

• WATER

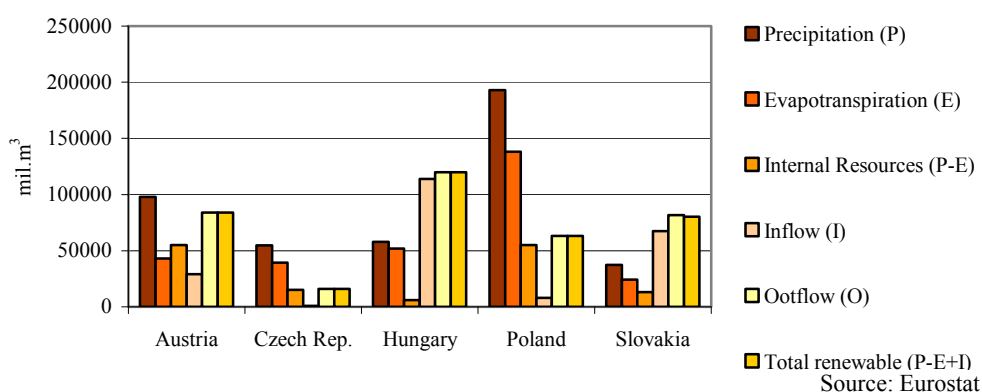
◆ Water management planning and River Basin Management Plans

The Slovak Republic creates and publishes documents required by the Water Act, which include **River Basin Management Plans, Water Management Plan of Slovakia, and International River Basin Management Plans.** Watershed management plans represent binding documents approved by the Ministry of Environment of the Slovak Republic for all who carry out activities within the scope of the Water Act. The Water Management Plan of Slovakia sets out broad responsibilities for protection and improvement of water conditions, and for economical exploitation of the water potential. Water Management Plan of Slovakia is approved by the Slovak Government and serves as the basis for drafting the International Danube River Basin District Management Plan and the International Visla River Basin District Management Plan.

Water sources and water fund

Significant part of the Slovak surface water fund flows in from the neighboring states and the usability of this fund is limited. In total, the long-term in-flow average is approximately $2.514 \text{ m}^3 \cdot \text{s}^{-1}$ of water, which is about 86 % of our total surface water fund. In the long run, there is approximately $398 \text{ m}^3 \cdot \text{s}^{-1}$ of water springing in Slovakia, which represents 14 % of the water fund.

Long term freshwater resources in the selected countries in 2008



Surface water

◆ Precipitation and runoff conditions

Total **atmospheric precipitations** in the Slovak territory in 2008 reached the value of 817 mm, which represents 107 % of the normal level. In terms of precipitations, this year had been considered normal. Total excess of precipitations reached the value of 55 mm.

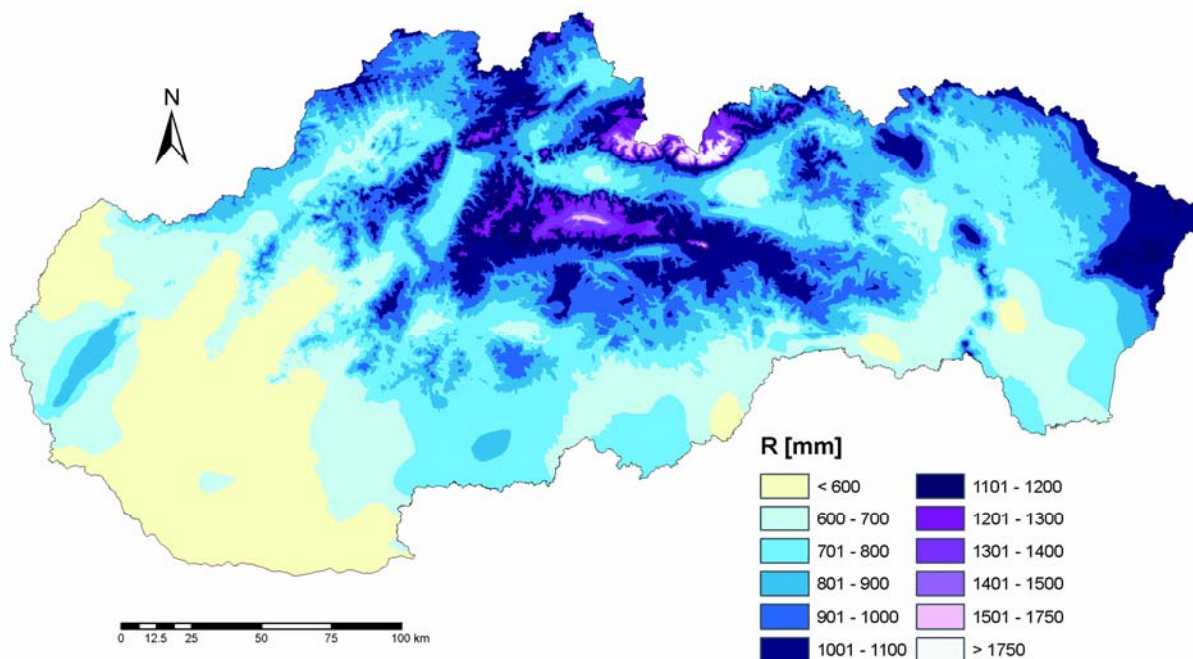
Characteristics of total precipitation figures for most watersheds were normal, with the exception of partial watersheds of Hron, Bodrog, Poprad, and Dunajec that showed humid precipitation conditions. The only very humid partial watershed was that of the Hornád river.

Average rates of precipitation and runoff in particular catchment areas

Catchment area	Dunaj		Váh		Hron			Bodrog a Hornád				SR
	*Morava	*Dunaj	Váh	Nitra	Hron	*Ipeľ	Slaná	Bodva	Hornád	*Bodrog	*Poprad and Dunajec	
Catchment area extent (km ²)	2 282	1 138	14 268	4 501	5 465	3 649	3 217	858	4 414	7 272	1 950	49 014
Average precipitation (mm)	663	600	851	689	872	745	812	737	856	847	981	817
% of normal	97	96	101	99	111	109	103	101	126	120	117	107
Character of rainfall period	N	N	N	N	V	N	N	N	VV	V	V	N
Annual runoff (mm)	94	22	259	105	216	68	140	86	319	219	419	208
% of normal	71	61	83	73	75	50	74	41	72	74	122	79

* watercourses and corresponding data only for the Slovak part of the watershed
 Source: SHMI
 Characteristics of the precipitation season: N - normal, S - dry, SS - very dry, V – humid, VV – very humid, MV – exceptionally humid

Annual atmospheric precipitation (mm) in Slovakia in 2008



Source: SHMI

Annual runoff volumes in SR in 2008 reached 79 % of the long-term average value. Runoff volumes from partial catchments exceeded the long-term average only in the Poprad and Dunajec catchments with the value of 122 %. The remaining catchments showed values within 41 – 83 %.

◆ **Water balance**

In 2008, there was 69 005 mil.m³ of water flowing into Slovakia, which is 5 486 m³ more than in 2007. **Runoff** from the territory has grown by 794 mil.m³, compared to the previous year.

Total water volume as of 1.1.2008, in water reservoirs was 798 mil.m³, which represented 69 % of total usable water volume in water reservoirs. As of 01.01.09, total available volume of the assessed accumulation tanks compared to the previous year 2008 dropped to 809.4 mil.m³, which represents 70 % of total exploitable water.

Total hydrological balance of water resources in the SR

	Volume (mil. m ³)		
	2006	2007	2008
Hydrological balance:			
Rainfall	36 274	39 460	40 049
Annual inflow to the SR	70 711	63 519	69 005
Annual runoff	85 646	72 593	73 387
Annual runoff from the territory of the SR	14 900	9 264	10 146
Water management balance			
Total abstraction of the surface and ground water in the SR	882.47	480	664.6
Evaporation from water reservoirs and dams	55.79	62	51.9
Discharge into surface waters	669.7	628	608.9
Impact of water reservoirs (WR)	7.8	32	12.6
	improving	accumulation	accumulation
Total volume in WR as of 1st January of the following year	681.60	798	809.4
% of supply volume in accumulation WR in the SR	59.00	69	70
Rate of water exploitation (%)	6.38	5	6.55

Source: SHMI

◆ **Surface water abstraction**

Decreasing trend in surface water abstractions with all surface water users continued also in 2008, reaching the value of 312.991 mil.m³, which is 4.2% lower than in the previous year. This year shows reduced abstractions for all surface water users. Industrial abstractions in 2008 reached 251.797 mil.m³, which is 14.98 mil.m³ less than in 2007, e.g. 5.62 %. A slight reduction was recorded also in surface water abstractions for waterlines, which, compared to the previous year, dropped by 1.26 mil.m³, that is 2.7 %. Surface water abstractions for irrigation grew and reached the value of 9 133 mil.m³.

Surface water exploitation in the SR (mil.m³)

Year	Public water-supplies	Industry	Irrigation	Other agriculture	Total	Discharging
1998	68.370	621.858	42.447	0.0400	732.707	1 078.500
2006*	55.567	323.709	15.854	0.0120	395.142	748.537
2007*	53.315	266.776	6.036	0.0120	326.139	628.270
2008*	52.057	251.797	9.133	0.0040	312.991	608.997

*data from database „Aggregate balance sheet of water“

Source: SHMI

◆ **Surface water quality**

At present, Slovakia is undergoing changes in surface water assessment, pursuant to the provisions of framework Directive on Water No. 2000/60/EC.

Surface water quality assessment has been carried out on the basis of data obtained during the water level monitoring process. For the year 2007, surface water quality monitoring was split into the basic monitoring, operational monitoring, and monitoring of protected territories (PT). This division followed the provisions of **the MoE SR Resolution No. 221/2005 Coll. which sets forth details on detecting the occurrence and assessment of surface and ground water situation, its monitoring, keeping the water register and water balance records.** The basic monitoring network comprised 171 abstraction sites with 35 sites monitored within the water formation characterisation process, 68 within the reference conditions monitoring, 38 were monitored within the boundary water courses, 75 within the process of characterisation of water course types, and 9 abstraction sites were monitored for the ICPDR. (International Committee for the Protection of the Danube River)

Number of assessed surface water abstraction sites in 2007-2008

Catchment	Sampling site	
	Basic	Operational
Danube catchments area	21	10
Váh catchments area	25	52
Hron catchments area	22	35
Bodrog catchments area and Hornád catchments area	28	34
Poprad and Dunajec catchment area	6	5
Total	102	136

Source: SHMI

Indicators were monitored within this transitional period that are pursuant to the **SR Government Regulation No. 296/2005 Coll. which introduces requirements on the quality and qualitative goals for surface water, as well as the limit indicator values for wastewater and special water contamination.** General requirements for surface water quality (Annex 1) pursuant to the SR Government Resolution 296/2005 Coll. were fully complied with for the following physical-chemical indicators: total organic carbon, calcium, sulphates, magnesium, as well as micro pollutants that include tensides, cyanides, copper, nickel, chromium, and a various specific organic substances. Indicators with most exceeded values included aluminium and selenium with 100 % occurrence of excessive values. Chloroform and the nitrous form of nitrogen were among the often exceeded indicators. Values for faecal streptococci, thermo-tolerant and coliform bacteria as part of the microbiological indicators were frequently exceeded. Tetrachloromethane, 1,1,2-trichloroethylene, cis 1,2 - dichloroethene, and PCB were not assessed, since the detection threshold was greater than the limit defined in the Government Resolution 296/2005 Coll.

◆ Indicative chemical balance assessment

Indicative assessment of surface water bodies chemical balance involved the use of all measured data for the priority substances, together with other eight pollutants in surface water included in the SHMI database for 2007. The assessment included 67 abstraction sites classified into 46 water bodies. Of 46 water bodies, 24 are assessed as those with poor chemical balance, and 22 bodies are classified into the category of good chemical balance.

The poor chemical balance category included water bodies mainly due to their exceeded environmental quality norms (ENK) for Bis(2-ethylhexyl)phtalate - DEHP (14-times), PAU (6-times), nonylphenols (2-times), chloroform (6-krát), 1,2 dichloroethene (2-times), lead (2-times), and cadmium (2-times) Among the priority substances, the DEHP indicator most often classified the water bodies as "not reaching good chemical balance". Due to the universal occurrence of this substance, it is necessary to test the potential secondary contamination of the extracted surface water samples, especially at their extraction and transport (these are mainly samples extracted from water bodies in the eastern part of Slovakia)

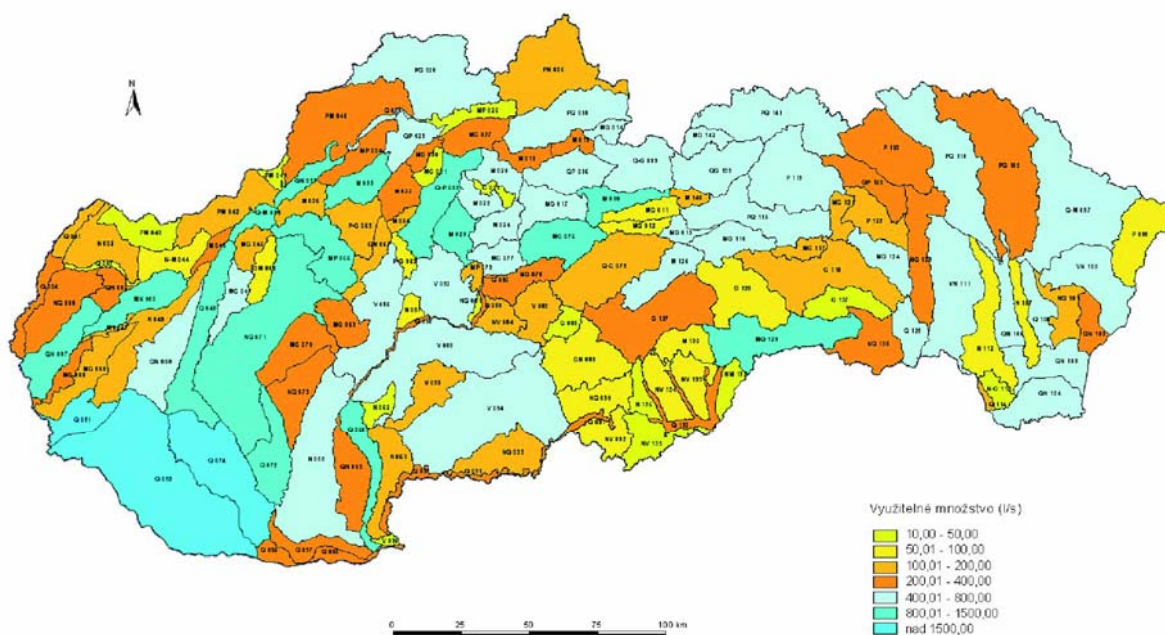
Ground water

◆ Water resources

In 2008, based on the hydro-geological assessment and surveys in Slovakia, there were **77 080 l.s⁻¹ available groundwater resources**. In comparison with the previous year 2007, there was observed a slight increase of the efficient groundwater volume by 249 l.s⁻¹, i.e. by 0.32 %. In the long-term evaluation, the increase of the efficient volume in comparison with 1990 makes 2 305 l.s⁻¹, i.e. 3.1 %.

On the basis of assessment of water management balance expressed by the balance status (proportion of abstractable volumes/abstractions), which is the indicator that shows the rate of water sources abstraction, we see that in **2008, out of total number of 141 hydro-geological regions in SR, 123 regions show good balance status, 17 regions show acceptable status and one region show tense status**. Critical and emergency balancing state did not occur in any region.

Efficient groundwater volumes in the hydrogeological regions in 2008 (l.s⁻¹)



Source: SHMI

◆ Groundwater levels

In 2008, the highest detected ground water levels were found especially in the period of July through October, with apparent influence of above-normal rainfall totals on the rise of ground water levels, reaching the maximum detected annual ground water levels. In the Morava, Nitra, and Hron watersheds, maximum ground water levels are associated with the Spring months of March - May. Minimum ground water levels were mainly recorded in the winter season, in the months of September - December, while springs showed minimal yields in September through October.

◆ Gabčíkovo interest area

Rainfall totals for the area of Žitný ostrov in 2008 were slightly higher or equal to the long-term average annual totals. Higher average rainfall totals during the operation period of the VDG were recorded at Veľký Meder and Veľký Blahov. Highest monthly totals were detected everywhere in July, only in the area of Bratislava these totals were highest in June. The latter, together with annual maximum Danube levels caused also the rising ground water levels. The lowest monthly rainfall totals were detected in the whole territory of Žitný ostrov in February.

◆ Groundwater abstraction

In 2008 there was being **extracted 11 122 l.s⁻¹ of ground water in average** by the users (which are subjects to reporting obligation) in Slovakia that was 14.4 % of the documented efficient volume. During the year 2007 the groundwater extractions slightly decreased by 243.9 l.s⁻¹ which means 2.1 % in comparison with year 2007.

Groundwater extraction in 2008 according to the purpose of use

Year	Public water supplies	Food-processing industry	Industry excl. Food-processing	Agricult. and Livestock	Vegetable prod. Irrigation	Social purposes	Others	Total
2005	9 159.87	288.25	856.75	308.82	95.07	279.72	878.98	11 867.46
2006	8 836.13	295.62	852.34	275.80	94.96	340.15	970.20	11 665.20
2007	8 441.59	383.87	891.32	267.84	146.25	333.44	901.65	11 365.96
2008	8 468.82	284.98	823.02	253.29	67.52	271.23	953.23	11 122.09

Source: SHMI

◆ Groundwater quality

Pursuant to the WFD requirements, the older system of dividing Slovakia into significant water management areas was abandoned. Since 2007, classification has been based on delineation of groundwater formations. Monitoring of ground water chemical situation has been divided into:

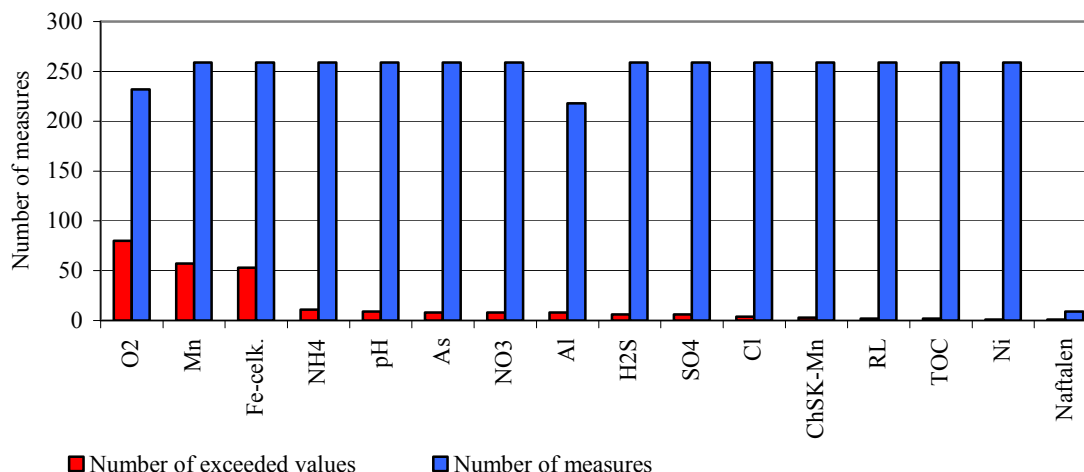
- basic monitoring,
- operation monitoring.

In 2008, ground water quality was monitored at 133 basic monitoring facilities. Ground water samples were extracted 2 times from 40 quaternary objects, 1 times in 49 pre-quaternary objects, and 3 times in 44 pre-quaternary karst objects.

Further, within the operational monitoring conducted for the Slovak territory (with the exception of the Žitný ostrov area) 212 objects were monitored with the assumption to detect a potential penetration of contaminants from a potential contamination source or group into the ground water. Ground water samples were extracted 2 times from 156 quaternary objects, 1 times in 28 pre-quaternary objects, and 3 times in 28 pre-quaternary karst objects.

Adverse **oxidation-reduction** conditions dominate at ground water **basic monitoring** facilities, apparently caused by most frequent occurrences of exceeded acceptable concentrations of total Fe (53 times), Mn (57 times), and NH_4^+ (11 times). Besides these indicators, there has been an untypical event of exceeded concentrations in the group of **physical - chemical indicators**, specifically in the case of the Cl^- , SO_4^{2-} , and NO_3^- anions, COD_{Mn} and H_2S . Most frequently recorded excessive concentrations in **trace elements** included Al (8 times), As (8 times), Pb (3 times), Sb (6 times) and Ni (1 time). Contamination by **specific organic substances** shows only local character and the majority of specific organic substances was recorded below the detection limit.

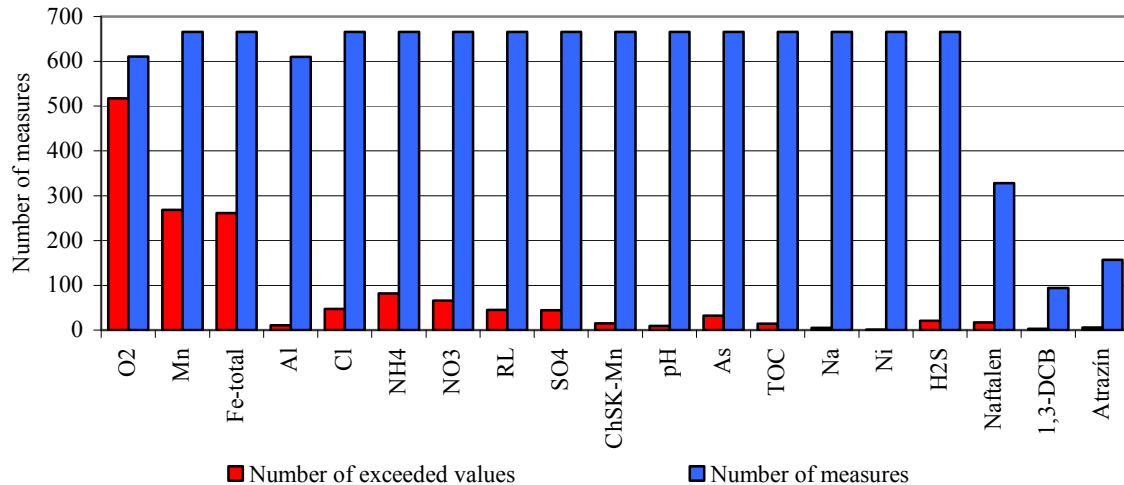
Occurrence of exceeded indicators at basic monitoring facilities pursuant to the SR Government Directive 354/2006 Coll. in 2008



Source: SHMI

Ground water at **operation monitoring** is relatively low in oxygen, with the exception of the Žitný ostrov area. This is also apparent from the fact that the recommended percentage value for oxygen water saturation was reached only in 15 % of the samples. Most frequently exceeded indicators include Mn and total Fe, which suggests persisting adverse **oxidation-reduction situations**. Exceeded Cl⁻ and SO₄²⁻ limit values also indicate the impact of anthropogenic pollution on ground water quality. Character of land use (agricultural exploitation) is reflected into increased contents of oxidized and reduced nitrogen forms in ground water, with ammonia ions NH₄⁺ (82 times) and NO₃⁻ (66 times) being the most prevalent. In 2008, the acceptable value set by legislation was exceeded in **6 trace elements** (Al, As, Sb, Cd, Ni, and Pb) at operation monitoring facilities. Most frequently recorded increased contents include Al (11 times) and As (32 times). Presence of **specific organic substances** in ground water indicates impact by human activities. In 2008, operation monitoring facilities detected a wider range of specific organic substances. Most cases involved exceeded limit values in case of indicators from the group of poly-aromatic hydrocarbons (phenanthrene, fluoranthene, benzo(a)pyrene, pyrene) and the group of volatile aromatic hydrocarbons (1,3 dichlorobenzene, 1,4-dichlorobenzene, and 1,2-dichlorobenzene). Limit values for pesticides and volatile aliphatic hydrocarbons were exceeded only sporadically.

Occurrence of exceeded indicators at operation monitoring facilities pursuant to the SR Government Directive 354/2006 Coll. in 2008



Source: SHMI

♦ Ground water quality assessment on the Žitný ostrov territory in 2007-2008

Ground water monitoring at Žitný ostrov suggests that there is a major issue of adverse **oxidation-reduction conditions** documented by frequently increased concentrations in Fe, Mn, and NH_4^+ .

Continuing landscape use within the monitored area (urbanised and agriculture territory) is reflected in the increased contents of oxidised and reduced nitrogen forms in water.

In 2007, 56.97 % of all analyses did not meet the criteria set forth by the SR Government Resolution 354/2006 Coll., while in 2008 it was 52.02 %. This means that of the total number of 244 analyses, 139 were such that showed at least one indicator exceeding the values of the Government Resolution 354/2006 Coll. in 2007, while in 2008 it was 129 out of the total number of 248 analyses.

Waste Water

Decreasing trend in **discharge of waste water** into surface water courses continued in 2008 with 619 286 thous. m^3 , which was less than in 2007 by 15 133 thous. m^3 (2.4 %), and less than in 1998 by 518 601 m^3 (54.4 %).

Also, decrease in the volumes of waste water for selected pollution indicators was slighter, with most reduction recorded in the indicator of insoluble substances (IS) - by 669 tons per year, compared to 2007. The other indicators showed only minimal reduction: chemical oxygen demand by dichromate was reduced by 225 tons per year, biochemical oxygen demand by 180 tons per year, and the non-polar extracting substances (NES_{UV}) by 27 tons per year, compared to the previous year.

Percentage of discharged treated waste water to total volumes of waste water discharged into watercourses in 2008 was 90.94 %.

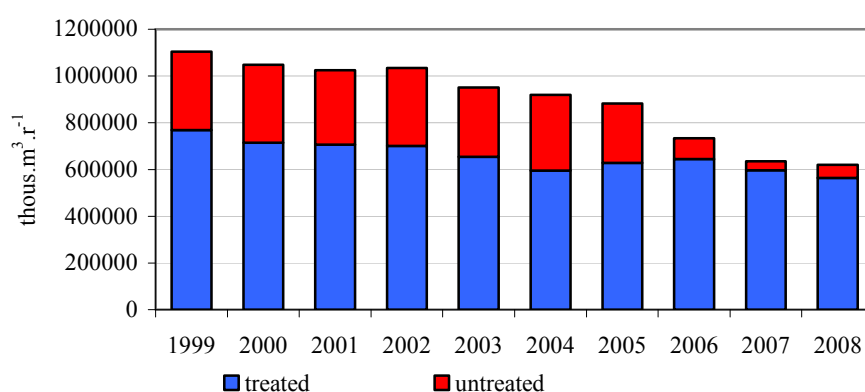
Load of the balanced contamination sources discharged into surface watercourses in the period of years 1998-2008

Discharged waste water	Volume (thous.m ³ .y ⁻¹)	IS (t.y ⁻¹)	BOD ₅ (t.y ⁻¹)	COD _{Cr} (t.y ⁻¹)	NES _{uv} (t.y ⁻¹)
1998	1 137 887	29 443	21 993	66 351	512
2005	881 946	12 670	10 661	37 312	55
2006	733 594	11 200	9 026	31 563	44
2007	634 419	9 405	6 521	26 913	58
2008*	619 286	8 736	6 641	26 688	31

*data from database „Aggregate balance sheet of water“

Source: SHMI

Trend in discharging of the treated and untreated waste waters into watercourses in the period of 1999-2008



Source: SHMI

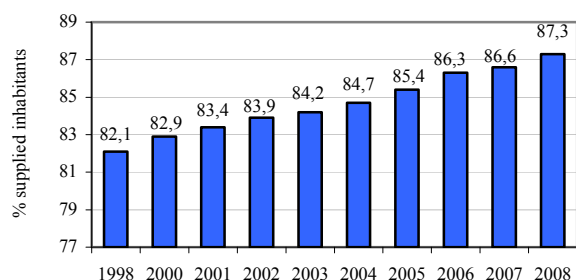
Public water supply, sewerage systems and waste water treatment plants

◆ Public water supplies

Number of inhabitants supplied with drinking water from the public water supply in 2008, reached the number of 4 727 thousand, which represented 87.3 % of supplied inhabitants. There were in the SR 2 353 individual municipalities that were supplied with public water supply, and their portion on total SR municipalities was 81.4 %. Share of Slovak villages connected to public water supply remained roughly at the same level as in 2007.

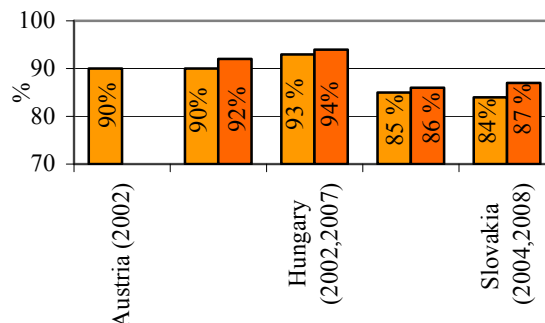
Henceforth there persisted the long-term decrease in the drinking water demand. **The volume of the produced drinking water** reached in year 2008 the value of 319 mil. m³ of the drinking water, which is the decrease in comparison with year 2007 by 3 mil. m³. From the ground water resources there were produced 270 mil.m³ (84 %) and from the surface water resources 49 mil.m³ (16 %) of the drinking water. **Water losses** in the pipe system represented in year 2008 28.5 % from the total water produced in the water management facilities. **Specific water consumption for households** decreased in 2008 to 87.3 l.inhab⁻¹.day⁻¹.

Drinking water supplying of the inhabitants from the public water supplying in the SR



Source: SO SR

Comparison of the drinking water supplying of the inhabitants from the public water supplying in selected countries

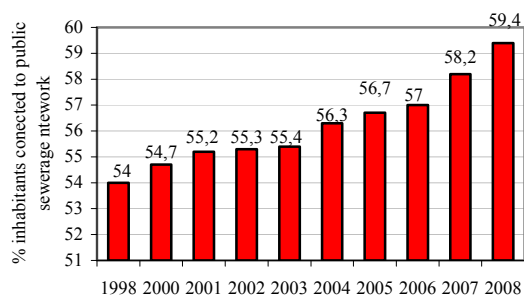


Source: Eurostat, SO SR

◆ Sewerage system

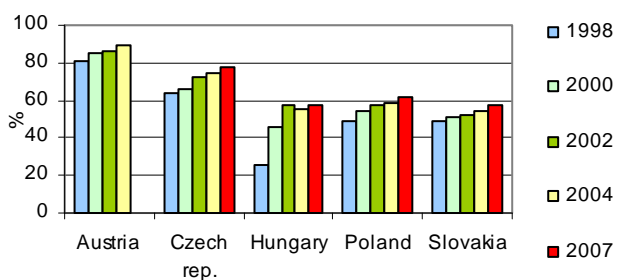
Development of public sewerage systems lags behind that of public water supplies. **Number of inhabitants** living in households **connected to public sewerage systems** in 2008 grew by 66 thousand and reached the number of 3 212 thous. inhabitants, which is 59.4 % of all inhabitants. Of the number of 2 891 of stand-alone municipalities in 2008, 846 of them had public sewerage systems in place (i.e. 29.3 % of all Slovak municipalities), while 636 municipalities (i.e. 22 % of all Slovak municipalities) had their wastewater sent directly off to the wastewater treatment plant. Adverse situation remains also in individual regions of Nitra, Trnava, and Prešov, these regions stay behind the national average.

Connecting of the inhabitants to the public sewerage network in the SR (%)



Source: SO SR

Comparison of the connecting of the inhabitants to the public sewerage network in the selected countries (%)



Source: OECD

◆ Waste water treatment plants

In 2008, 112 waste water treatment plants were added into the Administration of water supplies and water sewerage systems scheme, reaching the number of 612. Greatest share on these had mechanical-biological WWTPs (89.2 %). Increase in WWTP's capacity was still on the rise, reaching the value of 2 211.6 m³.day⁻¹ in 2008.

In 2007, watercourses with public sewerage system (administered by municipalities and water management companies) received 394 mil.m³ of discharged waste water, which was by 10 mil.m³ less than in the previous year, and the volume of treated waste water discharged into the public sewerage system reached 395 mil.m³.

Volume of the discharged wastewater by the public sewerage system (in administration of water sewerage systems and in administration of the municipalities) in 2008

Water discharged by the public sewerage and WWTP	Sewage	Industrial and other	Precipitation	Separate	Administration of the municipalities	Total
	(thous.m ³ .year ⁻¹)					
Treated	108 312	100 482	45 947	128 782	11 462	394 985
Untreated	1 562	784	1 558	2 574	1 603	8 081
Total	109 874	101 266	47 505	131 356	13 065	403 066

Source: WRI

In 2008, there were 55 305 tons of the sludge dry matter produced in municipal WWTPs. Of this, 38 368 tons (66.4 %) were used for soil processes, 10 766 tons (18.6 %) were temporarily stored, and 8 676 tons were landfilled (15.0 %). In 2008, there was direct application of sludge into the agricultural soil. 33 455 tons of sludge dry matter was used for compost production, while 4 913 tons of sludge were used for soil processes (reclamation of landfills, areas, etc.)

Sludge produced in the waste water treatment plant

Year	Amount of the sludge (tons of dry residue)								
	Total	Used				Incinerated	Disposed		In other way
		Applied into the agricultural soil	Applied into the forest soil	Composted and used in other way	Land filled		Total	Suitable for the further use	
2004	53 085	12 067	0	30 437	0	4 723	3 470	5 858	
2005	56 360	5 870	0	33 250	0	8 530	6 960	8 710	
2006	54 780	0	0	39 405	0	9 245	8 905	6 130	
2007	55 305	0	0	42 315	0	3 590	583	9 400	
2008	57 810	0	0	38 368	0	8 676	0	10 766	

Source: WRI

Drinking water

◆ Drinking water quality monitoring and assessment

Water quality control and its health safety is determined through a set of water quality indicators representing physical, chemical, biological, and microbiological properties of water. Drinking water indicators are defined under the **SR Government Regulation 354/2006 Coll.**, which stipulates requirements on water designated for human consumption and its quality control. Water quality control for radioactivity follows the **Resolution of the Ministry of Health no. 528/2007 Coll.** which

stipulates details on requirements to limit the level of irradiation from natural radiation. Besides the **complete water analysis**, the implemented **minimum analyses** - e.g. analyses of 28 water quality indicators, is carried out to monitor and obtain periodic information on the stability of water bodies and effectiveness of water treatment, mainly water disinfection, biological quality and the sensoric properties of drinking water.

Water quality was assessed on the basis of the number or proportion of individual limits shown to have exceeded the pertinent sanitary norms. In 2008, were analysed at operation laboratories of water management companies 11 382 samples. The samples were abstracted at sites located within distribution networks and 287 783 analyses were carried out to monitor individual drinking water quality indicators. Share of drinking water analyses that complied with the sanitary limits in 2008 reached 99.45 % (in 2007 it was 99.32 %). Percentage of samples that meet drinking water quality demands for all indicators reached 91.84 % (in 2007 it was 89.78 %). These samples did not include the active chlorine indicator, as this test was done separately, in relation to the microbiological quality of drinking water.

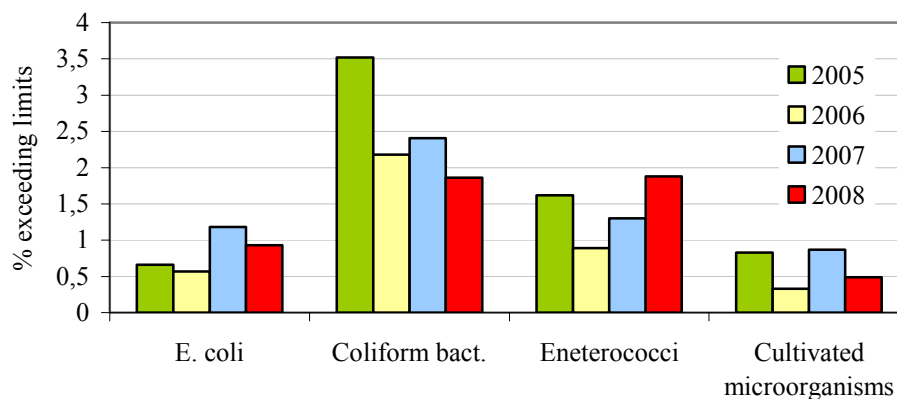
Exceeding limits in drinking water samples in accordance with the SR Government Resolution no. 354/2006 Coll. on demands on drinking water and drinking water control

Year	2006	2007	2008
Share of drinking water samples that do not meet the NMH and MHRR limit.	1.32 %	2.03 %	2.34 %
Share of drinking water quality indicators analyses that do not meet NMH and MHRR	0.32 %	2.46 %	1.02 %

NMH - maximum threshold values, MHRR – threshold values of the reference risk

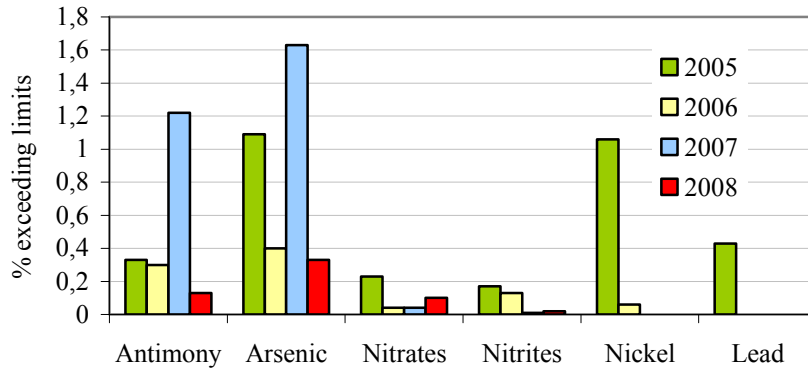
Source: WRI

Results of monitoring the microbiological and biological indicators of drinking water within Slovakia's distribution networks



Source: WRI

Results of physical and chemical drinking water indicators monitoring within Slovakia's distribution networks - inorganic indicators



Source: WRI

Quality of recreational water in 2008

Slovak Government Regulation no. 87/2008 Coll. on the requirements on natural bathing water bodies effective as from March 5, 2008 implements **Directive 2006/7/EC concerning the management of bathing water quality, and repealing Directive 76/160/EEC.**

In 2008, all public health offices launched the new **Information system** for water bodies and bathing. Besides processing data on natural and artificial bathing water bodies, the system is designed to produce reports in the area of bathing water, as well as to inform the public on the relevant conditions of bathing sites during the season.

The assessment included 70 natural sites - gravel pits, sand pits, and enclosed water tanks used for a number of purposes, including recreation. Organized recreational activities took place at 18 of these sites. 10 sites may be considered as those with partially organized recreational activities. In 2008, 35 natural sites in Slovakia were declared by generally binding resolutions issued by Regional Environmental Offices as those with water suitable for bathing. Compared to the previous year, this time the programme of monitoring did not include three sites - Zelená voda - Kurinec, Veľké Kolpašské lake, and Tona Šurany.

Over the season, 453 water samples were extracted and 6 883 tests were done on chemical, physical, microbiological, and biological water quality indicators. Limit value of detected indicators was exceeded in 218 samples and for 410 indicators. In the area of water quality at natural bathing sites, compared to the previous year, this year there was recorded a higher number of non-compliant water samples for the microbiological indicators - especially for intestinal enterococci.