• WATER

Key questions and key findings

What is the situation and trend in the use of water in terms of preserving the water sources?

- **Volumes of water usable per capita fluctuate due to climate conditions. Percentage of usable water abstraction after 2000 does not even reach 10%, the only exception being the year 2003 that was characterised as exceptionally dry and showing significant abstractions for irrigation purposes.**
- **Surface water abstraction after 1995 showed a significant decline despite minimal year-to-year increments and reductions. In 2012, volumes of abstracted surface water was 59.7% of abstracted volumes in 1995, and 55.8% of abstracted volumes in 2000. Between the years 2011 and 2012 abstracted volumes grew by 38.2%.**
- **Groundwater abstraction also declined after 1995; however, since 2000 its trend has been balanced, with very few increments and reductions. In 2012, volumes of abstracted groundwater were 41.6% of the abstracted volumes in 1995, and 24.6% of the abstracted volumes in 2000. Compared 2011, abstraction grew by 1.1%.**

Has there been a reduction to the pressure on the surface water quality expressed by the volume of pollution discharged into surface water?

- **Since 1994, volumes of discharged wastewater into surface water have been declining, despite year-to-year increments and reductions. In 2012, wastewater production declined by 47.2% compared to 1994, and by 38.3% compared to 2000. In 2012, volumes of organic pollution characterised by parameters of COD_{Cr}, BOD, and IS.**

What is the quality of water in Slovakia?

- **Surface water quality in 2012 at all monitored sites complied with the limits for selected general indicators and the radioactivity indicators. Exceeded limit values were recorded mainly for synthetic and non-synthetic substances, hydrobiological and microbiological indicators, and nitrite nitrogen. Until 2007, surface water quality was assessed under the norm STN 75 221 in 5 quality categories and 8 indicator groups. In the years 1995-2007, 40-60% of abstraction sites showed the IV. and V. quality categories for the groups of F - micropollutants, and E - biological and microbiological indicators.**
- **In line with the requirements of Directive 2000/60/EC (Water Framework Directive - WFD) water quality is expressed by the ecological and chemical balance of surface water bodies. Adverse and critically adverse ecological situation was recorded in 4.13% of water bodies, reaching the length of 1 485.18 km. 176 water bodies (10%) did not reach good chemical balance.**
- **Monitoring for groundwater chemical balance in 2012 was carried out within the framework of basic monitoring (171 objects) and operational monitoring (295 objects). Both types of monitoring showed exceeded values for set contamination limits. In 1995-2006, groundwater quality was assessed under norm STN 75 7111 in 26 water management significant areas.**
- **Drinking water quality in the SR has long been of the high level. In 2012, share of drinking water analyses that complied with the limits reached the value of 99.67%, while in 2000 it was 98.64%.**
- **In 2012, classification of water suitable for bathing under Directive 2006/7/EC was carried out at 32 natural sites. 23 sites (72%) showed excellent water quality, while 8 sites (25%) were classified as having good water quality for bathing. 1 natural bathing water pool (3%) was classified as a site with sufficient quality of bathing water. The natural water bathing body of Ružín has not been classified due to the unavailability of data for the last 4 years. Over the years 2000 to 2004, water quality in water bodies was monitored for eutrophication processes expressed by the indicator of chlorophyll-a. In 2000, the concentration of chlorophyll-a was exceeded at 18 monitored water bodies.**

What is the trend in connectedness of the public to public water supplies and sewerage systems?

- **Number of inhabitants connected to drinking water from public water supplies reached 87.0% in 2012. This value does not reach the values shown by the neighbouring countries. In 1993, 4 138 thousand of inhabitants (77.8%) were connected to water supplies, while in 2000 it grew to 4 479 thousand (82.9%).**
- **Connectedness of the public to public sewerage systems is significantly less than connectedness to water supplies. 51.5% of inhabitants were connected to public sewerage systems in 1993, while in 2000 this number grew to 54.7%, and in 2012 it reached 62.4%. This level is comparable to Hungary, Poland; however, it is significantly lower than that of the Czech Republic and Austria.**

Surface water

♦ Water balance

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.

Annual inflow to Slovakia in 2012 was 68 645 mil.m^3, which, compared to 2010, growth by 13 002 mil.m^3. **Runoff** from the territory has declined by 1 765 mil.m^3, compared to the previous year.

Total water volume as of 1.1.2012, in water reservoirs was 635.7 mil.m^3, which represented 55% of total usable water volume in water reservoirs. As of 1.1.2013, total available volume of the assessed accumulation tanks compared to the previous year 2012 incerased to 722.3 mil.m^3, which represents 62% of total exploitable water.

Total hydrological balance of water resources in the SR in years 1995, 2000 and 2012

	Volume (mil. m^3)		
	1995	**2000**	**2012**
Hydrological balance			
Rainfall	40 637	37 500	34 853
Annual inflow to the SR	74 717	77 999	68 645
Annual runoff	87 113	90 629	76 678
Annual runoff from the territory of the SR	12 793	12 842	7 597
Water management balance			
Total abstraction of the surface and ground water in the SR	1 386	1 172	675,39
Evaporation from water reservoirs and dams	52.20	60.00	57.25
Discharge into surface waters	1 120.30	989.80	646.60
Impact of water reservoirs (WR)	137.70	32.98	47.50
	improving	**improving**	**accumulation**
Total volume in WR as of 1st January of the following year	732.3	757.0	722.3
% of supply volume in accumulation WR in the SR	59.1	65.0	62.0
Rate of water exploitation (%)	11.0	9.1	8.89

Source: SHMI

Usable water per year per capita includes two factors: (1) increment in population, and (2) water resources provided by nature. In Central Europe, especially in Slovakia, usable water per capita and year reflects the trend in natural conditions, since the growth of population has been stagnant. Usable water fluctuates since it is has been impacted by climate conditions. For instance, in the year 2003 that was characterised as extremely dry, usable water declined by more than a half compared to the long-term mean values for the years 1931-1980 (1.29 vs. 2.84). Usable water also relates to the real water demand - water abstractions that, due to increased prices, declined significantly. Besides, the decline in abstractions below 10% points to inadequate water savings.

Usability of water per capita in the SR

	1993	2000	2003	2005	2008	2009	2010	2011	2012
Usable water ($m^3.10^3$/year/capita)	1.37	2.36	1.29	2.21	1.88	2.00	4.22	1.73	1.41
Real withdrawal (m^3/ year/capita)	297.6	220.8	196.4	170.8	122.8	115.8	111.0	109.7	125.0
% witdrawal from usable water	21.7	9.40	15.2	7.7	6.6	5.8	2.6	6.3	8.9

Source: SHMI

♦ Precipitation and runoff conditions

Total **atmospheric precipitations** in the Slovak territory in 2012 reached the value of 711 mm, which represents 93% of the normal level. In terms of precipitations, this year had been considered normal. Total excess of precipitations reached the value of 49 mm.

Based on the characteristics of the precipitation period, the year 2012 showed normal values in the watersheds of Nitra, Hron, Ipeľ, Bodva, Hornád, Bodrog, and Poprad. For the watersheds of Morava, Váh, and Slaná, the year was characterised as dry. For the watershed of Danube, the year 2012 was assessed as very dry.

Average rates of precipitation and runoff in particular catchment areas in 2012

Catchment area	**Dunaj**		**Váh**		**Hron**			**Bodrog a Hornád**			
Subcatchment area	***Morava**	***Dunaj**	**Váh**	**Nitra**	**Hron**	***Ipeľ'**	**Slaná**	**Bodva**	**Hornád**	***Bodrog**	***Poprad a 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
Average precipitation (mm)	570	490	755	640	771	630	704	697	704	727	804
% of normal	84	78	89	92	98	92	89	95	104	103	96
Character of rainfall period	S	VS	S	N	N	N	S	N	N	N	N
Annual runoff (mm)	86	13	246	85	159	36	79	50	109	148	307
% of normal	65	36	78	59	55	26	42	30	52	50	89

* 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 runoff volumes in SR in 2012 reached 59% of the long-term average value. Runoff volumes from partial watersheds did not exceed the long-term average for any watershed, as the values oscillated within the range of 26 to 89%.

♦ Surface water abstraction

In 2012, surface water abstractions increased to 326.429 mil.m^3, which is 38.2% more than in the previous year. Abstractions for industry in 2012 were at 259.2 mil. m^3, which was a significant growth by 82.6 mil.m^3, i.e. 46.8%, compared to 2011. A slight growth was recorded also in surface water abstractions for waterlines, which, compared to the previous year, increased by 0.55 mil.m^3, that is 1.1%. Surface water abstractions for irrigation grew and reached the value of 18.138 mil.m^3.

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

Year	Public water-supplies	Industry	Irrigation	Other agriculture	Total	Discharging
1995	71.963	661.836	74.325	0.0360	808.159	1 120.29
2000	70.571	575.872	90.540	0.0440	737.027	989.825
2009*	50.433	217.009	12.319	0.0020	279.763	605.274
2010*	48.098	205.497	5.864	0.0010	259.460	742.818
2011*	48.545	176.610	10.125	0.9210	236.201	610.093
2012*	49.090	259.200	18.138	0.0013	326.429	646.600

*data from database „Aggregate balance sheet of water“ Source: SHMI

♦ Evaluation of surface water quality by the SR government Regulation 269/2010 Coll.

Surface water quality assessment has been carried out on the basis of data obtained during the water level monitoring process. In 2010, surface water quality monitoring in the Slovak Republic was divided by the **MoE SR Resolution 418/2010 Coll. on implementation of selected provisions of the Water Act** into basic monitoring, operational monitoring, and monitoring of protected areas (PA). Quality surface water indicators in 2012 were monitored in compliance with the approved Programme of Water Balance Monitoring for 2012. 314 sites were monitored under the basic and operational monitoring schemes.

Quality indicators monitored at all monitoring sites (basic and operational) in 2012 were assessed pursuant to the **SR government Regulation 269/2010 Coll. which sets forth criteria for achieving a favourable water balance.** General requirements for surface water quality were met at all monitoring sites for the following indicators: **general indicators** (part A) - magnesium, sodium, disulphate, free ammonia, fluoride, surface active substances, phenolic index, chrome (VI), vanadium, chlorobenzene, dichlorbenzenes. Also, **radioactivity indicators** complied with the requirements (part D): bulk volume alpha and beta activity, tritium, stroncium, and caesium.

Surface water quality criteria were exceeded in the **synthetic substances** category (part B) by the indicators for arsenic, cadmium, copper, lead, zinc. In the category of **non-synthetic substances** (part C) the following substances did not comply with the criteria for the annual average: alachlor, hexachlorobenzene, di-(2-ethyl hexyl) phtalate (DEHP), 4-methyl-2 6-di-tert-butylphenol, benzo(g,h,i)perylen+indeno(1,2,3-cd)pyren and cyanides. The highest permissible concentration has been exceeded in the indicators of mercury and 4-methyl-2 6-di-tert-butylphenol. **Hydrobiological and microbiological indicators** (part E) included the bioseston saprobic index, abundance of phytoplankton, chlorophyll a, coliform bacteria, thermotolerant coliform bacteria, intestinal enterococci and culturable microorganisms at 22 ^{o}C. Nitrite nitrogen indicator has often been exceeded in all partial watersheds for the **general indicators** group. Most exceeded criteria in the group of

hydrobiological and microbiological indicators included those for intestinal enterococci (in 6 partial watersheds), thermotolerant coliform bacteria (in 6 partial watersheds), and coliform bacteria (in 7 partial watersheds).

♦ Evaluation of status of surface water bodies

Assessment of surface water formations balance is based on the assessment of their ecological condition, i.e. their ecological potential and chemical balance.

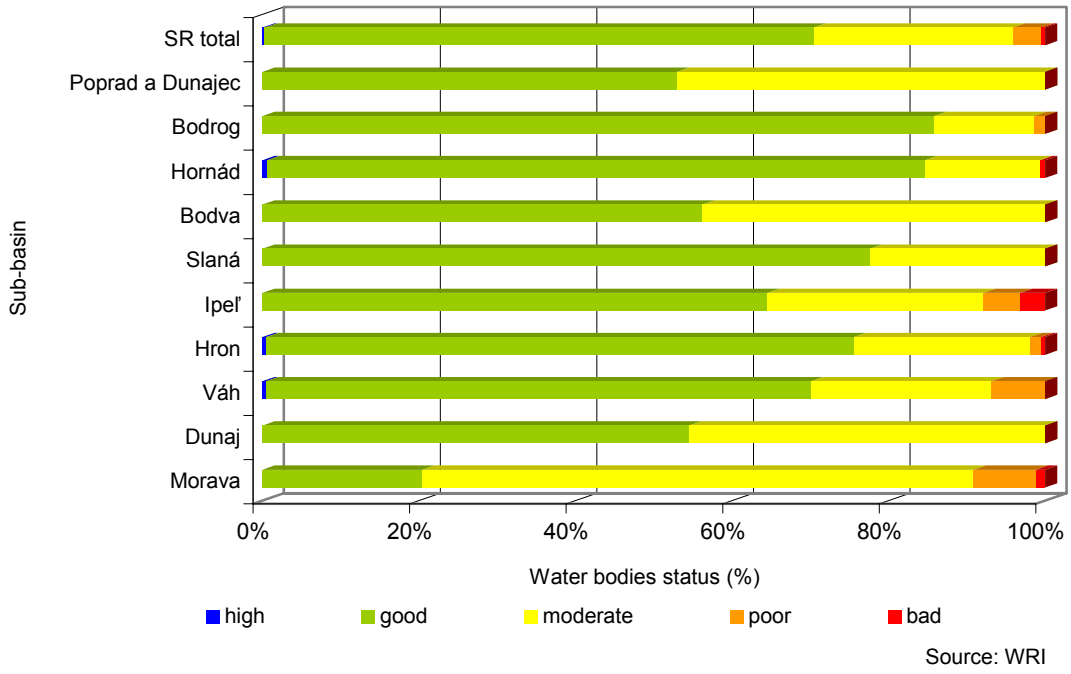
Resulting water balance is determined by the worse of the pair of chemical or ecological balance that forms the basis for the subsequent activities relating to the compliance with one of the environmental quality goals under Framework Water Directive (FWD) - to reach a favourable water balance for all water formations by 2015.

♦ Assessment of the ecological balance of surface water bodies

Assessment of the ecological balance of surface water bodies for the year 2010 was carried out at 1 648 natural surface water bodies. Best situation in terms of the ecological balance was recorded in partial watersheds of Bodrog, Hornád, Slaná, Hron, and Váh.

Very good and good ecological balance was recorded in 70.51% of water bodies in Slovakia. In terms of water bodies' length, the number represents 55.55% (10 524.11 km). A relatively high number of water bodies showed average balance, specifically 25.36% of them, which represents the length of 5 331.95 km. Condition of surface water bodies was classified as adverse and critically adverse in 4.13% of water bodies, reaching the length of 1 485.18 km.

Share of the total number of water bodies classified into the individual ecological status/potential in the river basin of SR (2010)



Source: WRI

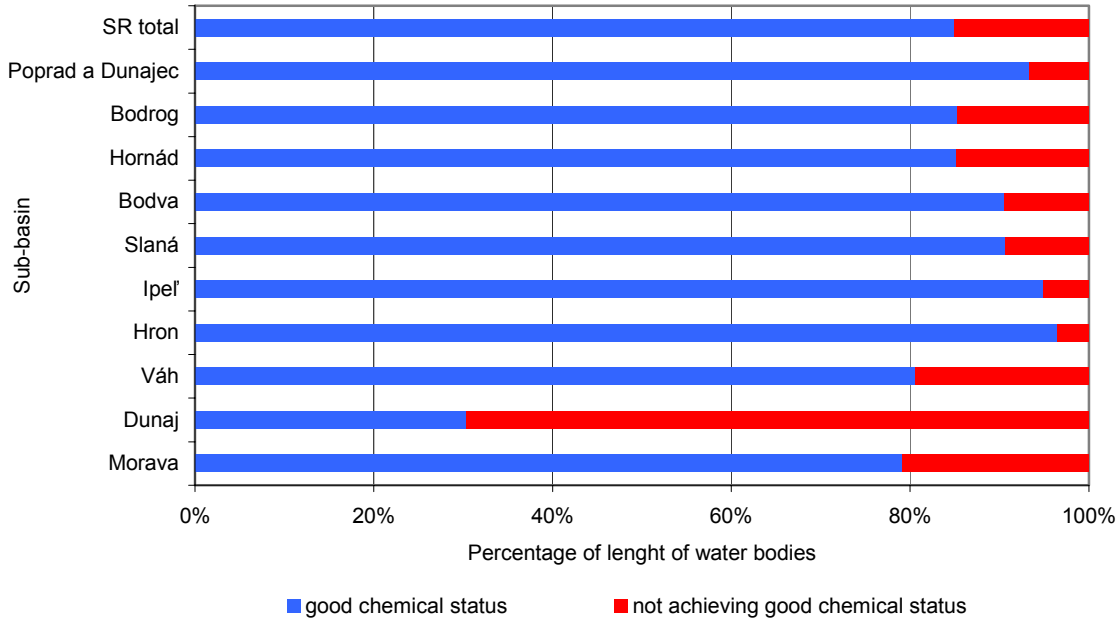
♦ Assessment of chemical balance of surface water bodies

Assessment of chemical balance of surface water bodies in 2010 was performed at 1 760 water bodies (these include 1 737 surface water bodies at rivers (flowing waters) and 23 surface water bodies at rivers with a changed category (standing waters). 1 584 (90%) water bodies in Slovakia showed good chemical balance, while 176 (10%) water bodies did not.

122 water bodies showed deficient chemical balance caused by specific synthetic pollutants, while 44 water bodies were in this condition due to specific non-synthetic priority pollutants. Seven water bodies showed exceeded environmental quality norms for both groups and no pollutants were identified in 13 water bodies since deficient chemical balance is determined on the basis of outcomes of risk analysis.

In total, 15.07% of the length of water bodies in Slovakia do not show good chemical balance. Most adverse situation exists in the partial watershed of the Danube River with almost 70% of its length not reaching good chemical balance. Watersheds of the Váh and Morava rivers follow with almost 20%.

Assessment of chemical balance of surface water bodies' lengths in 2010



Source: WRI

Groundwater

♦ Water resources

In 2012, based on the hydro-geological assessment and surveys in Slovakia, there were **78 939 l.s^{-1} available groundwater resources**. In comparison with the previous year 2011, there was observed a slight increase of the efficient groundwater volume by 138 l.s^{-1}, i.e. by 0.17%. In the long-term evaluation, the increase of the efficient volume in comparison with 1990 makes 4 164 l.s^{-1}, i.e. 5.6%.

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 wate sources abstraction, we see that in **2012, out of total number of 141 hydro-geological regions in SR, 130 regions show good balance status, 10 regions show acceptable status and one region show critical status.** Emergency balancing state did not occur in any region.

♦ Groudwater levels

Average annual levels in 2012 in Slovakia showed decline, compared to 2011. Average annual values of groundwater levels declined within the interval of -20 to -100 cm. A single and non-typical increase has been recorded in the watershed of the middle and upper Váh River.

Average annual levels in 2012, compared to long-term average annual levels declined for most parts from -10 cm to -30 cm, occasionally by -80 cm in the whole territory. Occasional increases have been recorded in all watersheds, especially Danube (mostly up to +70 cm).

♦ Well capacities

Given the **average spring yields** and comparing them with the previous year, almost unified decline in yields has been observed, down to the level of -40% to -90% of last year's figures. The figures for Slaná and Bodva watersheds show only 3% - 40%. Occasional increments (mainly in the watersheds of Morava and Hornád) reached up to 125% of last year's average yields.

Average annual yields compared to long-term average yields declined in most part by 50% - 90% or less in few sites. Increments are prevalent in the watershed of the Poprad River (up to 190%), their occurrence has been recorded in the watersheds of these rivers: Morava, Nitra, Hron, Bodva, and Hornád (in most parts up to 140%).

♦ Groundwater abstraction

In 2012 there was being **extracted 10 719 l.s^{-1} of ground water in average** by the users (which are subjects to reporting obligation) in Slovakia that was 13.58% of the documented efficient volume. During the year 2012 the groundwater extractions slightly increase by 117.6 l.s^{-1} which means 1.11% in comparison with year 2011.

Groundwater extraction according to the purpose of use in years 1995, 2000- 2012 (l.s^{-1})

Year	Public water supplies	Food-processing industry	Other industr.	Agricult. and Livestock	Vegetable prod. Irrigation	Social purposes	Others	Total
1995	14 373.10	390.60	2 327.20	727.10	25.00	286.50	202.70	18 332.20
2000	11 188.38	321.23	1 177.18	446.78	18.20	432.99	632.66	14 217.42
2008	8 468.82	284.98	823.02	253.29	67.52	271.23	953.23	11 122.09
2009	8 475.40	268.13	762.18	232.07	93.80	249.44	963.58	11 044.60
2010	8 295.00	265.00	781.00	217.20	48.70	254.40	967.20	10 819.50
2011	8 071.10	206.20	802.20	210.20	81.10	237.80	993.20	10 601.80
2012	8 149.70	256.60	797.80	221.20	108.40	218.40	967.25	10 719.35

Source: SHMI

♦ Monitoring of groundwater quality

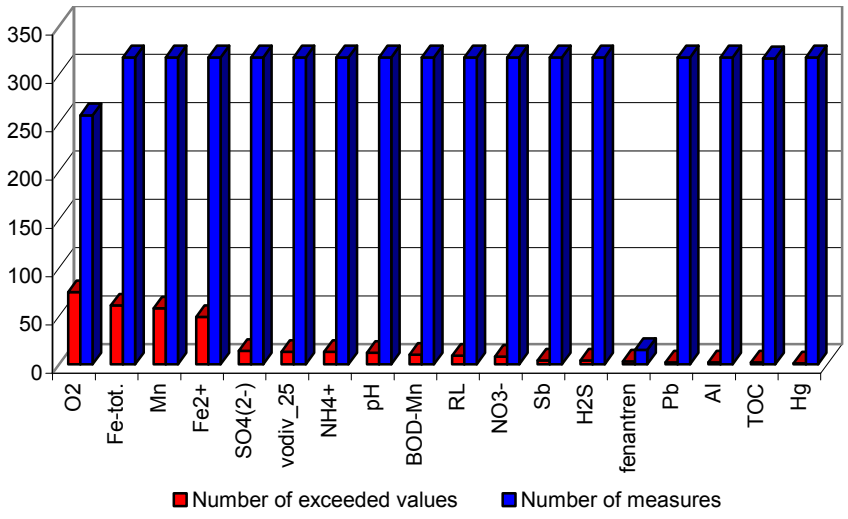
Pursuant to the WFD requirements, the older system of dividing Slovakia into significant water management areas was abandoned. Since 2007, classification has been based on delineation of groundwater formations. Monitoring of ground water chemical situation has been divided into:

- basic monitoring,
- operation monitoring.

In 2012, ground water quality was monitored at 171 **basic monitoring facilities**. Ground water samples were extracted 2 times from 39 quaternary objects, 1 times in 67 pre-quaternary objects and 11 quarternary objects, and 3 times in 54 pre-quaternary karst objects.

Recommended value for oxygen saturation percentage determined in situ was achieved in 72.09% of samples. pH values fluctuated within the limit values, with the exception of 12 samples. Of the total number of 318 measurements, conductivity exceeded the indicative value set by the government regulation in 13 cases. The issue of adverse **oxidation-reduction** conditions becomes predominant within the groundwater object basic monitoring as witnessed most frequently by exceeded admissible concentrations of total Fe (61 times), Mn (58 times), and NH_4^+ (13 times). Besides these indicators, there has been a single case of exceeded values for NO_3^- (8 times), SO_4^{2-} (14 times), and soluble substances at 105°C, COD_{Mn}, TOC and H_2S. In **trace elements**, increased concentrations were recorded for Al (2 times), Pd (2 times), Sb (4 times), and Hg (1 time). Pollution by specific organic pollutants within the basic monitoring objects shows only local character. In 2012, there was recorded a single case of increased concentration exceeding the set limit, specifically within the group of polyaromatic hydrocarbons. (phenanthrene) Majority of **specific organic substances** was below the detection limit. In the group of general organic compounds indicators, all the analyses complied with the set limit.

Occurrence of exceeded indicators at basic monitoring facilities pursuant to the SR Government Directive 496/2010 Coll. in 2012



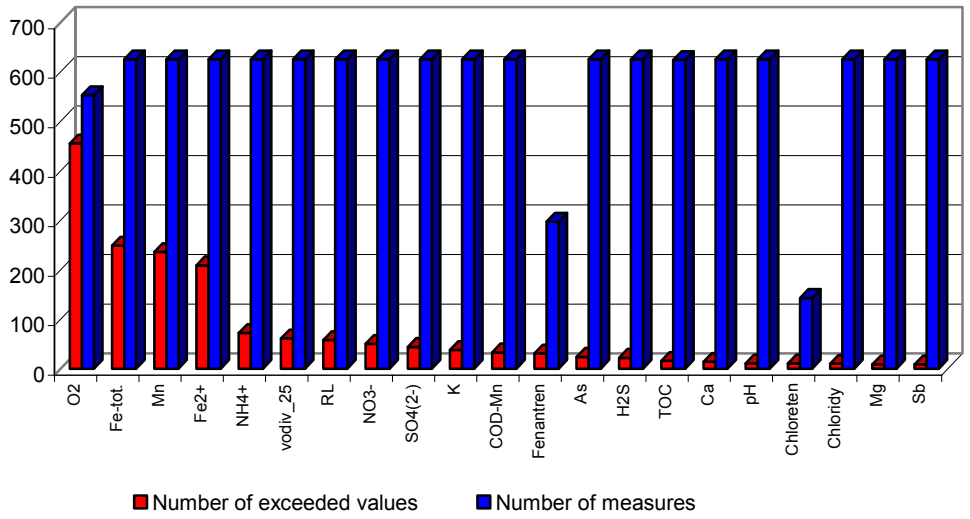
Source: SHMI

Operational monitoring was conducted at all ground water formations that were assessed as high-risk in terms of not being able to reach a favourable chemical balance. In 2012, within the operational monitoring 295 objects were monitored with the assumption to detect a potential penetration of contaminants from a potential contamination source or group into the ground water. The area of Žitný ostrov forms a separate part of the SHMI monitoring network, since it plays an important role within the whole process of water quality changes in Slovakia, and since the area itself represents a reservoir of drinking water for our territory.

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 17.72% of the samples. Most frequently exceeded indicators include Mn and total Fe, which suggests persisting adverse **oxidation-reduction situations.** Exceeded Cl^- and SO_4^{2-} limit values also indicate the impact of anthropogenic pollution on ground water quality. The limits for the following basic parameters were exceeded: soluble substances at 105°C (58 times), H_2S (22 times), Mg (9 times) and Na (3 times). Character of land use (agricultural exploitation) is reflected into increased contents of oxidized and reduced nitrogen forms in ground water, with ammonia ions NH_4^+ (72 times), NO_3^- (50 times) and NO_2^- (1time) being the most prevalent. In 2012, the acceptable value set by legislation was exceeded in **5 trace elements** (Al, As, Sb, Ni, and Zn) at operation monitoring facilities. Most frequently recorded increased contents include As (24 times) and Sb (9 times). The impact of anthropogenic activity on groundwater quality is indicated by the increased concentration of COD_{Mn} (33 times).

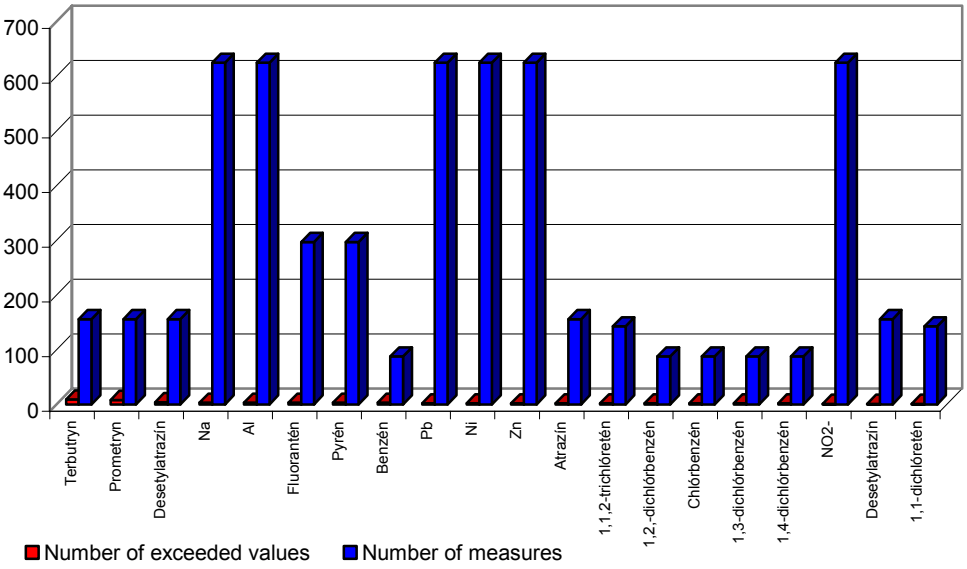
In the group of general organic compounds, values for total organic carbon exceeded the limit value as many as 16 times, while the limit values for hydrocarbon index for non-polar extractable substances (NPE-UV) in 2012 were not exceeded. Presence of **specific organic compounds** in groundwater indicates impacts by human activities. Objects of operational monitoring recorded a wider range of specific organic compounds. Most frequently exceeded values were recorded for indicators pertaining to the category of polyaromatic hydrocarbons (phenanthrene, fluoranthene, pyrene, chloroethylene, dichlorobenzene, and trichlorethylene) and pesticides (desethylatrazine, atrazine, deethylatrazine).Exceeded were also the limit values for the category of volatile aliphatic hydrocarbons and volatile aromatic hydrocarbons.

Occurrence of exceeded indicators at operation monitoring facilities pursuant to the SR Government Directive 496/2010 Coll. in 2012



Source: SHMI

Occurrence of exceeded indicators at operation monitoring facilities pursuant to the SR Government Directive 496/2010 Coll. in 2012



Source: SHMI

♦ Assessment of the condition of groundwater bodies

Assessment of the condition of groundwater bodies has been carried out by assessing their chemical balance and the quantitative balance.

In Slovakia, 101 groundwater bodies have been designated, including 16 quaternary, 59 pre-quaternary, and 26 geothermal groundwater bodies. For the purposes of groundwater chemical balance assessment in 2012, all quaternary and pre-quaternary groundwater bodies were covered with monitoring objects, with the exception of 2 pre-quaternary bodies. Groundwater quality was monitored at 466 objects including 164 within pre-quaternary and 302 within quaternary bodies. Geo-

thermal groundwater formations have not been assessed due to the absence of data on their usable potential and on their monitoring and use.

Objects were assessed for each water formation based on compliance to the Slovak Government Resolution no. 496/2010 Coll. which amends Slovak Government Resolution No. 354/2006 Coll. **which sets forth criteria for water for human consumption and its quality assessment.** Objects showing the exceeded threshold value set by legislation by at least one indicator were labelled as unfavourable.

On the basis of assessment of the ground water chemical balance, of the total number of 75 ground water formations:

- 13 ground water formations were declared as those with unfavourable chemical balance - 7 quaternary and 6 pre-quaternary
- 62 ground water formations were declared as those with favourable chemical balance.

Summary of chemical status evaluation in the groundwater bodies in SR

SR water bodies	Chemical status classification				Total area
	good		poor		
	km^2	%	km^2	%	
Quaternary	6 081	57.1	4 565	42.9	10 646
Pre - quaternary	39 446	80.5	9 536	19.5	48 982
SR total	**45 527**	**76.4**	**14 101**	**23.6**	**59 628**

Source: MoE SR

Favourable chemical balance was indicated for 82.7% of groundwater formations, i.e. 76.4% of total size of formations (quaternary and pre-quaternary). Favourable chemical balance was indicated for 17.3% of groundwater formations, i.e. 23.6% of total size of formations (quaternary and pre-quaternary).

Quantitative balance of groundwater formations involves assessing the impact of the documented phenomena on the groundwater formation as such. In Slovakia, this involves assessing the impact of groundwater abstractions. For the purposes of assessment of the quantitative balance of groundwater formations within quaternary sediments and pre-quaternary rocks, outcomes of four assessments have been summarised. 5 groundwater formations in the territory of the Slovak Republic have been classified as having an adverse quantitative balance.

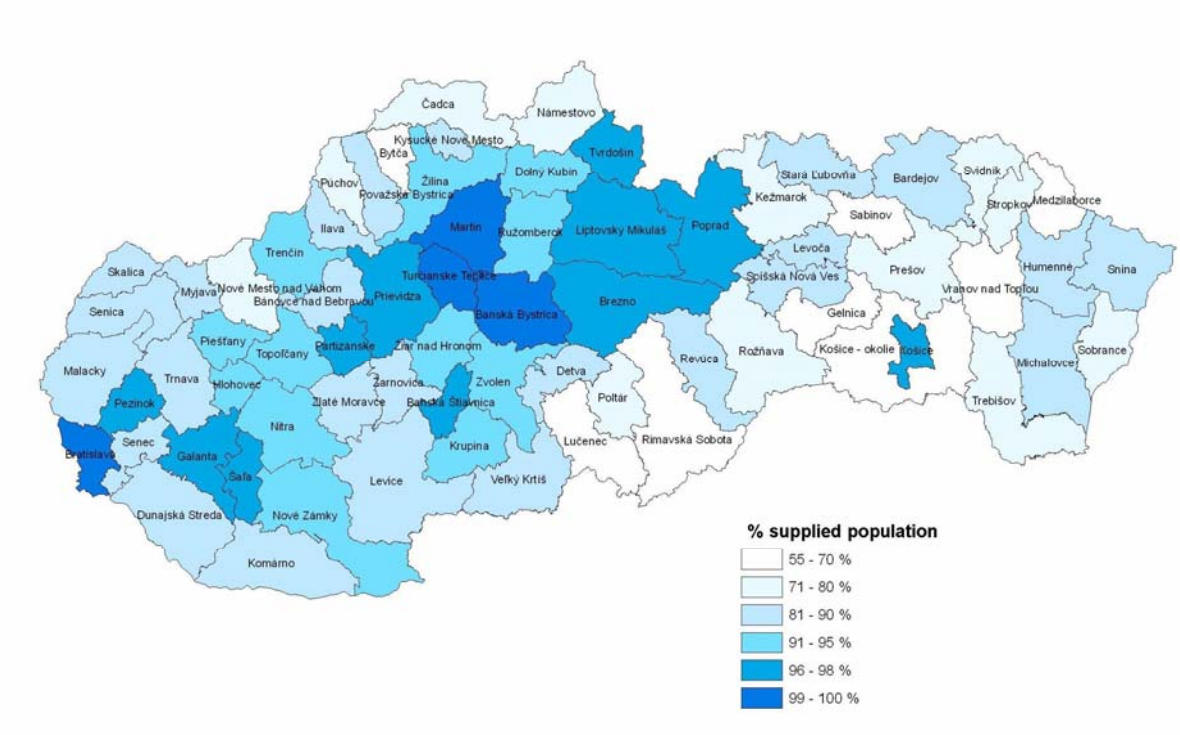
Public water supplies

♦ Infrastructure in supplying the public with drinking water

Number of inhabitants supplied with water from public water supplies in 2012 declined compared to the previous year by 15.8 thous. inhabitants down to 4 707.0 thous., however, the percentage of supplied inhabitants grew to 87.0% of total Slovak population. Decline in the number of supplied inhabitants was due to decreased figures in the Slovak population as shown by the census of 2011. In 2012, there were in the SR 2 349 individual municipalities that were supplied with public supply water, and their share in total SR municipalities was 81.3%.

In 2012, major changes were registered in drinking water abstraction. **Volume of produced drinking water** reached the value of 302 mil.m^3 of drinking water, which, compared to 2011, represents an increase by 3 mil.m^3. Of all groundwater sources, 256 mil.m^3 was produced (increased by 2 mil.m^3), while 46 mil.m^3 of drinking water was produced of all surface water sources (increased by 1 mil.m^3) Of total water produced at water management facilities, **water losses** by pipe network were 27.6% in 2012. **Specific water consumption by households** decreased to 80.8 l per person per day. This is alarming not only due to the fact that these abstractions are close to the sanitary limits, but mainly because the high drinking water prices motivate the people to build their own drinking water sources whose drinking water quality is, in most cases, far below the sanitary standards.

Drinking water supplying of the inhabitants from the public water supplies in 2012 (%)



Source: WRI

♦ Drinking water quality monitoring and assessment

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 desinfection, biological quality and the sensoric properties of drinking water.

In 2012, were analysed at operation laboratories of water management companies 9 274 samples. The samples were abstracted at sites located within distribution networks and 251 195 analyses were

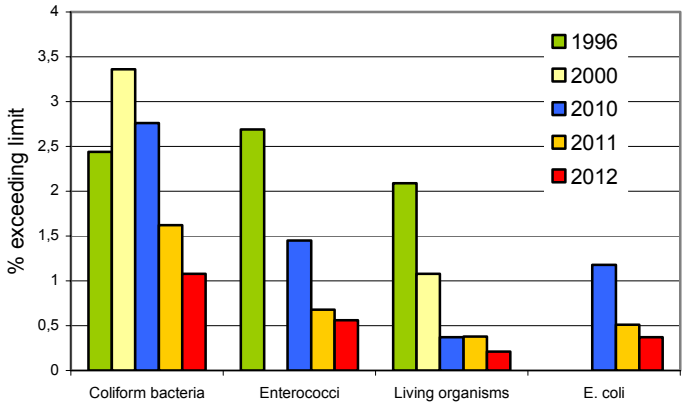
carried out to monitor individual drinking water quality indicators. Share of drinking water analyses that complied with the sanitary limits in 2012 reached 99.67% (in 2011 it was 99.60%). Percentage of samples that meet drinking water quality demands for all indicators reached 94.27% (in 2011 it was 92.05%). 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

Year	2000	2005	2012
Share of drinking water samples that do not meet the NMH and MHRR limit.	4.54 %	2.10 %	0.65 %
Share of drinking water quality indicators analyses that do not meet NMH and MHRR	1.36 %	1.15 %	0.73 %
NMH - maximum threshold values, MHRR – threshold values of the reference risk			

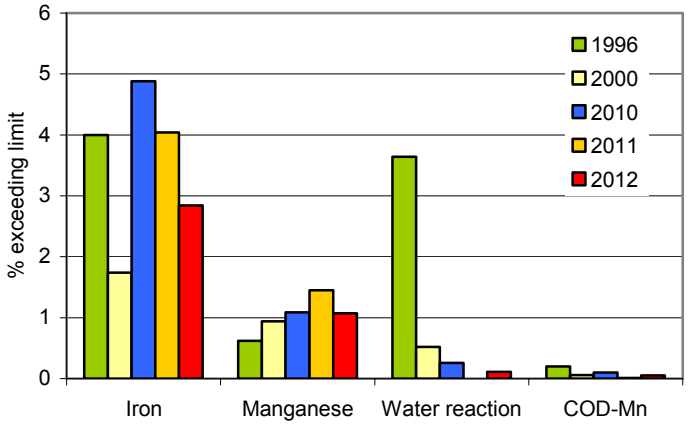
Source: WRI

Results of monitoring the microbiological and biological indicators of drinking water within Slovakia's distribution networks (1996-2012)



Source: WRI

Results of physical and chemical drinking water indicators monitoring within Slovakia's distribution networks - indicators that cannot adversely affect drinking water sensorial quality (1996 – 2012)



Source: WRI

Waste water discharge and treatment

♦ Waste water production

In 2012, 647 159 thous.m^3 of **waste water** were discharged into the surface water, which represents a growth by 34 784 thous.m^3 (5.7%) compared to the previous year. When compared with 2000, it is less by 400 522 thous.m^3 (38.3%).

Compared to the previous year, volumes of organic contamination of surface water continued to decline. The contamination was characterised by the following oxygen regime parameters: chemical oxygen demand by dichromate (COD_{Cr}) by 1 500 tonnes per year, biochemical oxygen demand (BOD) by 263 tonnes per year, and for the parameter of insoluble substances (IS) by 1 037 tonnes per year.

Major sources of organic contamination of water bodies include residential agglomerations, industry, and agriculture.

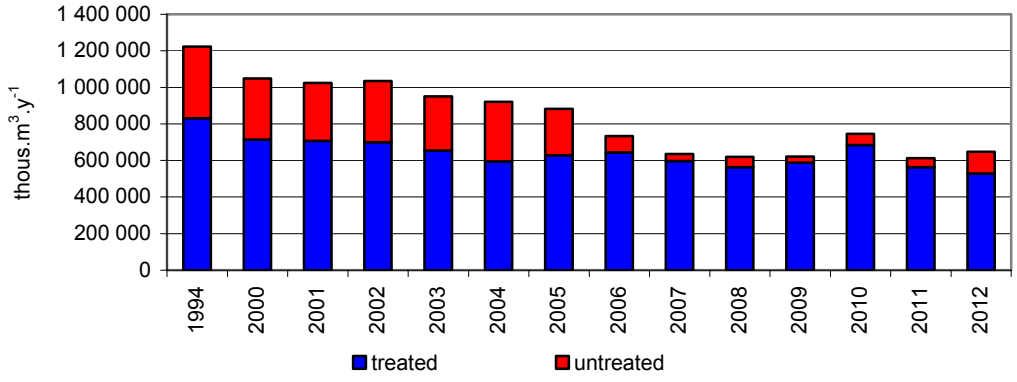
Percentage of discharged treated waste water to **total volumes of waste water** discharged into watercourses in 2012 was 81.62 %.

Load of the balanced contamination sources discharged into surface watercourses in the period of years 1994, 2000-2012

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} ($t.y^{-1}$)
1994	1 223 549	41 446	34 275	106 960	772
2000	1 047 681	23 825	20 205	61 590	298
2001	1 024 320	22 998	19 707	61 599	270
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
2006	773 594	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
2009*	620 340	7 707	5 546	25 660	31
2010*	744 756	9 018	5 580	25 750	32
2011*	612 375	7 258	4 825	21 358	28
2012*	647 159	6 221	4 562	19 858	25

*data from database „Aggregate balance sheet of water“ Source: SHMI

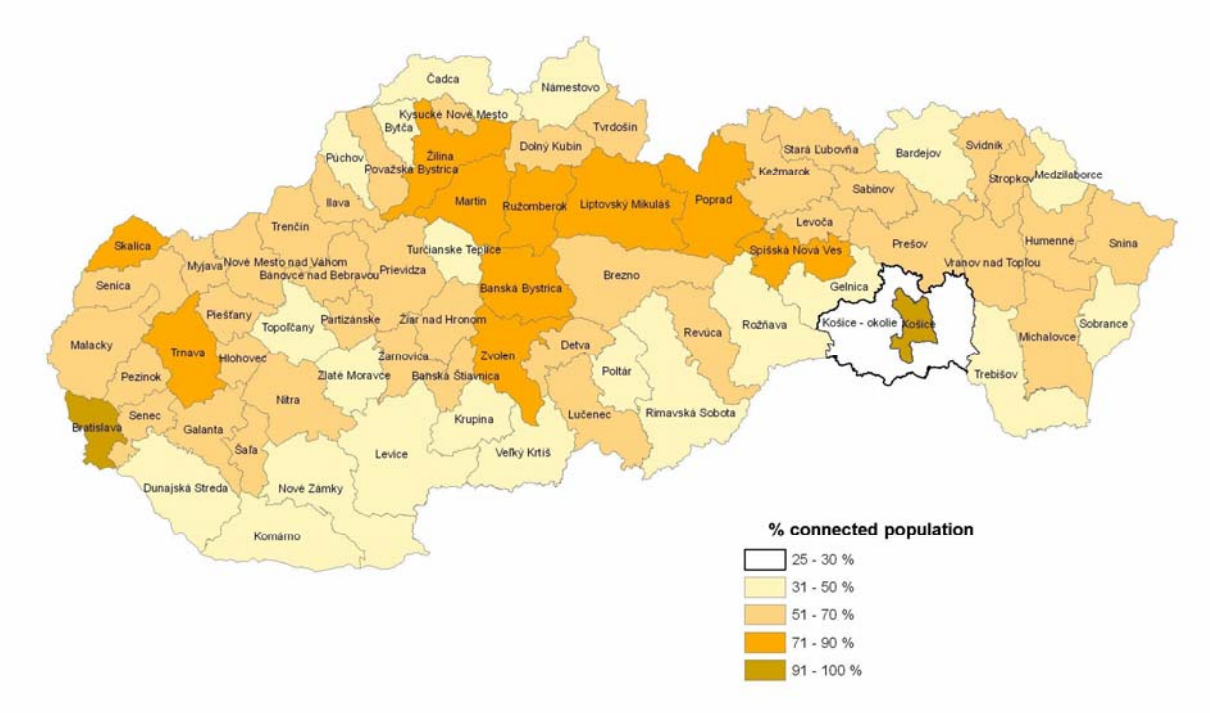
Trend in discharging of the treated and untreated waste waters into watercourses in the period of 1994, 2000-2012 Source: SHMI



♦ Waste water discharge

Development of public sewerage systems lags behind that of public water supplies. **Number of inhabitants** living in households **connected to public sewerage systems** in 2012 reached the number of 3 376 thous. inhabitants, which is 62.4% of all inhabitants. Of the number of 2 891 of stand-alone municipalities in 2012, 953 of them had public sewerage systems in place (i.e. 33.0% of all Slovak municipalities).

Connecting of the inhabitants to the public sewerage network in 2012 (%)



Source: WRI

♦ Waste water treatment plants

In 2012, 631 waste water treatment plants were administered by water management companies, municipal governments, and other subjects, most of these plants have been mechanical-biological WWTPs. Total capacity of WWTPs in 2012 was 2 010.3 thous.m^3 per day.

In 2012, watercourses with public sewerage system (administered by municipalities and water management companies) received 389 mil.m^3 of discharged waste water, which was by 25 mil.m^3 less than in the previous year, and the volume of treated waste water discharged into the public sewerage system reached 380 mil.m^3.

Volume of the discharged wastewater by the public sewerage system (in administration of VaK and in administration of the municipalities) in 2012

Water discharged by the public sewerage and WWTP	Sewage	Industrial and other	Precipitation	Separate	Total
	(thous.m^3.$year^{-1}$)				
Treated	111 921	86 263	44 895	137 898	380 977
Untreated	3 215	615	1 047	3 066	7 943
Total	**115 136**	**86 878**	**45 942**	**140 964**	**388 920**

Source: WRI

Sludge from WWTPs is a necessary by-product of the waste water treatment process. Sludge volumes produced in Slovakia at WWTPs operated by regions or water management companies remained virtually unchanged, with fluctuations within 53 - 58 thous. tonnes of sludge dry matter.

Sludge produced in the waste water treatment plant

Year	Amount of the sludge (tons of dry residue)						
	Total	Applied into the agricultural soil	Applied into the forest soil	Composted and used in other way	Incinerated	Land filled	In other way
2007	55 305	0	0	42 315	0	3 590	9 400
2008	57 810	0	0	38 368	0	8 676	10 766
2009	58 582	0	0	47 056	0	2 696	8 830
2010	54 760	923	0	35 289	0	16	6 681
2011	58 718	358	0	50 111	0	2 306	5 943
2012	58 706	1 140	0	49 642	0	7 924	0

Source: WRI

Bathing water quality

Through **Act no. 355/2007 Coll. on protection, support and promotion of public health and amendments to other laws as amended by Act no. 140/2008 Coll., as well as through the Slovak Government Regulation no. 87/2008 Coll. on requirements on natural recreational water formations**, the Slovak Republic designated a responsibility for carrying out monitoring of water formations appropriate for bathing for the National and Regional Public Health Authority of the Slovak Republic and for site operators, in line with the appropriate frequency and methods set forth by Directive 2006/7/EC concerning the management of recreational water quality.

Assessment of natural bathing waters in 2012 included 84 sites that are used also for recreational purposes. Of this, recreational activities are organised at 23 sites and their operation was licensed by the Regional Public Health Authority (RPHA). In cases of non-organized recreational activities, monitoring of sites was carried out by the RPHA depending on the number of visitors and the existing situation. Frequency in water quality monitoring was roughly every other week and depended on the site's significance.

Over the season, 506 water samples were extracted and 7 245 tests were done on chemical, physical, microbiological, and biological water quality indicators. Limit value (LV) for set indicators was exceeded for 195 samples and in 352 indicators, which is 38.3% of total number of samples. (increased by app. 4 %, compared to the previous year). When assessed by indicators, proportion of non-compliant indicators is only 4.86%, since with almost each non-compliant sample only one water quality indicator was exceeded. A number of water surfaces showed physical and chemical indicators that were impacted by weather conditions. These represented 68.45% of total number of non-compliant indicators. Most frequently occurring physical and chemical indicators included: transparency, colour, water oxygen saturation, water reaction and less frequently total phosphorus and phenols. The greatest number of non-compliant microbiological indicators included intestinal enterococci, less E. coli, and occasional coliform bacteria.

In 2012, Slovakia carried out the second assessment and qualification of bathing waters, also in

line with the Directive 2006/7/EC. This assessment has been applied to 32 sites that have been declared so-called bathing waters by the general binding decrees of regional environmental offices. 23 sites of bathing waters have been classified as sites with excellent bathing water quality, 8 sites showed good bathing water quality, and one site had sufficient bathing water quality. The natural bathing site of Ružín has not been assessed since it did not have available data for 4 years that is needed to assess water for bathing purposes under the methodology published in Directive 2006/7/EC.

Notwithstanding the occasionally exceeded limit values for microbiological and biological indicators, over this year's recreation season no diseases or health complications have been detected that would relate to bathing at a natural bathing water surface.

Eutrophication

Eutrophication under article 2 of Council Directive 91/27/EEC on treatment of municipal wastewater means enriching the water with nutrients, mainly nitrogen and phosphorus compounds, which causes an increased growth of algae and higher plant forms. This may bring about an undesirable deterioration in the biological equilibrium and quality of such water. The indicators that characterise eutrophication of surface water include $N\text{-}NH_4$, $N\text{-}NO_3$, $N\text{-}NO_2$, N_{total}, and $P_{total.}$and biomass of phytoplankton (chlorophyll-a (CHLa) and the abundance of phytoplankton (ABUfy)).

356 abstraction sites were assessed in the period of 2008-2011 in order to evaluate eutrophication of watercourses in Slovakia. Oligotrophic state was recorded in 30.89% of abstraction sites, while the mesotrophic state in 37.92% of abstraction sites. About one fifth of sites was in the eutrophic state (31.34%) while 9.83% of sites were in the hyper-eutrophic state. These included mainly monitoring stations at streams that have been impacted, besides agriculture, also by point pollution sources. Of the towns assessed under the French methodology, those sites that show trophic conditions as eutrophic or hyper-eutrophic may be considered threatened by eutrophication or with existing eutrophication. These sites call for close attention and in cases of continuing stagnation or deterioration, adequate measures for water quality improvement should be proposed.