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HEALTH ISSUE THROUGH THE SCOPE OF ENVIRONMENT STATISTICS AND THE CONJUNCTION WITH VARIOUS STATISTICAL SCHEMES OF DATA PRODUCTION

Paper submitted by the Statistical Office of Estonia[1]

Summary
The overview and synthesis of health - environment issue is given in the framework of driving force, pressure, state, impact and response indicators. Concerning environment pressures which have a clear impact on health, two rather unique surveys are described - the "Use of heavy metal compounds" and "The use of pesticides". Regarding the response measures the statistical survey on environment quality and health safety inspection is outlined.

Introduction

During the last quarter of the previous century the number of registered new-born abnormalities in Estonia increased from 198 cases in 1970 to 346 cases in 1996. The death rate of cancer as a reason of death showed the same tendency (179.3 cases in 1970 and 224.4 in 1996).

It cannot be stated for sure whether these increases reflect reality or are simply the artefacts explained by the increasing effectiveness of registration and diagnostics. Still, the average life expectancy in Estonia is lower as well — 64.8 for men and 76 for women, as compared to the average in the EU — 74 and 80.5 respectively. The rate of infant mortality (12–15 deaths per 1,000 births between 1990 and 1998) and the number of early deaths caused by tumours is, on the average, twice as high as in Scandinavian countries.

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The impact of the increased pollution of the surrounding environment on the above described trends is not measured. One aspect is apparent — the presence of toxic chemicals in the surrounding environment, the breathing in and consumption of these chemicals via food, water and everyday commodities disturb the functioning of living organisms. Dependent on the biochemical reactions, the potential impact of toxic chemicals varies from poisoning, allergy, asthma, nervous system disturbance, cancer and immune deficiency to foetal and many other abnormalities. Scientists have figured out that a permanent exposure to the relatively low dosages of toxic substances indirectly increases their negative impact on health through the synergetic effect of the chemical compounds.

Health problems caused by toxic substances usually appear with a time shift and also the majority of synthetic compounds are younger than one generation. In 1995 the world produced nearly 400 million tons of synthetic chemicals. Due to insufficient knowledge, the impact of various chemicals on humans and ecosystems is not precisely known yet.

Although the alteration of the major bio-geo-chemical cycles of carbon, nitrogen and water and synthetic chemicals are the main factors of human health issues from the environmental point of view, this is not the only aspect of the complicated causal environment-health issue. The increasing urbanisation that deprives people of space and natural environment, the growing industrialisation with contingent specialisation carries the everyday life away from traditional lifestyle.

Inequality and poverty also affect health issues. In Estonia minority of the population consumes majority of wealth and can therefore guarantee itself a safe environment in sense of space, water and air.

National Environment Health Action Program (1999) has pointed out as short term (1999 - 2003) priorities the following:

- the need for decreasing of traumatic accidents
- the requirement for improvement of living conditions and work in sense of housing and indoor air pollution
- the prevention of chemical contamination of food products and drinking water
- protection of citizens for bacteriological infections
- abating of noise and psychological stress

1.1. Driving forces

According to the Human Development Report of 1999 (1), Estonia has improved its human development ranking by 22 positions, as compared with 1998. The human development index is calculated mostly on the basis of economic and social indicators. However, little attention has been paid to the impacts of growth in economic indicators on the environment health.

Driving forces (Table 1) behind the formation of healthy/not-healthy environment get the rooting from the economic and historical development status of the state, the policies and programs taken by the government as well as the overall development pattern of modern society. A lot of data is already available via routine statistical data production schemes concerning driving forces. Meanwhile, driving force indicators have a feature of being closely interlinked with other economic and social indicators, which makes it difficult to “improve ” them. Looking at the driving force indicators, which have been identified in Table 1, the following interlinkages could be identified in Estonia:

- Oil shale based electricity production is the source of relatively cheap electricity, which, from the point of view of health and environment, gives the biggest share of hazardous waste, acid sediments, water pollution and extraction and CO_2 emissions.
- The use of heavy metal compounds poses a risk to health and environment if the residuals are not properly treated, but adds value to the GDP, creates and sustains workplaces.
- Cargo turnover of oil products via ports is a source of seawater pollution but also a source of the pollution of food that people get from the sea (marine fish), whereas the transit of oil products has proved to be profitable. The ports at the Baltic Sea are important transport and transit centres, with oil products and gas as the main goods in transit. In 1998 the volume of transit amounted to 20.4 million tons, accounting for 74% of the total volume of goods transported through Estonian ports. The increasingly vigorous transport of goods, including transit goods, leads to the extension of port areas and the growth in waste. The transport of oil products increases the risk of oil contamination as well.
- Owning a car is a symbol of wealth and prosperity, but the increasing traffic intensity and the growing share of private car transport lead to an increase in urban air pollution and noise level. A well-functioning transport system is an essential part of a contemporary living environment. In 1998 the value added produced by the transport, storage and communications sector accounted for 12.4% of the GDP. As compared to 1997, the sector had grown by 10%. Such a growth in transport sector has several negative effects on the environment, for example, the increasing demand for mineral oils (fuel), an increase in air and water pollution and in the noise level. The number of motor vehicles has been steadily increasing, reaching 540,000 by the end of 1998 (excluding buses and coaches), of which 451,000 are passenger cars, which makes 300 cars per 1,000 population. In the last five years, the latter has shown an annual growth by 24–26 cars — such a growth rate is the highest in Europe. The majority of cars are bought second-hand from the West. Cars in Estonia are, on the average, six years older than in the EU countries.
- Fuel use for energy production in cities does lead to higher levels of air pollution but nowadays using fuel does not have easy alternatives in large blockhouse districts.
- Household consumption patterns depend on income and consequently the greatest part of the population consumes cheaper but also less healthy and environmentally friendly products, off-quality drinking water, etc.
- The share of population living in overpopulated areas indirectly leads to the concentration of pollution, but the situation is difficult to change as people move into the areas where money flows.

So, the driving forces that lie behind the rise of health and environment issues are quite easy to identify, but it is more difficult for the politicians to use the corresponding indicators and promote the health – environment issue.

1. 2. Pressures

While studying the pressures the human community presents on the global ecosystem, there are only a few topics that could be left aside when tackling environment health issues. Probably the pressures leading to the loss of biodiversity and to the depletion of resources can be ranked as irrelevant. Other pressures are, in one way or another, directly or indirectly, relevant to the health issues. Such environmental issues as air and water pollution, waste, ozone layer depletion, the emission of toxic chemicals to environment, climate change and urbanisation affect health as well. So, the same way the according anthropogenic pressures contribute to the arising of environment issues or problems, they contribute to health issues as well.

The list of pressures (Table 2) include the emissions of heavy metal compounds, the generation of chemical waste, the incineration of waste, the disposal of hazardous waste in landfills, illegal landfills, the use of pesticides, the emission of hazardous substances via waste water and wastewater sludge, the emission of radioactive compounds, as well as the use of CFC and HCFC that contribute to the depletion of ozone layer. ("Ozone hole" has widened already to the first over-100,000-citizen-town in South America in September 1999).

In addition the annual amount of recorded spilled oil, traffic intensity in urban areas and road traffic, aircraft and railway noise, should also be taken under scope. Attention should be paid to dispersed pollution as well. This explains why Tallinn and north-eastern Estonia, where the coastal sea is at places contaminated with oil products, phenols, heavy metals and toxic substances, are the areas where the problems relating to the quality of water are most serious.

Although air pollutant emissions have fallen in the past 15 years (nitrogen oxides by 1.6 times, sulphur oxides by 2.4 times, carbon monoxide by 1.4 times, carbon dioxide by 1.8 times and solid volatile particles by 4.3 times), they still remain at a higher level than in the EU countries. (Sulphur dioxide emission, for example, was three times as high as the EU average).

The biggest potential pressure in case of Estonia that should be mentioned, is the near coast radioactive uranium waste pond, containing 12 million tons of uranium enrichment waste, heavy metal compounds, acids, etc. The production of slightly radioactive waste is still continuing and the new quantities are still reaching the radioactive uranium waste pond – waste disposal, which was originally created for mining waste and which does not correspond to the requirements of safe radioactive material and chemical waste disposal.

The Statistical Office of Estonia published environmental pressure indicators (2) according to 9 most important environmental policy fields in 2000 and will release a new version in 2001. Considering the whole framework there are indicators that cannot be constructed due to the absence of basic data. Unfortunately several of such indicators as the index of heavy metal emission to air and water, the emission of radioactive material, the consumption of toxic chemicals are also tightly related to health issues.

Having compiled indicators on the emissions and the use of chemicals on the basis of IUCLID, production and trade statistics, and toxicity weighting, EUROSTAT admitted that they still faced many problems in constructing them (choice of chemicals, weighting by toxicity, data availability).(3)

At present Estonia still lacks a functioning registration system for the potentially dangerous substances, which could also be used for deriving statistics. Government suggested the Statistical Office should collect data on the use of pesticides and ozone layer depleting substances from the relatively big population of enterprises acting on both of these fields. The survey on the use of ozone layer depleting substances has been supplemented with an additional list of heavy metal compounds and with a selection of halogenisated solvents not covered by any treaties. These surveys have been carried out for 6–7 years for now. The outline of the studies concerning the use of heavy metal compounds and pesticides are given in the next two sections.

1.2.1. The use of heavy metal compounds

Heavy metals appear in the surrounding environment as residuals of industrial processes, as constituents of different chemical products and everyday commodities or when burning fuel. In order to reflect the flow of heavy metal compounds, the input-output analysis on enterprise level has been applied.

The study on the use of heavy metal compounds by enterprises forms a module of the "Use of chemicals" survey. The population of enterprises surveyed amounts to 1,000. The activities, which presume the use of heavy metal compounds, have been totally surveyed. The importers and exporters of the according substances were included in a sample as well.

The survey covers the use of antimony, arsenic, beryllium, mercury, cadmium, cobalt, copper, chromium, nickel, lead, selenium, tin and zinc compounds. Enterprises report the stocks at the beginning and at the end of the year, the import and export, the amounts used and the residuals and emissions (Table 5). So the full query makes an input-output balance for the above mentioned compounds on the enterprise level. In addition the enterprises indicate the technological process the substance has been used in (Table 6), as well as the type of operation undertaken (whether it was sold or it forms a constituent of a product or it changes in the production process or reduces into metal). The amounts of heavy metal compounds used have been calculated on pure metal.

Statistics shows that the use of heavy metal compounds has decreased from year to year, from 700 tons in 1997 to 300 tons in 1998 and 200 tons in 1999. In 2000 industrial enterprises used in total nearly 200 tons of lead, tin, zinc, chromium, cobalt, nickel, cadmium and copper compounds.

The treatment of imported heavy metal waste seems to be a raising trend. 3,000 tons of heavy metal waste were used by enterprises treating hazardous waste in 2000.

The residual stocks in enterprises indicate both the amounts still in production process and in stocks. So in 2000, 700 tons of lead, 60 tons of chromium, 60 tons of zinc compounds, 40 tons of copper, 25 tons of nickel, and 12 tons of cadmium compounds were accounted in stocks.

In Estonian enterprises zinc, chrome, cadmium, cobalt and nickel compounds are used in galvanising, chrome in the tanning of leather, lead in the production of resins and plastic products, arsenic in the chemical industry. Lead also appears in the environment from the use of leaded petrol, arsenic from the boiling of fossil fuels, copper as a constituent of plant protection chemicals, paints and varnishes.

30 tons of lead, 24 tons arsenic and 2 tons of nickel compounds waste were formed and disposed in 2000. The generation of chromium and nickel waste has declined to less than 1 ton for the year 2000, while years before several thousand of tons of their waste were formed.

53 tons of chromium, 50 tons of nickel, 2555 tons of lead, 14 tons of zinc compounds was the output from the enterpises as a constituent part of a product.

1.2.2. The use of pesticides by agricultural and forestry enterprises, private farms and railroads

Pesticides (phenols, phosphor organic compounds and chlorinated carbons) are mainly used as weed, parasite and insect killers, with the aim of increasing crops. The characteristics of these compounds — stability, low solubility in water and high solubility in fats — lead to their accumulation in living organisms and food-chains. Depending on biochemical reaction the pesticides block, their toxic impact on human and animals' organisms (cancerogenic, teratogenic, estrogenic) varies also.

The survey on the use of pesticides has been carried out since 1993, by the order of the Plant Protection Inspectorate of the Ministry of Agriculture. The population surveyed covers the agricultural and forest cultivation enterprises and private farms. Since 1998 railroads with the length of at least 10 kilometres have been included in the survey. The Ministry of Agriculture approves the pesticide list every year.

The data are arranged according to the pesticide types, amounts, the area pesticide is applied for and cultivated species treated. The survey is a census survey as the extension of specific pesticide groups gives too big a statistical error.

55% of forestry and agricultural enterprises used pesticides in 2000. 83% of the pesticides used by enterprises in 1999 were herbicides, which represent a minor health risk. Greater amount (73%) of pesticides was used for treating of cereals. Fungicides and insecticides were mainly used for treating potatoes (63%).

The total amount of pesticides used in enterprises and private farms cannot be calculated, as the procedure of extrapolation still cannot be used for private farms. Thus the data about use of pesticides in farms show the average amount of pesticides used in one private farm using pesticides. 51,000 farms were registered in the Land Cadastre on January 1, 2000.

The amount of pesticides used has decreased in comparison with the beginning of the 1990s. This can be explained by the relatively high prices, or by increasing effectiveness of pesticides.

1.3. State

Presently, there is no consensus as to which simple or aggregate indicators provide the most adequate reflection of the quality of the living environment. The general tendency is to measure the indicators relating to the problems specific of a particular area (e.g. air quality indicators in areas with heavy transport load, waste-recycling indicators in densely populated areas, water quality indicators in agricultural areas). Even these area-specific indicators are, however, rather incomplete, due to the high cost of the measuring equipment and the amount of work involved in the compilation of time series data.

The pollution of air is a source of serious problems both in and around towns. The direct effects of air pollution include health risks caused by the inhalation of chemical substances as well as their destructive effect on buildings and the harm done to wildlife. Many air pollutants, such as carbon dioxide and sulphur and nitrogen oxides, etc. affect the living environment also indirectly by contributing to the climate change, acidification and the stratospheric ozone layer depletion.

The degree of air pollution in urban areas may vary with hours, days and seasons, depending also on the area measured and the climatic conditions. For a number of toxic substances, such as volatile organic compounds, ozone, etc. no routine concentration measurements have been carried out due to the lack of equipment. There are 18 air pollution-monitoring stations in Estonia (ETC-AQ), however, the data provided by the stations are incomplete. Nitrogen oxide, sulphur dioxide, carbon mono-oxide, dust concentration in the air, pH and some acids in sediments are those compounds which are measured on a daily basis in 5–10 stations.

The main source of drinking water in Estonia is groundwater, accounting for two thirds of the total drinking water resource. Tallinn and Narva use processed surface water.

Groundwater in Estonia has been considered relatively free from negative environmental impact when compared to the purified surface water. However, in the agricultural areas of central and western Estonia top groundwater layers are in some areas polluted with nitrates, in the north-east with phenols from oil-shale industry and in former military areas with oil products. The nitrogen concentration in shallow wells, which in 1988 exceeded the established nitrate standard in 30% of inspections, had, however, fallen to around 5% by the end of the 1990s.

The radiation background in some areas of Estonia is already higher than natural. The higher level of radioactivity is explained by the procession of slightly radioactive oil shale.

Cs 137 contamination of soil has been mapped according to 118 measurement points. Higher levels are detected in the north-eastern part, but mostly the levels do not exceed the correspondent levels in other areas of Europe.

Data on the levels of heavy metals (Cd, Pb, Hg) in the environment (in some tested species of plants and animals and in the soil and water) have been available for some years and some areas. These data are usually the result of one or another monitoring program and the comparisons over time and space are usually not feasible.

We lack data on the state of environment in relation to health aspects. Complete monitoring might be a very large and costly undertaking. The Ministry of Social Affairs, being in charge of health protection and supervision, has ordered a survey that should indicate the total number of measurements performed in food products and water for several indicators from the Statistical Office. On the one hand these results reflect the contamination of food and water, on the other hand, the supervision capacity of the institutions involved. The survey is outlined under the section Responses 1.5. — Environment quality and health inspection.

1.4. Impact

Improvement in health is commonly associated with the accomplishments of clinical medicine. What most people do not realise is that medicine can influence health to the extent of about 10% only. Health is more significantly influenced by the surrounding environment (20%), genetic factors (20%) and lifestyle (50%). The actual impact of changed environment on health as it is stated in National Environment and Health Action Program could be somewhere 40% in case of Estonia or even more.

As even the state indicators are not available with long enough time length and geographical coverage, with the only exception of air quality measurements, which are available on daily basis for some cities, it is probably not yet sound to talk about risks and exposures. In addition also water and food are the main exposure routes of environment health hazards.

Although no data would reflect a direct correlation between the deteriorated quality of the environment and the decline in lifestyle and health, except in the most extreme cases (large-scale radioactive pollution), a number of serious medical conditions, such as asthmatic diseases, tumours, immunodeficiency, nervous system and hormonal balance disorders, have increasingly begun to be associated with environmental pollution.

Pollution affects human health mostly through inhalation and consumption, via food, water and consumer goods, of relatively small quantities of pollutants. Many health problems caused by the polluted environment probably become evident only over a longer period of time. We do not know yet, for example, how chemical substances affect health as many of the synthetic combinations used in modern households have been in use only for one or two generations.

Insufficient monitoring and the knowledge of negative impacts does not allow, on the one hand, to evaluate the quality of the living environment, and, on the other hand, to develop the necessary legislation.

In terms of environmental impact, Estonia can be divided into four regions: the industrial north-eastern Estonia, where the impact is the highest, the urbanised northern Estonia, the agricultural central Estonia and the southern and western Estonia with a relatively small population and low effect on the environment.

Risk assessment in Estonia is routinely performed on some groups of pesticides only. For other issues data are not available at all. The transition of risk from traditional hazards to modern hazards is a process in force with not enough information available.

1.5. Response

Probably most of the expenditures made on the environment should be considered as health investments in the long run. The Statistical Office has collected data on the investments by enterprises for some years already.

The inspection of the quality of food and water – the important exposure routes for several chemicals and health hazards, could be seen as a response or measure of a society as well. The outline and some results of a survey carried out is given in next section.

1.5.1. Environment quality and health inspection

The Ministry of Social Affairs being in charge of health protection and supervision, has ordered a survey from the Statistical Office. The survey should indicate the total number of measurements performed as well as the number of measurements exceeding the set standards for several indicators in food products and in water. On the one hand these results reflect the contamination of food and water, on the other hand, the supervision capacity of the institutions involved.

Statistical Office has set in collaboration with the Health Protection Inspectorate and the Ministry of Social Affairs the list of the substances to be statistically analysed. The substances statistics has been provided on include: micro-organisms, hormones, mycotoxins, alfatoxins, pesticides, radioactivity, inorganic substances, lead, cadmium, iron, nitrates, food additives, food colours, food conservation substances, organoleptic and other indicators.

The list of food products covered by the statistical survey included: potatoes, fruit, grain, bakery products, sugar, honey, confectionery, tea, coffee, substitutes of coffee, salt, spices, sauces, other vegetable products, beverages, alcoholic beverages, milk, eggs, meat, fish, seafood, food fats, edible oils, prepared food, salads and children's food. Imported and domestic products should have been differentiated. Out of water the drinking ground water, pipe water, drinking soil water, surface water for drinking purposes, water bodies water and bathing water were subject to statistical analyses. Also the number of the noise measurements made was asked.

The institutions supervising health safety — Health Protection Inspectorate, Department of Veterinary and Food, Plant Protection Inspectorate and Environmental Inspectorate were included in survey.

58,000 analyses were performed for supervision or control purposes of which 30,000 accounted for the food. Food analyses break up as follows: 10,000 for meat, 4,000 for milk and 2,000 for fish. Food products of domestic origin were tested predominantly for supervision (the share of imported products in examinations was 10%).

Food products

Among imported food products the share of polluted analyses was around 4%. 13% of the performed analyses of meat products exceeded the permitted standards, as to vegetables, 9% of analyses were non-compliant.

For domestic food products the share of non-compliant analyses was around 7%. Over 27,000 analyses were made on the domestic food products, of which 15,000 for the presence of micro-organisms, 5,000 for organoleptic indicators and 2,000 for the presence of veterinary medicines.

In domestic food the share of polluted analyses was the highest in prepared food. 20% out of 842 prepared food analyses, 18% out of 2,000 of salads analyses, 12% out of 1,000 offal analyses and 11% out of 680 vegetable analyses were non-compliant.

39% of the total food product analyses were performed by one district, while the share of polluted analyses was bigger in the regions where much less analyses had been made. The highest share of food product analyses exceeding the permitted level was 16% in one district and 13% in another.

Drinking water

Out of drinking water the majority — more than 17,000 analyses (73% of all drinking water analyses) were made of pipe water. 19% of the ground water analyses and 18% of pipe water analyses exceeded the permitted iron content.

As to the tested analyses of soil water for drinking proposes 28% exceeded the permitted content for micro-organisms, 27% for nitrates, 23% for iron, 9% for inorganic substances and 18% for organoleptic indicators.

Nearly 20% of all the analyses of drinking water were made in one district out of fifteen. The highest share of drinking water analyses exceeding the permitted level was 32% in the case of one county and 24% in the case of another county. The number of tested samples was also low in those cases — 85 and 315, respectively.

Water bodies water

Nearly 3,000 analyses of bathing water and over 1,000 analyses of other water bodies water were examined. 9% of the latter exceeded the permitted content for iron, 9% for inorganic substances, 4% for micro-organisms and 9% for organoleptic indicators. Most of the examinations of the water bodies water were also made in one district — 34% of all the performed.

Noise

The level of noise exceeded the permitted level on 43% of the cases. But it should be mentioned that measurements (173) were taken only in 4 districts out of 15.

Pesticides

Estonian controlling institutions made over 1,000 analyses for pesticides in 2000.

700 measurements of food products were made for detecting pesticides. The share of measurements exceeding the permitted content was 2% when taking the measurements together. While moving to the level of districts the picture turns relatively diverse. There are products (potatoes, fruits) of which only two or four analyses made in the district have exceeded the permitted level. There are districts were hundreds of analyses are made from one food product (lemons and oranges) without any measurement exceeding the permitted level. There are districts where nearly 10% of the performed analyses are over the standard and the number of measurements is about 50. Presuming that at least 10 analyses were made of each type of the product in each district a year, the number of measurements should have been nearly ten times higher than it was in 2000.

Drinking water was analysed for pesticides in 460 cases. The majority (95%) was performed in two districts out of fifteen and the share of measurements exceeding the permitted level was nearly 0 %. The districts where drinking water was analysed for pesticides were not the ones, which use the majority of pesticides.

1.6. Conclusions

The healthy environment is one precondition for healthy population. The factors influencing healthy environment are in lot of cases several anthropogenic pressures. So the framework of driving forces-pressure-state-impact-response model was here presented as a general framework. In this framework a lot of data is available with evident environment health aspect. The deficiency of these data lies in the fact that they do not allow clear and direct interpretation of the causal relationships between more hidden economical driving forces, arising environmental problems and according human health impacts.

The high shares of analyses of food products and drinking water, which are exceeding the permitted standards for several indicators reflect indirectly relatively high according pressures. If in average 7% of domestic food products analyses exceeded the permitted standards than for selected articles these shares were 20%, 18% or 11%. While looking at drinking water the majority of problems in pipe-water seemed to be connected with high iron content, when in case of soil water for drinking purposes the problems are more heterogenous - micro-organisms, nitrates, iron, other inorganic substances and also organoleptic indicators.

Should be kept in mind that the inspection of the quality of food products and water cannot be considered as monitoring and it reflects rather the capacity of inspection institutions.

The position of supervising institutions is influencing the results so much that in case of rural districts it is even difficult to say whether the high shares of the non-compliant analyses are accidental as the number of measurements is small, or is the situation really very bad. Almost half of the food product analyses were performed by one district, while the share of polluted analyses was bigger in the regions where much less analyses had been made(Table 7). If the average share of food analyses exceeding the permitted level was 7%, while in some districts it was over 15%. In case of drinking water the highest shares of non-compliant analyses 32% and 24% accompany also the lowest number of tested samples — 85 and 315, respectively (Table 7). The noise measurements were performed only in four counties out of fifteen. So the low capacity of health supervising institutions could be pointed out.

The main focus from environment statistics point of view lies on pressures leading to environment and health problems and the measures taken, not on the impacts of changed environment on health as there is nearly any data available. The framework of anthropogenic pressures behind evolving environmental problems works reasonably for the environment-health issue as well.

As to the chemicals in the surrounding environment, the basic data call for considerable improvement, stipulating in the long run the simple registration of all substances in the market. Concerning environmental pressures the two surveys described here (Use of heavy metal compounds, Use of pesticides) are the attempts from the side of the Statistical Office to produce missing data for important areas as there is not enough information available in administrative sources.

The input-output balance of heavy metal compounds on enterprise level could serve several porposes: on the one hand, it gives in a harmonized way the used amounts and the residuals for several compounds, on the another hand it gives the possibilitiy for analyses and for veryfing information derived from other more indirect information sources (production statistics, custom statistics, waste licencies).

Taking into account the big number of chemicals the flows of which should be monitored it seems not feasible that statistics could produce the input-output analyses for all the substances of interest by routine questioning of enterprises. The creation of the registration based basis for data production is therefore needed as the first step in order to make progress in this field of statistics. Prospective chemical register should form a basis for deriving statistics for the main groups of prioritised compounds. The classification of production and trade should enable to disaggregate "down" to the level of chemical composition. Otherwise the basis for production of chemical risk indicators will remain very scarce.

Differentiation between toxic and less toxic pesticides is possible now, but the toxicity of different nature and their grown effectiveness does not allow the evaluation of the trends in the consumption of pesticides in a comprehensive way.

Public discussions have brought about the need to identify the priority toxic and hazardous substances in order to monitor their presence in the environment and their health impacts. Interest has risen towards estimating the overall flow of traditional and new-born chemicals. There is little data available for these estimations and still no supportive legislation has been adopted.

References:

(1) Estonian Human Development Report 1999, United Nations Development Programme in Estonia, 1999.
(2) Environment 1999, Statistical Office of Estonia, 2000.
(3) "How can the progress of the strategy be monitored", Summary of Conference on Chemicals in Products as a Source of Environmental Pollution, Falkenberg, Sweden 5 – 6 April 2001.
(3) National Environment and Health Action Programme, Social Ministry of Estonia, Tallinn, 1999

Tabel 1. Driving force indicators, environment health issue, data availability

Issue	Indicators	Statistical surveys behind	Timeframe
Heavy metals and other pollutants in air, water and soil	Share of fossil fuels in electricity production	Energy balance	1980-2000
Heavy metal compounds in environment	Use of heavy metal compounds	Use of chemicals	1994-2000
Air pollution	Traffic intensity	none	-
Air pollution	Car fleet age structure	Car register	1980-2000
Air pollution	Share of private car transport	Car register	1980-2000
Air pollution	Fuel use for energy production in cities	Energy balance	1980-2000
Chemicals intensity of lifestyle	Households consumption patterns	None	-
Water problems	Cargo turnover of oil products via ports	Customs statistics	1990-2000
Water problems	Agricultural intensity	Growing area for crops	1980-2000
Urbanisation	Share of population living in overpopulated areas	population statistics	1980-2000

Tabel 2. Pressure indicators, environment health issue, data availability

Issue	Indicators	Statistical surveys behind	Timeframe
Heavy metal compounds in environment	Residuals of heavy metal compounds	Use of chemicals	1994-2000
Chemicals in environment	Generation of waste of chemicals	Waste management	1994-2000
Chemicals in environment	Incineration of waste	Waste management	1994-2000
Chemicals in environment	Disposed hazardous waste in landfills	Waste management	1994-2000
Chemicals in environment	Illegal landfills, or the share of population not severed by municipal waste collection	None	-
Pesticides in environment	Use of pesticides	1. Use of pesticides 2. Agricultural holdings – showing areas	1994-2000
General air pollution	Emission of heavy metals to air	Pollution of air from stationary sources	1994-2000
Water pollution	Emission of hazardous substances to water and soil via wastewater and wastewater sludge	Water management	1994-2000
Water oil pollution	Annual amount of recorded spilled oil	Administrative data sources	1994-2000
Noise, urban air pollution	Traffic intensity	None	-
Noise	Aircraft and railway noise	None	-
Radioactivity	Number of facilities with nuclear risk	Administrative data sources	1994-2000
Radioactivity	Emission of radioactive compounds	Administrative data sources	1994-2000

Tabel 3. State indicators, environment health issue, data availability

Issue	Indicators	Statistical surveys behind	Timeframe
Radioactivity	Cs 137 contamination of soil	Administrative datasources	1998
Heavy metal compounds in environment	Heavy metals in mosses	Separate scientific studies	1994, 1996
Water pollution	Drinking water quality inspection	Statistical survey on health safety supervision	2000
Water pollution	Bathing water quality inspection		2000
Water pollution	Waterbodies water quality inspection	Statistical survey on health safety supervision	2000
Noise	Noise levels	Statistical survey on health safety supervision	2000
Air quality	Air quality assessment	Administrative datasources	1993-2000

Tabel 4. Response indicators, environment health issue, data availability

Issue	Indicators	Statistical surveys behind	Timeframe
Chemicals in environment	Investments on integrated technologies	Environmental expenditures	1994-2000
Chemicals in environment	Taxes on chemicals	Administrative datasources	
Chemicals in environment	The change in the effectiveness of wastewater treatment plants (the difference between effluent and influent characteristics of wastewater)	Water management	1994-2000
All issues	Environmental investments into different fora	Environmental expenditures	1994-2000
Chemicals in environment	Number of quality measurements of food and drinking water	Statistical survey on health safety supervision	2000
All issues	Number of ISO 1400 certified companies	Administrative datasources	2000
Air pollution	Number of on-line monitoring stations measuring air pollution	Administrative datasources	- 2000
Radioactivity in air	Number of on-line monitoring station	Administrative datasources	- 2000

Tabel 5. The input-output tables concerning heavy metal (+arsenic) compounds use in Estonian enterprises, 2000

	Stock at the beginning of year	Input to enterprises	Output				Stock at the end of year
			Product or raw material	Change in production process	Waste and residuals	Selling	
Antimony	130	768	732	2	0	5	159
Arsenic	24 370	0	-	0	24 369	-	1
Beryllium	1	-	-	-	-	0	1
Mercury	79	1	-	1	61	0	17
Cadmium	13 193	1 918	5	1	0	3 010	12 094
Cobalt	2 058	1 041	897	14	171	19	1998
Chromium	53 955	64 073	53 081	546	99	4 493	59 808
Nickel	60 891	17 752	50 319	703	609	2 061	24 950
Lead	1 028 733	2 308 815	2 555 121	27	30 002	-	752 399
Selenium	91	770	391	-	0	50	421
Tin	609	711	617	33	2	0	668
Zinc	57 652	132 554	14 466	118 503	51	440	56 746
Copper	37404	3 858	1 686	15	7	606	38 947

Table 6. The use of heavy metal (+arsenic) compounds by processes, 2000 (kg)

	Galvanics	Waste treatment	Leather tanning	Cata-lysts	Stabi-lizers	R&D	Forage produc-tion	Glass produc-tion	Paint produc-tion	Wood treat-ment	Other
Antimony	2					0		732			
Arsenic		24 369									0
Mercury		65				2					
Cadmium		2 994				0		5			
Cobalt	14			4		0	118	7	138	631	
Chromium	706		41 920	8		3		10 983			107
Nickel	1 311	50 270		45		1		5			
Lead	396	2 584 226			495	0			11		
Selenium						0	47	344			
Tin	587					1		6			66
Zinc	129 990			145	2 939	0	1 899	987	8 402		95
Copper	838			20		1	476			366	

Table 7. Examination of health safety for supervision by counties, regional dimension, 2000