Environmental Risk Factors and Pressures

Physical Risk Factors

Radiation

In 1997, input of the **air-dose-equivalent (PDE)** remained constant as compared to previous years. PDE value ranged from 88 to 184 nSv per hour (average value - 124 nSv.h^{-1}). The average annual effective dose within Slovakia calculated from the data mentioned above equalled to 811mSv.

Table 103 Average radiation exposure (1997)

Author	H_x	K^a	E	Measuring device
	[nSv . h^{-1}]	[nSv . h^{-1}]	[μSv per year]	
Spurný (1997)	124.8	108.4	811	GM Tube STS 6
SURMS (1997)	124.0	107.8	811	FAG 621 B

H_x - input of air-effective-dose per hour E - effective dose per year Source: ÚPKM
K^a - input of air-photon-radiation -dose per hour

Air Contamination

In 1997, the trend set in 1996 continued as continued deviations in artificial radionuclides **air contamination**. As for artificial radionuclides, only those of ^{137}Cs were detected. In 1997, their values ranged from 0.25 to 0.95 μBq.m^{-3}. In analysed samples, also natural radionuclides ^{7}Be (100 - 5 000 μBq.m^{-3}) and ^{10}Pb (40 - 1300 μBq.m^{-3}) were present and detected. In the period 1993 - 1997, a gradual decrease in ^{37}Cs volume activity was recorded. ^{7}Be volume activity did not show any significant year-to-year variation. However, seasonal maximal and minimal values were recorded within a year period.

Table 104 ^{137}Cs air volume activity (1993-1997)

Year	Unit	1993	1994	1995	1996	1997
Number of samples		23	29	29	32	31
Samples exceeding MDA		7	16	20	17	15
Minimal value	[μBqm^{-3}]	3.4	1.1	0.5	0.4	0.25
Maximal value	[μBqm^{-3}]	9.1	13.8	7.3	2.9	0.95
Average value	[μBqm^{-3}]	5.8	4.5	1.7	1.4	0.60

MDA - minimal detectable activity Source: ÚPKM

ontamination of the Environment Components

Components of the environment were contaminated with ^{137}Cs nuclides gradually falling out from upper atmosphere layers. Surface fallout activity was measured in samples gathered within a period one month. ^{137}Cs values ranged from 2 to 2 500 mBq per m^2 (average value - 280 mBq per m^2). Surface drinking water contamination was lower than 0.02 Bq per l (minimal detectable activity) in all recorded cases. Tritium contamination was also measured and recorded and its values ranged from 8 to Bq per l (average value - 17 Bq per l).

Table 105 ^{137}Cs activity in the individual components of the environment (1997)

Component	Unit	Average	Band
Air	$Bq.m^{-3}$	5.7 E-07	2.5 E-07 – 9.5 E-07
Fallout-monthly	$Bq.m^{-2}$	2.8 E-01	2.0 E-03 – 2.5 E+00
Soil	$Bq.kg^{-1}$	not recorded	not recorded
Water	$Bq.l^{-1}$	4.0 E-03	1.0 E-03 – 3.0 E-02
Water (tritium)	$Bq.l^{-1}$	1.7 E+01	8E+00 – 4.65 E+02

Source: ÚPKM

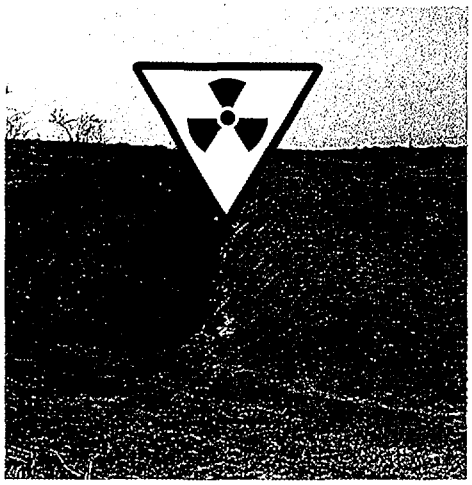
Food Contamination

With regard to artificial radionuclides, only ^{137}Cs radionuclide was detected in food samples analysed. Its content fell in the majority of samples below the level 0.5 Bq per kg.

Table 106 ^{137}Cs activity in food and agricultural products (in Bq per kg or Bq per l)

Product	Type	Average	Min	Max
Milk	Fresh	1.22 E-2	1.00E-03	1.50E-01
Beef	Fresh	1.80E-01	5.00E-02	6.50E-01
Pork	Fresh	1.62E-01	2.50E-02	1.05E+00
Game	Fresh	3.26E+00	2.50E-01	4.25E+01
Poultry	Fresh	6.12E-02	<0.005	7.50E-01
Cereals	dry matter	7.58E-02	<0.005	1.15E+00
Potatoes	dry matter	1.58E-02	<0.005	5.00E-02
Vegetables	dry matter	1.94E-02	<0.005	7.50E-02
Fruit	dry matter	7.07E-02	<0.005	1.00E+00
Forest berries	Fresh	*	<0.005	8.50E+01
Grass	Fresh	1.50E-01	5.00E-02	4.50E-01
Mushrooms	dry matter	*	3.00E-01	2.50E+01

Source: ÚPKM



Radon and its radioactive decay products represent the most significant source of human radiation exposure (approximately 43 % of annual radiation effective equivalent). For this reason a special attention is paid to natural radioactivity and potential radon risk. Natural radioactivity is the most usually calculated in Gamma radiation dose input.

Data recorded on the territory of Slovakia (63.3 nGy per hour) exceeded set the European limit. Average concentrations of K reached 2.52 %, Th 9.4 ppm and U 3.3 ppm. The highest concentrations of U are common for rocks of Permian ages in which also uranium ore mineralisations are present (Novoveská Huta, Považský Inovec, hronicum system of the Nízke Tatry Mountains).

In 1997, the study 'Radon Risk Assessment from Geological Bedrock of Towns with Population Exceeding 10 000 and District Towns with Medium and High Radon Risk' was completed. Simultaneously, radon risk map at scales 1: 500 000 and 1: 200 000 including the whole territory of Slovakia was created. High potential radon risk was recognised in Spišsko-gemerské rudohorie Mountains area (Smolník, Rožňava, Hnilčík, Poproč, Medzev, Hnilec, Novoveská Huta), in Horehronské podolie basin, in Bratislava, Košice, Banská Bystrica, Kremnica and their surrounding areas as well as in the town of Levice, Rožňava, Žilina, Partizánske, Bytča and mainly Pezinok. High radium and radon values were recorded in water samples taken from different thermal and mineral springs (e.g. Oravice, Bešeňová, Plavnica). However, the highest occurrence of waters with high radon values was registered in waters coming from core areas (such as Malé Karpaty Mountains, Považský Inovec Mountains, Tríbeč

Mountains, etc.) and in waters of Veporské and Stolické crystalline Mountains.

Importance of **radon health risk** in indoor facilities (work places and living areas) is stated for different radon volume equivalent activity intervals (EOAR) and is based on representative survey results. The survey was conducted by ÚPKM and included 2 745 housing units and 650 nursery schools and educational facilities, serving as sample material. The above mentioned data represents approximately 1.5 ‰ of the Slovak housing fund. According to the survey results given in cartographic form it is possible to say that weighted arithmetic mean (AP) EOAR calculated from the population distribution is equal to 48 Bq per m^3. When comparing samples of family houses and blocks of flats the following differences were recorded: family houses - AP - 125 Bq per m^3, GN (geometric mean) - 73 Bq per m^3 and blocks of flats - AP - 22 Bq per m^3, GN - 14 Bq per m^3 (EOAR). The maximal recorded value of EOAR is 1 500 Bq per m^3 and the average radon decay products inhalation effective dose in indoor facilities per capita is 3 mSv.

Table 107 EOAR values recorded in indoor facilities (SR)

EOAR [$Bq.m^{-3}$]	Number of flats	Number of flats [%]
< 20	728	26.5
20 – 199	1 651	60.2
200 – 599	336	12.2
600 – 999	27	1.0
> 1000	3	0.1

Source: ÚPKM

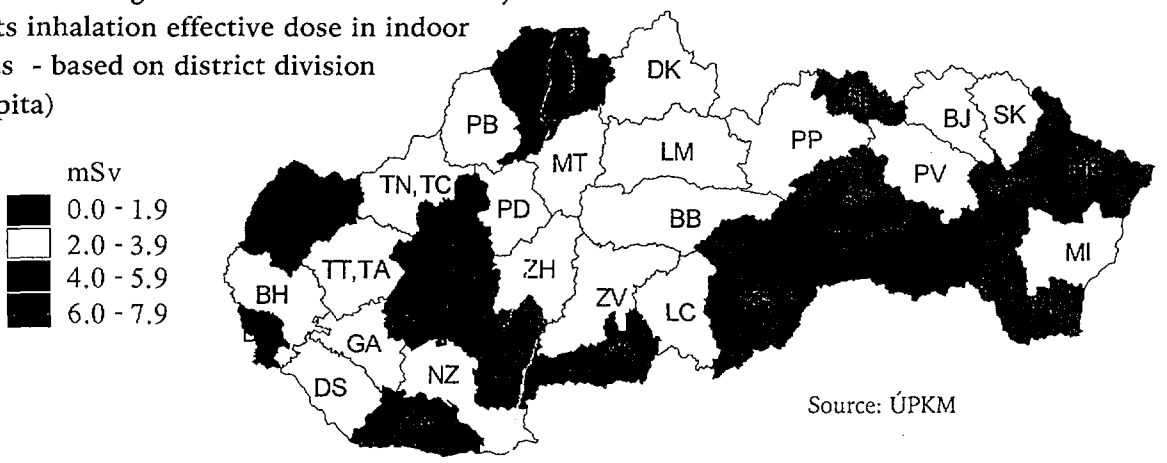
According to the Regulation of the MZ SR No. 406/1992 Coll. on existing developments, so-called action level (400 Bq per m^3), is recommended. This regulation allows the executive bodies to decide upon introduction of corrective measures. In case of new indoor facilities development so - called reference level (100 Bq per m^3) is used. This level has been set for areas with medium or high risk of the radon content in soil air.

Table 108 Districts with the highest average EOAR values and average annual radon and its decay products exposure effective dose in indoor facilities (per capita)

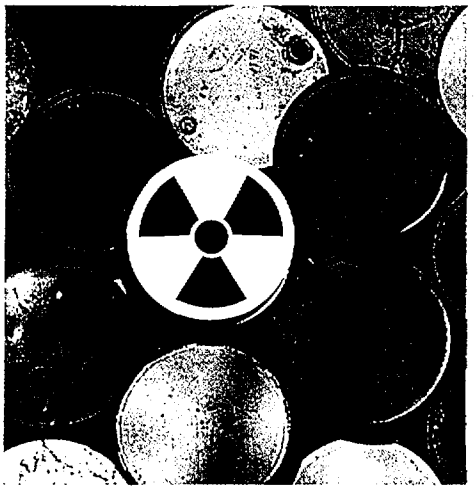
	District	EOAR [$Bq.m^{-3}$]	E [mSv]
1.	Rožňava	120	7.5
2.	Košice-vidiek	119	7.4
3.	Spišská NováVes	94	5.9
4.	Rimavská Sobota	87	5.4
5.	Stará Ľubovňa	87	5.4
6.	Veľký Krtíš	79	4.9
7.	Trebišov	72	4.5
8.	Nitra	71	4.4
9.	Komárno	66	4.1
10.	Levice	65	4.1

Source: ÚPKM

Figure 45 Average annual radon and its decay products inhalation effective dose in indoor facilities - based on district division (per capita)



Source: ÚPKM

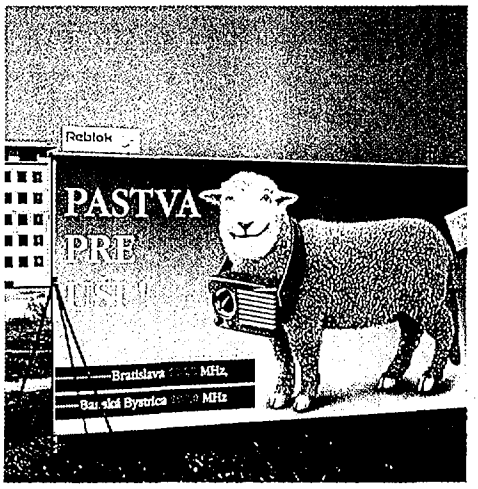


In 1997, total amount of generated radioactive waste produced in V-1, V-2 and A-1 nuclear power stations in Jaslovské Bohunice is presented in the following table.

Table 109 Generation of radioactive waste (RAO)

		V – 1	V – 2	A – 1
Concentrates	Total amount	263 m^3	123 m^3	5 m^3
	Salt content	61.7 t	29.5 t	0.3 t
	Total activity	$5.3.10^{11}$ Bq	$1.3.10^{10}$ Bq	2.10^{11} Bq
Sorbents	Total amount	-	3 m^3	0.86 m^3
	Total activity	-	$2.5.10^{9}$ Bq	2.10^{14} Bq
Solid RAO	Burnable	121 m^3	38.75 m^3	
	Refractory	61.8 m^3	16.5 m^3	267 m^3
	Total	182.8 m^3	55.25 m^3	267 m^3
Air technical filters		9.7 m^3	7.9 m^3	

Note: increased amount of liquid and solid RAO in nuclear power station V-1 is due to undergoing reconstruction Source: ÚJD SR



The Slovak State Health Institute (SŽÚ SR) is responsible for dealing with the problem of **noise pollution.** According to the 1997 statistics on noise pollution, this was monitored in 46 towns and villages with the total population of 1 357 598. Railway traffic impact was tested only in the town of Trnava (71 783 inhabitants).

Table 110 Percentage of population affected by road and railway traffic noise based on the equivalent noise levels (L Aeq) excess in dB (A)

Noise level	% of population affected by road traffic noise	% of population affected by railway traffic noise
> 55 dB(A)	19.69	1.27
> 60 dB(A)	15.62	1.26
> 65 dB(A)	6.48	0.46
> 70 dB(A)	1.00	0
> 75 dB(A)	0.07	0

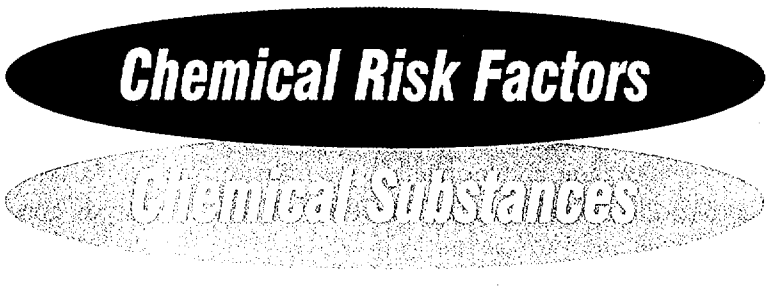
Source: SZÚ SR

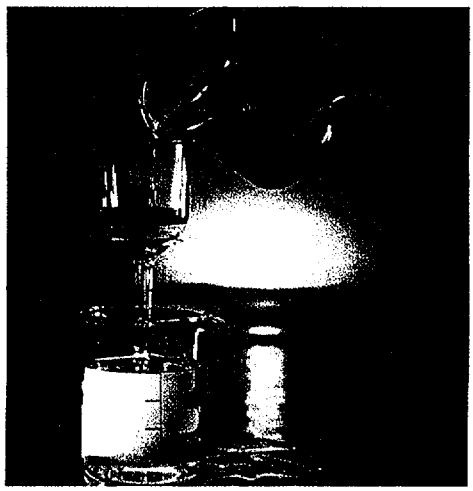
Noise level of 65 dB (A), as given by results of medical research, represents a level where negative impacts on human autonomic nervous system start. According to ***the Regulation of the MZ SSR No.14/1977 Coll.*** *allowed noise limits are as follows: 60dB (A) - day-time and 50dB (A) - night-time*

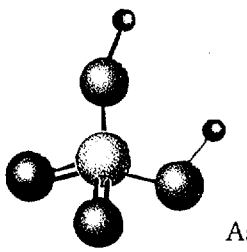
Table 111 Results of the noise pollution monitoring in the selected towns based on the equivalent levels of the road traffic noise

Place	% of population affected by road traffic noise in dB(A)				
	> 55 dB(A)	> 60 dB(A)	> 65 dB(A)	> 70 dB(A)	> 75 dB(A)
Dunajská Streda	10.816	7.216	4.132	0.592	0
Levice	12.205	3.449	0.504	0.072	0
Nové Zámky	1.371	0.649	0.172	0.003	0
Nitra	9.745	8.082	3.962	1.183	0
Pezinok	2.940	2.163	1.683	0.240	0
Topoľčany	3.503	3.398	3.228	1.599	0.119
Trnava	11.021	9.109	3.551	0	0
Banská Bystrica	8.172	5.840	3.576	0.746	0
Bardejov	1.620	1.420	0.300	0	0
Čadca	9.675	6.059	1.528	0.792	0
Liptovský Mikuláš	6.587	5.942	4.980	0.480	0
Lučenec	4.265	2.940	0.484	0.0054	0
Martin	12.795	10.476	7.026	2.209	0.353
Považská Bystrica	9.036	7.136	5.980	0	0
Zvolen	12.311	7.568	3.293	0.063	0
Žilina	5.573	4.871	4.620	1.689	0.108
Košice	43.035	28.801	13.536	3.575	0.338
Rimavská Sobota	8.036	6.235	1.670	0.074	0
Prešov	20.449	13.259	4.842	1.921	0.092
Senica	7.062	4.092	0.846	0	0
Vranov nad Topľou	4.132	3.277	2.205	0.070	0
Dubnica nad Váhom	3.293	2.235	1.360	0	0

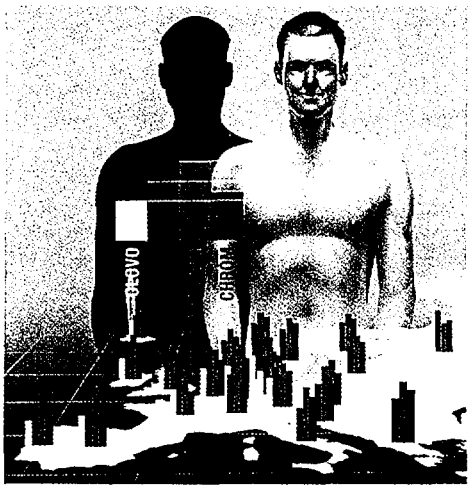
Source: ŠZÚ SR







The **new chemical legislation** was prepared under the supervision of MH SR, in collaboration with MZ SR, MŽP SR, MP SR, MO SR, MV SR, ÚBP SR, the Slovak Association of Industrial Ecology and the Association of Chemical, Pharmaceutical Industry. This legislation was based on the Government Decree No.533/1994 and 100/1995. This is the act on chemical substances and products, which principles were negotiated and approved by the Slovak National Council Committees in January 1997. The juridical act wording was submitted for approval to the Governmental Legislative Council on December 1, 1997. The relevant act creates legal preconditions on the unification in registration, classification, labelling and packaging of the chemicals and the chemical products that are produced, imported and placed on the market in the SR. This also includes monitoring of already existing substances and their risk reduction, assessment of the chemicals potential impacts on the environment and results from conclusions accepted at international level (OECD and EU legislation).



PMS Xenobiotics in Foodstuffs and Animal Feed consists of 3 partial systems: Co-ordinated ***Purpose-oriented Monitoring System (KCM), Consumption Monitoring System (MSK), and Monitoring of Game and Fish (MLZ).***

Year 1997 was the second year of the second 5-year-cycle of partial system KCM carried out since 1991. Its main objective was to identify mutual correlation among agricultural soil contamination, irrigation water, feed water and plant and animal production. Since 1991, the total amount of **13 133 samples** have been analysed; 1 017 (7.7%) samples have exceeded limit values of at least one of the monitored contaminants. When regarding the samples of soil and animal products, the most significant excess of set limit values was observed in case of fluorine and cadmium. In the analysed samples of feed water, animal feed and plant products, the excess of nitrate limit values was recorded. The contamination of irrigation water was caused mainly by nitrites. Cadmium is considered as being the most significant contaminant from the group of monitored chemical elements. From a total amount of 4 748 soil samples being analysed since 1991, in 496 cadmium content exceeded set limit values which represent 10.4 % of all samples. According to assessment of the average amount of cadmium present in soil, the highest average values were registered in Čadca, Tvrdošín and Levice districts. The second most cogent chemical element is mercury. From a total amount of 4 578 soil samples analysed since 1991, mercury content limit value was exceeded in 301 cases (6.6%).

Since 1993, Partial system MSK aiming at gathering data about food contamination within consumers network has been in operation. Analyses of organic and inorganic contaminants, medicines, additives and radionuclides are carried out in each group of commodities. The total amount of analysis done through MSK reached 46 880 (3 026 samples).

The highest values of weekly intake into human body were calculated for the following chemical elements:

- nickel - 0.88 mg per person per week
- chromium - 0.37 mg per person per week
- lead - 0.34 mg per person per week
- arsenic - 0.17 mg per person per week.x

Occurrence of the samples with excessive heavy metal content was minimal. Samples not meeting set criteria were most numerous in case of cadmium (beer, table salt, pork, drinking water), nickel (vegetable oil, butter, vine) and chromium (vegetable oils, table salt). Occurrence of the samples with excessive heavy metal content was recorded mainly in Kežmarok and Kraľovský Chlmec areas. In Nitra area, unlike other areas, higher average values of nitrates present in vegetables were registered.

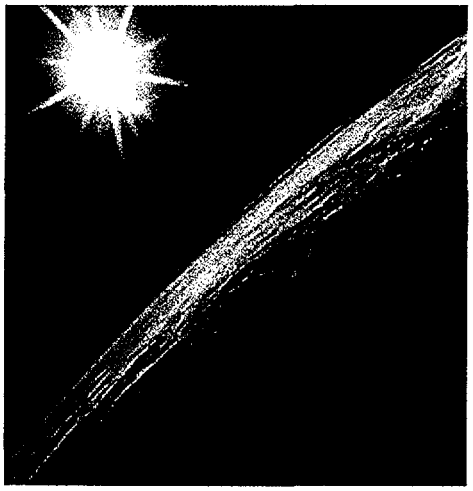
In 1995, for the first time, **monitoring of xenobiotics presence in fish and wild animal organisms** was carried out in the selected areas of different Slovak regions. Partial system MSK focuses on the monitoring of contaminants and their penetration into organisms of wild animals and fish, as fish serve as a natural water quality bioindicator and form a part of human diet. Excessive values of risk elements were recorded in Košice region (Košice - surrounding area, Trebišov, Spišská Nová Ves) and Prešov region (Bardejov and Humenné). Most frequently recorded excessive values were those of cadmium, mercury, lead and copper.

Table 112 Amount of samples, samples with excessive limit values and number of analyses carried out within the partial monitoring system xenobiotics in the food chain

subsystem	Number of analyses	Number of samples	Number of samples with excessive limit values	Percentage of samples with excessive limit values %
KCM	24 135	2 706	147	5.5
MSK	14 291	743	23	3.1
MLZ	3 509	355	110	30.9

Source: VÚP

The Ozone Layer Depletion



The Slovak Republic succeeded the former Czechoslovakia into **the Vienna Convention for the Protection the Ozone Layer** (Vienna, 1985) and **Montreal Protocol on Substances that Deplete the Ozone Layer** (Montreal, 1987), joined the world-wide effort concerning the Earth ozone layer protection. Taking into consideration the fact of ever growing trend in the ozone layer depletion, the Montreal Protocol signatories consented upon tightening measures on their meeting in London (1990), Copenhagen (1992), Vienna (1995) and Montreal (1997).

The Slovak Republic became the signatory of **the London Amendment** on April 16, 1994 after approvals of the Slovak Government (Decree No.272, April 1993) and the Slovak National Council (Decree No.393,17th February, 1994). It became the signatory of **the Copenhagen Amendment** on January 9th, 1997 after receiving approvals from the Slovak government (Decree No.535, July 15th, 1997) and the Slovak National Council (Decree No. 732, October 2nd, 1997).

Following the Montreal Protocol Amendments and changes resulting from the London and Copenhagen Amendments, consumption of the monitored and registered substances of group I Amendment A - perchlorfluorhydrocarbons, group II Amendment A - halons, group I Amendment B- other perchlorfluorhydrocarbons, group II Amendment B - tetrachlormethane, group III Amendment B- 1,1,1-trichlorethane in the Slovak Republic should be since January 1st, 1996 completely stopped. Only recycled, regenerated and stocked substances are allowed to be in further use. The only exception to this rule, is when these substances are used for laboratory and analytical purposes.

According to the Copenhagen Amendment to the Montreal Protocol (1992) which was further elaborated in Vienna (1995), the production and consumption of substances in group C.I. (chlorfluorhydrocarbons) should be equal to 0.5% of calculated level of the starting year 1989 during the next decade. Production of these substances during the next decade is strictly limited to servicing purposes, with the commitment of their total elimination by the year 2020. Methylbromide consumption (E.I.group) should in accordance with the Montreal Protocol changes (1997) decrease by 25% by the year 1999; by 50% by the year 2001; by 70% by the year 2003 with its total elimination by the year 2005. The initial year of this intention was 1991. Since January 1st 1996, production and consumption of the group C.II. substances is banned (bromfluorhydrocarbons).

The Slovak Republic fully complies with the principal commitment as given in the Montreal Protocol, accepting all its changes. Calculated consumption of the group C.I. limited production (chlorfluorhydrocarbons) in accordance with the Copenhagen Amendment (using ozone depletion potentials - ODP) is lower than 6% of the allowed calculated consumption level of these substances. Methylbromide consumption in 1997 reached 56% of consumption allowed.

Table 113 Consumption of substances under control (1992-1997) (t)

Group of substances	1986/89	1992	1993	1994	1995	1996	1997
	Initial consumption	Consumption	Consumption	Consumption	Consumption	Consumption	Consumption
AI - freons	1 710.5	609.6	986.9	229.4	379.2	1.2[1)]	2.05[1)]
A II - halons	8.1	2.5	2.0	0.0	0.0	0.0	0.0
BI* - freons	0.1	0.0	0.1	0.0	0.0	0.0	0.0
B II* - CCl_4	91.0	251.8	250.0	315.4	0.6	0.0	0.16[1)]
BIII* - 1.1.1 trichloroethane	200.1	107.3	180.0	136.7	69.4	0.0	0.1[1)]
C I*	49.7				37.2	61.0	59.9
C II -HBFC22B1						14.3	0.0
E** - HBr	10.0					9.6	5.6
Total	2 019.5	971.2	1 419.0	717.5	449.2	86.1	61.81

* 1989 – starting year
** 1991 – starting year

Source: MŽP SR

1) consumption of A.I., B.II. and B.III substances in two consecutive years 1996,1997 represents import of these substances on analytical and laboratory purposes in accordance with the general exception to the Montreal Protocol.

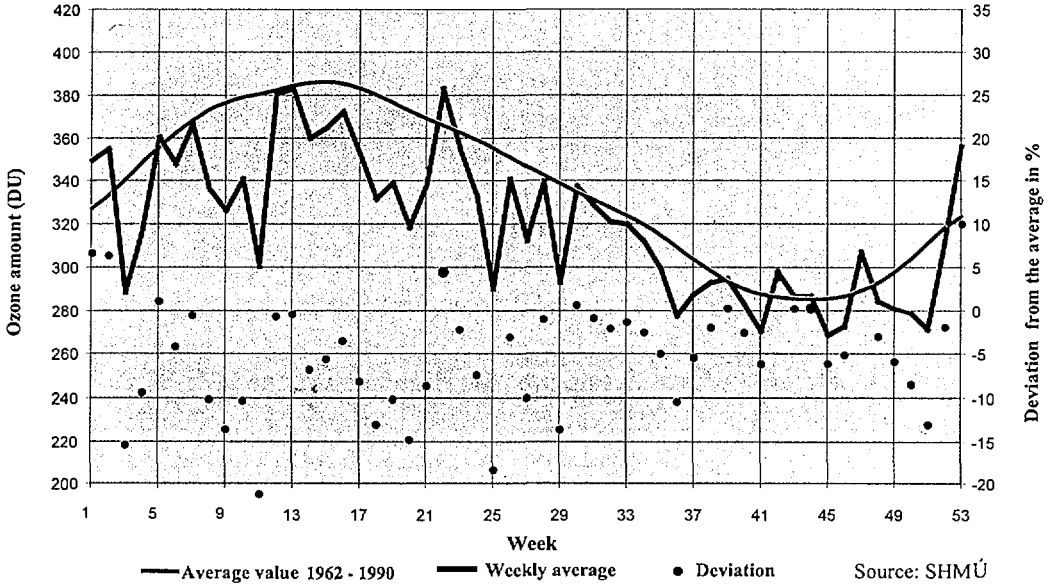
Note 1: In 1996, besides the above mentioned substances, 250 tonnes of recycled tetrachloromethane and 20 tonnes regenerated freon CFC12 were imported. However, amount of these substances is not calculated towards total consumption as given by valid methodology. Data concerning consumption of C.I., C.II. and E substances from the previous years is not available.

Note 2: In 1997, besides the above mentioned substances, 40 tonnes of used freon CFC12 were imported. Following the methodology valid, this amount is not calculated towards consumption. 2.16 tonnes of methylbromide were also imported for the purposes of medicine and drug production and were received by Slovakofarma Pharmaceutical Comp. This amount is not calculated towards total consumption.

Since September 1993, monitoring of **the total atmospheric ozone** over the territory of Slovakia has been conducted by SHMÚ monitoring station located in Poprad - Gánovce. This station also monitors intensity of UV-B radiation. The average annual total atmospheric ozone value in 1997 was 323 Dobson units (D.U.). This represents 5% decrease in comparison to the long-term average value (1962-1990) - data obtained from Hradec Králové (the Czech Republic), but used for the territory of Slovakia as well. All monthly averaged values were lower, too; in March and May 8% decrease was recorded. The situation in July and August was more favourable than in the previous years, with negative deviation of monthly average values ranging from 2 to 3%. Weekly average values remained under the long-term average values.

Intensity of UV-B radiation on the Earth surface is characterised by distinctive daily and yearly pattern depending on the Sun elevation above horizon. The route of the sunlight is dilated through the ozone layer at the lower Sun elevation. Therefore, the harmful radiation is more effectively reduced. The highest values are being recorded in the period of May-August during sunny days, at noon. In May and June 1997, the average ozone value was 8% below normal. Despite this fact, the harmful UV-B radiation flow density exceeded the value of 175 mW per m^2 which is considered to be high. The UV-B flow density is assessed by DIFFEY biological efficiency spectrum. The limit value of 175 mW per m^2 was exceeded only during several days from the end of June to the first half of August. It was caused by prevalent cloudy weather conditions.

Figure 46 Total atmospheric ozone level over the territory of Slovakia (1997)



Waste

Waste generation

In 1997, total **amount of waste generated** in the SR equalled 19.8 mil tonnes out of which 10.1 mil tonnes were of other waste, 9.7 mil tonnes were of special waste including 1.8 mil tonnes of municipal waste and 1.5 mil tonnes of hazardous waste. Data for statistics was collected by District Offices - sections of the environment and elaborated by the Slovak Environment Agency (SAŽP) - the Waste Management Centre in Bratislava using the **Regional Information System** on Waste (RISO).

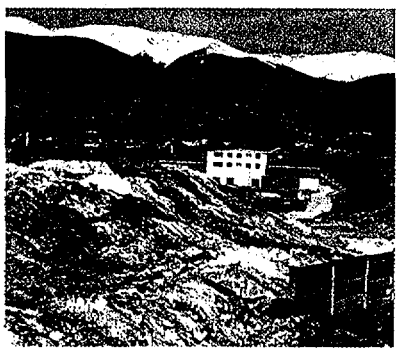
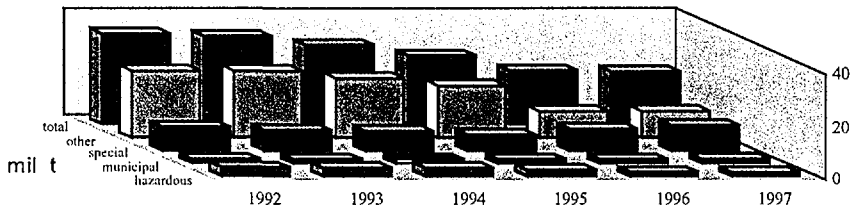


Table 114 Waste generation in 1997 (mil tonnes)

Waste	Amount
Other	10.1
Special	9.7
Including : Municipal	1.8
Hazardous	1.5
Total	**19.8**

Source: OÚ

Figure 47 Trend in waste generation based on category classification (mil tonnes)

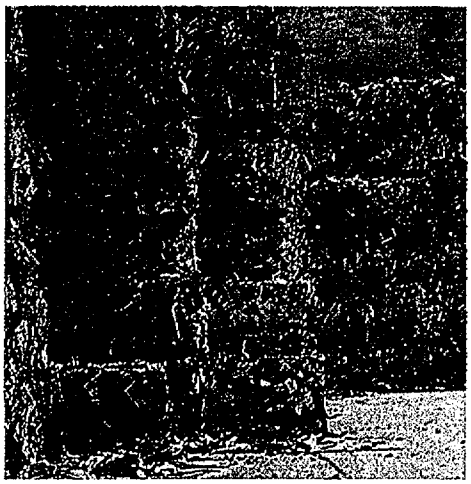


Source: OÚ

In accordance with valid legislation, data collection concerning other waste production was not performed in 1997. The above mentioned value represents professional estimate based on 1995-96 data comparison.

In compliance with new valid **Waste Catalogue** (the Regulation of the MŽP SR No. 19/1996 Coll. on Waste Categorisation), 1992-1997 comparison in total waste generation is possible only with regard to changes stated in and approved by this regulation. In concrete terms, straw and manure have been excluded from the total waste generation as they are directly utilised in agriculture; also soil from construction sites (trenches) is excluded. These exclusions refer to waste generated in 1995 in total amount of 8.6 mil tonnes. Another legislative change concerned transfer of animal faeces, dung and liquid manure from other waste category to special waste category (amount of 5.4 mil tonnes).

Compared to 1996, total waste generation in 1997 slightly decreased (by 0.4 mil tonnes) which represents 2 % of total amount. Other and special waste production remained more or less stable. The total production of special waste fell by 0.4 mil tonnes (3.9%).



From the total volume of special and hazardous waste generated, more than 54.6% was utilized. The most common **disposal methods** of the mentioned waste were landfill disposal followed by **biological treatment and physico-chemical treatment, incineration and storage.**

Waste Landfills

Disposal of municipal waste on land is still the major disposal root in the SR. In 1997, 540 landfills were operated in Slovakia, out of which 124 fully complied with set technical standards. From the total amount of special and hazardous waste, 2.3 mil tonnes were deposited at landfills. This number represents 25.6% of total volume of special and hazardous waste being generated. 5 new landfills (Zlaté Moravce, Michalovce, Spišská Belá, Slavošovce and Žilina region landfill) were under construction in 1997. Landfills at Brezová pod Bradlom, Dolný Bar, Žlkovce, Cerová and Pezinok were open in 1997 for the first time. The process of closing down and reclamation of landfills further continued.

Table 115 Special and hazardous waste treatment in 1997 (tonnes)

Methods of treatment of special and hazardous waste	Total	Waste amount	
		Special excluding hazardous	Hazardous
Physico-chemical	337 245.37	1 983.22	335 262.25
%	3.61	0.03	22.59
Biological	783 784.26	450 346.72	333 437.54
%	8.40	5.74	22.47
Incineration	188 818.18	119 801.60	69 016.55
%	2.02	1.53	4.65
Landfill disposal	2 389 940.00	2 066 949.30	322 990.69
%	25.61	26.33	21.77
Other methods	252 488.97	57 211.36	195 277.61
%	2.71	0.73	13.16
Recycling	5 095 344.60	4 928 211.20	167 133.45
%	54.60	62.79	11.26
Storage	161 406.30	116 314.90	45 091.40
%	1.72	1.48	3.04
Methods not specified	123 810.98	108 030.98	15 780.00
%	1.33	1.38	1.06
Total	**9 752 126.20**	**8 249 732.1**	**1 502 394.1**

Source: OÚ

Waste Incineration

Compared to 1996, the amount of waste being **incinerated** in 1997 decreased by 110 thousand tonnes. This decrease resulted from unsatisfactory technical conditions of incineration plants and from introduction of tighten emission limits. In Slovakia, 38 out of 78 existing incineration plants are used for hospital waste disposal. The main disposal centres for municipal waste are Bratislava and Košice incineration plants. In 1997, 188 818 tonnes of special and hazardous waste were incinerated. This number represents 2.02% of total waste volume. In 1997, preparation for reconstruction of the municipal waste incineration plant in Bratislava, started. Reconstruction of hazardous waste incineration plants at Slovnaft a.s. Bratislava and Duslo a.s. Šaľa is under ongoing discussion.

Waste Storage

In 1997, 161 thousand tonnes of waste were **stored** (1.72 % of the total waste volume). This volume represented the kind of waste for which incineration and disposal facilities are non-existent in Slovakia as yet.

Waste Recycling

Most waste contains significant amount of valuable materials which can be recovered and reused in production processes. According to RISO data, 54.6% (5.1 mil tonnes) of the total volume of special and hazardous waste is being recycled or utilised in another way. High percentage of utilised waste results from a high degree of livestock breeding waste utilisation (4.2 mil tonnes).

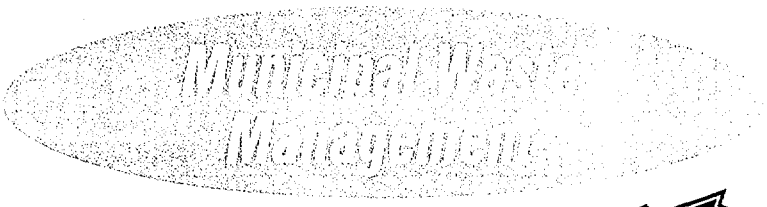
Other important kinds of waste suitable for recovery and reuse are scrap iron, waste paper and waste glass. To a lesser extent, waste is being used as secondary raw material such as rubber waste, waste tyres, non-ferrous metal scrap, waste textiles, waste plastics, waste oils and sawdust.

Iron scrap is being reused in VSŽ Holding a.s. Košice and Iron Works a.s. Podbrezová which used 1 250 thousand tonnes of iron scrap (1997). Iron scrap consumption estimated amount being used in engineering in 1997 was 50 thousand tonnes. The total iron scrap consumption in the SR reached 1 300 thousand tonnes (1997). For processing purposes, 159 thousand tonnes were imported from abroad. The export of iron scrap represented 214 thousand tonnes which fully complied with the EU association agreement.

Waste paper is reused by JCP a.s. Štúrovo, PT a.s. Žilina, HP a.s. Harmanec and SCP a.s. Ružomberok. In 1997, above mentioned companies used 115.6 thousand tonnes of waste paper. Import from abroad represented 71.5 thousand tonnes. The Slovak export amounted to 5 324 tonnes.

Skloobal a.s. Nemšová, specialized in **waste glass** processing, used 31.6 thousand tonnes of waste glass (1997). 22.8 thousand tonnes of waste glass were provided by household collection, 8 799 tonnes were imported.

In 1997, Mach Trade Company based in Šaľa processed 6 955 tonnes of waste lead accumulators.



Situation in waste management was assessed on the grounds of **municipal waste management** statistics. In 1997, the total amount of municipal waste generated was 1.8 mil tonnes. In comparison to 1996, the increase by 0.1 mil tonnes was caused by GDP growth as well as by life-standard improvement.

Per capita, **313 kg of waste per year was generated, out of which 7.88 kg of the individual components were selected.** A slight increase (by 9.2%) was recorded in the amount of the secondary raw material obtained from municipal waste, mainly waste glass, waste metals and bio-waste. Municipal waste management expenditure per cap per municipality reached 127.49 Sk on average and the cost of waste separation was 8.99 Sk .

According to municipal waste management analyses, prevalent part of above mentioned waste is being disposed via landfills operated in compliance with valid legislative regulations. However, when compared to 1996, the amount of waste being disposed using this method decreased by 19% which is caused by gradual introduction of waste separation in municipal sphere. Waste management benefits from the fact that waste production has been restricted as a consequence of growing public awareness in the area of waste separation.

Table 116 Waste separation in SR municipalities in 1997 (tonnes)

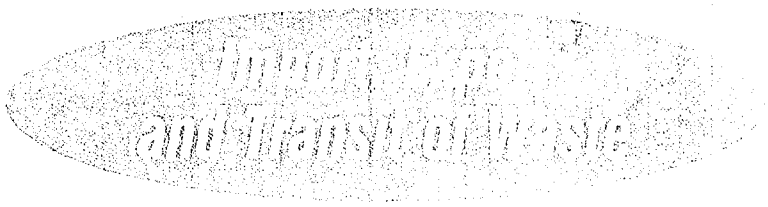
Kind of waste	Amount of waste	Being used as		
		Secondary raw material	Energy generation material	Other methods of recycling
SR total	**42 379.6**	**39 162.7**	**774.2**	**2 442.7**
Paper	8 140.9	8 021.9	52.1	66.9
Glass	12 127.0	12 090.5	0	36.5
Textiles	238.8	229.1	6.0	3.7
Plastics	752.7	670.2	0	82.5
Metals	12 575.3	12 423.8	0	151.5
Bio-waste	7 963.6	5 579.6	610.7	1 773.3
Hazardous components	103.9	80.6	0	23.3
Others	477.4	67.0	105.4	305.0

Source: ŠÚ SR

Table 117 Municipal Waste Management (tonnes)

Denomination of waste	Amount of waste	Including							
		Being recycled as			Methods of disposal				
					Landfills		Incineration		
		Secondary raw material	Composting	Energy generation material	Within municipality area	Outside municipality area	For energy production	Without energy production	Other methods
Municipal waste total including:	**77 5767.0**	**36 423.5**	**63 165.8**	**951.5**	**469 190.3**	**772 533.8**	**153 534.2**	**7 668.9**	**272 299.0**
Household waste	907 606.6	27 726.8	2 144.3	446.6	243 250.2	531 018.8	95 193.7	3 546.8	4 279.2
Other waste similar to household waste from municipalities	226 482.5	1 951.7	368.2	3.1	66 360.4	104 212.4	51 211.7	306.5	2 068.5
Separately sorted household waste containing injurants	1 484.0	169.7	-	6.6	269.8	880.0	0.1	2.5	155.3
Ceespool waste	324 462.3	1 714.1	24 370.9	-	2 613.1	9 823.0	-	30.57	262 400.6
Bulky waste from households	83 188.0	2 650.3	576.6	119.0	39 829.6	36 407.0	2 211.0	633.7	760.8
Bulky waste from municipalities	81 788.3	1 574.1	366.1	311.0	34 242.7	44 247.7	448.6	352.3	245.8
Street litter	66 435.7	76.7	1 299.9	7.5	40 777.4	23 027.3	605.1	269.4	372.4
Green waste	84 319.6	560.1	34 039.8	57.5	18 307.1	22 917.6	3 864.0	2 557.1	2 016.4
%	**100**	**2.05**	**3.6**	**0.05**	**26.4**	**43.5**	**8.6**	**0.43**	**15.3**

Source: MŽP SR



In 1997, the MŽP SR issued **150 permissions for import, export and transit of waste.** Out of this number, 99 permissions referred to waste import, 15 permissions regarded hazardous waste export and 36 permissions were issued for transit of waste through the territory of the SR.

In 1997 (regarding already existing processing facilities), **the import** of the following commodities was permitted - scrap iron, waste paper, waste copper and waste glass - with the intention of their utilization as secondary raw material. In some cases, insufficient number of existing facilities dealing with hazardous waste disposal and its recycling causes the need to export this waste abroad. The MŽP SR issues hazardous waste export permissions in accordance to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989).

Hazardous waste export permissions are issued on the grounds of officially written import permission issued by the relevant state administration environmental authorities of the country of waste import. There must be a guarantee that hazardous waste will be treated in accordance to regulations on environmental protection.

In 1997, hazardous waste **export** was permitted into **7 countries**: Belgium, the Czech Republic, Finland, France, Norway, Austria and Germany. Waste import and export in the above mentioned cases is subject to the Regulation of the MH SR No. 302/1995 Coll. on Condition for Official Permission for Import and Export of Commodities and Services in wording of the Regulation of the MH SR No. 101/1996 Coll., the Regulation of the MH SR No. 158/1996 Coll. and the Regulation of the MH SR No. 23/1997 Coll.

Year 1997 was the first year of the second phase (the year period 1997-2000) of **the Slovak Republic Waste Management Programme** realization (POH SR). POH SR main objectives and measures until the year 2000 were specified on the grounds of complex analysis and the first phase progress evaluation. Approved objectives and measures reflected current economic situation in Slovakia and estimated economic development in the context of its results achieved in individual spheres of waste management. Year 1997 was also important in terms of the SR's international recognition in the field of waste management.

Table 118 List of Hazardous Waste Export permissions issued in 1997 (tonnes)

Denomination of waste	Amount
Lead dross	100
Light metal dross containing Al	13 500
Filter dust containing non-ferrous metals	600
Waste lead accumulators	900
Waste barium salts	18.2
Waste transformer, heat carrying and hydraulic oils containing polychlorinated biphenyls (PCB) and polychlorinated terphenyls (PCT)	321.7
Waste devices and equipment containing PCB	246.5
Other waste containing PCB	10
Waste aromatic amines	50
Waste catalysts	100
PCB and PCT	10
Total	**15 856.4**

Source: MŽP SR

Attached to SAŽP, Waste Management Centre based in Bratislava, the first **Regional Training Centre for the Basel Convention** and worldwide technology transfer implementation (RSC) was established following the selection process administered by the Basel Convention Secretariat. Within the framework of UNEP / SBD No. BS 3100/97-01 project, RSC administers a 2-year educational project focused on further education of managers working in the field of waste management. This project is open to 19 Central and Eastern European countries undergoing economic transformation process. RSC is also involved in activities supporting implementation of environmentally friendly methods of hazardous waste management.

Table 119 List of waste import permissions issued in 1997 (tonnes)

Denomination of waste	Amount
Waste paper	115 500
Waste dolomite	500
Waste chromium-magnesite	6 000
Waste glass suitable for further processing	21 850
Waste plaster	2 500
Iron scale	200
Scrap iron including means of transport and machinery (particularly locomotives, vehicle railway fleet, aircraft, vessels) meant as secondary raw material	420 220
Waste from machining not contaminated by harmful substances	16 000
Waste Al, alloys, compounds	11 460
Waste copper, alloys, compounds	23 951
Waste from cables	270
Waste transformer, heat carrying and hydraulic oils not contaminated by PCB and PCT	1 600
Waste polyethylene	1 000
Waste tyres and their cuttings	2 580
Textiles and fabric residues	345
Waste garments, rugs, textile	2 500
Total	**626 476**

Source: MŽP SR

Table 120 Permitted amounts of hazardous waste import and export in 1997 (tonnes)

Country	Waste import	Waste export
Belgium	-	600
Belarus	3 200	-
The Czech Republic	171 260	2 618.2
Finland	-	300
France	505	200
The Netherlands	730	-
Croatia	2 500	-
Lithuania	600	-
Hungary	132 300	-
Norway	-	10 000
Poland	49 150	-
Austria	1 090	60
Russian federation	18 815	-
Slovenia	70	-
Germany	60 200	2 078.2
Switzerland	50	-
Italy	30	-
Ukraine	185 921	-
Great Britain	55	-
Total	**626 476**	**15 856.4**

Source: MŽP SR

Natural and Technological Hazards

In 1997, the trend in a number of **accidents** being recorded and causing **water quality deterioration and contamination** showed more or less stable development. According to data provided by the Slovak Environmental Inspectorate (SIŽP), the main factors threatening water quality were as follows:

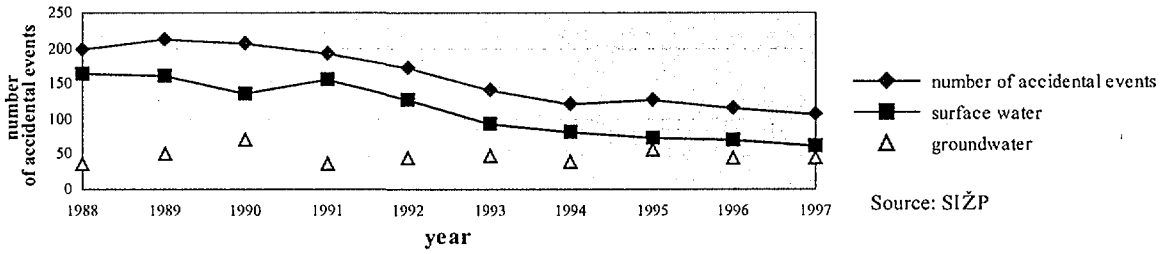
- Low working and technological discipline (35 cases)
- Unsatisfactory facilities conditions caused by insufficient maintenance (10 cases)
- Inappropriate technical design of facilities (4 cases)
- Transport and haulage (28 cases)

The main substances contributing to water quality deterioration were:

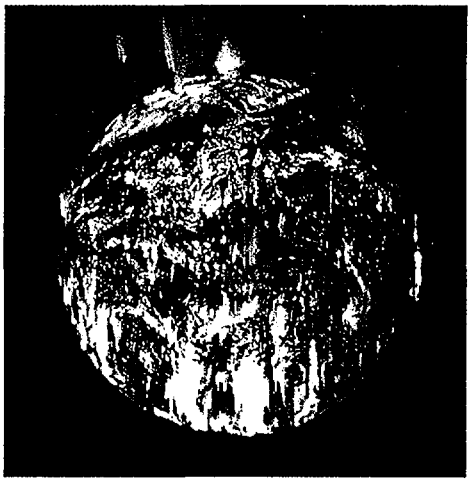
- Oil products (50 cases)
- Alkali (10 cases)
- Livestock faeces (8 cases)
- Waste waters (11 cases)
- Toxic substances (5 cases)
- Insoluble substances (8 cases)
- Pesticides (1 case)
- Sillage fluids (1 case)

From the total number of cases of alarming groundwater quality deterioration recorded, in 14 cases water was contaminated and in 32 cases water quality was threatened.

Figure 48 Trends in alarming water quality deterioration



Fire Risk



In comparison to 1997, **the number of fires** recorded in the SR increased by 1 145 and direct cost of damages increased by 586 908 000 Sk . **The death toll** increased by 6 persons and the number of **injured persons** fell by 12 cases (all comparing to 1996 statistics).

Most fires occurred in March (2 196), April (1 492) and August (1 028). Increased incidence of fires during springtime was caused mainly by annually re-occurring fires accompanying dry grassland firing activities and human outdoor activities with nature. Higher fire risk in August resulted from post-harvest agricultural activities such as firing of straw residues left on the fields. The most common origin of fires was negligence and carelessness of adult population (6 305 cases). Technological accidents resulting from faulty material and construction caused 1 609 fires. 874 fires were initiated by children. 609 fires can be written down to arsoning activities and 302 fires to unsatisfactory conditions of heating units and stacks/chimneys.

The highest occurrence of fires was recorded in Banská Bystrica and Prešov regions - 1 588 cases . The lowest number of fires was in Trnava region - 883 cases.

Table 121 Number of fire accidents, cost of damages, rescued material values, death toll and number of injured persons (1992-1997)

Year	Number of fire accidents	Cost of damages (thousand Sk)	Rescued material values (thousand Sk)	Death toll	Injured
1992	3 908	245 716.4	2 139 089.0	68	183
1993	6 354	491 306.3	2 209795.0	49	181
1994	6 960	280 971.1	2 020 964.8	38	153
1995	7 639	558 423.9	2 989 076.7	59	202
1996	9 462	342 461.4	2 365 331.6	61	167
1997	10 607	930 443.9	3 231 081.0	67	180

Source: ÚPO MV SR