The Environment in Your Pocket I – 2018

CAEN

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CROATIAN AGENCY FOR THE ENVIRONMENT AND NATURE

Impressum

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Basic Data on the Republic of Croatia

Mainland surface area	56,594 km^2
Territorial sea surface area	31,479 km^2
Coastline length	6,278 km
Islands, rocks, reefs	1,185
Highest mountain summit	Mt. Dinara, 1,831 m
Counties	21
Cities and municipalities	556 (128 and 428)
Population	4,174,349
Population density per km^2	73.8
Populated islands	47
Language	Croatian
Script	Roman
Political system	Parliamentary democracy
GDP per capita in 2017	11,882 EUR

Introduction

Dear readers,

The Croatian Agency for the Environment and Nature has issued this publication every year for the past fourteen years to mark World Environment Day. This year, the aim is to raise awareness among the general public about the effects of huge amounts of plastics on the environment and nature.[1] The United Nations is launching an appeal for rational use and immediate reductions in the production and consumption of plastics which are proving to be an increasing burden on the environment. This booklet has 31 selected indicators which represent only a small part of what the Agency covers, based on data from Environmental information system and Nature protection information system.[2] We have also included indicators of the state of the environment which have emerged from several years of cooperation with various national and European institutions, and which have allowed us to compare and direct Croatia's progress in attaining certain sustainability goals (one of the Agency's main tasks). So, for example, Croatia occupied 23rd place on the Eco-Innovation Scoreboard, indicating the need for greater investment and stronger support for this aspect of environment and nature protection policies. The EU-28 has achieved the absolute decoupling of economic growth from material consumption, yet Croatia is only now introducing a sustainable system for efficient material consumption which will reduce the effect of production and consumption on the environment and nature. Positive shifts have been noted in waste management at the local, regional and national levels (for example, 319 valid waste management plans were registered at the beginning of 2018). Between 2012 and 2016, there was 11.2% growth in the production of energy from renewable energy sources (RES). Tourism has also been growing, along with the highest seasonality in the EU-28, which has resulted in burdens on the environment in the most popular destinations and other places.

The emission of pollutants into the air has been reducing over the past years, along with emissions of acidic substances which are potentially harmful to forest and water ecosystems. Although emissions from transport have also been reduced, it is still necessary to implement further measures to reduce nitrogen oxides (NOx) and total suspended particles (TSP). In terms of reducing the emission of greenhouse gases, the obligations of the Paris Agreement will be

1 *Beat Plastic Pollution*, http://worldenvironmentday.global/
2 http://www.haop.hr/hr/informacijski-sustavi

met, but reducing emissions from waste and transport presents a greater challenge. Climate change is obvious at the global level, and Croatia is not unaffected. One indicator of this global mega-trend is the statistically significant rise in the mean annual air temperature recorded in all parts of Croatia. Only 2.9% of the total land area of Croatia is permanently sealed, as the result of urban development and construction, while the proportion of protected areas is 8.6%. In addition, there are more than 2,500 protected species in the country. In contrast to most European forests, those in Croatia are natural forests, and with forest lands cover 47% of the state territory. In agriculture, a trend towards reducing consumption of mineral fertilizers and increasing area under organic farming has been noted. Although transport of dangerous goods and the number of Seveso establishments[3] (which are obliged to report dangerous substances) are growing, measures to prevent undesirable consequences (major accidents) have been implemented successfully. According to indicators which provide data on the effects of the environment on human health, it is estimated that 722,942 people (17% of the population) are exposed to excess noise from road transport, while the incidence of melanomas caused by UVB radiation is falling.

Overall, based on this information, we can conclude that the state of the environment in Croatia is satisfactory in terms of high national, European and global standards. However, we are facing a number of challenges, particularly in regard to waste management and disposal, the use of resources, and natural protection. We all have a contribution to make, whether as a community or individuals.

Croatian Agency for the Environment and Nature

3 Regulation on the Prevention of Major Accidents Involving Dangerous Substances (OG 44/14, 31/17, 45/17)

Contents

Contents

Trends in the emission of acidic substances

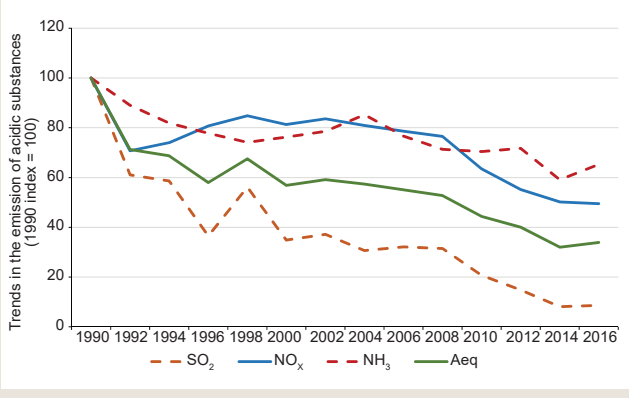
Sulphur dioxide (SO_2), nitrogen oxides (NO_X) and ammonia (NH_3) are the main pollutants which cause acidification and eutrophication. Emissions of these acidic substances are expressed according to the acid equivalent (Aeq)[4], which measures the total quantity of a substance which contributes to the acidification of soils or waters as a result of reduction in Ph values. This has a negative effect on water and forestry ecosystems.

Trends and current state

Emissions of the main acidic substances has decreased, particularly in comparison with 1990. Total sulphur dioxide emissions in 2016 were 14.7 kt, which was a 91.4% reduction compared to the base year (1990). The main reason was using fuels with lower sulphur contents, and also an increase in the consumption of natural gas. Emissions of nitrogen oxides and ammonia also decreased (NO_X by 53.4%, and NH_3 by 34.7%). The dominant source of nitrogen oxides is fuel combustion, particularly in road transport. It should be noted that the structure of NO_X emissions has not changed essentially in the observation period, since they are mostly depended to technology, rather than fuel quality. The agricultural sector most contributes to ammonia emissions (around 80%). Since it is expected that sulphur dioxide emissions will continue to reduce, the acid equivalent should also fall, provided that NO_X and NH_3 emissions stay at the same levels.

4 Acid equivalent index, a calculation based on weighted coefficients: 0.0313 for SO_2, 0.0217 for NO_X and 0.0588 for NH_3.

Trends in the emission of acidic substances



Source: CAEN

Number of exceedances of hourly limit values for hydrogen sulphide in urban areas

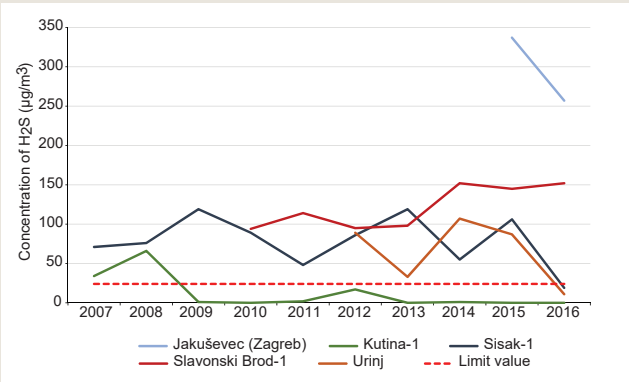
Hydrogen sulphide (H_2S) is an unpleasant smelling gas. It occurs in the petroleum refining, production of mineral fertilizers and waste disposal sites, so the monitoring stations are purposely placed near the sources of H_2S emissions. Data indicate that hourly limit values for H_2S at monitoring stations in Croatia are often exceeded. It should be noted that even where the highest hourly concentration levels have been found over longer periods, there is no indication of danger to human health. However, the exceedance of threshold smell level cause a significantly negative effect on quality of life – odour nuisance.

Trends and current state

According to the Regulation on levels of pollutants in ambient air[5], the hourly limit value for hydrogen sulphide is 7 μg/m³. In the observation period, levels of hydrogen sulphide pollution were exceeded at the monitoring stations in Zagreb, Slavonski Brod, Sisak and Kostrena (Urinj). In Kutina, a significant decrease in pollution was recorded, particularly after 2009, as a result of introducing the best available techniques in the production of mineral fertiliser. At the monitoring station Jakuševec in Zagreb, measurement of hydrogen sulphide were started in 2015. In relation to the other monitoring stations in Croatia, the data show that hourly limit values were exceeded most in 2015 and 2016, due to waste decomposition. In the Slavonski Brod area the cause of exceedances is transboundary air pollution from Brod Oil Refinery (in Bosnia and Herzegovina).

5 OG 117/12, 84/17

Number of hourly limit values exceeded for H_2S (7 μg/m³)



Source: CAEN

Climate change

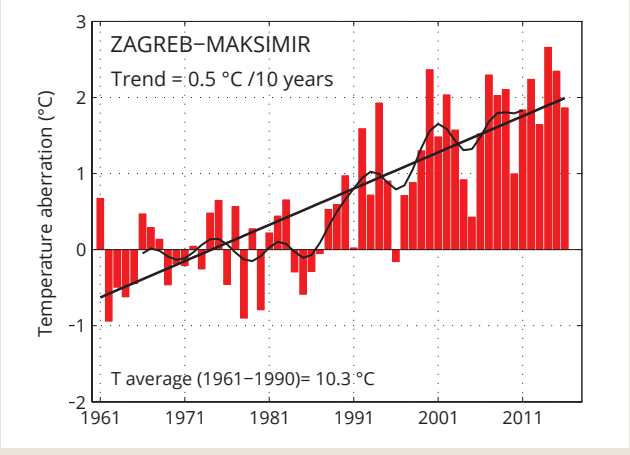
Mean annual air temperature

Indicators follow the trend of mean annual and seasonal temperatures at individual meteorological stations for which data have been available since 1961, and are expressed in degrees Celsius per decade. Average annual air temperatures in Croatia indicate warming.

Trends and current state

In the last 56 years, a statistically significant increase in mean annual air temperatures in all parts of Croatia has been recorded. There has been a particular increase since 1991. On the coast and in the Dalmatian interior, changes in temperature have changed from 0.2°C to 0.4°C per decade, while values are slightly higher in the continental part of the country, where changes ranging from 0.3°C to 0.5°C per decade have been recorded. This statistically significant increase in annual mean air temperature in Croatia is mostly due to the consistent, significant increase in summer and spring air temperatures, while in central and eastern Croatia, there has also been a significant rise in winter air temperatures (from 0.3°C to 0.5°C per decade). There is also a positive trend in autumn temperatures throughout Croatia, but it is significant in central Croatia and Istria, where it measures from 0.2°C to 0.3°C per decade.

Aberrations in mean annual air temperature at the Zagreb Maksimir station and trends 1961–2016



Source: DHMZ

Climate change

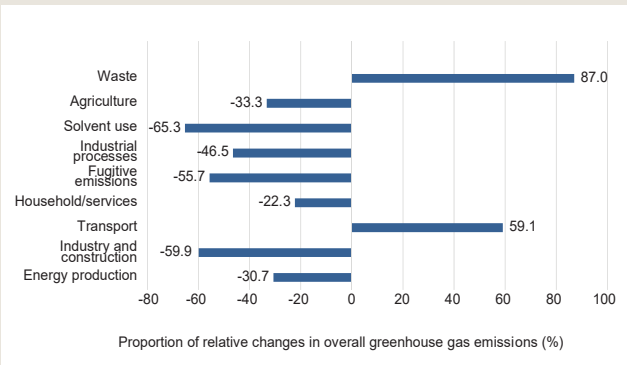
Changes in overall emissions of greenhouse gases by sector from 1990 to 2016

Climate change is one of the greatest global challenges today, and is linked to emissions of greenhouse gases which are rising, particularly due to fossil fuel combustion, agriculture, tropic deforestation, and other changes in land use.

Trends and current state

Between 1990 and 2016, the greatest increase in emissions of greenhouse gases was recorded in the waste sector (87%), mostly as the result of increased quantities of waste in landfill sites, followed by the transport sector (59.1%), mostly the consequence of increased mobility and the number of road vehicles. In the solvent use sector, there was actually a reduction of 65.3%, due to reductions in solvent production, the use of products based on solvents and population numbers in Croatia (in comparison to 1990). Industry and construction reduced emissions by 59.9%, fugitive emissions from oil and gas productions decrease by 55.7%, and from industrial processes by 46.5%, due to reductions in economic activities. Agricultural emissions also decrease by 33.3%, mostly due to reductions in agricultural production. Energy production emissions decrease by 30.7% as a result of reduced economic activity and the increasing proportion of renewable energy sources, while measures implemented to improve energy efficiency in the household and services sector accounted for a decrease of 22.3% in emissions.

Emissions and sinks of greenhouse gases in Croatia by sector



Source: CAEN

Inland waters

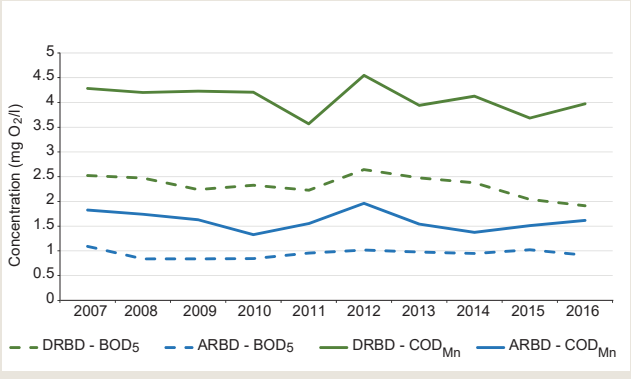
Pollution of rivers and lakes by organic substances

The reduction of concentrations of oxygen in water, as a result of the breakdown of organic substances, reduces water quality and upsets the ecological equilibrium, posing a threat to aquatic organisms. The five-day biological oxygen demand (BOD_5) and chemical oxygen demand (COD) are indicators which contribute to the degree of water pollution by organic substances.

Trends and current state

The quality of surface inland waters is assessed according to the Regulation on the Water Quality Standard[6]. The state of bodies or groups of bodies of surface waters is determined on the basis of their ecological and chemical status. Among other indicators, BOD_5 and COD_{Mn} are taken into account. Although Danube river basin district (DRBD) in Croatia exhibits a mild falling trend in these values, which may be the result of the construction of sewerage system and new wastewater treatment plants, no other significant trends in the observation period were noted regarding changes in the concentrations of these indicators.

Concentrations of organic pollution parameters (BOD_5 and COD_{Mn}) in rivers and lakes in Danube river basin district (DRBD) and Adriatic river basin district (ARBD)



Source: Hrvatske vode

6 OG 73/13

Inland waters

Sudden and accidental water pollution

Sudden water pollution occurs as the result of spillage or damage through which dangerous substances and/or pollutants enter the water and water environment. Accidental water pollution happens because of unfavourable hydrological and/or climate circumstances or other factors which impair water quality and often lead to the death of fish, particularly in the summer months.

Trends and current state

Between 2013 and 2017, a total of 231 cases of water pollution were recorded in Croatia, of which 81% were sudden, and 19% accidental. In the observation period, the number of cases dropped markedly. Most cases of minor sudden pollution did not lead to major negative effects on the water, and measures prescribed by the Waters Act[7] were not required. Most of this pollution occurred in the Danube river basin district (88%), and the rest in the Adriatic river basin district (12%). In 79 cases, action was taken to prevent the spread of damage and clean up the area. In 78% of these cases, the clean-up was performed at the expense of a known perpetrator, with most in the Sava river tributary area (67%). In 2017, the identified causes of pollution were traffic accidents (24%), industrial wastewater (24%) and illegal waste dumping (20%), but in 12% of cases, the causes were unknown.

Overview of water pollution 2013–2017

SUDDEN POLLUTION										ACCIDENTAL POLLUTION				
Known perpetrator					Unknown perpetrator									
2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
30	16	33	21	20	19	18	11	14	5	12	6	5	15	6
120					67					44				
187														
231														

Source: Hrvatske vode

7 OG 153/09, 130/11, 56/13, 14/14, 64/15, 104/17, 46/18

Soil and land

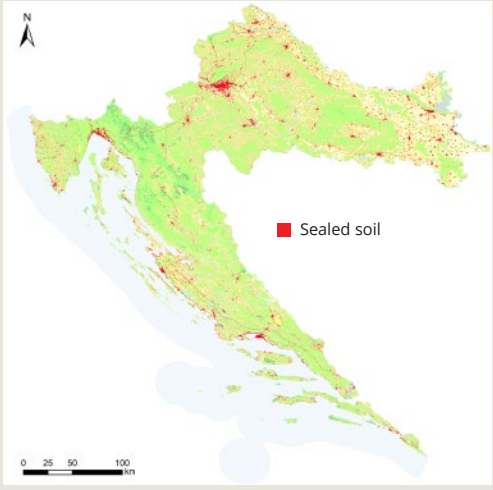
Soil sealing

Soil sealing means land surface areas covered by buildings, constructions and fully or partially impervious layers of artificial material, as the result of urban development and construction. Sealed soil loses most of its roles (production and ecological regulation, and as a source of genetic wealth, biological diversity and raw materials) and takes on a spatial and historical significance as the bearer of infrastructure and basis for human activity.

Trends and current state

In 2018, the Agency verified *Copernicus* land-monitoring service products,[8] including a high-resolution layer resulting from satellite image analysis in 2012, which showed area of sealed soil.[9] In contrast to the *CORINE Land Cover* database, high-resolution layers are more detailed and allow for more accurate data analysis. In Croatia, 161,027 ha or 2.9% of the total land area is permanently sealed. Level of sealed soil ranges from 1% to 100%, and does not include bigger green urban areas. The highest level of soil sealing (81% – 100%) covers 42,608 ha, or 0.8% of the total land area of Croatia.

Soil sealing in Croatia



Source: CAEN, EEA

8 http://www.copernicus.eu/main/land-monitoring
9 https://land.copernicus.eu/pan-european/high-resolution-layers/imperviousness/view

Soil and land

Mean SOC, C stock and total N in soil considering land use

Carbon (C) and nitrogen (N) in the soil are mostly concentrated in soil organic matter whose content depend on natural factors: the climate, precipitation, parent material, land cover, relief, and anthropogenic influences (land use, soil and land management and degradation processes). Between 2014 and 2017, a project[10] was carried out to collect data for the National Inventory Report of the UNFCCC.[11]

Trends and current state

In soil samples from 0 to 30 cm of depth, the average soil organic carbon (SOC) in Croatian soils is 2.5%. More than 4% of SOC contains soil of coniferous forest, maquis and shrub, while agricultural soil (annual or perennial crops) mostly contain less than 2%. Average organic carbon stock in the same layer of soil is 66.9 t/ha. Soil in wetland, grassland, coniferous forests and perennial cropland contains higher C stocks, while annual cropland has less C stock, since intensive soil tillage reduces C stock and regular harvest removal makes it more difficult to accumulate new. Agricultural soils contains from 0.1% to 0.3% of total N, of which the most (around 95%) is in soil organic matter. In Croatian soils, the average nitrogen content is 0.25%. More than 0.3% of N contains soil of coniferous forest, maquis and shrub, wetland and other land. Soil of annual cropland contains an average of 0.17% nitrogen, and perennial cropland 0.2% nitrogen.

Mean SOC, C stock and total N in 0-30 cm soil depth considering land use

LULUCF land uses categories	Soil organic carbon (SOC %)	C stock (t/ha)	Total nitrogen (N %)
Deciduous forest	2.67	69.85	0.239
Coniferous forest	4.43	74.05	0.348
Maquis and shrub	4.84	65.01	0.443
Annual crops	1.33	52.71	0.167
Perennial crops	1.92	71.01	0.197
Grassland	2.37	75.75	0.259
Wetland	3.34	76.34	0.342
Settlements	2.54	86.91	0.254
Other land	4.25	46.85	0.471
Mean value	**2.53**	**66.91**	**0.247**

Source: CAEN, CGS, CFRI, ALA

10 Project „Change of soil organic carbon stocks and the calculation of total N and SOC trends, and C/N ratio"

11 United Nations Framework Convention on Climate Change

Biodiversity

Strictly protected species

One mechanism for preserving species is legal protection. Pursuant to the Nature Protection Act, threatened or rare endemic or wild species for which this kind of protection is stipulated by EU regulations on the conservation of wild plant and animal species, or by international agreements to which Croatia is a party are declared strictly protected.

Trends and current state

In the natural area of distribution of strictly protected species it is prohibited to damage deliberately, collect, catch or kill, disturb deliberately, destroy or collect eggs, deliberately destroy, damage or remove any life forms, nests or broods and to damage or destroy breeding or resting sites. In accordance with the Ordinance on Strictly Protected Species, 2,464 species and subspecies are strictly protected, along with all species which are strictly bound throughout their entire life cycles to speleological objects (troglobionts), species within water springs, all other unlisted species of Cetaceans which are found naturally in the Croatian Adriatic Sea, and all other unlisted species of bats which are found naturally in the territory of the Republic of Croatia.

Strictly protected species according to the Ordinance on Strictly Protected Species

Taxonomic group	Number of species, subspecies, hybrids and varieties
MAMMALIA – MAMMALS	60
AVES – BIRDS	287
REPTILIA – REPTILES	33
AMPHIBIA – AMPHIBIANS	13
FISH	96
ECHINODERMATA – ECHINODERMS	3
BRYOZOA – BRYOZOANS	1
INSECTA – INSECTS	254
ARACHNIDA – ARACHNIDS	40
CRUSTACEA – CRUSTACEANS	102
DIPLOPODA – MILLIPEDES	5
ENTOGNATHA	3
HIRUDINEA – LEECHES	2
POLYCHAETA – BRISTLE WORMS	1
GASTROPODA – GASTROPODS	160
BIVALVIA – BIVALVES	9

Taxonomic group	Number of species, subspecies, hybrids and varieties
ANTHOZOA – ANTHOZOANS	16
TURBELLARIA – TURBELLARIANS	1
SPONGIA – SPONGES	12
PLANTAE – PLANTS	983
ALGAE – ALGAE	22
LICHENES – LICHENS	47
FUNGI – FUNGI	314
+ all species of cetaceans which are found naturally in the Croatian Adriatic Sea and are not included in the above number of strictly protected mammal species.	
+ all species of bats which are found naturally in the territory of the Republic of Croatia and are not included in the above number of strictly protected species	
+ all species which are strictly bound throughout their life cycles to speleological objects (troglobionts) and species within water sources	
Total	**2 464+**

Source: CAEN

Biodiversity

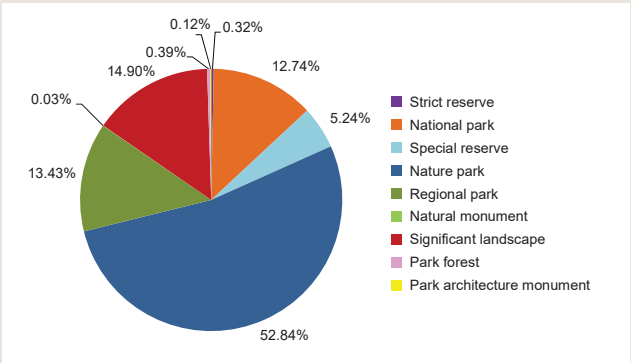
Network of protected areas in Croatia

Protected areas are the most important national mechanism for nature protection and date back to 1947. The Nature Protection Act defines nine national protected area categories: strict reserves; national parks; nature parks; special reserves; regional parks; nature monuments; significant landscapes; park-forests, and park architecture monument.

Trends and current state

Today, protected areas include 408 sites covering 758,534.88 ha, or 8.61% of the territory of Croatia. Most fall within the category of park architecture monuments (119), while the largest surface area is occupied by eleven nature parks (4.55% of the territory). Categories with strict protection regimes cover only 1.5% of the state territory (strict reserves – 0.027%, national parks – 1.1%, special reserves – 0.45%, and nature monuments 0.002%). This indicates that areas dedicated to the preservation of natural processes and unspoilt nature are underrepresented. On the other hand, nature parks, regional parks and significant landscape which allow the use of natural goods accounts for more than 80% of overall protected surface (7% of the state territory). So the Croatian network of protected areas is particularly demanding in terms of effective management.

Proportion of individual categories in the overall protected surfaces area



Source: CAEN, MEPE

Forestry

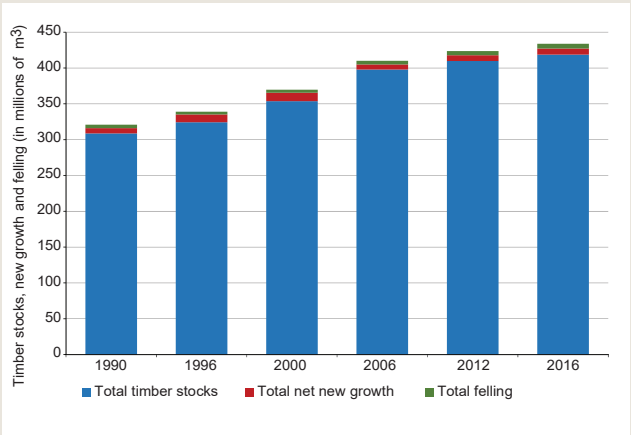
Forestry intensity

Forestry intensity is the level of activity within the sector, for example the quantity of felling and its ratio to new growth. In Croatia, the forests are managed according to the principles of sustainability, so that felling is consistently lower than new growth.

Trends and current state

The average new growth between 1990 and 2016 was around 9 million cubic metres per year, while felling accounted for between 70% and 75% of that figure. This allows new growth to accumulate every year and form timber stocks, thus assuring a healthy, stable forest ecosystem, along with raw material for the timber industry and energy sector. The natural basis and structure of the forests are maintained through planting. Felling includes removing trees damaged by natural disasters (snow, wind, fires), forest drying due to diseases or pests, age, as well as for the needs of infrastructure, etc. According to the most recent estimates (2016), the total timber reserves are around 418 million cubic metres. Since at the global level there is a need to find renewable sources of energy in order to reduce greenhouse gas emissions, one sector which may meet this demand is the forestry sector (wood for fuel, pellets and felling).

Forestry intensity



Source: Hrvatske šume d.o.o.

Forestry

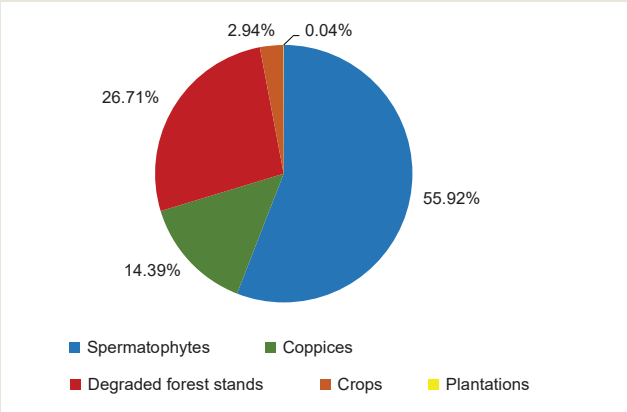
Naturalness and forest management

Since forests and forestland cover 47% of the land surface area of Croatia, and forests themselves 37% (0.46 ha per capita), Croatia is one of the most forested countries in Europe. It is among the rare ones which has mostly natural forests. In fact, 95% of the forests are natural, compared to those in the other EU-28 countries, which have tended to exploit their forests intensively and replace them with fast-growing species, leading to a less stable ecosystem.

Trends and current state

Forest components may be even-aged (where the trees of the main species are the same age), uneven-aged (where the trees are of different heights and girths) or varied (where trees of different ages and stages of development in an area of 1 ha are of the same size). In 2016, the proportion of even-aged (49%) to uneven-aged and varied (51%) forests indicated a good degree of diversity, and good distribution in terms of age, which means healthy, sustainable forests. Most forests are composed of mixed communities. In 2016, 2,492,676 ha were occupied by high growing form (spermatophytes, crops and plantations), low growing form (coppices) and various others (bushes and macchia). The most common species are beech, pedunculate oak, sessile oak, hornbeam and common pine.

Naturalness of forests and growing forms in 2016



Source: Hrvatske šume d.o.o.

Agriculture

Areas under Organic Farming

Organic farming is ecological agricultural production based on the principles of environmental protection, biological diversity and conservation of natural resources. Therefore the use of mineral fertilisers and chemical means of protecting plants are prohibited. Managing ecological production implies maintaining soil fertility, selecting plant species and strains, crop rotation, recycling organic material, and tillage techniques.

Trends and current state

The use of agricultural land for organic farming has risen continually since 2002, when the Register of Ecological Producers was established. In the last few years, the trend has become clearer, so that by 2015, the area under organic farming was 25,829 ha, an increase of 51.6% compared to 2014, while in 2016, an additional 17,931 ha were added, an increase of 23.6% compared to 2015. The total share of land under organic farming in terms of all used agricultural land was 6.1% in 2016. In terms of structure, most consists of arable land and gardens (47.1%), or meadows and pastures (41.7%).

Surfaces under organic farming

Year	Used agricultural land (ha)	Surface area under organic farming (ha)	Proportion of surface area under organic farming in terms of total used agricultural land (%)
2007	1 201 756	7 577	0.63
2008	1 289 091	10 010	0.78
2009	1 299 582	14 193	1.09
2010	1 333 835	23 282	1.75
2011	1 326 083	32 036	2.42
2012	1 330 973	31 904	2.40
2013	1 568 881	40 660	2.59
2014	1 508 885	50 054	3.32
2015	1 537 629	75 883	4.94
2016	1 546 019	93 814	6.07

Source: MA, CBS

Agriculture

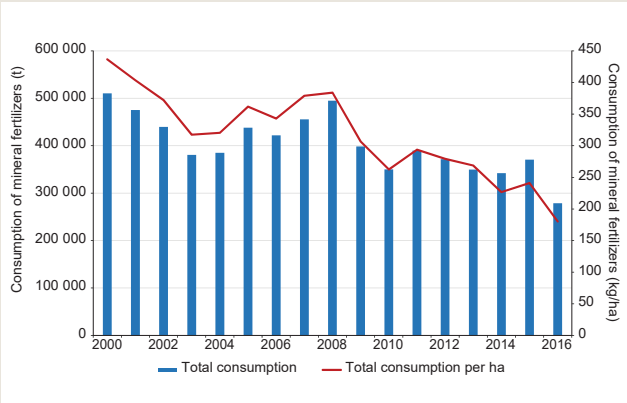
Consumption of mineral fertilisers

The consumption of mineral fertilisers is an important agricultural measure which ensures high, stable yields and profitability. So the level of consumption of mineral fertilisers is one of the most important indicators of the intensity of agricultural production. If it is excessive or uncontrolled, it can lead to environmental pollution and act counterproductively on plant production.

Trends and current state

Mineral fertilisers, particular those based on nitrates, tend to evaporate, leach into surface waters, and seep into deeper soil layers and underground waters. Therefore, their use must be controlled and good agricultural practice followed. In 2008, 384 kg/ha of mineral fertilisers were used. However, since then, quantities have been reducing continuously, so that by 2016, the figure was 180 kg/ha. The Nitrate Directive[12] limited the quantity of nitrates from mineral fertilisers to 210 kg/ha per year from 2013 to 2017, and prescribes a limit of 170 kg/ha for used agricultural land in 2018.

Consumption of mineral fertilisers



Source: CBS

12 Council Directive 91/676/EEC on reducing water pollution caused by nitrates from agricultural sources (OJ L 375, 31.12.1991.)

Waste management

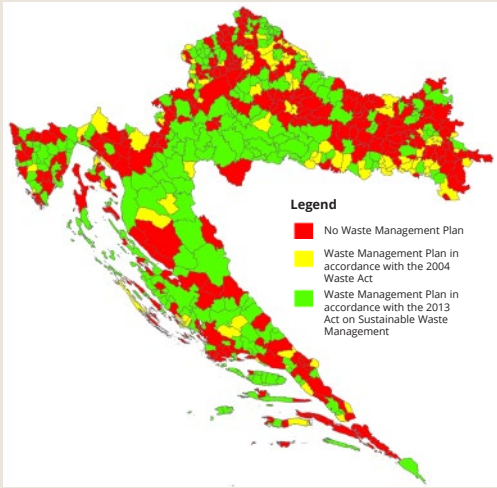
Waste management plans by local self-government units

Waste management plans, in accordance with the Act on Sustainable Waste Management, are produced and adopted at the level of local self-government units. They are documents which provide an analysis of the situation and needs in waste management, along with projections for waste generation and its prevention. The contents of the plans must be aligned with legal regulations and the Republic of Croatia's Waste Management Plan. The number of local self-government units which have produced and adopted such plans is an indicator of progress in achieving the goals of reducing and preventing waste generation and attaining sustainable waste management.

Trends and current state

By 2016, 284 out of 556 local self-government units had adopted waste management plans. In the first quarter of 2018, the total number of valid, adopted plans was 319, of which 86 were adopted under the earlier Waste Act, and 233 according to the new Act on Sustainable Waste Management. During 2017 and 2018 alone, 131 local self-government units (45 towns and 86 municipalities) adopted or revised their plans. The greatest numbers were in Sisak-Moslavina (95%), Brod-Posavina (86%), Lika-Senj (75%) and Karlovac (73%) County, and the smallest in Požega-Slavonia and Bjelovar-Bilogora (30%) and Osijek-Baranja and Varaždin (36%) County.

Production of waste management plans by local self-government units in 2018



Source: CAEN

Waste management

Transboundary waste movement

Directive EC 1013/2006 on shipments of waste applies to the transboundary movement of waste, which includes imports, exports and transits of waste which are subject or not subject to a notification procedure (reporting obligation).

Trends and current state

Between 2004 and 2016, the average annual shipment of all types of waste was 912,000 t, and increased by 46% in that period. There was a huge rise in the amount of exported waste which was subject to a reporting obligation. In 2014, this amount was 17,900 t, which then increased due to the production of fuel waste and sludges from treatment of urban waste water. Bosnia and Herzegovina, Austria and Germany were the main export destinations, with Hungary added in 2016. Imports of waste subject to reporting obligations were recorded for the first time in 2014, and in 2016 the amount was 6,510 t. Imports include batteries, fuel waste and sludges from treatment of urban waste water, mostly in Slovenia and Bosnia and Herzegovina. During 2016, the transit shipment of 60,000 t of waste through Croatia was approved. The average amount of exported waste which is not subject to a reporting obligation is 521,000 t per years (70% of total waste metals and 20% of paper and cardboard waste). Almost 75% of waste is exported to Slovenia, Italy and Turkey. An average of 365,000 t per year is imported, not subject to a reporting obligation, mostly from Bosnia and Herzegovina and Austria (waste paper and cardboard – 49%, waste from thermal processes – 31%).

Transboundary waste movement 2004, 2010 and 2016

Year	2004	2010	2016
Exports of waste not subject to a reporting obligation (t)	363 889	603 955	523 110
Imports of waste not subject to a reporting obligation (t)	265 265	225 224	328 227
Exports of waste subject to a reporting obligation (t)	12 805	18 937	77 826
Imports of waste subject to a reporting obligation (t)	0	0	6 510
Total transboundary waste movement (t)	641 959	848 116	935 673

Source: CAEN

Waste management

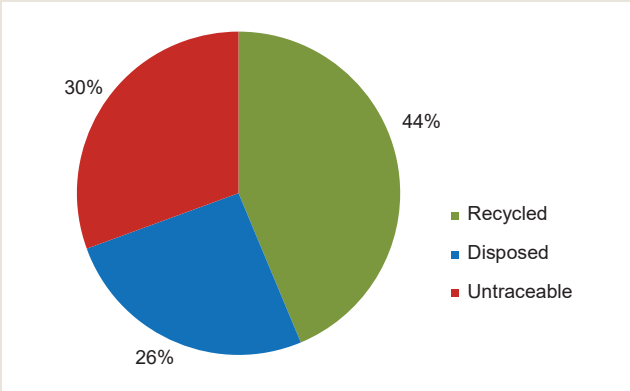
Construction waste

Construction waste is created during the construction, reconstruction, removal or maintenance of buildings, and when excavating building materials, and must be kept to a minimum, since it is a resource which can be reused if treated appropriately.

Trends and current state

The quantity of construction waste produced in 2015 (1,189,316 t) and 2016 (1,266,073 t) was derived from an evaluation of the project "Improving the flow and quality of data on construction waste and waste from researching and exploiting raw minerals in the Republic of Croatia". The project was conducted by the Croatian Agency for the Environment and Nature, whose database Environmental Pollution Registry indicates there is an annual increase of 6%. In 2016, most of this waste (47%) consisted of stone material and surface soil waste. About 44% (553,400 t) of construction waste produced was sent for processing, and 26% (325,600 t) for disposal, while 30% (387,073 t) was not traceable and can be assumed to have been tipped illegally. In 2016, 94,947 t were exported and 4,876 t imported. Taking into account the many kinds of construction waste and measures taken to use it, only 43.7% was recycled in 2016, which is insufficient in comparison with the goal of 70%, in line with the Waste Framework Directive which is due to be published in 2020.

Proportions of construction waste in 2016



Source: CAEN

Energy

Production and consumption of energy from renewable energy sources

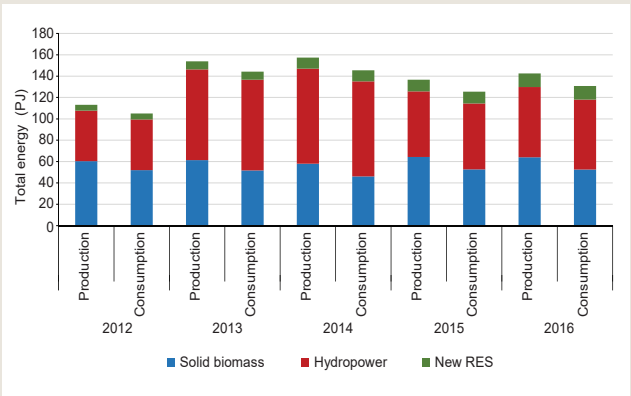
Renewable energy sources (RES) are consistently renewable and can be divided into traditional RES (hydropower and the solid biomass) and new RES (solar power, wind power, geothermal energy, landfill gas, bio-gas and liquid bio-fuel).

Trends and current state

Between 2012 and 2016, the production of primary energy from RES increase by 11.2%. Most of this came from hydropower (an increase of 38.7%), while new RES increase by 129.7%. The production of energy from the solid biomass fell slightly (6.2%). In 2016, the total production of electrical energy in Croatia was 12,818.6 GWh, of which 66.8% came from RES including large hydroelectric plants. These contributed 54.1%, which 12.7% came from other RES (wind power, small hydroelectric plants, the biomass, biogas and photo-charging). Although geothermal energy accounted for only a small proportion (0.3%), production increase in the observation period by 8.2% and accounted for 0.7 PJ in 2016.

In relation to total energy consumption, energy consumption from all types of RES amounted to 32.3% in 2016. As with production from these sources, the greatest proportion was from hydropower (16.2%), followed by the solid biomass (12.9%), while new RES accounted for 3.1%. In 2016, RES accounted for 46.7% of all electrical energy consumption.

Consumption and production of RES energy



Source: EIHP

Energy

Greenhouse gas emissions and air pollutants from the energy sector

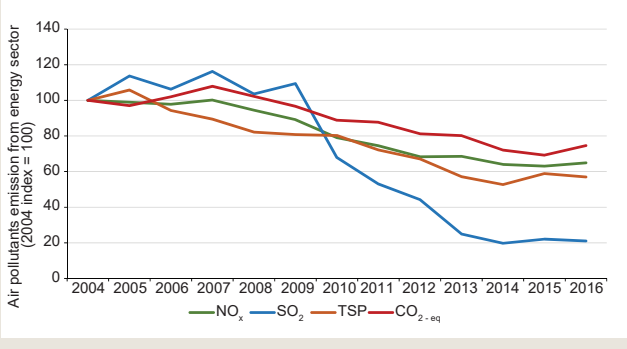
The energy sector accounts for the greatest proportion of greenhouses gases and air pollutants emissions (about 75%). Fossil fuel combustion accounts for 90% of all energy sector emissions.

Trends and current state

Between 2004 and 2016, $CO_{2\text{-eq}}$ emissions were reduced by about 23.8% as the result of energy efficiency measures and the use of RES, but also as the result of declining economic activity. In 2016, $CO_{2\text{-eq}}$ emissions were 17,074.4 kt. Methane (CH_4) accounted for 8% and nitrous oxide (N_2O) for 2%, while the rest was CO_2.

Since 2004, NO_x levels have been reduced by 38.6% and in 2016 amounted to 48.8kt. The energy sector contributes as much as 93.3% to total NO_x emissions, and the main source is the transportation subsector (48%), that is, road transport. The emission of total suspend particles (TSP) was reduced by 53.2%, and in 2016 amounted to 37.5 t. The energy sector accounts for half these suspend particles (50.6%), particularly domestic biomass consumption (38.8%). Reductions in NO_x and TSP are primarily the results of the economic crisis, the introduction of catalysers and vehicles with strict emission standards, along with eco-standardised and pellet-burning furnaces. In the same period, emissions of sulphur dioxide were reduced by 78.2% in 2016, up to 43.1% of sulphur dioxide emissions were in the energy sector. The rest were fugitive emissions (refineries and warehousing – 27.6%, energy combustion in industry and construction – 19.8%, and small mobile and immobile fireplaces – 7.2%). The total emissions of sulphur dioxide in 2016 were 14.7 kt. Reductions in this level are mostly the result of the transfer to low-sulphur fuels.

Emissions of NO_x, SO_2, TSP and $CO_{2\text{-eq}}$ from the energy sector



Source: EIHP, CAEN

Industry

Industrial wastewater

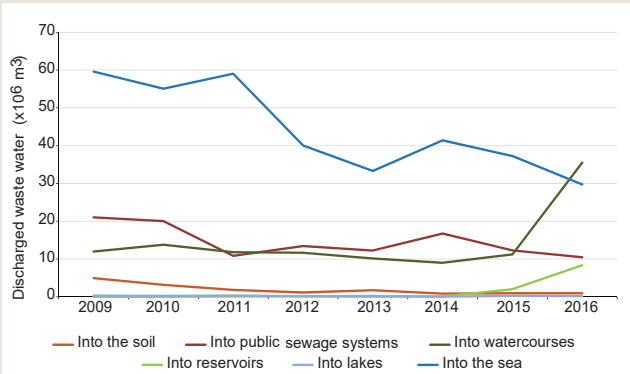
Industrial wastewater contains pollutants. For releases of pollutants to water, threshold values are specified for each pollutant according to the type of the recipient.

Trends and current state

According to the Croatian Bureau of Statistics, in 2016, 85.5 million cubic metres of waste water was discharged into recipients from industrial activities. In 2016, the greatest contributor to the total amount of waste water released was the Manufacturing (57.8%), followed by the Electricity, gas, steam and air-conditioning supply section (39.1%), Mining and quarrying (2.7%) and Water supply; sewerage, waste management and remediation activities (0.4%). Regarding recipients, the highest volume of waste water was discharged into watercourses (41.5%). Between 2009 and 2016, the volume of waste water discharged into watercourses increased from 14.56 million cubic metres to 35.5 million cubic metres, while less waste water was discharged into the sea (50.5% less) and the public sewage systems (55% less), and the volume discharged into the soil was reduced by 81.3%, and into lakes by 44%. At the same time, the volume discharged into reservoirs increased from zero to 8.36 million cubic metres.

Fluctuations in certain reported volumes are the result of changes in the number of those obliged to report, intensification in certain industrial activities, and improvements in methods for collecting and processing data.

Discharge of waste water from industry



Source: CBS

Industry

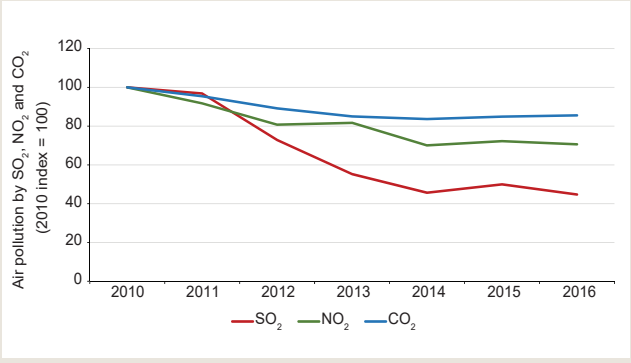
Air pollution by sulphur dioxides, nitrous dioxides and carbon dioxide

Emissions of sulphur oxides expressed as sulphur dioxide (SO_2) mostly occur as the result of burning solid and liquid fossil fuels (coal, wood, and liquid petroleum derivatives). Nitrogen oxides expressed as nitrous dioxide (NO_2) occur when fuel combusts at high temperatures, so its production depends on the characteristics of furnaces and how they are used. Carbon dioxide (CO_2), the main greenhouse gas, occurs during the combustion of fuel, raw materials and waste.

Trends and current state

Data on emissions of pollutants into the air are collected and stored in the Register according to the Ordinance on the Environmental Pollution Register. The sectors which report the highest emissions of SO_2, NO_2 and CO_2 are industrial: producers of cement, petroleum derivatives, nitrous fertilisers, mineral wools and fibreglass, heat and electrical energy. The smallest amounts are recorded from non-industrial fuel consumption for heating workplaces. Between 2010 and 2016, emissions of SO_2 were reduced by 50%, as a large number of users replaced solid fuels and heating oil with natural gas. In addition, NO_2 emissions were reduced by 30%, and CO_2 by 15%. The reasons were a drop in the use of fossil fuels and fewer reports to the Register when the prescribed limits for emissions were increased.

Air pollution by SO_2, NO_2 and CO_2



Source: CAEN

Chemicals

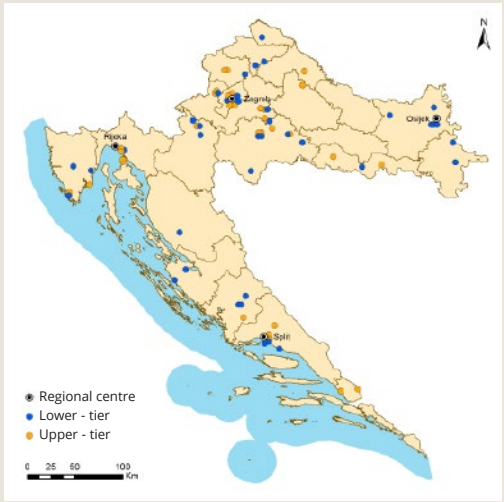
Seveso establishments in Croatia

According to the Regulation on the Prevention of Major Accidents Involving Dangerous Substances and the Ordinance on the Registry of Installations in which Dangerous Substances are Present / Register of Reported Major Accidents, Seveso establishments are obliged to report dangerous substances. These are substances which increase the risk of major accidents, and accidents may happen as a result of production, use, storage or handling. Data on risk assessments for dangerous substances can be found in the Registry of Installations in which Dangerous Substances are Present / Register of Reported Major Accidents.

Trends and current state

In 2016, seventy Seveso establishments were registered in Croatia; 33 upper tier and 37 lower tier establishments. Most are registered in Sisak-Moslavina County (10), followed by the City of Zagreb (7) and Zagreb County (7). There are six in Split-Dalmatia County, six in Osijek-Baranja County, and five each in Istria and Primorje-Gorski Kotar Counties. In 2016, for the first time, one lower-tier establishment was recorded in Lika-Senj County (for the production of explosives) and two in Vukovar-Srijem County (for extracting petroleum and warehousing petroleum derivatives). There are two upper-tier establishments in Dubrovnik-Neretva County (for warehousing petroleum gas and derivatives). The highest quantities of dangerous substances are registered in petroleum extraction activities, petroleum refineries, industrial gas plants and electrical energy production plants. The highest quantities of dangerous substances were registered in Primorje-Gorski Kotar and Sisak-Moslavina Counties, the City of Zagreb, and Dubrovnik-Neretva County.

Seveso establishments in Croatia in 2016



Source: CAEN

Tourism

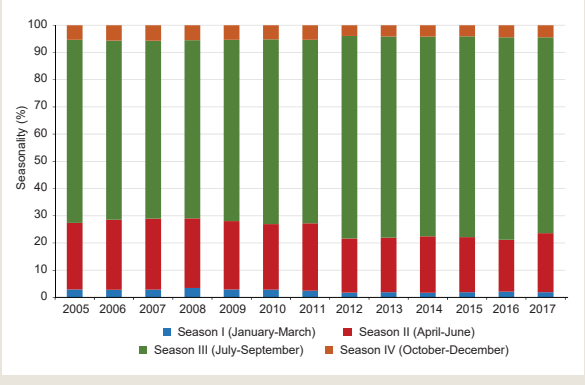
Seasonality of tourism in Croatia

In recent years, Croatia has been placed among the European countries with the highest growth rates in tourism. Tourism contributes 18% to GDP, but it is not evenly distributed throughout the country, and the greatest challenge is its marked seasonal character (April to September).

Trends and current state

The high seasonality in tourism is evident from the fact that about 95% of overnight stays and 87% of revenues from international tourism are recorded between April and September in coastal counties. In comparison to the other EU-28 countries, Croatian tourism has the highest seasonality. In 2016, this was 8.7 in comparison to the EU average of 3.3. During the short season, the main burden of the tourism sector falls on all environmental components in the coastal and hinterland areas. Karst river and lake areas, and natural protected areas are particularly vulnerable, and for these, carrying capacity must be calculated. High seasonality often causes organisational problems in tourist destinations, and the regional imbalance between the coastal and continental areas, as seen in the over- or under-use of the tourism infrastructure. Apart from extending the season on the coast, potential risks could be reduced by strengthening continental tourism and green tourism, or promoting cultural tourism and improving the structure of accommodation.

Seasonality of tourism in Croatia



Source: CAEN

Tourism

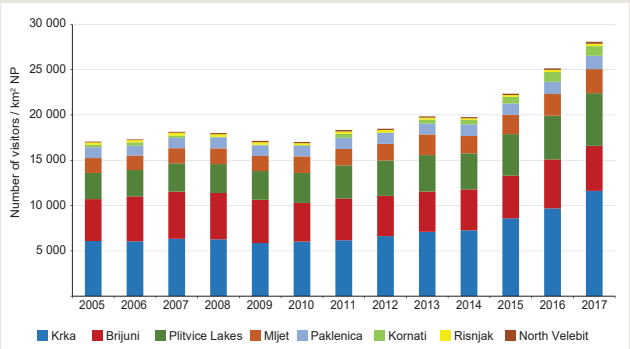
Numbers of visitors to national parks in Croatia

Tourism in protected areas popularises nature and raises ecological awareness. In addition, it forms an important part of the economy, since it provides local employment and stimulates the production of indigenous goods and services. However, if too many visitors arrive in a limited area in a short period, this can affect the natural world and their experience of it. The number of visitors in relation to the surface area of national park provides information on how much the environment is burdened by their presence.

Trends and current state

Between 2011 and 2017, the number of tourists to protected areas, particularly national parks, grew continuously. In 2005, 1,974,961 visitors were recorded in all national parks, while in 2017, the figure was 3,723,798, an increase of 88.5%. In 2017, the largest number of visitors visited Plitvice Lakes National Park (1,720,331), and in terms of visitors per total surface area, it occupies second place, with 5,806 visitors/km². Krka National Park had a greater concentration, at 11,613 visitors/km² in 2017. It should be emphasised that since 2017, Krka National Park has implemented new sustainable management measures based on carrying capacity in Skradinski Buk, where most of the park's recreational activities take place, and where 98% of visitors are staying. In 2017, Brijuni National Park recorded 4,979, Mljet National Park 2,654, Paklenica National Park 1,478, and Kornati National Park 1,062 visitors/km². The lowest concentrations were in Risnjak National Park (261 visitors/km²) and North Velebit National Park (205 visitors/km²).

Numbers of visitors to national parks (by surface area)



Source: CAEN

Transport

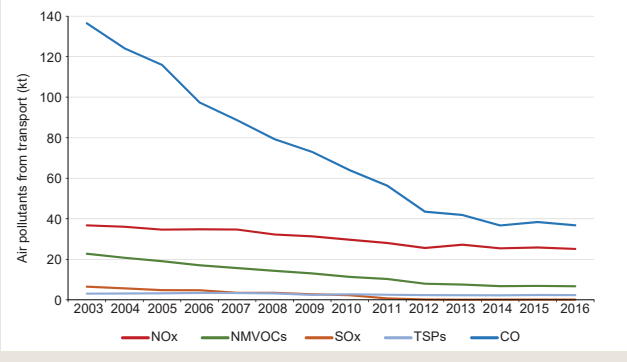
Emissions of air pollutants from transport

Globalisation and urbanisation processes intensify transport, which may in certain respects affect the quality of human life and the environment, primarily due to emissions of air pollutants such as nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), sulphur oxides (SO_x), total suspended particles (TSP), carbon monoxide (CO) and lead (Pb). Road transport is responsible for most of these emissions, and exhaust gases test is carried out according to the Ordinance on Technical Inspections for Vehicles. In order to reduce emissions and implement measures for cleaner transport and energy efficiency, stakeholders continue to carry out activities.

Trends and current state

In 2016, transport made a significant contribution to emissions of air pollutants: NO_x (42.6%), NMVOCs (9%), TSPs (5.6%), CO (17.2%) and Pb (51.6%). Looking at the figures since 2003, there have been notable trends in reducing these emissions. Low-sulphur fuels have been in use since then, leading to a 98% reduction in sulphur oxide emissions. A higher proportion of vehicles with catalysers has reduced carbon monoxide emissions by 73% and nitrogen oxides by 32%. NMVOCs are also falling (by 71%) thanks to lower levels of fugitive emissions from petroleum derivatives, mostly petrol and natural gas, and increasing numbers of energy efficient vehicles. Emissions of TSPs have fallen by 23.4%, representing similar quantities of emissions from fuel plant combustion and those from road wear, tyres and brakes. Since 2006, lead petrol has been completely removed from the market, so that by 2016, Pb emissions had fallen by 93%.

Emissions of air pollutants from transport



Source: CAEN

Transport

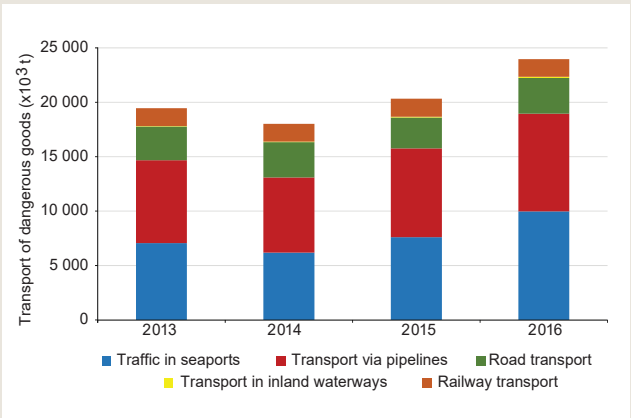
Transport of dangerous goods

Transport of dangerous goods is a potential hazard to people, property and the environment. Dangerous Goods Transport Act[13] prescribes the conditions for each type of transport, the obligations of persons involved, as well as packaging and vehicle conditions.

Trends and current state

Since 2014, there has been a continual increase in the transport of dangerous goods. In 2013, 19,461,000 t were transported, and in 2016, 23,962,000 t, mostly by sea and pipeline. In 2016, seaports handled 9,984,000 t, or 42%, and pipelines 8,970,000 t, or 37% of all dangerous goods. Road transport accounted for 3,284,000 t (14%) and railway transport 1,612,000 t (6.7%), while only 0.3% of dangerous goods were transported in inland waterways. In the same year, 21 accidents in transport were recorded, mostly in pipelines (71%) and road transport (19%). These accidents can be linked to the increase in quantities of dangerous goods transported in the observation period.

Transport of dangerous goods by mode of transport



Source: CBS

13 OG 79/07

Health and safety

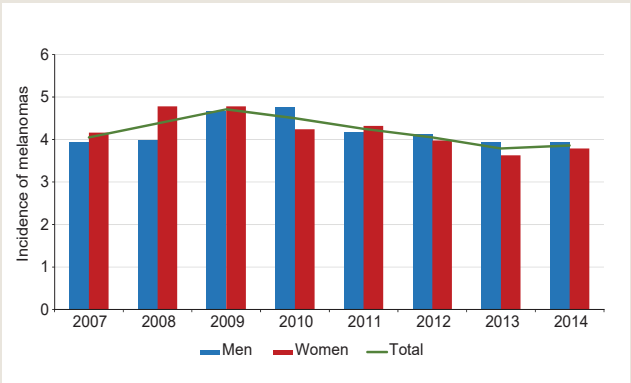
Incidence of melanoma in people aged under 55 years

This indicator points directly to health consequences linked to exposure to ultraviolet (UV) radiation. Exposure to the sun, which results in burns in childhood, affects a higher incidence of melanomas in later life, and there is also a link with exposure to pesticides.

Trends and current state

Although data for southern and eastern Europe indicate a higher prevalence of malign melanomas, the rate has been falling in Croatia in recent years. The incidence of melanoma in people aged under 55 years is around 4 in 100,000, which means Croatia belongs to the group of countries with a low incidence. One reason for this is a change in habits among the population (less exposure to the sun) and information about the UV index published by the Croatian Meteorological and Hydrological Service. The highest incidences of melanomas in Europe are in The Netherlands, Denmark, Sweden, Norway and Switzerland (17 to 20 men and 19 to 22 women per 100,000 inhabitants). The countries of central and Eastern Europe have the lowest incidence (4.5 for men and 4.6 for women per 100,000 inhabitants).

Incidence of melanoma in people aged under 55 years



Source: HZJZ

Health and safety

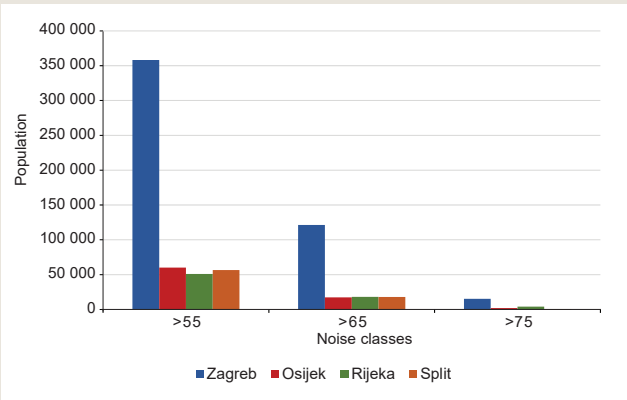
Environmental noise pollution

Along with air pollution, noise pollution has been identified as the second most frequent environmental cause of illness among people in urban areas. The EU's Seventh Environmental Action Programme aims to reduce noise pollution to levels recommended by the World Health Organisation by 2020.

Trends and current state

In cooperation with the Ministry of Health, the Croatian Agency for the Environment and Nature has set up a portal to access an information system of strategic noise maps and action plans, by which the public can be informed about exposure to noise. According to measurements taken so far, it is estimated that 722,942 inhabitants of Croatia are exposed to noise from road transport which exceeds the permitted level of 55 dB. The leading source of noise pollution in cities and towns is road transport, and it is estimated that 70 million Europeans are exposed to excessive levels daily. If the value indicator for total noise disturbance is seen in terms of Lden, then in Zagreb, throughout a whole day, 15,412 people are exposed to excessive noise higher than 75 dB; in Rijeka, the figure is 4,206, in Osijek, 1,934, and in Split, 529. The obligation to draw up action plans as instruments to resolve noise pollution is prescribed by the Noise Protection Act.

Exposure of the population to road transport noise



Source: CAEN

General environmental issues

Eco-Innovation Scoreboard

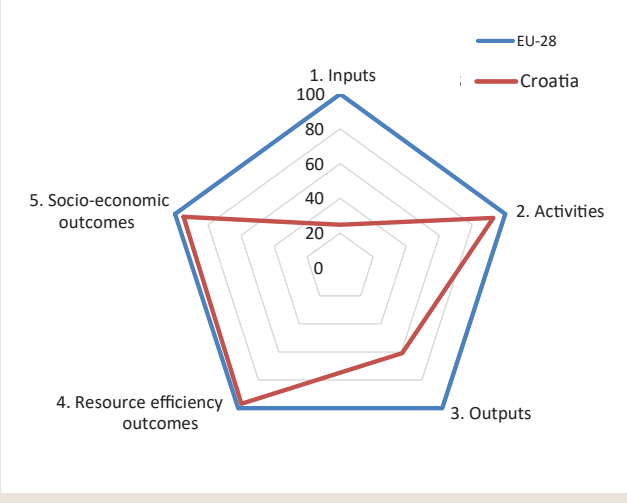
Eco-innovations are those which have only a minor effect on the environment and use resources more efficiently.[14] On the Eco-Innovation Scoreboard, which compares the eco-innovation indices of member states with the average of the EU-28, ranking is based on calculating 16 indicators divided into five thematic areas: inputs, activities, outputs, resource efficiency, and socio-economic outcomes.

Trends and current state

Data on eco-innovation in Croatia have been monitored since 2013, when Croatia occupied 23rd place on the scoreboard. A year later, thanks to increased exports of ecological products, it was close to the EU-28 average in 15th place. However, in 2017, the eco-innovation index was 25% lower and it fell again to 23rd place. Croatia had the best results in resource efficiency (97), followed by socio-economic outcomes (95) and activities (93), where it came close to the EU-28 average. No progress was made in inputs, primarily due to the low share of the Government Budget appropriations or outlays for research and development.

14 Decision 1639/2006/EC of the European Parliament and of the Council, 24 October 2006, on establishing a Competitiveness and Innovation Framework Programme (2007-2013) (OJ L 310, 9.11.2006).

Eco-Innovation Scoreboard for Croatia and the EU-28 in 2017



Source: European Commission, Eco-Innovation

Sustainable consumption and production

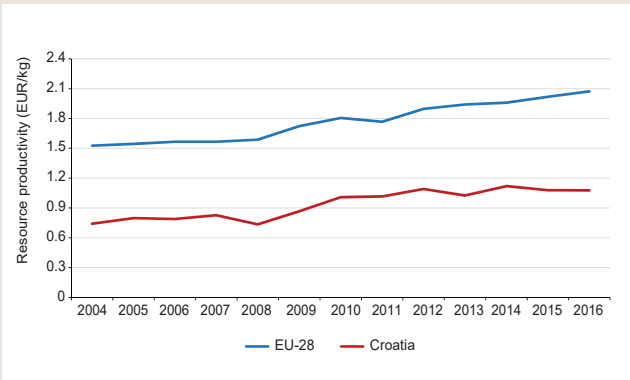
Resource productivity

One of the main aims of environmental protection policies is the efficient use of resources, decoupling material consumption from economic growth. The indicator which provides information on whether this is being achieved is resource productivity. The final aim is to achieve absolute decoupling, which implies economic growth while reducing material consumption. However, in most industrial countries, only relative decoupling is present, and this is evident in the comparative growth of the economy and material consumption, when material consumption has a lower growth rate than GDP.

Trends and current state

Between 2004 and 2009, resource productivity in Croatia was under 1 EUR/kg. This meant that every kilogram of material used directly in the economy created a value of less than 1 euro (from 0.7 EUR/kg in 2004 to 0.9 EUR/kg in 2009). In the same period, average resource productivity in the EU-28 was between 1.5 EUR/kg in 2004 and 1.7 EUR/kg in 2009. Resource productivity in Croatia has been rising since 2010, but this can be accredited to a fall in domestic material consumption, rather than a rise in GDP. In 2016, resource productivity in Croatia was 1.1 EUR/kg, which indicates the fact that absolute decoupling has not yet been achieved.

Resource productivity in Croatia and the EU-28



Source: Eurostat

Public relations

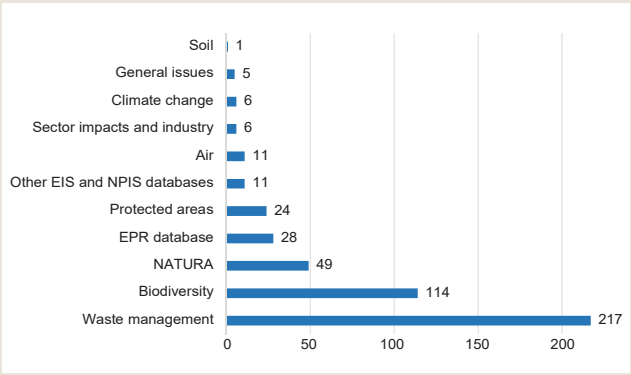
Number and structure of enquiries directed to the Agency by the public

The Croatian Agency for the Environment and Nature provides information for the expert and wider public on the situation in the environment and nature through its website, printed publications, participation in expert groups, media appearances and direct responses to enquiries.

Trends and current state

In 2017, we received 472 enquiries, of which almost half (46%) related to the area of waste management. The second most common area of public interest was biodiversity (24.2%). Data from the Environmental Pollution Register were the subject of 6% of public enquiries, and data from other databases of the Environmental Information System and Nature Protection Information System were subject to 2.3% of inquiries. Information on the Natura 2000 ecological network was sought in 10.5% of enquiries, while 5% asked for information on protected areas. Air attracted 2.3%, climate change and sectoral impacts 1.2% and general environmental issues 1.1% of enquiries. Over 80% of enquiries came from economic subjects whose activities were linked with waste management, producing expert studies, or the obligation to submit data to the Agency. The remainder were submitted by expert associates in institutions, local and regional self-government units, public environmental interests and students who requested information to help them write doctoral, specialist and graduation theses, or papers.

Number and structure of enquiries directed to the Agency by the public in 2017



Source: CAEN

Abbreviations

ALA – Agricultural Lands Agency
C – carbon
CAEN – Croatian Agency for the Environment and Nature
CBS – Croatian Bureau of Statistics
CFRI – Croatian Forest Research Institute
CGS – Croatian Geological Survey
CH_4 – methane
CO – carbon monoxide
CO_2 – carbon dioxide
$CO_{2\text{-eq}}$ – equivalent carbon dioxide
dB – decibel
DHMZ – Croatian Meteorological and Hydrological Service
Eurostat – statistical office of the European Union
GWh – gigawatt hour
ha – hectare
EIHP – Energy Institute Hrvoje Požar
H_2S – hydrogen sulphide
kt – kiloton (10 t)
MA – Ministry of Agriculture
N – nitrogen
NH_3 – ammonia
NMHOS – non-methane volatile organic compound
NO_X – nitrogen oxides
NO_2 – nitrogen dioxide
N_2O – nitrous oxide
OG – Official Gazette (of the Republic of Croatia)
Pb – lead
PJ – petajoule (10^{15} J)
EPR – Environmental Pollution Registry
RES – Renewable Energy Source
REDS/RRMA – Registry of establishment in which dangerous substances are present/Register of reported major accidents
SOC – soil organic carbon
SO_X – sulphur oxides
SO_2 – sulphur dioxide
TSP – total suspended particles
UNFCCC – United Nations Framework Convention on Climate Change
WHO – World Health Organisation

Glossary

- **Acidification** – term for a group of processes which lead to hydrogen ions accumulating in the soil. The result is the loss of ions of alkaline elements (primarily calcium and magnesium). Anthropogenic acidification is caused by acid rain and the intensive use of mineral and organic fertilisers.
- **Acid equivalent index** – the index which expresses the total amount of emissions of acidifying substances into the air: sulphur dioxide, nitrogen oxides and ammonia.
- **Biogas** – gaseous fuel produced from the biomass and/or biodegradable waste, which can be purified to the quality of natural gas and used as biofuel or generator gas.
- **Biomass** – the biodegradable part of production, waste and organic remains from agriculture (including plant and animal components), forestry and related industries, including fishing and mariculture; also the biodegradable part of industrial and municipal waste, including biofluids and biofuels.
- **Copernicus services** – services for monitoring the Earth, coordinated and directed by the European Commission, comprising services (products) which cover six thematic areas: land, the marine environment, the atmosphere, climate change, emergency management, and security.
- **Cleaner transport** – implies the use of ecologically acceptable vehicles (electric, hybrid) and plug-in hybrids.
- **CORINE Land Cover Base** – a digital database on the status of and changes to land cover and land use in the Republic of Croatia 1980–2006. The Croatian CLC is consistent and homogenised with land cover data for the entire European Union. It was produced as a result of the CORINE programme (CooRdination of Information on the Environment) accepted by the European Union and evaluated at the EU level as the basic reference dataset for spatial and territorial analysis.
- **Degradation processes** – processes which have a negative impact on the soil: erosion, landslides, reduction of organic substances and biodiversity in the soil, pollution, salinization, acidification, compaction of the soil, etc.
- **Eco-Innovation Scoreboard** – and index of 16 individual indicators which provide information on the success in eco-innovation of individual member states in relation to the EU-28 average.
- **Eutrophication** – over-enrichment of the water ecosystem. It may be the result of the anthropogenic introduction of plant nutrients (e.g. nitrates and phosphates), mineral fertilisers being washed out of the soil, or natural succession, and results in

the strong development of the primary producers of organic substances (algae and other plants).

- **Fugitive emissions** – emissions of volatile organic compounds into the air, soil and water from solvents contained in any product, released into the environment through windows, doors, vents and similar openings, rather than exhausts.
- **Greenhouse gases** – gaseous components of the atmosphere produced naturally and anthropogenically, which absorb and reflect infrared radiation: carbon dioxide, methane, nitrous dioxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
- **Lden** – indicator of total noise disturbance (day-evening-night level).
- **Liquid biofuel** – liquid fuel for transport, produced from the biomass (e.g. bioethanol, biodiesel, biomethanol).
- **Lower-tier establishment** – an establishment or installation which has an equal or greater amount of dangerous substances than the limit prescribed in column 2 of Annex 1 of the Seveso Directive.
- **Reporting obligation** – the requirement to submit a written notice in advance with authorisation for transboundary movement in waste which is subject to such a procedure.
- **Reservoir** – an artificial lake created by using a dam in valleys, ravines, and similar places.
- **Seasonal discrepancy (seasonality)** – estimated on the basis of the absolute discrepancy of monthly data (overnight stays) from mean values.
- **Seveso** – a town in Italy where a major accident occurred in 1976, when dangerous substances were released from a chemical plant producing herbicides and pesticides. The accident prompted legislation to be passed on preventing and controlling major accidents at the European level (the Seveso Directive).
- **Seveso establishment area** – designates the entire area where dangerous substances are present in one or more establishments, including their joint or related infrastructure and activities.
- **Speleological object** – a naturally formed underground hollow (cave, grotto, pothole, estavelle, etc.)
- **Stump forest** – trees which grow from the stumps or roots of leafy trees, mostly in areas with impoverished soil, used mostly for fuel and minor construction.
- **Upper-tier establishment** – an establishment or installation which has an equal or greater amount of dangerous substances than the limit prescribed in column 3 of Annex 1 of the Sesevo Directive.

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