked to the sustainability principles with ensuring all its functions.
From this substance, it is therefore possible to speak only minimally or in limited way of global negative impacts of the FM sector on the environment (while maintaining conceptual and legislative measures) as it is obvious in any other sectors of the economy. Forestry has always been based significantly more on ecological principles, as also agriculture or any other sectors. Any possible negative impacts of the sector on the environment result or can result from its limited economic possibilities under which forest management ensures functions of forests beneficial to the public as well as requirements of the sector of the environment. They can also result from the condition and operation of the transport network and from mining activities.

Positive aspects of forestry in the Slovak Republic from the environmental perspective are:

- total growing stock and carbon stock in forests,
- from the perspective of the nation-wide level, the relative suitable tree species composition continues,
- the extent of natural forest regeneration has been growing, and
- the protection forest area has been stabilized.

On the contrary, in terms of forestry it is necessary to further solve the following:

- forest area in particularly protected areas,
- co-operation and coordination with policies affecting forests and forestry,
- compensations for restricted forest management,
- promotion of forestry and work of foresters.

The following sub-chapters deal with the relation of forest management and the surrounding environment or they are related to or result from it.

7.4.1.1. Forest categorization

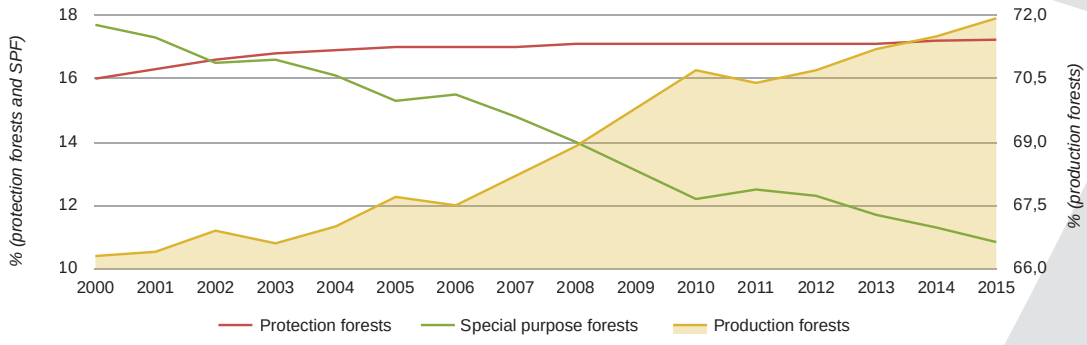
From its nature, forests fulfil more functions (benefits, services) simultaneously, in addition to production (economic) and extra-production (or also beneficial to the public) functions, i.e. ecological functions (soil-protection, water-management, climatic) and social functions (in particular health, cultural, recreational, nature- and water-protection).

In terms of their prevailing functions, forests are divided into the individual categories (forest categorization), i.e. production forests (mainly production functions), protection forests and special purpose forests (extra-production functions).

The most represented category of forests are production forests, followed by protection forests, and the least representation have special purpose forests (SPF). In the trend in forest categorization, from 2000 there is again an increase in the production forest area after the previous decrease to the detriment of SPF. In 2015, their area was approximately equal to the area of 1993 (72.2%); from 2000 it increased by 5.6%.

Due to increased requirements for fulfilment of functions of forest beneficial to the public, the area of protection forests was increasing for a long time (from 13.5% in 1990 to 16% in 2000 and 17.2% in 2015), while approximately from 2005 their area is stabilized.
The area of SPF with respect to their specific social need was increasing first (with its culmination in 1999 – 18.1%), from when it was decreasing gradually (among other things, also due to leaving out of the sub-category of forests under the influence of immissions), and as of 2015 it reached 10.8%. From 2000, their area decreased by 6.9%.

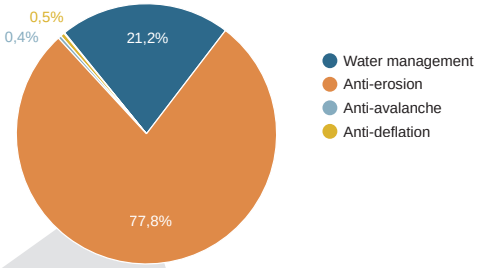
Trend in representation/share of forest categories from cover soil



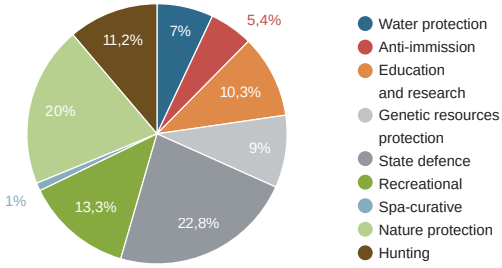
Source: NFC

In protection forests, forest with the anti-erosion function prevail (more than three quarters of their area) and the water-management function (over 21%). In SPF, their function of the state defence prevail (approximately 22.8%) and the natural and protective function (19.9%).

Structure of protection forest areas by function (2015)



Structure of areas of special purpose forests by function (2015)



Source: NFC

With their varied functions, forests as an important component of the natural and landscape environment are and will be playing an important role in mitigating consequences of the climate change and other environmental services. Therefore, these functions of forest covers will be strengthened further. In a perspective way, it will involve the creation of SPF ensuring favourable environment in the surrounding of facilities of curative-prevention care in spa towns, in protective zones of natural healing resources, table mineral waters and in the protective zones of water resources (reservoirs). Forest parks and suburban forests will also be extended.

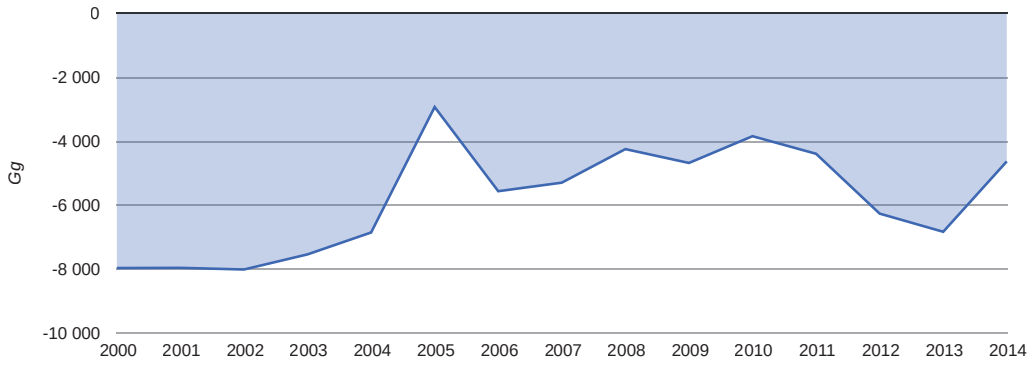
7.4.1.2. Carbon sequestration by forest ecosystems

One of the important functions of forests as ecosystems is CO_2 captures and long-term carbon sequestration.
Through the photosynthesis process, both trees and plants absorb atmospheric CO_2 and store carbon contained therein in their bodies. After they become necrotic, atmospheric CO_2 is again released into the atmosphere, but a part of this carbon in the form of overlying humus and tree crown waste remains bound in the ecosystem for a relatively long time.

CO_2 captures

The share of forest management in the production of carbon dioxide (CO_2), getting into the air mainly during the conversion of forest areas into arable land, is negligible. On the contrary, forest covers largely participate in captures of atmospheric carbon dioxide. The annual captures of CO_2 emissions by forest ecosystems in the territory of the Slovak Republic is relatively variable and ranges from 2,900 to 11,800 Gg of CO_2, which represents cutting total emissions of carbon dioxide in Slovakia by 7 – 22%. In 2014, CO_2 captures by forrest ecosystems was 6,834.11 Gg (6.8 million tonnes).

Trend in CO_2 captures by forest ecosystems



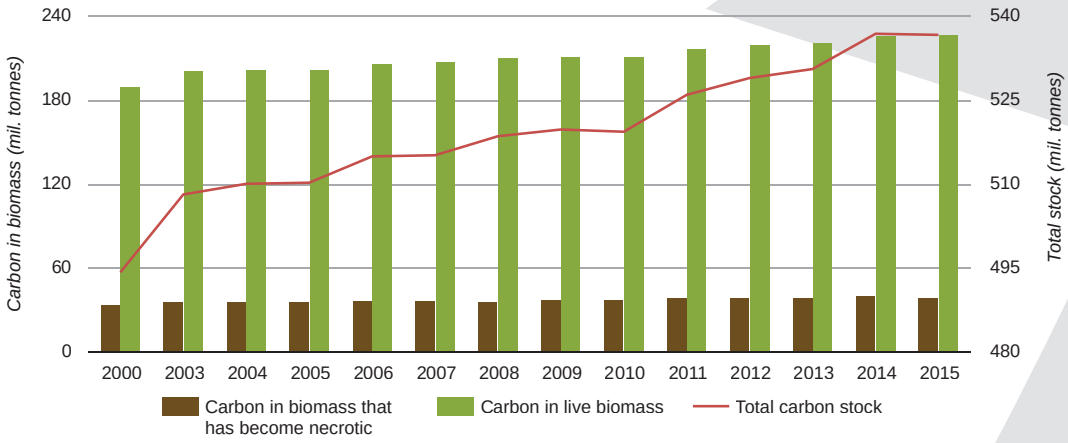
Source: SHMI – NIR 2015
Note: Emissions established as of 15 May 2016

Carbon stock

Out of natural ecosystems, forest ecosystems are one of the most important segments in the carbon circulation. Thanks to the large volume of wood biomass, forests are able to accumulate large volumes of carbon for a long time, thus reducing the CO_2 content in the atmosphere. Carbon can be stored in forest biomass and forest soil (in soil humus) for a long time. Fixation of carbon in forest ecosystems of the SR is determined based on the carbon balance in the aboveground (trees, herbal cover, overlying humus) and underground (roots, humus in soil) parts of forests, including appreciation of felling and forest fires.

Carbon stock in soil humus of forests are higher than in biomass and, in the Slovak Republic, these stock are about 271 megatonnes (million tonnes). Forest soils are characterized by a higher humus content, also compared to non-forest soils, and carbon remains bound therein for a longer time than in wood.

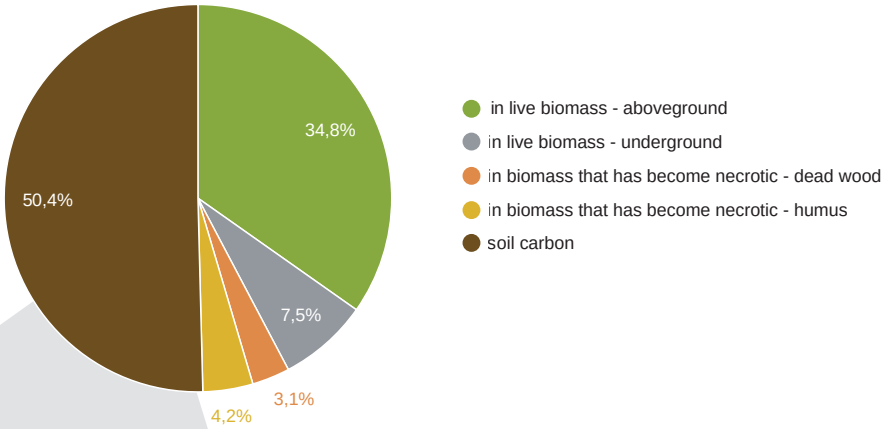
Trend in carbon stock in forest ecosystems



Source: NFC

Also, after 2000, carbon stock in forest ecosystems continue to grow gradually, which is a consequence of the extension of afforested area, and mainly increased hectare stock of wood matter. As of 2015, carbon stock bound in forests reached 536.7 million tonnes which represents an increase of 8.6% compared to 2000. The highest quantities of carbon are bound in soil (50.4%) and in aboveground tree biomass (34.8% as of 2015).

Share of carbon stock in forest ecosystems by resources as of 2015

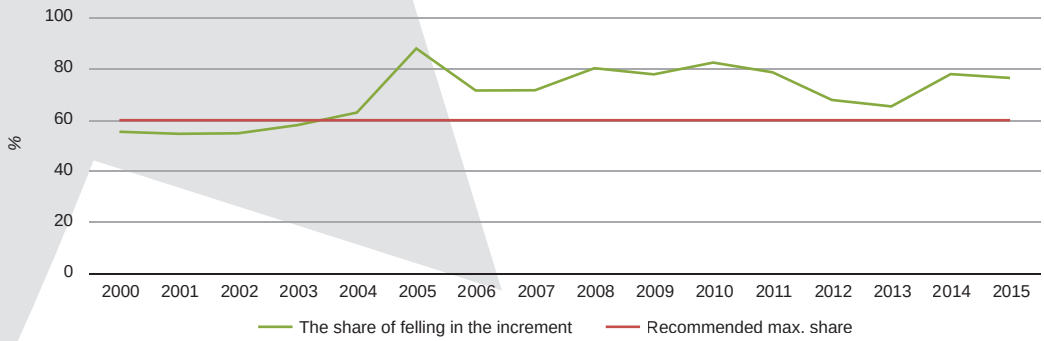


Source: NFC

7.4.1.3. Sustainable forest management

By means of the indicator Utilization of forest resources, or Intensity of felling, it is possible to assess in longer time intervals the utilization of forests with respect to their real productivity. It is connected with the sustainable utilization rate and real felling in terms of relative balance between growth of forests and felling there.
Therefore, it is the share of felling in the increment that can still be assessed as sustainable because felling is lower than its annual total current increment (TCI), however, it should not be felled more than 60% of the TCI volume. From 2000, the share of felling in TCI increased from 55.5% to the current 76.5% (2015). The increase was mainly connected with implementation of excessive incidental felling caused by calamities.

Share of felling and total current increment (utilization of forests)



Source: NFC

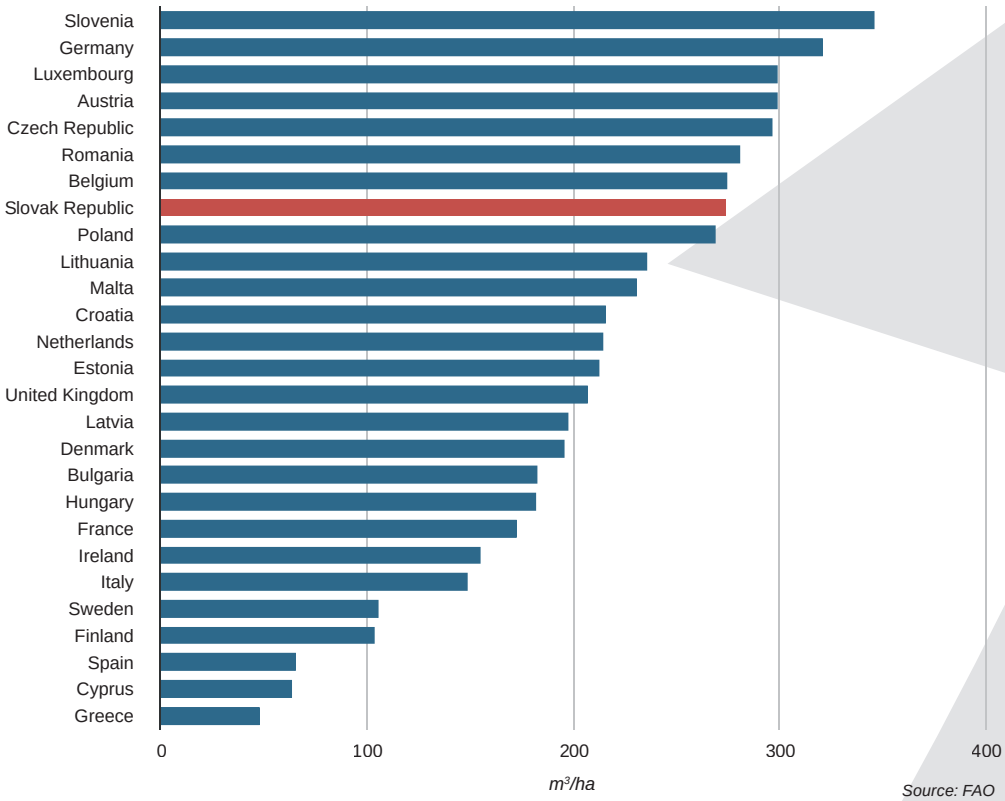
Growing stock

Growing stock in forests of the Slovak Republic are growing continually and they reached 478.1 million m³ large wood without bark (l. w. w. b.) as of 2015. In comparison with 2000, it increased by 16.6%. From 1994, stock of broad-leaved wood exceed stock of coniferous trees and, as of 2015, it accounted for 57.7% share. Together with the increase in cover growing stock, average stock per hectarea are also growing. In 2015, it was 247 m³ l. w. w. b. per hectare of timber land, which is an increase of 14.9% compared to 2000.

Trend in growing stock

Source: NFC

International comparison of growing stock in forests (2015)



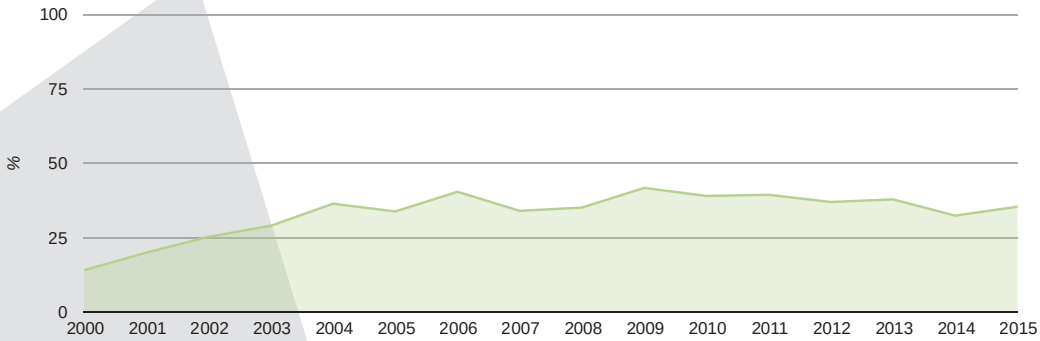
Source: FAO

The increase in total and hectare growing stock causes mainly higher (above-average) global representation of forests in the medium (from the 7th to 10th) age classes that have not reached the age of felling maturity yet, i.e. no regeneration felling is carried out there.

Share of natural regeneration

At present, in enforcing the sustainable management in forests, the special emphasis is laid on the natural regeneration and increase in its share. The share is increasing, but for the time being we do not reach the level of forest-developed states with comparable orthographical conditions (40 – 88%) yet. The natural regeneration is understood as a natural phenomenon in the process of forest development (auto reproduction of the forest community), but also as a complete system of purposeful growing activity and as a result of intentional effect of forest management. It contributes to maintaining genotype biodiversity, keeps the natural tree species composition of forests, their structure and ecological dynamics.

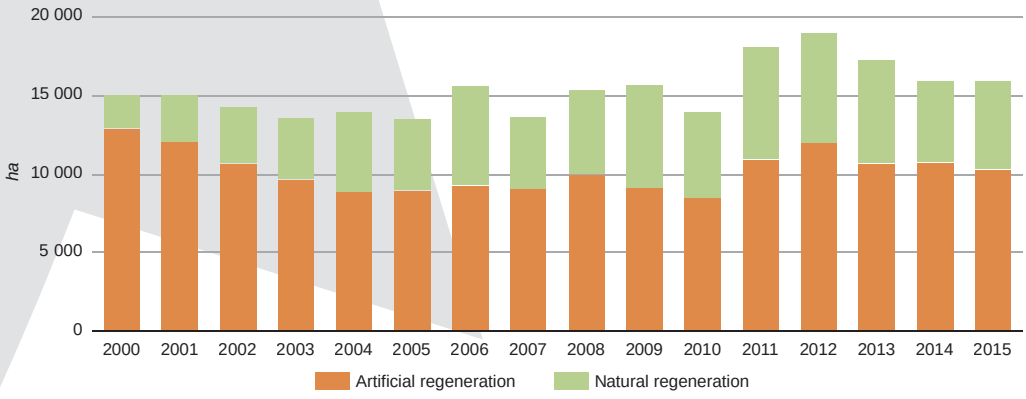
Share of natural regeneration of forest covers in the total regeneration



Source: NFC

At present, the share of natural regeneration of forest covers in their total regeneration is 35.5% (2015), which is an increase of 21.3% compared to 2000, while it has already been stagnating since 2004.

Trend in forest cover regeneration

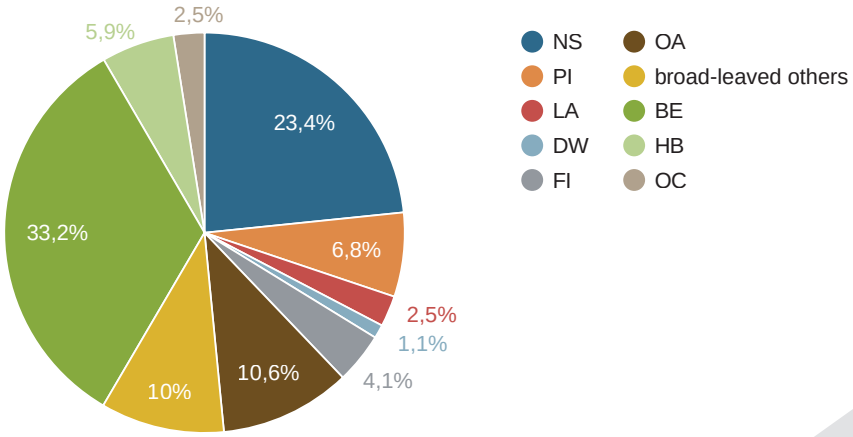


Source: NFC

Tree species composition of forests

The tree species composition of forest covers and its proximity to the natural or target condition is a long-term indicator of the rate of influencing forests by the economic activity. The representation of tree species must be adjusted to specific stand conditions (at present, also the assumed global climate change) as well as social requirements, so that all functions of forests are fulfilled optimally. Therefore, the requirement of variedness of forest covers has been enforced for a long time. The adequate biodiversity increases considerably both static and ecological stability of forests, which creates preconditions for their maintaining also in the case of major changes in stand conditions due to anthropogenic or natural impacts. Changes in type composition of forests, however, are a long process.

Share of tree species representation in forests of the SR (2015)

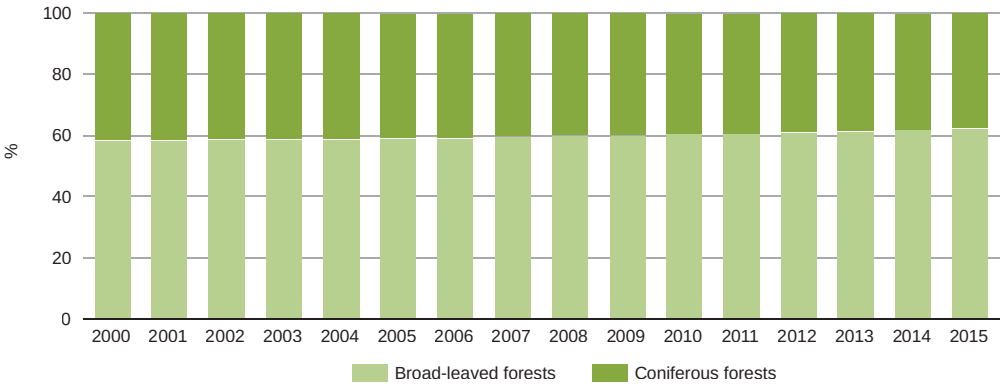


Source: NFC

Note: NS – Norway spruce, PI – Scots pine, FI – White fir, LA – Larch, DW – Dwarf mountain pine, BE – Common beech, OA – oaks, HB – Common hornbeam, OC – Oak cerium

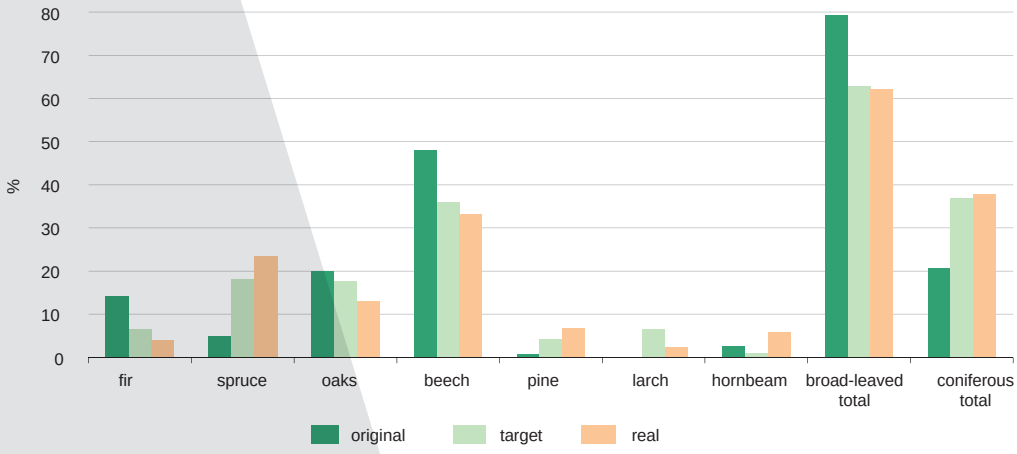
In forests of the SR, the appropriate tree species composition prevails from the stand-ecological perspective, i.e. the favourable and varied species structure. The positive feature is the gradual reduction of global representation of coniferous trees (37.8% in 2015) compared to broad-leaved trees (62.2%), where we are gradually approaching the target tree species composition (63% of broad-leaved trees). Compared to 2000, the share of coniferous trees decreased by 4.2%. In the long run, the highest representation have beech (33.2%), spruce (23.4%), oak (10.6%), and pine tree (6.8%).

Trend in tree species composition of forests



Source: NFC

Comparison of the real representation of selected tree species in forests of the SR (2014) with the original (historic) and target (outlook) (%)



Source: NFC

In forests of Slovakia, there are also newly introduced tree species (e.g. white locust, Euro-American poplars, black pine as well as Douglas fir, giant fir, eastern white pine or red oak, sweet chestnut, horse-chestnut and boxelder). They are 25 species and their share is approximately 2.9%. Their area has not been increasing for a long time, with the exception of expansive white locust that is the most wide-spread invasive tree species and it is also spread on non-forest lands. Boxelder and Tree-of-Heaven also become a problem.

7.4.1.4. Spring stock and hunting of game

Hunting is a part of forest management with the focus on preserving, improving, protecting and optimal using of gene pool of game that is a permanently renewable natural resource. It participates in the creation, protection and using the environment, but it must not disturb rational forest and agricultural land management.

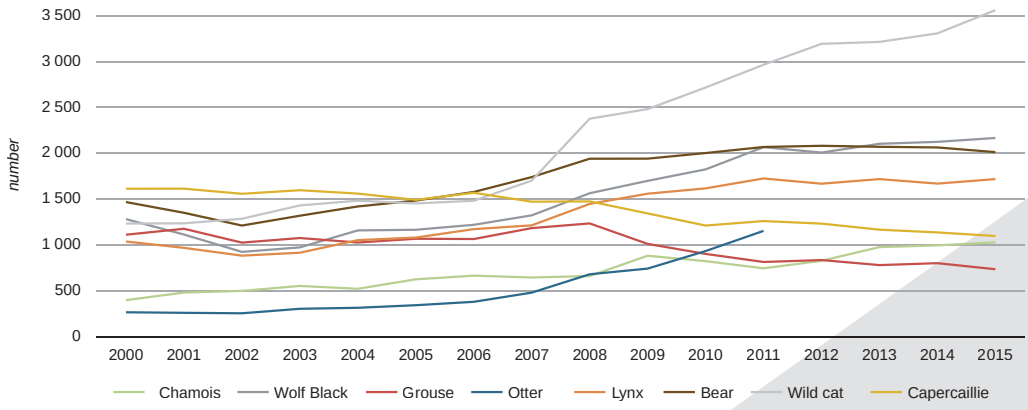
The spring stock (SS) of hoofed game were stabilized in 2012, or their unfavourable increase has been stopped in the recent years. In 2013, however, their numbers were again increasing (except for roe deer); in 2014 there was an undesirable trend of increasing SS of fallow deer (while numbers of mouflons and wild boar game slightly decreased in a year-on-year comparison) and, in 2015, there was again an unfavourable trend of increasing SS of hoofed game (except for roe deer). The constantly decreasing numbers of our original roe deer is alarming.

In the case of small game, SS continues to decrease, mainly for partridge, hazel grouse and wild turkey.

Numbers of large predators is assessed as stable according to statistics, with a positive trend of their population. In 2015, damages caused by large predators were calculated at EUR 1,405 thousand, of which the highest damages were caused by wolfs (69%).

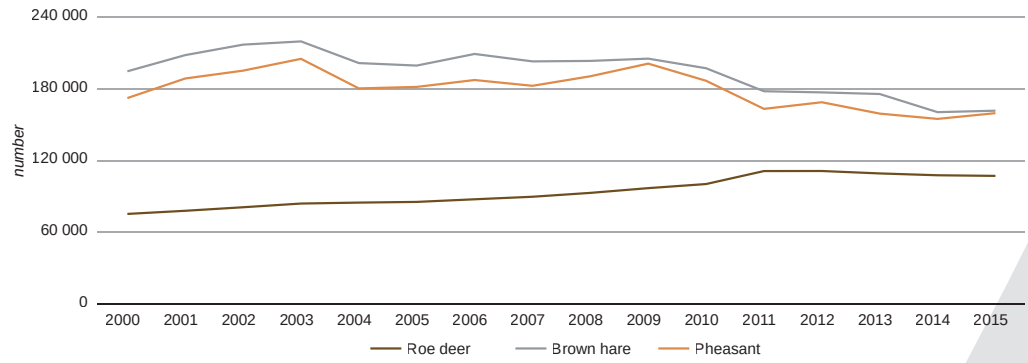
In the case of rare species, an increase in population was again recorded for eurasian beaver; on the contrary, an unfavourable development is seen in the annual decrease in the population of capercaillie and black grouse. Hunting of rare species of wide animals is strictly regulated.

Trend in numbers of selected game



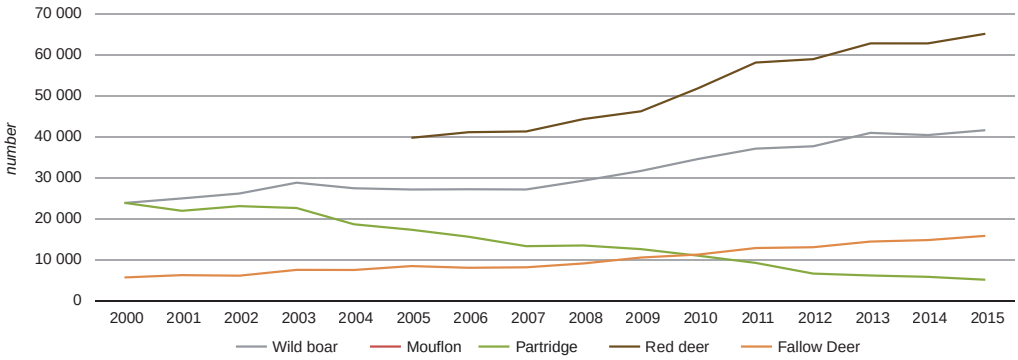
Source: SO SR

Trend in numbers of selected game



Source: SO SR

Trend in numbers of selected game



Source: SO SR

7.4.1.5. Forests and protected areas

Due to big geographical diversity of Slovakia, greatly varied natural and cover conditions can be found on a relatively small territory, and therefore many natural communities or communities close to nature, with a wide range of forest vegetation degrees and within them a varied palette of forest types. There are lowlands (40% of the total territory with the average forest coverage of 5 – 20%), highlands (38% with the forest coverage of 30 – 35%) and uplands, or also low highlands from 300 to 800 m above sea level and medium highlands from 800 to 1,500 m.a.s.l (21% with the forest coverage of 50 – 90%). Above the boundary of forests, there is the zone of dwarf mountain pines (1% with coverage 0 – 50%). Most forests in Slovakia can be classified as natural (64%) and mainly natural (22%). According to NFP SR, primeval forests are found in the area of approximately 24 thousand ha (1.2%), according to their mapping by citizens' association PRALES (2009 – 2014) in the area of only 10,483 ha (0.48%) and they are especially valuable relics of forests of Central Europe. Plantations cover the area of 19 thousand ha (1%). Such conditions with the respective biodiversity conditioned the origin of protected areas and also provide suitable and varied stands for wild animals.

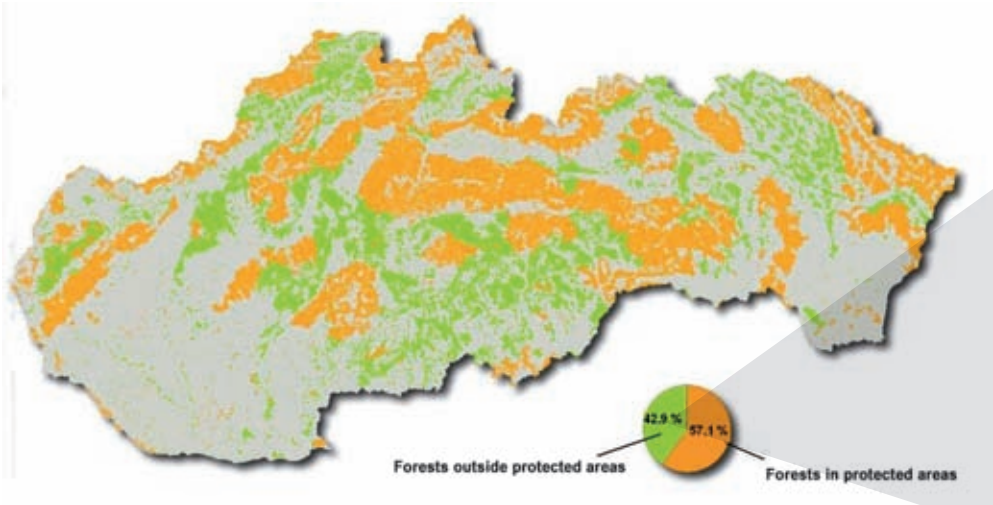
In accordance with the Act on Nature and Landscape Protection (No. 543/2002 Coll.), as protected areas are understood such localities on which habitats of Community interest can be found as well as habitats of national interest, habitats of species of Community interest, habitats of species of national interest and habitats of birds, including migratory species, for the protection of whom protected areas, important landscape elements or territories of the international importance are declared.

Pursant to this Act, the whole territory of the SR is protected (the 1st protection level – the so-called general protection). Specially protected areas (from the 2nd to the 5th protection level) include:
– protected landscape areas (PLA) with the 2nd protection level (PL),
– national parks (NP) with the 3rd PL
(the so-called "large-size" PA – LSPA), and
– protected site (PS) with the 3rd, 4th or 5th PL,
– nature reserve (NR) and national nature reserve (NNR) with the 4th or 5th PL,
– nature monument (NM) and national nature monument (NNM) with the 4th or 5th PL,
– protected landscape element (PLE) with the 2nd, 3rd, 4th or 5th PL
(the so-called "small-size" PA – SSPA).
These specially protected areas declared according to the aforementioned act form the national network of PAs.

Based on the conservation status of habitats, PAs can be divided into four zones: A (to which the 5th PL applies), B (the 4th PL), C (the 3rd PL), and D (the 2nd PL). The European network of PAs (NATURA 2000) consist of two types of areas declared in accordance with the EU Directives – Sites of Community interest and Special protection areas. Sites of Community interest (SCI) – they are not a new category of protected area, their definition results for the EU member states from Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). In the Act on Nature and Landscape Protection, they are defined in Section 27 and they are declared in any of the national categories of PAs (in particular PS or NR, with the respective PL).

Special protection areas (SPA) – it is a newer category of protected area introduced in the national legal system in connection with transposing Council Directive No. 79/409/EEC on the conservation of wild birds, subsequently replaced by Directive of the European Parliament and of the Council 2009/147/EC of 30 November 2009 on the conservation of wild birds (Birds Directive) that considers scientific – ornithological criteria to be the only and most important criteria for the selection of localities. In the Act on Nature and Landscape Protection, they are defined in the Section 26. As far as restrictions are concerned, the list of prohibited activities with negative impacts on the subject of protection is particularly defined in each area.

Forests with management restricted by one or more categories of PAs (2015)



Source: MoE SR, NFC

As far as the area of forests is concerned, in 2015 protected areas occupied (including the area of NATURA 2000) 1,150.3 thousand ha, which accounted for 57.1% of the total area of FL. In comparison with 2007 (since when data are available), this area increased by 2.1%, whereby the area of forests with restrictions of the nature protection also increased. The total area of timber land in the national network of PAs in 2015 was approximately 791.2 thousand ha, while the trend is a long-term slow increase in this area due to the gradual increase in the forest coverage. Forest management is totally excluded only in the strictest 5th protection level (76,433 ha).

As of 2015, the network of PAs consisted of 9 NPs, 14 PLAs and 1,109 SSPA. The total area of specially protected nature was 1,142,143 ha, which accounted for 23.3% of the territory of Slovakia.

The forest coverage in PLA was 70.6% as of 2015.
The forest coverage in NP (without buffer zones) was 88% as of 2015.
The forest coverage in SSPA (without buffer zones) was 71.7% as of 2015.

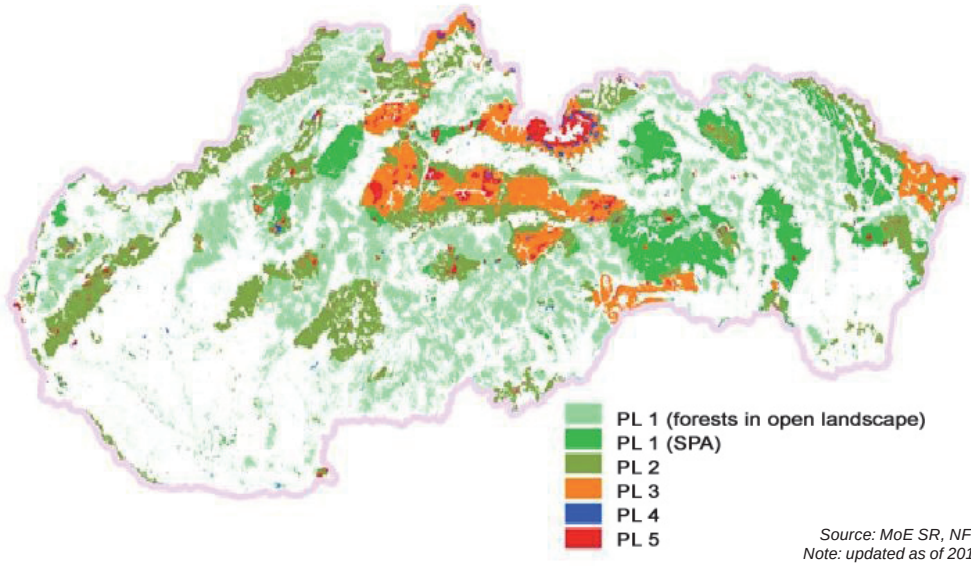
Area of timber land by protection level of categories of protected areas as of 2015

Protected areas		Protection level (thousand ha)					Total
		1	2	3	4	5	
Protected landscape areas (PLA)[1)]		–	325,5	–	–	–	325,5
National parks (NP)[1)]		–	–	207,5	–	–	207,5
Buffer zones NP		–	135,1	–	–	–	135,1
Zones of PLA2[2)] and NP[3)]	A	–	–	–	–	1,4	1,4
	B	–	–	–	2,3	–	2,3
	C	–	–	13,7	–	–	13,7
	D	–	17,5	–	–	–	17,5
Small-size protected areas (SSPA)	(National) nature reserves ((N)NR)[3)]	–	0	0	4,5	74,5	79,0
	(National) nature monuments ((N)NM)	–	0	0	0,5	0,5	0,9
	Protected landscape elements (PLE)	–	0	0	0	–	0,0
	Protected sites (PS)	–	1,0	2,1	0,8	–	3,8
	Buffer zones of SSPA	–	0	0,4	4,2	–	4,5
Sites of Community interest (SCI) – outside the national network of PA		–	67,8	–	–	–	67,8
Special protection areas (SPA) – outside SCI and the national network of PA		291,3	–	–	–	–	291,32
Total		**291,3**	**546,8**	**223,7**	**12,1**	**76,4**	**1 150,3**

Source: NFC
Note: The area of forest lands in the table also includes military forests
Explanations: 1) area after deducting SSPA and zoned PLA or NP; 2) zoned PLA: Horná Orava; 3) zoned NP: PIENAP

SSPAs on forest land represent remnants of the most preserved forest communities of both the national and Community interest. They are made of forest covers with the structure of primeval forest or natural forests and the related plant communities that are less affected by human activities or their occurrence is considerably limited with space. They can be found from bottomland forests up to the zone of dwarf mountain pines. Out of that, the highest 5th protection level requires excluding interventions by human beings and leaves the whole development on the nature, as reservations represent the most preserved parts of forest ecosystems with the original tree species composition, suitable structure and independent natural regeneration. In the 2nd to 4th PL, the following is limited, among other things: mainly using pesticides and fertilizers, construction of forest roads and other structures and buildings, picking of forest fruits, and exercising of the hunting right. From the FM perspective, however, it is arguable and it is not certain that the protection levels will guarantee keeping these natural values or the subject of protection.

Protection level (PL) on forest land



Source: MoE SR, NFC
Note: updated as of 2015

An increase in the area of FL in PAs can be observed mainly after 2004 in connection with the approval of the new European protected areas (NATURA 2000) related to the entry of the SR in the EU. The total area of European NATURA 2000 network (the overlapping localities SCI and SPA are included only once) was 445 thousand ha in Slovakia as of 2015. The overlapping of the area of the European network NATURA 2000 with the national network PAs was 780 thousand ha.

Overview of overlapping of the national network of protected areas and the NATURA 2000 network as of 31 December 2015

Category of protected areas	Total area of the territory of NATURA 2000[1)]	of which overlapping with the national network	Area of timber land in the NATURA 2000 network	of which overlapping with the national network
	thousand ha / %[2)]		thousand ha / %[3)]	
Sites of Community interest (SCI)	584	504	479	411
	11,9	10,3	24,7	21,2
Special protection areas (SPA)	1 311	667	836	493
	26,7	13,6	43,0	25,4
Mutual overlapping of SCI and SPA	450	391	375	296
	9,2	8,0	19,3	15,2
Total area of the NATURA 2000 network (the overlapping areas are included only once)	1 445	780	940	608
	29,5	15,9	48,4	31,3

Source: MoE SR, drawn up by NFC – Forest Research Institute
[1)] area of forest and non-forest lands in total;
[2)] percentage share in the territory of the Slovak Republic;
[3)] percentage share in the total area of timber land in the Slovak Republic

The area of forests in SPA is more or less stable and as of 2015 it was approximately 836 thousand ha (for the first time, it takes into consideration the exact area of military forests). The trend of its slow increase continues due to an increase in the forest coverage of these areas. The forest area in SCI was 479 thousand ha (after including the exact area of military forests).

7.5. What is the response of the society to mitigating or compensating consequences of forest management on the environment?

The basic and main instrument of the sustainable management of forests based on fulfilment of all their functions as well as their protection is forest management legislation. However, the equally important instruments are also economic instruments by using of which environmental principles in management in forests are, among other things, enforced or supported.

The response of the society to mitigating or compensating negative consequences of forest management on the environment is described based on indicators from the group of political, economical and social aspects.

7.5.1. Forest certification

Forest certification represents the direct economic instrument for enforcing certain principles of forest management into practice, i.e. whether forest management corresponds to environmental, economic and social standards according to the internationally recognized criteria. Leading woodworking companies require certified wood and their products from this wood are also certified, so the buyer knows that their production has not threatened the future of forests.

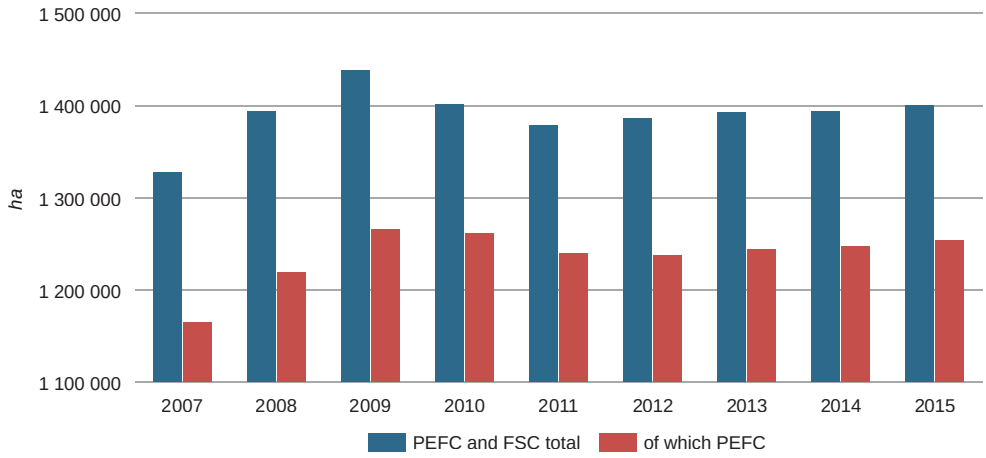
In the Slovak Republic, forest certification is implemented by means of two most wide-spread schemes in Europe:

- Programme for the Endorsement of Forest Certification schemes (PEFC)
  - in Slovakia, it is covered by the Association for Forest Certification of Slovakia as the national management body of PEFC in the Slovak Republic, and

- Scheme FSC (Forest Stewardship Council)
  - in Slovakia, it is covered by the Civil Association FSC Slovakia.

As of 2015, 1,254,466 ha of forests were certified according to the PEFC scheme (64.6% of the forest area of the timber land). From 2007, their area increased by 7.2%.
According to the FSC scheme, forests with the area of 146,941 ha were managed (7.6% of the timber land), which represents a decrease of 9.4% compared to 2007.

Trend in the area of certified forests



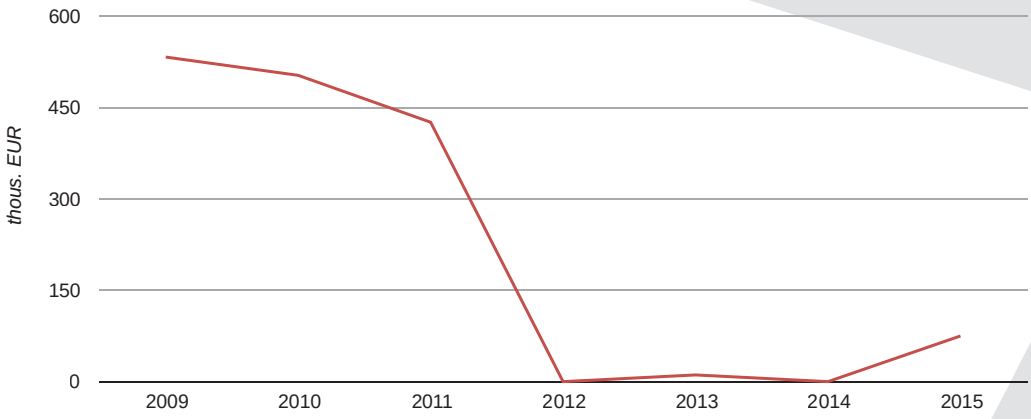
Source: NFC
Note: PEFC – the certification scheme of the Programme for the Endorsement of Forest Certification schemes; FSC – certification scheme Forest Stewardship Council

In total, the area of certified forests increased from 2007. However, the trend in their area (in total according to PEFC and FSC) has a fluctuating character; it is possible to state in the recent years their stabilized area at the level of approximately 72% of the land coverage of the SR.

7.5.2. Costs of the environmental protection in forest management

The costs include investment and current costs of forest management spent for the environmental protection. From 2009, there was a rapid decrease in forestry costs of the environmental protection that were EUR 75 thousand as of 2015 (i.e. a decrease of up to 85.9%).

Trend in costs of the environmental protection in forestry

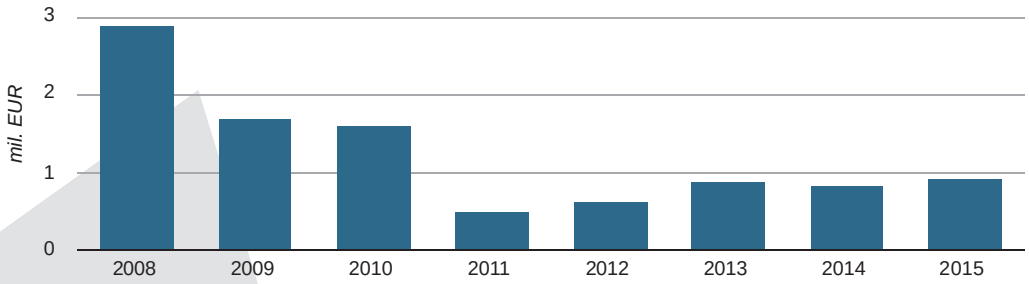


Source: SO SR
Note: No data are available for 2012 and 2014 (data are confidential)

7.5.3. Payments for the exclusion of forest land

Forest lands can be used for any other purposes than for the fulfilment of forest functions defined by law only on the basis of decisions made by the district authorities on taking out from the fulfilment of forest functions or on restriction of using forest functions on them. They can be taken out temporarily or permanently. The payment for the exclusion of forest land from the fulfilment of forest functions as compensation for loss of their extra-production functions (pursuant to section 9 of the Act on Forests) represents the economic instrument of the state focused on the protection of forest land as an environmental component and the natural capital of the country, their improvement and preserving for the future generations (environmental instrument).

Trend in payments for the exclusion of forest land



Source: NFC

Compared to 2008, until 2011 payments for the exclusion of forest land decreased by up to 68.3% to EUR 0.92 million, which represents a positive trend from the environmental perspective. Since 2011, however, they have been slightly increasing. The share of made payments from 2008, however, decreased considerably (by 47%), while it decreased rapidly as late as in the period of 2014 – 2015.

7.5.4. Compensations for restricted forest management

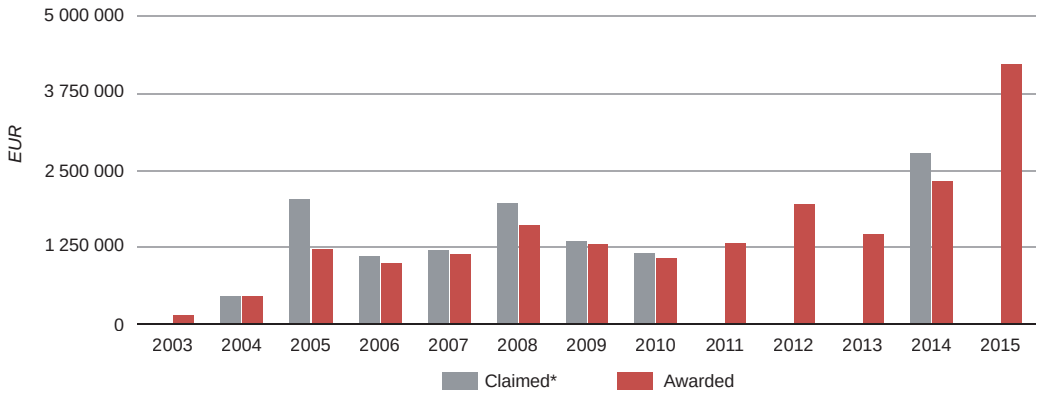
Due to the fulfilment, implementation of any other interests on forest land resulting from various legal regulations, there is restricted forest management or implementation of ownership rights in forests. The highest share in these restrictions have in particular Act No. 543/2002 Coll. on Nature and Landscape Protection, Act No. 326/2005 Coll. on Forests, the Construction Act No. 50/1976 Coll. as subsequently amended, Act No. 274/2009 Coll. on Hunting, as amended, Act No. 656/2004 Coll. on Energy Sectors, as amended.

Compensation for restricted forest management is enabled so far by Act No. 543/2002 Coll. on Nature and Landscape Protection, as amended, and Act No. 326/2005 Coll. on Forests, as amended, dealing with compensation for damages incurred to the forest property and compensation for restriction of ownership rights. It stipulates the possibility to apply compensation in particular in the case of taking out and restricting utilization on the forest land, forest cover, due to an increase in costs and in the special management regime.

In 2015, decisions were issued on awarding compensation for restricted forest management in the total amount of EUR 4,229,273. Compared to the previous year, an increase in compensations of 80.4% was recorded, while in comparison with 2003 they increased considerably, up to 27 times.

Financial requirements for restricted forest management due to the nature and landscape protection are claimed in particular in the zone of the 5th and 4th protection level; in the zones of the 2nd and 3rd protection level requirements have been claimed so far only to a limited extent.

Trend in compensations for restricted forest management



Source: NFC
*Note: * not all data are at disposal; data according to documents of the MoE SR and MoI SR*

According to the conception materials of the Ministry of Environment of the Slovak Republic, it is possible to claim compensations for restricted forest management on the total area of 813,505 ha and the quantified annual compensation is EUR 325,965,430.

Due to a lack of funds and complexity of proving incurred damages by owners of forest land, the process of compensation for damages in accordance with Act on Nature and Landscape Protection slowed down or stopped in the past. New impulses for a better and more effective solution of these issues came with the amendment to the Act on Nature and Landscape Protection (the Act No. 506/2013 Coll.) and from increased numbers of economic instruments for the compensation for damages. In addition to financial compensation, the purchase of forests, lease, order of ensuring benefit of the respective natural and protection function of forests and financial payment as well as a suitable combination of these instruments is considered.

The conditions for payment for damages from the EU funds by means of the Rural Development Programme (RDP) for 2007 – 2013 or 2014 – 2020 were created. With this aim, the following regulations were adopted: the Regulations of the Government of the SR No. 146/2008 on conditions for providing support in Sites of Community interest on forest land and No. 152/2008 on conditions of providing forestry-environmental payments regulating conditions for providing support and method of its application (later replaced by the Regulation of the Government of the SR No. 499/2008 on conditions for providing support under the RDP and the Regulation of the Government of the SR No. 75/2015, stipulating rules for providing support in connection with measures of the RDP).

Compensation for restricted forest management was solved in two measures of the RDP SR (2007 – 2013):

1. Support in Sites of Community interest on the forest land (1st payment in areas of Natura 2000 with the 5th protection level), The support of special methods of forest activity management in areas of Natura 2000 should contribute to the sustainable development in order to protect the natural environment and landscape, mainly biodiversity and areas with a high natural value. This payment relates to “no interevention“ in protected areas and the only condition for receiving subsidies is no intervention in forest coverage and no damaging of soil and vegetation cover.

2. Support in including in the measure of forestry-environmental payment – this 2nd payment is the only payment supporting the active forest management focused on the subject of protection – habitat, or birds. The payment was annual during the period of obligation of five years for the whole area of segment, regardless of which part of the segment was affected. It was necessary to meet conditions that are considerably close to nature – e.g. using of ecological oils, using of gentler methods in regeneration, keeping pioneer tree species, keeping five trees on uncovered clearing and in SPA the most important and maybe most restricting, time restriction for all forest-economic activities according to the individual species of birds during their nesting and bringing out nestling.

In the RDP SR (2014 – 2020), the following similar measures are defined:

1. Payments in the Natura 2000 network (Compensation payments in the Natura 2000 network – forest land).
2. Forest-environmental and climate services and forest protection (Payments for forestry-environmental obligations).

It can also be stated that the implementation of NATURA 2000 results in further restriction of management in forests, not only on its new protected areas, but also in most areas already protected before that with the 2nd to 4th protection levels. Only the original 5th protection level remains more or less without unchanged.

The forest sector considers as one of its key problems just the less efficient system of compensations for forest owners for restriction of management and increased costs due to the nature and landscape protection. This target can also be found in the National Forest Programme of the SR as part of the Priority 16: Solving the issue of insufficient compensation for restriction of implementation of ownership rights.

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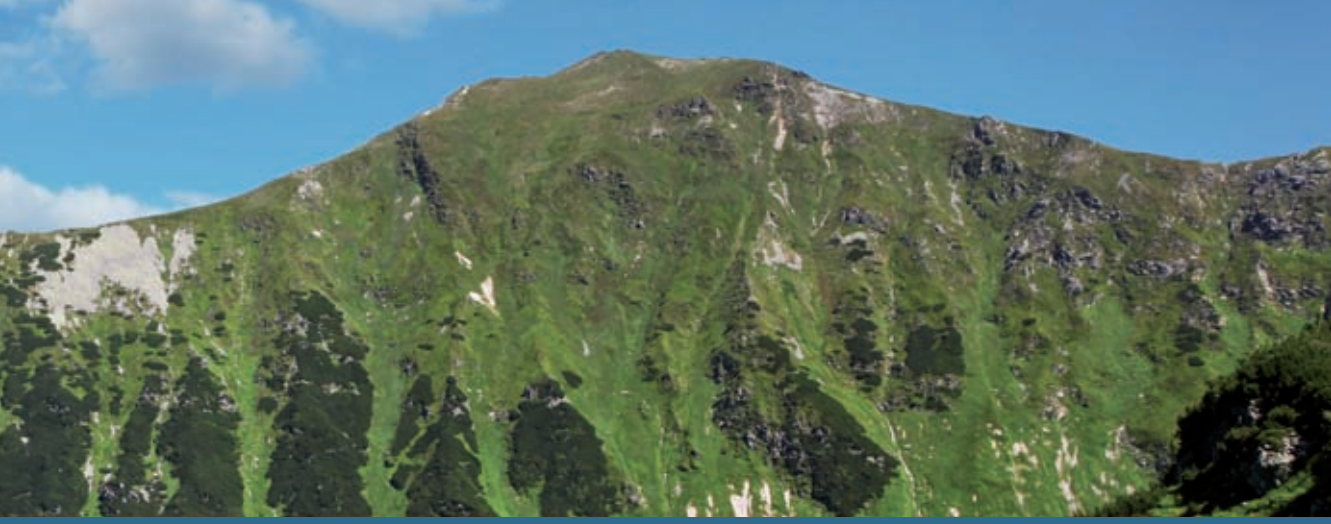
TOURISM

List of the sector indicators in tourism

Trends of the sector relevant for the environment
◀ Motives and types of visitors
◀ Accommodation facilities
◀ Tourist infrastructure
◀ Expenditures in tourism
◀ Water quality of natural outdoor swimming pools
◀ Number of visitors of caves
Interactions of the sector with the environment (demands of the sector in respect of resources and impacts of the sector on the environment)
◀ Soil erosion due to tourism
◀ Number of threatened SPAs due to tourism
◀ Production of waste from tourism



Political, economic and social aspects
◀ Number of assessed interventions in the nature and landscape related to tourist activities
◀ Costs of the environmental protection in tourism
◀ Environmental certification in tourism
◀ Assessment of impacts of proposed activities on the environment in tourism

According to the Statistical Classification of Economic Activities (SK NACE Rev. 2), tourism is included in the economic activities of the Section I – Accommodation and food service activities, the Section N – Administrative and support service activities, and the Section R – Arts, entertainment and recreation.

It consists of the following divisions:
51 – Accommodation
79 – Travel agency, tour operator reservation service and related activities
91 – Libraries, archives, museums and other cultural activities
93 – Sports activities and amusement and recreational activities

8.1. Summary assessment of the development in the sector of tourism

What is the state and directing of tourism in relation to the environment?

The dominant position among motives of foreign visitors of the Slovak Republic in 2000 – 2012 occuppied activities in accordance with the sustainable development; less favourable was a relatively high share of one-day and transit visitors bringing small economic benefit and negative environmental impacts. From 2013, the methodology of ascertaining motives changed; the priority areas were spending holiday and leisure time, while a high share of transit visitors remains. In 2015, the most important motives of holiday stays in the domestic tourism included in short-term stays: visiting relatives and friends and recreation and sports; in long-term stays: recreation and sports.

The number of accommodation facilities and their bed capacity was increasing from 2000, but it still lagged behind the average of both the EU and neighbouring countries. The average number of overnight stays decreased from 2000 and it was stabilized from 2011, while it lagged behind the neighbouring countries. In 2015, the number of overnight stays increased more considerably in the Slovak Republic in a year-on-year comparison. The biggest bed capacity was concentrated in the regions of Žilina and Prešov, the smallest in the region of Trenčín.
The tourist intensity was the highest in the region of Žilina and the lowest in the region of Košice. The total number of overnight stays increased from 2000; on the contrary, the average number of overnight stays decreased.

From 2004, the tourist density was gradually growing (the number of beds per km^2); which was the highest in the regions of Bratislava and Žilina and the lowest in the region of Nitra. Numbers of localities for mountain tourism activities stagnated from 2001 or were increasing only slightly, which is a positive fact from the perspective of natural environmental component. Only 14 administrations of large-scale protected areas had their own information centres, nine administrations do not have such centres. With the absence of information centres, these protected areas deprive themselves of one of possibilities how to direct movement of their visitors.

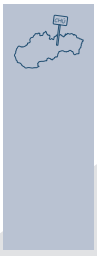
The average expenditures of inhabitants of the SR for domestic stays increased from 2003 to 2015 on average by EUR 15, while expenditures of long-term stays increased, and in particular of short-term stays (by up to of 3/4) in 2015. Financial expenditures of households for recreation and culture increased by more than a half from 2000.

In 2015, the classification of bathing water was in accordance with the Directive 2006/7/EC of the European Parliament and of the Council concerning the management of bathing water quality conducted in 28 natural localities. 16 localities of bathing water were classified as localities with excellent bathing water quality, 10 localities had good water quality, 1 locality had sufficient bathing water quality and 1 locality insufficient bathing water quality. In 2015, overpopulation of blue-green algae was recorded in Zemplínska Šírava and in the locality of Gazarka where the bathing prohibition was issued until the end of the season.

In 2000 – 2008, the average number of visitors of caves was stabilized at 680,000 visitors per year. In 2009, there was a considerable decrease in the number of visitors by more than a third in a year-on-year comparison, from 2010 the number of visitors was again increasing gradually.

What are interactions of tourism and the environment?

In 2001 – 2015, the length of tourist marked trails (TMT) in NPs affected by erosion increased considerably (to 1,051 km). The biggest share of the length of trails affected by erosion was in the areas of NP Malá Fatra and NAPANT. The absolute longest tourist trails affected by erosion could be found in the area of NAPANT. In the monitored period, there was also an increase in the length of cycle routes affected by erosion, from a more detailed monitoring (the year of 2008) this increase was more than one fifth. The biggest share of the length of cycle routes affected by erosion was in the area of PIENAP and NAPANT. The biggest absolute length of cycle routes affected by erosion was in the area of NAPANT (89.7 km).



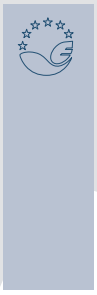
In 2000 – 2015, the highest rate of threatening of small-size protected areas (SSPA) due to activities of tourism manifested itself in areas of administrations of TANAP, NAPANT, NP Malá Fatra, PIENAP and NP Slovenský raj. As far as PLAs are concerned, they were mainly PLA Dunajské luhy, PLA Malé Karpaty, PLA Strážovské vrchy, PLA Poľana, PLA Cerová vrchovina, and PLA Vihorlat. From 2013, water SSPAs were also monitored that can be threatened by construction activities, (illegal) fishing or water sports. Such SSPA were identified in areas of administrations of NP Veľká Fatra, PIENAP, PLA Dunajské luhy, PLA Horná Orava and PLA Cerová vrchovina.

In 2000 – 2008, the decreasing trend of waste production was seen in the sector Hotels and restaurants. From 2009 (a change in methodology) to 2015, there was a considerable decrease in the waste production in accommodation and food service activities.

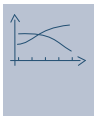
What is the response of the society to mitigating or compensating negative consequences of tourism on the environment?

60 – 80% of opinions of State Nature Conservancy of the SR requiring the approval of the competent nature protection authority (mainly the areas of TANAP, NAPANT, NP Slovenský raj, and NP Malá Fatra) related in total to the categories of protected areas. In 2003 – 2010, the number of opinions stagnated, but there was a considerable increase from 2011.

In 2009 – 2015, costs of enterprises for the environmental protection in tourism decreased. The share of costs in tourism was only negligible as part of the total costs of the environmental protection in the Slovak Republic.



In tourism, the quality management systems are only applied with difficulties in comparison with the other sectors. Implementation of systems is materially and financially demanding for small entities. In 2000 – 2015, the organisations with the certified Environmental Management System (EMS) included the companies Kúpele Dudince, a. s. and Termálne kúpalisko Podhájska. In the national register EMAS, there were no organisation registered from the sphere of tourism until the end of 2015. In total, three accommodation service facilities were assessed and awarded with the EU Ecolabel: MaMaison Residence Šulekova **** apartment hotel in Bratislava, Eco Friendly Hotel Dália *** in Košice, and Hotel Bojnický vínny dom **** in Bojnice.



Environmental efficiency of tourism, measured by macroeconomic indicators of tourism outputs (the value added of tourism and the value added of the sector of tourism) in relation to the number of assessed interventions in the nature and landscape was developing favourably during the monitored period, except for 2014.

8.2. How are the environmental principles and targets related to tourism implemented into the strategic documents?

8.2.1. Implementation of environmental principles and targets related to tourism into the strategic documents at the EU level (the most important documents)

2001	***Working together for the future of the European tourism*** Defining main challenges of European tourism faced by the individual societies and destinations; these challenges are both opportunities and threats. It is the continuing considerable growth of demand and the volume of implemented tourism in Europe together with a different development of various forms of tourism. The suitable reply to these challenges can also be the origin of new forms of tourism. The challenges also included the sustainable development and the environmental protection.
2002	***The Sixth Environment Action Programme of the EU "Environment 2010: Our Future, Our Choice"*** Target – ensuring a high level of the environmental protection while taking into consideration a variety of conditions in the individual regions of the Community, and achieving weakening of the relation between the economic growth and environmental pressures caused by this growth. Supporting the integration of protection and renewal of values of the landscape into other policies, including the tourism policy.
2003	***Basic orientations for the sustainability of European tourism*** Identifying challenges and targets of sustainable tourism, i.e. sustainable activities and growth, balanced approach to basic pillars of sustainability, sustainable models of conduct on both sides of consumption – i.e. of tourists on one side and of production (i.e. service providers) on the other side. Progress in this direction was evaluated as slow. Overcoming this condition was in the approach based on co-operation of all involved actors and their optimal active effects.
2004	***New perspectives and new challenges for sustainable tourism*** Focusing on competitiveness and quality of services, safety and certainty; new initiatives of sustainable tourism; knowledge and support of European tourism; tourism and transport; structural interventions co-funded by the EU; tourism and legislative activity of the EU; tourism in the Treaty establishing a Constitution for Europe. Among other things, it was emphasised therein that if tourism reached an excessive development in some regions that burdened both inhabitants and the environment disproportionately, an extensive potential of tourism was used insufficiently in some other regions.
2006	***A Renewed EU Tourism Policy: Towards a stronger partnership for European tourism*** Defining measures, such as partnership among involved actors in the sphere of tourism, increasing efficiency of the sector functioning, improvement of perception and making visible of European tourism and support of the sustainable development of the sector of tourism.

2006	***Renewed EU Sustainable Development Strategy*** The overall target of the renewed SU SDS was determining and developing measures that would enable the EU to achieve the continuous improvement of the quality of life of both current and future generations by creating sustainable communities able to use resources efficiently and manage them and use the potential for both ecological and social innovations of the economy, and thus ensuring prosperity, environmental protection and social cohesion.
2007	***Agenda for a sustainable and competitive European tourism*** Target – to contribute to increasing competitiveness of European tourism and create more better jobs with the simultaneous ensuring of the sustainable growth of tourism in Europe as well as in the global context. The EC also recognized that the priority task is ensuring the economic growth and increasing employment with the simultaneous support of social or environmental targets, and it announced the preparation of the European Agenda 21 for the sphere of tourism.
2010	***Europe, the world's No 1 tourist destination – a new political framework for tourism in Europe*** Supporting the coordinated approach to initiatives of tourism and defining a new action framework for the support of its competitiveness and ability of the sustainable growth.
2010	***Europe 2020: A European strategy for smart, sustainable and inclusive growth*** The strategy basis includes three mutually complementary priorities: – Smart growth: creating a knowledge- and innovation-based economy. – Sustainable growth: supporting a more ecological and competitive resource-efficient economy. – Inclusive growth: supporting an economy with a high employment rate that will ensure social and territorial cohesion. Out of the targets adopted for the EU by 2020, the following ones are mainly relevant for the sphere of transport: – cutting greenhouse gas emissions by 20% (or up to 30% on condition of a wider global agreement) compared to 1990, – obtaining 20% energy from renewable sources, – achieving 20% increase in energy utilization effectiveness. The Strategy has brought seven flagship initiatives; while out of them the especially important initiatives from the perspective of increased competitiveness and sustainability of tourism is the initiative Industrial Policy at the Age of Globalization.
2012	***Blueprint to Safeguard Europe's Water Resources*** Target – ensuring sustainability of all activities impacting water, and thereby ensuring accessibility of high-quality water for sustainable and fair utilization of water. It contains the requirement to include more largely targets of the policy in water management into the sector policies.
2013	***The Seventh Environmental Action Programme of the Union to 2020 "Living Well, Within the Limits of Our Planet"*** The key feature of the Programme is the protection and improvement of natural capital, support of better utilization of current resources and accelerated transition to a low-carbon economy. The Programme is to support the sustainable growth and creating new jobs, and thus create from the EU a healthier and better place for living. The Programme defines the necessity to include environmental issues into the other policies, among other thing also into the policy of tourism, in order to create a coherent and mutually interconnected approach.

8.2.2. Implementation of environmental principles and targets related to tourism into the strategic documents at the SR level (the most important documents)

2001	***Slovak Spatial Development Perspective – Changes and supplements*** Defining conceptual principles of the tourism development in the Slovak Republic. In the sphere of the recreation and tourism development, it proposes to link localization of services ensuring the recreation and tourism process preferably to settlements in order to prevent unjustified extension of recreational units in open landscape, while it also recommends using regeneration and revitalization of historic urban and rural units and buildings of cultural monuments. In the territory of national parks and protected landscape areas it requires to maintain the tolerable proportion of the function of nature protection and other functions related to recreation and tourism.
2001	***National Sustainable Development Strategy*** Setting priorities and targets of the sustainable development, Strategic Objective 22. Improvement of transport and technical infrastructure, tourism development.
2007	***Tourism Development Strategy of the Slovak Republic to 2013*** The basic development document for tourism by 2013. It also included coexistence between interests of the state in the sphere of nature and landscape protection and interests of the tourism sustainable development. Key forms of tourism for which Slovakia has the best preconditions and which have to be preferably supported, developed and improved during the next years were, among other things, also summer tourism and stays near water, spa and medical tourism where all facilities together use advantages of higher quality of the environment, and winter tourism and winter sports, while interests of the nature, landscape and environmental protection must be respected in accordance with the applicable legislation. Tasks for fulfilment of strategic targets also included quick processing of zoning of the territory and drawing up principles for the tourism development in protected areas, with the emphasis on preserving natural values that are at the same time also main motives for a large number of visitors of Slovakia.
2005	***Action Plan for the Sustainable Development of the Slovak Republic 2005 – 2010*** Defining main targets, including tourism, concretized for the individual sectors. They include measurable indicators, deadlines, determination of responsibility for their fulfilment and methods of their financing.
2014	***Updated National Biodiversity Strategy up to 2020*** Defining targets valid cross-sectionally for all sectors. The most important intentions of the strategy from the perspective of tourism include: – ensuring integration of the biodiversity protection into strategies, planning and decision-making processes in various sectors, – improving co-operation of environmental and sector policies for measures aimed at reducing the ecological trace in accordance with the international co-operation and support of upbringing, education and research in this sphere.

2014	***The Tourism Develompent Strategy until 2020*** It declares the importance of the nature protection in the vision of the tourism development in Slovakia. The potential of tourism in Slovakia is represented by a complex of natural, cultural and historical values. Their capital in co-operation and activities of tourism entities create real preconditions for the perspective development of this sector. Therefore, we see Slovakia in terms of the vision as a country with advanced tourism that is internationally competitive, with the developed and high-quality destination management, services provided in a quality way, sufficiently educated and qualified personnel, in clear coexistence with the nature protection, cultural values and preserving the cultural and natural heritage. The document pays the attention to the zoning process, support of environmentally-friendly forms of tourism, using protected areas and premises for fine forms of tourism (in particular to the area of the High Tatras and the Low Tatras). The Strategy assumes drawing up methodology of the area tolerability for the sustainability of tourism and preserving values of the area as well as drawing up principles of the development of sustainable tourism in protected areas.

8.3. What is the state and directing of tourism in relation to the environment?

The development of tourism in the Slovak Republic is one of few perspective sectors for which this country has such given facts that cannot be moved to its neighbouring countries. However, it does not mean that it can develop without limits under the conditions of Slovakia. For professionally justified and more exactly well-founded regulations or directing the development of tourism, including the number of visitors, it is necessary to define the tolerability of area preferably in localities with a high number of visitors and vulnerable environment.

Tourism is one of the most dynamically developing sectors in the world and with its outputs it is also an important economic sector under the conditions of Slovakia. Foreign exchange incomes from tourism approached EUR 2 billion in 2014. More than 20 thousand entrepreneurs do business in tourism; at present, there is approximately 3,000 accommodation facilities in Slovakia with more than 150 thousand beds with around 11 million overnight stays each year only in these facilities monitored by SO SR. In Slovakia, recreational centres using both summer and winter seasons have been built.

In terms of record-keeping, reporting, statistics, but also some aspects of management, tourism under the conditions of Slovakia is not a comprehensive sector inputs and outputs of which can be measured in the national accounting system, such as agriculture, building industry or industry, but it is a conglomerate of products and activities from many various sectors that are participating in activities of tourism. Even if the decisive task in the development of tourism has the private sector, the task of the public sector (from the national up to local level) is irreplaceable.

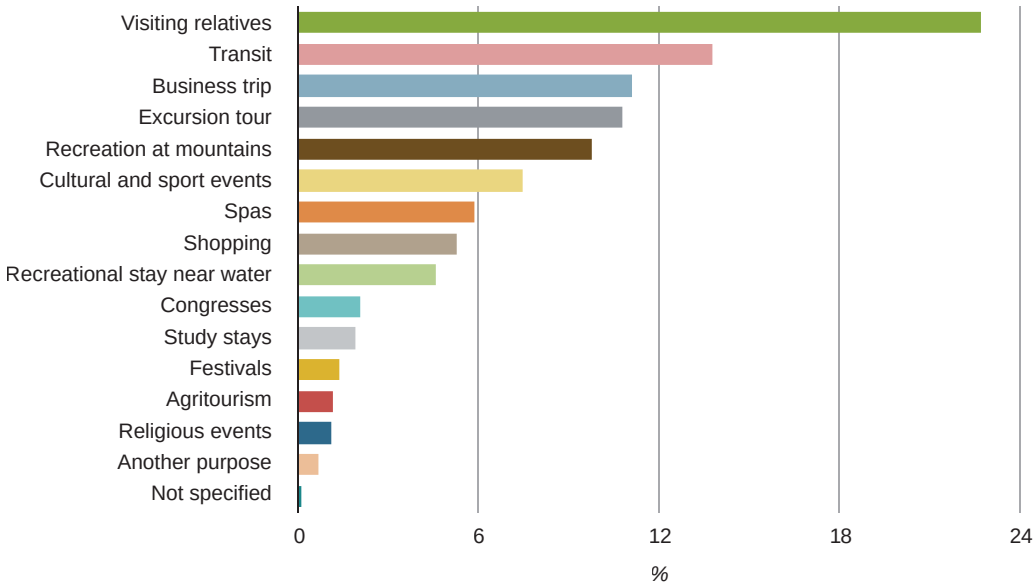
The state and directing of tourism in relation to the environment is characterized based on indicators from the group of trends of the sector relevant for the environment.

8.3.1. Motives and types of visitors

Learning motives of visits enables to evaluate potential negative impacts of performed activities of tourism on natural and cultural and historic resources. Transit foreign visitors

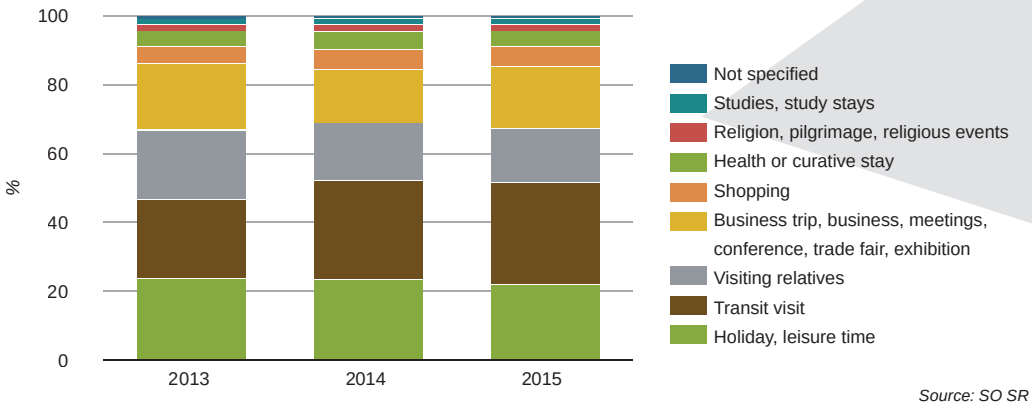
mainly with a lower economic effect contribute to increasing intensity of transport mainly on overloaded main transport routes and contribute to negative effects on the environment along these routes.

Motives of foreign visitors of the Slovak Republic (the average from the period 2000 – 2012)



Source: SO SR

Motives of foreign visitors of the Slovak Republic



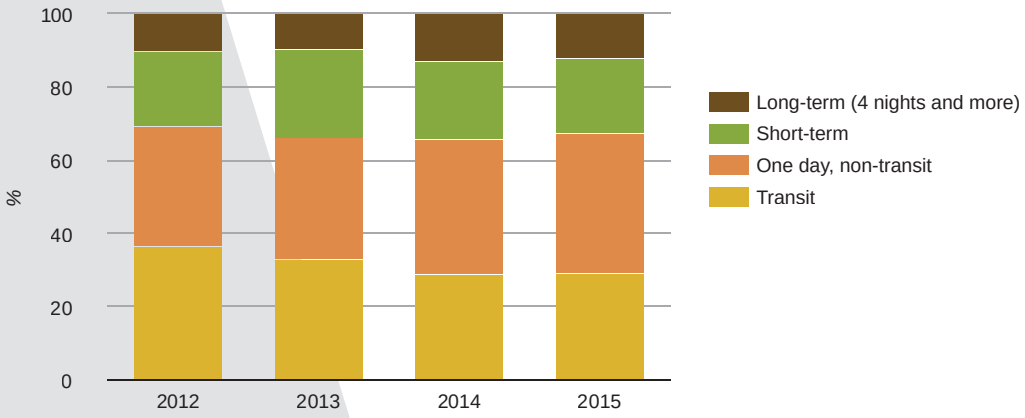
Source: SO SR

Transit and one-day non-transit visitors burden the environment, while only smaller economic benefits in tourism result from them; on the contrary, short-term and mainly long-term visitors bring more considerable economic effects in the form of expenditures for accommodation, food services and various supplementary services, whereby they contribute to the economic

development of tourism as the economic sector as well as of local economies, and, at the same time, they compensate to a certain extent any possible related burden of the environment. On the site of demand in tourism and in the motivation area, there are more socioeconomic factors and facts effecting, such as increasing possibilities of leisure time activities, changes in the demographic development, economic conditions and standard of living, the education level is increasing and gradual change in the style of living of citizens with a bigger emphasis on spending leisure time, changes caused by the transport development, and other factors.

Among motives of foreign visitors of the Slovak Republic, activities in accordance with requirements of the sustainable development basically dominate, in particular as far as hotel-based tourism is concerned. The considerable range of foreign visitors' interest throughout the year and among the individual types of tourism manifest themselves identically; of course regional differences are also considerable. The stable interest of foreign visitors in culture and sightseeing can be assessed positively. For the time being, these visitors' interest in stays and activities in the mountain environment during both summer and winter seasons is smaller, even if an increase in the number of visitors can also be observed here.

Development of the share of types of foreign visitors of the Slovak Republic

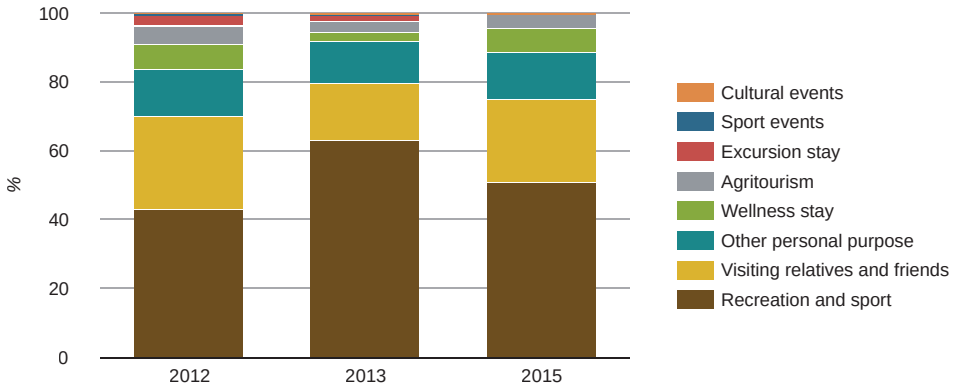


Source: SO SR

The structure of foreign visitors by the length of stay has not been developing favourably, on one side in the period of 2003 – 2008 the share of transit visitors was increasing, and on the contrary the share of short-term and in particular long-term tourist visitors decreased. The group of foreign visitors not using any accommodation facilities (transit and one-day non-transit) has constantly overall majority to three-third share. However, in terms of economic benefits or the impact on the environment, one-day visitors cannot be assessed generally as negative; some segments of one-day visits are, on the contrary, positive in both aforementioned aspects.

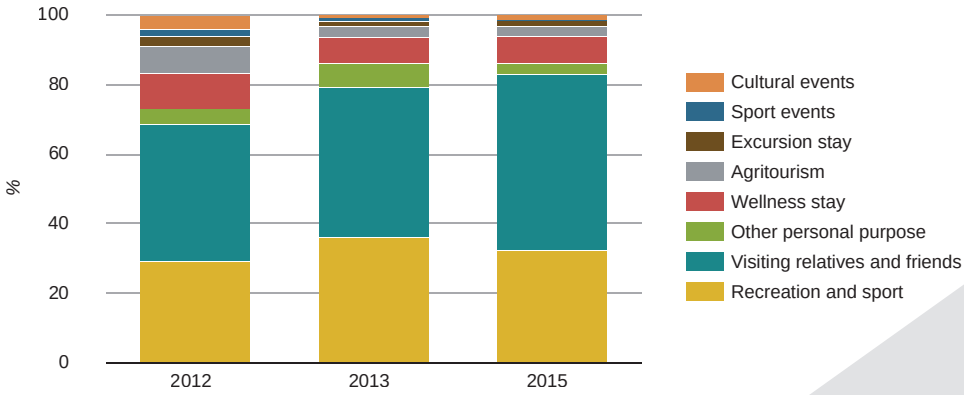
The representation of the individual types of foreign visitors of the Slovak Republic has remained, in terms of percentage, constant, and except for some small fluctuations, its has not practically been changing considerably. The structure of foreign visitors by the length of stay has not been developing favourably, but from the perspective of the environment this is not a problem.

Motives of holiday stay in domestic tourism – long-term trips



Source: SO SR

Motives of holiday stay in domestic tourism – short-term trips



Source: SO SR

The number of stays of citizens of Slovakia in their own country follows an increasing trend not only in the recent years. This positive development in terms of tourism and the standard of living is simultaneously a challenge for the management of areas in exposed destinations as well as searching for long-term sustainable forms of domestic tourism together with incoming tourism.

When visiting families and friends, expenditures of foreign visitors are lower by expenditures for accommodation services; the positive aspect with respect to the impact on the environment is the fact that these visitors will accommodate in the existing settlements. Excursion tourism brings more favourable economic impacts on the sector of tourism in the form of using accommodation, food services and other supplementary services (purchase of souvenirs, etc.). The favourable impact in terms of burden on the natural environment lies in the fact that these visitors are predominantly concentrated in localities of concentration of cultural and historic monuments that are mainly large settlements, and thus not burdening the natural environment.

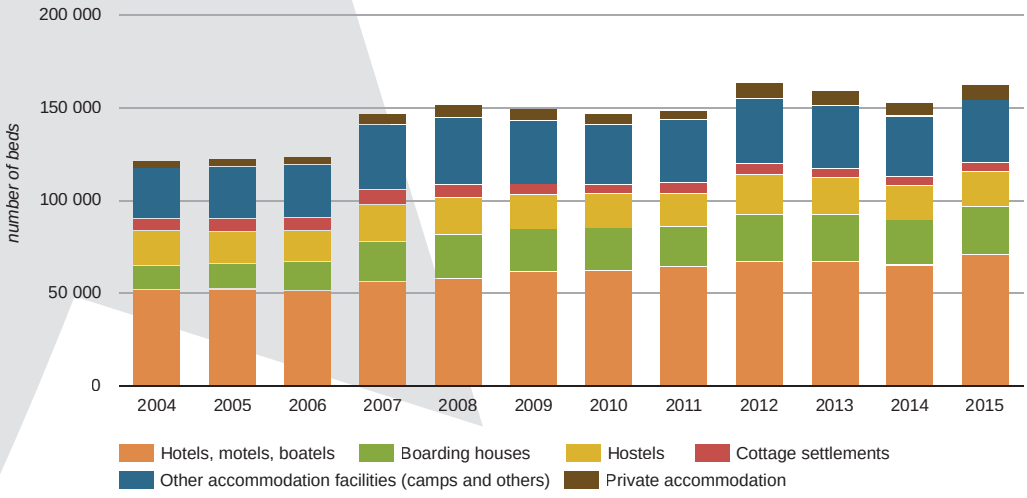
Shopping tourism is mainly connected with one-day visits and its particularity among these visitors includes higher expenditures for shopping in the retail network. Winter sports, including skiing, and mainly touring skiing, are traditionally connected with strong negative impacts on the natural environment in the form of building and operating mountains transport equipment and high concentration of visitors on relatively small areas. Due to the development of technologies in the sphere of passenger mountain transport equipment (PMTE) and mechanical snowing, as well as the changing approach of winter mountain centre operators to the environment, the impact of construction and operation of these centres manifests itself in a gradually less burdening manner on the environment where they are situated.

Staying at mountains as the main motive of a domestic participant of tourism can be, in terms of the impact on the natural environment, considerably internally differentiated, including sustainable activities with regard to the fact how they burden of natural resources (recreation), activities medium-risky for the natural environment (hiking and skiing tourism, cycling tourism, etc.) up to tourist activities requiring strict regulation concerning high risks of potential negative impacts, mainly in protected areas (downhill skiing, mountain climbing, paragliding, etc.). In the event of stays near water in areas around water reservoirs, there is a negative impact of intensive recreation in the summer period, with concentration of this impact in selected recreational centres where no basic infrastructure for drinking water suppliers and waste water disposal is built.

8.3.2. Accommodation facilities

The most important implementation precondition for the development of tourism in the respective area is the condition of infrastructure including quantitative and qualitative characteristics of accommodation and food service facilities and other supplementary services. Such accommodation facilities have the most important position whose utilization by visitors, in immediate dependency on their length of stay, creates preconditions for using also other supplementary services, increases attractiveness of tourist localities and the level of spent expenditures of tourist visitors. After relatively high investment, the qualitative level of accommodation in the Slovak tourism has considerably increased in the recent years.

Development of accommodation facility capacities by categories and classes in the Slovak Republic

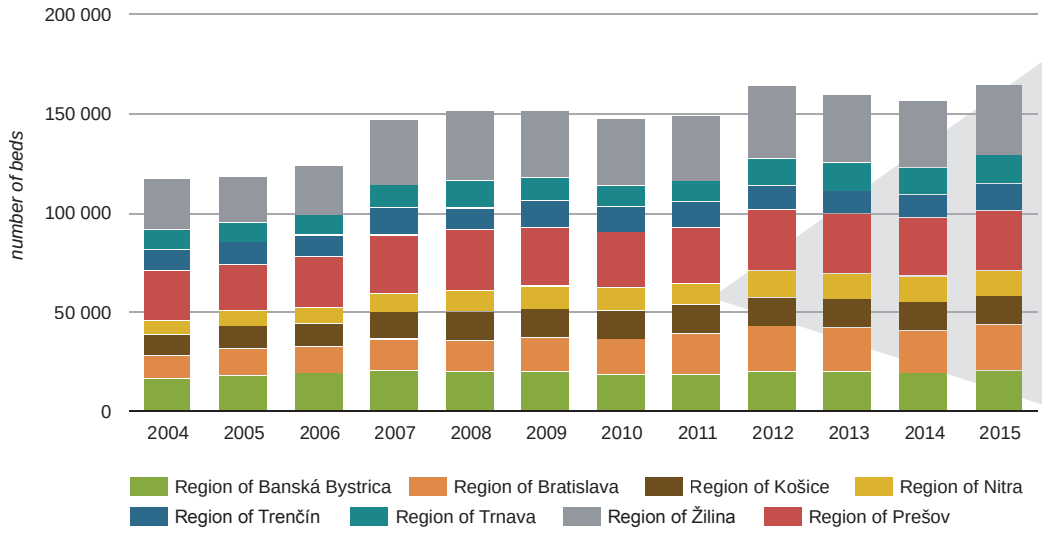


Source: SO SR

Growth of accommodation capacities influenced considerably volumes and distribution of hotel-based tourism in the country and its individual destinations. In addition to the number of visitors, the existence and method of operating accommodation facilities also influence the quality of the environmental components.

The highest tourist intensity (the number of beds per capita) can be seen for a long time in the region of Žilina, followed by the regions of Prešov and Bratislava. On the opposite end, there are the regions of Košice, Nitria and Trenčín. The area distribution of accommodation facilities is, of course, considerably overlapping with the areas with the highest concentration of localization agents of tourism, either natural (national parks, protected landscape areas, international protected areas) or cultural and historic attractive places that are largely concentrated mainly in the regions of Žilina, Prešov, Banská Bystrica, and Bratislava (in this case, in particular cultural and historic attractive places). More than two thirds of accommodation facility capacities in the region of Žilina are concentrated in the area of the districts of Liptovský Mikuláš, Ružomberok, Martin, and Žilina; more than a half of accommodation facility capacities in the region of Prešov is concentrated in the area of the district of Poprad and more than a third of accommodation facility capacities in the region of Banská Bystrica is concentrated in the area of the districts of Brezno and Banská Bystrica. Thus, the highest area concentration of accommodation facility capacities in the SR includes the compact continuous territory of the areas of the following mountains: the High Tatras, Western Tatras and Low Tatras Mountains, Veľká and Malá Fatra with the adjoining areas of the basins of Poprad, Liptov, Turiec and Horehronie.

Development of accommodation facility capacities by regions in the Slovak Republic

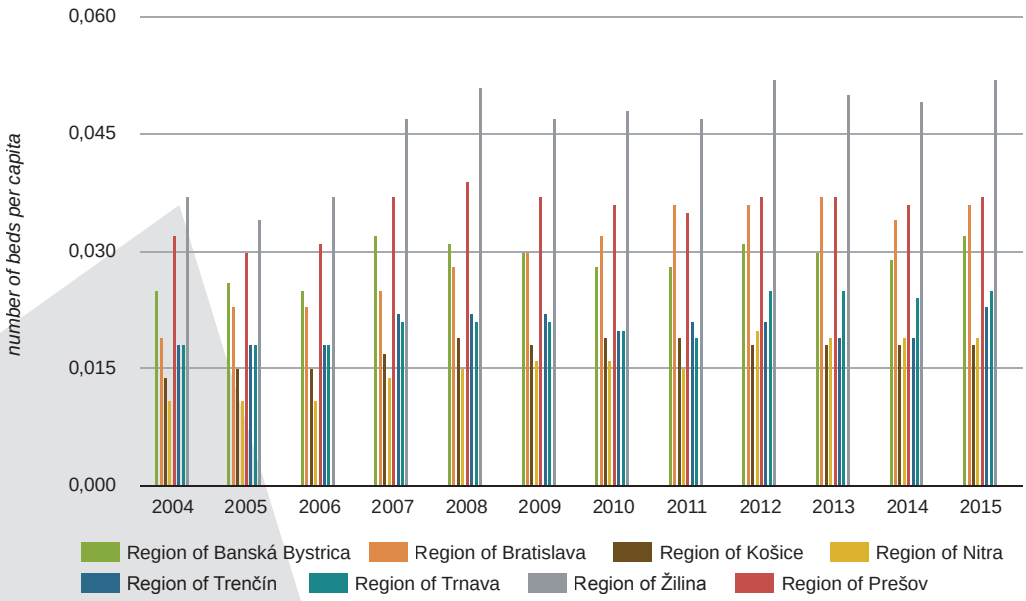


Source: SO SR

The most visited area is the north of Slovakia where accommodation facilities in the regions of Prešov and Žilina register together 4 – 5 million overnight stays each year, which is approximately 40% of the total number of overnight stays in Slovakia. The highest dynamics of the development, however, could be seen in the monitored period in accommodation facilities in the region of Bratislava where their temporary lack was solved with new capacities as well

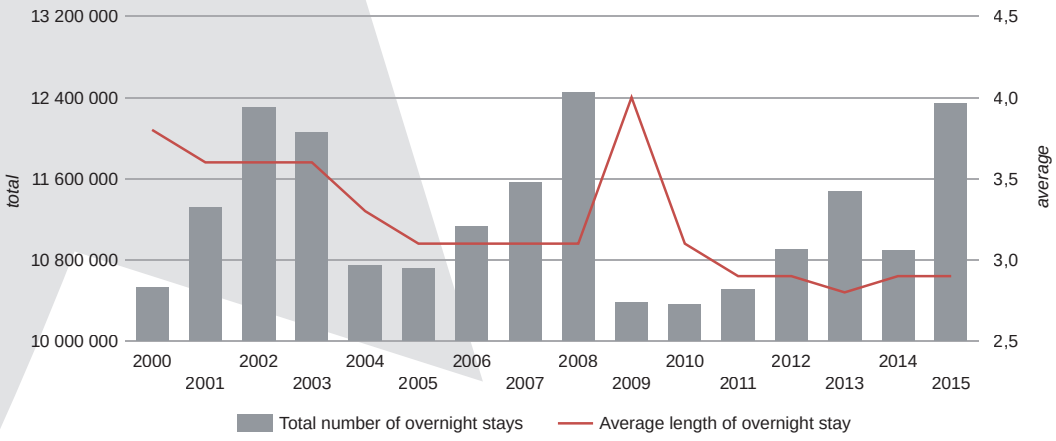
as the necessary change in the structure of hotel capacities for the benefit of higher class facilities. At the same time, it can be stated that overnight stays in the region of Bratislava have a short-term character and the shortest average length of stay exceeding only little bit more than two overnight stays is recorded here. In the other regions, this indicator shows basically a balanced tendency.

Development of tourist intensity in the individual regions of the Slovak Republic



Source: SO SR

Development of outputs of accommodation facilities in the Slovak Republic

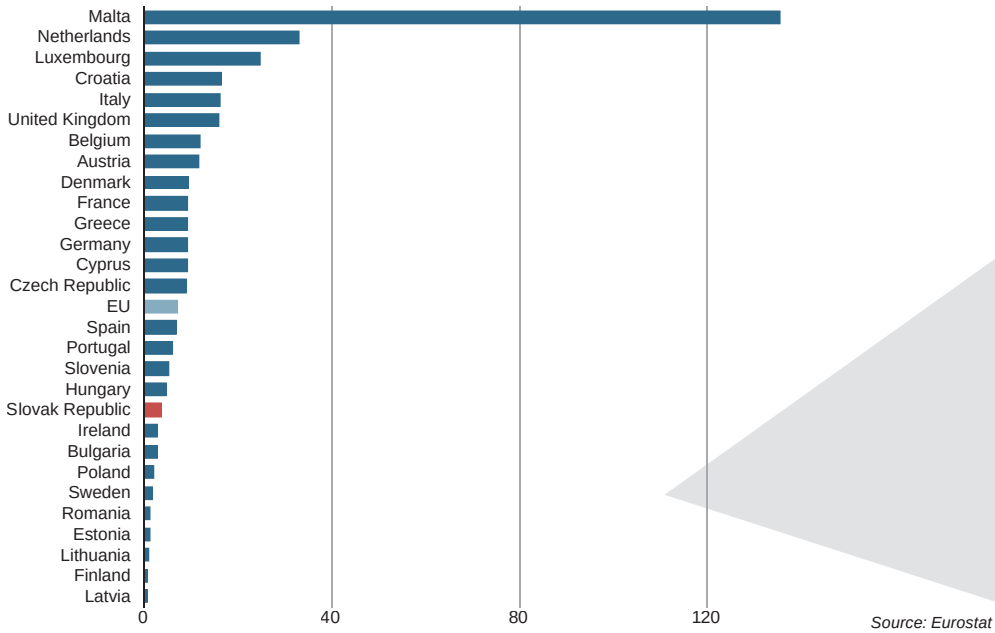


Source: SO SR

The positive development in the area of foreign exchange incomes from incoming tourism is not given only with the growth of outputs of accommodation facilities, which is a positive fact from the economic perspective. The growth of these outputs is, however, important with respect to the necessity to keep the long-term dynamic development as all types of economic effects of tourism are connected with an increasing number of overnight stays. The growth of the number of overnight stays also has to be assessed in terms of the number of tourists, from the perspective of the target of growth of the average length of stay. From both the economic and ecological perspective, growth of overnight stays being ahead of growth of the number of tourists is a positive and desirable or requested development. When trying to achieve this growth, it is also necessary to respect to an increased extent the environmental protection, among other things, also for growth of clientele sensitivity to the condition of the environment where they spend their holiday and other stays.

Although the bed capacity of tourist facilities has been gradually increasing in Slovakia, we are still lagging behind the EU average, and in particular its most developed countries with comparable natural conditions (e.g. Austria). From the perspective of the existing demand, however, the current supply of accommodation capacities is sufficient in terms of the total extent as well as the structure of supply.

Number of beds per km² – international comparison for 2015



Source: Eurostat

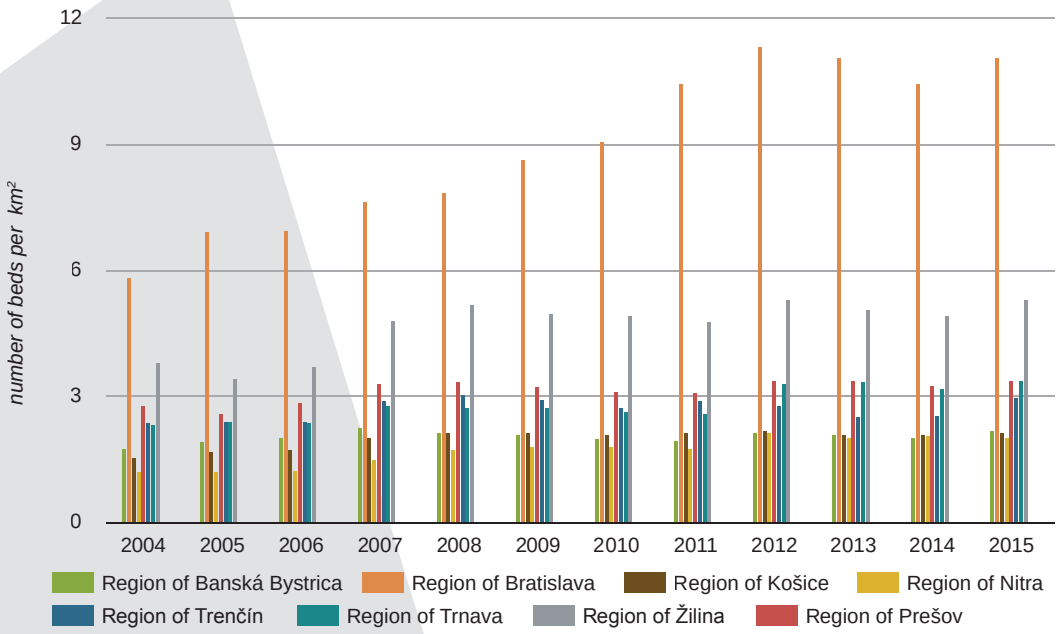
8.3.3. Tourist suprastructure

Using accommodation facilities by tourism participants, in the immediate dependency on their occupancy rate and the number of days of staying; creates requirements for using water resources and waste water disposal in the individual tourist areas.
The number of overnight stays in 2000 – 2015 was around 10.3 to 12.5 million in the Slovak Republic annually, without any more considerable growth trend. Periods of growth alternated (with the peak in the pre-crisis year of 2008) with, on the contrary, short considerable decreases (in particular in the period of crisis time-related with the transition to the Euro). This considerable decrease in the number of overnight stays (a decrease of up to 17%), in comparison with a longer period of growth during 2005 – 2008, could be seen just in 2009. In

the post-crisis period, we can observe the recovery of growth that is enforced in some years with oscillations around the growth trend. By comparing the number of guests and overnight stays in the individual years, it is also possible to observe the development of the average length of stay with which tourists reacted to the development of conditions and adjusted their travel activities to that. With respect to the impact on water, the number of overnight stays and days of staying is crucial.

As already mentioned, from the regional perspective the most visited area is the north of Slovakia where accommodation facilities record the total number of 4 – 5 million of overnight stays each year in the regions of Prešov and Žilina. The highest dynamics of the development, however, could be seen in accommodation facilities in the region of Bratislava. In Bratislava, there was a lack of accommodation capacities after the SR establishment, mainly at hotels of higher categories. At present, the situation has considerably changed, hotel capacities in Bratislava have increased considerably, and thus also competition at this market. With respect to the infrastructure condition, urban hotels create a lower pressure on the water quality compared to hotels localized in the mountain non-urbanized environment.

Development of tourist density in the individual regions of the Slovak Republic



Source: SO SR

The intensity of tourist attendance in the most valuable and vulnerable natural areas is not equally distributed as far as areas are concerned, the increased concentration of tourist visitors in certain localities and areas becomes a considerable problem. Specific consequences of concentration of tourist activities are most considerable just in the highest-quality areas of national parks. With respect to the level of anthropic burden on the natural environment, localities for active sports are concentrated in the area of the Tatra National Park (small areas of Roháčska and Žiarska valleys in the Western Tatras and Mlynická, Mengusovská, Velická, Mala Studená and Veľká Studená and Skalnatá valleys in the background of tourist and recreation centres of Štrbské Pleso, Starý Smokovec and Nový Smokovec and Tatranská Lomnica at the High Tatras) and the National Park Low Tatras (small areas of Demänovská and Jánska valleys and the northern hills of the Mountain of Chopok

in the background of the tourism and recreation centre of Jasná in the northern part of Bystrá and Vajskovská valleys making up the background of recreation and tourism centres of Srdiečko – Kosodrevina, Tále and Krpáčovo in its southern part). With regard to the density of marked cycle routes and tourist marked trails, the most fragmented areas with respect to their area include PIENAP, NP Muránska planina, and NP Slovenský raj.

Numbers of localities and length of routes for activities of mountain tourism beyond boundaries of built-up area of the municipality in the territory of national parks (Section 14 (1) b), c), d) of Act No. 543/2002 Coll. on Nature and Landscape Protection)

Protected area name	Mountain and rock climbing	Skialpinism	Camping, tenting and bivouacking	Ski centres	Cross-country skiing ** (km or km/km²)	Bicycle tourism ** (km or km/km²)	Hiking ** (km or km/km²)
Tatra National Park							
2001	whole area*	6	-	-	-	150/0.2	600/0.81
2010	whole area*	6	1	7	108/0.14	172/0.23	690/0.93
2015	whole area*	6	1	7	108/0.14	270/0.37	703/0.95
National Park Low Tatras							
2001	4	1	-	-	-	201/0.25	800/0.98
2010	4	6 (3 premises, 2 routes, 1 locality)	7	6	40 + suitable TMT	718.5/0.4 (including OP NP)	800/0.44 (including OP NP)
2015	4	6 (3 premises, 2 routes, 1 lok.)	7	6	41.2 + suitable TMT	722/0.4 (including OP NP)	816.5/0.45 (including OP NP)
National Park Malá Fatra							
2001	1	1	-	-	-	-	157/0.69
2010	5***	-	4	9	50 + vhodné TZCH (including OP NP)	44.3/0.22	217.6/1.1
2015	10**	-	3	5	88 + vhodné TZCH (including OP NP)	102/0.5	238/1.3
National Park Muránska planina							
2001	3	-	-	-	-	-	318/1.57
2010	2	-	3	-	44 + all TMTs, i.e. 362 (including OP)	147 (NP including OP)	318 (including OP)
2015	2	-	3 (with that bivouacking: up to 100 m from TMT except for NNR, NR and PS)	-	44 + all TMT, i.e. 362 (including OP)	198 (NP including OP)	318 (including OP)

National Park Poloniny							
2001	-	-	-	-	-	-	119/0.4
2010	-	-	2	1	121/0.41	44/0.15	121/0.41
2015	-	-	2	1	142/0.48	33/0.11	85/0.29
National Park Slovenský kras****							
2001	-	-	-	-	-	-	-
2010	1	-	5	-	suitable TMT	38/0.19	270/0.78
2015	1	-	4	-	suitable TMT	38/0.19	270/0.78
National Park Veľká Fatra****							
2001	-	-	-	-	-	-	-
2010	8	1 + TMT	6	3	302/0.75	103/0.26	310/0.77
2015	8	1 + TMT	6	3	302/0.75	140/0.32	333/0.81

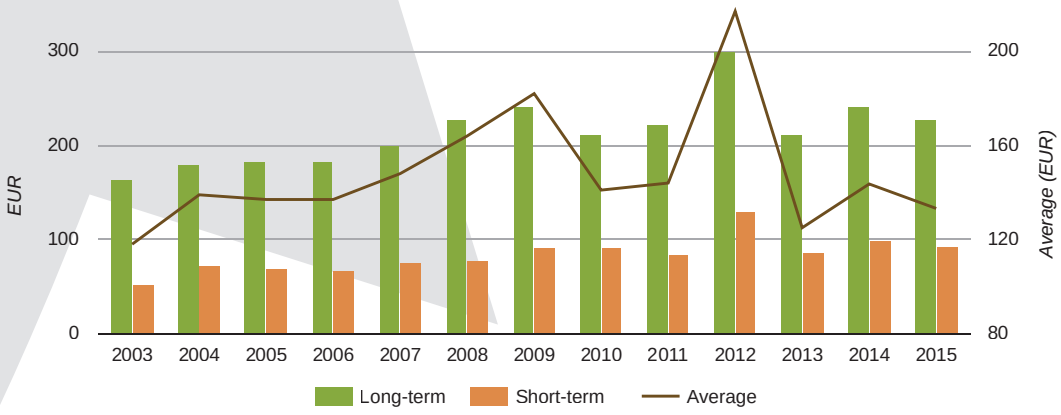
** except for 8 localities specified in the Visiting Regulations where mountain climbing is forbidden*
*** for cross-country skiing, cycle tourism and hiking, data on the length of marked cross-country routes, cycle routes or tourist marked trails in km or in km/km2 are provided*
**** including icefall climbing*
*****NP Slovenský kras and NP Veľká Fatra were declared as late as in 2002*
Source: SNC SR

As part of the administrations of NP and PLA, at present we register 14 information centres (including a nature protection school) administered by the State Nature Conservancy of the SR. The administrations of TANAP, NP Slovenský kras, and PLA Záhorie, Malé Karpaty, Ponitrie (area around the town of Nitra), Strážovské vrchy, Poľana, Cerová vrchovina and Vihorlat do not have their own information centres.

8.3.4. Expenditure in tourism

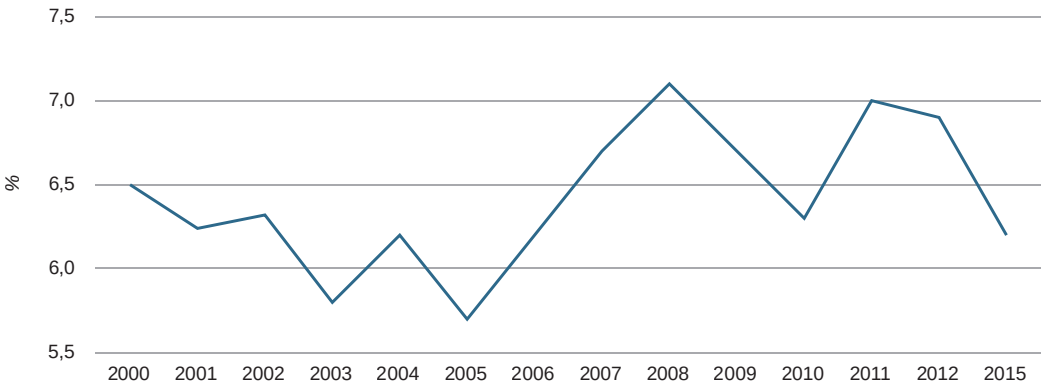
The average expenditure of domestic holiday stays throughout the monitored time period has mainly been increasing, the development of the share of expenditure of households of recreation and culture has not been changed considerably since 2000.

Development of the average expenditure per capita of the Slovak Republic of long-term and short-term domestic stay



Source: SO SR

Development of the share of expenditures of households for recreation and culture, annually per 1 household member



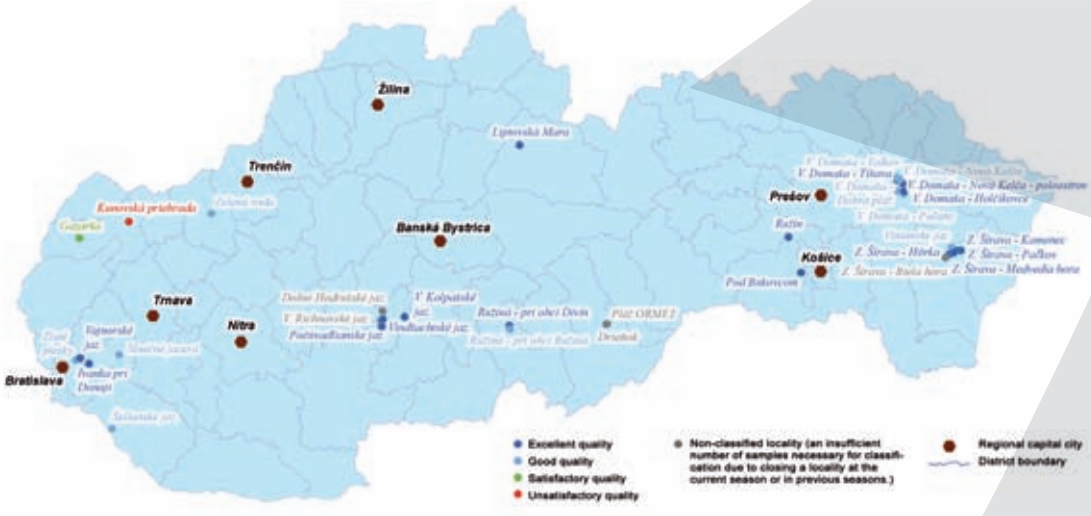
Source: SO SR

8.3.5. Water quality of natural outdoor swimming pools

The potential risk of surface water pollution is high mainly in the case of natural water areas (lakes, gravel pits, etc.) with a small area, where excessive and often spontaneous concentration of visitors can result in negative effect on the water quality, and also in selected recreation and tourism centres where no infrastructure has been built, including waste water cleaning.

The quality of recreational water in water reservoirs and lakes is mainly satisfactory; in some localities there is unsatisfactory situation at the infrastructure level.

Quality of bathing water during the summer tourist season 2015



Source: ÚVZ SR, EC, SEA

During the bathing season of 2015, the hygienic situation was monitored by public health care authorities in natural outdoor swimming pools.

During the season of 2015, 70 natural water bodies were included in the detailed evaluation, while in 7 localities bathing water was not monitored due to performed reconstruction works. In total, 404 water samples were taken, of which 3,440 examinations of the water quality indicators were performed. The limit value of defined indicators were exceeded in 29.46% of the total number of samples (in 2014, it was 32.07%) and 5.03% of the total number of indicators (in 2014, it was 8.47%). Compared to the last year, the number of unsatisfactory samples remained at the same level; however, if indicators were compared, there was a decrease in unsatisfactory biological indicators of the water quality (in particular due to a smaller number of takings). As far as the microbiological contamination is concerned, above-limit presence of intestine enterococues had a predominance, less *Escherichia coli* and in most cases they were only short-term contamination. In 2015, overpopulation of cyanobacteria was recorded, in particular in localities that were problematic already in the past. Examined physical and chemical indicators, such as well-arrangement, saturation of water with oxygen, total organic carbon, water reaction, colour, total nitrogen and total phosphorus, were established above the framework of requirements of legal regulations. They are indicators increased values of which do not represent any direct health impact, but have an informative character of the locality development.

In 2015, the Slovak Republic evaluated and classified the bathing water quality also according to the requirements of the Directive 2006/7/EC concerning the management of bathing water quality. In the bathing season of 2015, 28 natural water localities were evaluated and monitored that were declared, by generally binding decrees of regional environmental authorities, to be the so-called bathing waters. Sixteen bathing water localities were classified by the European Commission as localities with the excellent bathing water quality, 10 localities had a good bathing water quality and one locality had a sufficient bathing water quality. At the Kunovská dam, the quality deteriorated from sufficient to unsatisfactory bathing water quality.

With respect to an unsatisfactory bathing water quality, the bathing prohibition was issued in Holiday resort Šaštín Stráže – Gazarka, and in the resorts at Zemplínska šírava (Hôrka, Kamenec).

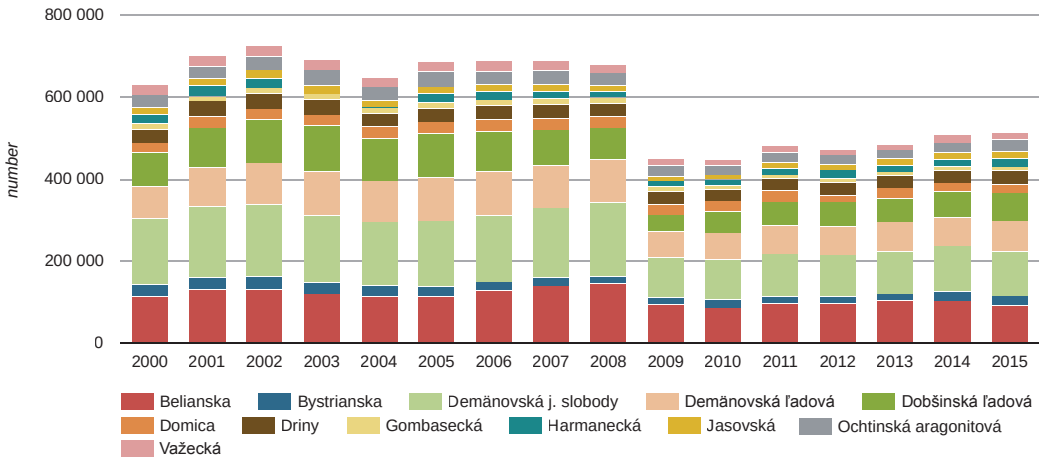
During the bathing season of 2015, no illnesses or health complications were recorded that would be related to bathing at natural outdoor swimming pools.

8.3.6. Number of visitors of caves

Caves are one of places most attacked by human beings. Negative anthropogenic impacts on the caves micro environment include radiation of heat into the environment, evaporation of water by sweating, increasing humidity of the environment by breathing out, growth of algae under the influence of lights, distributing spores on clothing and shoes, etc. We can prevent or minimize these phenomena by the attendance regulation.

In 2000 – 2008 period, the cave attendance was stabilized, and there was a considerable decrease in attendance in 2009 in a year-on-year comparison by more than a third; however, from 2010 attendance was again slowly increasing. Demänovská jaskyňa slobody and Belianska jaskyňa are te most visited caves in long-term perspective (on average, more than 100,000 visitors per year).

Development of the number of visitors of caves open to the public



Source: SNC SR - SCA

8.4. What are interactions of tourism and the environment?

The very frequent motivation of tourism participants is staying in a high-quality and preserved natural environment – for this reason the protection of natural values and the environment represents one of the most important preconditions for the tourism development.
In this connection, however, co-operation between the tourism and environmental sectors has been progressing only slowly in the sphere of national park zoning and identification of possible differences between interests of the tourism development and nature protection.

From the perspective of national economy, such fact is important that tourism is a sector demanding few raw and other materials, which is especially important for the country demaning many raw materials and imports such as Slovakia.

The intensity of tourist attendance under the SR conditions is not evenly distributed as far as the area is concerned, while negative consequences of increased concentration of tourist visitors in the highest-quality natural localities and areas become a considerable problem, in comparison with other areas. Therefore, it appears necessary to set limits of area tolerability for the most frequented and threatened areas and in accordance with them to apply also the visitor management of these localities.

For the aforementioned reason, just areas of national parks and not the whole territory of the country (where data are averaged and do not indicate the situation in areas with a high-quality, but also vulnerable natural environment) were used as the basic levels of the geographic scale in the following part.

Understandably, the impact of tourism on the environment is most clearly observed in areas with intensive tourism. These impacts manifest themselves most intenstively in the areas where tourism is a dominant human activity, such as negative impacts of tourism are more visible in the areas of national parks than e.g. in towns where some other human activities also impact, in addition to tourism, the environment and local inhabitants, such as industry, transport, housing, services, etc., but mainly there is a less vulnerable environment there.

The incorrectly managed development of tourism can result in the environmental pollution by producing waste, a high intensity of tourist transport and the related noise level, and by producing emissions from mobile resources. Non-conceptual building of facilities for provision of tourist services (accommodation and food service activities, mountain transport equipment, skiing routes, tourist marked trails, cycle routes, etc.) can not result only in damaging or even destroying ecosystems and biodiversity reduction, but also considerable visual disturbing of the landscape structure and landscape scenery of the areas affected, and the related reduction of their attractiveness for visitors.

Water resources are used to supply accommodation facilities, sport and relaxation complexes and any other supplementary services for tourist visitors with drinking water. On the other side, these tourist complexes pollute watercourses by producing waste water, unless they are connected to waste water treatment plants. The production of waste water caused by excessive number of visitors can cause local and seasonal problems related to the management ensuring their disposal.

In comparison with any other sectors of economic activities, it is not possible to provide data on the total water consumption in tourism and total quantity of produced, cleaned and subsequently discharged waste water from tourism facilities. Due to the failure to ensure the satisfactory mechanism for data collection for data fulfilment, i.e. the indicators Water consumption in tourism and Waste water production included in the list of indicators due to the tourism activities that would cover with its content in a very satisfactory manner issues of raw material demands and the pressure of activities on the environment. Requirements for water consumption and waste water production in tourism or the individual tourist areas are usually characterized by considerable differences between the high season (the summer period in the event of recreation and tourism centres situated near water reservoirs or the winter period in the event of ski centres situated in mountain regions) and the low season and they put considerable demands on the water resources management, supplying with drinking water and waste water disposal (the absence of public sewerage systems and waste water treatment plants in some selected recreation and tourism centres), mainly at the local and regional levels. Mutual interactions of tourism and the environment are characterized based on indicators from the group of interactions of the sector with the environment.

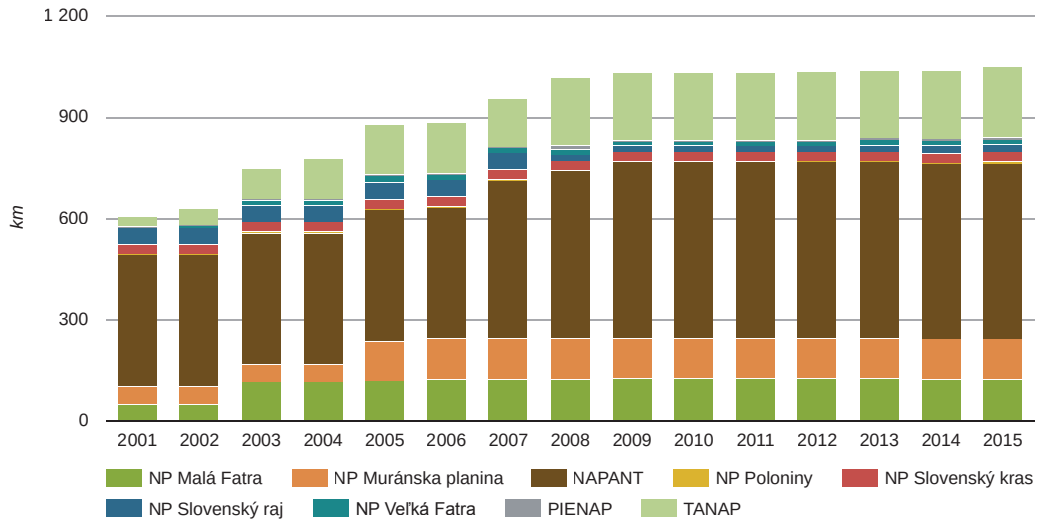
8.4.1. Erosion of soil due to tourism

The critical soil erosion on tourist marked trails manifests itself in the area of NAPANT (a considerable increase in erosion in 2006 – 2009), the National Park Malá Fatra (a considerable increase in erosion in 2002 – 2003) and the National Park Muránska Planina (a considerable increase in erosion in 2004 – 2005). A considerable increase in erosion of tourist marked trails in 2004 – 2008 could also be seen in the area of TANAP. On the contrary, a considerable or slight decrease in erosion of tourist marked trails in 2009 could be seen in the area of the Pieninsky National Park and in the area of the National Park Veľká Fatra. In 2010, the situation in national parks did not change when compared to 2009.

In 2011, there was a slight increase in the length of cycle routes affected by erosion and in the areas of TANAP and NP Slovenský kras and a very slight increase in the length of tourist marked trails affected by erosion in the area of NP Veľká Fatra. In the next years, the situation stabilized in NAPANT, NP Muránska planina and NP Slovenský kras. In total, there was an increase in the areas of NP Poloniny, NP Slovenský raj, NP Veľká Fatra, PIENAP and TANAP.

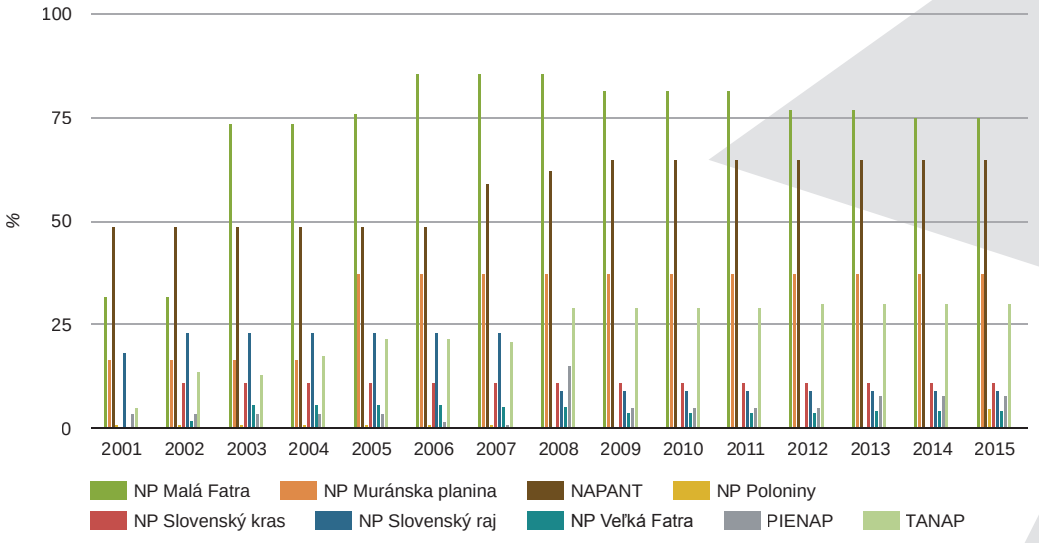
There was a slight decrease only in the area of NP Malá Fatra.

Development of length of tourist marked trails affected by erosion



Source: SNC SR

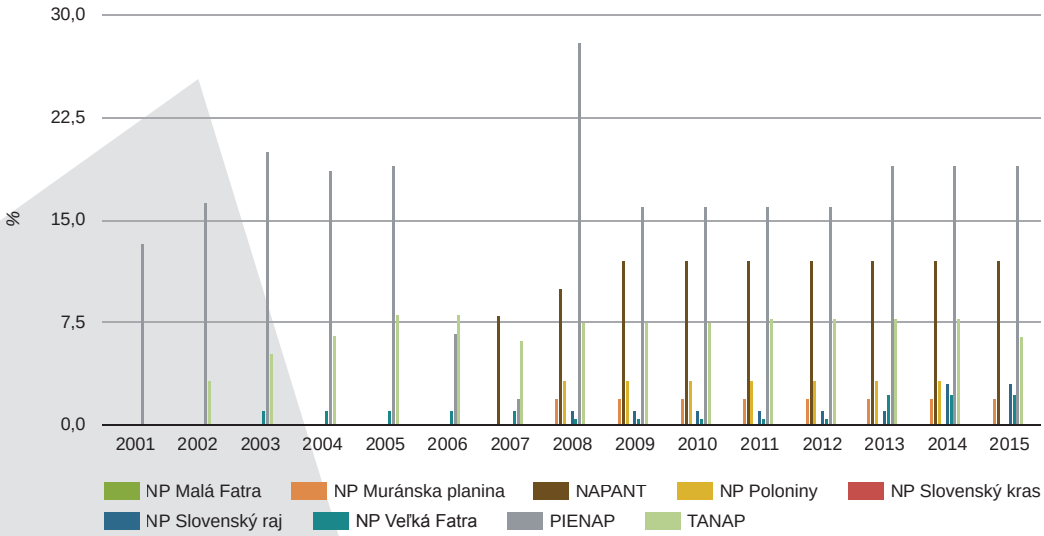
Development of the share of length of tourist marked trails affected by erosion out of their total length



Source: SNC SR

A considerable environmental problem is a permanent increase in the length of tourist marked trails affected by erosion situated in the zone above the upper boundary of forests and in gorges where there are considerably deteriorated localization conditions for soil and vegetation regeneration due to extreme climate conditions, and increased financial costs also manifest themselves connected with construction and technical measures on these trails and corrective measures in the area of nature protection. The total length of tourist marked trails affected by erosion in national park areas is 1,051 km and the total length of cycle routes affected by erosion is 120.4 km. Tourist marked trails are also often cycle routes. The biggest share of the length of cycle routes affected by erosion out of the total length of cycle routes is in the areas of PIENAP, NAPANT, and TANAP.

Development of the share of length of cycle routes affected by erosion out of the total length of cycle routes



Source: SNC SR

8.4.2. Number of threatened small-size protected areas due to tourism

The highest rate of threatening of small-size protected areas due to tourism activities has manifested itself in the areas of the administrations of TANAP, NAPANT, NP Malá Fatra, PIENAP, and NP Slovenský raj as well as PLA Dunajské luhy, PLA Malé Karpaty, PLA Strážovské vrchy, PLA Poľana, PLA Cerová vrchovina, and PLA Vihorlat. Paddling sports, navigation, bathing and recreational construction mainly threaten the areas administered by PLA Dunajské luhy, PLA Malé Karpaty, PLA Horná Orava, PLA Cerová vrchovina, but also by PIENAP and NP Veľká Fatra.

Number of threatened SSPAs in national parks and PLAs due to tourism activities in 2015

TANAP	
Localization of accommodation facilities (number of facilities / number of beds)	13 high mountain cottages/564 beds (NNR – the valleys of Mlynická dolina, Mengusovská dolina, Velická dolina, Studené doliny, Skalnatá dolina,Dolina Bielej vody, Belian Tatras, Western Tatras – Žiarska, and the valley of Jalovská dolina)

Localization of mountain transport equipment (km) (cable cars, ski tows)	Cable cars in NNR: Mlynická dolina and Furkotská dolina – 2.3 km, Skalnatá dolina – 32 km, Studené doliny – 1.8 km, Strednica – Belian Tatras – 0.5 km, Spálená – Roháčska dolina – 2.2 km, Tatranská Javorina – 0.2 km
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	Mountain climbing (all, except for NNR Javorová dolina, Belian Tatras, Slavkovská dolina, Štôlska dolina, NNR in the Western Tatras) Paragliding (NNR – Skalnatá dolina, Studené doliny, Slavkovská dolina, Mlynická dolina, Furkotská dolina) Skialpinism (NNR – Dolina Bielej vody, Skalnatá dolina, Studené doliny, Mlynická dolina, Furkotská dolina)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 650 km, and approximately 60 km of cycle routes in SPA (Juráňova dolina, Osobitá, Roháčske plesá, Sivý vrch, Suchá dolina, Tichá dolina, Kôprová dolina, Važecká dolina, Furkotská dolina, Mlynická dolina, Mengusovská dolina, Štôlská dolina, Batizovská dolina, Velická dolina, Slavkovská dolina, Studené doliny, Skalnatá dolina, Dolina Bielej vody, Belian Tatras, Javorová dolina, Bielovodská dolina, Grapa, Mokriny, Pramenište, Mraznica, Baba, Poš, Choč, Prosiecka dolina, Kvačianská dolina)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	NNR Furkotská dolina (Štrbské pleso – rowing)
NAPANT	
Localization of accommodation facilities (number of facilities / number of beds)	3 facilities/325 beds (NNR Demänovská dolina)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	NNR Demänovská dolina, NNR Ďumbier NNR Jánska dolina
Localization of marked cycle routes and tourist marked trails (TMT) (km)	60 km of TMT in SPA (NNR – Demänovská dolina, Ďumbier, Jánska dolina, Ohnište, Salatín, Skalka, NR – Kozí chrbát, Štrosy, Martalúzka) In NP (without OP) – approximately 500 km of TMT and 148 km of cycle routes
NP Malá Fatra	
Localization of mountain transport equipment (km) (cable cars, ski tows)	NNR Chleb (1 ski tow – 0.88 km, of which 0.03 km in NNR, 1 chairlift – 1.88 km) – illegal skialpinism, high concentration of people in the surroundings – erosion In NP, in total other approximately 12 facilities with the length of approximately 11.5 km (of which the length of 2.1 km is out of operation)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	NNR Chleb (skialpinism, paragliding), NNR Suchý and NNR Prípor (skialpinism), NNR Rozsutec (mountain climbing, skialpinism, paragliding) – the aforementioned activities are performed at contrary against law. NR Veľká Lučivná and NNR Chleb (sightseeing flights of helicopters)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT in NP – 172 km, of which SPA (NNR – Tiesňavy, Prípor, Starý hrad, Suchý, Kľačianska Magura, Veľká Bránica Rozsutec, Chleb, Šútovská dolina) – in the connection with that bivouacking in the TMTs in question, walking around worse places and creation of parallel trails, pollution with waste, illegal cycle tourism on the ridge Cycle routes in NP, but outside SPA – 24.4 km (including down-hill routes)

NP Muránska planina	
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	2 places reserved for rock climbing (Tesná skala near NNR Šiance, Rozštiepená skala in NNR Hrdzavá dolina)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 23 km in SPA (NR Bacúšska jelšina, NNR Hradová, NNR Hrdzavá, NNR Veľká Stožka, NNR Malá Stožka, NR Fabova hoľa, NR Suché doly, NNR Cigánka, NR Čertova dolina, NR Tŕstie, NNR Šarkanica)
PIENAP (instead of SPAs, there are zones)	
Localization of accommodation facilities (number of facilities / number of beds)	2 facilities/188 beds (Lesnica – zone C, Haligovce – zone D)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 11.5 km (zone B Haligovské skaly zone B Breaking through the river of Dunajec, Breaking through the brook of Lesnický potok)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	Zone B – Breaking through the river of Dunajec and zone A, B – Breaking through the brook of Lesnický potok (floating of the river of Dunajec and subsequently taking out rafts and sport ships)
NP Slovenský raj (instead of SSPAs, there are zones)	
Localization of accommodation facilities (number of facilities / number of beds)	42 facilities zone A – Breaking through the river of Hornád, zone A Mokrá – on the boundary, zone A – Kyseľ, zone A – Čingovské hradisko, zone A Breaking through the river of Hornád, zone A – Stratená, zone A – Zejmarská roklina, NR Muráň (BZ of NP)
Localization of mountain transport equipment (km) (cable cars, ski tows)	zone A – Stratená (1 chairlift Dedinky – non-functioning) zone A Stratená (on the boundary, 2 ski tows Dedinky – 0.5 km, Biele vody – 0.5 km) zone A Breaking through the river of Hornád (on the boundary, ski tow Zelená Hora – 0.5 km) zone C (the municipality of Vernár – 1.5 km)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	rock climbing – 4 localities in the zone A (Breaking through the river of Hornád – Tomášovský výhľad, Breaking through the river of Hornád – the neck of Hornád, Breaking through the river of Hornád – Letanovský mlyn, Stratená – Stratenská píla) and 1 locality in the zone B (Barbolica) icefall climing in winter – 5 localities in the zone A (Suchá Belá, Breaking through the river of Hornád – Letanovský mlyn, Breaking through the river of Hornád – Kláštorská roklina, Kyseľ – Sokolia dolina, Zejmarská roklina)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT in the length of approximately 52 km in the zone A (Suchá Belá, Piecky, Sokol, Breaking through the river of Hornád, Kyseľ, Zejmarská roklina, Stratená, Čingovské Hradisko, Mokrá) TMT – approximately 6 km in NR Muráň (BZ of NP) cycle route – approximately 1 km in zone A (Stratená, Stratenský kaňon (canyon)) cycle route – approximately 5 km in NR Muráň (BZ of NP) TMT v NP and its BZ – approximately 238 km total length of cycle routes in NP and its BZ – approximately 65 km

Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	zone A – Prielom Hornádu (floating – approximately 10 km; it is a controlled weir operated by the Administration of NP Slovenský raj, there is no risk of threatening) zone A – Stratená (on the boundary – rowing – approximately 10 km)
NP Poloniny	
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 37.5 km in SPA (NNR Stužica, NR Borsukov vrch, NNR Jarabá skala, NR Šípková, NNR Pľaša, NR Udava) Educational trail (ET) – approximately 2.3 km in SPA (NNR Havešová, NNR Rožok)
NP Veľká Fatra	
Localization of accommodation facilities (number of facilities / number of beds)	1 facility/70 beds (Smrekovica in NNR Skalná Alpa in BZ of NP)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	Rock climbing (NNR Tlstá)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 30 km in SPA (NNR Jánošíkova kolkáreň, NNR Suchý vrch, NNR Čierny kameň, NNR Skalná Alpa, NNR Tlstá) Total – approximately 390 km of TMT and cycle routes in NP
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	NR Rojkovská travertínová kopa (swimming)
NP Slovenský kras	
Lokality pre tzv. aktívne športy (horolezectvo, skialpinizmus, paraglajding)	NNR Zádielska tiesňava (20 routes for mountain climbing), the area of Jasovská planina – Soroška (paragliding)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 20 km (NR Gerlašské skaly, NR Palanta, NNR Zádielska tiesňava, NNR Domické škrapy)
PLA Dunajské luhy	
Localization of accommodation facilities (number of facilities / number of beds)	illegal cottages – tramp shelters (NR Dunajské ostrovy) The proposed construction of the sport-recreational premises Danubia park in the cadastral district of Čunovo and the project of the sport-recreational premises Action land park in the cadastral district of Čunovo In PLA, two recreational zones are approved: – the lake of Vojkanské jazero/1,998 beds – plan – the lake of Šulianské jazero/4,100 beds – Gabčíkovo – cottage construction according to the approved territorial plan In all zones, construction is being carried out now.
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – 40 km in PLA, ET – 3 km in PLA cycle routes on the dam in PLA bridge for pedestrians and cyclists over the river of Danube in the area of Dobrohošť in PLA
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	Only localities in SSPA: SCI Hrušovská zdrž (recreational navigation and kaysurf), NR Dunajské ostrovy (houseboats), NR Ostrovné lúčky (bathing), NNR Klátovské rameno (exception for fishing for Slovak Fishing Union), SCI Malý Dunaj (houseboats), NR Opatovské Jazierko (exception for fishing for Slovak Fishing Union), SCI Hrušovská zdrž (yacht ports)

PLA Malé Karpaty	
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	Paragliding (NNR Devínska Kobyla, NNR Roštún, NNR Záruby, NNR Pohanská)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 830 km in PLA, of which in SPA (NNR Devínska Kobyla, NR Strmina, NR Pod Pajštúnom, NR Zlatá studnička, NR Vysoká, NNR Roštún, NNR Pohanská, NR Klokoč, NR Čierna skala, NNR Záruby, NR Bolehlav, NNR Kršlenica, NR Kamenec, NNR Hlboča, NR Čertov žľab, NR Katarínka, NR Slopy, NR Ľahký kameň, NR Plešivec, NNR Čachtický hradný vrch) Cycle routes – approximately 530 km in PLA, of which in SSPA (NR Slopy, NR Pod Pajštúnom)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	PS Sĺňava (water sports)
PLA Biele Karpaty	
Localization of mountain transport equipment (km) (cable cars, ski tows)	BZ of NR Veľká Javorina (1 ski tow – 0.6 km)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	Mountain climbing (NM Beckovské hradné bralo)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT and ET – approximately 4.3 km in SSPA (NR Červenokamenské bradlo, NR Vršatské hradné bralo, NR Krasín, NR Turecký vrch, NM Drietomica, NM Pavúkov jarok, NM Štefanová, NR Šmatlavé uhlisko, NR Prieľačina, NR Beckovské Skalice, NR Sychrov, NR Žihľavník, NR Omšenská Baba, NM Haluzická tiesňava), Cycle routes – approximately 1.6 km in SSPA (NR Bindárka, NNR Tematínska lesostep (forest-steppe), NR Prieľačina)
PLA Ponitrie (area around the town of Nitra)	
Lokality pre tzv. aktívne športy (horolezectvo, skialpinizmus, paraglajding)	Mountain climbing and paragliding (NR Žibrica, NNR Zoborská lesostep (forest steppe), NNR Veľká skala, NM Ostrovica, NM Končitá, NR Makovište)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 10.2 km in SSPA (NNR Zoborská lesostep (forest steppe), NR Žibrica, PS Jelenská gaštanica, NR Buchlov, NNR Vtáčnik) Cycle routes – 3.4 km in SPA (the border of NNR Zoborská lesostep (forest steppe), NR Žibrica, NNR Vtáčnik) In total in PLA – 156 km of TMT and 190 km of cycle routes
PLA Štiavnické vrchy	
Localization of accommodation facilities (number of facilities / number of beds)	1 facility/no beds for now (NNR Sitno
Localization of mountain transport equipment (km) (cable cars, ski tows)	PLA (Banská Hodruša – chairlift – 2.1 km)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	Mountain climbing (NNR Sitno)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT with the length of approximately 218.5 km in SSPA (NNR Sitno, NR Krivín, NR Kamenné more, NR Bralce, NR Szaboóva skala, NR Holík, NM Žakýlske pleso, NM Krupinské bralce)

PLA Strážovské vrchy	
Localization of accommodation facilities (number of facilities / number of beds)	2 facilities/35 beds (NNR Súľovské skaly), 5 facilities/62 beds (BZ of NNR Súľovské skaly, only 1 facility with the capacity of 52 beds in operation, the other is a restaurant without any accommodation facility) 36 private cottages (BZ of NNR Súľovské skaly – locality Čierny potok)
Localization of mountain transport equipment (km) (cable cars, ski tows)	BZ of NNR Súľovské skaly (ski tow – approximately 0.2 km)
Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	NNR Manínska Tiesňava (the operation of a mountain school), Mountain climbing (NNR Súľovské skaly, NNR Manínska Tiesňava, NR Kostelecká tiesňava, NM Bosmany, NM Prečínska skalka)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT in PLA – approximately 910 km, of which in SSPA (NNR – Strážov, Súľovské skaly, Manínska tiesňava, Vápeč, NR Kostelecká tiesňava), Cycle routes – approximately 2 km in SSPA on the state road (NNR – Súľovské skaly, Manínska tiesňava, NR Kostelecká tiesňava)
PLA Kysuce	
Localization of accommodation facilities (number of facilities / number of beds)	1 facility/40 beds (BZ of NNR Veľká Rača – in close proximity)
Localization of mountain transport equipment (km) (cable cars, ski tows)	NNR Veľká Rača (2 cable cars – 2.3 km, of which 0.32 km in NNR) BZ of NNR Veľká Rača (1 cable car and one bobsleigh route on the borderline)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 13 km in SSPA (NNR – Veľká Rača, Veľký Javorník, Malý Javorník, Veľký Polom, NM Vychylovské skálie, NR Klokočovské skálie, NM Korňanský ropný prameň) Cycle route – approximately 1 km (NR Klubinský potok)
PLA Horná Orava (instead of SSPAs, there are zones)	
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 15 km in the zone A (Babia hora, Pilsko)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	PS River of Orava except for PLA (gravel mining, construction, water sports), zone B Vtáčí ostrov (recreation and water sports), zone B Orava water reservoir (illegal structures, fishing huts, water sports, houseboats, pollution with waste), zone B Jelešňa (illegal structures, fishing huts), zone C Alúvium Mútňanky (gravel mining)
PLA Poľana	
Localization of accommodation facilities (number of facilities / number of beds)	1 hotel/112 beds and 10 small cottages/approximately 80 beds (NNR Zadná Poľana – nearby – out of operation), 1 facility/45 beds (near NNR Ľubietovský Vepor – in the distance of pproximately 0.5 km)
Localization of mountain transport equipment (km) (cable cars, ski tows)	NNR Zadná Poľana (1 ski tow – 0.35 km – out of operation)

Localities for the so-called active sports (mountain climbing, skialpinism, paragliding)	Rock climbing (NM Melichova skala, NM Kalamárka)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 10.1 km in SSPA (NNR Zadná Poľana, NNR Ľubietovský Vepor, NR Havranie skaly, NNM Water fall Bystrého potoka) Cycle route – approximately 3.6 km in SSPA (PS Meander of Kamenistý brook)
PLA Cerová vrchovina	
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – 10.6 km in SPA (NR Steblová skala, NNR Ragáč, NR Hajnáčsky hradný vrch, NNR Pohanský hrad, NNR Šomoška, NM Belinské skaly, NM Zaboda, PS Fenek) South tourist arterial road – 24.5 km, partially through PLA and near SSPA (NM Čakanovský profile, NM Lipovianske pieskovce)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	only SSPA except for PLA – PS Hikóriový porast (cover), NR Water reservoir Gemerský Jablonec, NR Príbrežie Ružinej, NR Kurinecká dubina (everywhere water sports and fishing)
PLA Latorica	
Localization of marked cycle routes and tourist marked trails (TMT) (km)	ET – 15 km in PLA and near SCI (Bešiansky polder, Čičarovský les, Latorica)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	only in SPA Medzibodrožie (the river of Veľká Krčava – illegal constructions near water)
PLA Vihorlat	
Localization of accommodation facilities (number of facilities / number of beds)	3 facilities/65 beds (NNR Morské oko)
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT – approximately 73.2 km in SSPA (NNR Morské oko, NM Sninský kameň, NM Malé Morské oko, NR Jedlinka, NR Lysák, NR Baba pod Vihorlatom, NNR Motrogon, NR Viniansky hradný vrch, NR Vinianska stráň) Cycle routes – approximately 9.5 km in SPA (PS Zemplínska Šírava, NNR Morské oko)
Localization of areas threatened by water sports (paddling sports, navigation, bathing) and construction near water (houseboats, fishing huts, etc.)	PS Zemplínska Šírava (water sports, fishing)
PLA Východné Karpaty	
Localization of marked cycle routes and tourist marked trails (TMT) (km)	TMT in PLA – approximately 180 km, of which in SSPA (NR Hamburské rašelinisko)

Source: SNC SR

Seasonal tourist activities that are concentrated in (close vicinity) high-quality areas from the natural and protective perspective can have an especially important impact on the environment.

The intensity of tourist attendance is not evenly distributed as far as the area is concerned, while the most attractive places include mainly areas with the most jagged relief and diversity of plant communities that are, under the SR conditions, mainly areas of national parks.

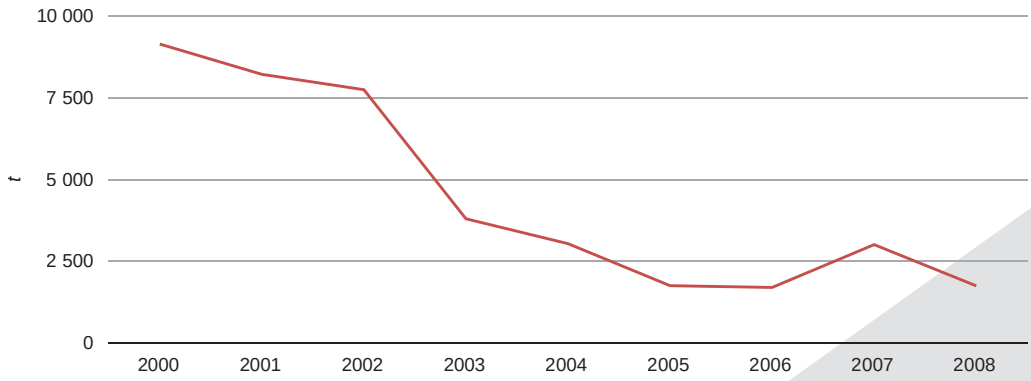
In this connection, it is possible to state that localization of the mentioned buildings, facilities or activities in small-size protected areas does not have to inevitable mean their degradation from the perspective of the subject of protection; however, on the other hand it always puts increased requirements for the environmental management of the area and also often the increased requirements of raising funds intended for their protection or revitalization.

8.4.3. Production of waste from tourism

Compared to the other sectors of economic activities, tourism does not produce high volumes of waste, however, often considerable seasonal differences in the number of visitors require considerable requirements for the infrastructure level and management.

With the exception of 2007, it is possible to very positively evaluate the decreasing trend of waste production in the sector Hotels and restaurants, however, so defined reporting units do not cover all economic entities doing business in the sector of tourism.

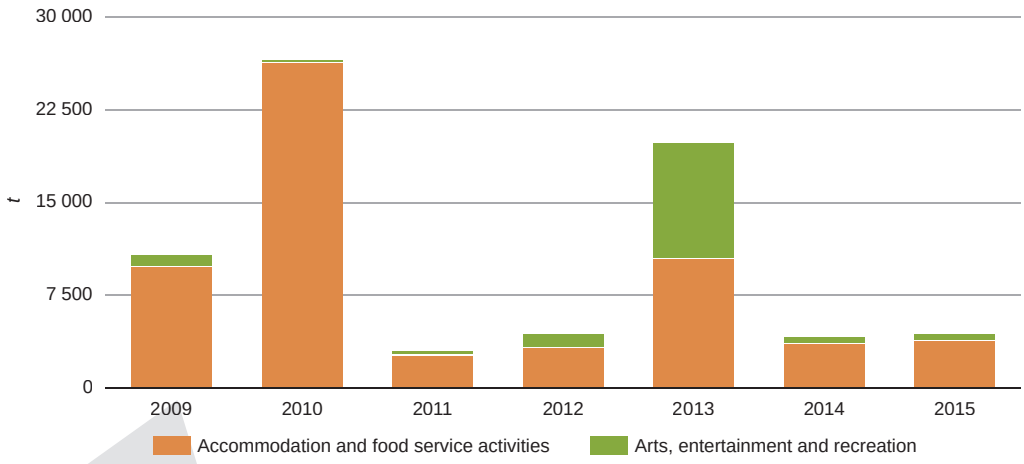
Development in production of waste from tourism in 2000 – 2008 (Hotels and restaurants)



Source: SO SR

Since 2008, the Classification of Economic Activities in the NACE division has been introduced for the waste origin and one of its section is also the Section I – Accommodation and food service activities. The substance of this change is transition of the Statistical Office of the Slovak Republic to the revised classification of economic activities SK NACE Rev. 2. When comparing these both classifications, it is necessary to point out to the fact that the Item I: Accommodation and food service activities in the classification SK NACE Rev. 2 is wider in terms of its methodology and content than the item H. Hotels and restaurants (55. Hotels and restaurants) in the division according to OKEČ (the Sector Classification of Economic Activities). Due to different definitions of these items in the mentioned statistical classification, it is not possible to compare data obtained in this way.

Development in production of waste from tourism from 2009



Source: SO SR

It is possible to positively evaluate, after its considerable increase in 2010, an even more considerable decrease in the waste origin in the Section I – Accommodation and food service activities in 2011. There was a slight increase in 2012 and a considerable increase in 2013 in the quantity of produced waste. A more considerable decrease was seen in 2014 and the volume stablized at this level in 2015. From 2009 (a change in methodology) to 2015, the waste production decreased (in the Section I – Accommodation and food service activities and in the Section R – Arts, entertainment and recreation) by 59.2% (to 4,414.6 tonnes).

8.5. What is the response of the society to mitigating or compensating negative consequences of tourism on the environment?

In order to accomplish the main targets of the tourism policy, at the EU level and the Slovak Republic level, various supporting mechanisms are adopted.

The response of the society to mitigating or compensating negative consequences of tourism on the environment is described based on indicators from the group of political, economic and social aspects.

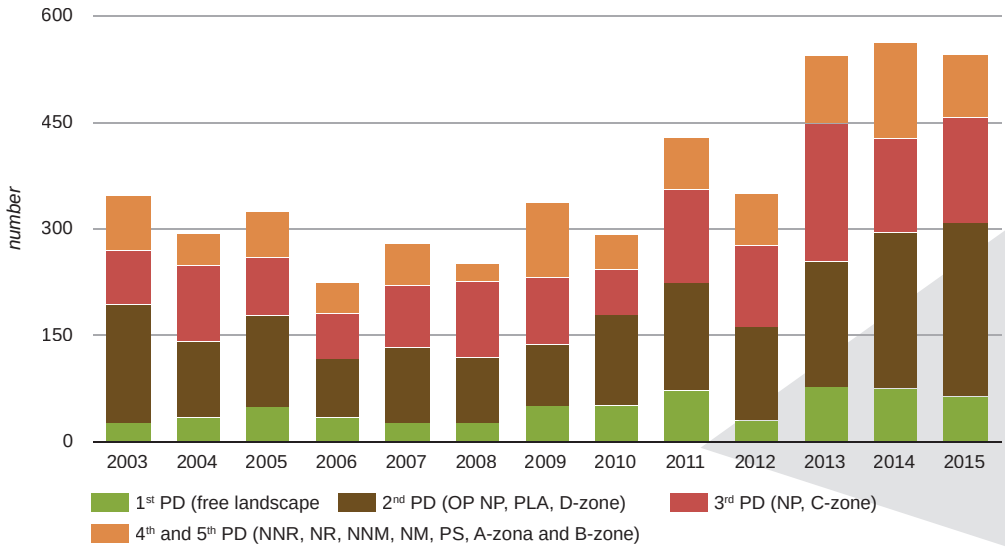
8.5.1. Number of assessed intervention in the nature and landscape related to tourism activities

With respect to the fact that the currently valid Act No. 543/2002 Coll. on Nature and Landscape Protection was passed on 25 July 2002 and came into effect from 1 January 2003, no data are available on the number of assessed interventions in the nature and landscape due to tourist activities from the period before 2003. The time series for the period of 2003 – 2014 of the length of 14 years, however, provides a relatively sufficient reference period for examining dependencies of performance indicators of tourism and the number of assessed interventions in the nature and landscape. When arriving at conclusions of the correlation of the aforementioned phenomena, however, it is necessary to realize that a number of other

factors also impact both these phenomena considerably influencing their development, and effects of these other factors cannot be adjusted. Conclusions of tightness correlation among the monitored indicators in the graphs below can be interpreted, to a certain rough extent, in the manner what was obtained in tourism outputs for the price that was paid on the side of the environment in the form of interventions in the nature and landscape. Examining this relation can be deepened by differentiating of assessed intervention, as interventions in areas with higher protection level (in particular the 4th and 5th protection degree) represent a higher price, such as interventions in the first protection level (free landscape without any particular protection regime). On the other side, benefits of tourism a part of which is also implemented due to interventions in the nature and landscape, can also be expressed by means of various indicators and thus evaluate various aspects of benefits – outputs of tourism and at the same time, to a different extent, complexity or partiality. Understandably, the biggest problem in quantitative evaluations and analyses is always availability of relevant statistical information.

Although all categories of protected areas occupy in total only approximately 23.3% of the SR area, in total 60 – 80% of assessed interventions in the nature and landscape relate to them, requiring the approval of the competent nature protection authority (mainly the areas of TANAP, NAPANT, NP Slovenský raj, and NP Malá Fatra).

Development in the number of opinions of State Nature Conservancy of the SR (SNC SR) on interventions in the nature and landscape with tourism activities



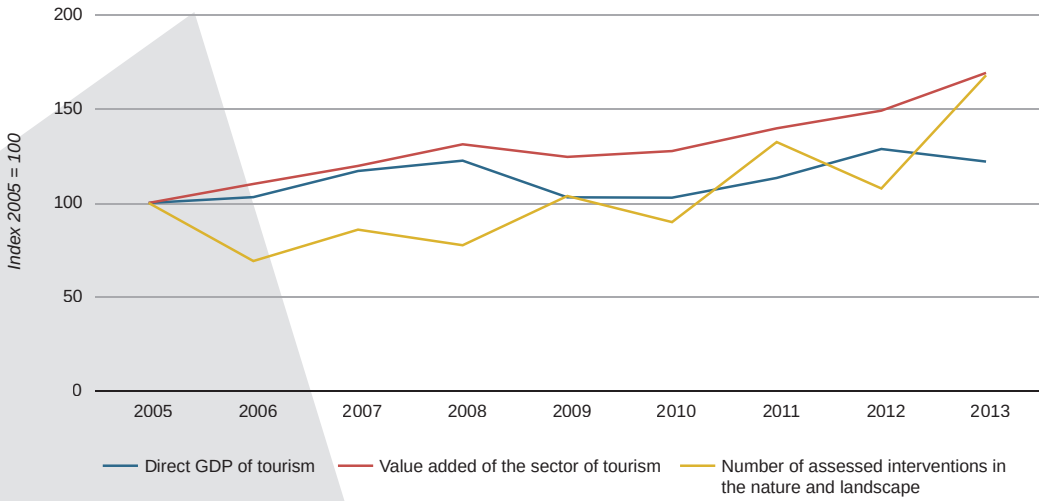
Source: SNC SR

With respect to the categories of protected areas, the most opinions of SNC SR on interventions in the nature and landscape connected with tourism activities in the initial period related to the buffer zones of national parks, protected landscape areas and national parks, the least to the free landscape. Later, in 2011, there was a considerable increase in opinions in all categories of protected areas, while the most considerable increase was in the highest-quality areas with the 3rd to 5th nature protection level. A big increase in the number of opinions was recorded in 2013 and 2014. In 2015, the number of opinions of SNC SR on interventions due to building tourist trails, educational trails, jogging, skiing, cycling and moto routes, organizing public events and lighting increased in a year-on-year comparison. On the contrary, there was a decrease in opinions on overflights, building golf courses, accommodation and sport facilities.

Environmental efficiency of tourism with respect to the number of interventions in the nature and landscape

When evaluating it, numbers of assessed interventions in the nature and landscape are compared with the economic indicators expressing in a more synthetic manner the economic side of tourism benefits, i.e. GDP formed directly by tourism and the value added of the tourism sector (i.e. also from outputs implemented in tourism in some other sectors). In this case, the period to 2010 can be evaluated as favourable from the perspective of this manner of measuring environmental efficiency. In 2011, growth of the number of interventions exceeded the growth rate of the direct GDP of tourism and in 2013 it nearly levelled up the growth of the value added of the tourism sector.

Environmental efficiency of tourism in relation to the number of assessed interventions in the nature and landscape



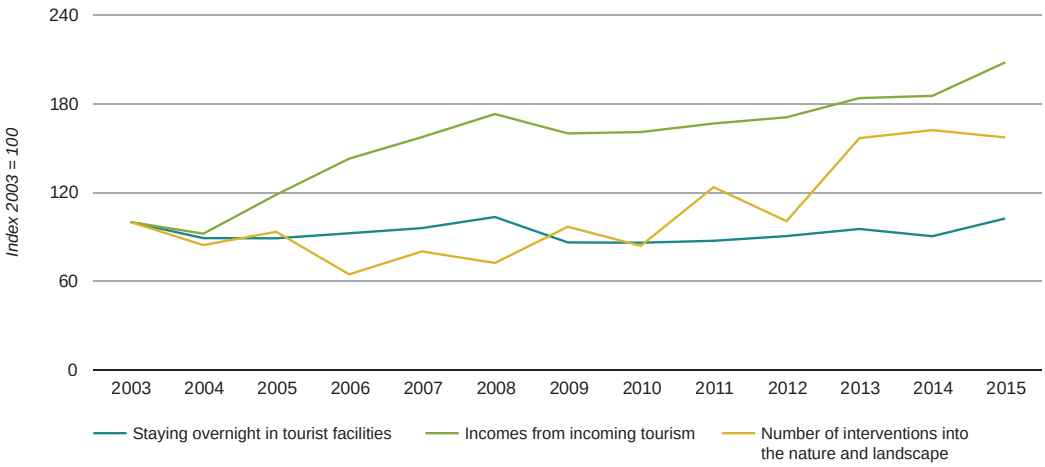
Source: SO SR, SNC SR

In the following graph, the development of the number of assessed interventions in the nature and landscape is compared with the development of incomes from incoming tourism and the development of the number of overnight stays in accommodation facilities of tourism.

The number of overnight stays is the indicator expressed in physical units and includes overnight stays of both domestic and foreign tourists, whereby it covers both parts of tourism implemented in our territory. Although these overnight stays do not represent all overnight stays of tourists in Slovakia, it is the economically most interesting part of overnight stays. Incomes from incoming tourism are the value indicator expressing the economic benefit of foreign incoming tourism usually presented, together with the creation of jobs, as the crucial importance of tourism for national economies.

The development presented in the graph below was not favourable after 2012; a slightly positive change can be seen in 2015.

Environmental efficiency in relation to assessed interventions in the nature and landscape



Source: SO SR, SNC SR

Environmental efficiency of tourism with respect to waste origin

As it is not possible to compare data before and after 2008, the data of 2009 are only used in the following graphical overview. In this case, environmental efficiency of tourism or accommodation and food service activities is assessed by comparing the waste production by accommodation and food service activities and the output indicator of these services in physical units – the number of overnight stays in accommodation service activities. With the exception of na extreme deviation in the quantity of waste produced in 2010, the development of the relation between the number of overnight stays and the waste creation is favourable as with the balanced, stagnating development of the number of overnight stays the creation of waste in these services decreases. Operators of tourism services enterprises start realizing that environmentally-friendly establishments have not only lower operating costs, but also a competitive advantage in the form of positive reputation of an enterprise from increasingly more conscious tourists. In this segment and from the perspective of the aforementioned indicators, it is possible to state a favourable development of environmental efficiency in the whole period after 2010, with the exception of 2013.

Environmental efficiency of tourism in relation to waste origin in accommodation and food service activities

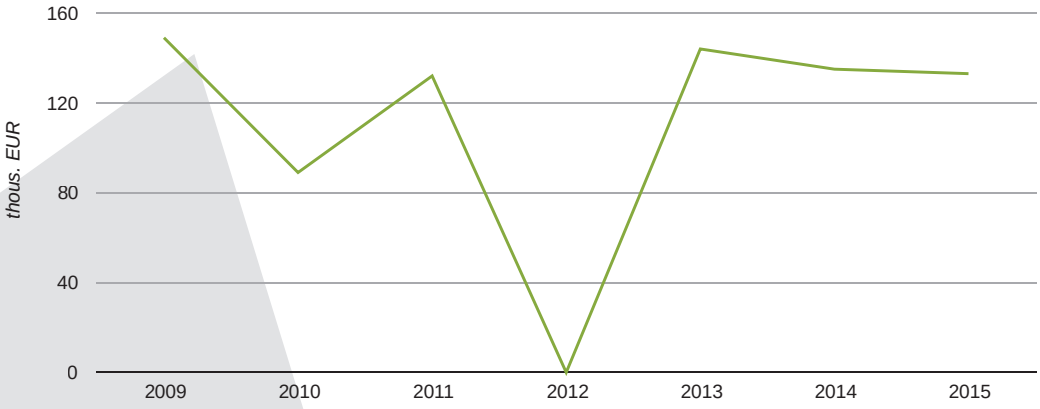
Source: SO SR, SEA

8.5.2. Costs of the environmental protection in tourism

The indicator describes the amount and share of funds spent in tourism for the environmental protection.

The costs of the environmental protection consist of the costs of the environmental protection from enterprises with 20 employees and more. The totum of costs of the environmental protection is the total sum of investment and current costs of enterprises. In 2009 – 2015, the costs of enterprises of the environmental protection in tourism decreased by 12% (EUR 16 thousand).

Development in costs of enterprises for the environmental protection in tourism



Source: SO SR

The share of costs of the environmental protection in tourism in the total costs of the environmental protection in the Slovak Republic is negligible (only 0.02%).

8.5.3. Environmental certification in tourism

In tourism, the quality management systems and any other forms of certification can only be applied with difficulties in comparison with the other sectors (e.g. eco-labelling). Implementation of systems is materially and financially demanding for small entities. By the end of 2014, the organisations with the certified Environmental Management System (EMS) pursuant to Standard ISO14001 included the companies Kúpele Dudince, a. s. and Thermal outdoor swimming pool Podhájska. In the national register EMAS, there is no organisation registered from the tourism sector. In total, three accommodation service facilities were assessed and awarded from 2004 in the Slovak Republic with the EU Ecolabel according to the original decision of the European Commission No. 2003/287/EC (valid until 31 October 2009) and the revised, currently valid Decision of the European Commission No. 2009/578/EC, establishing the ecological criteria for the award of the Community Ecolabel for tourist accommodation service. The development is shown in the following table:

BRAND HOLDER/ SERVICE NAME NUMBER	EC DECISIONS	VALIDITY
MaMaison Bratislava, s. r. o., Bratislava Accommodation service: MaMaison Residence Šulekova **** apartment hotel	2003/287/ES	V/2008 – X/2009
DAIRA, s. r. o., Košice Accommodation service: Eco Friendly Hotel Dália – the class *** premises	2009/578/ES	XII/2011 – XII/2016
Ing. Michal Lekýr-Divek Bojnice Accommodation service: Hotel Bojnický vínny dom ****	2009/578/ES 2015/345/EU	III/2015 – XI/2017

8.5.4. Assessment of impacts of proposed activities on the environment in tourism

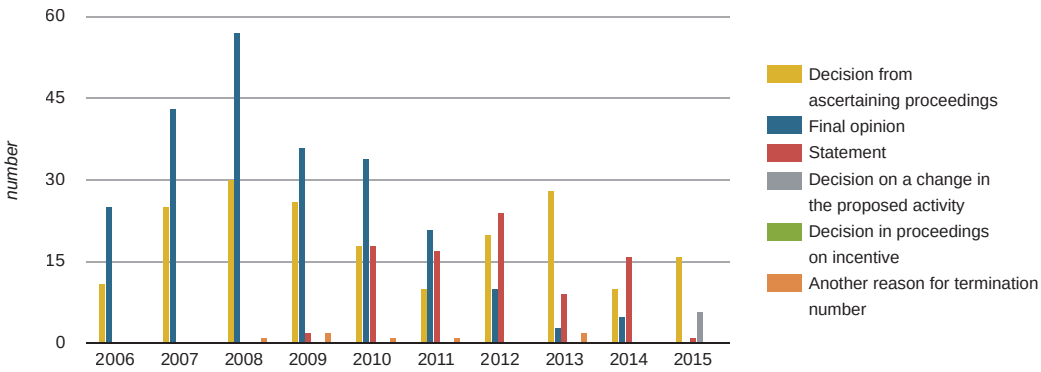
At present, in Slovakia the process of assessment of impacts of proposed activities before decision on their placement or before their permit is legislatively regulated by Act No. 24/2006 Coll. on environmental impact assessment and on amendments to certain acts.

In accordance with Annex No. 8 of the Act, the sector of tourism is included in the Table No. 14. Purposeful facilities for sport, recreation and tourism. The individual activities, buildings and facilities being subject to the EIA process were changed and supplemented from 2006 to 2015, i.e. the number of items included in the Table No. 14 was changed. Statistical processing of activities that were the subject of EIA includes all these changes.

The share of the individual items of activities evaluated in the sector of tourism for the period of 2006 – 2015 was as follows:

- 3 activities included in the item of ports for water sports (including wharfs, storing areas, repair workshops, etc.),
- 3 activities evaluated in the item of sport and recreational ports,
- 4 activities focused on building recreational ports for yachts and small boats,
- 15 permanent racing routes and testing routes for motor vehicles,
- 20 thematic parks,
- 39 activities included among sport and recreational sites including permanent campings and caravan places not included in any other items,
- 81 activities included in the items of downhill routes, cross-country routes, ski tows, ski jumbs, cable cars, and other facilities,
- 83 activities included in the item of sport sites and the related facilities (outdoor sport playgrounds and buildings for sports) – outdoor sites and the related facilities – buildings for sport,
- 86 activities of the character of other sport and recreational sites,
- 227 activities included under recreational premises and the related facilities (accommodation facilities except for private accommodation, food providing facilities).

Overview of the number of activities with the terminated EIA process by the individual types of proceedings in the sector of tourism



Source: SEA

8.6. List of used literature

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List of selected used abbreviations

AFT	Active foreign tourism
BOD_5	Biochemical oxygen demand
CAP	Common Agricultural Policy
CBD	UN Convention on Biological Diversity
CC	Climate change
CCTIA	Central Control and Testing Institute in Agriculture
CLC	Corine Land Cover
CNG	Compressed natural gas
COD_{Cr}	Chemical oxygen demand by potassium dichromate
E	Environment
EC	European Commission
EDW	Extraordinary deterioration of water
EEA	European Environment Agency
EEC	European Economic Community
EFI	European Forest Institute
EFICS	European Forest Information and Communication System
EI	Energy intensity
EMAS	Scheme for environmental management and audit
E-PRTR	European Pollutant Release and Transfer Register
ETS	Emissions Trading System
EU	European Union
EUROSTAT	Statistical Office of the European Communities
FAO	UN Food and Agriculture Organisation
FEC	Final energy consumption
FL	Forest lands
FM	Forest management
FSC	International non-profit-making organisation (Forest Stewardship Council)
FPS	Forest Protection Service
GCCA SR	Geodesy, Cartography and Cadastre Authority of the Slovak Republic
GDP	Gross domestic product
GIC	Gross inland consumption
GMES	Global Monitoring for Environment and Security
GVA	Gross value added
HTU	Higher territorial unit
IFF	International Forum on Forests
IPF	International Panel on Forests
IPI	Industrial production index
KP	Kyoto Protocol
l.w.w.b.	Large wood without bark
L_{den}	Day-evening-night equivalent level
L_{night}	Night equivalent level
LPG	Liquefied petroleum gas
LSPA	(the so-called) Large-size protected area
LULUCF	Sector of land use, land use change and forestry
MA SR	Ministry of Agriculture of the Slovak Republic (until 2010)
MARD SR	Ministry of Agriculture and Rural Development of the Slovak Republic (from 2010)
MB SR	Monuments Board of the Slovak Republic

MC SR	Ministry of Culture of the Slovak Republic
MCPFE	Ministerial Conferences of the Protection of Forests in Europe
ME SR	Ministry of Economy of the Slovak Republic
MoE SR	Ministry of Environment of the Slovak Republic
MESRS SR	Ministry of Education, Science, Research and Sport of the Slovak Republic
MH SR	Ministry of Health of the Slovak Republic
MoI SR	Ministry of Interior of the Slovak Republic
MTCaRD SR	Ministry of Transport, Construction and Regional Development of the Slovak Republic
NAFC	National Agricultural and Food Centre
NC SR	National Council of the Slovak Republic
NEAP	National Environmental Action Programme
NFC	National Forest Centre
NFP SR	National Forest Programme of the Slovak Republic
NM	Nature monument
NMC	National Motorway Company
NMVOC	Non-methane volatile organic substances
NNM	National nature monument
NNR	National nature reserve
NP	National Park
NPP	Nuclear power plant
NPP EBO	Nuclear power plants Bohunice
NPP EMO	Nuclear power plants Mochovce
NPP V1	Nuclear power plants V-1 Jaslovské Bohunice (the 1st and 2nd blocks)
NPP V2	Nuclear power plants V-2 Jaslovské Bohunice (the 3rd and 4th blocks)
NR	Nature reserve
NRA SR	Nuclear Regulatory Authority of the Slovak Republic
NSSD	National strategy for sustainable development
OECD	Organisation for Economic Co-operation and Development
OP QE	Operational Programme Quality of the Environment
PA	Protected area
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PEFC	Programme for the Endorsement of Forest Certification schemes
PES	Primary energy sources
PFT	Passive foreign tourism
PHA	Public Health Authority
PL	Protection level (of nature)
PLA	Protected landscape area
PLE	Protected landscape element
PMS	Partial monitoring system
PMS-S	Partial monitoring system Soil
PMTE	Passenger mountain transport equipment
POP	Persistent organic pollutants
PS	Protected site
PSR	P – pressure, S – state, R – response
PT	Public transport
RAW	Radioactive waste
RDP SR	Rural Development Programme of the Slovak Republic
REACH	Registration, Evaluation and Authorisation and Restriction of Chemicals
RES	Renewable energy sources
RIPPA	Research Institute for Plastics Processing and Application
RONI	Regulatory Office for Network Industries
SCI	Sites of Community interest

SDS	Sustainable development strategy
SE, a.s.	Slovenské elektrárne, joint-stock company (Slovak Power Stations)
SEA	Slovak Environment Agency
SHMI	Slovak Hydrometeorological Institute
SHMI - NIR	Slovak Hydrometeorological Institute - National inventory report
SIE	Slovak Inspectorate of the Environment
SK NACE	New Classification of Economic Activities
SNC SR	State Nature Conservancy of the Slovak Republic
SO SR	Statistical Office of the Slovak Republic
SP	Solid pollutants
SPA	Special protection areas
SPF	Special purpose forests
SPP	Slovenský plynárenský podnik (Slovak Gasworks)
SR	Slovak Republic
SRA	Slovak Road Administration
SS	Spring stock
SSCRI	Soil Science and Conservation Research Institute
SSPA	(the so-called) Small-size protected area
TCI	Total current increment
TEN-T	Trans-European Transport Network
TFEU	Treaty on the Functioning of the European Union
TL	Timber land
TRI	Transport Research Institute
UN	United Nations
UNCED	United Nations Conference on Environment & Development
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
USD	American dollar
WRI	Water Research Institute
WTO	World Tourism Organisation
WWTP	Waste water treatment plant

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