Distr.: RESTRICTED

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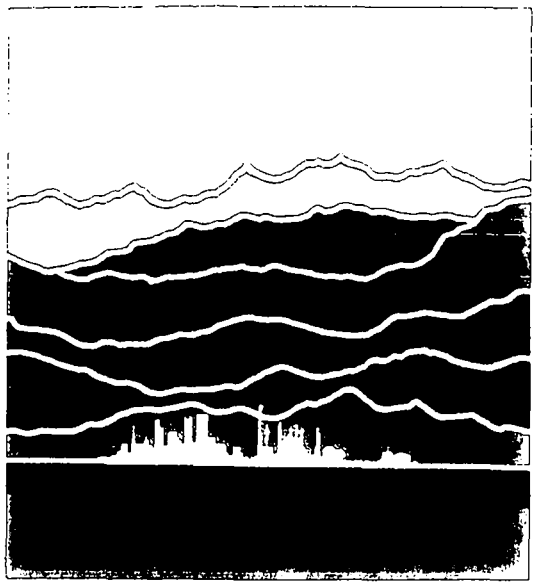
R 821 CSSL93

NATIONAL INTEGRATED PROGRAMME ON ENVIRONMENT AND HEALTH IN THE SLOVAK REPUBLIC

ENVIRONMENTAL HEALTH STATUS OF RUŽOMBEROK



WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR EUROPE

EUROPEAN CENTRE FOR ENVIRONMENT AND HEALTH
BILTHOVEN DIVISION

R 821 - 11992

Environmental pollution in some regions of Central- and Eastern Europe has reached the point where the data are sufficient to indicate that the health of their inhabitants has deteriorated. In line with the recommendations stemming from the WHO European Charter for Environment and Health, the WHO Regional Office for Europe, through the European Centre for Environment and Health, fosters the dialogue between the respective national authorities responsible for environmental management and public health administration at the national, regional and local level.

Through a Trust Fund arrangement with the Government of The Netherlands, technical assistance activities are carried out by the European Centre for Environment and Health in the form of National Integrated Programmes on Environment and Health with Poland, the Czech Republic, the Slovak Republic and Hungary.

The National Integrated Programmes are addressed to:

* establish more reliable linkages between environmental factors and the health of affected population groups;
* improve the quality of monitoring data on food and soil contamination through interlaboratory tests and unified analytical methods; and
* train chronic disease epidemiologists to deal with the major environmental health problems arising from exposure to environmental contamination.

For further information on the National Integrated Programmes on Environment and Health, please contact:

Heinrich W. Wyes
Programme Manager Bilthoven
WHO European Centre for Environment and Health,
Bilthoven Division
P.O. Box 1
3720 BA Bilthoven
The Netherlands
(tel. +31-(0)30-295324 / fax +31-(0)30-294252)

The attached report was supported by a Grant of the WHO-EURO European Centre for Environment and Health within the framework of the National Integrated Programmes on Environment and Health in countries of Central- and Eastern Europe.

PROGRAMME SIPEH - WHO: RUŽOMBEROK

I. General information

1. The aim of this study is to determine the degree of population exposure to pollutants in environment and the degree of its effects according to ways of exposure, by air, water or the food chain. To determine the biological activity of pollutants using direct and indirect exposure tests, to determine how the human organism reacts to pollutants using genotoxicological and immunotoxicological methods. To evaluate the health conditions in different population groups living and working in this area and to make suggestions for improving these conditions.

1.1 The area of study was determined in relation to major sources of environment pollution, namely Central Slovakia Paper and Pulp Works, state enterprise Ružomberok, Cotton Works, state enterprise TEXICOM and North Slovakia Brick-Field Ružomberok. The main source of population exposure is air pollution. The main biologically active pollutants are - dust, oxides of sulfur, oxides of nitrogen, organosulfur compounds (methylmercaptan, dimethysulfide, dimethyldisulfide) and hydrogen sulfide. These pollutants have strong irritating effects on the respiratory system, skin, eyes and organosulfur compounds in higher concentrations also affect the central nervous system. Their smell threshold is quite low and because of their ill-odour they bother the population considerably. According to current knowledge they do not have any long term effects in the sense of carcinogenity, mutagenity or teratogenity.

1.2 Regarding the degree of environment pollution the studied area includes: the town of Ružomberok and neighbouring villages - Lisková, Liptovská Štiavnica, Martinček, Ludrová, Liptovské Sliače. The population of this area amounts to 37 428, with 29 416 living in the town of Ružomberok and 8 022 in the remaining area - Sliače, Ludrová, Lipt.Štiavnica, Lísková and Martinček.

1.3 We hold the assumption, that the environment pollution might affect the morbidity rate of respiratory organs, which has been confirmed also by a study of selected group of children from Ružomberok. During the period 1986 - 1991 an increasing trend in respiratory diseases incidence has been recorded. The results of monitoring genotoxicity in selected children and workers of Fatraservice in Ružomberok so far indicate higher genetic risk. Results obtained by immunological examinations (phagocyte activity of neutrophiles) in children are unfavourable. Ill-smelling organosulfur compounds emmitted by the Paper and Pulp Works in Ružomberok increase neuropsychological distress in the population. All this information clearly shows that further studies of the exposed population health condition are necessary.

1.4 Priorities in environment and health monitoring planned as phase II. of the Project:
- objectivize organosulfur compounds concentrations in environment
- evaluate air mutagenity with regard to the presence of other pollutants that are impossible to detect by chemical analyses
- documenting drinking water quality in Lísková and Liptovská Štiavnica in households supplied by water from private sources
- evaluation of neuropsychological distress in a selected population group
- influence life style of population in exposed area by means of CINDI project - healthy town, healthy workplace, healthy school

II. Range of study

3. Socio-demographic data and health care infrastructure

3.1 Total population of the studied area

Name of community	Population
Ružomberok	29 416
Sliače	3 769
Lisková	2 123
Ludrová	940
Lipt. Štiavnica	748
Martinček	406
T o t a l	37 438

3.2 Population by towns and communities, by sex and age in five-year intervals

Ružomberok

Age	Males	Females	Total
0 yrs.	-	-	421
1 - 4	-	-	1 841
5 - 9	1 391	1 301	2 692
10 - 14	1 464	1 353	2 817
15 - 19	1 242	1 258	2 500
20 - 24	914	957	1 871
25 - 29	1 036	1 142	2 178
30 - 34	1 221	1 247	2 468
35 - 39	1 293	1 394	2 687
40 - 44	1 075	1 079	2 154
45 - 49	662	747	1 409
50 - 54	561	707	1 268
55 - 59	508	628	1 136
60 - 64	560	676	1 236
65 - 69	485	677	1 162
70 - 74	213	327	540
75+	372	664	1 036
T o t a l	14 149	15 267	29 416

Note: data on sex of 0 year old and 1-4 year old children were not available

Sliače

Age	Males	Females	Total
0 yrs.	-	-	55
1 - 4	-	-	225
5 - 9	126	147	300
10 - 14	179	165	344
15 - 19	164	172	336
20 - 24	142	123	265
25 - 29	141	130	271
30 - 34	139	132	271
35 - 39	173	155	328
40 - 44	135	116	251
45 - 49	101	89	190
50 - 54	102	91	193
55 - 59	82	84	166
60 - 64	88	122	210
65 - 69	84	90	174
70 - 74	36	34	70
75 +	43	77	120
T o t a l	1 892	1 877	3 769

Note: data on sex of 0 year old and 1-4 year old children were not available

Lisková

Age	Males	Females	Total
0 yrs.	-	-	31
1 - 4	-	-	80
5 - 9	92	81	173
10 - 14	81	95	176
15 - 19	104	76	180
20 - 24	80	54	134
25 - 29	56	52	108
30 - 34	73	73	146
35 - 39	88	79	167
40 - 44	80	80	160
45 - 49	49	61	110
50 - 54	56	63	119
55 - 59	57	50	107
60 - 64	49	68	117
65 - 69	52	72	124
70 - 74	26	35	61
75 +	51	79	130
T o t a l	1 051	1 072	2 123

Note: data on sex of 0 year old and 1-4 year old children were not available

Ludrová

Age	Males	Females	Total
0 yrs.	-	-	19
1 - 4	-	-	35
5 - 9	32	25	57
10 - 14	37	44	81
15 - 19	49	37	86
20 - 24	33	34	67
25 - 29	33	21	54
30 - 34	30	34	64
35 - 39	44	37	81
40 - 44	36	30	66
45 - 49	21	20	41
50 - 54	21	30	51
55 - 59	28	26	54
60 - 64	25	25	50
65 - 69	22	24	46
70 - 74	11	22	33
75 +	24	31	55
T o t a l	466	474	940

Note: data on sex of 0 year old and 1-4 year old children were not available

Lipt. Štiavnica

Age	Males	Females	Total
0 yrs.	-	-	18
1 - 4	-	-	27
5 - 9	23	26	49
10 - 14	23	35	58
15 - 19	40	33	73
20 - 24	31	34	65
25 - 29	26	23	49
30 - 34	21	25	46
35 - 39	22	22	44
40 - 44	35	27	62
45 - 49	16	20	36
50 - 54	23	23	46
55 - 59	20	24	44
60 - 64	29	36	65
65 - 69	22	21	43
70 - 74	5	11	16
75 +	11	32	43
T o t a l	375	409	784

Note: data on sex of 0 year old and 1-4 year old children were not available

Martinček

Age	Males	Females	Total
0 yrs.	-	-	11
1 - 4	-	-	24
5 - 9	13	16	29
10 - 14	29	17	46
15 - 19	16	19	35
20 - 24	16	16	32
25 - 29	11	9	20
30 - 34	16	12	28
35 - 39	19	18	37
40 - 44	14	12	26
45 - 49	10	11	21
50 - 54	7	7	14
55 - 59	6	10	16
60 - 64	9	12	21
65 - 69	9	8	17
70 - 74	3	2	5
75 +	9	12	21
T o t a l	208	198	406

Note: data on sex of 0 year old and 1-4 year old children were not available

3.3 Population by industrial groups for towns and villages of exposed area

Ružomberok

Industrial groups	Economically active persons		
	males	females	total
Agriculture	472	258	730
cooperatives	291	135	426
Forestry and water management	245	67	312
Industry	3 651	3 215	6 866
workers	2 585	2 042	4 627
Construction	984	338	1 322
workers	628	68	696
Transportation and Communications	416	205	621
workers	274	46	320
Trade and other manufact. activities	373	863	1 236
Science, research, development	10	6	16
Public utilities	343	325	668
Education, culture and health serv.	558	1 770	2 328
Other nonmanufacturing activities	334	207	541
Active without specified group	93	101	194
T o t a l	7 479	7 355	14834

Sliače

Industrial groups	Economically active persons		
	males	females	total
Agriculture	151	72	223
cooperatives	118	54	172
Forestry and water management	25	11	36
Industry	555	442	997
workers	468	344	812
Construction	173	11	184
workers	152	5	157
Transportation and Communications	50	18	68
workers	36	4	40
Trade and other manufact. activities	28	133	161
Science, research, development	0	0	0
Public utilities	35	39	74
Education, culture and health serv.	34	174	208
Other nonmanufacturing activities	19	18	37
Active without specified group	7	6	13
T o t a l	1 077	924	2 001

Lisková

Industrial groups	Economically active persons		
	males	females	total
Agriculture	86	61	147
cooperatives	78	55	133
Forestry and water management	25	6	31
Industry	247	196	443
workers	181	126	307
Construction	87	22	109
workers	62	5	67
Transportation and Communications	32	23	55
workers	27	8	35
Trade and other manufact. activities	23	65	88
Science, research, development	0	0	0
Public utilities	17	17	34
Education, culture and health serv.	21	67	88
Other nonmanufacturing activities	18	22	40
Active without specified group	7	6	13
T o t a l	563	485	1 048

Ludrová

Industrial groups	Economically active persons		
	males	females	total
Agriculture	85	37	122
cooperatives	50	27	77
Forestry and water management	5	0	5
Industry	102	80	182
workers	81	60	141
Construction	25	5	30
workers	18	0	18
Transportation and Communications	7	6	13
workers	4	1	5
Trade and other manufact. activities	13	37	50
Science, research, development	0	0	0
Public utilities	6	2	8
Education, culture and health serv.	13	33	46
Other nonmanufacturing activities	3	7	10
Active without specified group	9	2	11
T o t a l	268	209	477

Lipt. Štiavnica

Industrial groups	Economically active persons		
	males	females	total
Agriculture	34	19	53
cooperatives	32	19	51
Forestry and water management	10	5	15
Industry	118	78	196
workers	97	52	149
Construction	18	1	19
workers	18	0	18
Transportation and Communications	9	1	10
workers	5	0	5
Trade and other manufact. activities	11	27	38
Science, research, development	0	0	0
Public utilities	4	2	6
Education, culture and health serv.	11	35	46
Other nonmanufacturing activities	3	4	7
Active without specified group	1	1	2
T o t a l	219	173	392

Martinček

Industrial groups	Economically active persons		
	males	females	total
Agriculture	25	16	41
cooperatives	24	16	40
Forestry and water management	2	0	2
Industry	54	35	89
workers	44	25	69
Construction	12	0	12
workers	8	0	8
Transportation and Communications	4	2	6
workers	4	1	5
Trade and other manufact. activities	2	14	16
Science, research, development	0	1	1
Public utilities	2	5	7
Education, culture and health serv.	4	22	26
Other nonmanufacturing activities	3	0	3
Active without specified group	0	1	1
T o t a l	108	96	204

3.4 **Average monthly salary in the district:**

In 1991 the average monthly salary in the state and cooperative sector including agricultural cooperatives was 3 557 CS crowns.

3.6 **Health care infrastructure:** Number of doctors 135, number of nurses 321, number of beds 401.

4. Analysis of environmental data

4.1 Air pollution

4.1.1

SO_2, 24-hour means MAC = 150 $\mu g.m^{-3}$
Value recommended by WHO = 125 $\mu g.m^{-3}$

Area / year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991	1. Roveň	22	DL	137	0,0
	2. Dg.ústav	28	DL	155	1,2
	3. Urxova St.	21	DL	154	1,8

NO_2, 24-hour means MAC = 100 $\mu g.m^{-3}$
Value recommended by WHO = 150 $\mu g.m^{-3}$

Area / year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991	1. Roveň */	49	DL	156	5,0
	2. Dg.ústav	-	-	-	-
	3. Urxova St.	-	-	-	-

*/ measured only at Roveň from August to December 1991

H_2S, 24-hour means MAC = 8 $\mu g.m^{-3}$

Area / year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991	1. Roveň	-	-	-	-
	2. Dg.ústav	1,28	DL	12,3	2,8
	3. Urxova St.	0,78	DL	7,19	0,0

At Roveň NO_x were measured

Fall dust, 24-hour means
MAC = 150 $\mu g.m^{-3}$

Area year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991 */	1. Roveň 2. Dg.ústav 3. Urxova St.	156 188 183	19 27 45	564 698 586	43,7 47,8 47,2

*/ Measurements performed only in January through October 1991

Sedimentation dust, monthly means
acceptable limit = 12,5$g.m^{-3}$/30 days

Area year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991	*/	6,73	0,02	96,4	7,2

*/ Data for the whole town,i.e. mean from 19 measuring places

Metal content in fall dust
Pb = yearly means MAC = 0,5 $\mu g.m^{-3}$

Area year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991 */	1. Roveň 2. Dg.ústav 3. Urxova St.	0,056 0,043 0,035	0,022 0,015 0,007	0,198 0,085 0,079	0,0 0,0 0,0

* / Same as for fall dust table

Pb content in fall dust
mean yearly value - ($\mu g.m^{-2}$/ 1 month)

Area year	Place of measurement	Arithmet.mean from all measurements
Ružomberok */ 1991	1. Roveň 2. Dg.ústav 3. Urxova St.	Pb 846,0 Cu 95,0 Cr 292,0 Ni 578,0

*/ Results burdened by fault from blind determination

Metal content in fall dust
Cd - yearly mean values

Area year	Place of measurement	Arithmet. mean	Value range		% samples over MAC
			min.	max.	
Ružomberok 1991 */	1. Roveň 2. Dg.ústav 3. Urxova St.	0,0018 0,0038 0,0038	DL DL DL	0,003 0,013 0,022	

4.2 **Drinking water supply and quality**

4.2.1 100% of the total population in the town of Ružomberok are supplied by drinking water from the public water system. In the studied villages the average supply of drinking water is 86,64% of the population, in villages Ludrová, Liptovská Štiavnica and Martinček it is 100%, in Liptovské Sliače 76,4% and in Lísková 56,8%.

4.2.2 Drinking water in the area does not represent a source of population exposure to pollutants. During the last five year period (1987 - 1991) not all water samples taken from the public water system had met the CSN 75 7111 Drinking Water Standard mostly in microbiological and chemical indicators (nitrates, chlorides, ammonia ions).

4.3 Living conditions

- Average living space per person in the whole area is 15,01 m^2, in urban areas it is 14,3m^2 and in rural areas 15,72 m^2.
- Central heating is installed in 8 844 flats, in the urban area in 8 152 flats and in the rural area in 692 flats. Other types of heating are in 2 924 flats, 1 317 urban, 1 607 rural.
- 2 798 households are supplied by gas, 2 676 urban, 122 rural.
- 10 971 households have sewage, 9 214 urban, 1 757 rural. Dry toilet is used in the whole area by 1 232 households, 434 urban, 798 rural.

5. <u>Vital statistics</u>

5.2 **Infant death rate:**
neonatal (within 7 days) 16,1
postnatal (within 28 days) 1,8
infant (within 1 year) 12,6
fetal death rate..... 7,1
incidence of congenital development defects 28,8

5.3 Number of infants with birth weight under 2 500 g...36,03 (per 1 000 live births)

5.4 Not estimated

5.5 **Incidence of selected infectious diseases:**

dg.003 - Salmonellosis:
Ružomberok ..... 95,2 (per 100 000)
Whole area 93,5
Rural area 87,2

dg. 004 - Bacillary dysentery:
Ružomberok 44,2
Whole area 34,7
Rural area ..... -

dg. 008 - Bacterial diseases with determined etiol. agent:
Ružomberok 193,9
Whole area 203,0
Rural area 236,6

dg. 070 - Hepatitis epidemica:
Ružomberok 13,6
Whole area 13,4
Rural area 12,4

dg. 056 - Rubeolla:
Ružomberok 6,8
Whole area 8,0
Rural area 12,4

TBC incidence:
Ružomberok 37,4
Lisková 47,5
Ludrová ..... -
Martinček 353,9
L.Sliače ..... -
L.Štiavnica ..... -
Whole area 34,7
Rural area only 24,9

Diagnoses 002, 005, 009, 033 and 072 were not reported in this area in 1991.

5.6 Job related diseases:

a/ Number of job related diseases by factories in exposed area in 1987 - 1991

Diagnosis	1987	1988	1989	1990	1991
Poisoning	-	-	-	-	-
Skin diseases	2	-	7	1	-
Infectious diseases transmit. by man	2	2	4	-	2
Zoonoses	2	1	10	1	2
Impaired hearing	2	1	3	2	-
Diseases caused by vibrations	1	-	2	-	3
Silicosis	1	-	-	-	-
Other diseases	-	-	-	-	2
Other damages	1	-	-	-	1

b/ Number of job related diseases by residence in the exposed area in 1987-1991

Diagnosis	1987	1988	1989	1990	1991
Poisoning	-	-	-	-	-
Skin diseases	3	-	6	1	-
Infectious diseases transmit. by man	2	2	4	-	3
Zoonoses	3	2	8	-	2
Impaired hearing	2	-	3	1	-
Diseases caused by vibrations	-	-	1	-	1
Silicosis	-	1	-	-	-
Other diseases	-	1	-	-	3
Other damages	1	-	-	-	1

5.7 Incidence of diseases:

Incidence of tumors:

Ružomberok	312,9 (100 000)
Lísková	376,5
Ludrová	320,9
Martinček	-
L. Sliače	238,2
L. Štiavnica	508,9
Whole area	309,9
Rural a. only	298,0

Chronic bronchitis incidence

Ružomberok	183,7
Lísková	282,4
Ludrová	-
Martinček	-
L. Sliače	211,8
L. Štiavnica	254,5
Whole area	187,0
Rural a. only	199,3

Bronchial asthma incidence:

Ružomberok	74,8
Lísková	94,1
Ludrová	106,6
Martinček	-
L. Sliače	-
L. Štiavnica	-
Whole area	66,8
Rural a. only	37,4

Pollinosis incidence

Ružomberok	299,3
Lísková	47,5
Ludrová	-
Martinček	-
L. Sliače	132,3
L. Štiavnica	-
Whole area	248,5
Rural a. only	74,7

6. Monitoring health conditions in relation to environment factor.

Monitoring of health conditions in relation to environment factors was and still is performed within the study "Analysis of the health condition of a selected children group in the town of Ružomberok". This analytical study started in 1986 and is still continuing. The study consisted of monitoring the overall morbidity of children and selected groups of diseases, registration of children with chronic diseases and immunological examinations. A single anthropometric examination was performed in part of the study group

and heavy metals content in hair was estimated.
Comparison between morbidity incidence of children population in the town of Ružomberok and morbidity incidence in the less polluted control area of Nitra showed clearly, that morbidity incidence and selected disease groups incidence (VI, VIII, IX, X, XII) is higher in the exposed area, with the exception of dg. group X.
The morbidity study of preschool and school children in the area covered by Ružomberok Hospital during the period of 1.9.1979 - 31.8. 1984 was performed by the Department of Pediatrics led by the Head of Department Rajecký, M.D. The study was retrospective. Attention was focused on respiratory diseases. It was stated in its conclusion, that respiratory diseases incidence is higher in Ružomberok than in control area of Lúčky. Morbidity was significantly higher in Ružomberok than Nitra. During the study period however respiratory diseases incidence did not increase, as was expected.
Genotoxicity in children of Ružomberok and neighbouring villages was monitored by a group from the Institute of Clinical Genetics at the School of Medicine in Martin, led by Prof. Sršeň, M.D., D.Sc., from September 1990 - June 1991. Their results indicate that children from both urban housing complexes belong to a group with increased genetic risk, children from Lísková village belong to a group with high genetic risk and children from the control area belong to group with low genetic risk. Children with high genetic risk are registered.
Another study concerned monitoring the health conditions of Liptovský Mikuláš district by means of the Cornell Questionnaire. This was done also in the area of Ružomberok. Questionnaires from exposed locality (the town of Ružomberok + 5 villages) were analysed separately and we compared the results from this locality with results for the whole district and also with overall results for 7 districts of the former Central Slovakia Region, where the Cornell Questionnaire was applied.

The findings were as follows:

Total critical index, represented by the percentage of individuals who gave 30 and more positive answers in the questionnaire was 38,7% in the monitored area - compared to index for the district: 33,6% and for the 7 districts : 39,2%.

Critical index M-R, the so called index of psychological lability, based on 5 or more positive answers was 67,7% in the monitored area - compared to district : 60,6% and in the 7 districts: 62,6%.

The analysis of disease incidence by selected organ systems, where the individual with 3 or more positive answers was considered as disturbed, evidently showed worse results in the monitored area of Ružomberok in comparison with the

district results but also with results from the 7 districts of the former Central Slovakia Region, where the study was performed.

System	Results		
	for Ružomberok area	for district	for 7 distr. former CSR
Cardiovascular	51,6%	38,9%	43,6%
Locomotor	18,3%	14,6%	18,8%
Respiratory	52,7%	36,8%	36,0%
Allergies	35,5%	23,1%	24,3%
Neurological diseases	37,6%	35,7%	38,3%
Diabetes mellitus	0	4,9%	4,2%