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ENVIRONMENTAL HEALTH AND MONITORING IN ESTONIA

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An assessment of environmental health and monitoring in Estonia after the dissolution of the Soviet Union has shown that the country suffered from neglect during the "cold war" after World War II, and efforts to improve the status quo have been slow since independence was gained in 1991. Conditions in Estonia are affected by the fifty-year long occupation. Industrial, military and agricultural activities have left a legacy of pollution and obsolete installations. The regulatory framework and life style attitudes from the Soviet era interfere with reform efforts. The current transition period holds risks that derive from a run-down infrastructure, a weak economy, and disruptions, inherent in the reorganization itself. Over the past few years a recession has further complicated the situation and the public health status has worsened. International assistance programmes as well as efforts by Estonians have led to some change and progress in environmental management since 1991, and lately ambitious environmental and public health sector programmes have been initiated by the government. Much work, however, still needs to be done. An examination of the recent history of this small country provides examples of environmental neglect and consequences, as well as recommended corrective measures.

Key terms:
environmental neglect, environmental pollution, health project in Estonia, public health

After World War II, Estonia (Figure 1) came under Soviet occupation (1). This meant that communication with the rest of world was practically cut off. All activities that were considered important for the security of the Soviet Union

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came under direct control from Moscow and few areas of human activity were totally exempt from reporting to central authorities. Lower-level inter-agency contacts were discouraged.

The country regained its independence in the autumn of 1991. The withdrawal of Russian troops was not completed until the autumn of 1994 and full control of the country was not gained until 1995 when the last military base was turned over to Estonian authorities. The move towards independence had, however, begun much earlier (2).

Indeed, one of the major forces driving the movement for independence was a deep concern for the environment and for health effects related to the environment (3). Major protests broke out in 1987, when plans were revealed to start large-scale mining operations in Kabala and Toolse (Figure 1) to provide fertilizers for Soviet agriculture. The government of the then Estonian Soviet Socialist Republic (ESSR) finally was forced to act to postpone the project.

Three major factors influence the current environmental and public health situation in the country. The first is the fifty-year long occupation by the Soviet Union. The second is the period of transition, which began in the eighties with the beginning of the break-down of Soviet rule, and intensified after the declaration of independence in 1991. The third factor is the recession that developed over the past few years.

When Estonia became occupied by the Soviet Union during World War II, the north-east of the country was especially seriously affected because of the desirable resources and technological know-how present in the region. Resource development started, following a decision to process uranium-rich deposits at a factory in Sillamäe. Many of the current environmental and public health problems derive from this decision.

The intense industrial and agricultural development, the heavy military presence and the specific security requirements under Soviet occupation seriously affected environmental and public health. This was followed by the period of transition to independence. The effects from both of these periods are analysed in the present paper along with current environmental and public health monitoring. Finally a few recommendations are discussed.

INDUSTRIAL POLLUTION

As early as in the spring of 1945, high-level interest became focussed on the exploitation of black alum-shale to produce uranium (4). The concept to process uranium at Sillamäe originated at a meeting, attended by Beria, Voroshilov, Malenkov, Mikojan, Zaveniagin and Andropov, among others. I. Maloshev reported on a process for uranium extraction, developed in the Narva district. This process had been successfully studied by an all-union institute, specializing in mineral technology. Verification of large deposits of uranium-rich sedimentary ore in north-eastern Estonia, along with the above process, provided the basis for a decision to start uranium processing at Sillamäe. Industrial operations were rapidly started under control of the USSR military industrial complex. A coastal zone

was established to which access, even for inhabitants, was allowed only by a special permit issued by offices of the Ministry of Internal Affairs. During the Soviet occupation, Sillamäe was a closed town and, until various Communist Party archives became available, there was no public information about the town. A report based on these archives was published in 1995 (4).

In parallel with the mining for uranium, the oil shale industry started to expand. Oil shale has been mined industrially in Estonia since 1916, but until 1946 a maximum of 2 million metric tons was mined annually. In 1950, production reached 3.5 million metric tons, and was 17.5 million metric tons in 1970. The oil shale was used for the production of fuel, chemicals and electric power (5). The mining of oil shale was located in the area between Kiviõli and Narva river. Chemical factories were located in Kohtla-Järve, Sillamäe, Kiviõli and Jõhvi (Figure 1) (6). Two large thermo-electric power plants were built close to the Narva river. The Baltic thermo-electric power plant (1435 MW_e) is fuelled by 10.5 million metric tons of oil shale and 60,000 metric tons of heavy fuel oil annually, while the Estonian thermo-electric power plant (1610 MW_e) uses 11 million metric tons of oil shale (7). Smaller power plants were located in Ahtme (60 MW_e) and in Kohtla-Järve (40 MW_e). On the coast, the Kunda cement factory was expanded (capacity 1.24 million metric tons/a), and still further west, a pulp and paper industry was operated at Kehra.

With the rapid growth of oil shale based power production, the mining operations intensified and peaked in 1980, with 31.3 million metric tons. Starting

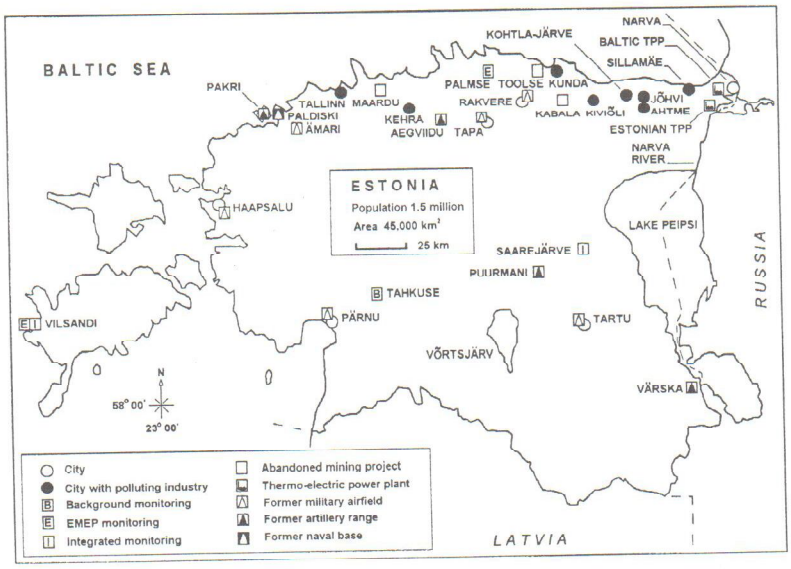

Figure 1 *Sites of major industrial pollution, military installations from the Soviet occupation and environmental monitoring stations participating in international programmes in Estonia (map adapted from 12)*

in 1985, the annual production began to fall. This occurred as power from nuclear power plants began to be distributed to the Baltic area (5). The major uses of oil shale remained, however, and in 1990 the production was still substantial (Table 1).

The massive mining operations and industrial activities in this rather small area create large amounts of waste that end up in tailings. In 1994, 1.8 million metric tons were dumped in tailings from oil shale mining. At the same time, electrical power plants dumped 5.6 million metric tons of ash from utilized oil shale (8). To this was added the waste water, aerosols and gases that are released to surface waters and to the atmosphere (Tables 1 and 2).

Table 1 *Resource utilization and air pollution (8)*

	Year				
	1990	1991	1992	1993	1994
Resource utilization					
Water extraction (Mm^3)	3300	3056	2709	2082	1989
in industry (Mm^3)	164	158	125	75	69
for cooling (Mm^3)	2440	2227	1985	1441	1372
Oil shale mined (Mmt)	22.5*	19.6*	18.8**	14.9**	14.5
Air pollution (mt x 1000)					
Estonia, Total	610.9*	605.5*	479.2**	379.8**	354.0
Narva (Baltic TPP)	195.0*	194.2*	158.0**	123.7**	109.3
East Viru (Estonian TPP)	151.4*	135.5*	127.5**	98.7**	106.9
West Viru (Kunda)	98.4*	111.6*	94.2**	75.2**	64.2

M – million; mt – metric ton; * from ref.17, ** from ref. 12; TPP – thermo-electric power plant

In 1990, in the Kohtla-Järve/Sillamäe/Narva region the increased environmental contamination included an annual fallout of sulphur of 22.7 metric tons/km^2. The maximum allowable concentrations in the air for SO_2, NO_x, ammonia, hydrogen sulphide, phenols and naphthalene were frequently surpassed, as were those for the trace elements manganese, nickel and lead. The soil and ground-water maximum allowable concentrations were often exceeded for antimony, vanadium, uranium, caesium, boron, bismuth and barium in addition to the common lead and cadmium. Insufficient levels of the essential trace elements copper, nickel, zinc, cobalt, manganese and fluorine are typical for Estonia, but in the north-east their concentrations tend to be higher (9).

Ground-water levels in the area were lowered by the industrial use of water, and drinking water had to be trucked or piped in (10). As industrial water utilization was reduced during the recession, ground-water horizons started to recharge. Only in a few places, among them Sillamäe, the levels of ground-water continued to recede. Then, in 1994, the reduction in the ground-water utilization had practically stopped (8).

Run-off from oil shale related waste dumps is still a major source of water pollution. In 1994, the average concentrations of oil products in the Purtse and

Kohtla rivers that drain the Kiviõli and Kohtla-Järve areas, respectively, were 500 and 63 mg/L, and the Kohtla river contained 0.002-0.075 mg/L of phenols (8). A major concern in the north-east is the rising pH of river waters. In the Kunda and Selja rivers, the pH has been rising steadily since 1991 and has remained above pH 8 during 1994 (11). The run-off from ashfields near oil shale fuelled power plants is alkaline and the Narva river receives 1.5 million metric tons/a of run-off with a pH> 12. Also the precipitation becomes alkaline as it is affected by atmospheric pollutants from the power plants. Other emissions (Table 1) are added to these alkaline ones. The Narva river also receives cooling water at 6-9 °C from the two large thermo-electric power plants which causes an increase in water temperature at the point of release by 2-3 °C (10).

Lately, industrial pollution has started to increase in an area just to the east of Tallinn. Among the contributors are the town of Maardu, the Iru power plant and the Termoil company. In 1994, the level of BOD_7 was 6.0 mg/L and that of SO_4^{2-} was 1114 mg/L in the recipient waters (8).

At the beginning of the 1990s, the factory in Kunda contributed about 1% to the cement production of the USSR, while at the same time the population of Estonia made up only 0.5%, and the land area a mere 0.2% of that of the USSR. Due to poor filtration of emissions, the area was severely polluted with fallout of particulate matter. Solids in the emissions amounted to more than 90%, the silica content was 13.5%, and arsenic and lead, respectively, were reported at 36.1 and 60.0 ppm (10). In 1994, dust levels still reached maxima around 1700 $\mu g/m^3$ and allowed concentrations were exceeded practically every month. The monthly averages in the town were up to 300 $\mu g/m^3$ (8).

Radioactive pollution in Estonia comes from mining operations and from fallout, as there are no nuclear power plants in Estonia itself. There were, however, two training reactors, operated at the submarine base at Paldiski. The radioactive waste from the chemical and metal production plant at Sillamäe was dumped into a tailing, only meters from the Gulf of Finland. The tailing contains an estimated 1200 metric tons of uranium and 750 metric tons of thorium. The activity of radium exceeds 7 kCi. The radioactively and chemically polluted area covers over 100 ha and is reputed to have an impact on the health of local inhabitants. Since precipitation considerably exceeds evaporation, toxic compounds tend to be washed from the tailing by rain and can reach both the ground-water and the sea (2). During sampling of coastal waters in 1993, a zone devoid of zoobenthos was revealed adjacent to the Sillamäe tailing (12). An international team of specialists has been working on a risk assessment at the radioactive waste pond.

POLLUTION AT MILITARY INSTALLATIONS

During the occupation, the former USSR army established an extensive system of military installations on Estonian territory covering altogether 85,000 ha (about

1.8% of the territory of Estonia). The largest was the Aegviidu artillery range (>33,000 ha), followed by the military airfields at Tapa, Tartu, Pärnu, Ämari and Haapsalu (Figure 1). In January 1995, the number of sites used by the former USSR military was determined to have been 720. At that time, remedial action had been decided for only 290 sites. Efforts to estimate and to eliminate the damage caused by military units of the former USSR are conducted in cooperation with international expertise. A preliminary estimate shows that the damages caused may amount to DM 1.900,000,000 (12).

The former USSR naval base at Paldiski was off-limits for civilians for fifty years. Two nuclear reactors were operated on the base for training purposes. The nature of radioactive pollution from refuelling procedures and from the handling of radioactive waste, as well as the safe management of the reactors during the transition period, are important concerns. In May 1995, Swedish foreign aid was promised for the demilitarization of the base. Part of the aid would be used to remove the two Russian nuclear reactors, and support would be provided for the voluntary repatriation of Russian military personnel (13). The Paldiski base was turned over to Estonian authorities in September 1995 by the Russian military (14).

The environmental pollution at nearly all sites vacated by the Russian military includes spills of oil products and chemicals. The most hazardous are the airfields (Figure 1), especially the fuel tanks. At Tapa, the ground-water is undrinkable over an area of 16 km^2 due to leaked fuel from the airfied. Here the fuel layer in drillwells can be up to 5 m deep and, in 1994, pumping efforts yielded 20 m^3 of pure fuel. At Tapa and at Ämari, there is a danger that dissolved oil products will reach the Ordovician–Cambrian aquifer. At Sillaotsa military airfield near Tartu, there have been eight major spills, most recently in 1990 and 1991. Over 16 ha of the surface layer has been saturated with oil products and the pollution is easily detected at a depth of 3.5 m (Table 3). Oil products have begun to seep into local wells (12).

Serious risks arise from abandoned ammunition, explosives, rocket fuel and chemicals. These are found either in storage (napalm, smoke bombs and ignition mixtures), or unexploded (mines, shells and bombs), on artillery ranges. The landscape on artillery ranges has been damaged by shelling and bombing, and large areas of forest have been destroyed (12).

AGRICULTURAL POLLUTION

Not long ago, Estonians relied mainly on agriculture for their livelihood. In 1994, the sown area of field crops was 20.7% of the total land area, down from 23.4% in 1993 and from 24.7% in 1990 (15). Thus agriculture still represents an important resource, which also causes environmental problems that need proper management.

Overuse of mineral fertilizers was among practices adopted during the Soviet rule. In 1986, Estonia ranked second in the world in the use of artificial fertilizers containing phosphorus and potassium, and fifth in the use of nitrogen fertilizers, on a kg/ha basis (16). The negative effects on ground-water quality, and eutrophication levels in lakes and rivers have varied, but some effects have been severe. In 1990, the maximum loads of nitrate in well water samples from 11 out of 15 counties exceeded the maximum allowable concentration by 2 to 28 times. On average, the maximum allowable concentration was exceeded in 37% of the samples (17). Over the past four years, nitrates have decreased in the ground-water. Reductions of up to two times, and greater, have been recorded (8). Ground-water quality, however, depends on local conditions, type of aquifer and the impact from industry and agriculture. Part of the improvement in ground-water quality is due to a higher cost of fertilizer and part of it is due to a reduced use of water during the recession.

Table 2 *Water pollution load (metric tons/a) (8)*

	Year				
	1990	1991	1992	1993	1994
BOD_{tot}	49,000	44,200	23,500	11,250*	5,711*
Oil products	322	286	154	127	76
Sulphates	122,000	109,000	102,000	107,553	87,843
Chlorides	13,000	16,000	14,600	12,827	13,879
P_{tot}	792	909	673	445	353
N_{tot}	7,530	8,230	5,640	4,241	614
Fats	443	169	146	160	206

* BOD_7

Surface waters have been receiving run-off from farm lands as well as discharge from municipalities and industry. The calculated pollution loads have been decreasing lately (Table 2) (8), as have the levels of nitrogen and phosphorus in river waters (11).

POLLUTION BY MOBILE SOURCES

Motor vehicles in Estonia numbered about 6,000 in 1938. Only a few hundred remained after World War II. In 1960, the number was over 12,000, this increased to 120,000 in 1980, and there were 225,000 in 1989 (16). Since then, the number of motor vehicles has been increasing by more than 10% a year and reached 376,000 in 1995 (18). In 1994, there were 338,000 passenger cars, 6,000 buses and 54,000 trucks and specialty vehicles (15).

A sign of growing prosperity, environmentally this increase is of some concern, especially as 77% of the vehicles are more than nine years old and maintenance cannot be expected to be sufficiently focussed on emission control in a weak economy. Over a number of years, automobiles have been the dominating source of air pollution in Tallinn. The aging automobiles and the narrow streets of Tallinn's innertown make the exhaust problem more severe (19). Also, since a previous unreliable method was abandoned in 1993, currently there is no method to calculate pollution loads from motor vehicles (8).

The concentrations of CO in Tallinn have been increasing steadily, and frequently exceed the mean 24-hour limit allowed (3 mg/m^3), with maxima as high as 11.2 mg/m^3. Similarly, NO_2 levels frequently reach 60-70 $\mu g/m^3$, >1.5 times the mean 24-hour limit of 40 $\mu g/m^3$. During summer months, NO_2 limits are exceeded during 10-22 days a month. While emissions of NO_x from stationary sources in Tallinn increased in 1994 by 25% over the previous year, most of the other indicators remained at 1993 levels or lower (8).

EFFECTS FROM TRANSITION

Starting in the late 1980s, a number of Soviet era institutions and systems began to disintegrate along with the break-down of the Soviet Union. This intensified after the declaration of independence in 1991. Maintenance of monitoring systems, supply routes for reagents as well as services in the health sector were among areas affected. This and the reorientation to a market economy has necessitated reforms in practically all areas of Estonian life. Such a transition certainly is difficult and the problems arising are of several kinds.

In the course of reforms in property ownership and economy, agriculture and industry are being reorganized. The reforms have been slow, however, and in the process responsibility for the drinking water supply and waste water treatment, for example, has been neglected, leading to health risks (8).

In the health sector, some reform is on-going. First, it is necessary to replace services that were lost in the break-down of the Soviet health system. The services also need to be improved to meet current public health requirements, as these are set internationally. To this is added the need to remedy a recent decline in health, which is related to socio-economic mechanisms that apparently have been triggered by the transition process (20). Estonia is the first former Soviet country to introduce a comprehensive health sector reform (21).

An evaluation of difficulties in environmental monitoring shows that the complicated Soviet monitoring system is still used to an extent (22-24). The high number of standards in the system, over 1300 maximum allowable concentrations for water pollutants alone, makes excessive demands on personnel. Moreover, sometimes even different standards were authorized for the same method. It is necessary to replace this system, as environmental monitoring is

the very tool with which to probe current public health risks from environmental pollution.

Also certain attitudes, fostered during the Soviet period, are still abundant and tend to work against free and open communication in the administration and in the health services. There is also reputed to be a distrust between Russian and Estonian personnel. This attitude is said to be rotted in conditions stemming from the Soviet occupation, when Russian personnel were favoured over Estonians (10).

Lack of national security has been one factor in the transition period. Among factors promoting this insecurity have been actions by Russian officials and politicians (25). One such example was the plan to restore the Russian Empire in February 1994, but official threats to destroy Estonian independence have been expressed repeatedly.

DATA FROM THE SOVIET ERA

Data from this period have been known to be unreliable. An assessment of environmental and health monitoring concluded that official data produced before 1992 cannot be trusted or used (23, 24). In 1992, for example, the hydrochemical monitoring of river waters in Estonia had to be completely reorganized to meet international standards, and all data from previous years were declared unreliable (11). Similarly, the chemical monitoring of air, aerosols and precipitation was reorganized to an international level by upgrading equipment and methodology. This was completed in 1994. *Hertzman* (10) describes difficulties in accessing public health information during a visit to the north-eastern industrial region in 1991. He was frustrated by, on one side, missing health records and uninformed or evasive officials and, on the other side, an overwhelming visual evidence of intense pollution. Results from environmental and public health monitoring during this era frequently were in conflict with what was perceived as vital security interests by the Soviet Union. Data were often withheld by the authorities.

Previously restricted data have become accessible for some areas, as for example the figures for oil shale production (Table 1), whereas data from other activities were never collected or recorded. The restrictions that were applied to publications on statistics and epidemiology of cancer provide an example of the topics that were banned during this era (26). The topics were: number of incident cases and incidence rates by age group in the same paper; ethnic differences in incidence; time trend in incidence; mortality statistics; cancer distribution map with scale and without prescribed distortions in shape and distance; relative survival rate; association between environmental pollution and health effects; association between occupational exposure and disease.

Table 3 *Extent of aviation fuel pollution in ground water-and soil in 1993 (12)*

Airfield	Fuel layer	Polluted ground-water		Polluted soil	
	Area (ha)	Area (ha)	Depth (m)	Area (ha)	Depth (m)
Tapa				2	1
Haapsalu	600	1600	25	1.5	1
Ämari	2.5	7.3	10	24	1.5
Rakvere	16	237	20	0.2	2
Pärnu	0.2	50	20	12.1	2
Tartu				16.2	up to 4

Table 4 *Infant and perinatal mortality per 1000 live births in Estonia*

	1960[1]	1970[1]	1980[1]	1990[1]	1991[2]	1992[3]	1993[3]	1994[3]
Infant mortality	31.1	17.1	17.1	12.1	13.4	15.8	15.8	14.5
Perinatal mortality	21.0[4]	17.4	16.1	13.6	n.a.	10.3	8.2	6.5
Stillbirths	n.a.[5]	n.a.[5]	n.a.[5]	n.a.[5]	n.a.	9.6	7.9	8.8

1) from ref. 26; 2) from ref. 20; 3) from ref. 15; 4) 1965; 5) Included in perinatal mortality

This is not to say that the health professionals were not dedicated, or that severe health problems were not addressed at higher levels of the Soviet administration. Indeed, during the 1980s, a certain liberalization occurred and improvements were made. One expert (22), visiting in 1992, actually praised prenatal and infant care in Estonia, as reflected in the decline in infant mortality during the 1980s (Table 4). That also the general public had gained more access to information in the 1980s was, for example, shown by the widespread protests that finally stayed the preparations for mining fertilizer minerals in 1987 (3).

CURRENT ENVIRONMENTAL MONITORING

A long-time recording of reliable environmental data is essential for successful planning and resource management. The Estonian Environmental Monitoring Programme was legislated in 1993 by decree from the Minister of the Environment. A Monitoring Council directs the programme, coordinated and managed by the Environmental Information Centre (8). A programme outline has been published (11).

The Estonian Environmental Research Laboratory is the principal laboratory mandated to address, for example, quality assurance, national and international intercalibration, development of standards, ratings and methods. Government laboratories in Tartu, Pärnu and Tõhvi along with 12 contracted laboratories were enrolled in the monitoring activities in 1994.

Networks of stations provide data for meteorological, physical-chemical and biological monitoring. Specifically, five stations in the northern and north-eastern part of the country examine precipitation chemistry, and atmospheric air is monitored in nine towns: Tallinn, Tartu, Pärnu and six centres in the north-east.

Since 1994, Estonia is participating in two international monitoring programmes (Figure 1). Integrated monitoring is carried out at Vilsandi and at Saarejärve, and both stations meet the requirements of this international programme. The Saarejärve station is intended for intensive monitoring over an entire catchment area centered on a small lake. The monitoring of air quality within the European Monitoring and Evaluation Programme, EMEP, occurs at Vilsandi and Palmse. After reorganization, direct contacts have been established with the Western centre of EMEP in Norway. To obtain background readings, air is monitored at Tahkuse in the south-west.

A comprehensive agenda is thus in place and, during 1993-94, substantial progress was recorded. However, substantial amounts of work and funding are still needed.

International interest has been focussed on environmental monitoring problems in Estonia over a number of years (7, 10, 19). As an example, a major project on the "Assessment of Environmental Monitoring in Estonia" (23, 24) was conducted during 1992-93 by the World Health Organization with support from the Canadian government. The findings included several observations and recommendations which subsequently have been confirmed by others. A number of the comments in the report are still very valid due to the difficulties in implementing changes. For example: the reliability of the data which have been, and are provided, by various Estonian agencies should be assessed; there is a need for coordination and streamlining of health and monitoring services; proper laboratory procedures must be implemented; sound validation of all methods is required; and adequate laboratory supplies are required.

HEALTH DATA

For a long time, the public health service in Estonia was forced to accommodate the requirements of the occupying USSR, its politics, its industry and its military. As a consequence, a situation evolved, where, at times, medical professionals were forced not to act on hazardous health conditions.

Part of the serious health situation that had developed was revealed at the conference "Development and Health of Estonian Youth" held in Tallinn in 1991. One of the larger health surveys (9) compared children in the north-eastern, heavily industrialized part of the country with children from Tartu. Altogether 4,049 children, between 3 and 14 years of age, were examined by the same team of specialists. The results indicate a higher incidence of poor health and morbidity in the north-east (Table 5). In all, there were 50 reports presented at

the conference, covering various aspects of health. Besides higher morbidity rates in the north-east, it was also apparent that children from the cleaner, reference communities showed a high incidence of disease. Frequent reference was made to a harmful life style among children, parents and health care personnel. Smoking, alcohol abuse and low levels of physical activity were mentioned.

Table 5 *The frequency of certain health deviations in children of three towns in north-east Estonia in relation to Tartu in 1990. A total of 4 049 children were examined (9)*

	Tartu	Kohtla-Järve	Narva	Sillamäe
Inflammations	1.0	2.8	2.9	2.0
Allergies	1.0	3.4	3.1	4.0
Deviations in health, typical of				
– environmental contamination	1.0	1.3	1.7	2.0
– deficiency in some trace elements	1.0	0.8	2.8	1.2
Population	114,232	61,218	82,199	20,942

The international community has been forthcoming with assessments, advice and assistance. Foreign experts soon noticed or were made aware of the critical health situation in Estonia (7, 10), the high rate of people with poor life styles and the shortcomings of public health services (10, 22). Experts from Estonia repeatedly presented their concerns. In Stockholm, at the Swedish Royal Academy of Sciences in 1991, delegations from the three Baltic countries discussed environmental and health concerns with colleagues from Sweden (27). In November 1991, a workshop was organized in Stockholm by the WHO Regional Office for Europe on environment and health in the Baltic countries. A report was presented at the workshop, dealing with environmental pollution in north-east Estonia including data on food, radiation, waste management and problems of occupational toxicology (19). J. Steensberg, on leave of absence from the Ministry of Health in Denmark in the autumn of 1992, acted as consultant to the Ministry of Health in Estonia. A detailed analysis of the health care system and suggestions for improvement were given, but other issues, such as lack of horizontal consultation within the government and the wide spread of poor life style attitudes also were stressed.

RECENT TRENDS IN HEALTH STATUS

The conditions in the health care sector changed in the 1980s, resulting in an improved health situation as reflected in, for instance, the perinatal health indicators (Table 4). After the declaration of independence in the autumn of 1991, more political restrictions were removed and an increasingly open communication on all levels became possible. The general public, as well as the health care sector,

were granted more freedom, but this also meant more responsibilities. The transition may simply have been too rapid, bringing uncertainties and worries about funding. Health status has worsened during this transition period. This has been shown by the Statistical Office of Estonia (15) and summarized in an article in January 1996, by the president of the Estonian Council of Medical Science (20), where it is clearly shown that such a period of transition carries great risks (Table 4).

The focus of the article is that in 1994 the number of deaths per 1000 inhabitants was higher than the number of births by 5.3. Affecting the birth rate were 139.5 abortions for every 100 live births. Perinatal mortality and stillbirths together made up 15.3 per 1000 live births and infant mortality was 14.5 per 1000 live births. The overall death rate was influenced by an unusually high rate of accidental deaths. In 1994, accidents and poisonings replaced cancer as the second most important cause of death after diseases of the circulatory system. Homicides rated at 28, and suicides at 41 per 100,000 population (20). The suicide rate, for example, was almost three times the Canadian rate, which is considered high.

In 1994, there was a 4.9% gap in life expectancy between Estonia and the European average, and this gap was widening (21). As much as 80% of the gap was attributed to higher mortality among the population under 65 years of age. The risk factors were distributed as follows: personal risk factors - 50%; socio-economic conditions - 30%; health services - 15%; and environmental factors - 5%.

In the 1996 article (20), the author does not point out specific causes for the worsened health situation. Instead, he indicates possible risk factors by listing a number of observations: everyday needs are far from being satisfied; there is unemployment and an uncertain future; excessive stress in 50% of those interviewed is identified in recent research conducted in cooperation with experts from Finland; the impact of Western culture and values has brought a break-down of previous values; a careless attitude to human life, already fostered under Soviet rule, is deepening; a large number of people with unhealthy life styles underlines the need for policies to change attitudes; and the necessity of preemptive practices against disease is not perceived by the general public or by public administrators. Additionally, a number of faults are listed in the health care system: a large number of people lack health insurance; financial resources are not used efficiently; the concept of public health is lacking; there are too frequent changes to the health care system; and there are no broad-profile public health physicians and also none are presently being trained (20).

The "Estonia Health Project" (21) was activated in July 1995. This is a four-year programme to support health reforms initiated by the Estonian government. The project is backed by a loan from the World Bank and assistance from a number of sponsoring countries. There are four main components. The "Health System Reorientation" will support the new national health strategy of the Ministry of Social Affairs, and the "Development of Human Resources for Health" will carry out programmes for training and re-training health professionals

and personnel. The remaining two components deal with management of financial resources and project coordination.

The project emphasizes health promotion and disease prevention programmes to increase awareness of healthy life styles, and enhancing the efficiency and quality of health services. Family physicians are seen as a key to many of the current health problems. To help family physicians to establish practices, a rotating fund will be operated by the Estonian Association for Family Physicians. Eventually, 700 family physicians will work in the system. To ensure adequate recruitment of new family physicians, a retraining of medical specialists is planned at a centre for continuing education in Tallinn. The student admissions by the Medical faculty in Tartu will be reduced by more than 50% to balance supply and demand. The project provides a framework for the ongoing reforms. It gives incentive but does not interfere with the specifics of Estonian health care.

DISCUSSION

Part of the impact from the Soviet occupation is still in the process of being identified, while some of the damage already has been assessed. The Russian military left behind a number of severely polluted installations and these along with a number of industrial sites make up the more severe cases of environmental pollution. Effects most difficult to analyse and to repair are those to systems such as environmental and health monitoring and health care, especially when life style attitudes are of prime public concern.

The Ministry of the Environment of Estonia has enacted a credible framework for the protection and monitoring of the environment. The system incorporates both old and new elements and there is a substantial amount of international cooperation and commitments. This legislative framework was criticized by the United Nations Economic Commission for Europe (28) as being too costly and there also was reference to legislative conflicts, allegedly arising from mistakes in planning. It is true that the programme will be costly, especially since the entire system for environmental monitoring has to be built practically from scratch.

However, the government may not have a choice. Firstly, it is important that a plan has been instituted, for administrative purposes as well as to remove cumbersome regulations left over from the Soviet era. The emphasis on the north-east shows where the problems are, and that the government intends to address these. The concept for protection and management of the environment, as it is developing in Estonia, concentrates much of the control of the resources under one authority. This is similar to conditions in Luxembourg, Poland and Denmark (12).

The recession has turned out to be a benefit for the Estonian environment. Soil and water have been given a reprieve as resource utilization has slowed. This is one of the reasons for the reduction of pollution loads. However, in 1994,

certain production figures were up and the end of the recession was also reflected in the diminished decrease of water utilization. A more domestically directed, balanced output is to be expected, but the pollution load will soon start to rise and regulations will be put to a test.

Pollution from motor vehicles seems to have been less affected by the recession and emissions can be expected to increase rapidly with a recovering economy. A timely response to pollution from motor vehicles and from emerging industrial centres will have to be forthcoming if Estonians in the future are to enjoy improved environmental conditions and better health.

Activities in agriculture may be slower in restarting. Part of this is due to a slower than expected land and property reform.

The impact from transition to a new economy was anticipated, but few seem to have been able to assess the full impact and how deeply it really would cut into the lives of Estonians. The resilience of the "old ways" from the Soviet era surprised many as well.

The currently serious health situation in Estonia did not develop overnight and has been known to officials. The issue was only brought into focus recently (20). At the same time, the new "Estonia Health Project" has not yet had time to reach the public. It is not surprising therefore that the high degree to which the health project is designed to improve shortcomings in the current health service has not been noticed more. Thus changes in policy are materializing, but effect on life style and attitudes will take a long time to emerge. Broadly based mutual support between the public and professionals has been suggested to bridge the difficult times ahead (20). Difficulties in the implementation of the health reform are expected in many areas, but especially standards of practically every kind seem to be lacking.

RECOMMENDATIONS

The recently reorganized environmental and health services need help to realize their respective objectives. The environmental monitoring capability has to be upgraded. This is required to identify hazards to public health. The need is for training, technology, equipment and supplies. In the health sector, help with standards and resources for buildings and apparatus is necessary.

The new-found freedom and private ownership also introduce new responsibilities. Many areas, previously strictly regulated by the Soviet administration, have become vulnerable. Until new regulations are put in place or good management practices develop, special care is necessary to prevent damage to the environment and to public health. Especially the operation of motor vehicles and emerging industrial centres may present problems.

New attitudes to health and health promoting practices have to be created. The new family physicians need public support in their work.

Being a small country, Estonia can be expected to respond more rapidly to new and developing situations than larger countries. This has been noted, and suggestions have been made to use Estonia as a model system for health related questions (21). The UN Economic Commission for Europe is developing an environmental assessment model based on data from Estonia (28). Current issues, related to poor life styles and health attitudes, offer an opportunity to develop skills for their management. Such skills could benefit not only countries recently violated by war or occupation, but western-type industrialized countries as well.

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Sažetak

ZDRAVSTVENA EKOLOGIJA I NADZOR OKOLIŠA U ESTONIJI

Zdravstveno-ekološka ocjena situacije u Estoniji nakon raspada Sovjetskog Saveza pokazala je da je država zanemarivana tijekom razdoblja hladnog rata nakon II. svjetskog rata i da su od proglašenja nezavisnosti godine 1991. bili spori napori za poboljšanje postojećeg stanja. Na stanje u Estoniji utječe pedesetogodišnje razdoblje okupacije. Industrijske, vojne i poljoprivredne djelatnosti ostavile su u nasljeđe onečišćenost i zastarjela postrojenja. Zakonski okviri i stavovi o načinu života iz sovjetske ere ometaju reformske napore. U sadašnjem prijelaznom razdoblju prisutne su opasnosti koje proizlaze iz upropaštene infrastrukture, slabe ekonomije i poremećaja usko povezanih s reorganizacijom. Tijekom posljednjih pet godina ekonomska kriza još je više otežala ove okolnosti, a stanje u javnom zdravstvu se pogoršalo. Nakon 1991. međunarodni programi pomoći kao i napori samih Estonaca doveli su do nekih promjena i napretka u nadzoru okoliša, a nedavno je vlada potaknula veoma nadobudne programe u područjima okoliša i javnog zdravstva. Međutim, potrebno je obaviti još puno posla. Pregled nedavne povijesti ove malene države pruža primjere sustavnog zanemarivanja i nagomilanih posljedica te preporučene korektivne mjere za njihovo razrješavanje.

Ključne riječi:
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