



REPUBLIC OF SLOVENIA
MINISTRY OF AGRICULTURE AND THE ENVIRONMENT
SLOVENIAN ENVIRONMENT AGENCY



Environmental indicators in Slovenia



REPUBLIC OF SLOVENIA
MINISTRY OF AGRICULTURE AND THE ENVIRONMENT
SLOVENIAN ENVIRONMENT AGENCY

Environmental indicators in Slovenia

ENVIRONMENTAL INDICATORS IN SLOVENIA

Publisher:

Ministry of Agriculture and the Environment – Slovenian Environmental Agency (ARSO)
Vojkova cesta 1b, Ljubljana

Represented by:

Joško Knez, Director-General

Edited by:

Urška Kušar, Barbara Bernard Vukadin, Nataša Kovač

Editing of chapters:

Air: Nataša Kovač

Climate Change: Nataša Kovač

Water: Urška Kušar

Land Use and Nature: Urška Kušar

Waste and Resources: Barbara Bernard Vukadin

Translation and language editing:

Translation and Interpretation Division, Secretariat-General of the Government of the Republic of Slovenia

Design, layout and printing:

Birografika BORI d.o.o.

We would like to express our special thanks for the illustrations to Erazem, Mark, Neva and Timi.

© ARSO, 2014

Circulation:

400 copies

The publication is printed on Cyclus Print paper made of 100% recycled fibres.

1st Edition

Gift edition

Ljubljana, 2014

CIP - Kataložni zapis o publikaciji

Narodna in univerzitetna knjižnica, Ljubljana

502.175(497.4)

ENVIRONMENTAL indicators in Slovenia / [edited by Urška Kušar, Barbara Bernard Vukadin, Nataša Kovač ; translation Translation and Interpretation Division, Secretariat-General of the Government of the Republic of Slovenia]. - 1st ed. - Ljubljana : Ministry of Agriculture and the Environment - Slovenian Environmental Agency (ARSO), 2014

ISBN 978-961-6324-53-3

1. Kušar, Urška

274293504

CONTENTS

Foreword	5	Precipitation and temperature	29
Introduction	6	Extreme weather events	30
AIR	10	Annual growing season length	31
Emissions of substances that cause acidification and eutrophication	12	Changes in glacier extent	32
Emissions of ozone precursors	13	Proportion of resident population living in a flood plain ..	33
Emissions of particulate matter	14	Lyme borreliosis	34
Quality of transport fuels	15	Energy prices	35
Air pollution by ozone	16	Energy taxes	36
Air pollution by PM ₁₀ and PM _{2.5}	17	Subsidies in the energy sector	37
Exceedances of air quality objectives due to traffic	18	Final energy consumption by sector	38
Exposure of residents and children to polluted air due to PM ₁₀ particulate matter	19	Renewable energy sources	39
Asthma and allergic diseases in children	20	WATER	40
Use of alternative fuels in transport	21	Water exploitation index	42
Public awareness about the effects of transport on the environment	22	Annual river balance	43
Passenger transport demand	23	Groundwater recharge	44
Freight transport demanda	24	Sea level	45
Transport final energy consumption	25	Chemical and ecological status of surface waters	46
CLIMATE CHANGE	26	Biochemical oxygen demand in rivers	47
Greenhouse gas emissions	28	Phosphorus in lakes	48
		Nitrates in groundwater	49
		Pesticides in groundwater	50
		Bathing water quality	51

Drinking water quality	52	WASTE AND RESOURCES	74
Water protection areas	53	Packaging waste	76
Wastewater treatment	54	End-of-life vehicles	77
Water permits	55	Transboundary shipments of waste	78
Intensification of agriculture	56	Environmental management systems	79
Gross nitrogen balance in agriculture	57	Dwellings	80
Consumption of plant protection products	58	Energy efficiency and energy consumption in the household sector	81
LAND AND NATURE	60	Household expenditure	82
Land cover and land use	62	Size of the vehicle fleet	83
Brownfield sites	63	Landfill of waste	84
Habitat types of European importance	64	Municipal waste	85
Species of European importance	65	Hazardous waste	86
Brown bear	66	Waste from production and service activities	87
Farmland birds	67	Direct Material Input and Domestic Material Consumption	88
Threatened species	68	Resource productivity	89
Naturalness of forest	69	Ecological footprint	90
Compensation for damage caused by protected species	70	Indicators, data sources and authors	91
Natura 2000	71	User opinions on Environmental Indicators in Slovenia	96
Protected areas	72		
Valuable natural features	73		

FOREWORD

Monitoring and analysing the state of the environment, as well as reporting to domestic and international audiences and institutions, are important tasks of the Slovenian Environment Agency, which operates as a body affiliated to the Ministry of Agriculture and the Environment.

Through the Environmental Information and Observation Network (EIONET), which is run by the European Environment Agency (EEA), the Slovenian Environment Agency monitors, collects and analyzes environmental data, as well as other data and information relevant for the environment. In doing so, it links government institutions engaged in professional and research tasks in the environmental field to the EIONET. Accurate, reliable, targeted and timely environmental data are crucial for the implementation of legislation and for the monitoring of environmental objectives. These data are compiled into environmental indicators, which are among the most effective tools to assist decision making and raise public awareness.

The environmental indicators developed by the Slovenian Environment Agency are presented in the publication entitled "Environmental Indicators in Slovenia". It is intended for both the general public and experts. Above all, we wish to reach also the youngsters as future decision-makers in the environmental field. This is why special attention during awareness-raising campaigns is given to eco-schools.

The publication touches upon basic environmental issues which are nowadays at the forefront of European and international environmental policy – climate change mitigation and adaptation, preservation of biodiversity, sustainable use of natural resources and protection of human health.

Air, water, nature, land, all this is our natural capital. It is the environment we live in. Environmental indicators, which provide data that are collected and presented in an agreed form, bring forward pressures on the environment, pollution level, impacts of the polluted environment (on human health and ecosystems), policy responses (as economic instruments of environmental protection), and driving forces that generate environmental pressure through socio-economic activities. Knowledge of this five-level assessment framework, which is based on indicators, is a key to successful environmental management. With the proper use and combination of indicators, we can obtain information on how to manage our environment more effectively.

We will have to find ways to live well within limits of our planet. With this in mind, we need our natural resource management to become more efficient and we also need to make the transition to a green and low-carbon economy. In this way the conditions will be created for the establishment of sustainable development and a healthier and cleaner environment.

Joško Knez
Director-General

INTRODUCTION

Environmental indicators – a tool for monitoring the environment

The capacity of the environment is limited. Our way of living significantly affects the environment and causes it to change, sometimes irreversibly. The non-sustainable exploitation of natural resources (non-renewable and renewable) may threaten our economy, while excessive emissions may seriously damage our health. Ecosystems are very vulnerable and at the same time irreplaceable. They provide us with clean air, water, food, energy and other resources, as well as a stable climate. They are also a sink for emissions and waste.

The complexity of the environment requires an intricate approach to monitoring. We use environmental indicators to monitor the implementation of objectives under the environmental legislation in force, providing the reader with an insight into the environment in terms of environmental management that we know today and that we will gradually improve, based on our visions and the implementation of strategic documents and the relevant legislation until we achieve environmental stability. As the slogan of the EU's 7th Environment Action Programme to 2020 says: "Living well, within the limits of our planet."

The leading European institutions in the area of the environment believe that, in view of the increasing

burden on the global environment, Europe should be among the first to make the transition to an innovative, circular economy. A circular economy is an economy that seeks to manage resources sustainably, re-uses most of the waste in production processes, preserves biodiversity and values ecosystems and their contribution to economic progress and overall well-being.

To achieve the priority objectives of the 7th Environment Action Programme, knowledge of the environment and a high level of awareness among people are of crucial importance. Environmental indicators are very helpful in this respect, as they show changes in the environment, which are a result of many factors, in a transparent manner. They are based on numerical data indicating the current state, specific characteristics and development of a selected phenomenon, which is linked to the objective of environmental policy.

Indicators can be linked in various ways. They enable a comparison with other countries, while providing a good overview of available environmental data sources in different information systems. Given our experience to date and that of other countries and international institutions, we can argue that environmental indicators are an efficient and useful tool for monitoring and reporting on the state of the environment and the progress of environmental policies. This is why they are intended for both decision-makers and the general public.

Environmental indicators may also be used to support the presentation of topics that look at environmental issues from a different perspective – a green economy, ecosystem services, and the efficient use of resources. With respect to resource efficiency, we would include, for example, material-flow indicators, waste indicators, indicators for emissions into air and water and indicators for land-use changes, economic instruments and biodiversity.

Presentation of indicators in the publication

Five-part DPSIR assessment framework

Environmental indicators are presented by means of a five-part assessment framework, which shows the connection between the economy, society and the environment. Driving forces behind economic and social activities put pressures on the environment, which adversely affect the state of air, water and soil, which in turn has negative impacts on human health and ecosystem resilience. Politicians and society respond and exert influence to change the driving forces, and the above-described cycle repeats itself. (Figure 1)

The five-part assessment framework is highly simplified, summarising the complex interactions of various indicators. In some cases, measures at the national level only partially contribute to an improvement in the state of the environment, as changes are a result of transboundary or global

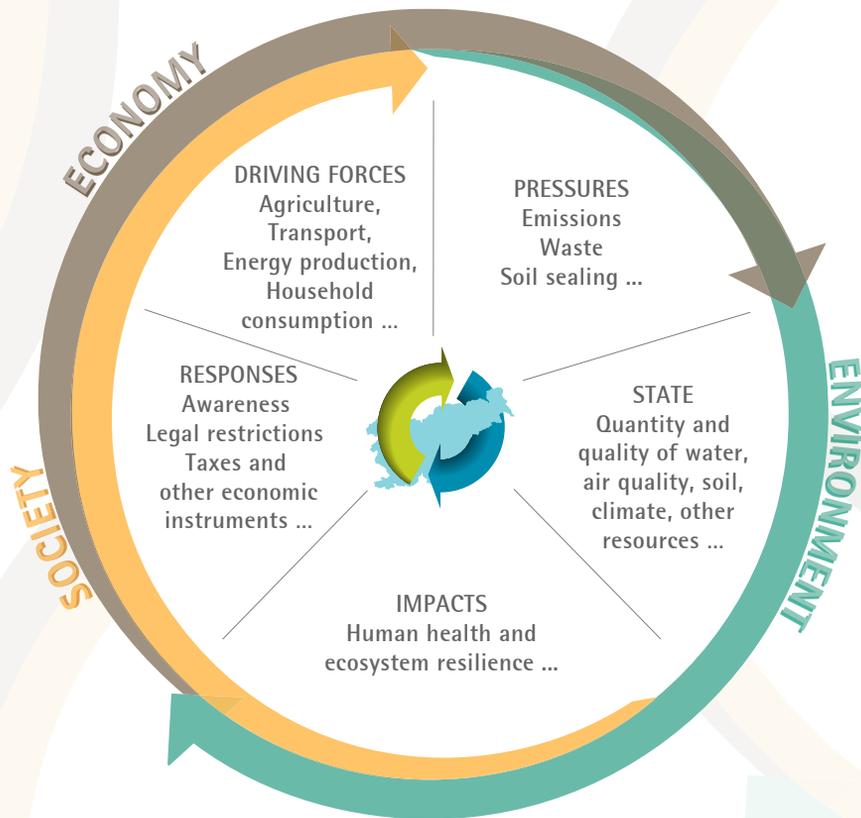


Figure 1: Five-part DPSIR assessment framework and connection between the environment, society and the economy

impacts.

Contents of the publication

Indicators are presented in five chapters:

1. Air
2. Climate change
3. Water
4. Land use and nature
5. Waste and natural resources

The introduction to each chapter begins with an outline of indicators that puts the indicators relevant to the chapter within the five-part DPSIR framework. There is an image of a daisy displayed before the name of the presented indicator, assessing the development of the monitored phenomenon (good – towards achieving the set objective, undefined, bad – failure to achieve the set objective). An indicator printed in italics is relevant to the chapter, but is presented in detail in the other chapter, in which it is of more relevance. In addition to the outline, the introduction also includes a summary of the key messages of the indicators that are presented below. Each chapter covers 10 to 15 indicators, which are taken from the system of the Slovenian Environment Agency (ARSO) indicators entitled “Environmental indicators in Slovenia”, which are published on the Slovenian Environment Agency’s website (<http://kazalci.arso.gov.si>).

Selection of indicators, time frame and data framework

In selecting indicators, we focused, in particular, on the following criteria: the relevance of an indicator to Slovenia within the five-part assessment framework, the reliability of the data source, the clarity of the set objectives and the international comparability of the methodology for calculating the indicator.

As a rule, indicators are presented with annual values for Slovenia as a whole. Environmental phenomena have different time dynamics. Some of them change quickly (on an hourly, daily basis), while others respond much more slowly to impacts (annually, on a ten-year basis, on a hundred-year basis). In addition, their spatial distribution and variability may vary. Methods for monitoring particular phenomena and the availability of data are therefore adjusted accordingly. This is why the length of the data set is selected on the basis of the availability of data and their relevance to the phenomenon monitored.

Data sources

Data for indicators are collected from different databases, which are administered by different institutions in Slovenia (around 20) and at the international level (particularly the European Environment Agency, the Statistical office of the European Union – Eurostat, the World Health Organization, the European Commission, the United Nations Economic Commission for Europe). Most of the data sources used in indicators are managed by the Slovenian Environment Agency. Data for the latest published year under a particular indicator in this publication depend on the method of data acquisition and data

processing. Data that were available in March 2014 were used. The data on the quality of water, for instance, are gathered by sampling water, analysing the sample in the laboratory, entering the data in a database and controlling and processing the data. Air quality is monitored by means of an automatic network of monitoring sites or by means of manual routine sampling. In the case of automatic monitoring, data are updated on a half-hourly basis. Since these data are not quality assured immediately, the quality evaluation is carried out subsequently after data processing and aggregation. A different kind of data is data linked to the administrative procedure. Data on waste, for example, are reported by reporting agents (polluters, collectors and others) in a manner and within the time limits set out in regulations. Until the introduction of electronic reporting, reports were made for the previous year. Similar is true of the international level. The availability of data for international comparison depends on the method of data collection and reporting to international institutions.

In addition to data displayed in the graph, each indicator is complemented by text (comment) on the described phenomenon, providing a basic analysis and additional information relevant to the understanding of the state and development of the phenomenon (e.g. structure, spatial diversity, international comparison). Comments are summaries of texts that have been produced by the creators of indicators and published in the online version. The texts have been mainly written by experts in their respective fields at the Slovenian Environment Agency. Other topics were covered in cooperation with experts from other Slovenian institutions (the

National Institute of Public Health, the Institute of the Republic of Slovenia for Nature Conservation, the Slovenian Forestry Institute, the Slovenian Forest Service, the Jožef Stefan Institute, DOPPS – BirdLife Slovenia, the Agricultural Institute of Slovenia, SRC SASA – Research Centre of the Slovenian Academy of Sciences and Arts, the Statistical Office of the Republic of Slovenia, the Urban Planning Institute of the Republic of Slovenia and others).

Data sources used for each indicator and the names of experts who provided comments are listed in the table of authors and sources at the end of the publication.

Structure of indicators

Indicators have a multi-level structure for less and more demanding readers. The key message and the indication of the trend for the phenomenon (daisy) provide a quick overview of environmental issues. The graph, accompanied by comments and a list of indicators related to the subject discussed, provides a more detailed insight into these issues. The codes of the aforementioned indicators correspond to the codes under which these indicators are published online (<http://kazalci.arso.gov.si>), where more information is available.

Statements on the usefulness of the Slovenian Environment Agency indicators

The publication also contains the opinions of experts in various fields who have been monitoring environmental indicators in Slovenia for several years. We sincerely thank them for their opinion.

Publication design

The environmental indicators publication contains the knowledge of people from different institutions in Slovenia. Knowledge is a key basis for good decisions. Decisions that we take today will affect the lives of our descendants. This is why the publication also includes children's drawings. The title of each chapter is followed by a text indicating questions answered in this chapter.

Environmental indicators in Slovenia online

The system 'Environmental indicators in Slovenia' can be accessed on the following website: <http://kazalci.arso.gov.si/>.

It comprises about 190 environmental indicators divided into 17 topic groups. It has been developed since 2004. The system provides an overview of the key messages by chapters, trends with regard to individual indicators by years and related indicators. Indicators published online are more comprehensive in content compared to those included in the publication, as they contain more graphic images, a detailed definition of an indicator and the terms used, and the description of the methodology for data collection, processing and display.

Previous printed publications of indicators and language versions

The publication 'Environmental indicators in Slovenia' is the fourth in succession. The previous publications, which were published in Slovenian, are as follows:

1. Environmental indicators 2003
2. Environmental indicators 2005
3. Environment and transport 2008

The publication 'Environmental indicators in Slovenia' is published in Slovenian and English.

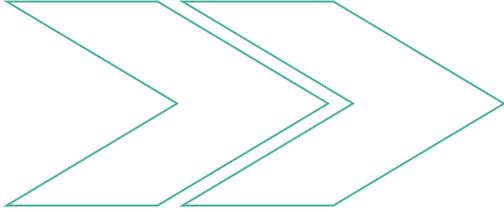
Environmental indicators and environmental reporting in Slovenia

Environmental indicators in Slovenia are one of the essential building blocks for the preparation of the national report on the environment and Slovenia's contribution published in the European environment – state and outlook 2015 report (SOER 2015 Report). Environmental indicators are a result of Slovenia's constructive cooperation with the European Environment Agency and its

active participation in the exchange of data and information within the European Environment Information and Observation Network (EIONET). They are used in drawing up other international reports for institutions such as the Organisation for Economic Co-operation and Development, the World Health Organization and the United Nations Economic Commission for Europe. They are also increasingly used by other national institutions in monitoring the implementation of operational programmes and national strategies, and in drawing up various reports.

The legal basis and binding documents for the development of indicators

- Environmental Protection Act (Uradni list Republike Slovenije, no. 41/2004 as amended)
- Regulation (EC) No 401/2009 of the European Parliament and of the Council of 23 April 2009 on the European Environment Agency and the European Environment Information and Observation Network
- Multiannual Work Programme of the European Environment Agency 2014–2018
- Annual Work Programme of the European Environment Agency and European Topic Centres.



HOW CLEAN IS THE AIR

WE BREATHE?

The quality of the air we breathe affects our health and our lives. Economic activities related to road traffic, the generation of power and heat, industry, and agriculture are the main source of air pollution, which has direct and indirect impacts on human health, ecosystems, and materials.

This chapter covers the emissions of gases that cause acidification and eutrophication, emissions of ozone precursors, and emissions of particulate matter. Since the particulate matter is the main source of air pollution it is important to monitor air emissions from individual households and transport which are regarded to be the main polluters. Emissions from cars are a source of harmful substances like benzene and sulphur.

Air pollution by ozone and particulate matter (PM₁₀ and PM_{2.5}) is a major environmental and health problem throughout Europe. Recent health studies have confirmed links between air pollution from PM₁₀ and the development of asthma in children. It is known that approximately 40% of children in Slovenia are exposed to PM₁₀ concentrations of 30–40 µg/m³, which is above the level recommended by the World Health Organization.

Measures to improve the quality of air are aimed at enhancing efficiency in the transport and energy sectors. The fact is that freight and passenger transport volumes are increasing. In this regard, road transport is the most unsustainable and polluting mode of transport. With regard to freight transport, emissions from transit traffic, which increased considerably after Slovenia joined the EU, are causing most concern. Road transport, which is the fastest growing mode of transport, is a major energy consumer.

Due to transboundary air pollution, it is important to address air pollution issues in cooperation with neighbouring countries. This is especially relevant in terms of ozone pollution which is regarded to be a regional problem while PM₁₀ pollution is more than less a local problem. Thus, promoting and implementing local measures in order to minimise PM₁₀ pollution seems to be essential within the country. If we are to improve the quality of air in the future, we will have to increase the use of green and more efficient in buildings and the use of alternative sources have to be paid to raising public awareness. Gaining "public legitimacy" will be the key to the practical application of solutions.



ECONOMY

SOCIETY

DRIVING FORCES

- Passenger transport demand
- Freight transport demand
- Transport final energy consumption

RESPONSES

- Use of alternative fuels in transport
- Public awareness about the effects of transport on the environment
- Renewable energy sources

PRESSURES

- Emissions of substances that cause acidification and eutrophication
- Emissions of ozone precursors
- Emissions of particulate matter
- Quality of transport fuels
- Greenhouse gas emissions

IMPACTS

- Exposure of residents and children to polluted air due to PM₁₀ particulate matter
- Asthma and allergic diseases in children

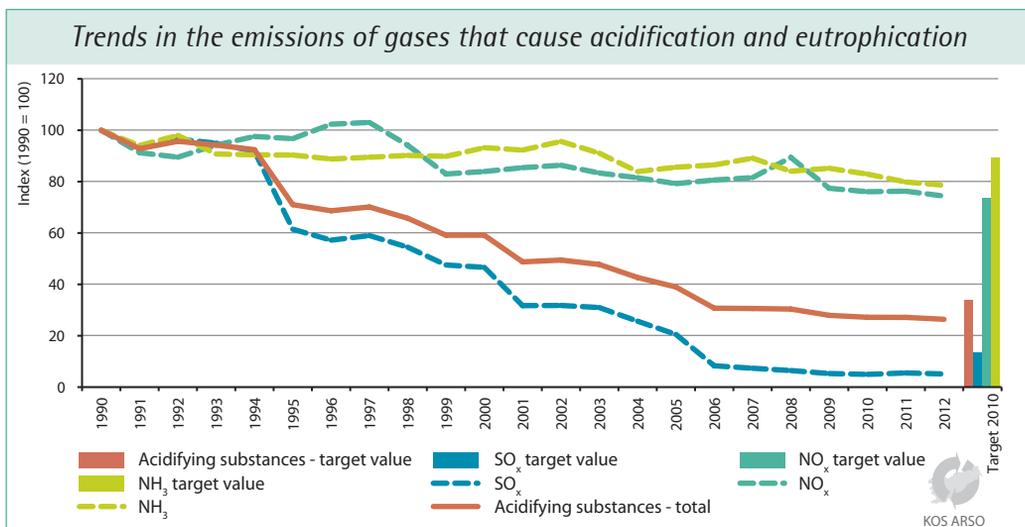
STATE

- Air pollution by ozone
- Air pollution by PM₁₀ and PM_{2.5}
- Exceedances of air quality objectives due to traffic
- Precipitation and temperature

ENVIRONMENT

EMISSIONS OF SUBSTANCES THAT CAUSE ACIDIFICATION AND EUTROPHICATION

In the period from 1990 to 2012, emissions of gases that cause acidification and eutrophication decreased by almost 74%, mainly due to a reduction in sulphur oxides (by 95%).



To meet target values for sulphur oxides, nitrogen oxides, and ammonia, measures aimed at improving energy efficiency and substituting natural gas and renewable sources of energy for solid fossil fuels have been adopted. In addition, more stringent standards for motor vehicle emissions have been introduced. Consistent implementation of environmental legislation, in particular in the area of comprehensive prevention and control of industrial pollution (the use of the best technologies available), and the promotion of good agricultural practices have also contributed to the reduction of emissions.

Substances that cause acidification are sulphur oxides (SO_x), nitrogen oxides (NO_x), and ammonia (NH₃). Nitrogen oxides and ammonia also contribute to eutrophication.

The emissions of gases which cause acidification and eutrophication decreased by almost 74% in 2012 compared to the 1990 levels, mainly because of a reduction in sulphur oxide emissions (by 95%). The reduction is the result of the introduction of desulphurisation devices in the Šoštanj and Trbovlje thermal power plants, the use of imported low-sulphur coal in the Ljubljana heat and power plant, the introduction

of liquid fuels with lower sulphur content, and the substitution of natural gas for liquid and solid fuels.

In 2012, ammonia accounted for the major part (44%) of emissions of gases which cause acidification and eutrophication, followed by nitrogen oxides, which accounted for 42%. The main source of ammonia emissions is agriculture, while the main source of nitrogen oxides is road transport and energy supply. Data for 2012 show that emissions of gases which cause acidification and eutrophication were below the target value set for 2010.



kazalci.arso.gov.si

ZR09 Emissions of gases that cause acidification and eutrophication

ZR16 Sulphur content of fuels

EN09 Emissions of air pollutants from energy sources

KM13 Emissions of ammonia from agriculture

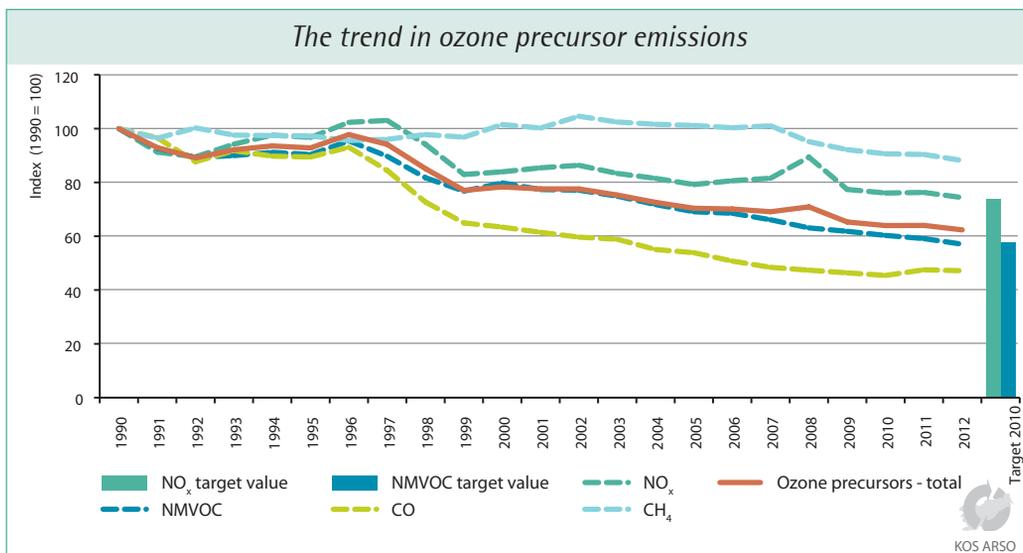
PR08 Emissions of air pollutants from transport

ZR05 Air pollution by sulphur dioxide

ZR06 Air pollution by nitrogen dioxide

EMISSIONS OF OZONE PRECURSORS

In the period from 1990 to 2012, emissions of ozone precursors decreased by almost 38%, mainly due to a reduction in carbon monoxide (by 53%).



Source: National database on air emissions, National database on GHG emissions, Slovenian Environment Agency, 2013

Ozone precursors are chemical compounds that contribute to the formation of ground-level (tropospheric) ozone. Ozone precursors are nitrogen oxides (NO_x), carbon monoxide (CO), methane (CH₄), and non-methane volatile organic compounds (NMVOC).

In the period from 1990 to 2012, emissions of ozone precursors decreased by almost 38%, mainly due to a reduction in carbon monoxide (by 53%). In 2012, nitrogen oxides accounted for the majority (49%) of ozone precursor emissions, followed

by carbon monoxide (35%), non-methane volatile organic compounds (15%), and methane (1%). In terms of economic sectors, the majority of emissions were from the transport sector (39%), followed by fuel consumption in households and the commercial sector (24%), and production of electricity and heat (11%). The contribution of the industrial processes, and waste management sectors was small. Data for 2012 show that nitrogen oxides emissions were above the target value set for 2010, while NMVOC emissions were below that target value.

To meet the target values, measures have been taken to improve energy efficiency, more stringent standards for motor vehicle exhaust emissions have been introduced, the solvent content of paints, cleaning, and other products has been reduced, and environmental legislation has been implemented, particularly in the area of the comprehensive prevention and control of industrial pollution (the use of the best available technologies). Pollution from large combustion plants has also been limited.



kazalci.arslo.gov.si

ZR10 Emissions of ozone precursors

EN09 Emissions of air pollutants from energy sources

KM13 Emissions of ammonia from agriculture

KM14 Emissions of methane and nitrous oxide from agriculture

PR08 Emissions of air pollutants from transport

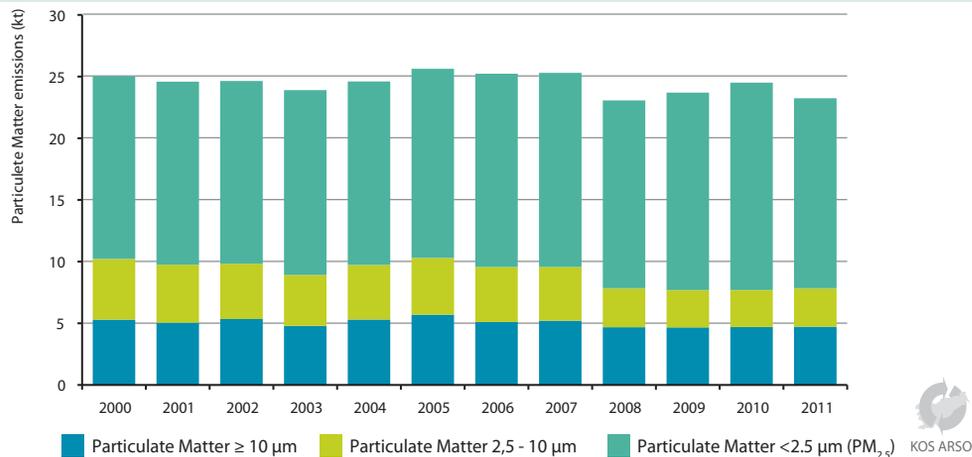
ZR07 Air pollution by ozone

EMISSIONS OF PARTICULATE MATTER

In the period from 2000 to 2012, emissions of PM_{2.5} increased by 15%, mainly due to the increased use of wood biomass in households.



The trend in emissions of particulate matter



Source: National database on air emissions, Slovenian Environment Agency, 2013

Atmospheric particles or aerosols are fine solid particles or liquid droplets suspended in gas. On the basis of the size of the diameter of particles, we distinguish between PM₁₀ particulate matter (particles with an aerodynamic diameter of less than 10 μm), PM_{2.5} particulate matter (particles with an aerodynamic diameter of less than 2.5 μm), and PM_{1.0} particulate matter (particles with an aerodynamic diameter of less than 1 μm). Particles may be of natural origin (pollen, dust, sea salt, smoke from forest fires, meteorite dust, volcanic ash) or anthropogenic origin (the result of emissions from energy production, industry, transport, agriculture, and residential wood combustion).

In the period from 2000 to 2011, emissions of particulate

matter (TSP – total suspended particles, PM₁₀, PM_{2.5}) decreased – TSP by 7.2% and PM₁₀ by 6%. In the same period, emissions of particulate matter less than 2.5 μm in diameter (PM_{2.5}), which are more harmful to health in comparison to TSP and PM₁₀, increased by 4%. The data for 2011 show that the PM_{2.5} target value set for 2020 was exceeded by 18%. In the structure of all particles (TSP), PM₁₀ particles accounted for 80%, while within the PM₁₀ fraction PM_{2.5} particles accounted for more than 83%.

The reduction in emissions of larger particles in the period from 2000 to 2011 is mainly due to a reduction in emissions from power and heat generation and the use of solvents in the industrial processes sector. In the same period, the transport

sector and the consumption of fuel in residential and commercial sectors accounted for the greatest increase in the emission of particles. The increase in emissions from households was also due to the more favourable price of wood compared to that of other heating fuels.

The major sources of TSP are fuel consumption in households and the commercial sector (56%), agriculture (25%), and transport (9%). Fuel consumption in households and the commercial sector accounts for 66% of total PM₁₀ emissions, followed by agriculture and transport, which account for 14% and 9%, respectively. Residential wood combustion is also the main source of PM_{2.5} emissions, accounting for 79% of total primary PM_{2.5} emissions, followed by transport, which accounts for 9% of emissions.

Measures for reducing PM₁₀ emissions in the ambient air are mainly linked to improving the energy efficiency of combustion processes, substituting natural gas and renewable sources of energy for solid fossil fuels, introducing stricter standards for motor vehicle exhaust emissions, and consistently implementing environmental legislation.



kazalci.arslo.gov.si

ZR15 Emissions of particulate matter

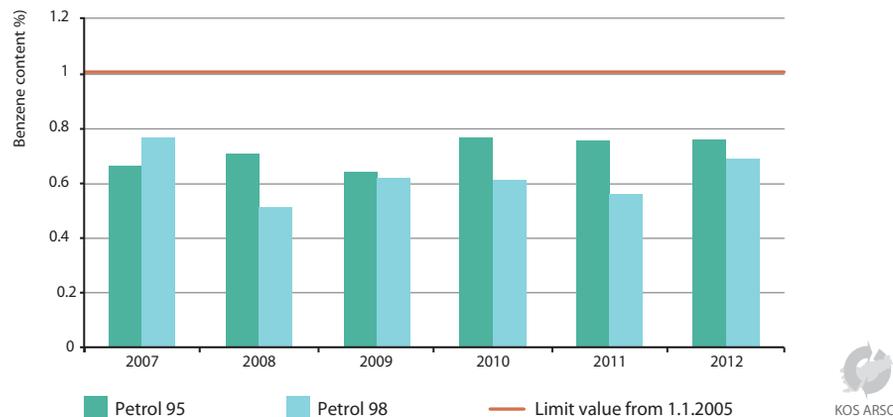
- EN16 Total energy consumption by fuels
- PR07 Exceedances of air quality objectives due to traffic
- PR08 Emissions of air pollutants from transport
- PR12 Average age of the vehicle fleet
- ZR06 Air pollution by nitrogen dioxide
- ZR08 Air pollution by PM₁₀ and PM_{2.5}

QUALITY OF TRANSPORT FUELS

The quality of the fuels used in road, air, and sea transport complies with the standards.



Concentration of benzene in fuels used in the road transport



Source: EU Fuel Quality Report, Slovenia, European Commission, 2012

The quality of fuels depends on the sulphur content of the fuels used in road, sea, and air transport and the lead and benzene content of the fuels used in road transport.

Lead in motor vehicle exhaust emissions is the most harmful to human health since it is highly toxic and can cause damage to many organs in the body. Lead has been shown to have deleterious effects on the developing nervous systems of children, leading to lower IQ and learning and behavioural problems.

Lead emissions from traffic have been decreasing since 1994, principally due to the introduction of catalytic converters on new vehicles with petrol engines, which are not allowed to use leaded petrol. The price policy has also played a part by lowering the price of unleaded petrol. As of July 2001,

the maximum permissible concentration of lead in petrol in Slovenia was reduced to 0.05 g/kg. As of January 1st, 2005, the use of lead in petrol has been banned, resulting in the elimination of the largest source of lead in Slovenia.

In the winter periods from 2005 to 2012, the concentration of sulphur in road transport decreased, stabilising at a certain level with regard to all types of fuels. In 2012 alone, this concentration was reduced by 500% regarding 95-octane petrol and by 700% regarding diesel, compared to 2005 levels. The reduction is due to measures that limit the concentration of sulphur in petrol and diesel fuels to 10 mg/kg of fuel, which have been in force since 1 January 2009. In 2012, the maximum permitted content of sulphur in fuels was not

exceeded. The same holds true for the average concentration of sulphur in marine and aviation fuels in the period from 2008 to 2012.

Transport is the largest source of benzene, which is a volatile organic compound confirmed as a carcinogenic. Benzene is contained in petroleum products. Benzene emissions can be most efficiently reduced by means of catalytic converters in cars with petrol engines. However, when driving with a catalytic converter that has not yet warmed up, which is a common phenomenon in urban areas, the reduction in emissions will be less efficient. Benzene emissions were reduced significantly in 2001 with the introduction of the European standard limiting the benzene content of fuels to 1% by volume. Accordingly, the limit values for benzene were not exceeded.



kazalci.arslo.gov.si

PR17 Quality of transport fuels

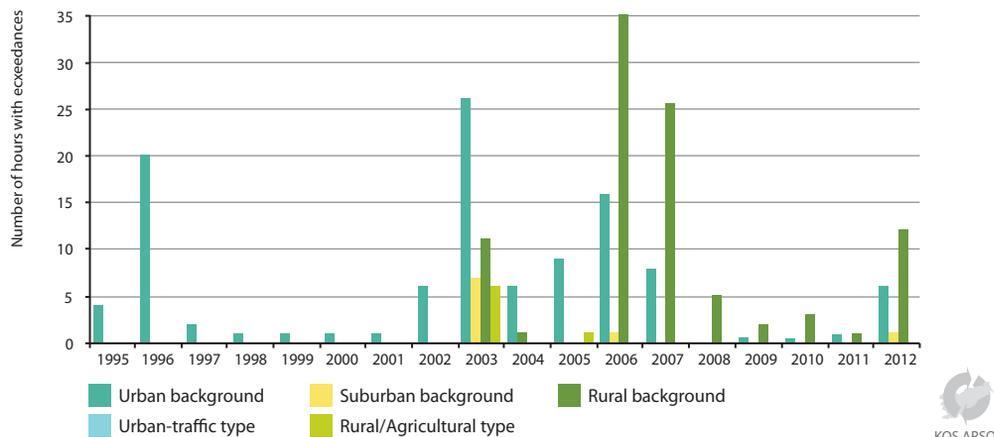
- EN27 Energy efficiency and energy consumption in the transport sector
- PR07 Exceedances of air quality objectives due to traffic
- PR08 Emissions of air pollutants from transport
- PR12 Average age of the vehicle fleet
- PR16 Road transport fuel prices
- ZR08 Air pollution by PM_{10} and $PM_{2.5}$

AIR POLLUTION BY OZONE

In summer months, the concentration of ozone exceeds levels acceptable for human health. Exceedances most often occur in the Primorska region and at higher altitudes.



Number of hours when ozone concentration exceeded the critical level ($180 \mu\text{g}/\text{m}^3$)



Source: Automatic Air Quality Measurement Database (DMKZ), Slovenian Environment Agency, 2013

Ozone is a highly reactive gas which occurs in two layers of the atmosphere. The layer closest to the Earth's surface is the troposphere. Here, ground-level or "bad" ozone is an air pollutant that is harmful to breathe and damages crops, trees, and other vegetation. It is the main ingredient of urban smog. The troposphere generally extends to an altitude of about 9-10 km, where it meets the second layer, the stratosphere. The stratosphere extends upward from about 9 to 50 km. The stratospheric or "good" ozone protects life on Earth from the sun's harmful ultraviolet (UV) rays. Ground-level ozone is created by chemical reactions between oxides of nitrogen, volatile organic compounds, and carbon monoxide (ozone precursors) in the

presence of sunlight and high temperatures. As a rule, the conditions for the formation of ozone are most favourable in summer months, when high temperatures limit outdoor activity.

The main source of ozone precursors is transport. The transport sector accounts for approximately two thirds of total emissions. Ozone concentrations are particularly high in summer, since the formation of ozone requires sufficient sunlight. Transboundary air pollution significantly contributes to ambient air pollution by ozone, particularly in the Primorska region. The lowlands of northern Italy are one of the areas in Europe where most ozone precursors are formed. In summer, ozone concentrations are highest in the Obala and Primorska regions in the presence of

moderate west and south-west winds. Measurement of ground-level ozone concentrations show that target values and long-term objectives have been exceeded at all monitoring stations in Slovenia, apart from those monitoring stations that are exposed to emissions of nitrogen oxides caused by traffic. At these monitoring stations ozone is transformed to oxygen molecules.

The Slovenian Environment Agency forecasts ozone concentrations for the whole territory of Slovenia two days in advance. When the information threshold for ozone is exceeded ($180 \mu\text{g}/\text{m}^3$), the public and different institutions (hospitals, community health centres, the media, rescue centres, municipalities, schools, and day-care centres) are informed thereof and given information on possible effects on health and recommendations how to minimise exposure.

High concentrations of ground-level ozone irritate the respiratory system and can lead to respiratory problems. People affected by asthma or bronchitis are most at risk. Older people and children are especially vulnerable in this regard. Ozone also contributes to cardiovascular disease and arteriosclerosis, exacerbates acute conditions, and increases the mortality rate.



kazalci.arslo.gov.si

ZR07 Air pollution by ozone

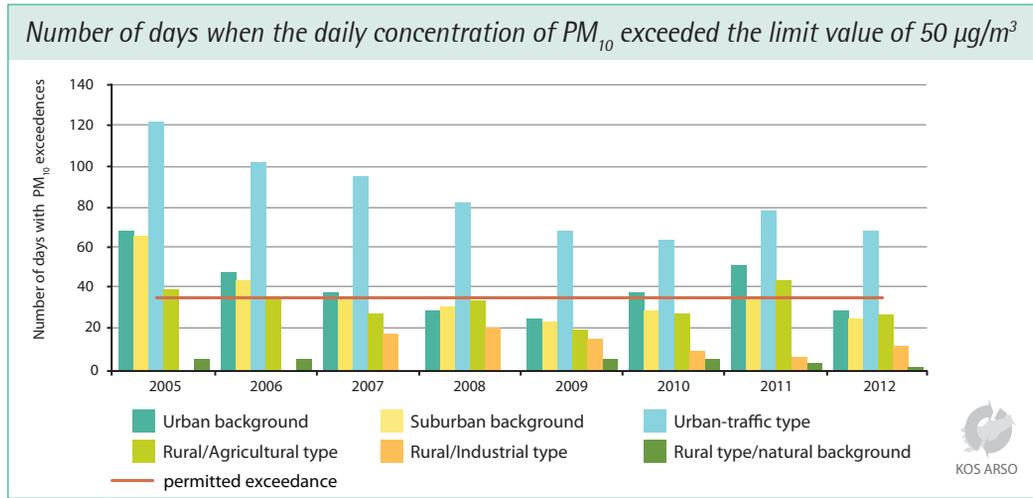
ZR10 Emissions of ozone precursors

ZR06 Air pollution by nitrogen dioxide

PS04 Precipitation and temperature

AIR POLLUTION BY PM₁₀ AND PM_{2.5}

Cities, where most people live, are most polluted due to PM₁₀ emissions from residential wood combustion.



Source: Automatic Air Quality Measurement Database (DMKZ), Slovenian Environment Agency, 2013; Air quality database of complementary automated measurement networks (Šoštanj Thermal Power Plant, Trbovlje Thermal Power Plant, Thermal Power Plant Ljubljana (TE-TOL), the Anhovo Environmental Information System on Air Quality), 2013

Particles are harmful to health because they enter the respiratory system, causing many health problems (sore eyes, asthma, bronchitis, lung damage, cancerous diseases). In addition to an adverse effect on health, particles have adverse effects on the environment, such as reduced visibility and the acidification and eutrophication of ecosystems. Damage to materials and cultural monuments are also more likely.

In 2012, the number of exceedances of daily threshold concentration of PM₁₀ decreased compared to 2011. Accordingly, the annual permitted number of exceedances was exceeded at fewer monitoring stations in Slovenia. In 2012, the limit values were exceeded exclusively in winter months, mainly due

to emissions from individual residential wood combustion sources. In addition to households, energy facilities, and transport, the stability of the atmosphere is one of the parameters affecting concentration levels in the air. Temperature inversions considerably increase the concentration levels of particulate matter, while wind and precipitation reduce them.

In the period from 2005 to 2012, the highest average annual PM₁₀ and PM_{2.5} concentration levels and the largest number of days when PM₁₀ daily limit values were exceeded were recorded at measuring stations in towns which are most affected by emissions caused by transport. On the other hand, PM₁₀ concentration levels were considerably lower at rural measur-

ing sites. The natural background of PM, which shows the permanent presence of particulate matter in the environment, is extremely low. Dust from active volcanoes (e.g. Iceland) or dust brought by wind from the Sahara desert in Africa may contribute to higher background concentrations, as dust from volcanoes and desert dust are regarded as a natural source.

Measures to reduce PM₁₀ concentrations in the outdoor air are envisaged in the Operational Programme for the protection of ambient air against pollution caused by PM₁₀ (2009). The programme plans to reduce emissions from residential wood combustion and road transport at the national, regional, and local levels, as well as emissions from industrial and construction sources.

The Government of the Republic of Slovenia in 2013 for the purpose of reducing PM₁₀ pollution on local level introduced Ordinances on air quality plans in the municipalities of Murska Sobota, Maribor, Celje, Kranj, Novo mesto, Ljubljana and Zasavje.



kazalci.arso.gov.si

ZR08 Air pollution by PM₁₀ and PM_{2.5}

PR12 Average age of the vehicle fleet

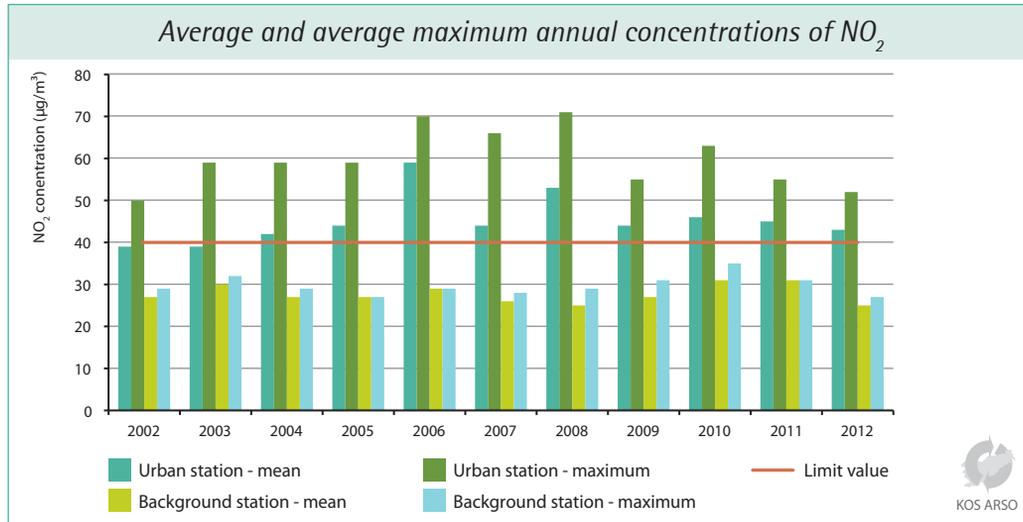
PS04 Precipitation and temperature

ZD02 Asthma and allergic diseases in children

ZD03 Exposure of children to polluted air due to PM₁₀ particulate matter

EXCEEDANCES OF AIR QUALITY OBJECTIVES DUE TO TRAFFIC

Road transport in urban areas is a major source of nitrogen dioxide and PM₁₀.



has slightly increased at monitoring stations with high traffic intensity, while it has decreased at urban background monitoring stations (suburban monitoring stations). In the entire measurement period, NO₂ concentrations at urban background stations were below the permitted limit value, although they have come dangerously close to it in recent years.

In the period 2001–2012, the measurement of PM₁₀ concentration levels showed that concentrations at urban background stations did not exceed the annual limit value, while this objective is yet to be achieved at stations with high traffic intensity. However, in the period 2005–2012, considerably larger differences were recorded with regard to the number of exceedances of the daily maximum PM₁₀ concentration (50 µg/m³), which is allowed to be exceeded only 35 times per year. In the monitoring period, PM₁₀ concentration levels at both types of monitoring stations decreased, although they were still above the permitted level. At the Ljubljana monitoring station located in the city centre (a station with high traffic intensity), the PM₁₀ daily limit value was exceeded as many as 107 times in 2012 and the PM₁₀ annual limit value was also exceeded.

Although it has been known for years that air pollution from PM₁₀ particulate matter and nitrogen dioxide poses significant health risks, new findings and evidence are emerging in this respect. Short-term exposure to nitrogen dioxide affects lung functioning and increases susceptibility to respiratory infections and sensitivity to allergens. Long-term exposure increases the risk of inflammation of the airways, particularly in more vulnerable groups, such as children. Nitrogen oxides contribute significantly to a number of pressing environmental issues, including acidification and eutrophication, and the forma-

tion of a photochemical smog and tropospheric ozone. Particles also cause respiratory problems. There is increasing evidence that tiny particles are more dangerous than large ones. It is estimated that every year in Europe there are 350,000 premature deaths attributable to air pollution from particles.

Data on ambient air pollution by nitrogen dioxide for the period 2002–2012 show that average and average maximum concentrations at locations with high traffic intensity considerably exceeded the limit value for the protection of human health (40 µg/m³). Since 2004, air pollution by nitrogen dioxide



kazalci.arso.gov.si

PR07 Exceedances of air quality objectives due to traffic

ZR08 Air pollution by PM₁₀ and PM_{2.5}

PR08 Emissions of air pollutants from transport

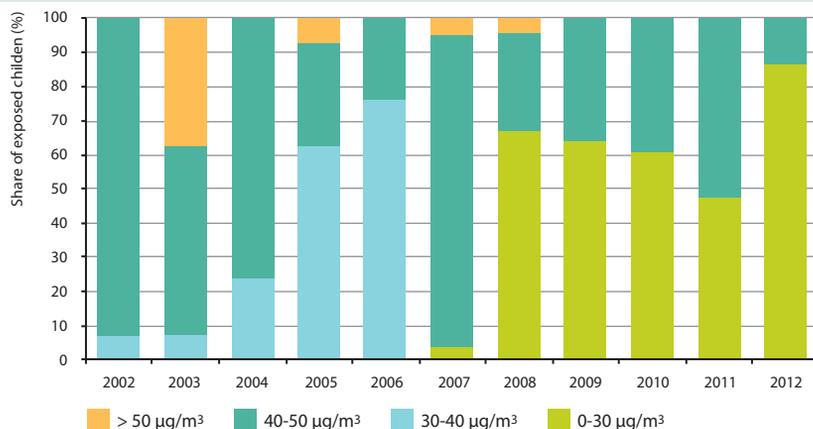
PR17 Quality of transport fuels

EXPOSURE OF RESIDENTS AND CHILDREN TO POLLUTED AIR DUE TO PM₁₀ PARTICULATE MATTER

Air pollution by PM₁₀ presents a serious threat to children's health.



Exposure of children (0–15 years of age) to higher PM₁₀ concentrations in the ambient air (the PM₁₀ limit value is 20 µg/m³ for human health protection and 40 µg/m³ for the environment protection).



Source: Database on hospital treatments, National Institute of Public Health, 2013; Automatic Air Quality Measurement Database (DMKZ), Slovenian Environment Agency, 2013

Long-term exposure to PM₁₀ increases the risk of mortality, lung disease, and cardiovascular disease. The effects of exposure are determined by the PM₁₀ concentration and exposure duration. The risk of mortality begins as early as in one's youth. Long-term exposure to particles increases mortality by 0.5% for each increase in the average annual concentration of particles by 10 µg/m³. Some studies have also reported arteriosclerosis and decreased lung functioning in adolescents due to pollution from particles.

Data show that children in Slovenia (0-15 years of age) are on average exposed to PM₁₀ concentrations of 30–40 µg/m³, which is above the level recommended by the World Health Organization (20 µg/m³). Data on hospital admissions show that, in the period 2002–2010, the majority of children (the 0-15 age group) admitted to hospital due to respiratory disease were from Celje and Murska Sobota. The number of hospital admissions due to respiratory diseases of children between 0 and 15 years of age accounts for a good 15% of all

hospital admissions of children. This number would be even higher if these patients did not already receive treatment on a regular basis from their physicians.

According to the calculations made by the World Health Organisation, the number of children admitted to hospital for respiratory disease would decrease by approximately 200 if the average annual PM₁₀ concentration were 20 µg/m³ (or less). A decrease in the PM₁₀ concentration by 10 µg/m³ would reduce the time children between 5 and 14 years of age suffer from diseases of the lower respiratory tract (wheezing, chest pain, shortness of breath, coughing) by 1.9 days/year/child. That is why the World Health Organisation proposes that limit values of 10 µg/m³ for PM_{2.5} and 20 µg/m³ for PM₁₀ be set as safe or acceptable limit values for protecting human health.



kazalci.arslo.gov.si

ZD03 Exposure of residents and children to polluted air due to PM₁₀ particulate matter

- ZD02 Asthma and allergic diseases in children
- ZR08 Air pollution by PM₁₀ and PM_{2.5}
- PR07 Exceedances of air quality objectives due to traffic
- PR12 Average age of the vehicle fleet
- PR17 Quality of transport fuels

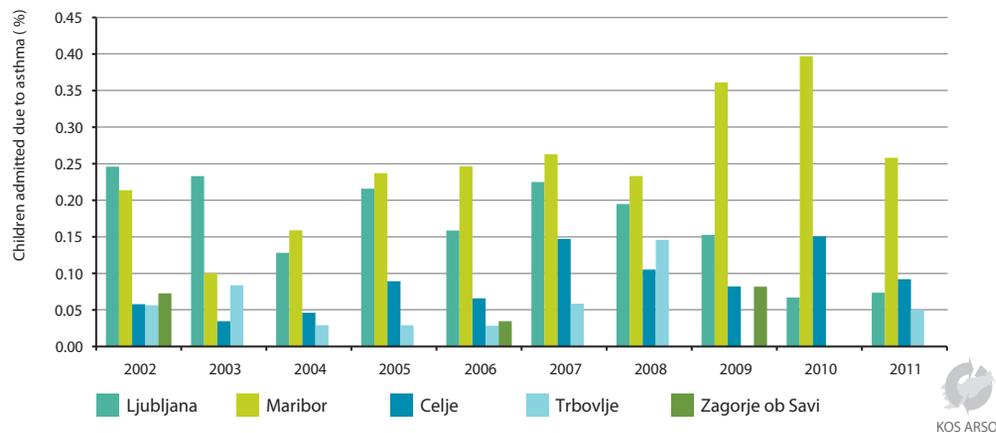


ASTHMA AND ALLERGIC DISEASES IN CHILDREN

Environmental pollution from transport significantly contributes to the development of asthma and allergic diseases in children.



Proportion of hospital admissions of children (0–14 years) due to asthma



Source: Database on hospital treatments, ISAAC, National Institute of Public Health, 2013

Asthma is a significant childhood disease and the main cause of hospitalisation of children under 15 years of age. Asthma is a chronic inflammation of the respiratory tract due to allergy, viral infection of the respiratory system, or airborne irritants (dampness, mould, mites, household pets). It is manifested in difficult breathing, wheezing in the lungs, and coughing. The development of asthma and allergic diseases in children involves a complex interaction between the environment, genetic factors, and the immune system. Among environmental factors, environmental pollution caused by

transport probably poses the most serious risk to the health of children.

According to the data of the World Health Organisation, allergic diseases affect around 20% of the world's population. In recent years, the number of children with asthma in Europe has increased by approximately 0.5% annually. In Austria, it has increased by approximately 1%, which is comparable to Slovenia, since Austria's geographic and cultural characteristics are similar to those of Slovenia. According to 2002 data, around 15% of children in Slovenia have asthma, while there

is no data on children with other allergic diseases. Since the number of asthmatic patients is not systematically monitored, only data on the number of hospital admissions due to asthma and other respiratory diseases are available. Data show that the majority of hospital admissions have been in Ljubljana and Maribor. The number of admissions is low, which shows that children with asthma are well taken care of on an outpatient basis – they receive adequate therapy. This prevents the aggravation of asthma leading to hospitalisation.

It has been proved that living close to major roads contributes to the higher frequency of asthma in children. Approximately 12% of the residents of Ljubljana live about 75 m from a busy road, of which approximately 8% of children aged between 0 to 17 years of age suffer from asthma. It is generally agreed that children living around 75m from a busy road face up to a 50% greater risk of developing asthma than children living more than 150m from a road.



kazalci.arso.gov.si

ZD02 Asthma and allergic diseases in children

- ZR08 Air pollution by PM₁₀ and PM_{2.5}
- PR07 Exceedances of air quality objectives due to traffic
- PR12 Average age of the vehicle fleet
- PR17 Quality of transport fuels

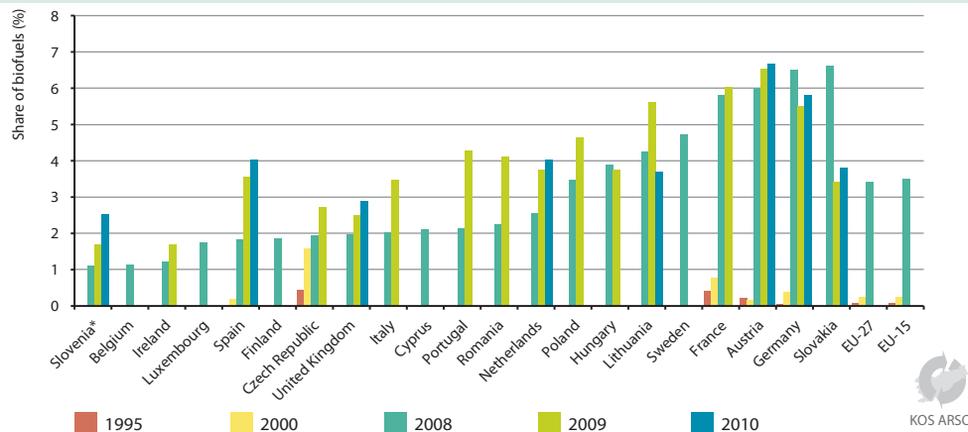


USE OF ALTERNATIVE FUELS IN TRANSPORT

Expectations regarding biodiesel production in Slovenia failed to materialise.



Share of biofuel in total transport fuel consumption in European countries



Source: Reports by EU Member States on the use of biofuels in accordance with the Directive 2003/30/EC, European Commission, 2011; CSI 037 – Use of cleaner and alternative fuels, European Environment Agency, 2011

In view of the high prices of motor fuels and increasing energy dependence, the EU places high hopes on biofuels, together with other renewable sources. By 2020 EU's fuel consumption should reach a 10% share of renewables in the transport sector. Higher use of alternative fuel sources should also contribute to better air quality. The term biofuel means a liquid or gaseous fuel for motor vehicle propulsion obtained from biomass.

The planned shares of biofuel consumption in Slovenia have not reached the set reference values because Slovenia does not have any refineries for the production of motor gasoline and does not produce enough biofuels that would be attractive to the market and suitable for mixing with motor fuels. Biofuels that were

blended experimentally with diesel fuels were partly imported from third countries or obtained from other EU Member States and partly produced in Slovenian plants producing vegetable oil.

In 2010, almost three times more land in Slovenia was planted with rapeseed than in 2005, resulting in 15,518 tonnes of rapeseed and enabling the production of as many as 5,000 tonnes of biodiesel. The production of biodiesel in recent years has been disproportionately small given production capacities, for which producers blame the market/price situation in the area of mineral/fossil fuels and biofuels. Biodiesel blended with diesel and used for motor vehicle propulsion in road transport was experimentally used in Slovenia as early as in 2004. Its share

in fossil diesel, as well as the share of other fuels (e.g. bioethanol), have gradually increased. Although the share of biofuels on the market is increasing on average, it still does not reach the set quotas. In 2010, most of the biofuel was sold as a blend of biodiesel and diesel with a biodiesel content of up to 5%. In 2012, the biodiesel content in diesel fuel was 3.66% m/m, while the bioethanol content in motor gasoline was 1.39% m/m.

At the end of 2009, the experimental production of biodiesel began in Slovenia in a new plant with an annual production capacity of around 50,000 tonnes. This encourages the cultivation of crops for the production of biodiesel. It was planned that the aforementioned plant would produce 25,000 tonnes of biodiesel annually in the short term. The raw material for the production would continue to be imported oil, waste edible oil, and fats of animal origin, and, to a lesser extent, home-produced seeds (particularly rapeseed). However, as already mentioned, the expectations of biodiesel production in Slovenia have failed to materialise.

The consumption of biofuels is promoted in the following ways: biofuels are exempt from excise duty and the suppliers of liquid motor fuels must achieve the objectives for the use of biofuels and other renewable fuels for motor vehicle propulsion by 2015.



kazalci.arso.gov.si

PR13 Use of alternative fuels in transport

EN20 Energy prices

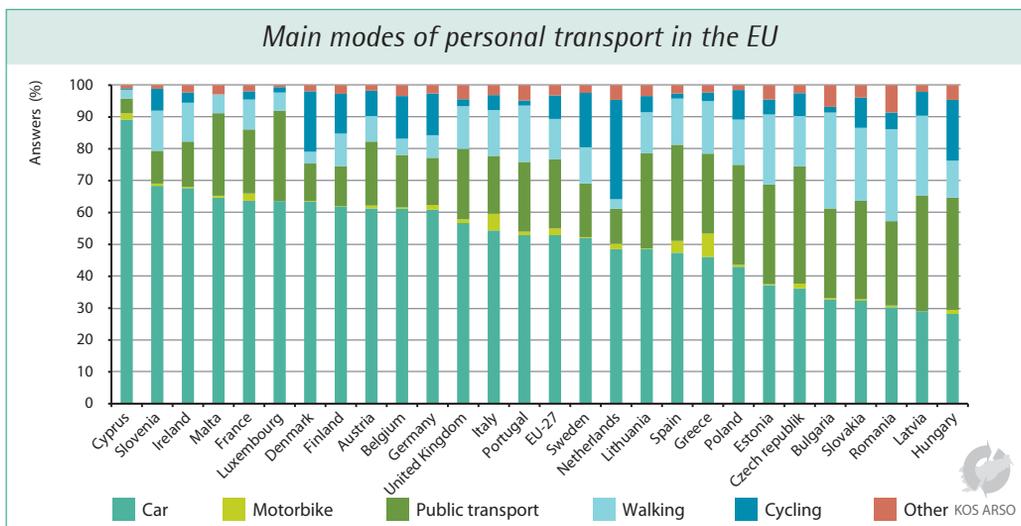
EN18 Renewable energy sources

EN24 Share of renewables in final energy consumption



PUBLIC AWARENESS ABOUT THE EFFECTS OF TRANSPORT ON THE ENVIRONMENT

Public awareness of the importance of clean air is increasing, yet this is not reflected in a change in our mobility habits.



Source: Flash Eurobarometer "The Future of Transport" (No 312), European Commission, 2010

The results of the survey conducted for the European Commission in 2010 and 2011 show that EU citizens living in 27 Member States and the citizens of Slovenia are aware of the consequences of the increasing volume of transport and would be willing to take measures to help solve environmental problems. The fact is that 68% of Slovenia's citizens use a car on a daily basis, while only 10% use public transport. In this respect, Slovenia ranks at the very bottom of the EU-27 countries.

According to the data from the European Environment Agency, people's dissatisfaction with transport is considerable. This is

most often due to an excessive amount of traffic and excessive air pollution, and, to a lesser extent, to damage to the landscape and noise. EU citizens would like to see greater use of cleaner modes of road transport (electric and hybrid vehicles, biofuel consumption) and other forms of non-road transport, such as cycling and walking. There is little public support for price policy (higher fuel prices). However, people's awareness of the environmental consequences of transport does not automatically lead to a change in mobility behaviour. A great deal can be done in this respect by providing information and raising people's awareness.

Slovenia advocates change with regard to mobility behaviour through an annual awareness-raising campaign called "In town, without my car!" The campaign has expanded into the European Mobility Week campaign, aimed at introducing and promoting sustainable transport measures and inviting citizens to try out alternatives to car use. With regard to raising awareness of more sustainable modes of transport, we should also mention the Rules on consumer information on fuel economy and CO₂ emissions in respect of new passenger cars, which entered into force at the beginning of 2004 and, inter alia, provide for the drawing up of a manual on fuel economy and CO₂ emissions.



kazalci.arso.gov.si

PR06 Public awareness about the effects of transport on the environment

PR13 Use of alternative fuels in transport

EN18 Renewable energy sources

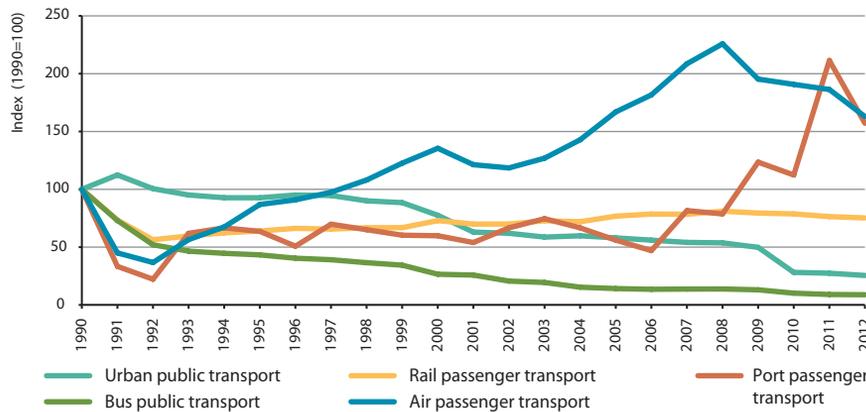
EN27 Energy efficiency and energy consumption in the transport sector

PASSENGER TRANSPORT DEMAND

Slovenia has an extremely high share of private cars in passenger transport, which is the most unsustainable mode of transport. The number of passengers using public transport is decreasing.



Passenger transport volume and modal split



Source: Passenger transport, Urban passenger transport and rail passenger transport, Statistical Office of the Republic of Slovenia, 2013

Monitoring passenger transport demand enables an understanding of the functioning of the transport system as it shows how much and how passengers travel. The selection of a mode of transport is important in terms of differences in the environmental, economic, and social efficiency of individual modes of transport and different effects of their use. The fact is that the use of private cars significantly affects the quality of air in urban areas, where most people live.

In Slovenia, as well as in other countries, a rapid increase in the use of private cars is one of the major environmental

challenges. It has been assessed that the volume of private car transport on Slovenian state roads increased by almost 26% compared to 2000, while other land modes of transport are lagging behind in this respect. Public road transport, including the public regular interurban bus service provided by Slovenian transport operators, causes the most concern. In 2012, the use of this transport mode decreased by 91% compared to 1990 or by 67% compared to 2000. After a significant decrease in the 1990s, the use of domestic rail passenger transport slowly increased in the past decade, although it has

been decreasing again in the past two years. In 2012, the use of this transport mode decreased by 25% compared to 1990. The number of passengers using air transport is increasing as a result of Slovenia joining the EU and the Schengen area and the rise of low-cost air carriers. After 2008, the trend reversed, most probably due to economic crisis. A similar trend is observed in port traffic.

A number of indicators (the development of motorisation, investment in infrastructure, different settlement patterns, non-competitive public passenger transport) show a distinct upward trend in the use of private car transport in Slovenia. Despite this, the situation in urban areas, which are areas with high traffic intensity and are most affected by traffic, compels decision-makers at the national and local levels to take different action. That is why, in the following years, the first steps towards sustainable urban mobility plans are expected to be taken at the local level.



kazalci.arso.gov.si

PR01 Passenger transport demand

PR03 Transport infrastructure investments

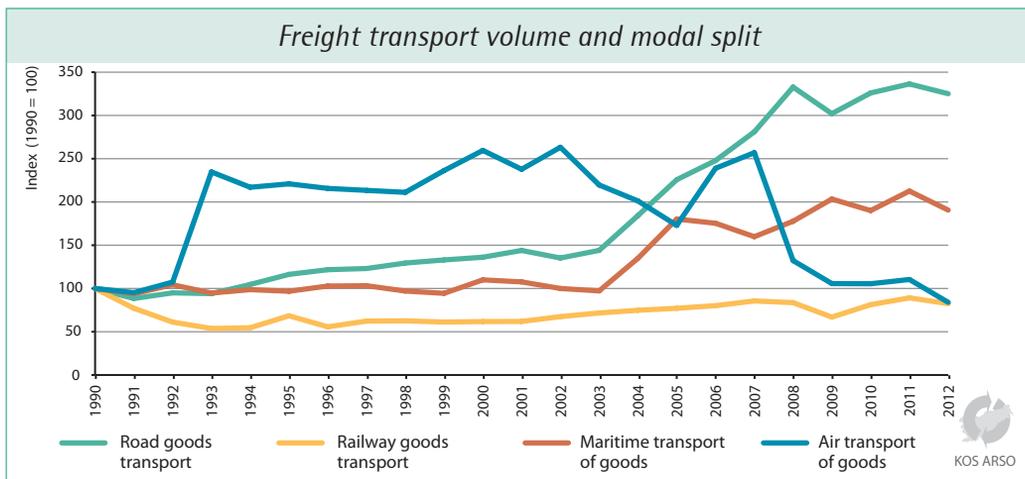
PR06 Public awareness about the effects of transport on the environment

AIR



FREIGHT TRANSPORT DEMAND

In future, Slovenia could expect an increase in the volume of road freight transport. Particularly worrisome is freight transit transport by road through Slovenia.



Source: Road goods transport, Railway goods transport, Maritime transport of goods, Air transport of goods, Statistical Office of the Republic of Slovenia, 2013

From the environmental point of view, it is important to monitor freight transport demand in terms of differences in the environmental efficiency of freight transport volume and mode. Differences enable the minimisation of the environmental consequences of freight transport by using transport policy measures that change the proportion of different freight transport modes used.

The volume of road freight transport in Slovenia has been increasing the most rapidly, assuming a growing quantity of freight, particularly since Slovenia joined the EU. In the period 2004–2012, its volume increased by 76%, while the volume of rail freight transport increased by only 10%. Before joining the EU, Slovenia had seen a more moderate increase in the volume of road and

rail transport, with a 6% annual increase in road transport and a 3% annual increase in rail transport since 1993 up to 2012. Particularly worrisome is also road freight transit transport through Slovenia, which, however, has not been subject to statistical monitoring since Slovenia joined the Schengen area and can be only indirectly assessed. From 2000 to 2004, the volume of road freight transit transport increased by approximately 10% annually, with this increase being considerably more rapid since Slovenia joined the EU – in the period from 2004 to 2007, the number of freight transport vehicles crossing the border with Hungary increased by as much as 112%. The estimation of the volume of transport by truck has confirmed that the volume of road freight transport in Slovenia has increased significantly in recent years. It is estimated

that, from 2000 to 2010, the volume of transport by light, medium, and heavy-duty vehicles and tractor-trailer trucks increased by 97%. In this period, the volume of transport by light and medium-duty vehicles increased by 68%, while the volume of transport by heavy-duty vehicles and tractor-trailer trucks increased by 148%.

In the period 1990–2012, the volume of port traffic increased for almost 100%, although in recent years the quantities of transported goods have varied considerably, most probably due to global economic crisis. Air freight transport is visibly decreasing – in period 2007–2012 up to 70%.

Considering the state of transport policy and the (non-)competitiveness of railways in Slovenia, this unfavourable trend is expected to continue, resulting in an increase in the volume of road freight transport and a decline in the volume of rail freight transport. In addition, the production of and trade in goods of considerable value, mainly transported by road, are increasing, while the production of and trade in bulk products, traditionally transported by rail, are decreasing. Road freight transport further increased after Slovenia joined the EU and administrative barriers at border crossings were removed. Moreover, the harmonisation of national railway systems, which will facilitate rail transport across national borders, is still underway.



kazalci.arso.gov.si

PRO2 Freight transport demand

EN27 Energy efficiency and energy consumption in the transport sector

PS03 Greenhouse gas emissions

ZR15 Emissions of particulate matter



TRANSPORT FINAL ENERGY CONSUMPTION

Road transport is the most energy-consuming mode of transport.



Energy consumption by modes of transport



Source: Energy use, Statistical Office of the Republic of Slovenia, recalculations "Jožef Stefan" Institute, 2013

Energy consumption in transport is closely linked to the volume of transport, which is correlated with economic growth. The negative impacts of energy consumption in transport can be decreased through a reduction in the use of fossil fuels and transport demand, increased energy efficiency of the means of transport, and an increased proportion of energy generation via alternative or more sustainable energy sources (particularly biofuels), and increased use of public transport, cycling, and other sustainable modes. Accordingly, the quality of air will improve.

In 2012, final energy consumption was higher by 2% compared to 2011 and lower by 4.7% compared to 2008, when the highest value was reached in the monitored period. The transport sector is the main energy consumer, followed by manufacturing industry sectors, the construction industry, and households, while energy consumption is lower for other sectors. Lower energy consumption in 2012 compared to 2008 is mainly due to the economic crisis.

In 2012, road transport energy consumption accounted for 97% of total consumption (rail and air transport accounted

for the rest). In 2012, it increased by 2% compared to 2011 and by 61% compared to 2000. However, compared to 2008, when the maximum value in the monitored period was reached, it decreased by 4%. In fuel consumption dominated diesel, followed by petrol.

Increased transport demand and an increased volume of road and air transport in combination with heavier and stronger private cars and trucks have, for now, offset technological improvements in the energy efficiency of engines, which have been smaller than planned. That is why in 2008 the EU set new objectives to reduce the average CO₂ emissions from the new car fleet to 130 g CO₂/km by 2015, with a further reduction of 10 g CO₂/km to be delivered by other technological improvements, such as better tyres, and by increased use of biofuels. However, the question remains as to when these technological improvements will overtake the increase in the volume of road transport. In Slovenia, the implementation of measures that would change behavioural patterns in transport is extremely slow.



kazalci.arso.gov.si

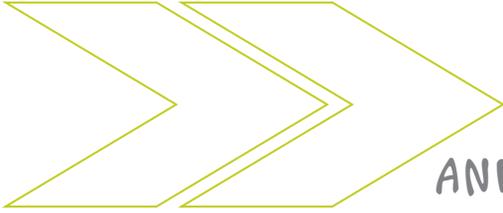
PR04 Transport final energy consumption

PR13 Use of alternative fuels in transport

PR16 Road transport fuel prices

EN27 Energy efficiency and energy consumption in the transport sector





WHAT DO WE KNOW ABOUT CLIMATE CHANGE AND WHAT IS BEING DONE TO REDUCE ITS IMPACT?

Our economy greatly relies on the use of fossil fuels. This results in higher emissions of carbon dioxide and other greenhouse gases. Global warming is a consequence.

The average rise in temperature in Slovenia has been faster than the global average, and what is even more a cause for concern are the changes in precipitation in individual seasons. The number of hot days is growing, the precipitation regime is changing, and we are facing catastrophic floods, droughts and increasingly intense heat waves. Although the lengthening of the annual growing season increases crop quantity and introduces the possibility of growing new plant species, the heat stress also causes harm to certain plants. The changing climate also boosts the spread of weeds (including invasive ones), harmful insects and plant diseases. Another piece of evidence that it is climate change that we are witnessing is the change in the Triglav glacier, which may completely disappear in the next few years. Climate change also indirectly affects human health. The data in Slovenia show an increase in the population's exposure to heat waves and floods and the prevalence of Lyme disease.

Most of the climate changes observed result from human activity. In Slovenia, the use of fossil fuels in the energy sector, households, industry and transport contributes more than three quarters of all greenhouse gas emissions. Therefore, all activities related to mitigation to climate change are more than necessary.

The number of storms with strong wind, heavy showers and hail in Slovenia is growing annually. There is also a growing occurrence of very intense local precipitation that lasts for a few hours or a day or two and can cause landslides and local flooding. We experience, almost annually, strong winds that uncover roofs and damage trees. Catastrophic droughts and floods are increasingly prevalent, sometimes affecting the country for several consecutive years. Excessive humidity and drought can occur within the same year. Lately we faced also with sleet. Therefore, in addition to the transition to a green tax reform, which is essential for mitigating to climate strategy, raising awareness and measures for Our lives are more and more dependent on the

change, it is also important to adopt an adaptation adaptation on national, regional and local level. ability to adapt to climate change.



SOCIETY

ECONOMY

DRIVING FORCES

- ☀️ Final energy consumption by sector
- ☀️ Renewable energy sources
- 🌸 Passenger transport demand
- 🌸 Freight transport demand
- 🌸 Transport final energy consumption

RESPONSES

- ☀️ Energy prices
- ☀️ Energy taxes
- 🌿 Subsidies in the energy sector
- 🌸 Use of alternative fuels in transport
- ☀️ Public awareness about the effects of transport on the environment

PRESSURES

- ☀️ Greenhouse gas emissions
- 🌿 Emissions of ozone precursors

IMPACTS

- 🌸 Lyme borreliosis
- 🌸 Asthma and allergic diseases in children
- ☀️ Proportion of resident population living in a flood plain

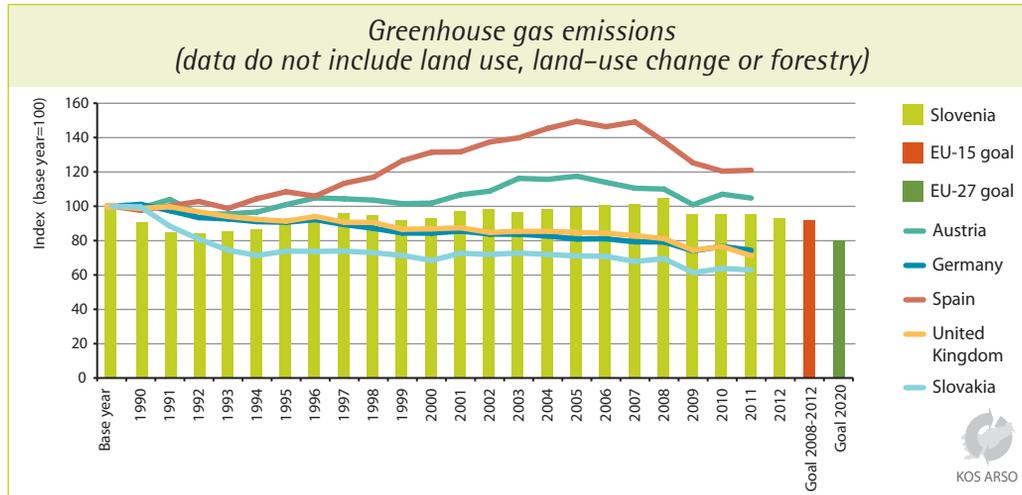
STATE

- 🌸 Precipitation and temperature
- 🌸 Extreme weather events
- ☀️ Annual growing season
- 🌸 Changes in glacier extent
- ☀️ Sea level
- 🌸 River balance
- 🌸 Groundwater recharge

ENVIRONMENT

GREENHOUSE GAS EMISSIONS

The reduction of greenhouse gas emissions is the key element of the transition to a low-carbon economy.



Sources: GHG Data Viewer, European Environment Agency, 2013; National database on GHG emissions, Slovenian Environment Agency, 2013

sions in 2008–2012 should not exceed 18,726.719 kilotonnes of CO₂eq. Slovenia aims to achieve the Kyoto target by introducing sinks (amounting to 1,320 kilotonnes of CO₂ per year).

For the purposes of reducing greenhouse gas emissions, Slovenia has adopted several measures for the improvement of energy efficiency in the energy and transport sectors. It also advocates the increased use of energy generated from renewable energy sources. The improved energy efficiency in all economic sectors is enabled by newly developed technologies for industrial processes, heating, car engines and electrical equipment. However, the area of energy efficiency will require further improvements, especially with regard to energy saving, energy generation processes and ensuring sustainable mobility.



kazalci.arso.gov.si

PS03 Greenhouse gas emissions

EN01 Energy-related greenhouse gas emissions

PR09 Transport emissions of greenhouse gases

KM14 Emissions of methane and nitrous oxide from agriculture

GZ04 Forest area

GZ05 Deforestation

Greenhouse gases include carbon dioxide, methane, nitrous oxide, F-gases such as hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride, and chlorofluorocarbons, hydrochlorofluorocarbons and ozone.

While greenhouse gas emissions in 2011 decreased in most European countries (compared to 2010), by 3.3% in the EU-27 and by 4.2% in the EU-15, they grew by 0.3% in Slovenia. The main reason for the reduced emissions in the EU was reduced fuel consumption in the generation of electricity and heat, mostly because of the modernisation of devices

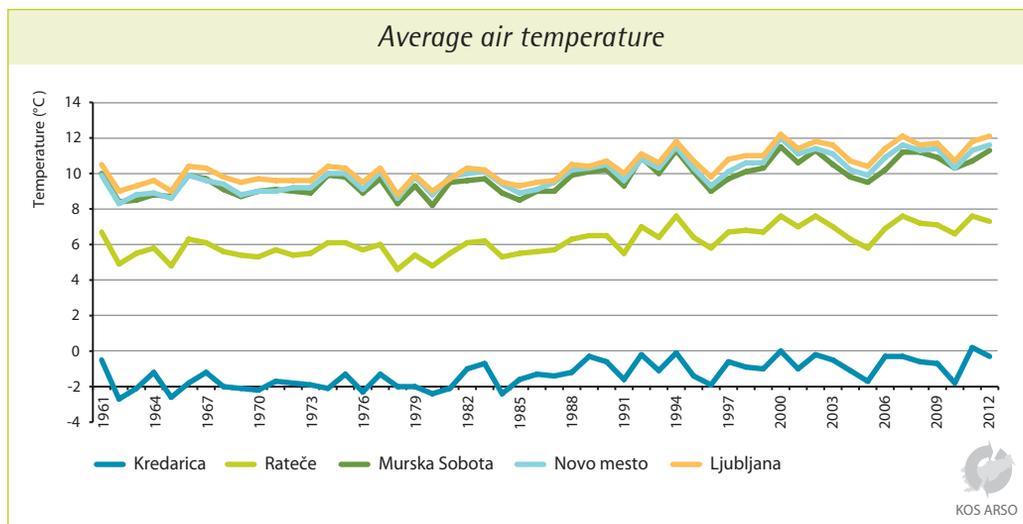
and the milder winter. The latter also resulted in the reduced emissions in commercial sectors and households.

In 2012, the total emissions of greenhouse gases in Slovenia reached 18,911Gg of CO₂ equivalent, which is 7.1% lower than the value in the base year of 1986 (20,354.042Gg CO₂eq) and 2.8% lower than total GHG emissions in 2011. In comparison to 2011, only increase of 1.3% should be mentioned in 2012 in the transport sector. In accordance with the obligation of the Kyoto Protocol that requires an 8% reduction in emissions (in comparison to 1986), the average GHG emis-



PRECIPITATION AND TEMPERATURE

The average increase in temperature in Slovenia is faster than the global average and even more a cause for concern is the changes in precipitation in regions and individual seasons.



Source: Meteorological database, Slovenian Environment Agency, 2013

Temperature observations show that the temperature growth in Slovenia is faster than the global average. The majority of unusually warm years in the 1961–2012 period occurred in the last three decades. The fastest growth trend was recorded in the last two decades of the previous century, while the growth has slowed down slightly in this century. In the 1961–2011 period, the average temperature increased by about 1.7°C, slightly more in the east than in the west of the country. The temperature rise was noticeable in all seasons, but most prominently in the summer and least in the autumn.

While mild winters prevailed in the 1987/88–2001/02 period, the number of normally cold winters has again increased in the last few years. Slovenia has had some very hot summers since 1992: especially hot was that of 2003, and the summer of 2012 was also exceptional, being the second warmest in the major part of Slovenia.

Apart from temperatures, another climate change-related concern is the changes in precipitation between regions and individual seasons. The regions differ significantly in terms of precipitation quantity: the average annual precipitation in

some areas of the Julian Alps reaches 3,500mm and the level decreases rapidly towards the east, with the annual average in the eastern extreme of Prekmurje below 800mm. At the national level, the annual quantity of precipitation declined by about 160mm in the period 1961–2011. The decline was greater in western and southern Slovenia. Approximately half of the decline occurred in the spring, while in other seasons the change was much smaller. Unlike temperature trends, precipitation trends are much more diverse – the variability is greater from region to region. More worrying than the variability in annual precipitation is the deviations from the average in shorter time intervals, i.e. periods of a few days, months or seasons. The consequences of major deviations from normal values can present as droughts, floods and landslides, for example.

It is very likely that our vulnerability to climate change is greatest in the activities related to the consequences of changes in precipitation. It is further intensified by insufficient financial investments in water management and the lack of a national strategy for adaptation to climate change.



kazalci.arso.gov.si

PS04 Precipitation and temperature

PS07 Extreme weather events

PS06 Annual growing season length

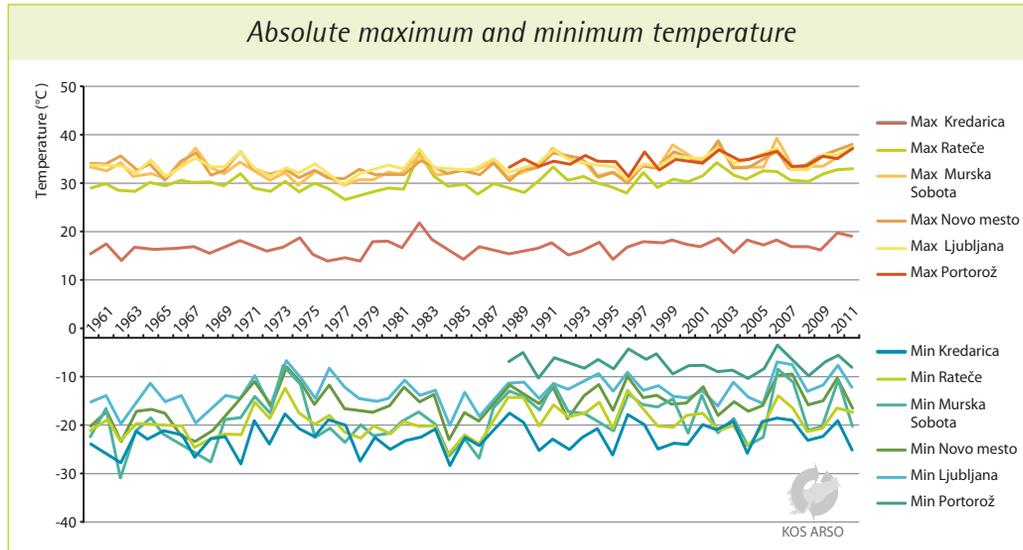
PS03 Greenhouse gas emissions





EXTREME WEATHER EVENTS

Extreme weather events (floods, drought, storms) indicate the need for a national strategy for adaptation to climate change.



Source: Meteorological database, Slovenian Environment Agency, 2013

The impact of natural variability is considerably higher than the multi-year trend, which means that the differences are greater from year to year, while the trend is less apparent, at least at first glance. According to the projected development of the global climate, average summers in the second half of this century will be as hot as the summer of 2003.

Precipitation is even more variable than temperature. The precipitation regime is changing, which also has an impact on the prevalence of days with precipitation above the selected thresholds. Regional differences may result from a differing precipitation regime. Besides the change at the annual scale, the changes in frequency and intensity by different seasons are even more marked.

The number of storms with strong wind, heavy showers and hail in Slovenia is growing annually. There is also a growing occurrence of very intense local precipitation that lasts for a few hours or a day or two and can cause landslides and local flooding. We experience, almost annually, strong winds that uncover roofs and damage trees. Catastrophic droughts and floods are increasingly prevalent, sometimes affecting the country for several consecutive years. Excessive humidity and drought can occur within the same year.



PS07 Extreme weather events

- PS04 Precipitation and temperature
- PS06 Annual growing season length
- PS03 Greenhouse gas emissions



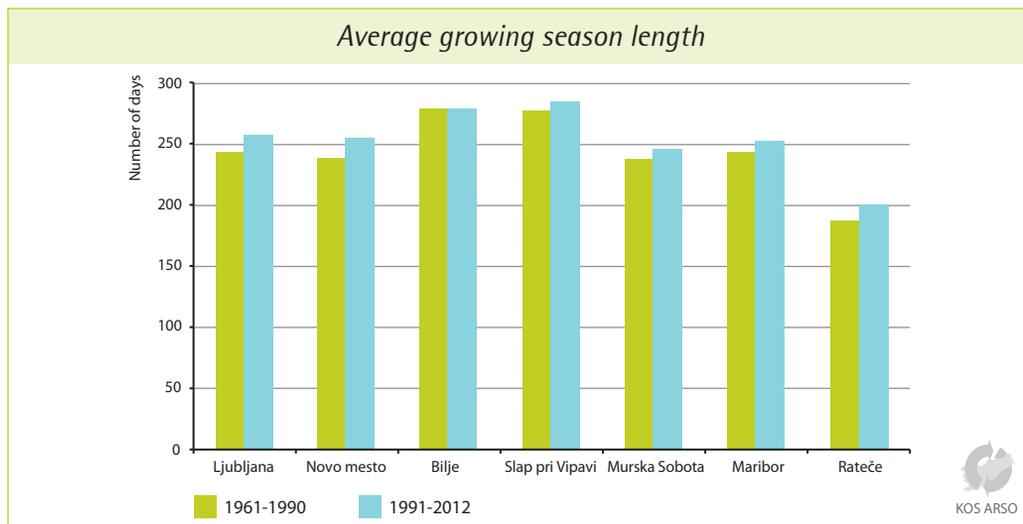
In the last decade we have noticed a growing number of dangerous weather phenomena and changes in climate whose consequences are often disastrous. The damage caused by the increasingly prevalent extreme phenomena is further aggravated by the modern way of life and inconsiderate interventions with the environment. The number of recorded deviations from the usual climate conditions in the comparative period of 1961–1990 is growing annually. Droughts and floods caused by abundant precipitation are becoming more and more frequent, heavy rain showers and storms with strong gusts of wind occur annually (though

there are differences year to year), and heat waves are becoming more frequent and marked.

The 1961–2012 period shows a trend of increasing absolute maximum and absolute minimum temperatures, which indicates the warming of the climate. The increasing trend in absolute annual minimum temperature is more prominent than that of the absolute maximum air temperature. The outstanding summers in terms of high temperatures were those of 2003 and 2012. The trend in the number of hot days is also positive, while the trend in the number of icy days shows a decline.

ANNUAL GROWING SEASON LENGTH

Extended annual growing season length requires sustainable forms of agriculture production.



Source: Meteorological database, Slovenian Environment Agency, 2013

The average rise in air temperature and the increased frequency of days with temperature above the vegetation threshold influence the extended annual growing season length.

The findings of different European researches have shown that the annual growing season length of several agricultural crops has changed. In numerous areas of Europe, indeed in the northern hemisphere in general, a lengthening of the period from the occurrence of the last spring frost to the first autumn frost has been recorded. The analysis of the growing season of agricultural crops in the 1975–2010 period shows that the lengthening of the annual growing season in Europe is not equally distributed in geographical terms. The greatest lengthening of the growing

season (more than 0,8 days per annum) has been established along the coast of the Atlantic, in the British Isles, in Denmark, in the central part of Europe (including Slovenia), in central Italy, in central and southern Spain, and in Turkey. Although certain areas in Europe recorded a shortening of the growing season, such shortening trends were not statistically significant.

The lengthening of the annual growing season increases the crop quantity and the possibility of growing new plant species that are normally not suitable for a certain area. The introduction of new sorts of agricultural crops and plants will cause the spread of weeds (including non-indigenous species), pests and plant diseases.

The adaptation to the changed length of the growing season is carried out by gradual changes in agricultural technology, which is, however, a lengthy process because of the nature of production. The introduction of new technologies in the agricultural practice will thus require the consideration of environmental factors, environmental protection law and support information systems (agrometeorological data). The alleviation of the pressure of the growing season change (introduction of new sorts) will require the upgrade of legal and economic instruments of environment protection (biodiversity, sustainable development), the implementation of adopted international conventions (the Convention on Climate Change, Desertification and Biodiversity), strengthened supervision of the sources of threats to the environment, strengthened environmental awareness and knowledge of the environmental problem, and the promotion of sustainable forms of agriculture.



kazalci.arso.gov.si

PS06 Annual growing season length

PS04 Precipitation and temperature

NB09 Plants – invasive species

KM03 Areas of land with agri–environmental measures

KM08 Areas of land with organic farming

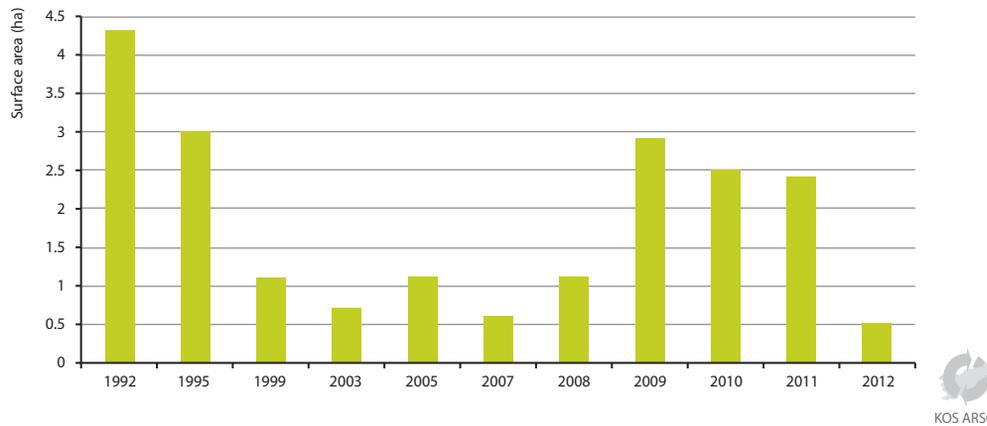


CHANGES IN GLACIER EXTENT

The Triglav glacier is gradually retreating and may disappear completely due to raising average temperature of the atmosphere.



Changes in the Triglav glacier surface area



Source: Achieves of the Anton Melik Geographical Institute of Research Centre of the Slovenian Academy of Sciences and Arts, 2012

several avalanches occurred. The growth in the area is thus the result of several metres of layers of glacial firn or compacted snow left from the past snow season. Because of the specific geographical position of the Triglav glacier, the glacial firn can turn into greenish firn ice. This is why the Triglav glacier has been nicknamed the “green snow”. The trend of the increase in the glacier area was stopped by the melting period of 2011, which removed all the surplus firn that had accumulated in the previous years. The winter of 2011/2012, which was below average in terms of snowfall, and the very hot summer of 2012 caused an intense melting of the firn from previous winters, which remained only in the lower part of the glacier at the end of the 2012 melting period.

The projection based on strong global warming is that the Triglav glacier may disappear completely in the coming years. A precise timing for this is not possible; however, as a sufficiently precise forecast of local weather changes resulting from global oscillations is impossible.

The change in the size and volume of the Triglav glacier is a good indicator of climate change. In the last decade, fast retreat has been typical of all Alpine glaciers. Slovenia has two glaciers: the Triglav glacier and the glacier below Mt Skuta. Their extreme south-eastern position in the Alps and low altitude make them particularly sensitive to climate change. The small size of Slovenian glaciers makes their relative retreat in relation to their current area and volume greater than in other Alpine glaciers.

The retreat of the Triglav glacier began to accelerate in the 1990s. The increasingly rapid thinning of the ice caused

the appearance of outcropping rocks in the centre. In 1992, the glacier split into two separate parts. The retreat and disintegration of the Triglav glacier has since continued, with the process stayed only in those years when the snow cover in late spring has been above average.

The smallest area of the glacier was measured in 2012 (0.5 ha), and before that in 2007 (0.6 ha). The area slightly increased in the 2008–2011 period (to 2.4 ha in 2011), especially as a result of two seasons that were above average in terms of the quantity of snow (2008/09 and 2009/10) and during which



kazalci.arso.gov.si

PS05 Changes in glacier extent

PS04 Precipitation and temperature

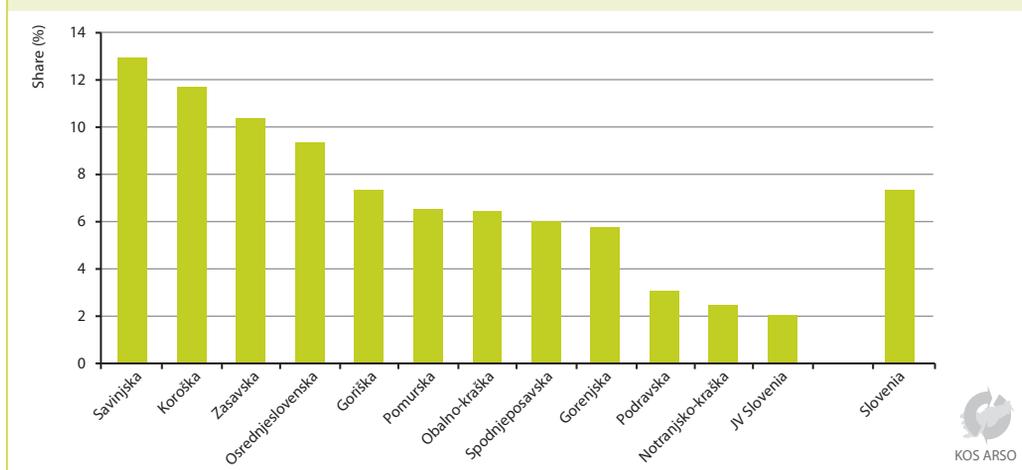


PROPORTION OF RESIDENT POPULATION LIVING IN A FLOOD PLAIN

Floods in Slovenia endanger lives and cause damage.



Proportion of people living in areas of flooding by statistical regions



Source: Indicative flood map, areas of potential flood–erosion activity of torrents, Institute for Water of the Republic of Slovenia, 2012; Central Population Register, Ministry of Interior of the Republic of Slovenia, 2012

Abundant precipitation usually causes high waters. Oscillations between low, medium and high waters are great and typical of the majority of watercourses in Slovenia. Floods occur almost every year in different parts of Slovenia, in some parts even several times a year. They are most frequent in the autumn and spring but can also occur in the summer as a result of sudden discharges of large quantities of water (i.e. storms). They can affect densely populated areas despite the measures taken. This is why timely preparation is necessary. Reduction of flood risk comprises measures for the limitation of floods and the reduction of their consequences.

About 7.3% of Slovenia's population live in flood plain areas, including the areas threatened by flood erosion caused by torrents. The biggest flood plain areas are the lowland and flatland parts of north-eastern and sub-Pannonian Slovenia, the pre-Alpine valleys, and the basins and plains by the Ledava, Mura and Ščavnica rivers. Another flood plain area is that by the Drava river, downstream from Maribor, and by the tributaries of the Drava (the Pesnica, Polskava and Dravinja). Eastern and central Dolenjska and Bela Krajina have several smaller flood plain areas by the Kolpa, Krka, Temenica and Mirna rivers and their tributaries. The Ljubljana Marsh, which

lies on the border between the Alpine and Dinaric mountain ranges, is the biggest flood-plain area. The annual floods cover about 2,300ha of the surface. The biggest shares of the population in flood plain regions are in the Savinjska (13%), Koroška (12%), Zasavska (10%) and Central Slovenian (Osrednjeslovenska) (9%) statistical regions, while the number of people is greatest in the Central Slovenian (about 51,800) and Savinjska regions (about 35,800).

River and coastal zone floods annually affect millions of Europeans and have an impact on their health. The European Environment Agency notes that the flood risk in the last fifty years has risen significantly in some parts of Europe, e.g. in parts of Germany, Great Britain, Austria and Spain.

Floods can cause the loss of human lives, migration, and environmental damage and can seriously threaten economic development. Human activities, such as inhabitation of flood-plain areas and improper use of soil contribute to the increased probability of the occurrence and harmful consequences of floods (e.g. landslides and damage to embankments).



kazalci.arso.gov.si

ZD24 Proportion of resident population living in a flood plain

PS04 Precipitation and temperature

PS07 Extreme weather events

ZD04 Number of outbreaks of waterborne diseases attributable to drinking water and bathing water

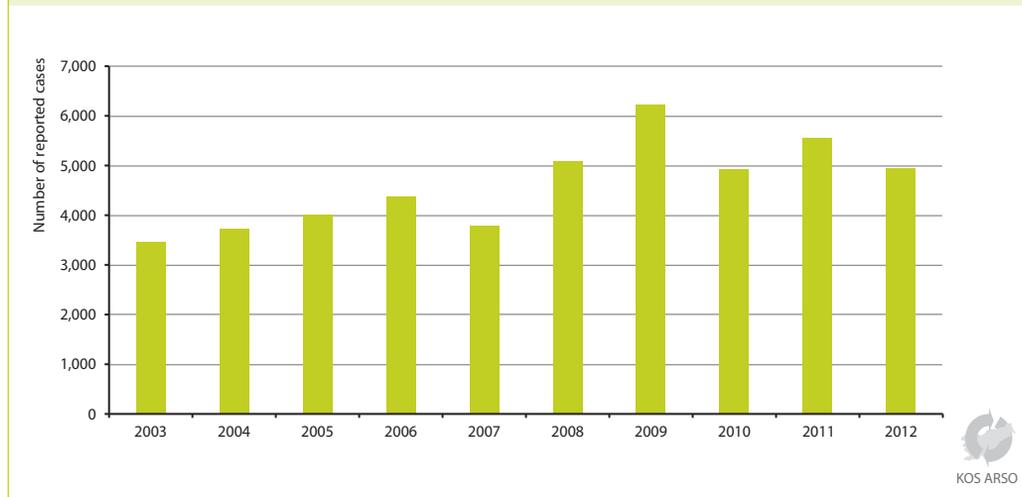


LYME BORRELIOSIS

The prevalence of Lyme disease is increasing with climate change as a contributing factor.



Reported cases of Lyme borreliosis in Slovenia



Source: Epidemiological surveillance of infectious diseases in Slovenia – Annual Reports, National Institute of Public Health, 2013

tion with agents causing Lyme borreliosis has been present in March or even in February. The effect of hot and dry summers is exactly the opposite – it reduces tick activity and therefore the probability of human infection.

The general rule is that the probability of infection is lower in highly urbanised environments than in rural areas. The scattered settlement of Slovenian population in forested landscape that enables the viability of ticks, small mammals, birds and other animals is an important factor of the incidence rate of infections. It has to be stressed that a healthy lifestyle that includes outdoor activity increases the exposure of individuals to the risk of infection with Lyme borreliosis.

After tick-borne meningitis, Lyme borreliosis is the second important disease borne by ticks. The increase in infection rate is also a result of climate change, especially the increase in the average air temperature.

In the period 2003–2012, from 3,000 to over 6,000 cases of Lyme borreliosis were annually reported in Slovenia. The number of women in the structure of reported cases is slightly higher than the number of men. The incidence is highest in the age groups of 50–64 and 5–9 in children. The incidence

reporting rate has increased since the introduction of the statutory requirement to report and is one of the highest in the EU. The growing reporting rate undoubtedly reflects an improved identification of the disease, more consistent reporting and other biotic and abiotic factors whose impact is more difficult to assess.

In the last ten years, higher average air temperatures in early spring have caused earlier tick activity and their spread to the higher altitude. This means that the possibility of infec-



kazalci.arso.gov.si

ZD25 Lyme borreliosis

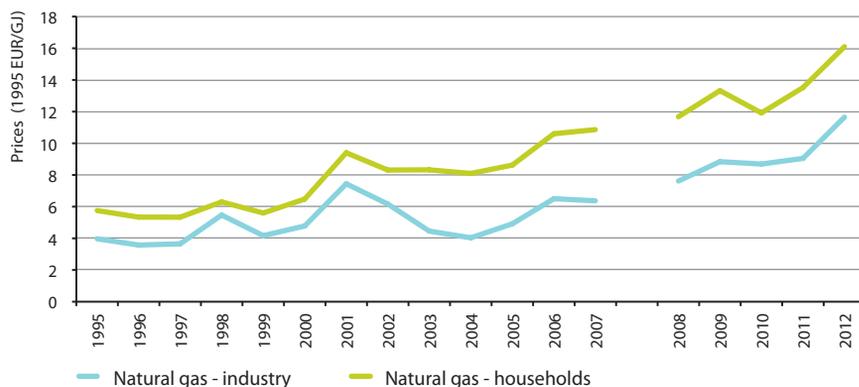
- PS04 Precipitation and temperature
- PS07 Extreme weather events
- TP01 Land cover and land use

ENERGY PRICES

The prices of fossil fuels are increasing, especially for natural gas.



Natural gas prices in industry and households



In 2007, new amendments to Directive 90/377/EC were adopted. The amendments introduced a new methodology for collecting electricity and natural gas data. Therefore, prices from January 2008 calculated and presented in accordance with the new methodology are not comparable to previously published prices.



Source: Energy prices, Statistical Office of the Republic of Slovenia, 2013; recalculations "Jožef Stefan" Institute, 2013

The absolute level of energy prices and their trends have both - a short-term and a long-term impact on total energy consumption and the change in demand for various fuels. The growth of energy prices is an incentive to reduce energy consumption in end-users, thus reducing the impact on the environment. Relative changes in prices of energy products which are interchangeable affect the choice of fuels used. Energy prices are largely determined by the market, except for the services of transmission and distribution of electricity and the retail prices of oil derivatives.

Energy product prices have increased significantly in real terms compared to 1995, mainly due to the increase in fuel prices in international markets. The pricing of electricity was significantly influenced particularly by the introduction and opening of markets and changes in taxation and in recent years also by the price trends in the wider European market.

The price of electricity in the period 1995–2000 increased most significantly for households, by almost 20%. The reasons for this were mainly the rise in tax and energy prices. On July 1st, 2007, the electricity market opened up for household

consumers, which resulted in the almost 30% increase in electricity prices for households in the 2008–2012 period.

In the period 2008–2012, natural gas prices for industrial customers increased by 53% and for households by 37.9% in real terms. The main reason for the increase in the final price of natural gas is a higher basic price of natural gas as a result of higher import prices and general conditions in international markets, which is closely linked to the markets of crude oil and oil derivatives.

Prices of oil derivatives grew in real terms in the period 1995–2007 at an average annual growth rate of over 4.5%. The reason for this increase was the higher taxation of oil derivatives (introduction of excise duty and VAT) and growth in basic fuel prices due to high oil prices on world markets. In 2009, oil derivative prices fell compared to 2008 due to lower prices on the market, but prices rose again in 2012. Slovenia is among the few EU Member States which fully regulates prices of oil derivatives. There is a prescribed methodology for basic fuel pricing, and the final price is established by the state by determining excise duty. The primary purpose of the control of oil derivative prices is consumer protection and the implementation of protective measures against the impact of global oil prices on inflation in Slovenia.



kazalci.arso.gov.si

EN20 Energy prices

- EN10 Final energy consumption by sector
- PG04 Household energy and transportation fuel consumption
- EN21 Energy taxes

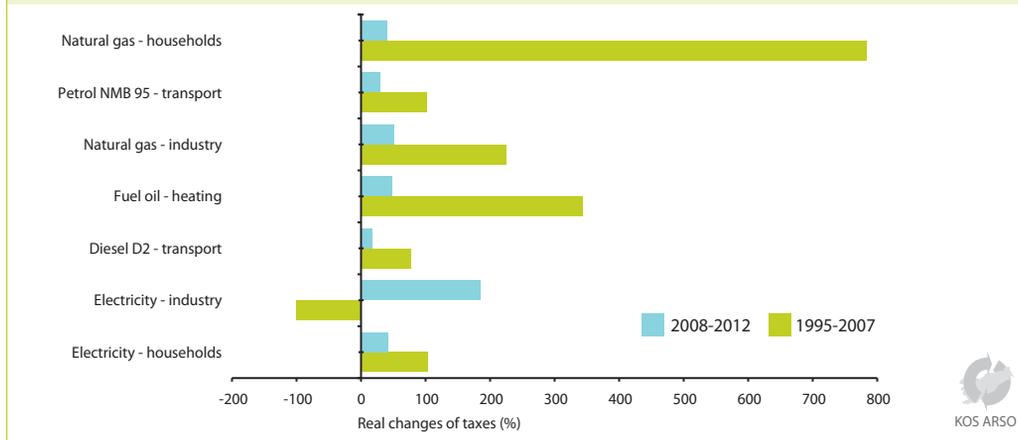




ENERGY TAXES

The green tax reform redistributes the tax burden and contributes to a greater energy efficiency.

Real changes of taxes on electricity and natural gas in industry and households, and oil derivatives



VAT, excise duty for electricity, and CO₂ and excise duty for natural gas. Thus, the share of taxes in the final price of electricity and natural gas for households amounted to 22.6% in 2012. In comparison to the EU-27, the natural gas taxes for households in Slovenia were 24% higher while the electricity tax was 37% lower.

Taxes on oil derivatives were characterised by relatively high growth in the period 1995–2000, which was a result of the introduction of excise duty and VAT. In 2012, the share of taxes in the final energy price was lower both for electricity and natural gas and for oil derivatives in comparison to 2011, mostly because of the growth of basic prices. The share of taxes in the final price of D2 diesel was 44.5%, mostly as a result of the introduction of the environmental tax on CO₂ (in fuel oil), excise duty and VAT. In comparison to the EU-27, motor fuel taxes in Slovenia were 8% lower for NMB 95 petrol and 12 % lower for D3 diesel.

In most countries, the basic objective of energy taxation is of a fiscal character, as taxes on energy constitute a considerable source of national budget funding. But, the role of taxes should not be limited to a budgetary nature. Higher energy taxation levels may provide a state incentive for reduced energy consumption by end-users which alleviates the environmental impact and may also influence price relationships, resulting in the replacement of environmentally harmful fuels with fuels that are less harmful. Such a taxation system is introduced only by the so-called green tax reform, whose objective is the redistribution of tax burdens from labour taxes to environmental taxes by reorganising the incentive policy. The essential characteristic of the green

tax reform is that the introduction of new environmental taxes does not lead to an overall tax increase but merely to the redistribution of tax burdens. Although Slovenia has a developed system of environmental taxation, the comprehensive green tax reform could considerably contribute to greater energy efficiency.

Energy taxes have grown since 1995, the only exception being electricity taxes for industrial users, where the direct tax burden has fallen because of the introduction of VAT. The biggest changes in taxation occurred in natural gas for household users, where the real taxes grew by almost 800% until 2008, and in fuel oil, where the taxes grew by slightly less than 350% until 2008.

The energy price for households is affected by energy tax,



kazalci.arso.gov.si

EN21 Energy taxes

EN20 Energy prices

EN10 Final energy consumption by sector

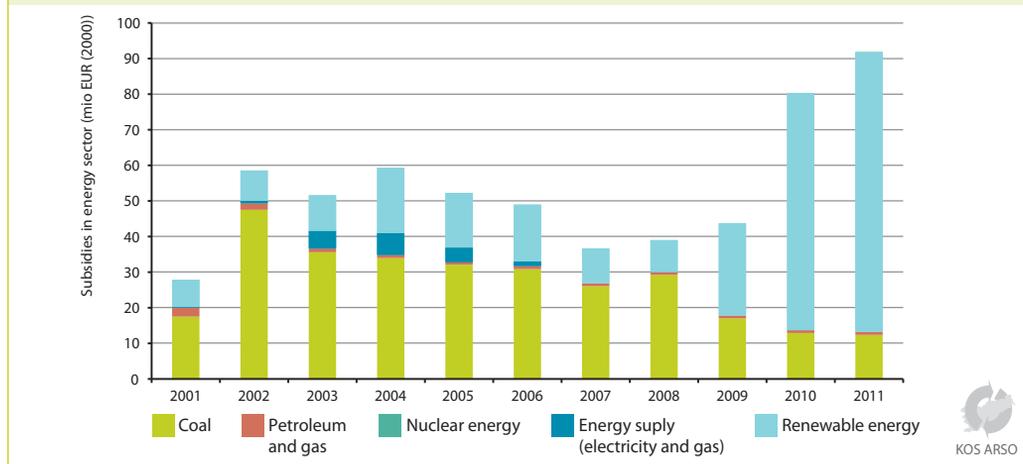
PG04 Household energy and transportation fuel consumption

SUBSIDIES IN THE ENERGY SECTOR

Subsidies support energy efficiency measures, cogeneration and renewable energy sources.



Subsidies in the energy sector (in fixed 2000 prices)



Sources: Data obtained from the Ministry of Finance of the Republic of Slovenia, 2012, Ministry of Infrastructure and Spatial Planning of the Republic of Slovenia, 2012, ELES, Ltd., Electricity Transmission System Operator, 2012 and Eco Fund; Slovenian Environmental Public Fund, 2012; recalculations "Jožef Stefan" Institute, 2012

Subsidies in the energy sector can indirectly either harm or benefit the environment. Environmentally harmful are those subsidies that lower the price of environmentally harmful energy by changing the relative energy prices to the benefit of a harmful resource that is subsidised. This may cause excessive generation of energy from a source that is harmful to the environment. Environmentally friendly are those subsidies that are intended to promote the use of sustainable energy sources, since the latter are less harmful to the environment than conventional energy sources. Subsidies can have an influence on a decrease of the generation price of such energy or the cost of its use. Subsidies

generally improve the competitiveness of an energy source in comparison to others.

The term subsidy most frequently includes direct payments to an energy producer or consumer; however, subsidies can also include other, less transparent, forms of aid or supporting mechanisms, such as exemption from the payment of taxes and discounts thereon, control of prices, restrictions in trade, restrictions in entering the market, and favourable interest rates. Another of the forms of subsidising is that the state, with its tax policy, efficiently eliminates market irregularities, since energy taxes insufficiently include external costs of energy production.

Notwithstanding the mechanism of subsidies, there are basically two forms of subsidies – “on-budget” subsidies and “off-budget” subsidies. The former represent a direct burden to the budget, while the latter are paid out through other sources and methods.

It is estimated that in 2011 in Slovenia, more than 136 million EUR in subsidies were allocated in the energy sector, 85.6% of this amount directly or indirectly earmarked for measures of efficient use of energy and renewable energy sources. The rest was earmarked for the exploitation of other sources – 13.5% for coal and 1.0% for oil and gas. The generation and exploitation of nuclear energy is not subsidised in Slovenia.

It is estimated that 32% (EUR 43.9 million) of subsidies in 2011 were on-budget, while the remaining 68% (EUR 92 million) were off-budget. Under off-budget subsidies, EUR 58 million was granted in the support scheme for the generation of electricity from renewable sources and cogeneration of heat and power, while EUR 23 million was granted to the Eco Fund, Slovenian Environmental Public Fund for measures of efficient use and renewable sources of energy. Under on-budget subsidies, EUR 31 million was granted from cohesion funds for measures of efficient use and renewable sources in public buildings, while EUR 10.8 million of budget resources was earmarked for the closure of the Trbovlje/Hrastnik mine.



kazalci.arso.gov.si

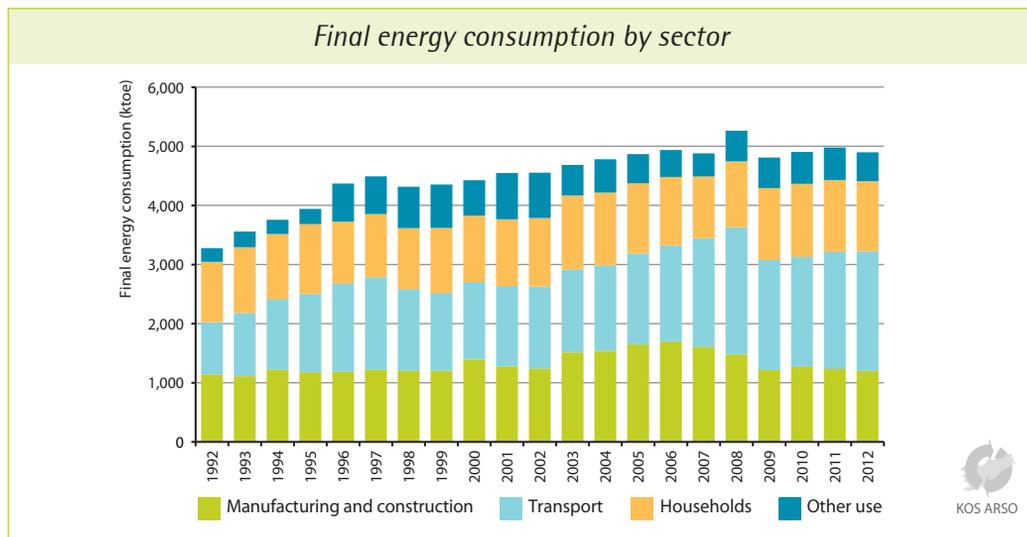
EN22 Subsidies in the energy sector

EN10 Final energy consumption by sector
PG04 Household energy and transportation fuel consumption



FINAL ENERGY CONSUMPTION BY SECTOR

The energy sector plays the key role in the transition to a low-carbon economy.



Sources: Fuel consumption, Statistical Office of the Republic of Slovenia and Statistical Office of the European Union, 2013; recalculations "Jožef Stefan" Institute, 2013

Final fossil fuel consumption has a direct impact on emissions of air pollutants and greenhouse gas emissions. The reduction of consumption is therefore important both in the context of enhancing the security of energy supply and increasing the economy's competitiveness and for reducing environmental impacts. Energy consumption contributed to more than 80% of total national greenhouse gas emissions in 2012. The major sources of emissions are electricity and heat generation (34%) followed by transport (28%); these also significantly contribute to air pollution from nitrogen oxide emissions.

In the period 2000–2012, the average annual growth rate in final energy consumption was 0.9%. After 2008, the final energy consumption decreased because of the impact of the global economic crisis and improved efficiency in general use (household and other), but has increased again since 2009. The latter can be attributed to the economic recovery, colder winters and the increase of the use in transport. By 2008, the high growth of final energy consumption in transport was the result of the increasing number of people who own motor vehicles and the increasing number of kilometres travelled per personal vehicle. The main source of increased

consumption of liquid fuels following accession to the EU is the highly marked increase in transit traffic and lower prices of fuels in comparison to neighbouring countries. Even in the period after the economic crisis, the consumption in traffic was largely influenced by price relationships of fuels between Slovenia and neighbouring countries. Thus, the final energy consumption in transport reduced in 2009 and 2010 because diesel fuel was more expensive in Slovenia than in the neighbouring countries, with the opposite applying to 2011.

A great potential to reduce energy consumption lies in the public sector, buildings and transport. Besides measures promoting efficient use of energy in the narrow sense, final energy consumption is largely influenced by measures of sustainable transport policy and general development policies, especially tax policy, policies of sustainable production and consumption and energy-efficient spatial planning.



kazalci.arso.gov.si

EN10 Final energy consumption by sector

- EN27 Energy efficiency and energy consumption in the transport sector
- EN28 Energy efficiency and energy consumption in the household sector
- EN14 Cogeneration of electricity and heat

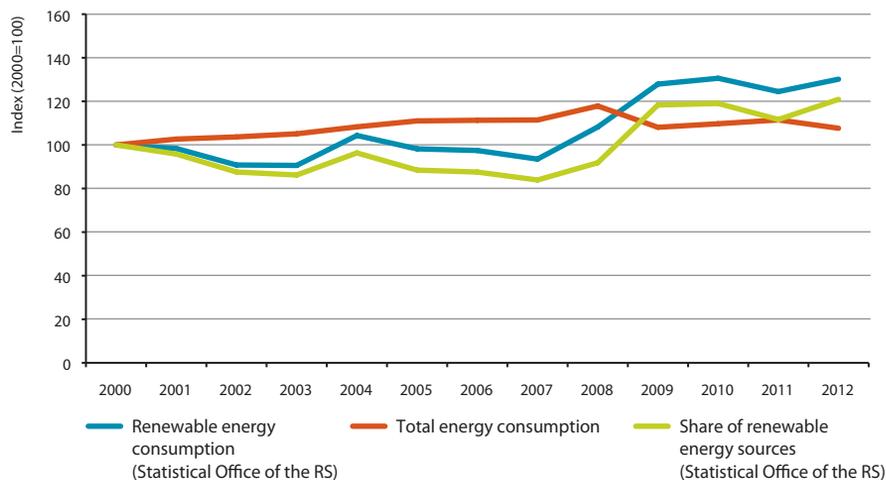


RENEWABLE ENERGY SOURCES

The use of renewable energy sources provides an opportunity for economic development.



Total energy consumption, use of renewable energy and share of renewable energy in total energy consumption (in comparison to year 2000)



Sources: Renewable energy and waste, Statistical Office of the Republic of Slovenia, 2013; recalculations "Jožef Stefan" Institute, 2013

Besides increasing energy efficiency, the use of renewable energy sources provides the principal opportunity for economic development. The area of renewable energy sources encompasses solar energy, biomass (wood, biogas and biofuels) and renewable fractions of waste, geothermal energy, hydropower and wind energy. Increased use of renewable energy sources has an impact on increasing energy efficiency and reducing greenhouse gas emissions. The problem in the use of biomass, which is a CO₂-neutral fuel, is in the emissions of particulate matter that is harmful to health.

The use of renewable sources constituted 14.9% of the total energy consumption in 2012. This means that the 2010 objective was exceeded (12%). In addition to the increased use of renewable energy sources and improved statistical monitoring, the objective was achieved by the reduction in total energy consumption as a result of the economic crisis and the implementation of energy efficiency measures. The share of biofuels in transport fuel increased in 2012 compared to the previous year and amounted to 2.7%. This is considerably less than the objective set for 2012 (6%).

More than half of the sources in the total use of renewable

energy sources are wood and other solid biomass (bone meal and fats, paper sludge and liquor used in industry), while hydropower represents approximately one-third. Other renewable sources are liquid biofuels, biogas, geothermal and solar energy.

The use of wood biomass in Slovenia is expected and efficient in view of the large forested area. In 2012, wood constituted 99% of the solid biomass use. Most solid biomass is consumed by households, followed by industry and transformations. The increased household use of biomass is the result of higher prices of fuel oil, the economic crisis and incentives to purchase wood-fired boilers. The use of wood in district heating is also increasing, with the number of small systems fuelled by biomass growing because of incentives.

Greater use of renewable energy sources is stimulated by various mechanisms, such as favourable loans and financial incentives of the Eco Fund, Slovenian Environmental Public Fund. The Ministry for Infrastructure and Spatial Planning, competent also for energy, promotes the use of wood biomass and geothermal energy. Electricity generation from renewable energy sources is stimulated by the support scheme for the generation of electricity from renewable sources. The exemption from excise duty here represents a promotion of the consumption of bio fuels.



kazalci.arso.gov.si

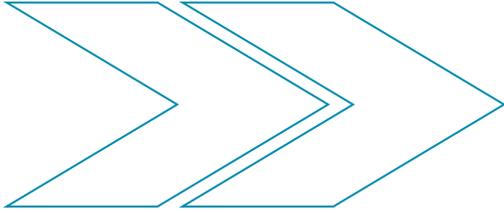
EN18 Renewable energy sources

EN24 Share of renewables in final energy consumption

EN19 Electricity production from renewable energy sources

PR13 Use of alternative fuels in transport





DO WE HAVE ENOUGH OF CLEAN WATER?

Slovenia is rich in water, but water resources are vulnerable and distributed unevenly. Slovenia utilises only a small portion of available water run-off (about 3%) for drinking-water supply, technological purposes, powering turbines in hydropower plants and other purposes. Approximately 15 billion m³ of water flows out of Slovenia through rivers every year, but long-term trends show that the quantity is falling. Owing to the headwater position and torrential character of the majority of water courses, the variability of flow rate during the year is very significant, particularly the repetitive pattern of the lack of water in the vegetative period and large quantity and floods during the other part of the year. The annual groundwater recharge also varies considerably, which indicates that groundwater storage in Slovenia's shallow aquifers is sensitive in terms of quantity.

Groundwater is an important source of drinking water in Slovenia; according to granted water rights, 93% of water for public water supply comes from springs and wells. In addition to an adequate and sustainably ensured quantity of water, the quality of water is also important for public water supply and health. Water fulfilling microbiological and chemical requirements is primarily provided through large water-supply systems, which can ensure that water is properly treated, in areas protected as water protection areas. Water protection areas cover 17% of Slovenia's land area, and nearly one third of them is agricultural land. The intensity of agricultural production in Slovenia has been moderately increasing in the last two decades. However, the excess nitrogen and the use of plant protection agents, which represent the greatest burden on the aquatic environment caused by agriculture, have been declining. The proportion of people whose waste waters are treated in municipal waste water treatment plants has increased considerably, but is still only 55%. Thus, the majority of surface water bodies indicate good chemical status and slightly more than a half also show good ecological status. The biochemical oxygen demand (BOD₅), which is the indicator of organic pollution, has decreased considerably in rivers. However, the status of water in reservoirs in North-East Slovenia has not improved. This is also the region where water bodies are most polluted with nitrates and pesticides.



SOCIETY

ECONOMY

DRIVING FORCES

- ☀ Intensification of agriculture
- ☀ Renewable energy sources

RESPONSES

- ☀ Water protection areas
- ☀ Wastewater treatment
- ☀ Water permits

PRESSURES

- ☀ Gross nitrogen balance in agriculture
- ☀ Consumption of plant protection products

IMPACTS

- ☀ Bathing water quality
- ☀ Drinking water quality

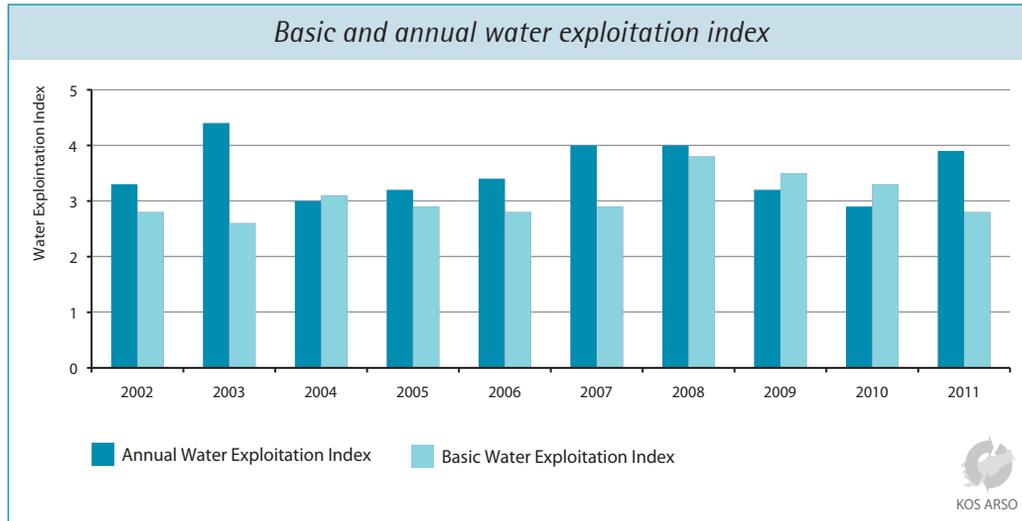
STATE

- ☀ Water exploitation index
- ☀ Annual river balance
- ☀ Groundwater recharge
- ☀ Sea level
- ☀ Chemical and ecological status of surface waters
- ☀ Biochemical oxygen demand in rivers
- ☀ Phosphorus in lakes
- ☀ Nitrates in groundwater
- ☀ Pesticides in groundwater

ENVIRONMENT

WATER EXPLOITATION INDEX

Approximately three per cent of available water is exploited.



Source: Slovenia – WISE SoE Water Quantity, Slovenian Environment Agency and Statistical Office of the Republic of Slovenia, 2013

The water exploitation index (WEI) ranks Slovenia among countries with no water stress. In the observed last ten years, the index has shown a slight increase in the share of water exploitation, but the values generally remain around 3 per cent of available water outflow. The most noticeable dry years were 2003, 2007, 2008, and 2011.

Water stress occurs when demand for water exceeds the available supply during a certain period, or when poor quality restricts its use. It causes a deterioration in water resources in terms of quantity (e.g. the drying out of watercourses, lowering of water table) and quality (e.g. eutrophication, organic pollution). WEI is an index for water exploitation which shows the

ratio of water withdrawal to long-term average water availability (basic WEI index), or the ratio of water withdrawal to water availability on an annual basis (annual WEI). A WEI of 20 per cent is a critical value, indicating the possibility of water stress in a certain area, whereas a WEI of more than 40 per cent indicates severe water stress and unsustainable use of water resources.

The index is calculated for the entire area of the country; however, significant differences in Slovenia in terms of spatial, temporal and quantitative availability and distribution of water are to be taken into account.

The largest percentage of Slovenia's water is used to produce hydropower, where the water is normally directed back

into the watercourse after a certain distance. Most of the major hydropower plants (HPPs) are run-of-river schemes (HPPs on the Sava, Drava and Soča Rivers). Small-scale hydropower plants along smaller watercourses can significantly affect the amount of water in the river, as the percentage of retained water quantity accounts for the major portion of the discharge. According to the latest available data, the quantity of water used for power generation is almost 75 billion cubic metres per year.

Compared to other countries, Slovenia's exploitation of available water is rather low. The highest WEI, exceeding 60 per cent, is in Cyprus, while Belgium, Spain, Italy and Malta have a WEI of more than 20 per cent. The highest WEI has usually been in Mediterranean and densely populated countries, and the lowest WEI in Scandinavia, which has a low population density.



kazalci.arso.gov.si

VD01 Water exploitation index

VD03 River balance

VD15 Groundwater recharge

VD 14 Water permits

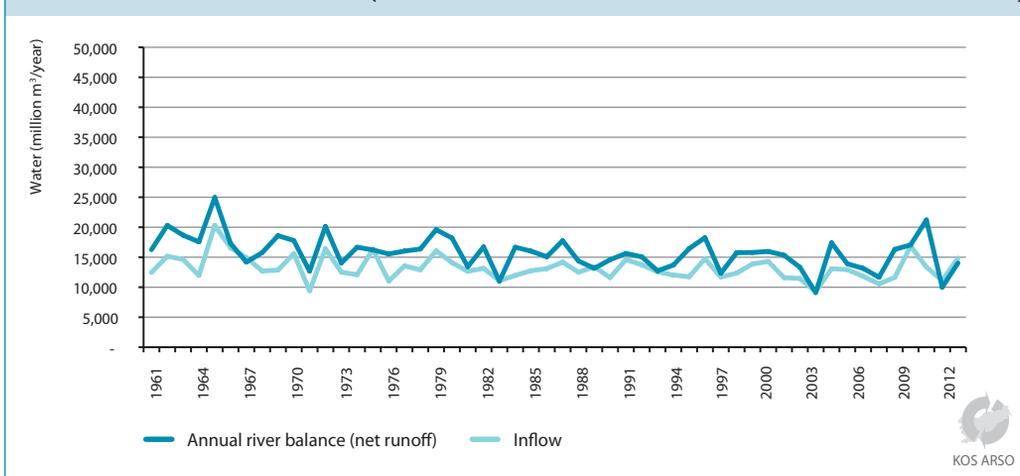


ANNUAL RIVER BALANCE

Multi-annual data series show a reduction in annual river runoff.



Annual river balance in Slovenia (net runoff as a difference between total runoff and inflow)



Source: Hidrolog – Hydrology database, Slovenian Environment Agency, 2014

The annual river balance, which is calculated for Slovenia as a whole, consists of inflow and runoff of river water in million m³ per year. Both elements are calculated on the basis of average annual flow rates (Qs) at hydrometric stations, which capture the majority of inflow and runoff of river water in Slovenian river basins.

The study of the entire data set (1961–2012) or thirty-year period (1971–2000) shows a clear decline in river runoff. In 2012, with 14,035 million m³ the river runoff came at least close to the average of the 1981–2010 period (14,961 million m³). However, flow regimes of Slovenian rivers were far from normal in 2012. Flow rates were below average in the

first eight months and above average in the last four months. The unfavourable pattern of below-average flow rates in the vegetative period and high flow rates and catastrophic floods in the other part of the year was repeated. The period trend of reduction in river runoff was maintained.

Indirect variations in annual river runoff could be a sign of increasing or decreasing probability of drought or floods. However, annual river runoff does not always correspond to changes in the water level.

The majority of Slovenian rivers have a torrential character. This means that flow rate quickly rises and also quickly falls, while the majority of water runs off in high-water or even

flood waves. High waters are most frequent in spring and autumn in the majority of rivers. They usually occur when snow is melting or upon heavy rainfall.

Watercourses with a torrential character are particularly vulnerable during low flow rates and hydrological drought. They are not so clearly linked to a certain season, they mostly occur in late summer or early autumn. Hydrological drought coincides with long periods of below-average precipitation and high air temperatures, which also results in agricultural drought. In order to guarantee ecologically acceptable river flow rates, there might be insufficient water for irrigation. The quality of water also deteriorates significantly in this period.



kazalci.arso.gov.si

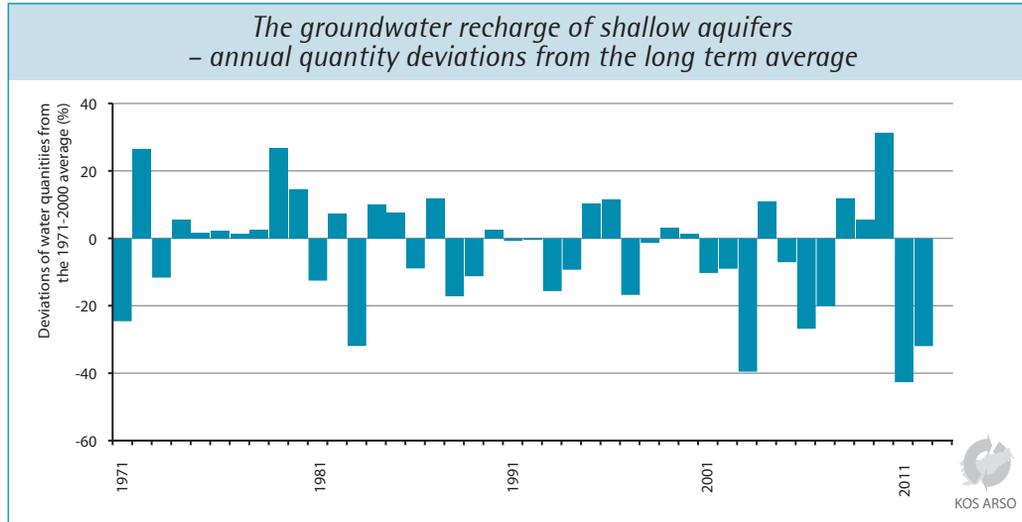
VD03 Annual river balance

- VD15 Groundwater quantitative recharge
- PS04 Precipitation and temperature
- VD01 Water Exploitation Index
- VD10 Nutrients and biochemical oxygen demand in rivers



GROUNDWATER RECHARGE

Annual groundwater recharge of shallow aquifers varies significantly.



Source: Assessment for hydrological years by regional water–balance model GROWA-SI, FZ JÜLICH and Slovenian Environment Agency, 2013

The total groundwater recharge of shallow aquifers in Slovenia in the hydrological year 2012 was below the 1971–2000 average, but slightly higher than in the extremely dry years of 2011 and 2003.

Groundwater is replenished by aquifer recharge, which is a complex process of establishing a balance between water inflow and runoff in a fully saturated groundwater zone. Whereas aquifers are naturally replenished by the infiltration of water from precipitation, they may also be recharged from local watercourses and other side inflows. At the regional level of water bodies or river basins, when the effects of water

retention is balanced, the sum of all individual inflows over a longer period, is equal to the volume of base run-off in the entire region. The recharge of aquifers for hydrological years is assessed for all Slovenia with the regional water balance model GROWA-SI. After deducting the actual evapotranspiration of precipitation, the model leads to the calculation of the total runoff, which is separated into direct runoff of surface waters and groundwater runoff – base runoff. Base runoff is equal to the volume of groundwater recharge, which is expressed by the height of the water column (mm) in each hydrological year (1 November – 31 October).

Given the average achieved in the 1971 – 2000 period, the index of annual groundwater recharge varies widely, indicating the high sensitivity of shallow aquifers regarding groundwater quantity in Slovenia. Since 2000, the number of dry years has significantly increased, the quantity of groundwater recharge being below average.

In Slovenia, groundwater recharge varies greatly between regions. In the last decade, the average aquifer recharge in the Goričko area has been more than ten times below the recharge recorded in the Julian Alps.



kazalci.arso.gov.si

VD15 Groundwater recharge

VD03 River balance

PS04 Precipitation and temperatures

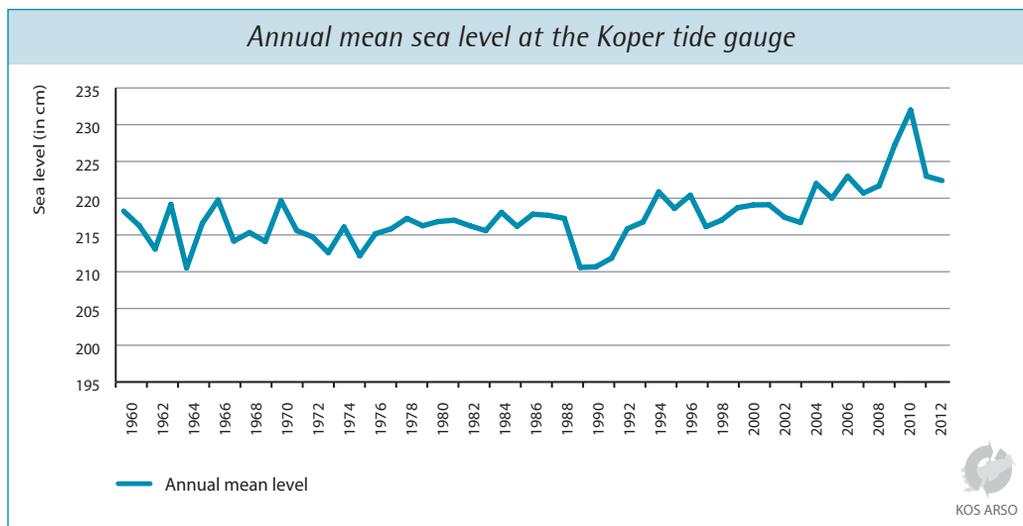
VD11 Groundwater quality

VD01 Water Exploitation Index



SEA LEVEL

In the period 1960–2012 the average sea level on the Slovenian coast rose by 1mm/year, in the last decade, however, the rate of sea level rise has accelerated.



Source: Multi-annual data series for sea levels, Slovenian Environment Agency, 2013

In the Koprski zaliv bay, the sea level changes have been monitored since 1960. The tide gauge point is primarily intended for monitoring and forecasting flood levels of the sea, while longer time series and analyses of influential parameters provide an insight into the effects of climate change.

In the observation period, the annual mean sea level ranged from 211 to 232 cm. The greatest deviation from the mean sea level value of 217 cm in the multi-annual period 1960–2012 was recorded in 2010, when it amounted to 15 cm.

The sea level on the Slovenian coast is rising, which has

been most evident in the last decade. The overall sea level rise is still comparable in size to the rise in the sea level of the Mediterranean Sea. According to UNEP's assessments (for 2001) the sea level of the Mediterranean Sea should rise from 12 to 30 cm by 2100. In the global assessment of sea level rise, the major share of the rise is attributable to sea water expansion caused by higher temperatures of the sea.

Due to the dynamical characteristics of the Adriatic Sea and the location of the Koper tide gauge in its northern part, the rise in sea level along the Slovenian coast is mostly observed

as the consequence of frequency of climate changes, such as frequency and intensity of surface cyclones.

Above-average tides are caused in particular by the falling of atmospheric pressure, strong southern winds and the occurrence of seiches (long-period 23-hour waving oscillations); partly they are also attributable to a relative closeness of the Adriatic Sea.

In the observation period, the sea level reached or exceeded the flood point (300 cm) 398 times, i.e. on average by approximately 9 cm. The highest sea level measured was 394 cm. Sea floods mainly occur in autumn, temporarily also during spring months, and on average slightly more than eight times a year and up to 31 times a year. Floods result from above-average tides which are mainly caused by weather conditions.

The sea level rise resulting from climate change requires numerous adaptations. The urban Slovenian coast is partly adjusted to the current flood situation and the predicted sea level rises.



kazalci.arso.gov.si

MR02 Sea Level

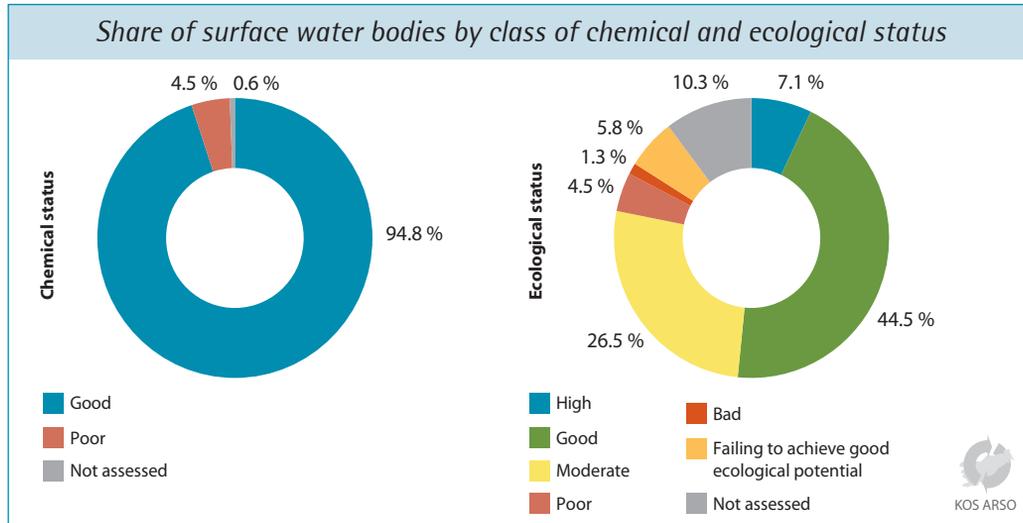
PS04 Precipitation and temperature

PS07 Extreme weather events



CHEMICAL AND ECOLOGICAL STATUS OF SURFACE WATERS

A large majority of surface water bodies has been assigned a 'good' chemical status and more than half a 'good' ecological status.



Source: Assessment for Water Management Plan, Slovenian Environment Agency, 2010

chemical, biological and hydro morphological quality elements relative to the reference condition, showing no, or only very minor, evidence of distortion. Since the reference conditions depend on natural characteristics, the assessment is based on a type-specific approach, whereby waters are first classified into ecological types according to their natural characteristics.

A good third of the surface water bodies in Slovenia do not achieve a 'good' ecological status or 'good' ecological potential. Of these, the water bodies Kamniška Bistrica Študa - Dol and Cerknjičica have been designated as 'bad'. However, all the assessed coastal water bodies have been adjudged 'good' or 'high'.

In accordance with the Water Framework Directive, status assessments of surface waters have also been made by other EU Member States. The majority note that the goal of restoring 'good status' to all water bodies by 2015 will not be reached.



kazalci.arso.gov.si

VD12 Chemical and ecological status of surface waters

MR06 Chemical and ecological status of coastal water bodies

VD09 Inland bathing water quality

VD13 Meeting water quality criteria for freshwater fish

VD10 Nutrients and biochemical oxygen demand in rivers

VD07 Phosphorus in lakes

MR07 Quality required of water supporting marine bivalves and gastropods

The indicator shows the assessment of chemical and ecological statuses of surface waters in the 2006-2008 period prepared for the first River Basin Management Plan for the Danube and North Adriatic River Basin Districts for the 2009–2015 Period.

The chemical status of surface waters denotes the concentration of 33 priority substances and priority hazardous substances for which environmental quality standards are set. These include substances like atrazine, benzene, cadmium, mercury and carbon-tetrachloride.

A large majority of surface water bodies have been desig-

nated as having a 'good' chemical status, while seven have been assigned a 'poor' chemical status, namely the Sava River near Vrhovo, due to mercury, and the Krka River near Otočec and coastal water bodies due to tributyltin compounds. In general, Slovenian surface waters are not polluted by priority or priority hazardous substances.

Ecological status is the expression of the quality of the structure and functioning of aquatic ecosystems associated with a surface water body. The assessment of the ecological status of surface waters presents changes in the values of the physico-

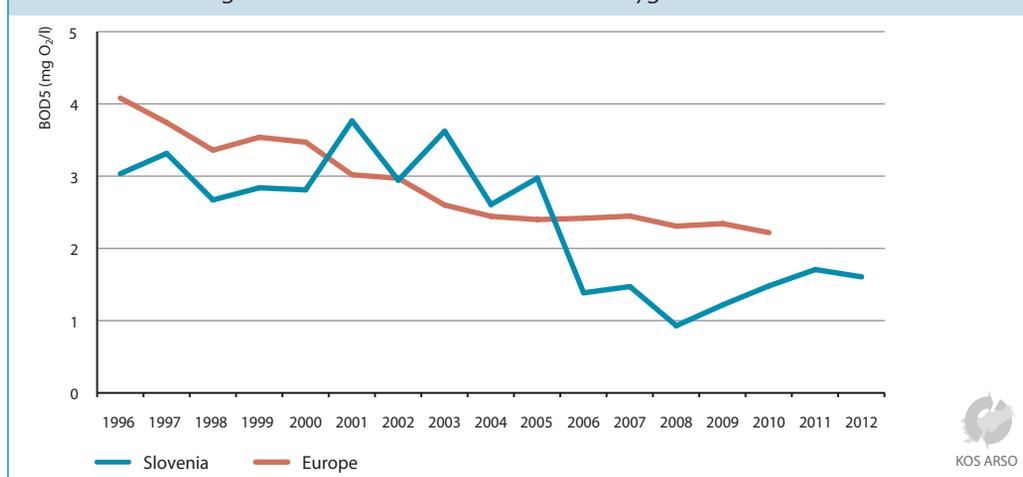


BIOCHEMICAL OXYGEN DEMAND IN RIVERS

The values of biochemical oxygen demand (BOD5) in rivers, usually an indicator of organic pollution, have significantly decreased.



Average annual values of biochemical oxygen demand – BOD5



Source: Standardised Database for Water Quality Monitoring, Slovenian Environment Agency, 2013; Oxygen consuming substances in rivers (CSI 019), European Environment Agency, 2012

The over-enrichment of water by nutrients may result in eutrophication or an algal bloom. Such a phenomenon causes environmental changes that lead to a reduction in the number of animal and plant species and has a negative impact on the use of water.

However, the self-purification capacity of rivers mitigates the adverse effects of water pollution by nutrients. Thus, the quantity of organic matter is decomposed into inorganic matter with the help of microorganisms. A rough measure-

ment for the self-purification capacity of a watercourse is biochemical oxygen demand (BOD5). As a rule, high levels of biochemical oxygen are due to organic pollution. High levels of biochemical oxygen demand cause a deterioration in chemical and biological water quality, a loss of biodiversity within an ecosystem and poor microbiological quality of water.

BOD5 levels in Slovenian rivers have significantly decreased due to an improvement in waste water treatment and the closure of industries that heavily polluted rivers with waste water.

A similar downward trend in BOD5 levels and nutrient loads (ammonium, nitrate and orthophosphate), but with a less pronounced decline, has been recorded on average for European rivers in general. The most significant decline in the level of pollutants has been in what were the most polluted rivers in the South, South-East and East of Europe.



kazalci.arso.gov.si

VD10 Nutrients and biochemical oxygen demand in rivers

- VD02 Wastewater treatment
- KM02 Consumption of mineral fertilisers
- VD07 Phosphorus in lakes
- VD12 Chemical and ecological status of surface waters
- VD09 Inland bathing water quality

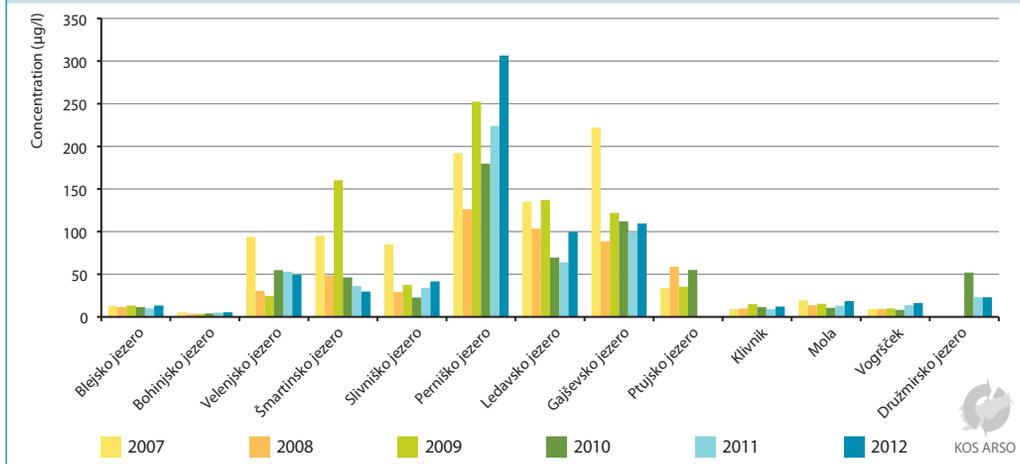


PHOSPHORUS IN LAKES

In artificial reservoirs in north-eastern Slovenia, the average phosphorus content is significantly higher than in natural lakes, with no indication of improvement.



Average annual concentration of the entire phosphorus load in the selected lakes



Source: Standardised Database for Water Quality Monitoring, Slovenian Environment Agency, 2013

Phosphorus is an essential biogenic element which, together with other environmental factors, regulates biological productivity levels in lakes of the temperate climate zone. A shortage of phosphorus in lakes is a limiting factor in the production of phytoplankton; while an increase accelerates it. Over-enrichment of lakes by nutrients, particularly phosphorus, triggers a number of biochemical processes known under the common term of eutrophication. A phenomenon accompanying eutrophication is excessive growth of planktonic algae and cyanobacteria in phytoplankton, which reduces water transparency. The average content of the entire phosphorus load is

an important indicator for evaluating the trophic status of lakes, while the transparency of lakes, measured as the Secchi depth in metres, is used as an auxiliary indicator of trophic status.

An increasing number of lakes in Europe have reduced phosphorus levels and greater transparency as a result of measures to reduce the burdening of lakelands. Compared to the situation in the 1970's, the remedial action has resulted in the improvement of the trophic status of Lake Bled; however, undue levels of phosphorus compounds are still occasionally present, which increase phytoplankton biomass and reduce the lake's transparency. Lake Bohinj is an oligotrophic, flow-through al-

pine lake, where the effects of human activity are still relatively mild; the concentration of phosphorus in the lake is low.

The reservoirs in central and north-eastern Slovenia are the most heavily loaded water bodies in the country, because they are located in areas where agricultural activity is intensive and utility infrastructure is incomplete. The large level of over-enrichment by nutrients and phosphorus is also due to intensive fisheries and aquaculture. No improvement has been observed.

A high average concentration of phosphorus, over 100 µg/l, has been recorded in the Perniško, Ledavsko and Gajševsko lakes. Compared with reservoirs in Štajerska and Prekmurje, the reservoirs in the Adriatic basin, i.e. Klivičnik and Molja in Brkini within the Reka River basin and Vogršček in the Vipava Valley, are less loaded with phosphorus.

The Velenje and Družmirje lakes are artificial, having formed due to the subsidence and flooding of abandoned parts of a lignite mine. The two lakes are heavily loaded with phosphorus, although the production of phytoplankton is likely to be lower than expected due to the higher level of pollutants (molybdenum and sulphates).



kazalci.arso.gov.si

VD07 Phosphorus in lakes

VD02 Wastewater treatment

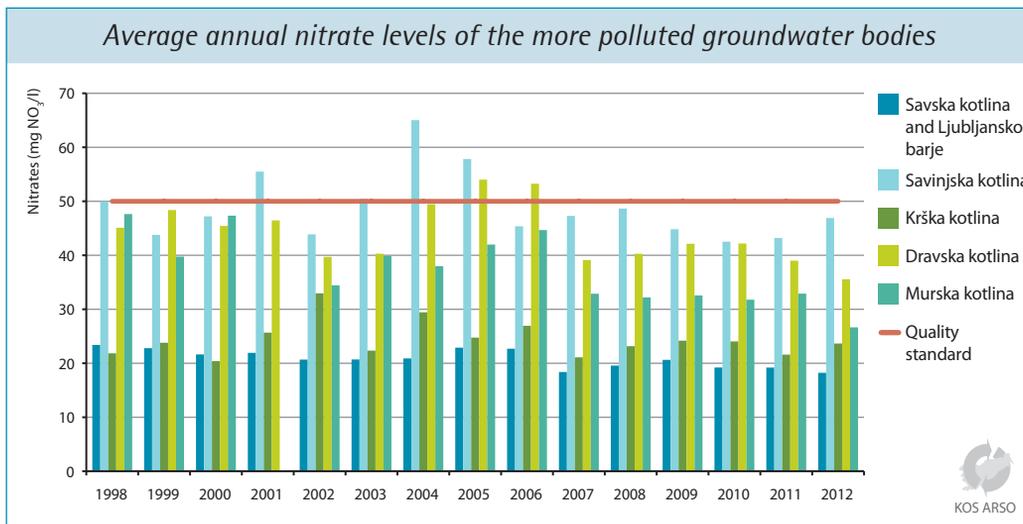
KM02 Consumption of mineral fertilisers

VD12 Chemical and ecological status of surface waters



NITRATES IN GROUNDWATER

Groundwater bodies most polluted with nitrates are those with inter-granular (alluvium) aquifers, particularly in north-eastern Slovenia.



Source: Standardised Database for Water Quality Monitoring, Slovenian Environment Agency, 2013

The main source of drinking water in Slovenia is groundwater; its quality is monitored in 21 water bodies, in some of which a decline in the level of nitrates has been recorded.

An aquifer is a geological formation capable of accumulating and channelling significant quantities of groundwater. In Slovenia, two types of aquifer prevail: those with inter-granular porosity (alluvial) and those with Karts-fracture porosity. A groundwater body supplies water to the aquifer. In Slovenia, the regulations cover 21 groundwater bodies,

Nitrates in groundwater may be of natural origin. The natural level of nitrates depends on the geological composition

of aquifers; in Slovenia, this is below 10 mg NO₃/l. Increased levels of nitrates in groundwater are the result of human activities, particularly agriculture and the unregulated discharge of municipal waste water.

Groundwater in karst and fractured aquifers contains less nitrate, due to geographical conditions, the low population density and scarce agricultural land, which was also substantiated by the results of national monitoring in 2012. The average annual nitrate content in most groundwater bodies with mainly karst and fracture aquifers is below 10 mg NO₃/l, nowhere exceeding the limit values of 25 mg NO₃/l.

Areas with the most intensive agricultural activity are in north and central Slovenia, specifically in the lowland river valleys (of the Drava, Mura, Savinja, and Sava), where aquifers with inter-granular porosity prevail. This is reflected in the concentration of nitrates in groundwater, which is normally higher than the natural background, and at some sampling points even exceeds the standard level of 50 mg NO₃/l. The most polluted water bodies are the Savinja, Drava and Mura basins; however, their annual average nitrate levels have not exceeded the standard quality level since 2007.

In the 1998-2012 period, nitrate levels in these water bodies showed a statistically significant downward trend. Thus, the results of the national monitoring of groundwater, at least of some water bodies, substantiate that positive effects are likely to result from measures taken to reduce the nitrogen input into the ground.



kazalci.arso.gov.si

VD05 Nitrates in groundwater

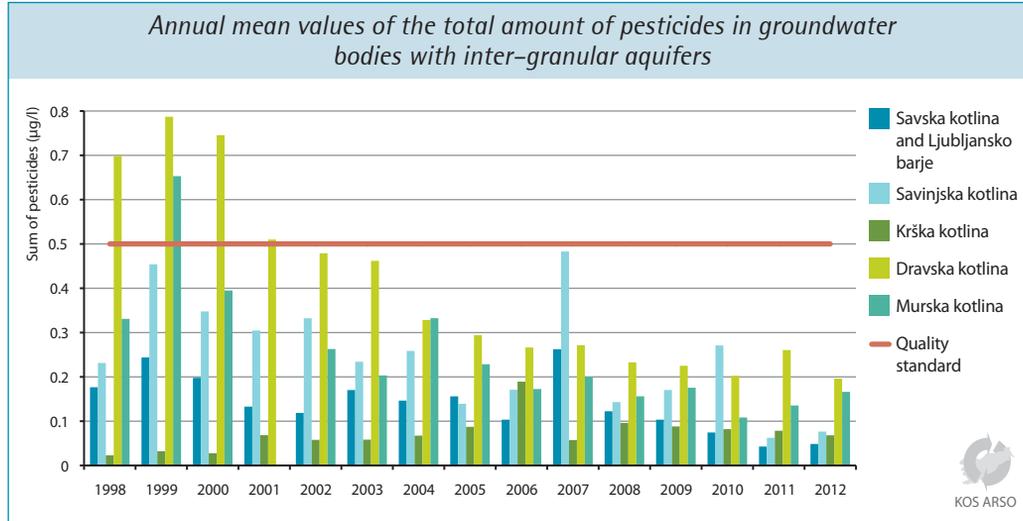
- VD11 Groundwater quality
- VD08 Drinking water quality
- KM22 Gross nitrogen balance in agriculture
- VD02 Wastewater treatment





PESTICIDES IN GROUNDWATER

The total amount of pesticides in groundwater bodies with inter-granular aquifers has mainly decreased.



In general, the levels of pesticides in groundwater have been decreasing. In the flat lands of Slovenia (the basins of the Drava and Mura rivers), where intensive agricultural activities are typical, the levels of some pesticides, mainly of plant protection products, still exceed the quality standards. Individual point sources of pollution have been recorded, which are very often the result of the unskilled use of these products.

In the 1998-2012 period, the total amount of pesticides in groundwater bodies with inter-granular aquifers showed a downward trend. The total pesticide load has been decreasing primarily due to the reduction of the levels of atrazine and its metabolite, desethyl-atrazine, which is a positive effect of the ban on atrazine use. Instead of atrazine, other plant protection products are used; however, these are rarely detected in groundwater due to their favourable physical-chemical characteristics (rapid decomposition, better adsorption, etc). The Savinja, Drava and Mura basins indicate a decreasing trend in the total amount of pesticides.

Incorrectly used, pesticides may pollute groundwater, which is the main source of drinking water in Slovenia. Since pesticides are harmful to the environment and health, the monitoring of their levels in groundwater is very important. Within the framework of state monitoring, approximately 120 different pesticides and their decomposition products, metabolites, are analysed.

In Slovenia, two types of aquifer prevail: those with inter-granular porosity (alluvial) and those with karst-fracture porosity. An aquifer is a geological formation capable of accumulating and channelling significant quantities of ground-

water. A groundwater body supplies water to the aquifer. In Slovenia, the regulations cover 21 groundwater bodies,

Pesticides monitored within the framework of the state monitoring programme include artificial organic compounds used for weed control and the control of insects, pests and diseases. According to the purpose of their use, pesticides are divided into plant protection products for protecting crops, and biocides. Biocides are added to coatings for wood protection, and to facade paints; they are also used for exterminating rodents and lice, as disinfectants, etc.



kazalci.arslo.gov.si

VD06 Pesticides in groundwater

VD08 Drinking water quality

KM01 Consumption of plant protection products

KM04 Intensification of agriculture



BATHING WATER QUALITY

Bathing water quality in rivers, lakes and the coastal area is good.



The assessment of bathing water quality relating to the Bathing Water Directive requirements



Source: Database on the quality of water in bathing areas, Institute of Public Health of the Republic of Slovenia, (2004–2009); Database on the quality of water in bathing areas, Slovenian Environment Agency (2010–2012), 2013

Water-based recreation is of great importance to human health and well-being. Besides physical activity, such recreation is a form of entertainment, relaxation, rest and play, thereby strengthening the body and maintaining health. Bathing sites and water may carry certain risks which are generally predictable and manageable if the causes of problems are identified and if we are familiar with procedures for appropriate action. Adequate bathing water quality is only one of the conditions for healthy swimming.

In Slovenia, bathing waters comprise 48 bathing areas in rivers, lakes and coastal areas which are intended for bathing;

coastal waters account for the largest share (21); inland bathing waters have bathing areas on the Krka, Kolpa, Soča, Idrija and Nadiža rivers (19) and bathing areas at Lake Bled, Lake Bohinj and Šobčev bajer (8).

The quality of bathing water is monitored at all the above-mentioned locations. The quality is good and comparable to the quality of bathing waters in other parts of Europe.

In the 2004–2009 period, a small percentage of bathing waters did not comply with the legal requirements because of the occasional short-term deterioration in the microbiological quality of water due to intensive rainfall. In the 2010–2012

period, all bathing waters in Slovenia satisfied the threshold microbiological parameters and were thus compliant even with the stricter mandatory requirements. For several consecutive years, all coastal bathing waters have met the bathing water quality requirements, and an increasing number of other bathing waters also meet these quality requirements each year. However, we must be aware that bathing water is not suitable for drinking or washing food, and that a shower is recommended after bathing.

On the whole, the quality of Slovenian bathing waters has gradually improved, not only because of the revised system for assessing quality introduced after 2009, but also because of the improved sewage system and construction of water treatment plants in bathing water catchment areas. Furthermore, information to the public and managers about bathing water quality also improved with the creation of bathing water profiles containing data on relevant natural characteristics and pollution sources in influential and bathing water catchment areas, which are needed to implement remedial measures. The data are available on the website of the Ministry of Agriculture and the Environment.



kazalci.arso.gov.si

VD09 Inland bathing water quality

MR05 Coastal bathing water quality

VD12 Chemical and ecological status of surface waters

VD02 Wastewater treatment

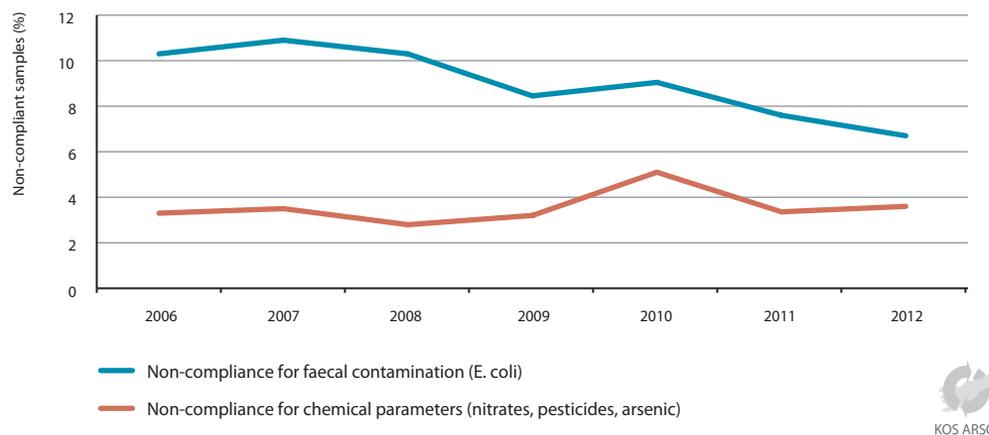


DRINKING WATER QUALITY

The quality of drinking water is suitable predominantly in larger water supply areas.



The share of drinking water samples not compliant with regulations



Source: State monitoring of drinking water. Institute of Public Health of the Republic of Slovenia, (2005 – 2008) and the Maribor Institute of Public Health, 2013

Drinking water quality in Slovenia in the 2004–2012 period improved slightly in terms of microbiological and chemical pollution. Microbiological contamination, particularly the faecal contamination characteristic of small water supply systems or supply areas supplying 50–1000 inhabitants, has become a public health problem. These systems often do not have designated water protection areas, or appropriate professional management or drinking water treatment. The long-term solution is to abolish unsuitable small-scale systems and connect residents to medium- and large-scale water supply systems (serving 1000–10,000 inhabitants) with a system op-

erator and organised professional management and supervision, or to make small-scale systems adequate.

In 2012, 3,449 samples of drinking water were taken in regular testing under state monitoring; 15% of these samples were non-compliant or unsuitable due to microbiological contamination, and 6.7% of them were non-compliant owing to the presence of *E. coli*. The percentage of non-compliant samples is decreasing considerably in relation to the size of supply areas; in small-scale supply areas (50 to 1000 inhabitants), almost a third of non-compliant samples exceed the microbiological parameters.

In the course of periodic testing (359 samples taken in 2012), which includes a wide range of chemical parameters for which the threshold value is determined on the basis of direct risk to human health, the results of drinking water samples showed that the percentage of non-compliant samples by chemical parameters (nitrates, pesticides, arsenic) varied from approximately 3 to 6%. In the entire period, the percentage of chemically non-compliant samples declined somewhat, particularly in large supply areas.

In this period, drinking water samples constantly exceeded the prescribed threshold values for atrazine and desethyl, bentazon and metolachlor, while the threshold values of other pesticides were exceeded only in particular years (metazachlor, bromacil, dicamba, dimethenamide, chlortoluron, mecoprop, mesotrione, permethrin and terbuthylazine). In 2012, 5% of the Slovenian population (approximately 100,000 people) were exposed to excessive pesticide concentrations, particularly in North-eastern and South-eastern Slovenia. In the 2004–2012 period, the share of population exposed to nitrate-contaminated drinking water decreased from 0.6% to 0.2% of the population; nitrate contamination levels were exceeded mainly in the north-east.



kazalci.arso.gov.si

VD08 Drinking water quality

ZD04 Outbreaks of waterborne diseases (epidemics)

ZD05 Access to safe drinking water

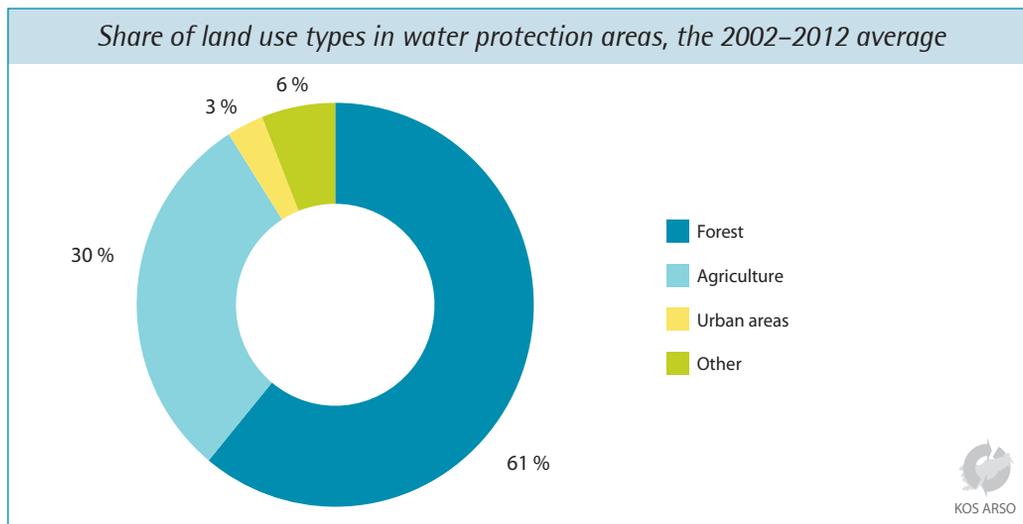
VD05 Nitrates in groundwater

VD06 Pesticides in groundwater



WATER PROTECTION AREAS

Water protection areas cover 345,000 ha or 17% of the territory.



Source: RABA, Ministry of Agriculture and the Environment, 2013;
Water protection areas, Slovenian Environment Agency, 2013

Water protection areas comprise almost one fifth, or about 345,000 hectares of the area of Slovenia, of which more than 7,000 hectares fall under the strictest protection regime.

Water protection areas are protected by municipal ordinances and government decrees. They have been designated with a view to protecting water bodies which are used, or intended to be used, for the public supply of drinking water against contamination or other types of pollution that might affect the wholesomeness of water or its quantity.

The size of water protection areas must be designated, so that the envisaged protection measures effectively ensure the

long-term sustainability of water quantity and quality of the water resource concerned. Depending on the distance and inflow time to the catchment area, water protection areas are divided into three-degree protection regimes.

Most surfaces in water protection areas are covered by forest, followed by agricultural land, urban land and other surfaces. Changes in the structure of land use within water protection areas took place in the 2002-2013 period, but were not extensive. Forest areas increased (by 1.3%), and urban areas (by 2.3%), while agricultural land decreased by 1,228 ha, or 1.2%). Less than half of agricultural land is covered by per-

manent grassland and pasture. Fields account for 36% of the surface of water protection areas, which are significantly decreasing in area, mainly on account of grassland and pastures. Less use of pesticides and fertilisers has resulted in a less contamination of groundwater from grassland and pastures. With regard to preserving the cultural landscape in water protection areas, the share of overgrown agricultural land decreased by 31.3%. However, the area of perennial crops increased by 1.9% in the 2002–2011 period, which usually entails a relatively large consumption of plant protection products.

The increase in the area of urban land in water protection areas is relatively small (by 2.3%), but in terms of water pollution, this can be regarded as an unwelcome phenomenon. In future, the increasing urbanisation is expected to come to a halt, in particular in the immediate vicinity of catchment areas (the strictest water protection regime), since the legislation regulating these areas is very strict.



kazalci.arso.gov.si

VD16 Water protection areas

KM23 Agriculture in water protection areas

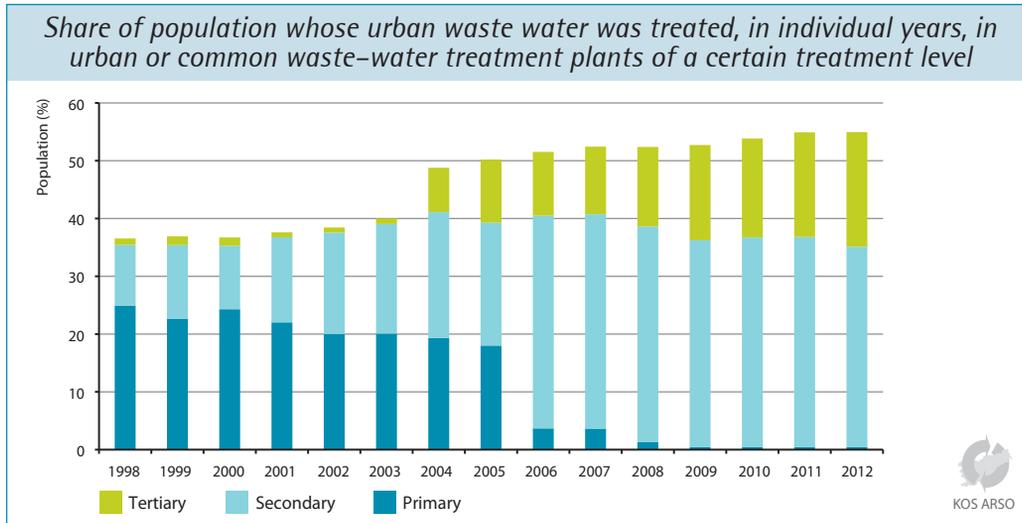
VD14 Water permits

VD08 Drinking water quality



WASTEWATER TREATMENT

The urban waste water of a good half of the population is treated in wastewater treatment plants providing secondary or tertiary treatment.



Source: Waste-water Treatment Plants Database, Slovenian Environment Agency, 2013; Statistical Office of the Republic of Slovenia, 2013

Urban waste-water treatment is one of the most important measures in the protection of all surface and ground waters from organic pollution of the environment, nitrogen and phosphorus input and from microbiological contamination.

Waste-water is treated in municipal or common wastewater treatment plants classified by level of treatment as specified in regulations. As a rule, primary treatment is defined as the mechanical or chemical elimination of a smaller quantity of organic loading and some suspended substances. Secondary treatment is a process of biological purification. It

removes a large amount of organic substances and nutrients (20%-30%). Tertiary treatment eliminates organic matter and a large amount of nutrients (nitrogen, phosphorus).

In recent years, the amount of waste water treated by secondary or tertiary treatment processes has increased. Since 2002, the quantity of waste water treated by these processes increased by 211% or from 38 million m³ (in 2003) to 81 million m³ (in 2012). Tertiary waste-water treatment was almost non-existent in Slovenia in 2002, while in 2012, as much as 37% of waste water, or 48 million m³, was treated by tertiary processes.

The development of waste-water treatment systems in EU Member States is at different levels. Approximately 70% of the EU population are connected to waste-water treatment plants. The Netherlands has the highest share of population connected to waste-water treatment plants (99%). For Spain, Germany, Italy and Austria, the rate of population is 90%. According to the 2012 data, this share is 55% in Slovenia, which means that we are among those where the share of population connected to municipal and common wastewater treatment plants is small, and that nearly half the population still uses septic tanks. Of these, less than one per cent is comprised of small municipal waste-water treatment plants (of less than 50 population equivalents).



kazalci.arso.gov.si

VD02 Wastewater treatment

VD05 Nitrates in groundwater

VD07 Phosphorus in lakes

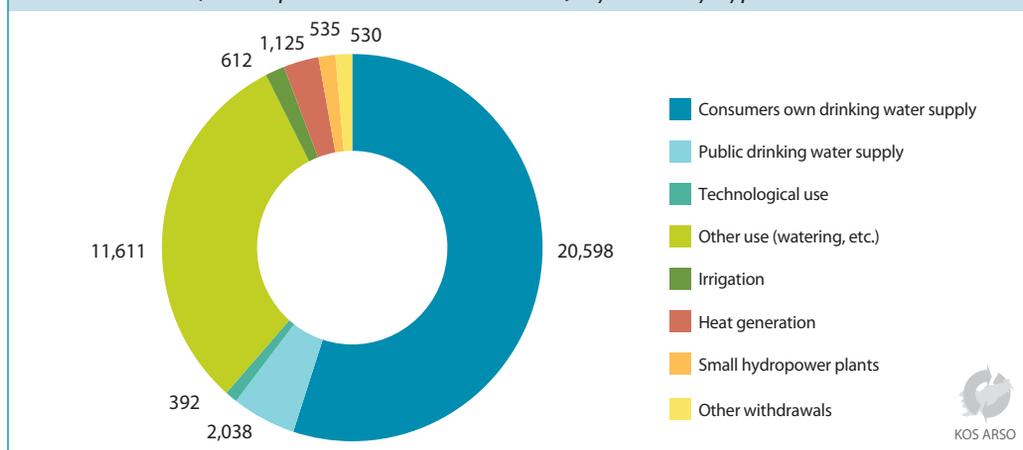
VD10 Nutrients and biochemical oxygen demand in rivers

WATER PERMITS

By the end of 2013, more than 40,000 water permits and concessions had been granted for special water use.



The number of licenses granting a right to use water from water intake (water permits and concessions) by 2013 by type of use



Source: Water Book, Slovenian Environment Agency, 2014

The preservation and control of water quantities, promotion of sustainable use of water and long-term protection of available water resources and their quality are the core objectives of water management. In order to ensure the rational use of water resources, the legislation specifies that for each special use of water (public water or marine asset or alluvium) a water right must be obtained, which is subject to payment; the fee for water is paid according to actual consumption.

The permit granting the water right, mainly to all non-return forms of water consumption (watering, irrigation, snow-making, drinking water supply, certain types of water use for technological purposes, filling swimming pools, beverage

production), also defines the maximum annual withdrawal of water; with regard to return forms of water consumption (hydroelectric power plants, heat production, aquaculture, mills and sawmills, natural bathing sites, ports, offshore platforms, etc.), the permit mainly defines the envisaged or installed current withdrawal capacity (l / s) or water area or aquatorium (in m²). Water rights are also required for the removal of sediment.

The highest number of permits granting water rights relates to the use of water for the consumer's own drinking water supply (more than 20,000) and for other uses (11,000), mainly for watering gardens; the total maximum allowable water withdrawal for both categories is less than one per cent of all water

rights conferred. The maximum quantity of water guaranteed for use for technological purposes amounts to over 1,100 million m³; however, a large proportion of this water is used for cooling; it is abstracted from surface watercourses – i.e. return water, and therefore is returned to a watercourse. A significant proportion – one third of the quantity or 565 million m³ of water per year (by 2038 water permits) – was approved for the provision of drinking water as a public service. Regarding the water rights granted, as much as 93% of water is intended for water supplies from springs, boreholes and wells, hence from groundwater.

15.07 million m³ in annually intended for irrigating agricultural and other land.

Among the licences granting water rights, which do not define the withdrawal, the highest number were for ports, berths and offshore platforms (1600), marine aquaculture (84) and natural bathing sites (440).



kazalci.arslo.gov.si

VD 14 Water permits

VD01 Water exploitation index

VD03 River balance

VD15 Groundwater recharge

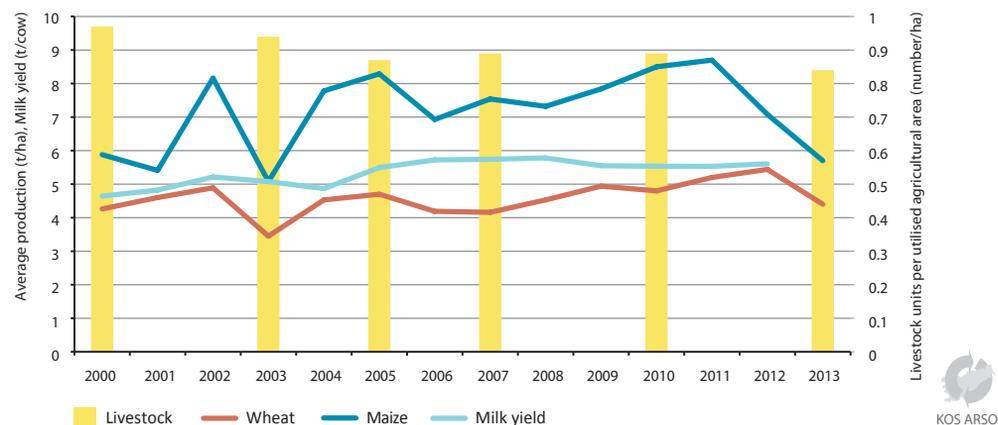


INTENSIFICATION OF AGRICULTURE

Intensity in agricultural production is moderately increasing.



Intensity of stocking and production: the average yield of wheat and maize per hectare, milk yield and number of livestock units per hectare of utilised agricultural area



Source: Statistical Office of the Republic of Slovenia, 2013; calculations by the Agricultural Institute of Slovenia, Institute of Macroeconomic Analysis and Development, Slovenian Environment Agency, 2013

In Slovenia, the level of intensification in agriculture is moderate, focusing primarily on improving labour productivity in agricultural production, i.e. reducing the input of labour per unit of area or product.

The intensification of agriculture allows agricultural production with lower costs per unit of agricultural product i.e. the cost labour, the land and capital. However, past experience has shown that its consequences, such as the increased use of fertilisers and plant-protection products, loss of biodiversity for spatial development etc., leads to the greatest burdening on the environment; accordingly, intensification has become

the focal theme of agricultural and environmental policies which develop instruments to limit its negative effects.

Almost 80% of all agricultural holdings in Slovenia are engaged in various types of livestock breeding, 47% of which are engaged in cattle breeding. The number of farmers engaged in cattle breeding decreased by almost one fourth in the 2000–2013 period alone. As in other EU countries, stock density (the number of livestock units per hectare of utilised agricultural area) is also decreasing in Slovenia; it declined by almost 9% (from 0.97 to 0.84 of livestock unit/ha) in the 2000–2013 period alone.

In spite of a rapid decrease in the number of holdings engaged in dairying, and a slightly less distinct decline in the number of dairy cows on these holdings, the total milk yield has remained almost unchanged. The reason for this is a notable increase in the concentration of dairying: in the 2000–2013 period, the average number of cows per holding rose by more than 50%, and at the same time, the intensity of dairying increased. In ten years, average milk production per dairy cow (milk yield) increased by more than 25% to stand at 5.6 tonnes of milk per cow in 2012.

Wheat and grain maize are the most important crops in Slovenia. According to data from the Statistical Office of the Republic of Slovenia, 31 thousand (wheat) and 42 thousand (maize) hectares of arable land were harvested in 2013. The concentration of production is distinctly increasing (average area of wheat and maize per holding), whereas the increase in hectare yield is less significant, which is due to the high dependence on weather conditions.



kazalci.arslo.gov.si

KM04 Intensification of agriculture

KM11 Farm management practices

KM12 Specialisation and diversification in agriculture

KM22 Gross nitrogen balance in agriculture

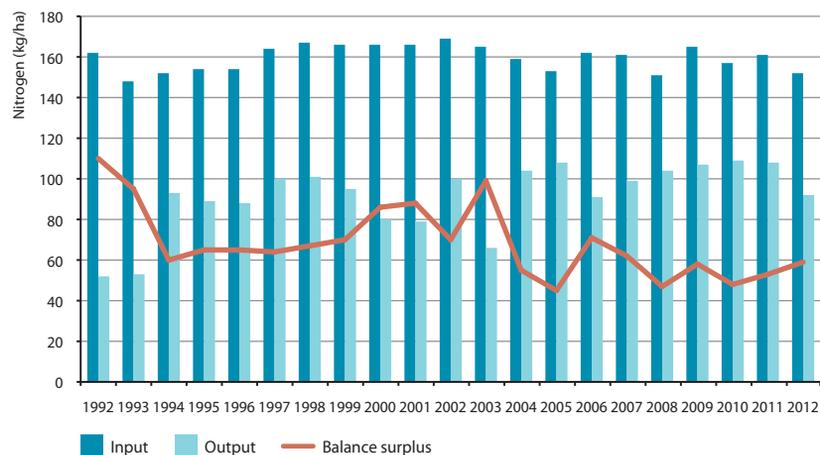


GROSS NITROGEN BALANCE IN AGRICULTURE

Gross nitrogen surplus in agriculture decreased



The average input, output and balance surplus of nitrogen per hectare of utilised agricultural area



Source: Nitrogen Balance, Agri-Environmental Indicators, Statistical Office of the Republic of Slovenia and the Agricultural Institute of Slovenia, 2014

In Slovenia, the balance surplus (gross stock) of nitrogen in agriculture has shown a downward trend in the last twenty years. In 2012, the amount of nitrogen per hectare of utilised agricultural area stood at 59 kg N/ha.

The balance of nitrogen in agriculture is the difference between the input and output of nitrogen from agricultural land. The sources of nitrogen input to utilised agricultural area are mineral fertilisers, livestock manure, and other kinds of organic manures, biological nitrogen fixation, atmospheric deposition and nitrogen from the seeds and planting material. The agricultural crops harvested from agricultural areas

are nitrogen output. The surplus of nitrogen input over output presents an environmental threat, because it accumulates on the ground, leaches into waters, or ends up in the air in a gaseous state.

The overall input of nitrogen on utilised agricultural area declined by almost a fifth, from 89,961 tons in 1992 to 72,710 tons in 2012, which is the lowest amount in the observed period. Furthermore, the average input of nitrogen per hectare of utilised agricultural area reduced, from 162 kg N/ha to 152 kg N/ha. The main source of nitrogen is livestock manures (50% in 2012) and mineral fertilisers (36% in 2012). The re-

duction of nitrogen input from mineral fertilisers significantly contributed to the reduced input of nitrogen in Slovenia.

The output of nitrogen with crops varied, since it amounted to between 28,973 and 54,956 tons of N, or 52 and 109 kg of N/ha per year on average. Such great differences depend on varying weather conditions, since in periods of drought; the output of nitrogen also decreases, mainly due to lower crop yields. The main source of nitrogen output is grassland (62% in 2012); arable crops and green fodder contribute around 33%, while the contribution of permanent plantations and vegetable crops is relatively small.

Spatial diversity in Slovenia is also shown in the balance of nitrogen. The analysis of areas with groundwater bodies which, due to the risks of pollution from nitrates in agriculture, are most sensitive to excessive concentrations, showed amounts of more than 100 kg N/ha in the south-eastern part of Slovenia, and below 50 kg N/ha in the central part of Slovenia, while the west and north-western parts show a barely positive balance of nitrogen, and in some groundwater bodies, even a negative nitrogen balance.



kazalci.arso.gov.si

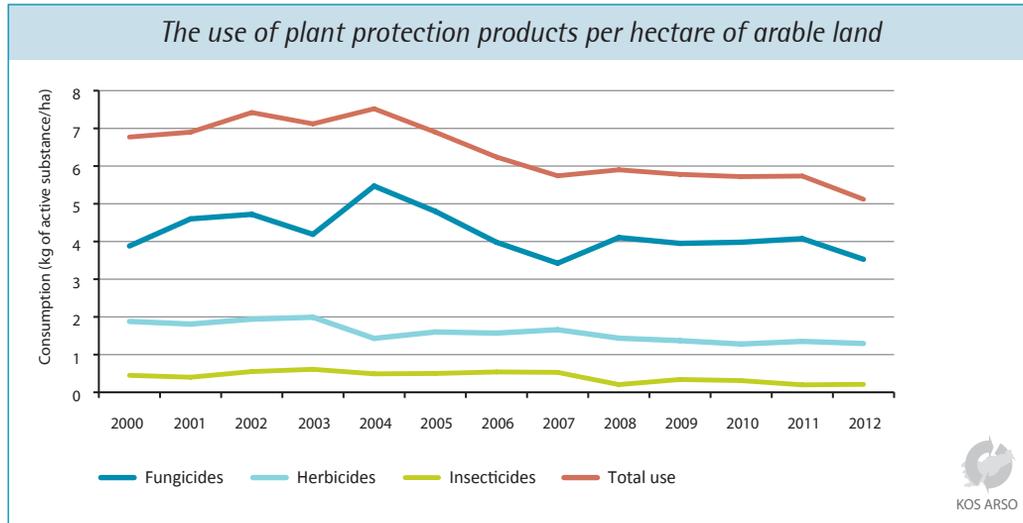
KM22 Gross nitrogen balance in agriculture

- VD10 Nutrients and biochemical oxygen demand in rivers
- VD05 Nitrates in groundwater
- VD08 Drinking water quality



CONSUMPTION OF PLANT PROTECTION PRODUCTS

Overall consumption of plant protection products (PPPs) has been decreasing.



Source: The sale of pesticides, Statistical Office of the Republic of Slovenia, 2013

Plant protection products (PPPs) (phyto-pharmaceutical products, subgroup of pesticides) are active substances or their preparations intended to protect plants by producing effects on harmful organisms or plants, parts of plants or plant products.

According to the sales data, the consumption of PPPs in Slovenia decreased by half, from 2,031 tons in 1992 to 1,016 tons in 2012. In the last five years, consumption has remained steady at around 5.7 kg of active substance per hectare of arable land, with fluctuations, mainly caused by weather conditions. In 2012, the total use of PPPs was 5.1 kg per hectare, which is the lowest use of PPPs in the entire observed period.

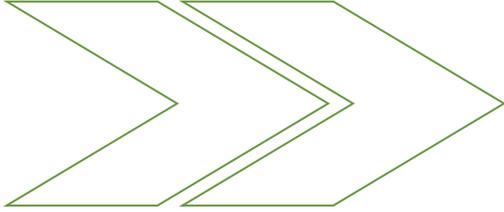
It should be taken into consideration that the presented consumption per hectare is slightly overestimated since the data on land do not include all the land where PPPs are used (agricultural areas owned by non-farmers, lawns, sports fields, etc.).

The consumption of PPPs per hectare of arable land in Slovenia exceeds the average consumption in most EU countries, but it is comparable with the consumption in the countries with a similar types of crops and production conditions. Slovenia is characterized by a high percentage of permanent crops – orchards, vineyards and hop fields; in these areas, the consumption of pesticides (mainly fungicides) per hectare is considerably higher than the consumption of such products

in cereals and the majority of root crops. The fungicides still account for more than two thirds of all PPPs used in Slovenia; the largest share among these is comprised of inorganic fungicides based on sulphur, which are less harmful to the environment.

The consumption of herbicides is declining, owing to the use of new groups of preparations containing lower doses of active substances per hectare and significant changes in the sowing structure. The consumption of insecticides, accounting for less than one-twentieth of all pesticides used, has varied, primarily due to weather conditions that favour the development of pests. With a view to protecting consumers of agricultural products as well as the environment – mainly water resources – the registration, turnover and consumption of PPPs are governed by law. Special restrictions apply to the use of PPPs in water protection areas.





WHAT COVERS THE LAND AND HAS NATURE BEEN SUFFICIENTLY CONSERVED?

Diverse land cover and land use with interweaving forest, agricultural and built-up areas are characteristic of Slovenia. Forests cover more than one half of the surface area and built-up areas slightly less than 3%, according to CORINE Land Cover data. However, the share of built-up areas has been increasing and there are almost 200 brownfield sites, covering almost one thousand hectares, which are the result of abandoned industrial, military, transport, infrastructure or mining activities.

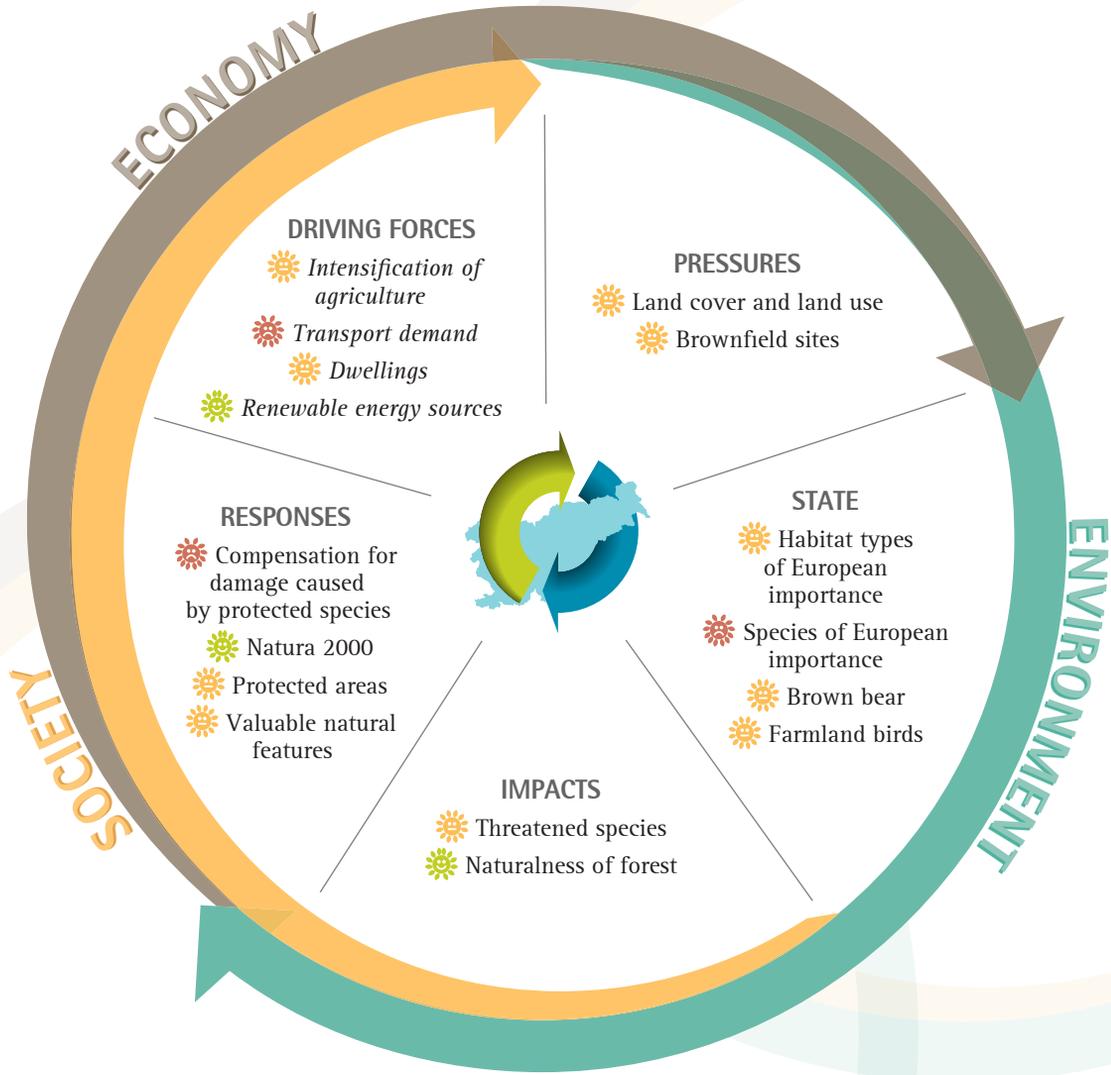
Slovenia's biotic wealth is reflected in its habitat types and species of European importance. Nearly half of the habitat types and 28% of the species have favourable conservation status. The status of one quarter of the habitat types and 13% of the species is poor. For this reason the management of Natura 2000 sites, which were established in order to conserve these habitat types and species, is very important. Natura 2000 sites amount to 7 683 km² or 37.9% of Slovenia's land area. One of the best-known species of European importance in Slovenia is the brown bear. Its population status has most probably been stable in recent years; it is estimated at 390 to 480 individuals. Nearly half of the mammal species, i.e. 41 including the brown bear, and more than four fifths of all known amphibian and reptile species are on the red list of threatened species. In order to facilitate the coexistence of humans and protected animal species, the state pays compensation for any damage caused by these animals to properly protected property. There were slightly less than 1300 such damage events in 2012. The fragile balance in the coexistence of birds and agricultural activities is reflected in the farmland bird index, which fluctuates over the years; in 2013 the population was more than one fifth smaller than in 2008.

The effective management of protected areas, i.e. the national, regional and landscape parks and nature reserves covering in total 13% of the territory, can facilitate the conservation of ecosystems and natural processes, as well as the conservation of areas with a quality and long-term interaction of humans with nature that have a high ecological, biotic or landscape value. Slovenia has also identified 14 970 valuable natural features, of which 9 083 are underground caves.

Forests have a special place in the biotic wealth natural tree composition, which indicates

of Slovenia. More than half of them still has the their resilience and sustainable management.

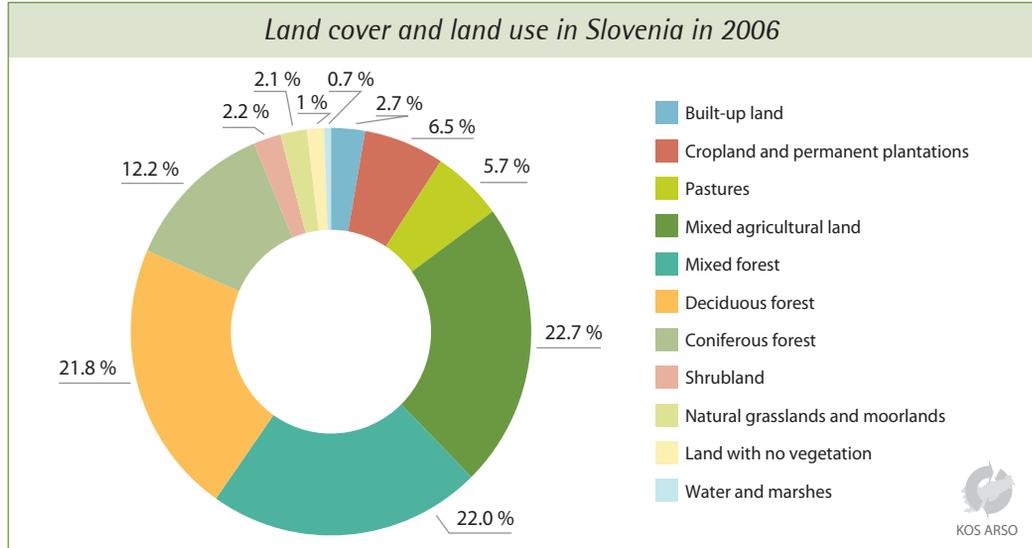






LAND COVER AND LAND USE

Diverse land cover and land use with interweaving forest, agricultural and built-up areas are characteristic of Slovenia.



Source: CORINE Land Cover 2006, Slovenian Environment Agency, Surveying and Mapping Authority of the Republic of Slovenia, European Environment Agency, 2007

More than half of Slovenia's land area is covered by forests (56% or 58% including shrubland), while other mostly natural vegetation accounts for 4%, 35% of the surface area is intended for farming, and slightly less than 3% is artificial areas.

This structure of land cover and use can be derived from satellite images captured in 2006 according to CORINE Land Cover methodology. Very similar structure can be interpreted from preliminary data of the 2012 capture. The same methodology was used to establish the status in 2000 and 1996.

Changes detected in Slovenia are relatively small and do not involve much more than one tenth of one percent of the entire territory in any period considered. However, it should be noted that under the methodology used, only changes in land cover that are larger than 5 ha are detected.

The majority of changes were detected in forest areas, i.e. forest clearance and reforestation. Some forest clearance was required for infrastructure construction. Approximately two thirds of the new built-up areas (after 2000) used to be forests

while the remaining third were agricultural areas.

Artificial areas have increased; between 1996 and 2006, the areas intended for road infrastructure increased by 603 ha; the majority of larger construction sites that were opened after 2000 (507 ha) are also intended for road infrastructure. Areas intended for industry and trade have increased by at least 86 ha. Preliminary data on changes between 2006 and 2012 also show an increase in artificial areas by 430 ha.

According to CLC2006, the cropland category includes 112,237 ha, vineyards 15 723 ha and other permanent plantations 3,627 ha, which amounts to 6.5% of Slovenia's land area. No major changes were detected in agricultural land categories in the 2000–2006 period (nor in 2012 according to preliminary data).

Diverse land cover with interweaving forest and agricultural areas is characteristic of Slovenia; mixed areas cover nearly one quarter of its entire surface area. The diversity of landscape patterns and interweaving of different land uses allows for greater biodiversity, and represents the natural and cultural heritage.



kazalci.arso.gov.si

TP01 Land cover and land use

TP03 Built-up land

GZ04 Forest area

KM10 Land use change and agriculture

SE08 Ecological footprint

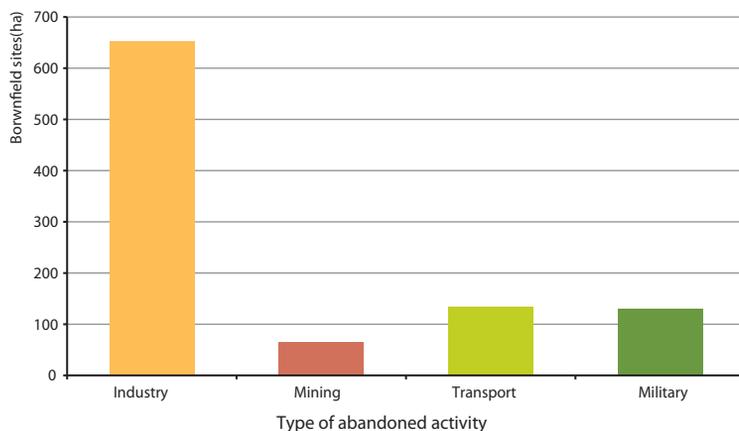


BROWNFIELD SITES

There are almost 200 brownfield sites in Slovenia amounting to nearly one thousand hectares.



Brownfield surface area by type of abandoned activity



Source: Record of brownfield sites, Department of Geography, Faculty of Arts, University of Ljubljana, 2011

According to the survey of 2011, there were 200 brownfield sites covering almost 1000 ha in Slovenia, which are suitable for expanding activities and to which new development projects and activities should primarily be directed so as to relieve the pressure on agricultural and forest areas.

The indicator shows the surface area and type of brownfield sites in Slovenia in 2011 resulting from abandoned activities and the change (degradation) of the land's function. This includes all areas degraded due to an industrial activity, military activity, mining (surface degradation) and areas of

transport and infrastructure facilities but not some other categories, such as degraded residential or agricultural areas (e.g. former farms with associated land). All areas larger than 1 ha are included, as a rule.

In all, there were 194 sites recorded, with a total surface area of 979 ha. They are present in 82 municipalities, and the largest one is in Lendava Municipality (72 ha). The majority (32) are in the Osrednjeslovenska statistical region, followed by the Savinjska (26) and Gorenjska (22) regions. There were no sites complying with the criteria recorded in the Koroška

region, while 9 were identified in the Zasavska region despite its small size. The majority of brownfield surface area is in the Podravska and the Osrednjeslovenska regions, while the sites in the Zasavska, Goriška and Notranjsko-kraška statistical regions cover the least surface area. There were as many as 49 sites larger than 5 ha recorded, of which 28 are industrial; 20 sites are even larger than 10 ha.

As expected, the majority of recorded brownfield sites are former industrial areas, which predominate in the central part of Slovenia and in old industrial centres in other regions.

Unresolved and dispersed ownership presents the greatest obstacle to the management of brownfield sites at the local/regional level and to the planning and placement of new activities and the remediation of these areas. Private ownership heavily predominates. Almost 200 ha are publicly-owned.



kazalci.arso.gov.si

TP02 Brownfield sites

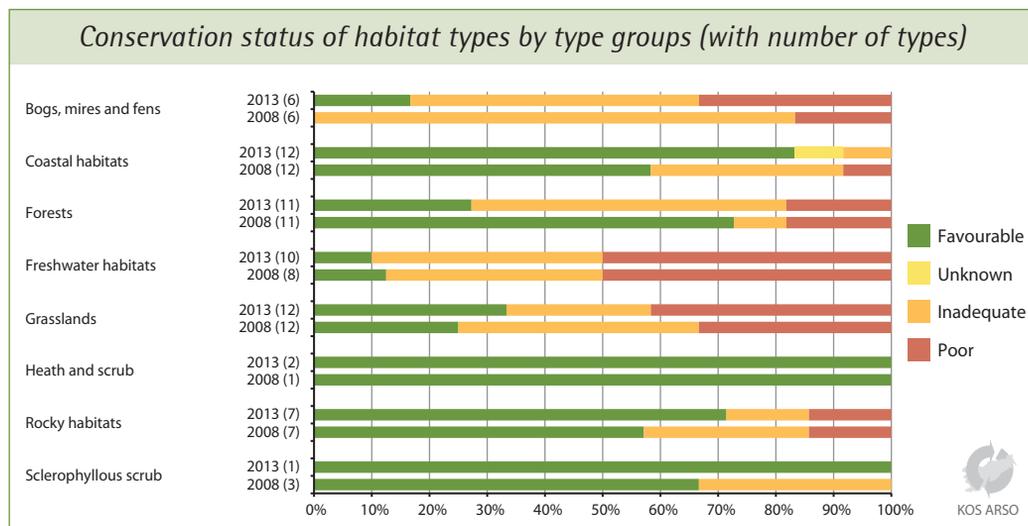
TP03 Built-up land

KM10 Land use change and agriculture



HABITAT TYPES OF EUROPEAN IMPORTANCE

Nearly half of the habitat types have favourable conservation status but the status of one quarter is poor.



Source: Report on the conservation status of species and habitat types pursuant to Article 17 of the Habitats Directive, Ministry of Agriculture and the Environment, Institute of the Republic of Slovenia for Nature Conservation, 2013 (preliminary data)

Freshwater and bogs, mires and fens habitat types are very vulnerable because of their small size, which is reflected in their conservation status assessment. Inadequate water-course management, changes in the water regime, pollution, the improper use of water, riverbeds and other water body elements, urbanisation and the introduction of invasive species are the main factors contributing to the poor conservation status of freshwater, bogs, mires and fens habitat types.

Another group of habitat types with poor conservation status is grasslands. The intensification of agriculture on one hand and the abandonment of agricultural land-use on the other are the main factors affecting the conservation status of grasslands. The poor status is amplified by urbanisation, changes in the water regime and the introduction of invasive species.

The conservation status of forest, shrub and coastal habitat types in the EU as a whole is worse than in Slovenia. In 2008, merely 17% of habitat types in the EU had favourable conservation status.

The indicator concerns the conservation status of habitat types of European importance identified as such pursuant to European legislation. The conservation status is assessed according to the following:

- whether the natural range and areas it covers within that range are stable or not diminishing;
- whether the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future;

- whether the conservation status of its typical species is favourable. The conservation status is a measure of impacts on a habitat type and its typical species.

The conservation status has been assessed as favourable for a large share of habitat types of European importance in Slovenia (46%). This is 3% more than in 2008. The best preserved are marine, coastal and halophytic habitat types and shrub and rocky habitat types, which also suffer the least pressure from human activities.



kazalci.arso.gov.si

NB12 Habitat types of European importance

NB11 Species of European importance

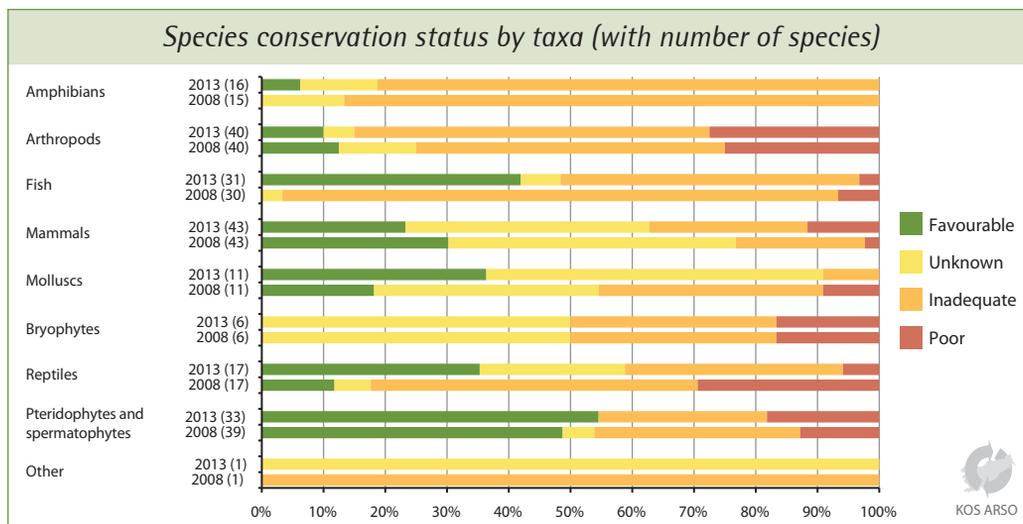
NV03 Natura 2000

NB09 Plants – invasive species



SPECIES OF EUROPEAN IMPORTANCE

The conservation status of species in Slovenia shows that more than half fail to reach favourable status.



Source: Report on the conservation status of species and habitat types pursuant to Article 17 of the Habitats Directive, Ministry of Agriculture and the Environment, Institute of the Republic of Slovenia for Nature Conservation, 2013 (preliminary data)

cies with the worst conservation status increased by 1%. The main reason for the unfavourable species conservation status in Slovenia is habitat loss caused by unsustainable management and other human activities affecting the environment. Because of great pressure on the habitats of extensive agricultural landscape and inland waters exerted by urbanisation and unsustainable development, the conservation status is the worst in arthropod species (crustaceans, lepidopterans, coleopterans and odonates). The development trend is also unfavourable for these species. Favourable conservation status is most common in pteridophytes and spermatophytes, of which more than half of the species have favourable conservation status. Many of these species are bound to forest habitat types, which are mostly well-preserved. Compared to 2008, the share of species with favourable conservation status has increased the most in fish species, mostly because of better knowledge about the status of these species and not because of the improved conditions in nature. For almost one fifth of species in Slovenia the conservation status has not been established owing to a lack of data and unknown state.

This indicator concerns the conservation status of species of European importance identified as such pursuant to European legislation. The following is assessed:

- whether population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitat;
- whether the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;
- whether there is, and will probably continue to be, a suf-

ficiently large habitat to maintain its populations on a long-term basis.

The species conservation status is a measure of impacts on a species that could affect the distribution and abundance of its populations in the long term.

The conservation status of the majority of species of European importance in Slovenia is unfavourable. Only 28% species (8% more than in 2008) had their conservation status assessed as favourable. Compared to 2008, the number of spe-



kazalci.arso.gov.si

NB11 Species of European importance

NB12 Habitat types of European importance

NV03 Natura 2000





BROWN BEAR

The brown bear population status has most probably been stable in recent years; it is estimated at 390 to 480 individuals.



Average number of bears sighted per counting point



Source: Statistics from monitoring population abundance trends and population structure in brown bears, Slovenian Forest Service and Hunters Association of Slovenia, 2013

The brown bear population in Slovenia is a part of the population living in the area of the Alps, the Dinaric Alps and the Pindus Mountains, which is one of the largest populations in Europe. Its abundance is estimated at 2100–2500 individuals.

The Slovenian Forest Service has been monitoring the brown bear population status since 1995 and assesses it as favourable. The brown bear depends on large forest areas, which in Slovenia are primarily high karst fir and beech forests, there-

fore, this indicator indirectly reflects the conservation status of these forests, the majority of which are included in the Natura 2000 network. The species is on the red list of threatened species, in the E category (endangered species). It is protected by Slovenian, European and international legislation.

In Slovenia, the brown bear population status has been monitored since 2003 on the basis of regular counting at permanent counting points. In the 2004–2012 period, the small-

est number of bears were sighted in 2007. This period is still too short to assess the trend in population size.

The reconstruction of population dynamics in the study conducted by the Biotechnical Faculty showed that bear culling in Slovenia has probably not been sustainable in the past; however, the population has not declined as there has been a constant inflow of bears from Croatia, where the extent of culling has been smaller. The estimated abundance for 2012 was approximately 440 individuals. At the end of 2007, the abundance was estimated by the molecular genetic method at 394 to 475 individuals.

Brown bear population management is based on the Strategy for brown bear (*Ursus arctos*) management in Slovenia. In 2012, 132 bears were taken from the wild, mostly by culling. In the 1995–2012 period, 57% of males and 41% of females were taken from the wild population. This ratio is a departure from the natural sex structure, as the ratio at birth is normally 1:1, and contributes to the increase in population fertility.



kazalci.arso.gov.si

NB06 Brown bear

NB11 Species of European importance

NB12 Habitat types of European importance

NV03 Natura 2000

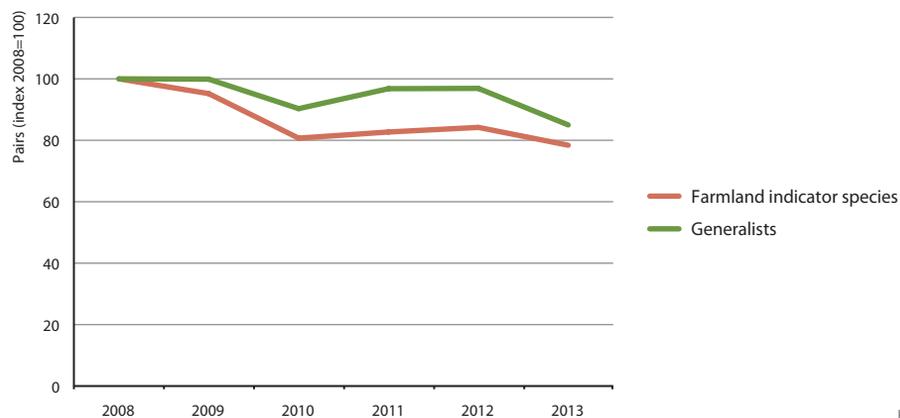
NB02 Threatened species

FARMLAND BIRDS

The Slovenian farmland bird index for the 2008–2013 period shows a 21.6% decline.



Slovenian farmland and generalist bird indexes



Source: The monitoring of widespread bird species to determine the Slovenian farmland bird index – Report for 2013, DOPPS, 2013

Typical farmland birds are dependent on extensive agricultural practices and their populations are mostly diminishing owing to the intensification of agriculture (reduced landscape heterogeneity, melioration, shrinking grasslands, increased pesticide input etc.). Reverse pressure also exists, particularly in the Mediterranean region, where farming is being abandoned and land is being overgrown and reclaimed by forest.

Changes in the populations of 29 typical farmland bird species in Slovenia are measured by the relative change (index) in the number of pairs on the basis of field surveys. It is

expected that we will be able to monitor long-term population trends, as the monitoring is designed robustly and on a large number of plots (103 plots in the 2008–2013 period). Furthermore, a great part of the survey is done by volunteers in the vicinity of their homes, and if data for a certain year are missing, they can be substituted by data from a well-fitting statistical model.

Data are available only for the last six years, so it is still difficult to determine a long-term trend. In the period from 2008 to 2013, the populations of common farmland bird species

declined by 21.6% (index 78.4). The comparison of this index with the index of undemanding species as regards habitat, i.e. generalists (85.0%), for the 2008–2013 period and increasing gap between these indexes indicate that the conditions for indicator farmland bird species are deteriorating. The trend of grassland species in Slovenia causes concern; index 67.2 for the 2008–2013 period. They are primarily affected by the transformation of grasslands into fields resulting from favourable subsidy schemes. Many species are also affected by the intensification of mowing and grassland management. With regard to individual species, some have faced distinct population difficulties in this period. There has been a sharp decline in populations of marsh warbler, sky lark, linnet, common stonechat, and turtle dove. Only two species have experienced a moderate rise, the barn swallow and yellow wagtail.



kazalci.arso.gov.si

NB12 Farmland birds

KM05 Agricultural areas with high nature value

KM04 Intensification of agriculture

NB11 Species of European importance

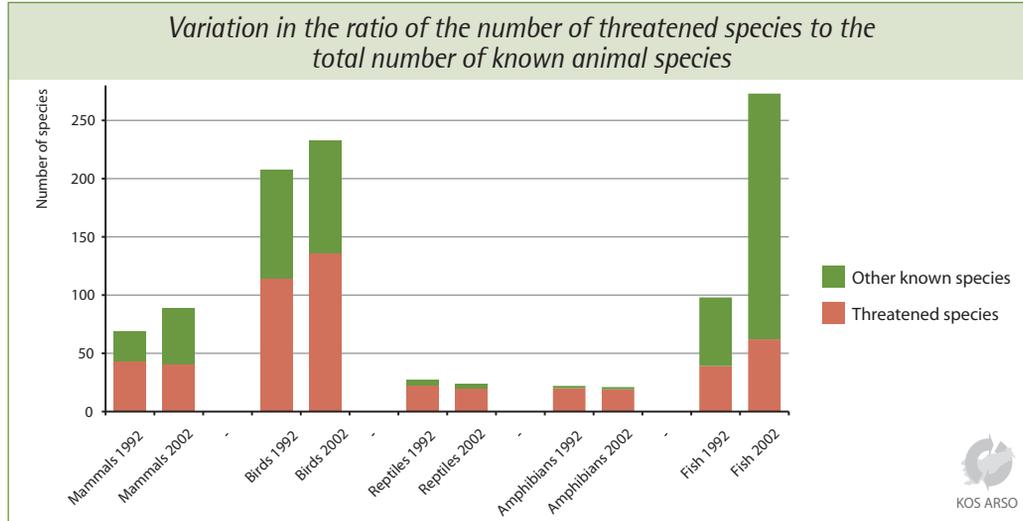
NB12 Habitat types of European importance

NV03 Natura 2000



THREATENED SPECIES

More than four fifths of all known amphibian and reptile species and almost half of mammal species (i.e. 41) are on the red list of threatened species.



Source: Nature protection, Red list of threatened animal species in Slovenia, no. 17, 1992; Rules on the inclusion of threatened plant and animal species in the Red List (Uradni list Republike Slovenije, no. 82/2002)

Despite its small size, Slovenia has an exceptionally high biodiversity. Many plant and animal species are declining in number and are threatened by extinction. For example, more than four fifths of all known amphibian and reptile species and almost half of mammal species (i.e. 41) are on the red list of threatened species.

A threatened species is a plant or animal species for which it has been established that its abundance is declining to such an extent that it might partly or entirely disappear in a certain

area. There are several threat categories – endangered species are under a direct threat, the existence of vulnerable species depends on the existence of their ecosystem, and rare species are only potentially threatened.

An endangered species is a species facing the risk of extinction if the threat continues. It is a species whose abundance has declined to a critical level or is rapidly declining. The endangered species include the following: greater pasqueflower (*Pulsatilla grandis*), brown bear (*Ursus arctos*),

eagle owl (*Bubo bubo*), sand lizard (*Lacerta agilis*) and fire-bellied toad (*Bombina bombina*).

A vulnerable species is a species whose abundance has declined or is declining in a major part of its range. It is a species living in areas that are very vulnerable to human impact. The vulnerable species include the following: Blagay's daphne (*Daphne blagayana*), European wildcat (*Felis silvestris*), Northern goshawk (*Accipiter gentilis*), nose-horned viper (*Vipera ammodytes*) and European green toad (*Bufo viridis*).

A rare species is a potentially threatened species owing to its rareness, which might quickly progress to endangered species category if threatened. The rare species include the following: bay laurel (*Laurus nobilis*), Brandt's bat (*Myotis brandtii*), carrion crow (*Corvus corone corone*), green sea turtle (*Chelonia mydas*) and black proteus (*Proteus anguinus parkelj*).



kazalci.arso.gov.si

NB02 Threatened species

NB10 Dolphins

NB04 Underground biodiversity

NB06 Brown bear

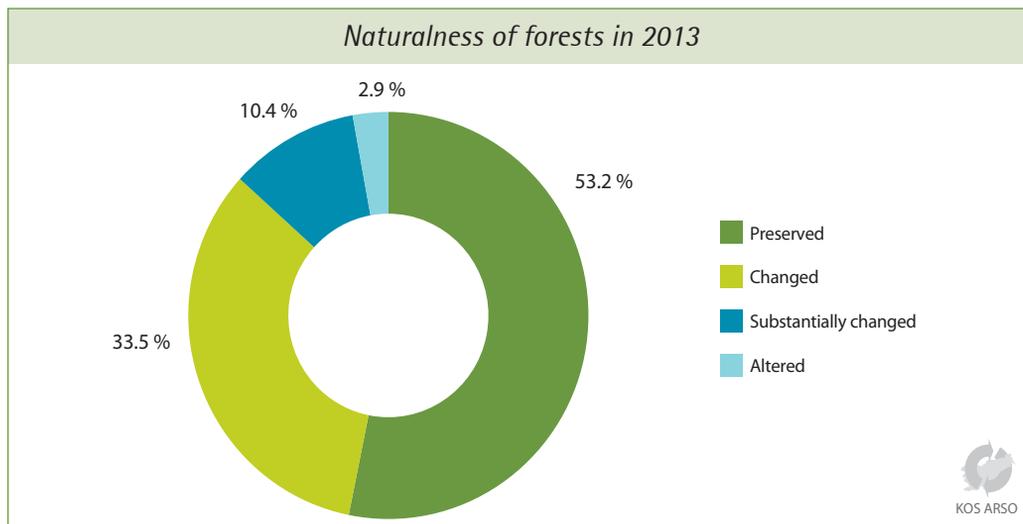
NB11 Species of European importance

NB05 Plants – species richness and endangered species



NATURALNESS OF FOREST

Natural tree composition has been conserved in more than half of forests.



Source: Central Database, Slovenian Forest Service, 2014

Naturalness of forest is an indicator showing the difference between the current and natural tree composition of forests. The share of actual growing stock by tree species is compared with the natural tree composition taking account of forest communities in a particular section.

Naturalness of forest can be described by the following four categories, depending on the share of tree species non-native to the area: preserved (up to 30%), changed (31–70%), substantially changed (71–90%), altered (over 90%).

The mountainous character of Slovenia, the inaccessibility of karst terrain and the consequently high share of forests that are difficult to access are the main reasons why the hu-

man impact on forests in Slovenia has been less detrimental than in the majority of other central European countries. This is why forests are relatively well preserved, especially as regards variety in the natural composition of tree species and the structure (vertical and horizontal) of stands.

At present, the share of preserved forests exceeds 50%, while only a little over one tenth is substantially changed, mostly spruce and altered forests. The departure from natural forest is mostly due to the introduction and spreading of conifers to habitats not suitable for them – primarily the planting of Norway spruce and black pine.

The changed or poorer tree composition poses the great-

est risk in the long term, as it results in a lower stability of stands, lower resistance of forests and consequently increased risk of damage (particularly fir and spruce) due to air pollution. A less stable forest is also more vulnerable to natural disasters. The tree species that are not suitable for a particular habitat (e.g. spruce) are under a lot of stress during dry and warm years and thus less resistant to bark beetle infestation.

The status of stands has been improving in terms of natural tree composition, through careful planning, increasing the share of deciduous trees in spruce stands and progressive indirect substitution. According to the FAO Global Forest Resources Assessment, Slovenia has a much larger share of natural forests than Europe as a whole.



kazalci.arso.gov.si

GZ02 Ohranjenost gozdov

NV03 Natura 2000

GZ01 Forest decline and tree defoliation

GZ04 Forest area

GZ05 Deforestation

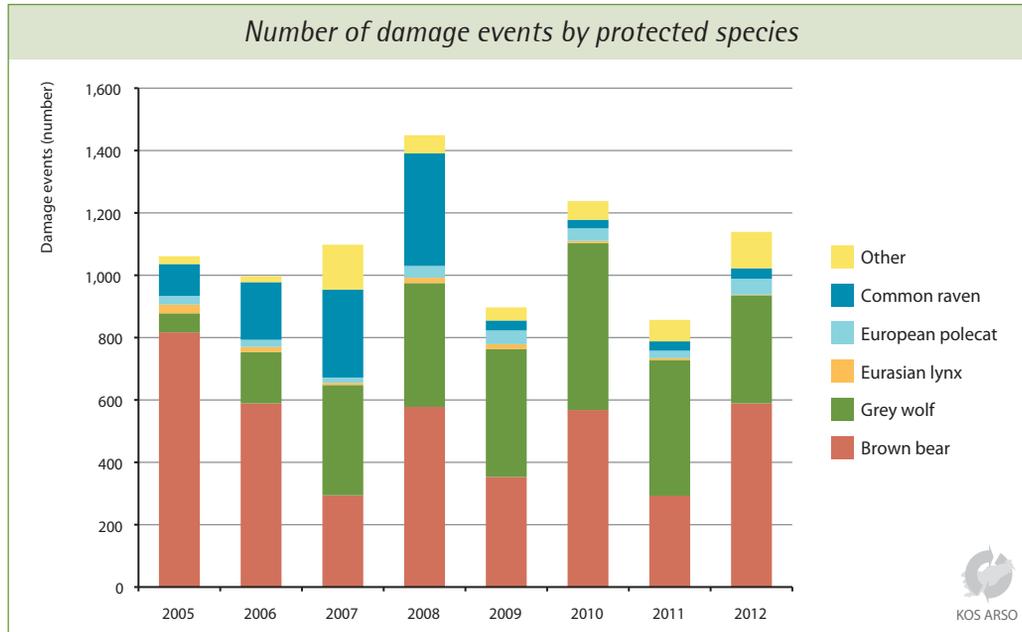


COMPENSATION FOR DAMAGE CAUSED BY PROTECTED SPECIES

In 2012, 1290 cases involving compensation for damage caused by protected species were considered



Number of damage events by protected species



Source: ODSEV, Slovenian Environment Agency, 2014

1400). The funds approved for compensation payments have also varied, but mostly increased. In 2012 they amounted to just over half a million euros, which is a little less than in 2010, when demand was the highest.

Damage caused by protected species was noticed by owners mostly in the period from July to October. Eighty percent of damage events for which compensation was approved were caused by large carnivores (most often brown bear and grey wolf); their share ranges between 75% and 92% of funds.

The majority of compensation is paid for damage to sheep and goats (between 40% and 78% in a year). In the last years examined, the use of funds for the payment of damages in the beekeeping sector has decreased by more than 10%. The share of funds used to compensate damage to fruit trees varies between 4% and 8%.



Animals of protected species may cause damage to property. Property owners must manage the property with due care and diligence and take any protective measures necessary. If, despite the measures taken, damage occurs, its costs shall be borne by the Ministry of Agriculture and the Environment. The proposed amount of compensation is de-

termined according to a scale set by the ministry. Payments are made on the basis of compensation claims filed by the persons suffering damage. A person who suffers damage reports the damage to the Slovenian Forest Service.

The number of damage events varies, the lowest was in 2011 (approximately 900) and the highest in 2008 (more than



kazalci.arso.gov.si

NB07 Compensation for damage caused by protected species

NB06 Brown bear

NB11 Species of European importance

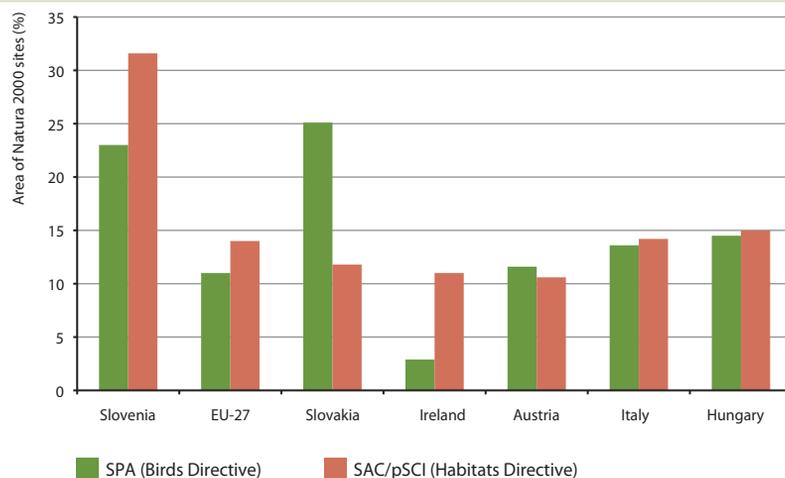
NB02 Threatened species

NATURA 2000

Natura 2000 sites amount to 7683 km² or 37.9% of Slovenia's land area.



The share of Natura 2000 sites in the total surface area of the territory of Slovenia, EU-27 and some other countries in 2010 (land area)



Source: Register of Natura 2000 areas, Slovenian Environment Agency, 2013; Natura 2000 Barometer, European Topic Centre for Biodiversity, 2010



The Natura 2000 sites were established in 2004 and supplemented in 2013. They constitute almost 7 683 km² or 37.9% of Slovenia's territory.

Natura 2000 is a European network of Special Protection Areas declared in the Member States of the EU with the main objective of preserving biodiversity for future generations. Special Protection Areas are intended for the conservation of animal and plant species and habitats which are rare or threatened at the European level due to human activities.

There are two types of Natura 2000 sites:

- Special Areas of Conservation and Potential Sites of Community Interest (SAC/pSCI) designated under the Habitats Directive; and
- Special Protection Areas (SPA) for conserving or attaining favourable bird conservation status designated under the Birds Directive.

Approximately 70 % of the Slovenian Natura 2000 network is covered by forests, which indicates that they are generally well preserved. In the past, lowland floodplain for-

ests were extensively cleared. They do not have a favourable conservation status and are especially protected by the network. Of the non-forested areas in the Natura 2000 network, about 20% are utilised agricultural areas, of which the most important are extensive meadows. In many areas, these still have a favourable conservation status; however, the pressure diminishing the favourable conservation status is great, either as a result of natural overgrowing due to the abandonment of farming or the intensification of their use.

The Natura 2000 network also affords special protection to caves. Inland waters represent only slightly more than one percent of the network's surface area, but their significance for the network conservation status is immense. Some built-up areas are essential Natura 2000 sites, as human dwellings are important for the reproduction, rest and wintering of certain animal species. These are primarily birds (e.g. white stork, scops owl) and mammals (e.g. bats).

Natura 2000 sites form a part of ecologically important areas, i.e. areas of ecologically important habitat types, their parts or larger ecosystem units that significantly contribute to biodiversity conservation in Slovenia. Since the 2013 amendment, ecologically important areas cover 54.9% of Slovenia's territory.



kazalci.arso.gov.si

NV03 Natura 2000

- NB11 Species of European importance
- NB12 Habitat types of European importance
- NV01 Nature areas under protection

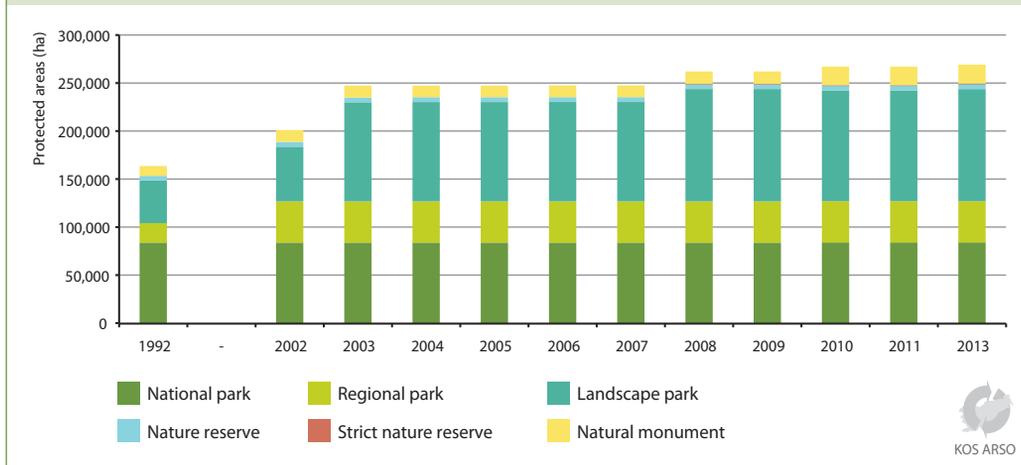


PROTECTED AREAS

Protected areas cover slightly less than 13% of Slovenia's surface area.



Protected areas by categories



Source: Register of protected areas, Slovenian Environment Agency, 2013

Landscape Park in 2003, Ljubljansko Barje Landscape Park in 2008 and Radensko Polje Landscape Park in 2012.

There are currently 1 national park, 3 regional parks, 44 landscape parks, 1 strict nature reserve, 59 nature reserves and 1 159 natural monuments in Slovenia that are protected by state and municipal acts.

Protected areas partly overlap with Natura 2000 sites. They cover smaller surface area than Natura 2000 sites; however, their management is better organised through well-formed management plans and designated managers.

Slovenia has exceptionally diverse landscapes, and rich plant and animal diversity. It also has many people who by living close to nature have become aware that humans and nature are irrevocably interdependent. The establishment of protected areas is one of the most important (and oldest) mechanisms for conserving plant and animal species and their habitats.

The indicator shows the share of protected nature areas in Slovenia in terms of the method of protection and category in accordance with the IUCN criteria. Protection areas are divided into wider (national, regional, landscape park) and

narrower (strict nature reserves, nature reserves and natural monuments) protected areas and are subject to regulated protection regimes.

Data for the period up to 2004 show that the share of protected areas has been increasing continuously. A significant part belongs to the only national park in Slovenia, Triglav National Park, which was first protected in 1981. In 2010 its surface area was extended by 174 ha, which is almost 0.01% of Slovenia's surface area. The protected surface area has increased recently, mostly owing to the designation of four large parks, i.e. the Notranjska Regional Park in 2002, Goričko



kazalci.arso.gov.si

NV02 Protected areas

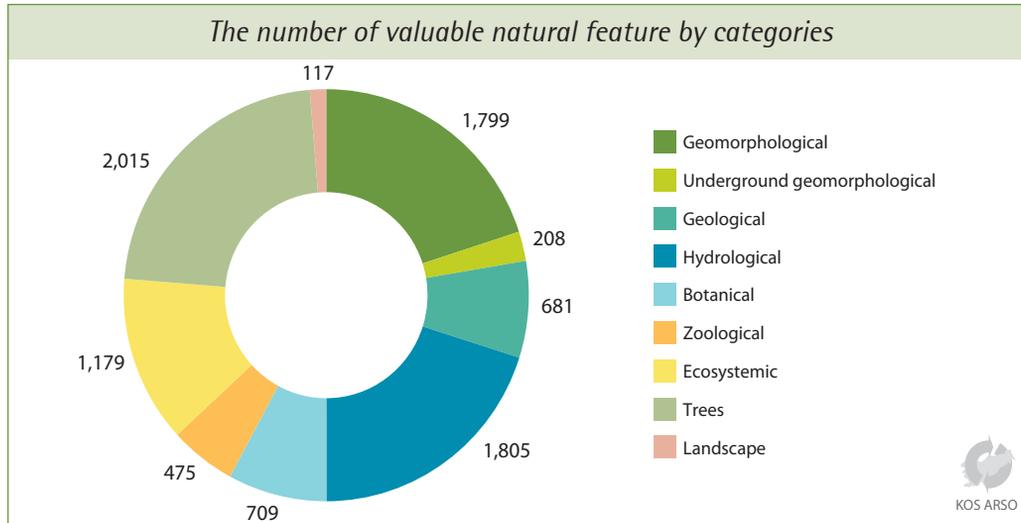
NV01 Nature areas under protection

NV04 Valuable nature features

NB02 Threatened species

VALUABLE NATURAL FEATURES

There are 14,970 valuable natural features in Slovenia, of which 9,083 are underground caves.



Source: Register of valuable natural features, Slovenian Environment Agency, 2013

There are 14,970 elements of nature with the status of a valuable natural feature in Slovenia, of which 9,083 are underground caves. Any activities affecting valuable natural features may only be carried out when no other spatial or technical options are available.

Valuable natural features cover the entire natural heritage in the territory of Slovenia. In addition to a rare, valuable or well-known natural phenomenon, a valuable natural feature can be any other valuable phenomenon; component or part of living or non-living nature; nature area or part thereof; an

ecosystem; landscape; or designed landscape. These include geological phenomena; minerals and fossils and mineral and fossil sites; surface and underground karst features; underground caves; gorges and other geomorphological phenomena; glaciers and glacial forms; springs; waterfalls; rapids; lakes; bogs; brooks and rivers with banks; sea-shore; plant and animal species and exceptional specimens and habitats thereof; ecosystems; landscape; and designed landscape.

The density of valuable natural features for all of Slovenia is 0.74 per km². The total surface area of all valuable natural fea-

ture sites amounts to 2,458.44 km², which represents 12.13% of the country's territory. Smaller sites predominate, and only 347 are larger than 1 km². In terms of surface area, the largest geomorphological valuable natural features are the Pokljuka and the Jelovica plateaus, followed by the Nanos thrust-fold mountain and the Karst Rim. Among valuable natural features are 3,142 objects that are presented as points in space.

In 2010, 9,083 caves were granted the status of underground geomorphological valuable natural feature of state importance. There are 217 caves that are closed to the public or entry into which is controlled. Twenty-two caves are identified as tourist caves.

Any activities affecting valuable natural features may only be carried out if no other spatial or technical options are available, and even then, they need to be performed so that the valuable natural feature is not destroyed and the properties for which this part of nature was recognised as a valuable natural feature are not changed.



kazalci.arso.gov.si

NV04 Valuable natural features

NV02 Protected areas

NV01 Nature areas under protection

NB04 Subterranean biodiversity

NB05 Plants – species richness and endangered species





WASTE AS A RESOURCE?

Our economy and prosperity are highly dependant on natural resources (national and imported). Given that some natural resources have become scarce or are only available in particular geographical areas of the world, it is important for Slovenia to move closer to a 'recycling society'. About one-fifth of annual resource extraction ends up as waste.

As a response to a need for waste prevention and to provide a better recycling rate, a waste management system with extended producer responsibility was initiated in 2004 (for some types of waste – packaging waste, end of life vehicles, medicinal waste products). In most systems, collection needs to be improved, whereas the recycling rates of the collected waste in general meet the targets. Certain types of waste cannot be appropriately treated in Slovenia, so they are exported.

Consumers are just one of the driving forces, with their way of life having an impact on the use of natural resources and waste generation. The number of dwellings is growing faster than the population. Private car ownership has almost doubled in the last 20 years. In terms of expenditures for 2012, the majority of costs are attributable to transport (16.8%).

The largest quantity of waste is generated from production and service activities (3.7 million tonnes in 2012, of which 120 thousand tonnes are hazardous waste). Since 2002, the recovery of such waste has amounted to more than 60%. In 2012, 672 thousand tonnes of municipal waste were generated (327 kg per capita). With separate waste collection and other legal measures, the quantity of landfilled municipal waste declined (74% in 2008 compared to 47% in 2012).

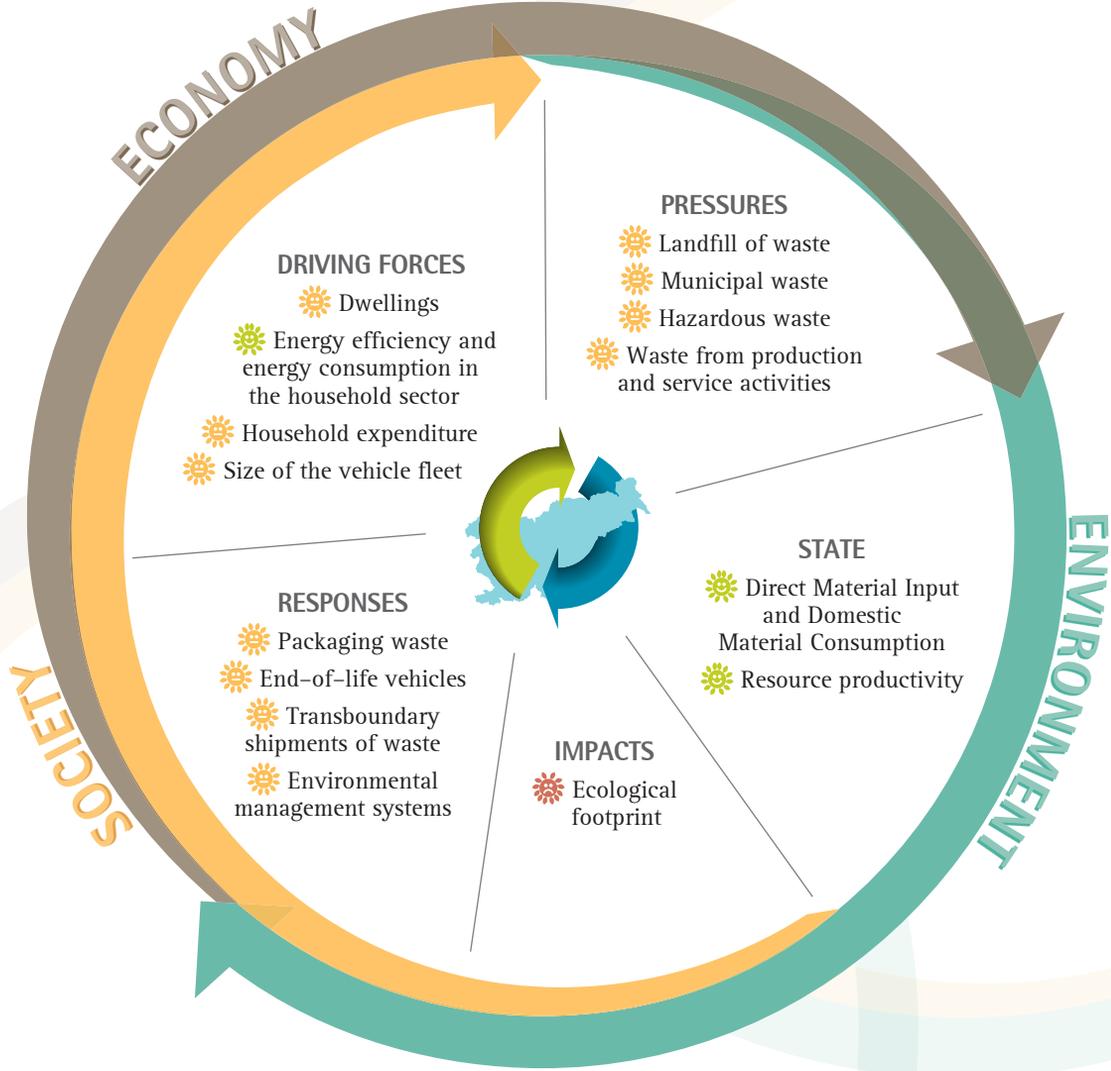
Domestic extraction of natural resources in Slovenia declined after 2007. In 2012, as much as 22 million tonnes were extracted, of which the vast majority were mineral resources used in the construction industry. Resource productivity has been rising since 2007, mainly on account of the reduced construction activity.

From the aspect of the limits of our planet, the ecological footprint of Slovenia exceeds its biological capacity. Slovenia has been running an ecological deficit since 1999.

2012 period. The footprint regarding biological also showed an upward trend.

Its carbon footprint increased the most in the 1992–resources as well as the infrastructure footprint

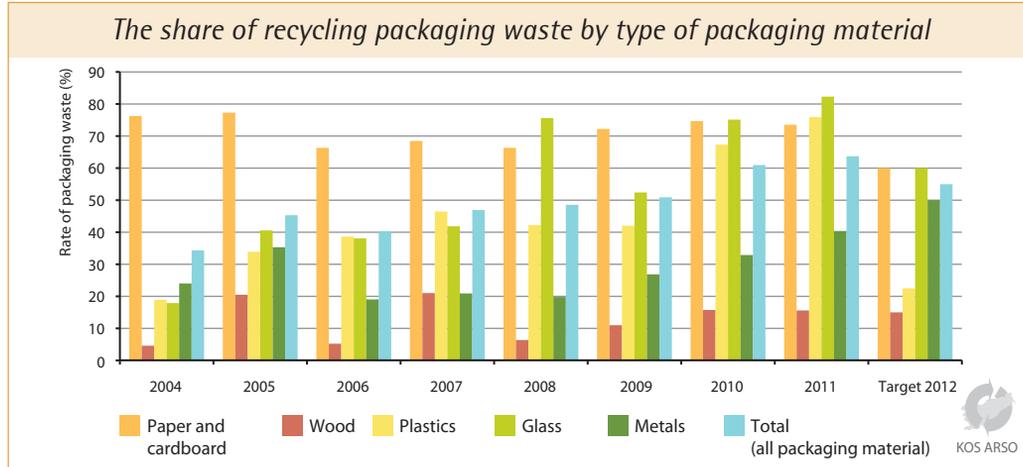






PACKAGING WASTE

Up to 2004, the majority of packaging waste was deposited, whereas nowadays about 70% is recovered.



Source: Analysis of annual Reports on waste management; Annual Reports of Slovenia to the European Commission, Slovenian Environment Agency, 2013

Waste management pays particular attention to packaging waste, not so much because of the generated quantities and risk potential, but primarily because of its enormous volume, short life cycle and substantial portion of organic matter. Up to 2004, the majority of Slovenian packaging waste ended up in landfills. Packaging waste accounted for 65% of mixed municipal waste. With the introduction of regulations providing for the payment of an environmental tax on packaging, the separate collection of packaging waste, the establishment of a system for processing packaging waste, and by focusing on achieving the objectives set for the recovery and recycling of packag-

ing waste, packaging waste management has seen substantial improvement.

The generation of packaging waste per capita in Slovenia stands at about 100 kg per year. It is treated by companies handling this type of waste. They collect municipal packaging waste that the inhabitants of a given municipality deposit separately from mixed waste, and the majority of packaging waste from production and service activities.

The recovery of packaging waste in Slovenia has been increasing and in 2011 stood at 70%. Recycling rates also continue their upward trend, in 2011 reaching 64%. Most of the material for recycling was glass and plastic packaging waste.

In 2010, the EU-27 generated 157 kg of packaging waste per capita on average. Twenty EU Member States, including Slovenia, have already reached the 2012 EU target, which dictates the recovery of no less than 55% of the total mass of packaging waste. In the EU-27, the disposal of packaging waste has been decreasing on average; incineration has stabilised since 2005 and has fluctuated around 13%.

The majority of EU Member States, including Slovenia, have still not managed to decouple packaging waste generation from GDP.

The environmental impacts of packaging begin with the exploitation of natural resources for its production and continue with the production itself and the collection and processing of packaging waste. The choice of materials, packaging design and redirection of useful material from packaging waste back to the manufacturing process are therefore all the more important.



kazalci.arslo.gov.si

OD13 Packaging waste

OD06 Direct material input and domestic material consumption

OD17 Waste from production and service activities

OD01 Municipal waste

OD07 Waste management

OD04 Transboundary shipments of waste

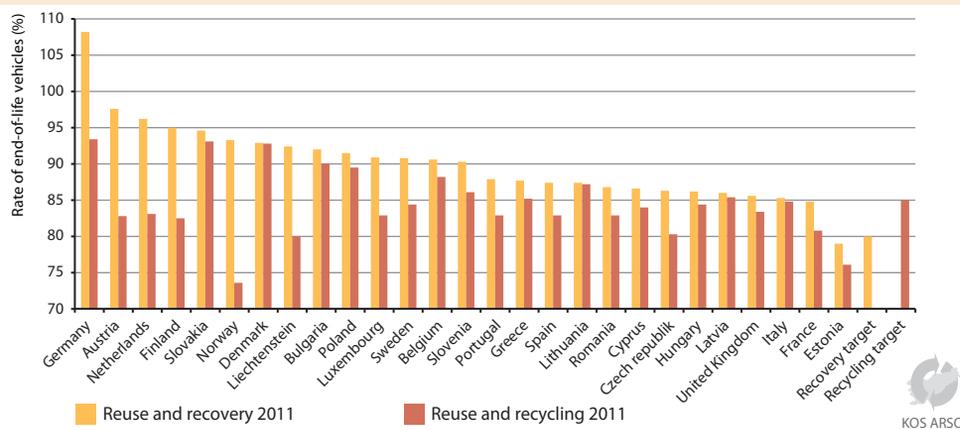


END-OF-LIFE VEHICLES

The collection of end-of-life vehicles is expected to improve, while the reuse and recycling target rates have already been achieved.



The rates of reuse and recycling of collected end-of-life vehicles in Slovenia and other EU Member States



Source: End of life vehicles, Eurostat, 2014

End-of-life vehicles (ELV) qualify as hazardous waste. The first system for the collection and processing of end-of-life vehicles was established in 2004. However, it included fewer end-of-life vehicles than expected. In 2012, a new regulation was adopted in this area in order to facilitate the achievement of the target rates for collection, reuse and recycling.

The majority of vehicle manufacturers in Slovenia are included in the joint plan for the collection and treatment of end-of-life vehicles. A vehicle owner who intends to discard an ELV as waste is required to deposit the vehicle at an au-

thorised and registered treatment facility. Upon depositing the vehicle, the owner is issued a certificate of destruction. The service is free of charge.

The number of newly registered motor vehicles reached a peak in 2008 (126,725) and decreased by 35% by 2012. Out of the total number of motor vehicles, passenger cars account for by far the highest share; in 2012, there were 63,084 newly registered passenger cars.

In recent years, the number of decommissioned ELVs in Slovenia has fluctuated around 6,500 per year. The last esti-

mates show that at least 30,000 end-of-life vehicles are generated annually in Slovenia. Their collection is expected to improve when the new regulation enters into force.

The rates of recovery and recycling of ELVs in Slovenia have reached the European average. In 2011, recycling and recovery rates from collected and decommissioned end-of-life vehicles stood at 86% and 90%, respectively. Thus, the targets set by the EU regulation have been achieved.

The European Parliament report shows that also in other Member States a considerable share of ELVs have not been included in the framework of the established decommissioning system. They estimate that around 50% of end-of-life vehicles are either exported to non-EU countries as second-hand vehicles, illegally decommissioned and their spare parts sold, or they are 'garaged' or abandoned.



kazalci.arso.gov.si

OD16 End-of-life vehicles

- PR11 Size of the vehicle fleet
- PR06 Public awareness about the effects of transport on the environment
- OD07 Waste management
- PR12 Average age of the vehicle fleet
- PR10 Transport accident fatalities

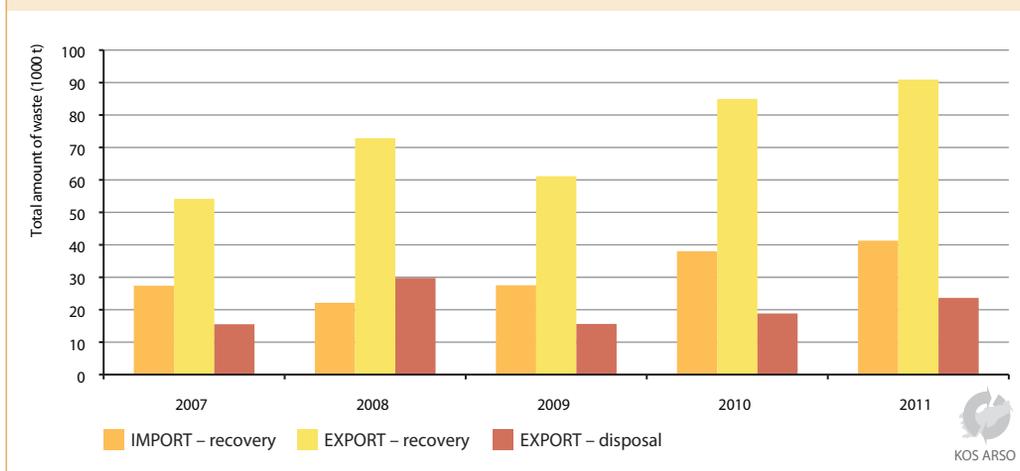


TRANSBOUNDARY SHIPMENTS OF WASTE

The import and export of waste into and from Slovenia have been increasing.



Treatment of waste imported to and exported from the country



Source: Transboundary Shipment of Waste Database, Slovenian Environment Agency, 2013

Supervision of transboundary shipments of waste was established mainly due to the export of hazardous waste for disposal. Since 1990, this area has been governed by regulations imposing on member countries the obligation, inter alia, to prevent illegal shipments of waste.

The amount of waste intended for transboundary shipments mainly results from price differences for recovery and disposal of waste, insufficient domestic capacities for recovery of waste, and the need for special processing technologies. In general, bigger countries have more diverse and technologically sophisticated facilities for recovery and disposal of waste.

The import of waste to Slovenia is permitted only for the

purpose of its recovery and disposal (and not for landfilling) provided that sufficient technical capacities are available. The export of waste from Slovenia for disposal purposes is only allowed if sufficient technical capacities and facilities required for harmless disposal are not available in the territory of the Republic of Slovenia or if such export is not in conflict with regulations.

The export of waste has been increasing since 2008. In 2011, it amounted to 116 thousand tonnes, mainly sludge from wastewater treatment plants (27%), and fluff – light fraction from shredding (10%). The waste was disposed of or recovered in Austria (45%), Hungary (32%), and Germany (14%).

In recent years, imports have also been increasing; in

2011, as much as 41 thousand tonnes of waste were imported, primarily for recovery by MPI-Reciklaža d. o. o. (almost 90%). Waste lead accumulators, the parts thereof and lead ash were imported mainly from Italy and Hungary. In 2011, Slovenia also imported waste to be used as fuel for energy production (10%).

In the last decade, the European Union has also been facing increased transboundary shipments of waste. In addition to illegal shipments and green waste (primarily due to the Asian market), special consideration is given to electrical and electronic equipment, which is exported from the EU to African and Asian countries for the purpose of reusing the components. In order to recover metals, the components are often incinerated in open fires, thus endangering human health and polluting the soil and water.

For an evaluation of the environmental and economic consequences of transboundary shipments, more detailed information is required on the categories of the waste shipped – this being the only way to establish the reasons for the shipments. A better overview of legal shipments at the EU level might also give a better indication of illegal shipments.



kazalci.arso.gov.si

OD04 Transboundary shipments of waste

OD08 Sewage sludge from urban wastewater treatment plants

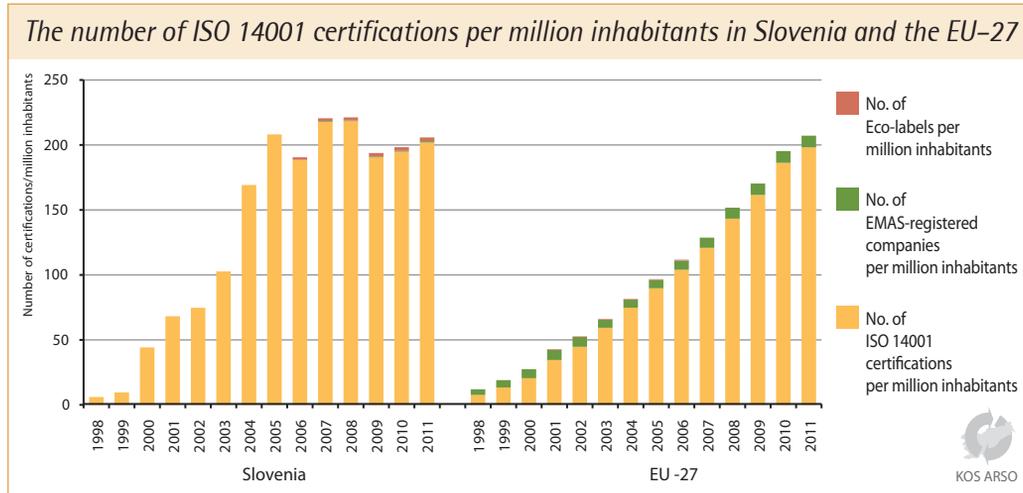
OD17 Waste from production and service activities

OD03 Hazardous waste



ENVIRONMENTAL MANAGEMENT SYSTEMS

The number of awarded ISO 14001 certifications has been increasing, whereas regarding EMAS, Slovenia is lagging behind the European average.



Environmental management systems – such as ISO 14001, EMAS, Ecolabel and environmental awards – are important economic instruments promoting sustainable production and consumption, as well as sustainable industrial policy. They have been introduced to promote continuous improvements, thereby enhancing the environmental performance of organisations. Their benefits are lower business costs and the increased competitiveness of enterprises.

ISO 14001 is an international standard for an environmental management system, setting out a range of requirements to be met by organisations, with a view to protecting the environment, preventing pollution and improving environmental performance.

EMAS is an instrument upgrading the ISO 14001 standard. It provides for enhanced transparency, credibility and periodic publication of validated environmental information.

The Ecolabel assesses a product's total environmental impact, from extraction of raw materials to eventual disposal and providing information to consumers on products and services.

The number of companies registered in accordance with ISO 14001 and EMAS has been increasing since 1995 in both Slovenia and the EU-27. In the EU, Slovenia is ranked among the countries with the average number of ISO 14001 certifications. In 2011, 202 organisations in Slovenia were ISO 14001 certified per million inhabitants in comparison with the EU-27 average,

which is 198 organisations per million inhabitants. Sweden has the highest number of ISO 14001 certified organisations per million inhabitants (430), followed by the Czech Republic (424).

With three EMAS awards up to and including 2011, Slovenia ranks in the bottom half of the EU-27 Member States.

In 2011, tourist accommodation services accounted for 36% of all awarded Ecolabels. Slovenia awarded seven Ecolabels in 2011 and has thus scored above the EU-27 average.

Slovenia also confers environmental awards. In 2012, the highest number of environmental awards were won for the following programmes: Responsible Care (118), clean production (33), and environment products of the year (21). The Responsible Care programme is a code of conduct reflecting the commitment of the global chemical industry. It primarily highlights the importance of health protection and safety at work.



kazalci.arso.gov.si

IP01 Environmental management systems

- EN11 Total energy intensity
- EN12 Electricity consumption
- TU01 Development and distribution of tourism
- OD17 Waste from production and service activities
- PS03 Greenhouse-gas emissions
- VD04 Quality of watercourses
- SE08 Ecological footprint
- OD06 Direct Material Input and Domestic Material Consumption
- OD18 Resource productivity

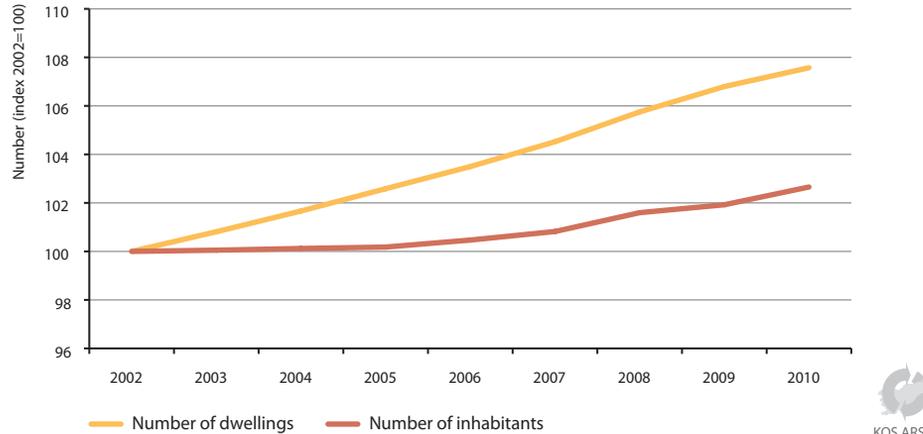


DWELLINGS

The number of dwellings grew faster than the number of inhabitants.



Development in the number of dwellings and inhabitants



Source: Construction of dwellings and dwelling stock, Statistical Office of the Republic of Slovenia, 2013

dwellings did not have a bathroom.

Almost half of all dwellings (houses and apartment blocks) are old and have extremely poor or no insulation, which results in considerable heat losses. In recent years, the Slovenian financial fund named the Ecofund has allocated grants to municipal residents with a view to promoting investments in solar heating systems, complete renovation of one- or two-dwelling buildings and the construction of low energy passive residential buildings and some individual measures concerning the renovation or retrofitting of existing residential buildings.

Our housing demands have a significant influence on the use of natural resources. Only a small percentage of recycled construction waste is used again in buildings. In addition to the building materials necessary for construction of the building, we still need energy, water and other raw materials for the products that are to be incorporated into the structures. On the other hand, all the phases, from construction and habitation to the demolition of built structures, place a burden on the environment. Land is needed and air and water are polluted. Consequently, the European Union has adopted a set of regulations that are currently more oriented towards energy efficiency in buildings and eco-innovations.

In Slovenia, the number of dwellings is growing faster than the number of inhabitants. Between 2002 and 2010, the number of dwellings increased by 7.6%, and the number of inhabitants increased by a mere 2.7%. One half of all dwellings were built after 1971. The construction of dwellings was most intense in the decade from 1971 to 1980.

According to the Statistical Office of the Republic of Slovenia, 844,349 dwellings had been constructed by the end of 2010; the estimated number for 2012 stood at 853,860. In 2012, the average dwelling size was 80 m². Spacious dwellings are available in the countryside. At the end of 2012, about 21% of dwellings had no central heating and 7% of



kazalci.arso.gov.si

PG03 Dwellings

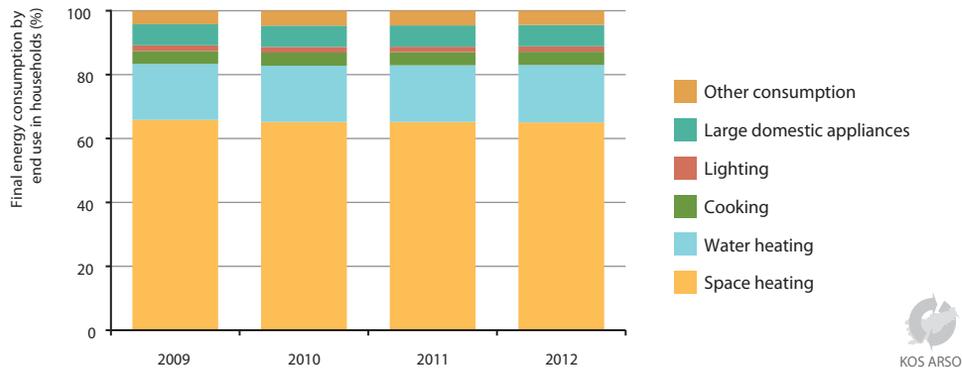
- OD14 Construction waste
- OD06 Direct material input and domestic material consumption
- PG05 Household electricity consumption
- PG04 Household energy and transportation fuel consumption
- PR03 Transport infrastructure investments
- PG02 Household number and size

ENERGY EFFICIENCY AND ENERGY CONSUMPTION IN THE HOUSEHOLD SECTOR

In the 2009–2012 period, energy efficiency increased significantly, particularly as regards heating systems and large household appliances.



The energy consumption structure by end use with climate-corrected energy use for heating in an average winter



Source: Statistical Office of the Republic of Slovenia, Institut "Jožef Stefan", 2014

Energy efficiency means getting the same service for less energy (an energy-efficient washing machine, for example, will wash the same amount of laundry with less energy while providing the same quality wash).

In the household sector, most energy was consumed for heating dwellings. In 2012, households consumed 34.9 PJ of energy (or 65%), followed by water heating (18%), large household appliances (7%), cooking (4%) and lighting (2%).

Over the 2009–2012 period, energy efficiency in the household sector increased by 5.9%. This is primarily due to the improved efficiency in space heating, which increased by

7.3% as a result of energy-saving renovations in the building stock, replaced heating systems, and a 6.3% increase in the efficiency of large household appliances. The energy efficiency of washing machines increased the most, i.e. by 12.8 %; an increase of 11.5% was recorded for freezers, 7.0% for refrigerators, 6.3% for drying machines, and 5.2% for dishwashers. Among household appliances, only TV sets increased energy consumption, by 5.8%, on account of larger TV screens. The efficiency of water heating improved by 0.9%, mainly as a result of replaced heating systems.

The following had an unfavourable impact on decreasing

energy consumption over the stated period: the increase in heated surfaces (by 3.3%), the number of electrical appliances (the number of large household appliances increased by 6.2%), and the number of inhabitants (by 0.3% over the 2009–2012 period).

With a view to improving energy efficiency, several energy-efficiency regulations for space heating systems and hot water systems for buildings were adopted. The EU has laid down energy performance requirements under which Member States are to ensure that by 31 December 2020 all new buildings are nearly zero-energy buildings. A strong incentive to improve the energy efficiency of energy-related products is provided by legislation laying down minimum energy efficiency and labelling requirements for such appliances, as is the case with large household appliances.

The funding of energy efficiency measures is provided by the Ecofund and since 2012 also by large energy suppliers to end users.



kazalci.arso.gov.si

EN28 Energy efficiency and energy consumption in the household sector

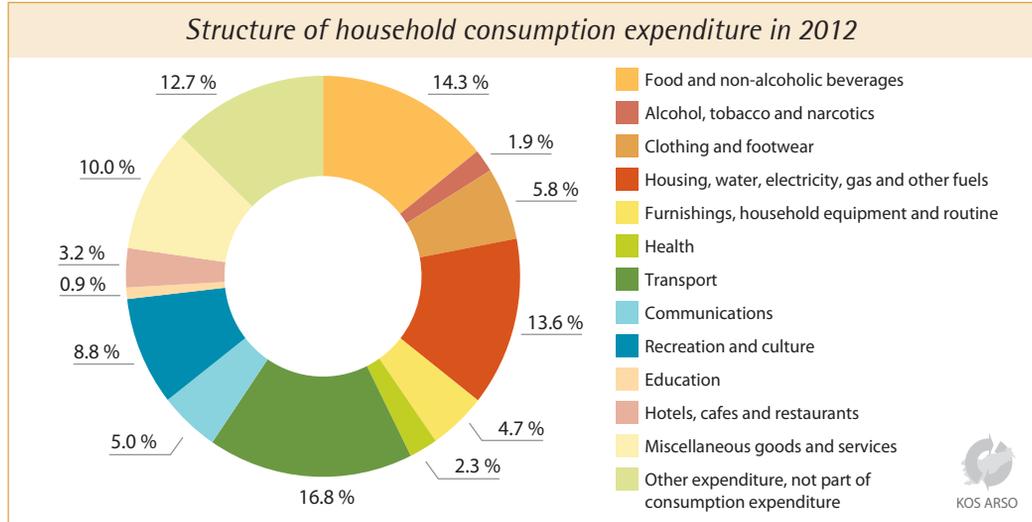
EN10 Final energy consumption by sectors
PG03 Dwellings





HOUSEHOLD EXPENDITURE

In 2012, the highest share of expenditure was spent on transport: 16.8% or 3,239 EUR per household.



Source: Average household consumption expenditure, Statistical Office of the Republic of Slovenia, 2014

reation and culture. Both categories belongs to those with lowest environmental pressure intensities. Among categories with higher than average intensities, like transport and housing, the share of expenditure remained relatively stable regarding the year 1995.

Households represent an important part of the production-consumption chain since household consumers make daily choices regarding goods and services, where and how to live, where to work, how to spend their leisure time, and which means of transport to use. Although the environmental impact of each household is relatively small compared to that of large industrial plants, due to their number, households are major contributors to the environmental burden. Most often, our choices are made with certain boundaries conditioned by past urban planning, transport infrastructure or settlements. However, even within the existing framework, it is possible to find a more balanced way of life.



kazalci.arslo.gov.si

PG06 Household expenditure

- SE01 Gross domestic product
- PR14 Expenditures on personal mobility
- PG07 Quantity of purchased food
- OD01 Municipal waste
- PR11 Size of the vehicle fleet
- TU02 Outstanding natural features visited
- PR01 Passenger transport demand
- PR06 Public awareness of the effects of transport on the environment



In terms of the environment, changes in consumption patterns are of significant importance since environmental impacts from various industries substantially differ. High consumption of food and non-alcoholic beverages burdens the environment more than, for example, expenditure on health care, recreation and education.

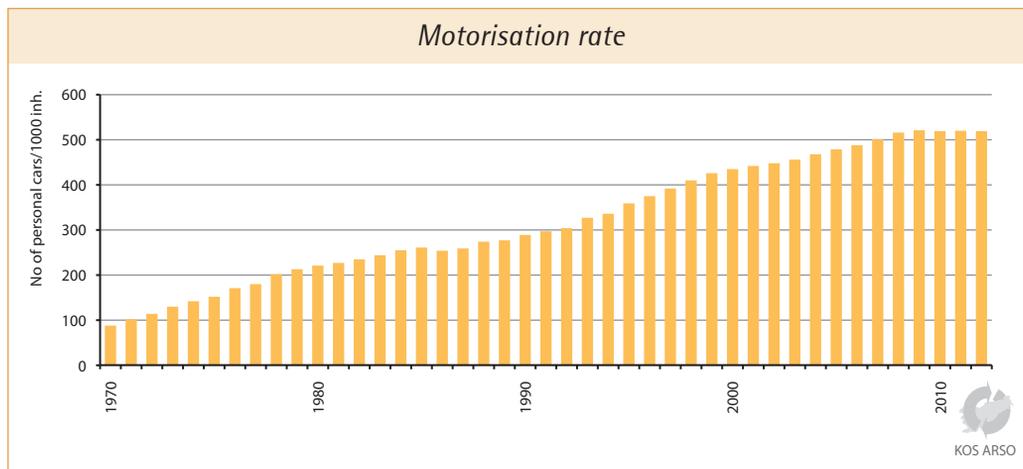
According to the Statistical Office of the Republic of Slovenia, a household member in Slovenia spends, on average, the most funds on transport (16.8%), somewhat less funds on food and soft drinks (14.3%), and the least on housing, water,

electricity and other fuels (13.6%). The total average expenditure per household member in Slovenia amounted to EUR 6,692. Expenditures on communications, health, housing, water, electricity, gas and other fuels are growing the fastest.

In the European countries (EEA members and collaborating countries), average expenditures in households were spent on housing, electricity, water, electricity, gas and other fuels (22%), transport (13%) and food and non-alcoholic beverages (12%). Similar to Slovenia in those countries expenditures on communications are growing the fastest. Followed by expenditures on rec-

SIZE OF THE VEHICLE FLEET

Passenger car ownership has almost doubled in the last 20 years; the motorisation level exceeds the situation in numerous economically more developed EU countries.



Source: Research – Statistics, Slovenian Traffic Safety Agency; Registered road vehicles, Number of population, Statistical Office of the Republic of Slovenia; Urban Planning Institute of the Republic of Slovenia, 2013

Passenger car ownership or the motorisation level is regularly expressed as the number of passenger cars per 1000 inhabitants. A passenger vehicle is a motor vehicle (other than a motorcycle) with no more than nine seats and designed to carry passengers.

Slovenia belongs to the countries with the highest increase in passenger car ownership. In 2012, Slovenia had 1,066,028 passenger vehicles, which is six times more than in 1970. In 2010, each household in Slovenia had on average 1.3 cars, which means that one in two inhabitants owned a car.

This also translates to household expenditure. In 2010, Slovenian households spent almost one third (30%) more of their funds for the purchase of vehicles and the operation of personal vehicles than households of the EU-27 countries; at the same time, Slovenian households spent a significantly smaller share of their funds (1.1%) for public transport in comparison with households in the EU-27 countries (2.4%).

A big issue regarding the increasing transport is GHG emissions and air pollution, which is also affected by the average age of passenger cars. The average age of passenger cars in Slovenia increased from 6.8 years in 1992 to 8.7 years in

2012. During this period, the average age of passenger cars in European countries declined. This means that new technologies are being introduced gradually and that the vehicle fleet is mostly less environmentally-friendly.

Regular roadworthiness tests are of great importance for reducing the environmental impacts of vehicles and for promptly removing inappropriate vehicles from road traffic.

In Slovenia and in the majority of other European countries, an annual awareness campaign "In town without my car!" has been conducted since 2000, expanding into the European Mobility Week initiative. The main purpose of both campaigns has been primarily to facilitate the implementation of sustainable measures and provide solutions for decreasing the overuse of passenger cars.



kazalci.arslo.gov.si

PR11 Size of the vehicle fleet

PG06 Household expenditure

OD16 End-of-life vehicles

PR01 Passenger transport demand

PR07 The impact of transport on of air quality

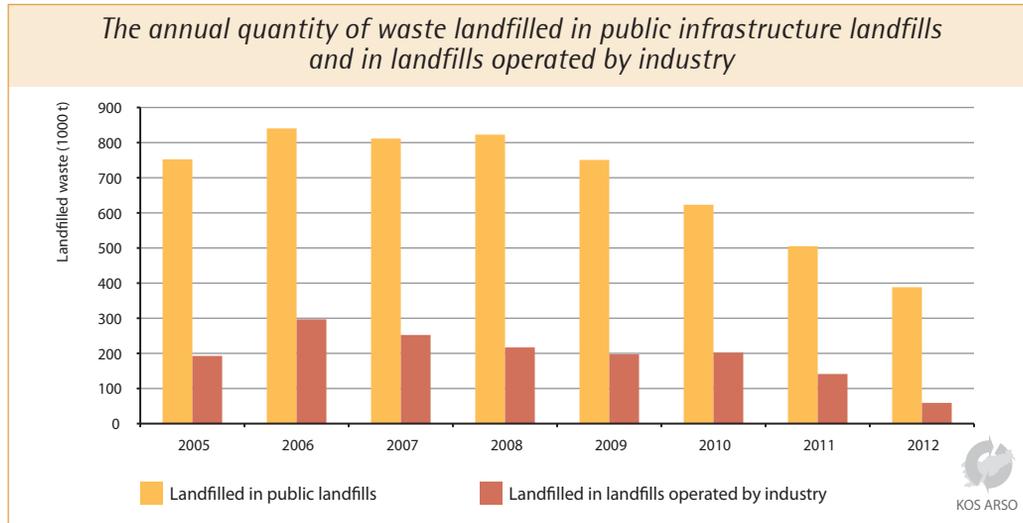
PR12 Average age of the vehicle fleet

PR14 Expenditures on personal mobility



LANDFILL OF WASTE

The total quantity of landfilled waste is falling; however, in 2012, almost half of the amount of the generated municipal waste was landfilled.



Source: Public waste removal and municipal landfill sites, Statistical Office of the Republic of Slovenia, 2014

Landfilling is a process of waste disposal without any material or energy recovery. In terms of resource efficiency management, waste management plays an important role. Waste regulations have also introduced a 5-stage waste hierarchy, according to which the top priority is given to the prevention of waste generation, followed by preparing for reuse, recycling, other recovery procedures (e.g. energy recovery), whereas waste disposal (e.g. landfilling, incineration without energy recovery) is deemed to be the least preferred option.

Since 2002, the recovery of waste generated from production or service industries has amounted to more than 60% and over the years this number has even increased, while the majority of municipal waste has been landfilled. In addition to municipal waste, a small percentage (20%) of other waste (construction waste, waste generated by waste processing equipment) is landfilled in public infrastructure landfills. The quantity of waste deposited in public infrastructure landfills started to decline after 2008 (823 thousand tonnes) and in 2012 the amount of landfilled waste was more than halved.

The waste deposited amounted to 388 thousand tonnes.

Non-hazardous waste, inert waste and also hazardous waste are deposited in landfills operated by industry. The share of landfilled hazardous waste has varied between 3% to 5% of the total annual quantity of deposited waste from production or service industries. In 2012, 59 thousand tonnes of waste were deposited in landfills operated by industry (of which 3.6 thousand tonnes were hazardous waste).

With the introduction of the separate collection of municipal waste and statutory requirements regarding the processing of mixed residual waste prior to disposal, the amount of deposited municipal waste in relation to generated waste has been declining. In 2008, 74% of generated municipal waste was deposited, compared to 47% in 2012. The restrictions on disposal in the past only referred to the amount of biodegradable waste. The most recent European regulation governing municipal waste requires that by 2020 a 50% reuse and recycling rate of certain waste materials of this type of waste are to be achieved.



kazalci.arso.gov.si

OD02 Landfill of waste

- OD01 Municipal waste
- OD17 Waste from production and service activities
- OD14 Construction waste
- PS03 Greenhouse gas emissions

MUNICIPAL WASTE

The portion of separately collected municipal waste is increasing, whereas the amount of municipal waste generated is declining.



The quantity of collected municipal waste



Source: Environmental indicators, Statistical Office of the Republic of Slovenia, 2014

Municipal waste means waste generated by households and other waste similar to household waste generated by the manufacturing, trade, service and other industries and the public sector. Waste management is provided as mandatory municipal service of general economic interest in the field of environmental protection.

The amount of municipal waste generated in Slovenia showed an upward trend until 2008 (847 thousand tonnes or 418 kg per capita), which was followed by a decline and, in comparison to 2008, its quantity decreased by 20% in 2012 (672 thousand tonnes or 327 kg per capita).

The volume of separately collected fractions of municipal

waste has been increasing in recent years and accounted for almost 40% in 2012. The system of door-to-door separate collection of waste facilitates further processing of separately collected waste (recycling and recovery). In this way we contribute to the conservation of natural resources and to a decrease in the negative environmental impacts of waste deposited in landfills (e.g. CO₂ emissions and other landfill gases and leachate waters, the impact on groundwater).

Despite efforts to ensure best compliance with the waste hierarchy and minimise the disposal of waste in landfills, almost half of the amount of municipal waste generated (47%) was landfilled in 2012. Consequently, a strategic document

adopted in this area provides for certain measures for achieving the following targets by 2020: increasing the recycling rate of municipal waste to 61–64%; increasing the incineration rate to approximately 25%; and decreasing the disposal of municipal waste in landfills to 11–15%. These targets require an investment in infrastructure; an estimated EUR 291 million is required (cohesion funds, national and municipal budgets) for the 2007–2015 period, and EUR 200 million for the 2016–2020 period. In addition, greater attention will have to be devoted to raising public awareness.

The environmental tax on environmental pollution due to waste disposal, which entered into force in 2011 and was intended as an additional financial incentive for adapting landfills to the prescribed standards, will be gradually channelled from municipal budgets to the state budget and earmarked for the financing of measures aimed at remediating old burdens and burdens due to illegal waste disposal or treatment.



kazalci.arslo.gov.si

OD01 Municipal waste

PG06 Household expenditure

OD03 Hazardous waste

OD07 Waste management

PG02 Household number and size

PS03 Greenhouse gas emissions

OD02 Landfill of waste

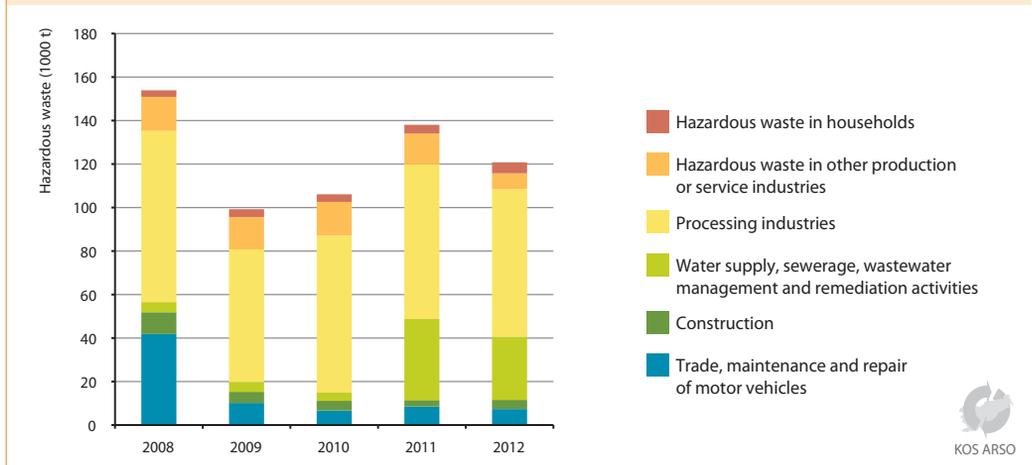


HAZARDOUS WASTE

More than half of hazardous waste is generated in the processing industry.



The quantity of hazardous waste generated by source



Source: Waste from Production and Service Activities, Environmental indicators, Statistical Office of the Republic of Slovenia, 2014



diation activities has been increasing (in 2012, 29 thousand tonnes or 24% were generated).

In 2012, the quantity of hazardous waste destined for recovery amounted to 63 thousand tonnes and for disposal to 38 thousand tonnes. Recycling accounted for 76% or 48 thousand tonnes, which included 41 thousand tonnes of discarded equipment. Chemical waste accounted for the largest percentage of disposed hazardous waste (72% or 72 thousand tonnes).

While the reporting threshold for generated non-hazardous waste amounts to 10 tonnes, the limit for hazardous waste is considerably lower and amounts to 5 kg. Hazardous waste must not be mixed or diluted with non-hazardous waste. The regulation also requires additional labelling of such waste, record keeping and so-called "cradle-to-grave" tracking of hazardous waste from the point of generation to final disposal or recovery.



kazalci.arso.gov.si

OD03 Hazardous waste

- OD14 Construction waste
- OD16 End-of-life vehicles
- OD15 End-of-life tyres
- OD01 Municipal waste
- OD17 Waste from production and service activities
- OD09 Health-care waste
- OD12 Waste batteries and accumulators
- OD04 Transboundary shipments of waste



Hazardous waste is waste that displays one or more of the hazardous properties listed in the regulation (e.g. toxicity, carcinogenicity, flammability, explosiveness).

Hazardous waste requires a stricter regime of control than non-hazardous since it poses a risk to the environment and human health. Therefore, it must be collected, deposited, recovered or destroyed separately from other waste. The transboundary shipment of hazardous waste (import, export and transport of the waste through Slovenia) is regulated by a special regulation. Hazardous waste is generated in industry, trade and agricultural production and processing, as well as in

households (e.g. solvents, paints and dyes containing hazardous substances, pesticides, fluorescent tubes and other waste containing mercury, paints containing hazardous substances, certain medicines, motor vehicles, etc.).

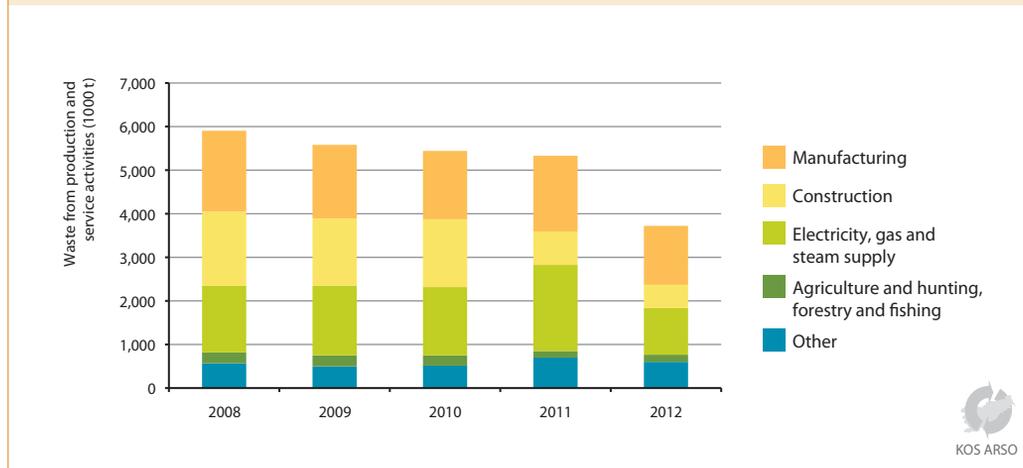
The volume of hazardous waste generated varies; in 2012, Slovenia generated 120,000 tonnes, of which 5,000 tonnes originated from households. However, most hazardous waste is generated from processing industries (56% or 68 thousand tonnes in 2012). In the last two years, the volume of hazardous waste under the category of waste covering water supply, sewerage, waste management and reme-

WASTE FROM PRODUCTION AND SERVICE ACTIVITIES

The quantity of waste generated from production and service activities declined in 2012 primarily due to the decreased economic activity and re-classification of some waste as by-products.



The structure of quantities of waste generated from production and service activities



Source: Waste from Production and Service Activities, Statistical Office of the Republic of Slovenia, 2014

Waste from production and service industries account for the majority of the waste generated in Slovenia. Waste is classified in groups with regard to origin.

From 2008 to 2011, the amount of waste from production and service activities gradually declined (around 3 percentage points). In 2011, 5.3 million tonnes of waste were generated. The structure of waste remained relatively steady until 2010. The largest amount of waste was generated in the construction sector (30% in 2009), followed by manufacturing industries, construction, and the sector of electricity, gas and steam supply, which amounted to approximately 30% for each sector.

In 2012, approximately 2.8 million tonnes of waste were generated in production activities or 32% less than in 2011, while the waste generated in service activities amounted to almost 882,000 tonnes or 27% less than in 2011. A decrease was also noted in the amount of waste from waste management facilities (down 54%), followed by waste from inorganic chemical processes (32%) and waste from thermal processes (22%). The decrease in generated waste is also the result of the reclassification of some waste as by-products.

For further reduction of the quantity of waste generated from production and service activities the manufacturing in-

dustry will have to be redirected to a 'closed-loop system' in which waste is used as raw materials. In this context, companies play a very important role since, when designing both a product and production process, they will have to give priority to the environmental aspect by manufacturing products that contain less hazardous substances and are composed of materials that are easier to recycle.



kazalci.arso.gov.si

OD17 Waste from production and service activities

- SE01 Gross domestic product
- OD14 Construction waste
- OD03 Hazardous waste
- OD02 Landfill of waste
- OD07 Waste management
- OD08 Ecological footprint
- OD06 Domestic consumption of material
- OD18 Resource productivity

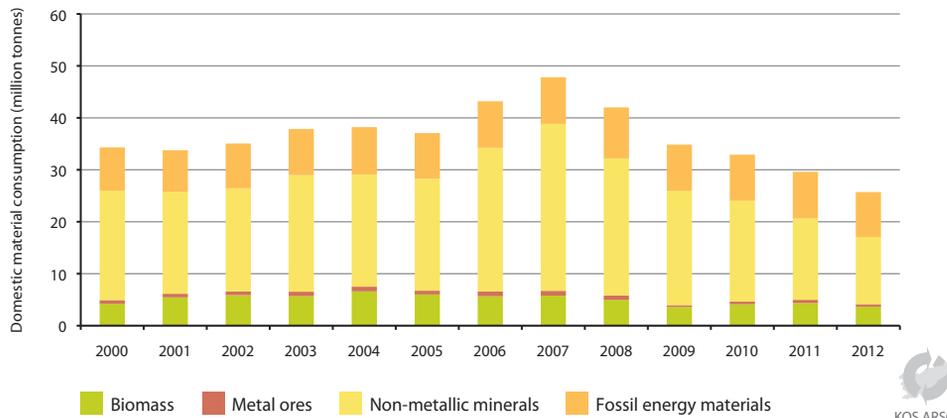


DIRECT MATERIAL INPUT AND DOMESTIC MATERIAL CONSUMPTION

The exploitation of natural resources produced or extracted in Slovenia showed an upward trend until 2007, when it began to decline.



Domestic material consumption in Slovenia



Source: Material Flow Accounts, Statistical Office of the Republic of Slovenia, 2014

The total amount of imported material and goods accounts for slightly more than one third (34% in 2012) of all materials used per year in Slovenia. The import of materials increased until 2008, but later it began to decline. In 2012, the import of materials was 3.5 tonnes higher than exports. The export of materials from Slovenia has been increasing gradually.

Direct material input per capita in EU Member States differs substantially. Around 15 tonnes of materials per capita are consumed on average in the EU-27 (in Slovenia 12.4 tonnes per capita in 2012). Malta and United Kingdom has the lowest material consumption per capita in the EU in 2011. They consumed around 10 tonnes of material per capita. On the other hand Finland and Estonia consumed more than 30 tonnes of material per capita and has the highest material consumption per capita in the EU in 2011.



kazalci.arso.gov.si

OD06 Direct Material Input and Domestic Material Consumption

OD18 Resource productivity

PG03 Dwellings

PG02 Household number and size

OD07 Waste management



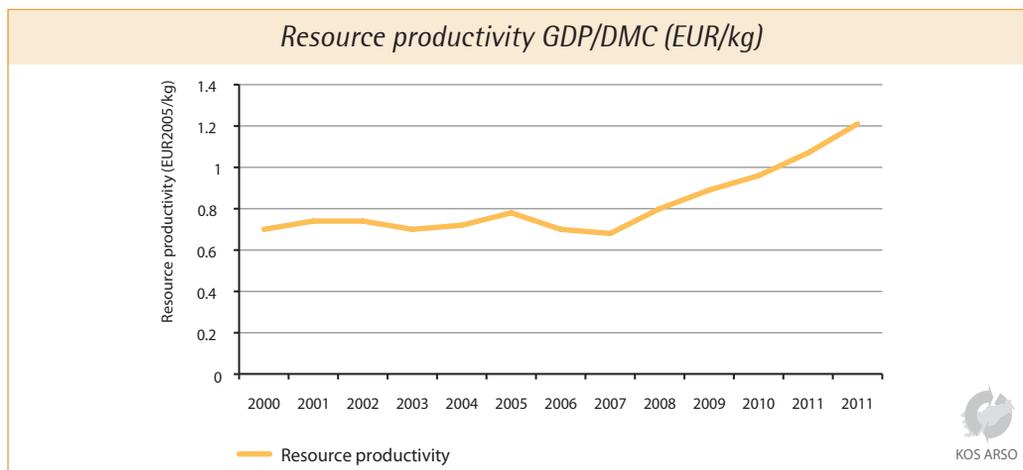
Our economy and prosperity are highly dependant on natural resources (renewable and non-renewable) – domestic and imported. Some natural resources have become scarce or are only available in particular geographical areas of the world. Furthermore, the use of natural resources is closely related to various pressures on the environment, including waste generation.

Direct material input for use in the economy takes into account domestic extraction plus total imports. If exports are deducted, the remainder is domestic material consumption.

The exploitation of natural resources produced or extracted in Slovenia showed an upward trend until 2007, when it began to decline. In 2012, 22 million tonnes of resources were used, which is 42% less than in 2007 (38 million tonnes) and 26% less than in 2000 (30 million tonnes). The extraction of mineral resources for construction decreased by more than half. In 2012, approximately 12 million tonnes were used. The use of biomass and fossil energy sources slightly vary in individual years, hovering around 5.5 million tonnes and 4.5 million tonnes, respectively.

RESOURCE PRODUCTIVITY

Resource productivity in Slovenia has been increasing since 2007 primarily due to the lower consumption of non-metallic minerals for construction.



Source: Material Flow Accounts, Statistical Office of the Republic of Slovenia, 2013

Resource productivity is an indicator expressing the ratio between gross domestic product (GDP) and domestic material consumption (DMC) in relation to weight. It is considered to be one of the most important resource efficiency indicators.

Europe, including Slovenia, is making efforts to improve the economy and at the same time reduce burdens on the environmental.

Resource productivity in Slovenia fluctuated around 0.7 EUR/tonne until 2006. It was the lowest in 2007 (0.68 EUR/t), then it began to grow and amounted to 1.21 EUR/t in 2012. Resource productivity increased after 2007, which is primarily attributable to the lower consumption of construction mate-

rial. According to data obtained from the Geological Survey of Slovenia, the production of resources for construction fell by more than half in 2012 (9.3 million tonnes) compared to 2007 (22.8 million tonnes). The production of other non-metallic minerals such as raw materials for the processing and construction industries has remained more or less unchanged. The consumption of non-metallic minerals substantially affects resource productivity mainly due to the weight of such products. The lowest resource productivity was in 2006 and 2007, when construction activity was very intense on account of final work on the Slovenian motorway network.

The increase in resource productivity does not imply that

material consumption actually decreased. It may also mean that economic growth was faster than material consumption in the observed period.

In 2007, the average resource productivity in the EU was 1.30 EUR/t (from 0.3 to 2.5), while in Slovenia it was 0.70 EUR/t. According to IMAD data, resource productivity in Slovenia in 2009 was at 75% of the EU average, and in comparison with 2005, the gap with regard to the EU average was not reduced.

OECD data indicate that about one-fifth of annual resource extraction ends up as waste. Improving resource productivity requires integrated life-cycle-based policies for waste, material and product management.



kazalci.arso.gov.si

OD18 Resource productivity

- OD06 Neposredni vnos in domača poraba snovi
- PG03 Dwellings
- PG02 Household number and size
- OD14 Construction waste

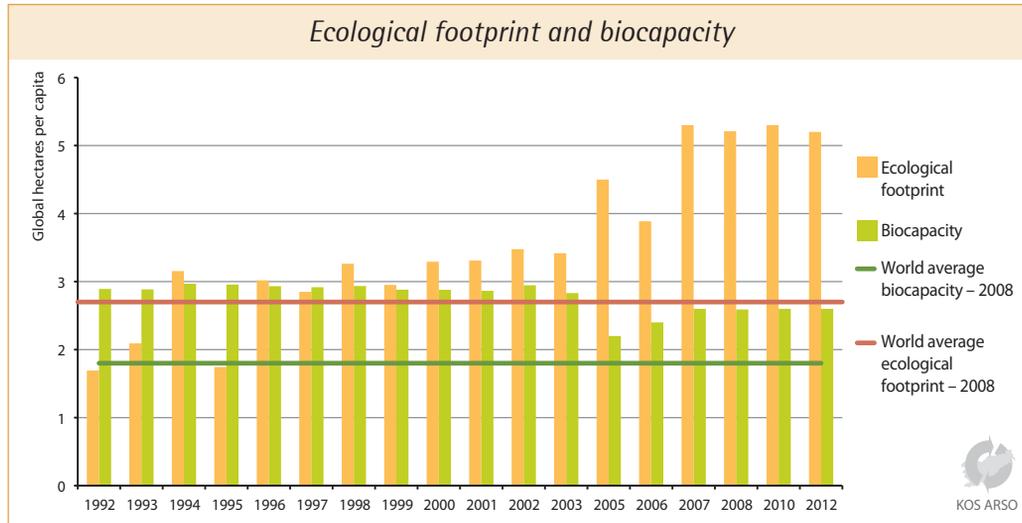


ECOLOGICAL FOOTPRINT

Current consumption in Slovenia and Europe is too high to meet demands with the resources available. We therefore depend on imports from other parts of the world.



Ecological footprint and biocapacity



Source: GFN, Footprint for Nations, 2013

footprint showed an upward trend. The increase in the carbon footprint was the strongest. In 2012, it stood at 3.2 gha/capita, which is almost four times more than in 1992. The carbon footprint is entirely attributable to the energy sector.

The ecological footprint of Europe in 2008 (4.7 gha/capita) exceeded the biological capacity (3 gha/capita). Most EU countries – except Finland, Sweden, Latvia and Estonia, which have high biocapacity values on account of their forests – are running ecological deficits. Europe is therefore dependant on imports from other parts of the world.

The global ecological footprint increased from 1.7 gha/capita in 1961 to 2.7 gha/capita in 2012. The highest ecological footprint is recorded in the United Arab Emirates (8.7 gha/capita), followed by Denmark (8.3 gha/capita) and the USA (8 gha/capita).

The ecological footprint is expected to become a key sustainability indicator and the basis for decision-making in all areas, especially for national governments.



The ecological footprint compares the biologically productive areas that the population needs to maintain its lifestyle with all available land area, including the sea. In global terms, there are 11.9 billion hectares of biologically productive areas, corresponding to roughly one-quarter of the planet's surface.

Biocapacity or biological capacity represents the area of land or sea required to meet human demands (production of food, fibre, wood, fuels and absorption of emissions, such as carbon dioxide) such that it still able to regenerate by itself.

The ecological footprint and biocapacity are expressed in

a comparable standardised unit called a global hectare (gha). An ecological deficit occurs when the needs of the population exceed the available biocapacity of the country.

In the 1992–2012 period, the ecological footprint in Slovenia increased by 3.5 gha/capita. Since the demand exceeds the biological capacity, Slovenia has been running an ecological deficit since 1999. In 1999, the ecological deficit stood at 0.1 gha/capita, while by 2007 it had increased to 2.7 gha/capita. In the 1992–2012 period, the footprint of biological resources, the carbon footprint as well as the infrastructure



KOS ARSO



kazalci.arslo.gov.si

SE08 Ecological footprint

TP01 Land cover and land use

GZ04 Forest area

SE07 Structure of the economy and exports of goods

INDICATORS, DATA SOURCES AND AUTHORS OF THE ENVIRONMENTAL INDICATORS IN SLOVENIA—ONLINE VERSION

CODE AND INDICATOR	DATA SOURCES FOR SLOVENIA	COMMENT - THE AUTHOR AND INSTITUTION
AIR		
ZR09 Emissions of gases that cause acidification and eutrophication	National database on air emissions, ARSO	Martina Logar, ARSO
ZR10 Emissions of ozone precursors	National database on air emissions, ARSO; National database on GHG emissions, ARSO	Martina Logar, ARSO
ZR15 Emissions of particulate matter	National database on air emissions, ARSO	Martina Logar, ARSO
PR17 Quality of transport fuels	EU Fuel Quality Report, Slovenia, EC	Mirko Bizjak, ARSO; Aljaž Plevnik, UI RS
ZR07 Air pollution by ozone	Automatic Air Quality Measurement Database (DMKZ), ARSO	Anton Planinšek, ARSO
ZR08 Air pollution by PM ₁₀ and PM _{2.5}	Automatic Air Quality Measurement Database (DMKZ), ARSO; Air quality database of complementary automated measurement networks	Tanja Koleša, ARSO; Tanja Bolte, MKO
PR07 Exceedances of air quality objectives due to traffic	Automatic Air Quality Measurement Database (DMKZ), ARSO	Peter Otorepec, Katarina Bitenc, Simona Perčič, NIJZ
ZD03 Exposure of residents and children to polluted air due to PM ₁₀ particulate matter	Database on hospital treatments, NIJZ; Automatic Air Quality Measurement Database (DMKZ), ARSO	Peter Otorepec, Katarina Bitenc, Simona Perčič, NIJZ
ZD02 Asthma and allergic diseases in children	Database on hospital treatments, ISAAC, NIJZ	Peter Otorepec, Katarina Bitenc, Simona Perčič, NIJZ
PR13 Use of alternative fuels in transport	Reports by EU Member States on the use of biofuels in accordance with the Directive 2003/30/EC, EC CSI 037 – Use of cleaner and alternative fuels, EEA	Mirko Bizjak, ARSO; Aljaž Plevnik, UI RS
PR06 Public awareness about the effects of transport on the environment	Flash Eurobarometer “The Future of Transport” (No 312), EC	Nataša Kovač, ARSO; Aljaž Plevnik, UI RS
PR01 Passenger transport demand	Passenger transport, Urban passenger transport and Rail passenger transport, SURS	Aljaž Plevnik, Mojca Balant, Luka Mladenovič, UI RS
PR02 Freight transport demand	Road goods transport, Railway goods transport, Maritime transport of goods, Air transport of goods, SURS	Aljaž Plevnik, Mojca Balant, Luka Mladenovič, UI RS
PR04 Transport final energy consumption	Energy use, SURS; recalculations IJS	Matjaž Česen, IJS

CLIMATE CHANGE		
PS03 Greenhouse gas emissions	GHG Data Viewer, EEA; National database on GHG emissions, ARSO	Tajda Mekinda Majaron, ARSO
PS04 Precipitation and temperature	Meteorological database, ARSO	Tanja Cegnar, ARSO
PS07 Extreme weather events	Meteorological database, ARSO	Tanja Cegnar, ARSO
PS06 Annual growing season length	Meteorological database, ARSO	Ana Žust, ARSO
PS05 Changes in glacier extent	Achieves of the GIAM	Matej Gabrovec, Miha Pavšek and Jaka Ortar, GIAM; Mojca Dolinar, ARSO
ZD24 Proportion of resident population living in a flood plain	Indicative flood map, areas of potential flood-erosion activity of torrents, IzVRS; Central Population Register, MNZ	Ivanka Gale, Katarina Bitenc, NIJZ; Blažo Đurovič, IzVRS
ZD25 Lyme borreliosis	Epidemiological surveillance of infectious diseases in Slovenia – Annual Reports, NIJZ	Maja Sočan, Mateja Blaško Markič, NIJZ
EN20 Energy prices	Energy prices, SURS; recalculations IJS	Matjaž Česen, IJS
EN21 Energy taxes	Energy prices, SURS; recalculations IJS	Matjaž Česen, IJS
EN22 Subsidies in the energy sector	Data obtained from the MF, MZIP, ELES, Ltd., EcoFund; recalculations IJS	Matjaž Česen, IJS
EN10 Final energy consumption by sector	Fuel consumption, SURS and Eurostat; recalculations IJS	Matjaž Česen, IJS
EN18 Renewable energy sources	Renewable energy and waste, SURS; recalculations IJS	Matjaž Česen, IJS
WATER		
VD01 Water exploitation index	Slovenia – WISE SoE Water Quantity, ARSO and SURS	Peter Frantar, Urška Kušar, ARSO
VD03 Annual river balance	Hidrolog – Hydrology database, ARSO	Marjan Bat, ARSO
VD15 Groundwater recharge	Assessment for hydrological years by regional water-balance model GROWA-SI, FZ JÜLICH and ARSO	Jože Uhan, Mišo Andjelov, ARSO
MR02 Sea Level	Multi-annual sea level dataset, ARSO	Igor Strojjan, Mojca Robič, ARSO
VD12 Chemical and ecological status of surface waters	Assessment for Water Management Plan, ARSO	Irena Cvitanič, Brigita Jesenovc, Mojca Dobnikar Tehovnik, Bernarda Rotar, Maja Sever, ARSO
VD10 Nutrients and biochemical oxygen demand in rivers	Standardised Database for Water Quality Monitoring, ARSO	Polona Mihorko, ARSO
VD07 Phosphorus in lakes	Standardised Database for Water Quality Monitoring, ARSO	Špela Remec Rekar, ARSO
VD05 Nitrates in groundwater	Standardised Database for Water Quality Monitoring, ARSO	Polona Mihorko, Marina Gacin, ARSO

VD06 Pesticides in groundwater	Standardised Database for Water Quality Monitoring, ARSO	Polona Mihorko, Marina Gacin, ARSO
VD09 Inland bathing water quality	Database on the quality of water in bathing areas, NIJZ (2004–2009); Database on the quality of water in bathing areas, ARSO (2010– 2012)	Mateja Poje, ARSO; Ivanka Gale, NIJZ
MR05 Coastal bathing water quality	Database on the quality of water in bathing areas, NIJZ (2004–2009); Database on the quality of water in bathing areas, ARSO (2010– 2012)	Mateja Poje, ARSO; Ivanka Gale, NIJZ
VD08 Drinking water quality	State monitoring of drinking water, NIJZ (2005 – 2008) and ZZVMb (2009–2013)	Ivanka Gale, Aleš Petrovič, Katarina Bitenc, NIJZ
VD16 Water protection areas	RABA, MKO; Water protection areas, ARSO	Stojan Krajnc, Urška Kušar, ARSO
KM23 Agriculture in water protection areas	RABA, MKO; Water protection areas, ARSO	Janez Sušin, Janez Bergant, KIS
VD02 Wastewater treatment	Waste–water Treatment Plants Database, ARSO; Population, SURS	Marjan Zajc, ARSO
VD14 Water permits	Water Book, ARSO	Urška Kušar, ARSO
KM04 Intensification of agriculture	SURS; recalculations KIS, UMAR, ARSO	Tomaž Cunder, KIS (Urška Kušar, ARSO)
KM22 Gross nitrogen balance in agriculture	Nitrogen Balance, Agri–Environmental Indicators, KIS and SURS	Janez Sušin, Jože Verbič, KIS (Urška Kušar, ARSO)
KM01 Consumption of plant protection products	The sale of pesticides, SURS	Andrej Simončič, KIS (Urška Kušar, ARSO)

LAND AND NATURE

TP01 Land cover and land use	CORINE Land Cover, ARSO, GURS and EEA	Urška Kušar, ARSO
TP02 Brownfield sites	Record of brownfield sites, Department of Geography, FF UL	Barbara Lampič, FF UL
NB12 Habitat types of European importance	Report on the conservation status of species and habitat types pursuant to Article 17 of the Habitats Directive, MKO, ZRSVN	Matej Petkovšek, ZRSVN
NB11 Species of European importance	Report on the conservation status of species and habitat types pursuant to Article 17 of the Habitats Directive, MKO, ZRSVN	Matej Petkovšek, ZRSVN
NB06 Brown bear	Statistics from monitoring population abundance trends and population structure in brown bears, ZGS and LZS	Miha Marenče, ZGS; Mateja Blažič, ARSO
NB12 Farmland birds	The monitoring of widespread bird species to determine the Slovenian farmland bird index , DOPPS	Primož Kmecl, DOPPS

NB02 Threatened species	Nature protection, Red list of threatened animal species in Slovenia, no. 17, 1992; Nature Conservation, Red List of endangered vascular cryptograms and phanerograms in the SR of Slovenia, no. 14/15, 1989 Rules on the inclusion of threatened plant and animal species in the Red List (Uradni list RS (Official Gazette of the Republic of Slovenia), no. 82/2002)	Mateja Blažič, Andrej Arih, Irena Nartnik, Inga Turk, ARSO
GZ02 Ohranjenost gozdov	Central Database, ZGS, 2014	Rok Pisek, Dragan Matijašič, ZGS
NB07 Compensation for damage caused by protected species	ODSEV, ARSO	Urška Mavri, ARSO
NV03 Natura 2000	Register of Natura 2000 areas, ARSO	Urška Mavri, Urša Mežan, ARSO
NV02 Protected areas	Register of protected areas, ARSO	Urša Mežan, ARSO
NV04 Valuable natural features	Register of valuable natural features, ARSO	Urša Mežan, ARSO
WASTE AND RESOURCES		
OD13 Packaging waste	Annual Reports of Slovenia to the EC	Eva Lipovž Ančik, Barbara Bernard Vukadin, ARSO
OD16 End-of-life vehicles	End of life vehicles, Eurostat	Barbara Štravs Grilc, Barbara Bernard Vukadin, ARSO.
OD04 Transboundary shipments of waste	Transboundary shipments of waste Database, ARSO	Nada Suhadolnik Gjura, Barbara Bernard Vukadin, ARSO
IP01 Environmental management systems	The ISO Survey of Certifications 2010, Eurostat	Nataša Kovač, ARSO
PG03 Dwellings	Dwellings, SURS	Barbara Bernard Vukadin, ARSO
EN28 Energy efficiency and energy consumption in the household sector	Energy, SURS; recalculations IJS	Matjaž Česen, IJS
PG06 Household expenditure	Average household consumption expenditure, SURS	Barbara Bernard Vukadin, ARSO
PR11 Size of the vehicle fleet	Statistics – AVP; SURS; recalculations UI RS	Aljaž Plevnik, UI RS
OD02 Landfill of waste	Public waste removal and landfill sites, SURS	Barbara Bernard Vukadin, ARSO
OD01 Municipal waste	Environmental indicators, SURS; Operational programme for municipal solid waste, MKO	Barbara Bernard Vukadin, ARSO
OD03 Hazardous waste	Waste from Production and Service Activities , Environmental indicators, SURS	Barbara Bernard Vukadin, ARSO
OD17 Waste from production and service activities	Waste from Production and Service Activities, SURS	Barbara Bernard Vukadin, ARSO

OD06 Direct Material Input and Domestic Material Consumption	Material Flow Accounts, SURS	Urška Kušar, Barbara Bernard Vukadin, ARSO
OD18 Resource productivity	Material Flow Accounts, SURS	Barbara Bernard Vukadin, ARSO
SE08 Ecological footprint	GFN, Footprint for Nations	Nataša Kovač, ARSO

ARSO – Slovenian Environment Agency
 AVP – Slovenian Traffic Safety Agency
 DOPPS – The Society for the observation and study of birds Slovenia (DOPPS – BirdLife Slovenia)
 EEA – European Environment Agency
 EC – European Commission
 FF UL – Faculty of Arts, University of Ljubljana
 GFN – Global Footprint Network
 GIAM – Anton Melik Geographical Institute of Research Centre of the Slovenian Academy of Sciences and Arts
 GURS – The Surveying and Mapping Authority of the Republic of Slovenia
 IJS – “Jožef Stefan” Institute
 IzVRS – Institute for Water of the Republic of Slovenia
 KIS – Agricultural Institute of Slovenia,
 LZS – Hunters Association of Slovenia
 MF – Ministry of Finance
 MKO – Ministry of Agriculture and the Environment
 MNZ – Ministry of Interior of the Republic of Slovenia
 MZIP – Ministry of Infrastructure and Spatial Planning
 NIJZ – National Institute of Public Health
 NLZOH – National Laboratory for Health, Environment and Food
 SURS – Statistical Office of the Republic of Slovenia
 UI RS – Urban Planning Institute of the Republic of Slovenia
 UMAR – Institute of Macroeconomic Analysis and Development
 ZGS – Slovenian Forest Service
 ZRSVN – Institute of the Republic of Slovenia for Nature Conservation
 ZZVMb – The Maribor Institute of Public Health

USER OPINIONS ON ENVIRONMENTAL INDICATORS IN SLOVENIA

Environmental Indicators is an extremely valuable collection of information. As such, it has many important functions and is, undoubtedly, essential in establishing and developing a dialogue between decision-makers, experts and representatives of the non-governmental sector.

*Associate professor, Ivan ERŽEN, MD, PhD
President of the Sustainable Development and Environmental Protection Council*

Environmental Indicators, which is publicly available in electronic form, is an invaluable source of information on the environment for all who work in the field of education. It is useful for both educators and students in all disciplines, be it social or natural sciences, seeing that the driving forces and environmental burdening are closely associated with the present and future development of our country. Knowledge of the environmental indicators also increases the awareness of those in school, who will more easily understand the limited bearing capacity of our environment and will, therefore, more easily eliminate future negative trends.

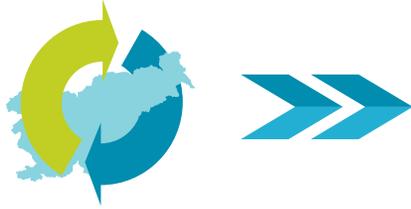
*Professor Lučka Kajfež Bogataj, PhD
Climatologist, Professor and Member of the
Intergovernmental Panel on Climate Change (IPCC)*

Change is the only constant feature of our environment. Environmental indicators help us obtain a clear picture of the changes that are happening around us. They provide an excellent basis for designing measures to respond to adverse changes in the environment. Environmental indicators are useful in many ways in the work of NGOs and help us in our activities to protect the environment from unsustainable practice.

*Lidija Živčič,
President
Focus Association for Sustainable Development*

Environmental indicators are not only a legal obligation – they are a transparent and comprehensive control panel that informs us about the state of the environment compared to other EU countries, and establishes the relevance of environmental policy. They are therefore a good basis for the campaign to catch up rapidly with more prosperous countries.

*Vida Ogorelec
Director
Umanotera, The Slovenian Foundation for Sustainable Development*



Environmental indicators in Slovenia

Environmental indicators are environmental data selected and presented in a concerted manner. They show the direction of environmental development in Slovenia and are used to monitor the achievement of environmental policy goals. They are classified into a five-part assessment framework and drawn up in compliance with an internationally applicable method. The indicators were developed in cooperation with professional institutions in Slovenia which are involved in environmental management and connected to the European Environment Information and Observation Network (EIONET). They are part of the environmental reporting system and are being drawn up by the Slovenian Environment Agency in accordance with Article 106 of the Environment Protection Act (Uradni list Republike Slovenije, No. 41/2004 as amended) to assist decision-making and to raise public awareness.



Republic of Slovenia, Ministry of Agriculture and the Environment,
Slovenian Environment Agency
Vojkova 1b, 1001 Ljubljana, p.p. 2608
Tel.: +386 1 4784000
e-mail: gp.arso@gov.si
web: www.arso.gov.si

A step forward 
in environmental management