MINISTRY OF THE ENVIRONMENT OF THE SLOVAK REPUBLIC

STATE OF THE ENVIRONMENT REPORT
SLOVAK REPUBLIC 2005

*Whoever is performing an activity, which could have an impact on the **condition of the surface waters and underground waters, and of water situation,** is obliged **to exert the necessary effort to provide for their preservation and protection.***

§ 30 par. 1 of the Act No. 364/2004 Coll. on Waters and on Amendment of Act No. 372/1990 Coll. on Offences as amended (Waters Act)

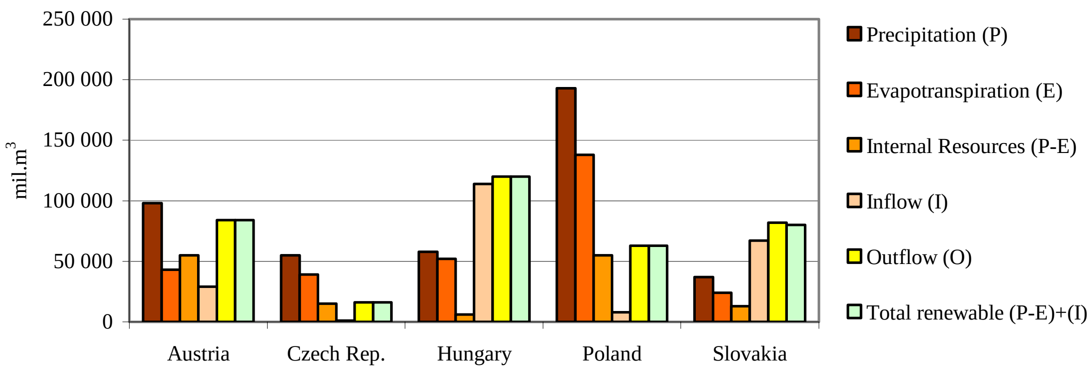
• WATER

Water sources and water fund

Slovakia is a central-European country with the majority of its territory belonging to the West Carpathian mountain range. Only the very north-eastern territory belongs to the East Carpathians and is part of the Carpathian eco-region. Less than a quarter of the whole Slovak territory is lowland – with the Vienna Basin from the west, the Panonia Plane from the south-west, and the Great Danube Basin from the south-east. These are part of the Hungarian lowland eco-region.

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 $m^3.s^{-1}$ of water, which is about 86 % of our total surface water fund. In the long run, there is approximately 398 $m^3.s^{-1}$ of water springing in Slovakia, which represents 14 % of the water fund. Due to its fluctuating characteristics the Slovak water potential is not able to meet the economic demand of the major economic and residential agglomerations, and it is necessary to increase its volume also by building water tanks.

Long term freshwater resources in the selected countries in 2004



Source: Eurostat

Surface water

- **Precipitation and runoff conditions**

Atmospheric precipitations balance in the Slovak territory in 2005 reached the value of 938 mm, which represents 123 % of the normal level. In terms of precipitations, this year had been considered very humid. In total, the year was evaluated as showing an excessive precipitation activity by as much as 176 mm.

Average total precipitation in the area of the SR

Month	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	Year
Mm	69	69	23	87	83	73	112	157	65	16	51	133	938
% normal	150	164	49	158	109	85	124	194	103	26	82	251	123
Surplus (+)/ Deficit (-)	23	27	-24	32	7	-13	22	76	2	-45	-11	80	176
Character of rainfall period	V	VV	SS	VV	N	N	V	VVV	N	SS	N	VVV	VV

Characteristics of the precipitation season: N - normal, S - dry, SS - very dry, V – humid, VV – very humid, VVV – exceptionally humid

Source: SHMI

Depending on the character of the precipitation season, virtually all Slovak watersheds may be considered as very humid, with the exception of the Danube, Morava, and Slaná watersheds that showed normal to humid precipitation characteristics. On the contrary, the Hornád watershed was exceptionally humid.

Average rates of precipitation and runoff in particular catchment areas

Catchment area	Dunaj		Váh		Hron			Bodrog a Hornád				SR
Subcatchment area	*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)	751	628	1 028	842	961	835	885	923	968	924	1 119	**938**
% of normal	110	100	122	121	122	122	112	126	143	131	133	**123**
Character of rainfall period	N	N	VV	VV	VV	VV	V	VV	VVV	VV	VV	VV
Annual runoff (mm)	61	51	343	136	264	158	191	144	301	330	514	**207**
% of normal	52	142	96	86	83	101	91	68	133	140	146	**79**

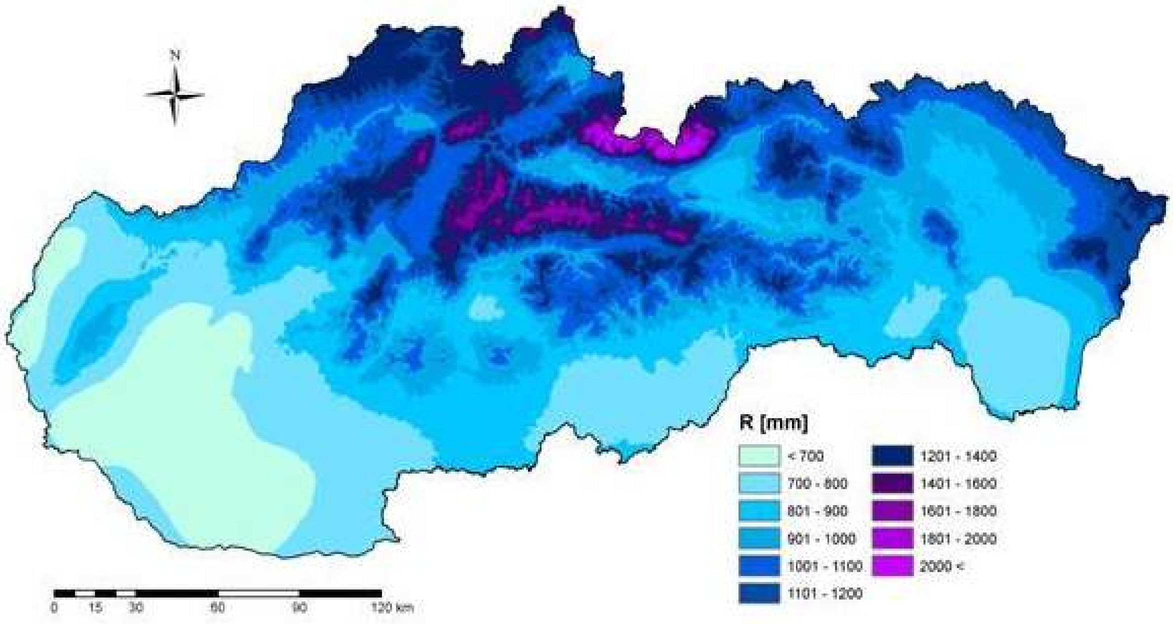
* watercourses and corresponding data only for the Slovak part of the watershed

Source: SHMI

Characteristics of the precipitation season: N - normal, S - dry, SS - very dry, V – humid, VV – very humid, VVV – exceptionally humid

The precipitation total by individual watersheds and its distribution in 2005 was shown in the annual runoff volumes from the major watersheds in the following manner: annual runoff volume from partial watershed reached or exceeded 100 % of the long-term average in the Danube, Hornád, Bodrog, Poprad, and Dunajec watersheds. In the Morava watershed, the annual runoff volume reached only 52 % of the long-term average, and in other watersheds the runoff volume oscillated between 68 to 96 % of the corresponding long-term values.

Annual atmospheric precipitation (mm) in Slovakia in 2005



Source: SHMI

♦ **Water balance**

In 2005, there was 69 806 mil.m^3 flowing into Slovakia, which is by 8 624 mil.m^3 more than in the previous year of 2004. Compared to the previous year, **runoff** from the territory was greater by 8 700 mil.m$^{3.}$

As of 1.1.2004, **total water volume** in water reservoirs was 631.0 mil.m^3, which represented 54 % of total usable water volume in water reservoirs. As of 1.1.2005, total available volume of the assessed water reservoirs compared to the previous year increased to 721 mil.m^3, which represents 62 % of total available water.

Total hydrological balance of water resources in the SR

	Volume (mil. m^3)		
	2003	**2004***	**2005**
Hydrological balance:			
Rainfall	28 088	41 715	46 029
Annual inflow to the SR	53 626	61 182	69 806
Annual runoff	60 527	71 279	79 979
Annual runoff from the territory of the SR	7 009	10 097	10 173
Water management balance			
Total abstraction of the surface and ground water in the SR	1 040.20	1 028.00	906.89
Evaporation from water reservoirs and dams	61.8	54.30	5.07

Discharge into surface waters	910.4	955.70	872.00
Impact of water reservoirs (WR)	272.8	355.60	111.61
	improving	**accumulation**	**improving**
Total volume in WR as of 1st January of the following year	573	631	721
% of supply volume in accumulation WR in the SR	49	54	62
Rate of water exploitation (%)	14.8	10.18	8.91

* Note: Data in the table were updated with results from the 2004 assessment Source: SHMI

♦ **Surface water abstraction**

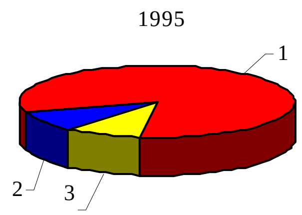
Surface water abstraction in 2005 reached the value of 532 791 mil.m^3, which, compared to the previous year, is a reduction by 21.7 % (compared to 1995, the reduction is 275 mil.m^3, which is 34.1 %). Surface water abstraction for industrial purposes in 2005 represented as much as 88 % of total abstraction volume, which, compared to 2004, was a reduction by 136 770 mil.m^3, that is 22.6 %. A slight reduction was recorded also in surface water abstractions for the public water-supplies, which, compared to the previous year, dropped by 2.16 mil.m^3, that is 3.8 %. These abstractions represented 10 % of total abstractions. In 2005, surface water abstraction for irrigation represented only 2 % of total abstractions and reached the value of 11.01 mil.m^3.

Surface water exploitation in the SR (mil.m^3)

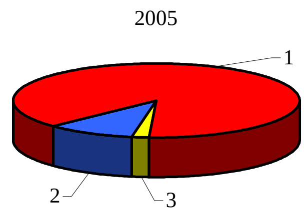
Year	Public water-supplies	Industry	Irrigation	Other agriculture	Total	Discharging
2003	66.449	489.467	65.042	0.0094	620.968	910.426
2004	55.984	604.728	18.935	0.0076	679.723	919.222
2005	53.828	467.957	11.006	0.0110	532.791	871.865

Source: SHMI

Comparison of surface water exploitation between 1995 and 2005



1995		2005
82 %	1 Industry	88 %
9 %	2 Public water supply	10 %
9 %	3 Irrigation	2 %

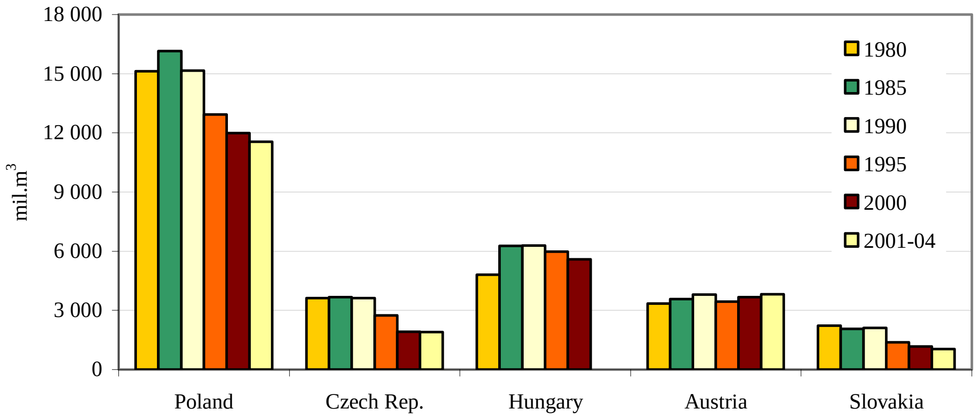


Source: SHMI

Source: SHMI

Decreasing trend in surface water abstraction was shown also in the neighboring countries. Surface water abstraction in the 15 EU countries is at the value of 175 700 mil.m^3.

Water abstraction in the neighboring countries between 1980 – 2004



Source: OECD

♦ **Surface water quality**

The basis for surface water quality assessment is the summary of all classification results under the **STN 75 7221 STANDARD "Water Quality".** Surface water quality classification evaluates water quality through 8 indicator groups of determinants (group A - oxygen demand, group B - basic physical and chemical determinants, group C - nutrients, group D - biological determinants, group E - microbiological determinants, group F – micropollutants, group G – toxicity, group H – radioactivity). Using the threshold values system, water is classified into five quality categories (I. class - very clean water, through V. class – extremely heavily polluted water), while categories I., II., and III. are considered as favorable water quality.

Program of water level monitoring includes surface and ground water quality assessment, which has been carried out on the basis of data obtained from water levels monitoring process.

Water quality monitoring in 2005 was carried out pursuant to the approved Program of Water Level Monitoring at 178 national sampling sites network, which include 175 basic, 3 special sampling sites designated to monitor radioactivity, while 30 sampling sites were monitored as boundary watercourses. Since 2004, water courses and selected water tanks have been included into the state monitoring system. Frequency of individual indicators monitoring in 2005 varied and oscillated between 1-24 times. Indicators with the lower frequency include biological determinants, heavy metals, and specific organic compounds.

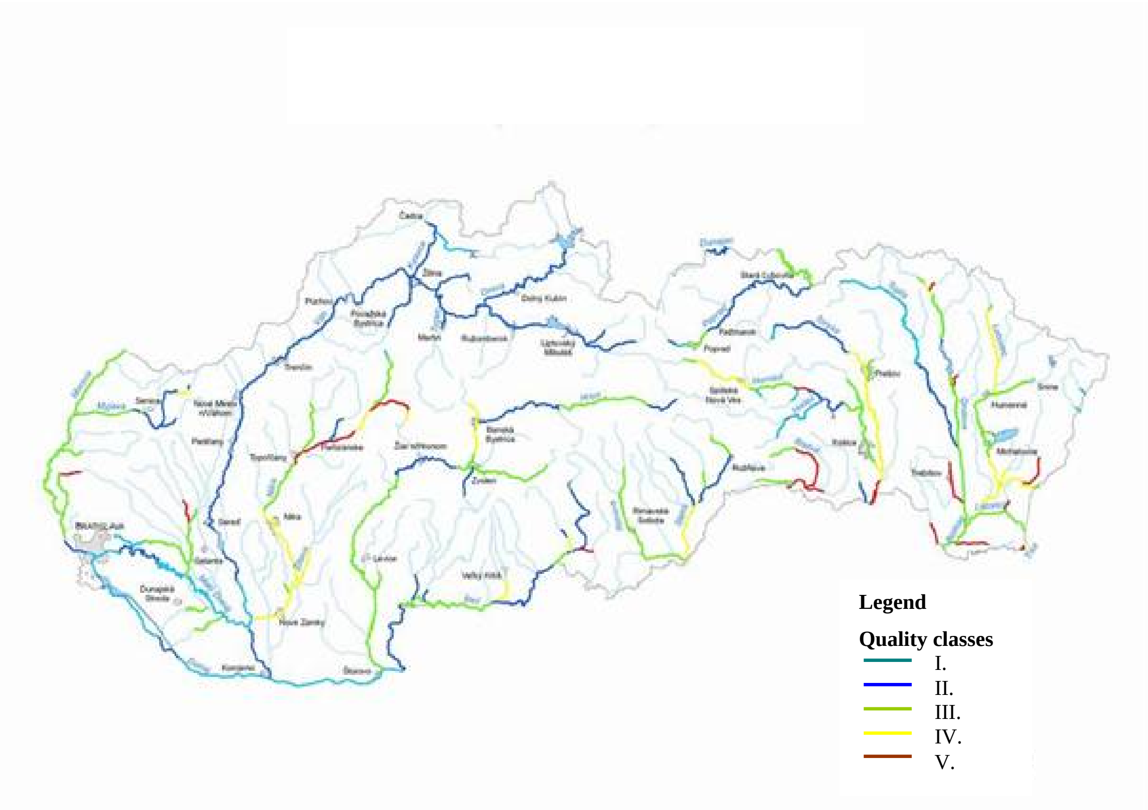
In 2004-2005, more than 77 % of the group **A – oxygen demand** sampling sites complied with the conditions of the groups I., II., and III., meeting the acceptable quality criteria (175 sampling sites). Determinants groups **B - basic physical-chemical** (175 sampling sites), **C – nutrients** (175 sampling sites), and **D – biological determinants** (172 sampling sites) stayed at the level of the previous period of years and dominate in the II. and III. quality class. There was 88 % of sampling sites that complied with the B indicators group (in 2002-2003 it was 73.5 % of sampling sites), while there was 64 % of extraction sites in the C determinant group (in 2002-2003 it was 70.1 %), and 83.14 % of extraction sites fell under the D quality group (in 2002-2003 it was 60.9 %). Number of sampling sites with acceptable surface water quality level in the E determinant group - microbiological determinant grew to 33.14 % (in 2002-2003 it was only 19.54 %), while in the F group - micro pollutants, the number of sampling sites dropped to 46.2 % (in 2002-2003 it was 54.5 %).

The 2004-2005 period of years showed a negative trend in the **E group - microbiological determinants** (175 sampling sites) that fall under the IV. and V. quality class, being the case of 66.86 % of all extraction (in 2002-2003 it was 80.46 %). Water quality improved significantly in the **F group – micro pollutants** (158 extraction sites) which showed unacceptable water quality (IV. and V. class) at 53.8 % of extraction sites (in 2002-2003 it was 45.4 %).

Compared to the previous period, the number of sampling sites with unacceptable (group IV. and V.) quality class increased only in the A group - oxygen demand, to 22.85 %, while in other groups there was a reduction in sampling sites - in the B group – physical-chemical determinants they dropped down to 12 % of sampling sites, in the C group – nutrients it was down to 36 %, and down to 16.6 % in the D group – biological indicators.

Water quality in the **H group of determinants - radioactivity** (31 sampling sites) for the monitored period complied with the I., II., and III. water quality class.

Surface water quality categories in the group A – oxygen demand in years 2004 – 2005



Source: SHMI

Legend: I. Class – very clean water (blue), II. Class – clean water (dark blue), III. Class – polluted water (green), IV. Class – heavily polluted water (yellow), V. class – very heavily polluted water (red)

Proportional representation of the water quality categories at the sampling points of the observed watercourses

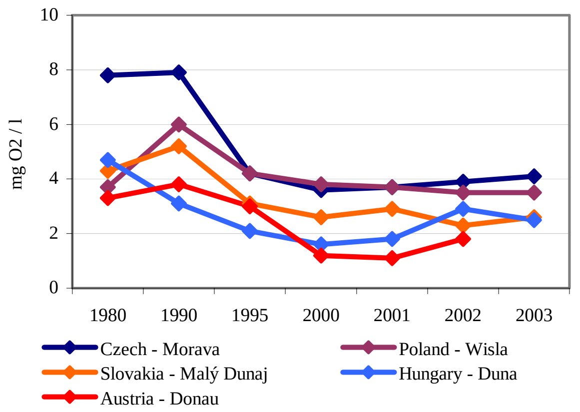
Water quality category according to STN 75 7221 standard	Year	A Oxygen demand indicators		B Basic physical and chemical indicators		C Nutrients		D Biological indicators		E Microbiological indicators		F Micropollutants		G Toxicity		H Radioactivity	
		Number of sampling points	%	Number of sampling points	%	Number of sampling points	%	Number of sampling points	%	Number of sampling points	%	Number of sampling points	%	Number of sampling points	%	Number of sampling points	%
1	**2000-01**	12	6.90	5	2.90	4	2.30	-	-	-	-	11	7.70	-	-	15	51.70
	2001-02	9	5.10	4	2.20	2	1.10	-	-	-	-	4	2.90	-	-	15	50.00
	2002-03	11	6.32	0	0	2	1.15	0	0	0	0	9	6.29	-	-	13	56.52
	2004-05	**23**	**13.14**	**11**	**6.29**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**5.06**	**-**	**-**	**22**	**70.97**
2	**2000-01**	60	34.30	79	45.10	64	36.6	36	20.60	1	0.60	4	2.80	-	-	14	48.30
	2001-02	81	45.50	67	37.60	70	39.3	29	16.30	1	0.60	12	8.80	-	-	14	46.70
	2002-03	81	46.55	56	32.18	71	40.80	34	19.54	2	1.15	23	16.08	-	-	10	43.48
	2004-05	**60**	**34.3**	**93**	**53.14**	**37**	**21.14**	**89**	**51.74**	**6**	**3.43**	**12**	**7.6**	**-**	**-**	**7**	**22.58**
3	**2000-01**	68	38.90	66	37.70	61	34.90	109	62.30	12	6.90	35	24.50	-	-	-	-
	2001-02	68	38.20	84	47.20	58	32.60	106	59.50	23	12.90	45	32.80	-	-	1	3.30
	2002-03	64	36.78	72	41.38	49	28.16	72	41.38	32	18.39	46	32.17	-	-	-	-
	2004-05	**52**	**27.71**	**50**	**28.57**	**75**	**42.86**	**54**	**31.4**	**52**	**27.71**	**53**	**33.54**	**-**	**-**	**2**	**6.45**
4	**2000-01**	21	12.00	18	10.30	29	16.60	25	14.30	88	50.30	77	53.90	-	-	-	-
	2001-02	10	5.60	17	9.60	32	18	37	20.80	108	60.70	67	48.90	-	-	-	-
	2002-03	10	5.75	36	20.69	31	17.82	45	25.86	102	58.62	47	32.87	-	-	-	-
	2004-05	**23**	**13.14**	**17**	**9.71**	**38**	**21.71**	**28**	**16.28**	**82**	**46.86**	**51**	**32.28**	**-**	**-**	**-**	**-**
5	**2000-01**	14	8.00	7	4.00	17	9.70	5	2.90	74	42.30	16	11.20	-	-	-	-
	2001-02	10	5.60	6	3.40	16	9	6	3.40	46	25.80	9	6.60	-	-	-	-
	2002-03	8	4.60	10	5.75	21	12.07	23	13.22	38	21.84	18	12.59	-	-	-	-
	2004-05	**17**	**9.71**	**4**	**2.29**	**25**	**14.29**	**1**	**0.58**	**35**	**20.00**	**34**	**21.52**	**-**	**-**	**-**	**-**
Total	**2000-01**	175	100	175	100	175	100	175	100	175	100	143	100	-	-	29	100
	2001-02	178	100	178	100	178	100	178	100	178	100	137	100	-	-	30	100
	2002-03	174	100	174	100	174	100	174	100	174	100	143	100			23	100
	2004-05	**175**	**100**	**175**	**100**	**175**	**100**	**172**	**100**	**175**	**100**	**158**	**100**	**-**	**-**	**31**	**100**

Source: SHMI

Since 1980, there has been a decreasing trend in the pollution of watercourses also in the other V4 countries and Austria.

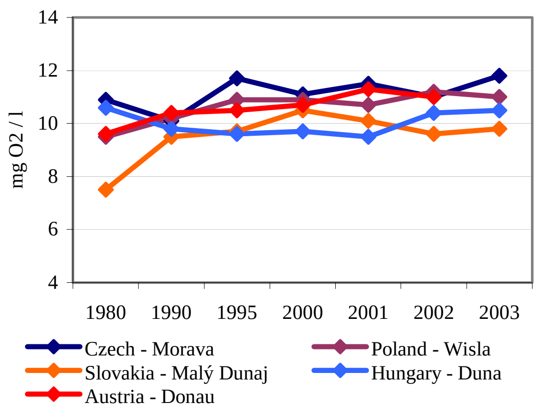
Comparison of the surface water quality development in the selected watercourses

BOD (mg O_2. l^{-1})



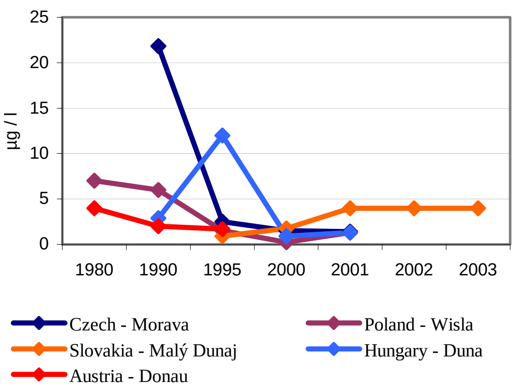
Source: OECD

Dissolved oxygen (mg O_2. l^{-1})



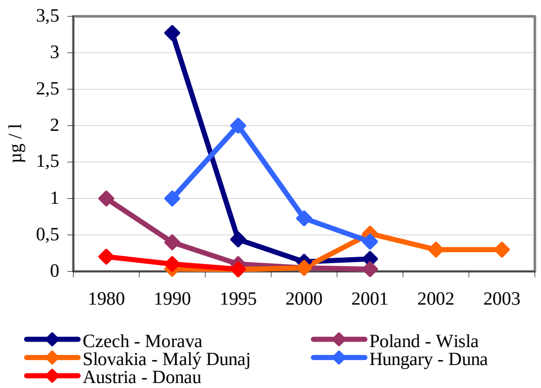
Source: OECD

Lead (µg. l^{-1})



Source: OECD

Cadmium (µg. l^{-1})



Source: OECD

Note: Average annual concentrations measured at the outflow points of watercourses or at their national border-line lower section.

Ground water

- **Water resources**

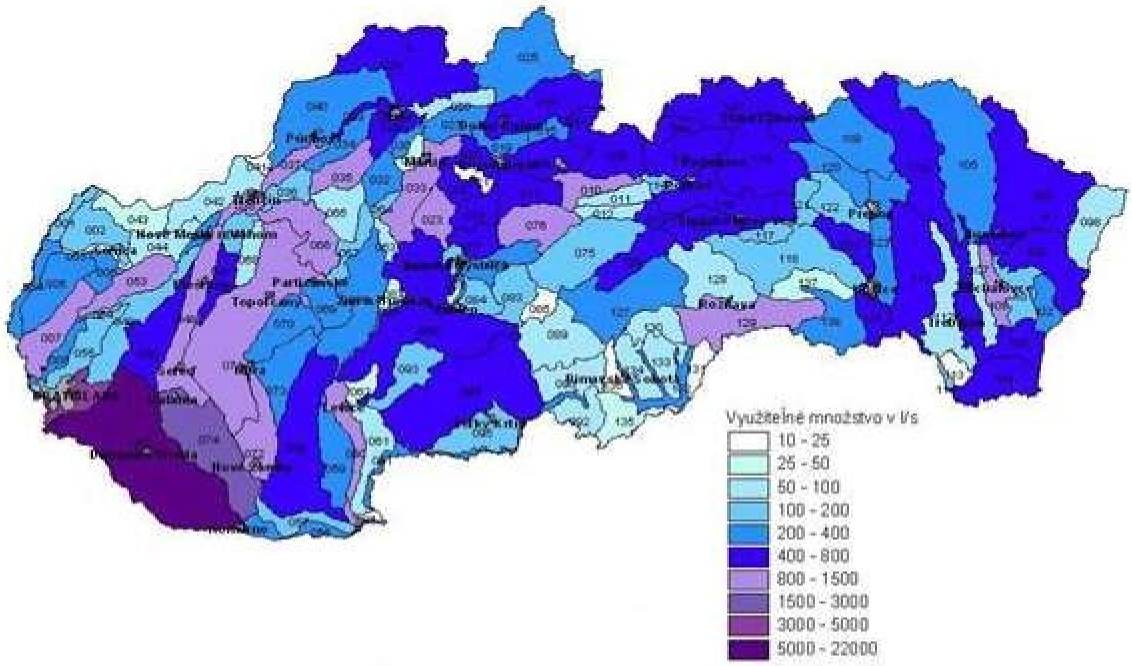
Groundwater is an irreplaceable component of environment. It represents an invaluable, yet easily accessible and most appropriate source of drinking water in terms of its quantitative, qualitative, and economic aspects. Despite favorable hydrological and hydro-geological conditions undermining the generation, circulation and accumulation of groundwater in Slovakia its uneven distribution offsets these advantages. The most significant groundwater volumes are recorded in the Bratislava and Trnava regions (46 %), while the least groundwater volumes are documented in areas of the Prešov and Nitra regions.

In 2005, based on the hydro-geological assessment and surveys in Slovakia, there were **76 806 $l.s^{-1}$**

available groundwater resources. Compared to the previous year of 2004, there was an increase in available groundwater volume by 257 $l.s^{-1}$, which is by 0.34 %. In the long run increase in available volume is 2 031 $l.s^{-1}$, that is 2.7 %, compared to 1990.

Greatest groundwater volumes are bound to the Quaternary and the Mesozoic hydro-geological structures or regions. By far, the greatest number of the available volumes (24.8 $m^3.s^{-1}$) has been documented in Europe's unique structure that stores great volumes of high-quality groundwater – the Podunajská lowland (the Žitný island). The area is represented by a strong Quaternary-Pliocene system of gravel and sand layers that also show the greatest abstractions of drinking water, while water from this area is used to supply the inhabitants through remote aqueducts going to central Slovakia and the Záhorie region.

Efficient groundwater volumes in the hydrogeological regions in 2005 ($l.s^{-1}$)



Source: SHMI

- **Groundwater levels**

Trend in groundwater levels and spring yields over the course of the year copies climatic indicators that ultimately impact the year's characteristics. For this reason trend in groundwater level and spring yield is not uniform within the same territory, since the orographic character of the territory plays an important role in the overall trend.

From the climatology point of view, trend in the overall precipitation in Slovakia was not uniform. Distribution of precipitation figures by individual territories and months is not uniform. Exceptionally high precipitation figures were recorded in April, August, and in December. The region of West Slovakia showed slightly abnormal annual characteristics (+109 mm above normal), while Middle

Slovakian regions (+189 mm above normal) and East Slovakian regions (+1 209 mm above normal) showed increased precipitation figures and we characterize them as humid.

In 2005, the highest annual recorded values of groundwater levels and spring yields in lowlands were dominant in the spring season, from the end of March till the beginning of June, occasionally in August. With increasing altitudes, occurrence of the greatest groundwater levels and spring yields delays until May or June. Occurrences of maximal spring yields also in higher altitudes were recorded only at the local level. Minimal groundwater levels and spring yields were recorded mainly during the winter season, in November and December, while for the springs alone, minimal yields persisted until March.

Recently, exceeding of the long-term maximal levels or spring yields or not reaching the minimal levels or spring yields become more frequent, which also may be caused by either a relatively short monitoring scale or weather fluctuations over the year - increased extreme periods, such as long drought, flood, and excessive rain episodes.

- **Gabčíkovo interest area**

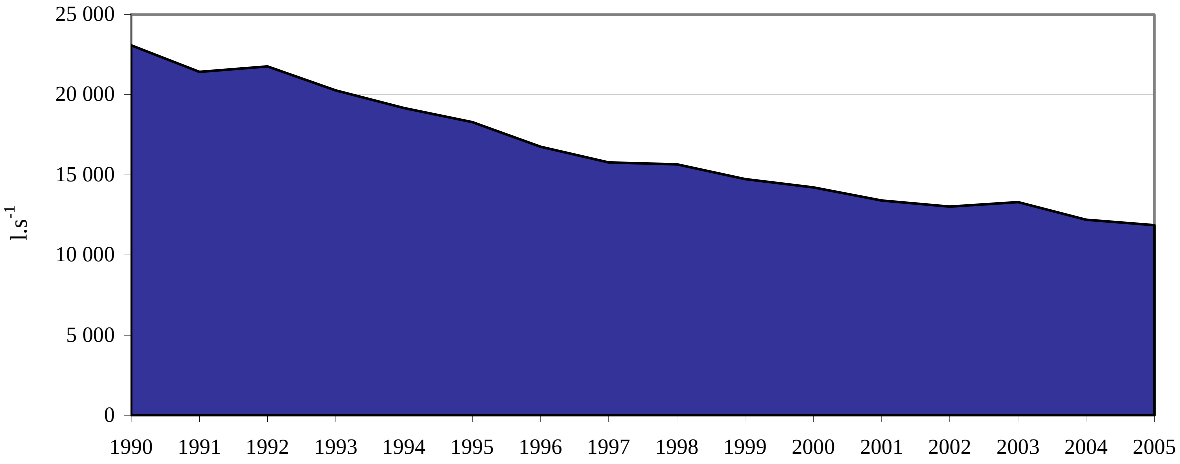
Groundwater balance in the area of the Žitný island is influenced by the presence of the Gabčíkovo water dam. Reduced water flow in the old Danube canal has been improved by letting more water into the affluent canal VD (during July) through the feeding gateway at Dobrohošť (appr. 30 $m^3.s^{-1}$). This additive measure gradually increased water level and besides having a positive impact also on groundwater levels. it revived the surrounding fauna and flora in the whole watershed area.

The runoff balance below the Gabčíkovo VD (just below the outflow of the draining canal) has been impacted only very little. This place shows more fluctuation in the momentary states and runoffs not only in the Danube watercourse itself, but also in groundwater levels. Regulating the flows at the Dobrohošť feeding gateway, it is possible to maintain the flow and level balance similar to the one that existed naturally (including the floods).

- **Groundwater abstraction**

In 2005, total volume of **abstracted groundwater average was 11 867 $l.s^{-1}$**, which is 15.4 % of all recorded available volumes. Over the course of 2004, ground water abstractions again showed a reduction, this time is was milder - only by 333.3 $l.s^{-1}$, which is a reduction by 2.7 %, compared to 2004.

Progress of groundwater extraction in Slovakia



Source: SHMI

After a more rigorous evaluation of groundwater abstraction in Slovakia by individual purposes we could see reduced water abstraction for most of the monitored abstraction categories with the exception of abstractions for irrigation (45 %) and other use (5 %) which showed an increase. Compared to 2004 groundwater abstractions for public water-supply purposes showed most reduction. by 27.6 $l.s^{-1}$ (-2.8 %) social purposes by 47.3 $l.s^{-1}$ (-14.4 %) and other industries by 44.9 $l.s^{-1}$ (-4.9 %).

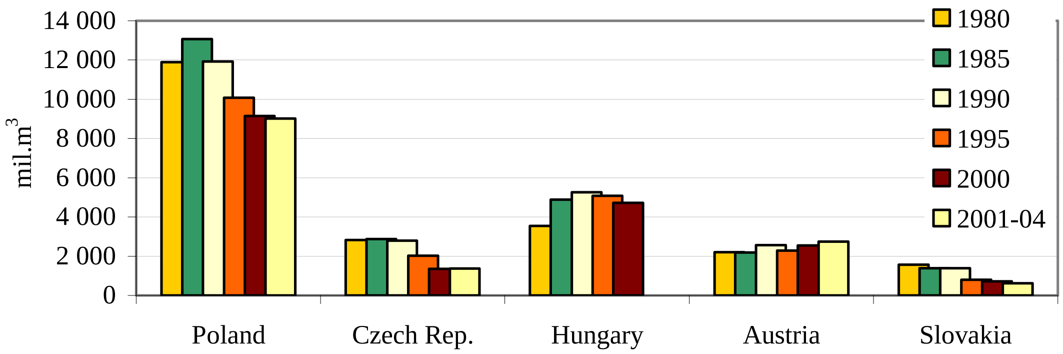
Groundwater extraction in 2005 according to the purpose of use

Year	Public water supplies	Food-processing industry	Industry excl. Food-processing	Agricult. and Livestock	Vegetable prod.. Irrigation	Social purposes	Others	Total
2003	10 064.94	329.51	999.29	385.49	380.87	320.74	822.52	13 303.60
2004	9 431.53	322.04	901.65	320.51	65.17	327.02	832.93	12 200.85
2005	9 159.87	288.25	856.75	308.82	95.07	279.72	878.98	11 867.46

Source: SHMI

Groundwater abstraction balance has changed since 1980 also in the neighboring countries and groundwater use shows a falling trend.

Groundwater abstraction in the neighboring countries



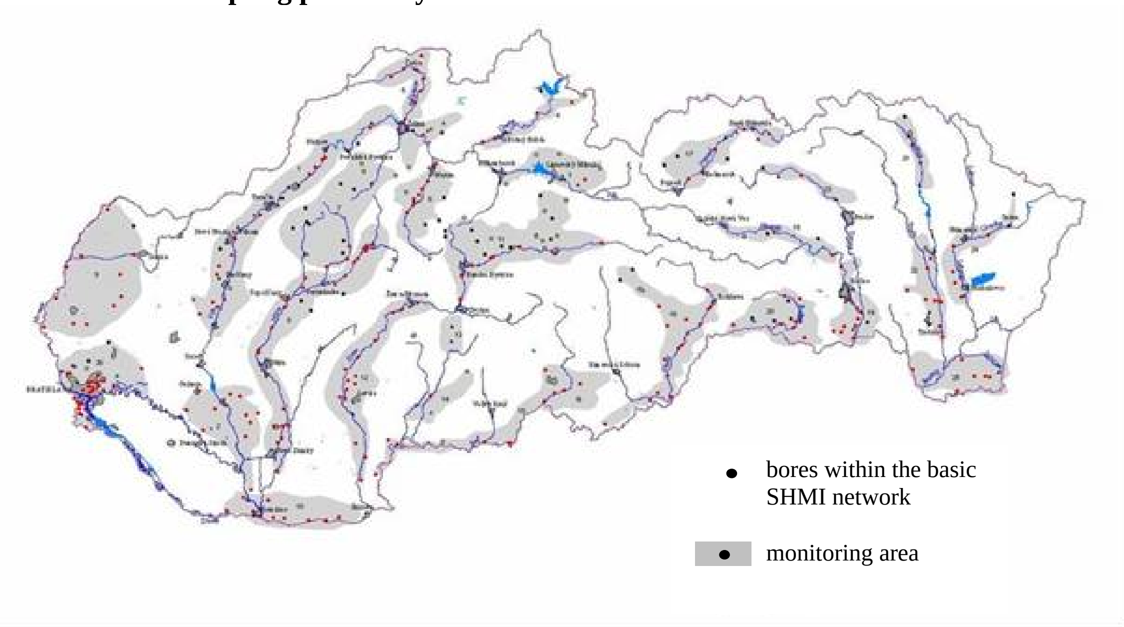
Source: SHMI

♦ **Groundwater quality in Slovakia**

Systematic groundwater quality monitoring has been carried out since 1982 under the **national monitoring program**. At present there are 26 monitored significant water management areas (river alluviums, Mesozoic and Neo-volcanic complexes). The monitoring now also includes the pre-Quaternary formations to meet the needs to obtain information on the trend in water quality in areas with a low anthropogenic impact.

In 2005, there were 334 objects monitored in total, which included 219 bores within the basic SHMI network, 25 used and 19 idle bores (investigative bores), 43 used and 28 idle springs.

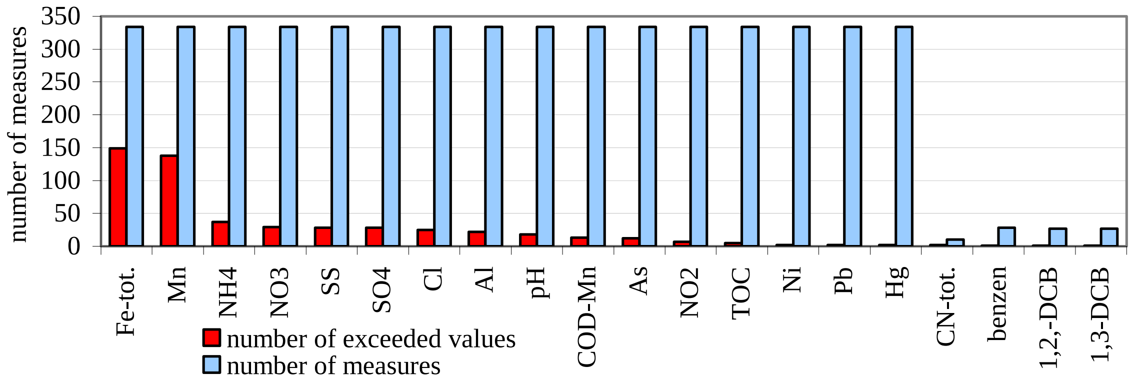
Groundwater sampling places in year 2005



Source: SHMI

Acceptable concentration figures (maximum acceptable concentration) defined under Regulation of the MoH SR No. 151/2004 Coll. on drinking water demands and drinking water quality, were exceeded in 2005 mostly for the following indicators: Fe_{total} (149 times), Mn (138 times), and NH_4^+ (37 times) out of the all 334 assessments.

Number of exceedings of the limit values of the concentrations of the particular indicators



Source: SHMI

The Figure suggests that there is a major issue of adverse **oxidation-reduction conditions** within the groundwater monitored areas documented by frequently increased concentrations in Fe, Mn, and NH_4^+.

Besides the already mentioned **physical-chemical indicators** concentrations of RL 105, SO_4^{2-} , and Cl^- anions were also exceeded.

Just like in the previous years, contamination by **organic substances,** indicated by exceeded acceptable COD-Mn concentration, is still present. Since in 2005, non-polar extractable substances were determined as the hydro-carbon index, we did not record any exceeding values for this indicator at any groundwater quality monitoring sites.

The on-going utilization of landscape within the monitored areas (urbanized and agriculture territories) is reflected in increased contents of the **oxidized and reduced nitrogen** forms in water (29 times in nitrates, 7 times in nitrites).

Most frequently recorded **trace elements** included increased aluminium (22 times) and arsenic (12 times) concentrations. In case of nickel, mercury, and lead, the limit values were exceeded 2 times, while in chrome, the limit was exceeded once in 2005.

Contamination by specific organic substances shows only local character and the majority of specific organic substances was recorded below the detection limit.

Percentage of exceeded limit values under Regulation of the MoH SR No. 151/2004 Coll. on drinking water demands and drinking water quality control (or STN 75 7111)

Indicator	Limit (according to regulation MoH SR No. 151/2004 Coll.)	Values over limit (%)		
		2003	2004	2005
Ammonium ions	0.5 mg/l	10.65	10.81	11.08
Magnesium	10.0-30.0 (125)	0	0	0
Manganese	0.05 mg/l	42.6	43.24	41.32
Iron	0.2 mg/l	40.5	44.44	44.61
Chlorides	100 (250) mg/l	7.39	6.61	7.49
Nitrites	0.1 mg/l	2.36	2.7	2.10
Nitrates	50.0 mg/l	8.87	10.51	8.68
Disulfates	250 mg/l	7.98	8.11	7.78
COD_{Mn}	3.0 mg/l	4.73	7.51	3.89
Aluminium	0.2 mg/l	2.36	5.71	6.59
Mercury	0.001 mg/l	0.29	0.3	0.60
Arsenic	0.01 mg/l	6.21	3.9	3.59
Chrome	0.05 mg/l	0	0	0.30
Nickel	0.02 mg/l	0.59	0.3	0.60
Mercury	0.01 mg/l	0.29	0.3	0.60
FN1		0.29	0.3	-
Humin substances		2.36	2.1	-
EPN_{UV}		22.18	18.92	-
1.1.-dichloretene		22.72	0	2.38
PCE	10 µg/l	0	0	-
DDT		0	0	0
Heptachlorine		0	0	0
HCB		0	0	0
Lindane		0	0	0
Metoxychlorine		0	0	0

FN1: phenols released in vaporized water Source: SHMI
PCE: 1.1.2.2-tetrachloretylene

Waste Water

Decreasing trend in discharged waste water remained also in 2005, 881 946 thous.m^3 of **waste water** was discharged into surface watercourses in Slovakia, which represents a reduction by 37 923 thous.m^3 (4.3 %) compared to 2004, and a drop by 285 978 thous.m^3 (25 %) compared to 1995. Most significant reduction in waste water load was recorded in insoluble substances (IS), by 8 719 t.$year^{-1}$, and in chemical oxygen demand by dichromate (COD), by 7 850 t.$year^{-1}$, while there was only a slight reduction in other indicators.

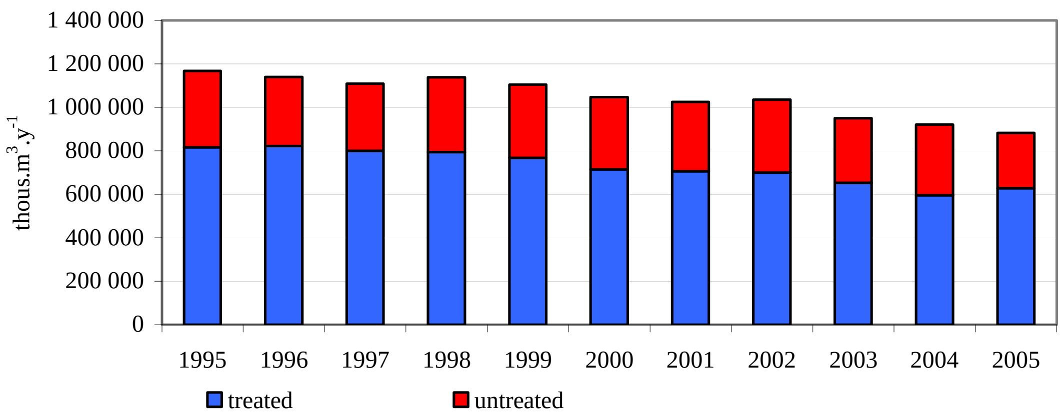
Percentage of discharged treated waste water to **total volumes of waste water** discharged into watercourses in 2005 was 71.2 %.

Load of the balanced contamination sources discharged into surface watercourses in the period of years 1995 - 2005

Discharged waste water	Volume (thous.$m^3.y^{-1}$)	IS ($t.y^{-1}$)	BOD_5 ($t.y^{-1}$)	COD_{Cr} ($t.y^{-1}$)	ENP_{uv} ($t.y^{-1}$)
1995	1 167 924	45 044	32 227	87 894	879
2002	1 035 068	22 790	18 803	59 204	252
2003	950 686	21 193	17 372	56 829	232
2004	919 869	21 389	13 702	45 162	57
2005	881 946	12 670	10 661	37 312	55

Source: SHMI

Trend in discharging of the treated and untreated waste waters into watercourses in the period of 1995 - 2005



Source: SHMI

The currently valid Water Act and its legal provisions draw on the EC legislation, for example the European Parliament and the Board Directive No. 2000/60/EC, the so called Framework Directive on Water and Board Directive 91/271/EEC relating to treatment of municipal waste water, adopted May 21, 1991. This Directive addresses one of very significant environmental pollution sources – municipal waste water. The Directive addresses collection, treatment, and discharge of municipal wastewater and water from specific industries, as well as handling the sludge generated during treatment of municipal waste water.

Proportion of waste water treatment in specific parameters of Directive 91/271//EEC

Category	< 2000 EO	2001 – 10 000 EO	10 001 – 15 000 EO	15 001 – 150 000 EO	> 150 001 EO	Average
COD_{Cr}	78.2 %	91.5 %	90.0 %	90.4 %	66.7 %	**85.37 %**
BOD_5	64.1 %	78.0 %	80.0 %	76.9 %	66.7 %	**72.20 %**
IS	73.1 %	91.5 %	80.0 %	88.5 %	66.7 %	**82.44 %**
N_{total}	-	-	20.0 %	19.2 %	33.3 %	**20.59 %**
P_{total}	-	-	10.0 %	23.1 %	50.0 %	**23.53 %**

Source: WRI

Mentioned values show that the level of treatment in the smallest agglomerations that are not so demanding in terms of the depth of purification is relatively poor, and the ratio of acceptable waste water treatment plants to all plants is little below three quarters. Majority of middle-sized and large municipal WWTPs used to be designed and built to meet lower qualitative requirements than those existing today. For that reason, today there are extensive reconstructions and intensifications of run-off networks and WWTPs.

Public water supply, sewerage systems and waste water treatment plants

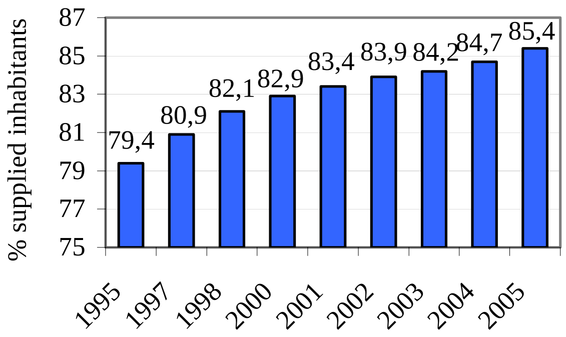
- **Public water supplies**

Number of inhabitants supplied with drinking water from the public water supply in 2005 reached the number of 4 605 thousand, which represented 85.4 % of supplied inhabitants. In 2005, there were in the SR 2 196 individual municipalities that were supplied with public water supply, and their portion on total SR municipalities was 76 %. Compared to 2004, share of supplied municipalities increased in the Trnava region (84.5 %), Bratislava region (95.5 %), and Žilina region (98.7 %). However, compared to 2004, Trenčín, Banská Bystrica, Prešov, and Košice regions showed unchanged number of municipalities with public water supply.

The year 2005 showed only a minimal reduction in drinking water abstraction. **Volume of produced drinking water** in 2005 reached the value of 352 mil.m^3, which compared to 2004, represents a reduction only by 1 mil.m^3. Of all the ground water sources, 299 mil.m^3 was produced (increased by 3 mil.m^3), while 53 mil.m^3 of drinking water was produced of all surface water sources, (reduction by 4 mil.m^3). Of total water produced at water management facilities, **water losses** by pipe network were 27.9 % in 2005. **Specific water consumption for households** increased in 2005 to 104 l.$inhab^{-1}$.day^{-1} (in 2004 it was 101.1 l.$inhab^{-1}$.day^{-1}).

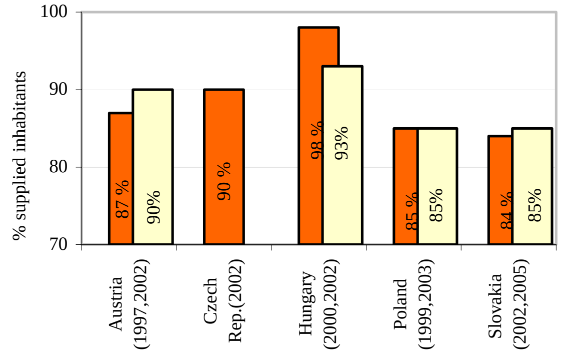
Also other countries showed a decreasing trend in the annual water consumption from public water supplies per capita. Czech Republic and Slovakia are approximately at the same level in terms of water consumption, while Poland shows the least consumption – only 57 $m^3.inhab^{-1}.year$, Hungary shows the best characteristics with having as much as 93 % of its inhabitants supplied with drinking water from public water supplies.

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



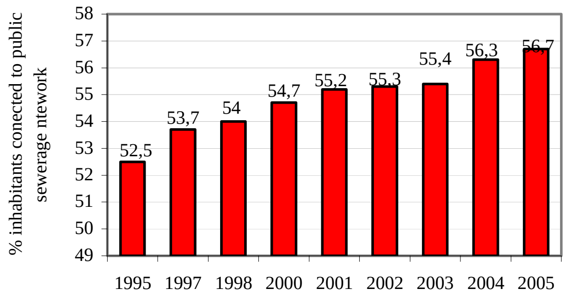
Source: OECD, SO SR

♦ **Sewerage system**

Number of inhabitants living in households **connected to public sewerage systems** in 2005 grew by 25 thousand, compared to 2004, and reached the number of 3 055 thous. inhabitants, which is 56.7 % of all inhabitants. In 2005, there were 612 municipalities in Slovakia (i.e. 21.2 % of all Slovak municipalities) with a built public sewerage network, while 545 municipalities (i.e. 18.9 % of all Slovak municipalities) had their wastewater sent directly off to the wastewater treatment plant. In 2005, the greatest increment in municipalities with public sewerage system was in the Bratislava region (54.8 %), while other regions showed only a minimal growth.

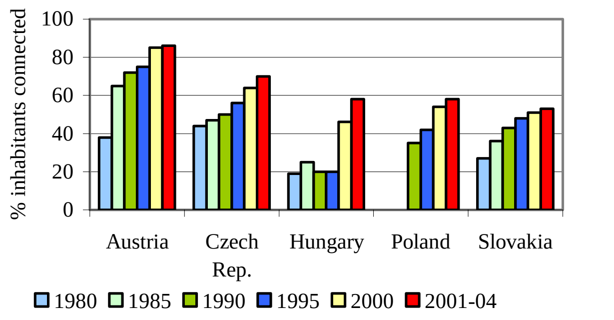
Greatest level of connectedness of the public to the public sewerage system from among the V4 countries reached Austria (86 %), and the Czech Republic (70 %), Poland, Hungary, and Slovakia show approximately the same level of connectedness, 56 % on average.

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 (%)

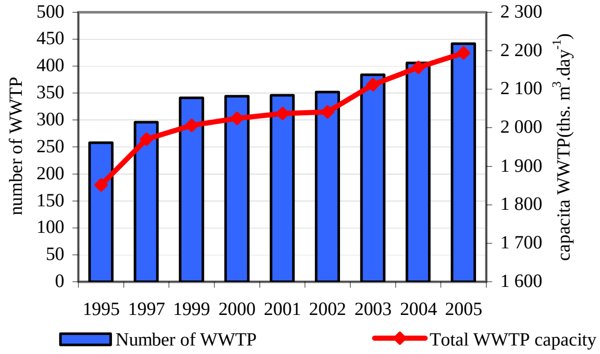


Source: OECD

- **Waste water treatment plants**

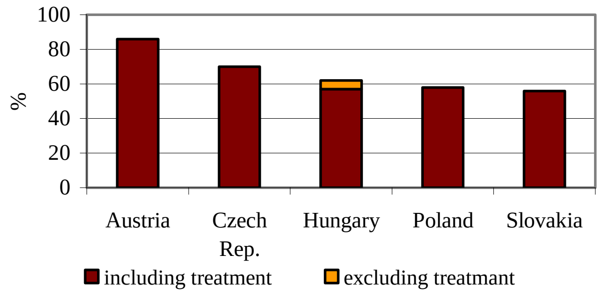
In 2005, there were 442 wastewater treatment plants administered by the VaK company and individual municipalities in Slovakia, and their number grew by 36, compared to 2004. Greatest share on these had mechanical-biological WWTPs (85.3 %). Also, the WWTP capacity changed, in 2005, it was 2 194 $m^3.day^{-1}$ (in 2004 it was 2 157 thous.$m^3.day^{-1}$).

Development in number and capacity of WWTP



Source: SO SR

Comparison of the connection of the inhabitants to the wastewater treatment plants in the selected countries



Source: OECD

In 2005, watercourses with public sewerage system (administered by municipalities and water management companies) received 443 mil.m^3 of discharged waste water, which was by 5 mil.m^3 more than in the previous year, and the volume of treated waste water discharged into the public sewerage system in 2005 reached 428 mil.m^3.

Waste water treatment plants with the secondary purification level are most developed in the V4 countries. In 2002 in Austria, as much as 80 % of wastewater was treated at biological WWTPs with chemical post-treatment (tertiary level of wastewater purification). In relation to the approximation of law within the EC, more attention will be given to this purification level also in Slovakia.

Volume of the discharged wastewater by the public sewerage system (in administration of VaK and in administration of the municipalities) and WWTP in 2005

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	122 043	92 532	42 355	161 052	10 206	428 188
Untreated	2 829	1 405	1 892	6 290	2 658	15 074
Total	124 872	93 937	44 247	167 342	12 864	443 262

Source: WRI

Sludge from WWTPs is a necessary by-product of the wastewater treatment process. In 2005, there were 56 360 tons of the sludge dry matter produced in municipal WWTPs. Significant sludge volumes – 39 120 tons were recycled through their application into the agricultural land (69.4 %).

WWTPs temporarily stored 8 710 tons (15.5 %) while 8 530 tons (15.1 %) of waste was stored at landfills. In 2005, only 5 870 tons of sludge dry matter was directly applied into the agricultural land, 28 910 tons of sludge dry matter was used for compost production, while 4 340 tons of sludge was used for land purposes through different ways (recultivation, etc.).

Sludge produced in the waste water treatment plant

Year	Amount of the sludge (tons of dry residue)							
	Total	Used			Disposed			
		Applied into the agricultural soil	Applied into the forest soil	Composted and used in other way	Incinerated	Land filled		In other way
						Total	Suitable for the further use	
2002	52 149	42 836	0	0	0	0	4 443	4 870
2003	54 340	16 640	605	22 085	0	8 110	7 610	6 900
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

Source: WRI

Drinking water

- **Drinking water quality monitoring and assessment**

In 2005, drinking water quality monitoring and assessment was carried out pursuant to the new **Regulation MoH SR No. 151/2004 Coll., on demands on drinking water and drinking water quality control.** The Resolution distinguishes a number of water quality indicators limit values, according to their corresponding health effects. Radiological indicators were determined in accordance with the Regulation of MoH SR No. 29/2002 Coll, on demands to ensure radiation control. In 2005, 12 353 samples were analysed at operation laboratories of water management companies. The samples were abstracted at sites located within distribution networks and 320 939 analyses were carried out to monitor individual drinking water quality indicators. Share of drinking water analyses that complied with the sanitary limits reached 99.23 % in 2005 (in 2004 it was 99.15 %). Percentage of samples that meet drinking water quality demands for all indicators reached 89.59 % (in 2004 it was 87.84 %). These samples did not include the active chlorine indicator, as this test was done separately, in relation to the microbiological quality of drinking water.

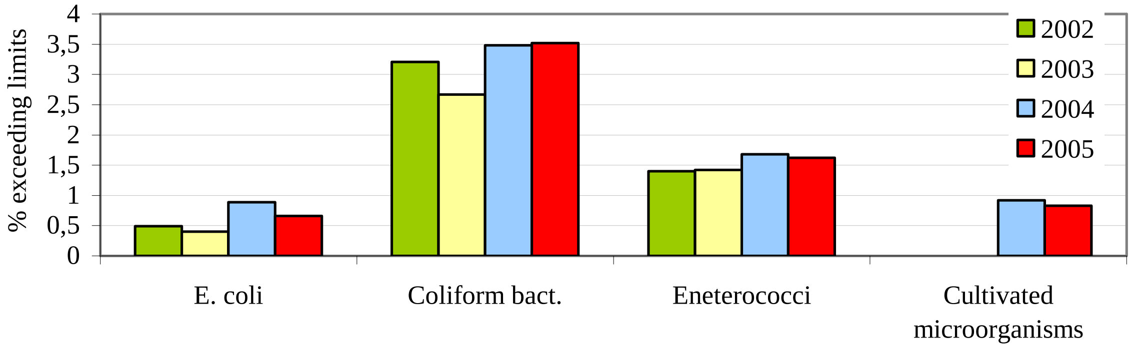
Exceeding limits in drinking water samples in accordance with the Regulation MoH SR No. 151/2004 Coll. on demands on drinking water and drinking water control

Year	2003	2004	2005
Share of drinking water samples that do not meet the NMH and MHRR limit.	-	2.03 %	2.10 %
Share of drinking water quality indicators analyses that do not meet NMH and MHRR	0.09 %	0.54 %	0.55 %
Share of drinking water samples that do not meet the MH, NMH, MHRR, and IH limit.	10.36 %	22.56 %	19.29 %
Share of drinking water indicator analyses that do not meet the MH, NMH, MHRR, and IH limits, pursuant to STN 75 711.	0.71 %	1.48 %	1.15 %

Source: WRI

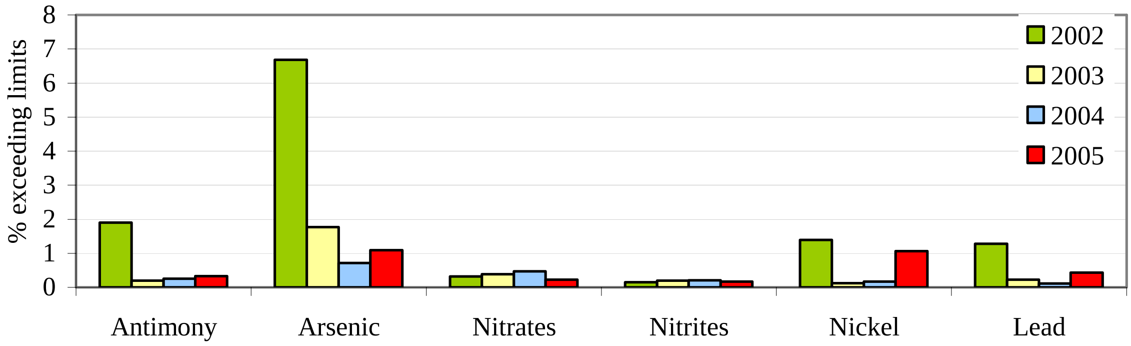
IH – indicative values, MH - threshold values, NMH - maximum threshold values, MHRR – threshold values of the reference risk

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



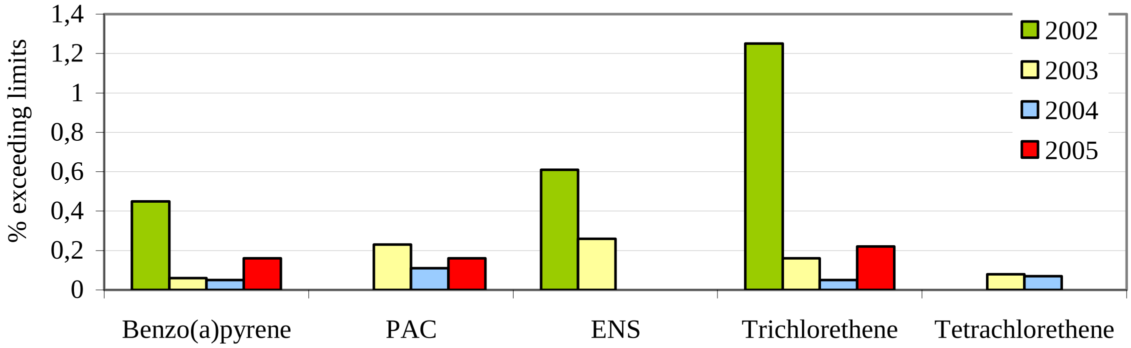
Source: WRI

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



Source: WRI

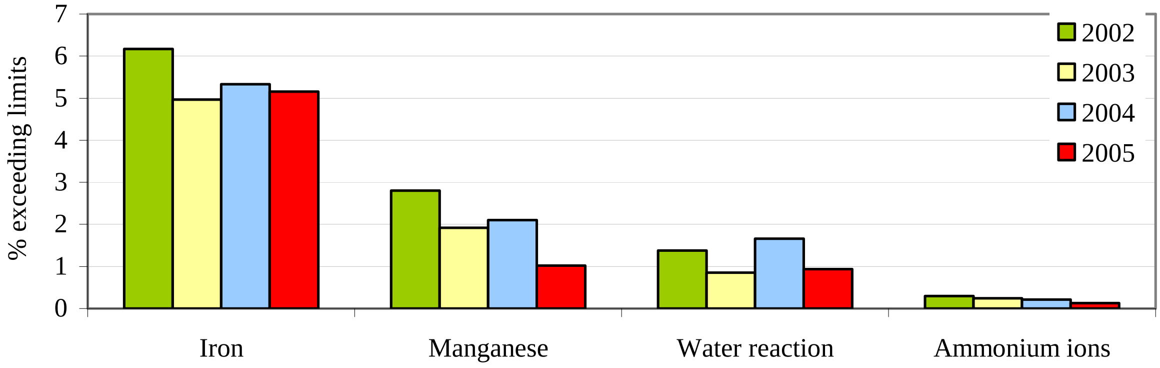
Results of physical and chemical drinking water indicators monitoring within Slovakia's distribution networks - organic indicators



Source: WRI

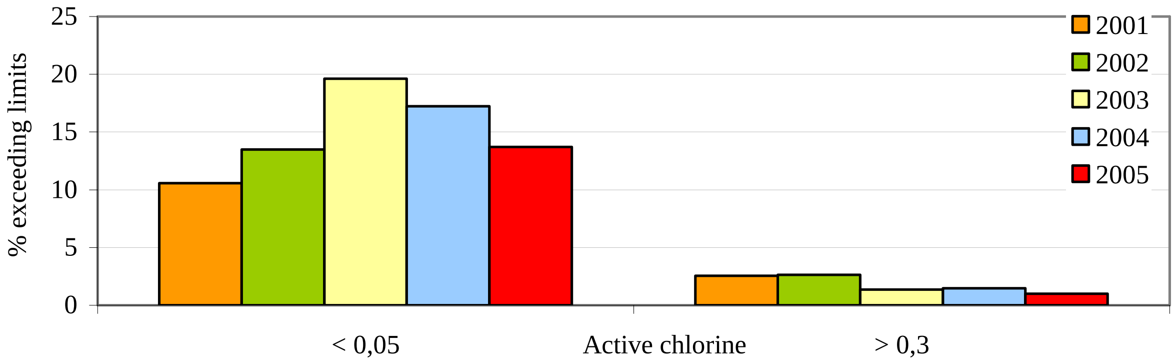
Note: PAC - Polycyclic aromatic carbohydrates
ENS - Non-polar extractable substances

Results of physical and chemical drinking water indicators monitoring within Slovakia's distribution networks - indicators that cannot adversely affect drinking water sensorial quality



Source: WRI

Results of monitoring for the presence of disinfection agents and their by-products in drinking water within Slovakia's distribution networks



Source: WRI