5. Health concerns in environmental management

The city of Kaunas health profile

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5.1 KAUNAS AND THE HEALTHY CITIES PROJECT

5.1.1 Implementing the Healthy Cities Project in Kaunas

The World Health Organization's (WHO) Healthy Cities project (HCP) is a long-term international development project which aims to place health high on the agenda of urban decision-makers and to enhance the implementation of health and sustainable development strategies based on the main principles and goals of Health For All 21 (HFA 21) and Agenda 21. The Healthy Cities project aims to improve the physical, mental and social state of city inhabitants, as well as their living and working environments.

In 1989, at the initiative of the Kaunas Medical Academy, the WHO's Healthy Cities Project was started in Kaunas. By expressing their willingness to take part in this project, Kaunas city municipal officials committed themselves to implementing the requirements for all participants – to improve the city and the health of the population.

Three phases of the HCP have now been completed. The first phase of the Healthy Cities Project (1989–1992) can be described as a phase for collecting health and environmental data, reorganizing structures, and preparing programmes and propositions. During the first phase of the Kaunas Healthy City project, priority was given to environment improvement programmes in the following areas:

water, green areas and municipal ecological monitoring. During the second phase (1993–1997), the Kaunas Healthy City project mainly dealt with the formation of public health policies, as well as searching for ways to improve public health at the city level.

As public health is described as the art and science of disease prevention, the main focus of attention in this project was paid to the strengthening of inter-sectoral cooperation, the creation and implementation of health promotion and environment improvement programmes. Health is understood not only as the absence of disease and the availability of adequate nutrition and physical activity. It is a complex state which is determined by housing, income, the avoidance of pollution and many other factors which can be successfully influenced by implementing inter-sectoral cooperation. Priority was given to the implementation of environmental improvement programmes and the creation of health promotion programmes in the following areas: Safe food, healthy kindergartens, non-communicable diseases, accident prevention, tobacco, active life, cavity prevention, social needs and social structures.

In the third phase (1998–2002), the main emphases were equalities in health, social development and sustainable development. Prioritised activities in city planning was oriented to the promotion of health and a good quality of life, propagation of a healthy lifestyle, decreasing poverty, meeting the needs of the elderly and youth, improvement of living conditions and social care, environmental management, investment for developments in health, and responsibility for health.

5.1.2 A strategy for public health

The activities of the Kaunas Healthy City project are oriented towards an integrated health plan for the city and sustainable development for controlling the environmental, economical and social health determinants. The environmental policy was reviewed and adjusted in 1999. The formation of the strategy of public health assessment and promotion at the city level was started in 1998, and completed by 2001. The plan for the improvement of social services and social determinants was also completed by 2001. The general development plan for Kaunas up to the year 2015 should be completed in 3 years, and the master plan for the city was accepted in 2003. The project made an effort so that public health issues will be considered and included in city development plans. In Phase III of the Kaunas Healthy City project, there are plans at every level of management and government to introduce the concept that health promotion strategy is the norm in plans for city development.

One of the requirements for the participants in the Healthy Cities Project is to achieve the implementation of "Health For All" principles in municipalities by mobilizing all sectors. The health sector is not the only sector responsible for the promotion of health. Municipalities, government, organizations and educational institutions are also key players. Therefore, according to WHO's recommendations, city health profiles are to be created. On the basis of the profiles, health plans are formed in which problems are defined and possible solutions are presented considering the quantitative and qualitative parameters of the
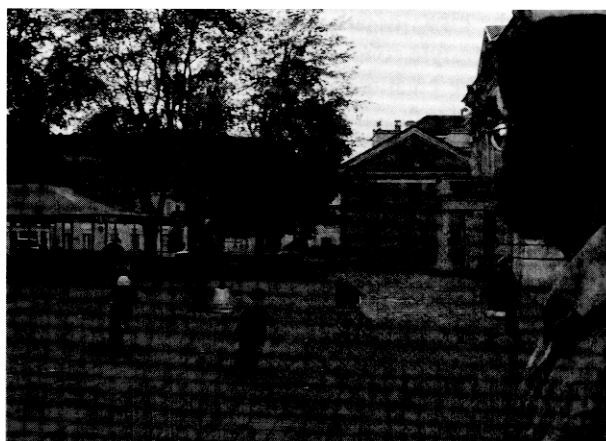

Figure 5.1 The number of births in Kaunas has been decreasing continually since 1987 and the population decreases. Photo: Lars Ryden.

STEPS TO DEVELOP THE KAUNAS HEALTH PROFILE AND HEALTH PLAN

The Kaunas health profile was created according to WHO recommendations. On the basis of the profile, a health plan for the year 2000 was developed. The Kaunas health profile was achieved in the following phases:

1. With the approval of the City Mayor, an inter-sectoral committee was established. Members of the committee include specialists from the Kaunas Medical Academy, the Lithuanian Sports Institute, environmental protection, social services, health and sports departments, and the police.

2. Financing for the creation of a health profile was provided by the environmental protection fund.

3. A competition, "We want to live in a healthy city", was held among public and governmental organizations.

4. Data about the inhabitants health and the environment was collected from municipal departments. Maps and diagrams were made using the data.

5. Using the municipal ecological monitoring programme in which data is collected in different districts of the city, differences in the state of the city environment were defined.

6. A sociological investigation of city inhabitants is being conducted, the purpose of which is to obtain a subjective evaluation of the health environment and the wealth in the city.

7. An outline of the city health profile was prepared and distributed among deputies and municipality representatives.

8. A primary plan of implemented programmes containing the targets and procedures was prepared.

9. According to WHO recommendations, the indicators from municipal departments were corrected and supplemented.

10. The experts evaluated the health profile.

11. The community (through organizations) evaluated the health profile.

12. A final version of the health profile was made.

13. Municipal committees approved the health plan.

health of the city's population and the social, environmental and lifestyle conditions which influence it.

In 1994, the creation of a health profile for Kaunas began. It indicates the city's progress in promoting health and plans for further activities. Every year the city health profile is updated and published, available to the public and municipal staff.

5.1.3 A health profile for the city's environmental management

A city health profile is a quantitative and qualitative description of the health of a city's population and factors (social, environmental, lifestyle) that affect it. It defines the problems and possible solutions. Its main purpose is to promote health-friendly activities and improve public health.

Thirty-two European cities – WHO's Healthy Cities Project members – are creating health profiles in order to help implement the main principles of the "Health for All" policy [1, 2, 3]. Health profiles usually reflect the following spheres:

- health status
- lifestyle
- living conditions
- socio-economic conditions
- physical environment
- inequalities
- physical and social infrastructure
- public health services and policy.

Health plans are being formed together with health profiles. They describe the health policy of a city and its strategic goals together with practical measures to achieve these goals during a certain period of time. Their aim is to create a vision for city health and the tools to achieve it by involving people at the regional, national, and international levels, and by making a commitment to health. Health plans have two main features: universality and intersectoral cooperation. Universality means that not only the health sector but also other sectors of the city are responsible for health.

5.2 DEMOGRAPHY

5.2.1 A decreasing population in Kaunas

In the beginning of the year 2000, 400,000 people lived in Kaunas. The largest increase in population during the postwar period occurred in the seventies and eighties. At the end of the eighties, the growth rates stabilized and since 1990 they have been decreasing. In 1992, for the first time during the post-war period, a population decrease was observed (Figure 5.2).

According to population prognosis data, this decrease will continue until 2020, and the number of inhabitants will drop to 370,000 inhabitants.

Natural increase accounted for the largest part of the population increase. In 1993, the number of births and deaths was almost in balance, but in 1994 the situation deteriorated – more people died than were born – and in 1995, it was 1.1 for 1,000 inhabitants.

Since 1987, the number of births has decreased continually and in 1999 only 4,230 babies were born in Kaunas (Figure 5.3). The decrease in demographic parameters and the decrease in the number of births was caused by a decrease in the economic situation and the deterioration of living conditions in all of Lithuania. In 1990 in Lithuania, there were 15.3 births for every 1,000 inhabitants; in 1995 there were only 11.1 births for every 1,000 inhabitants, which corresponds to less than two children per woman during her lifetime.

Since 1987, more people immigrated than emigrated. The largest group of immigrants were returning exiles. During recent years the character of migration has changed. Emigration has increased, particularly to Western countries. The pattern of migration within Lithuania has changed as well. The increase in the growth of cities and a decrease in the rural population, caused by migration from the countryside, reversed when in the 1990s the economy deteriorated with increasing unemployment, housing problems, and privatisation of land. Cities are no longer an attractive place for migrants and since 1992, more and more people have gone back to work on returned land.
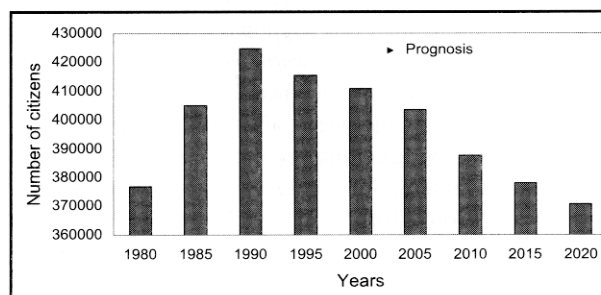

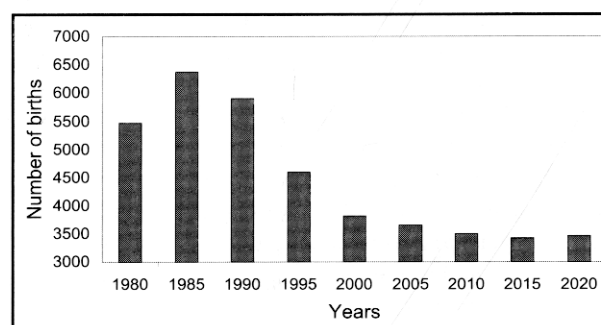**Figure 5.2** Kaunas' population changes to year 2020.
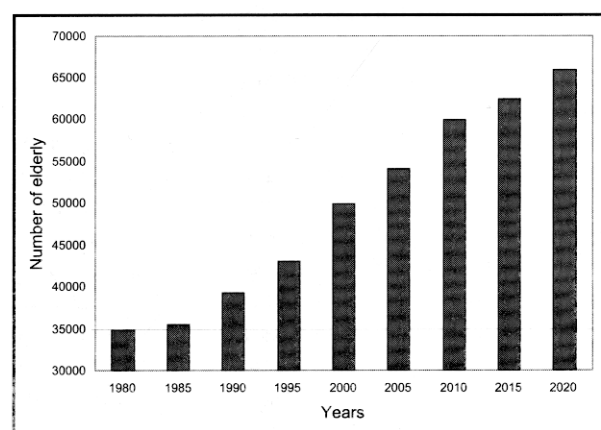

Figure 5.3 Number of births in Kaunas to year 2020.

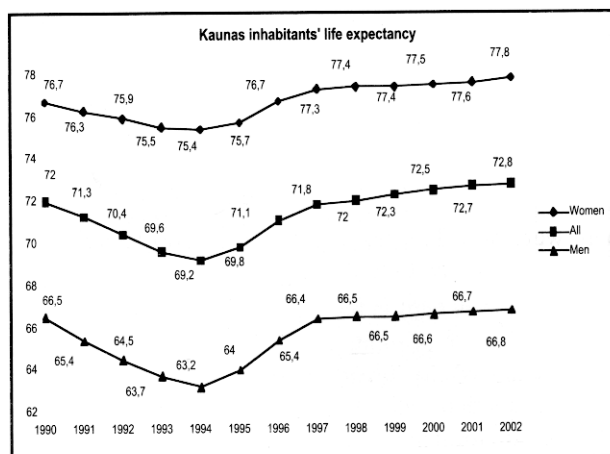**Figure 5.4** Number of elderly (over 65 years) in Kaunas.
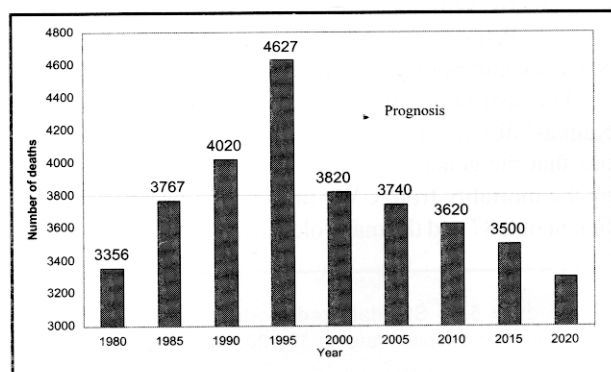
Figure 5.5 Life expectancy in Kaunas.

Figure 5.6 Number of deaths in Kaunas up to year 2020.

5.2.2 Increasing age and decreasing life expectancy

The number of inhabitants aged 65 and over is conti-nuously increasing. In 1990 they constituted 16.2% of the entire population. In 1995 it had increased to 17.3%. This means that Kaunas has exceeded the limit of high demo-graphic aging.

The aging of the population has two main causes – the number of children has decreased because of low birth rates, and the number of middle aged and elderly people has increased due to an increased life expectancy during the post-war period. As the aging of Kaunas' population appeared during a time of low birth rates, it will have a tendency to increase in the future as well (Figure 5.4).

The average life expectancy in Kaunas from 1987 to 1995 decreased from 71.5 to 69.2 years. The life ex-pectancy of males decreased more than that of females. The year 1993 distinguished itself as the most adverse for health. The main reasons for the decrease in life expec-tancy from 1990–1994 were accidents, injuries and cardio-vascular diseases, which were responsible for a respec-tive decrease in average life expectancy of 45 and 23% (men) and 27 and 29% (women). From 1995, the average life expectancy started to increase. The prognosis predicts an increase until the year 2002.

The changes in the age of the population have caused social and economic problems. The need for social main-tenance and care, medical and special services increased, as did the number of disabled people.

5.3 THE HEALTH PROFILE OF KAUNAS

5.3.1 Mortality 1980–2000

Mortality data of Kaunas' city districts were collected from 1980 as part of a municipal monitoring programme [4, 9]. During the fifteen years from 1980 to 1995, the mortality rate in Kaunas grew continuously [6, 7]. The Kaunas data compared with mortality data of the Lithuanian popula-tion as a whole [8]. Beginning in 1996, mortality from all causes started to decrease (Figure 5.6) Up to the year 2000, the mortality rate for men decreased every year, and the prognosis suggests a continued decrease to the year 2020. The mortality rates in Kaunas were lower than Lithuanian mortality rates (Figures 5.7a-d).

During the 15 years between 1980-95 the mortality of Kaunas' inhabitants aged 25-64 increased by 8.6%. The largest changes were observed in death rates caused by cardiovascular diseases (CVD) and external causes (inju-ries, poisoning, suicides, murders). During a 10-year pe-riod, mortality from CVD increased by 20.0%, and the mortality from external causes by 20.3%, from 321 (1986)

The health profile of Kaunas

1. The personal health evaluation in the different Kaunas city districts varies greatly. The highest occur-rence of complaints about health is found in Centras district (78%), the lowest in Dainava district (41%).

2. In 1999 more men (33.9%) than women (20.6%) evaluated their health as excellent or very good. 66.1% of the men and 79.4% of the women evaluated their health negatively (average, poor, or very poor health). This corresponds to the earlier obtained research data. Women evaluate their health as poor more frequently than men.

3. The highest percentage of respondents had complaints about having respiratory diseases (27.9%). A comparatively high percentage of respondents indi-cated that they have not been ill during the recent 12 month period (21.8%).

4. The most unfavourable city district for health is Centras. The occurrence of diseases in this district is the highest for 10 out of 14 listed groups of diseases. The most favourable district for health is Zaliakalnis. Complaints about having various diseases (except for mental diseases) is the lowest in this district.

5. The mortality rates of Kaunas city inhabitants (especially men), increased during 10 years (1983-1992). The mortality rate of Kaunas inhabitants in the age group 25-64 years increased by 8.6%. From 1995-2000 the mortality rates of Kaunas city inhabitants were decreasing constantly.

6. The different mortality zones in the city were defined. Sargėnai, Šilainiai, Zaliakalnis, Dainava and Kalnieciai districts are in low and average risk zones. Vilijampolë, Centras, Aleksotas, Panemunë, Dansiai, Petrasiûnai and Palemonas districts are in the in-creased risk zone.

7. Due to the decreasing birth rates the number of Kaunas inhabitants will be continuously decreasing till the year 2020.

to 430 (1992) per 100,000 inhabitants (CVD) and from 157 (1986) 290 (1992) per 100,000 inhabitants (external causes). There were no noteworthy changes observed in the rates of mortality caused by cancer.

The mortality rates for men and women were separately analysed. The mortality for males increased statistically from 827 (1986) to 1,163 (1992) per 100,000 inhabitants. For women the corresponding figures were 331 and 403 per 100,000 inhabitants. Though unreliable, the general mortality for females showed a tendency to decrease. For males between 25-44 years of age most frequently died from external causes (48.9% of all deaths). CVD was the most common cause of death for males aged 45 years and over. In the group of males between 55-65 years of age, deaths from CVD constituted 45.5% of all deaths. For females aged between 25-54 years cancer and external causes were equally important, with cancer being most important in the age group 45-54.

Since 1983, the Cardiology Institute of Kaunas Medical Academy has taken part in the international program, MONICA (Monitoring of Trends and Determinants in Cardio-vascular Disease). This enables comparison of the population of Kaunas' mortality rates with data from 39 other centres taking part in the MONICA program. A comparison of the data shows that the health of the Kaunas' population is worse than the health of the inhabitants in the majority of other countries. The general mortality rates of the male population of Kaunas are lower only than those of Budapest, Novosibirsk, Novi Sad and Warsaw. The mortality rates from CVD are rather high, 498/100,000. The highest mortality from CVD is in North Korea, 588/100,000 and the lowest is in Japan, 179/100,000 [6].

5.3.2 Mortality rates in the city districts

The distribution of mortality rates from all causes in the city of Kaunas' city districts is shown in Figures 5.8-5.11. The five districts with lower than average general mortality rates are located in the Northern part of the city, in the districts of Sargėnai, *Šilainiai*, Zaliakalnis, Dainava and Kalnieciai. The other seven districts, which have an increased risk, Vilijampolë, Centras, Aleksotas, Panemunë, Sanciai, Petrasiunai, and Palemonas, are situated in the Southern and South-eastern parts of the city.

The distribution of mortality from CVD in the city of Kaunas' districts is very similar (Figure 5.11). It's obvious that the general mortality rates are strongly affected by the mortality from CVD rates with a correlation coefficient of 0.87 and the manifold correlation coefficient ($r2$)

Figure 5.7a Standardized general mortality rate for 100 000 inhabitants.
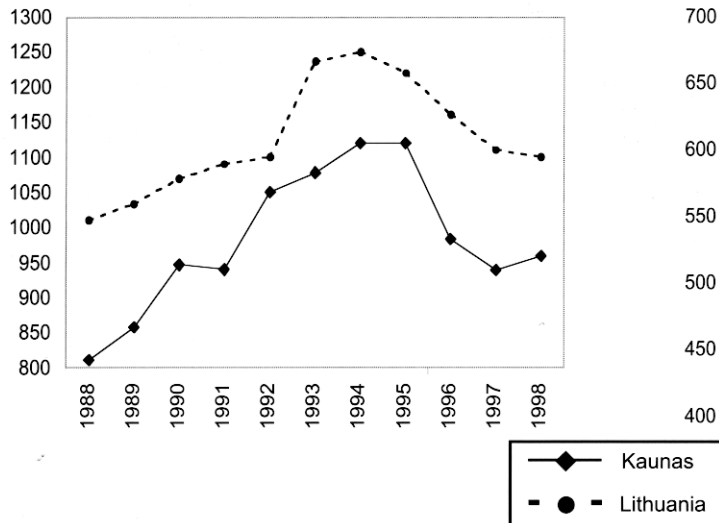
Figure 5.7b Standardized mortality from cardio-vascular diseases rate for 100 000 inhabitants.
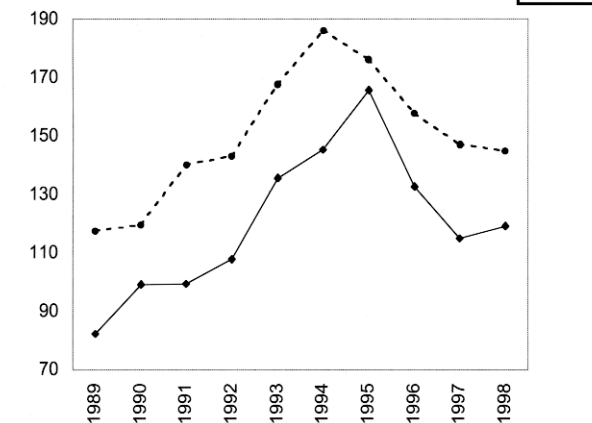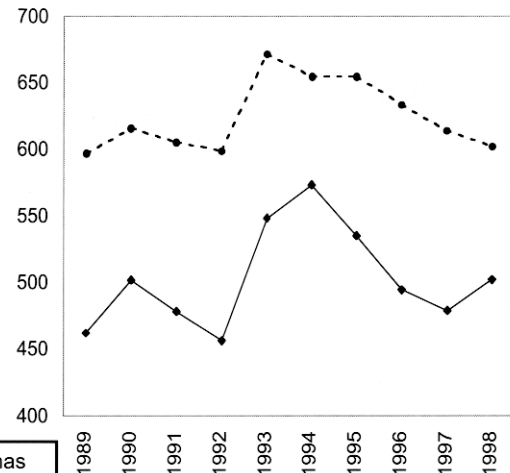
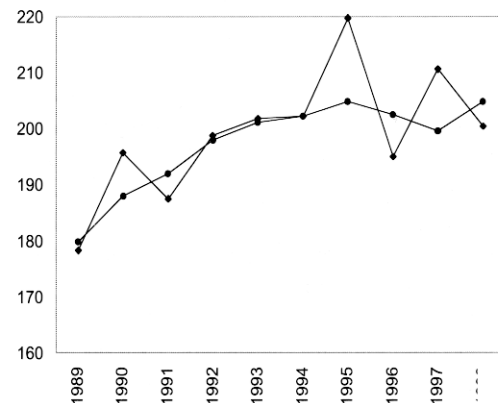**Figure 5.7c** Standardized mortality from all external causes for 100 000 inhabitants.

Figure 5.7d Standardized mortality rate from cancer per 100 000 inhabitants.
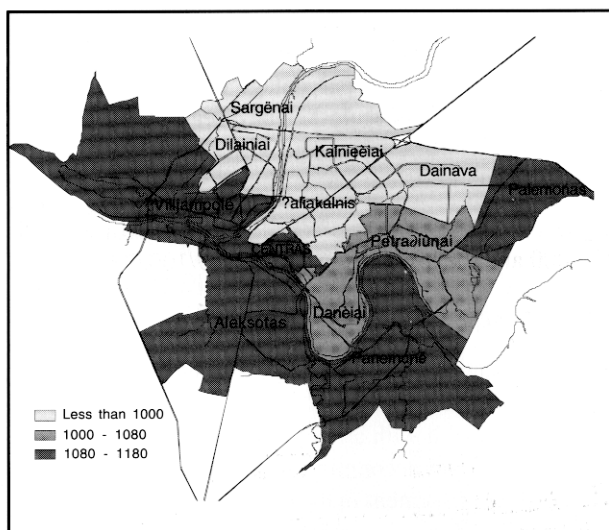
Figure 5.8 Standardized general rates of mortality per 100,000 inhabitants by individual district in the city of Kaunas, 1992–1996.
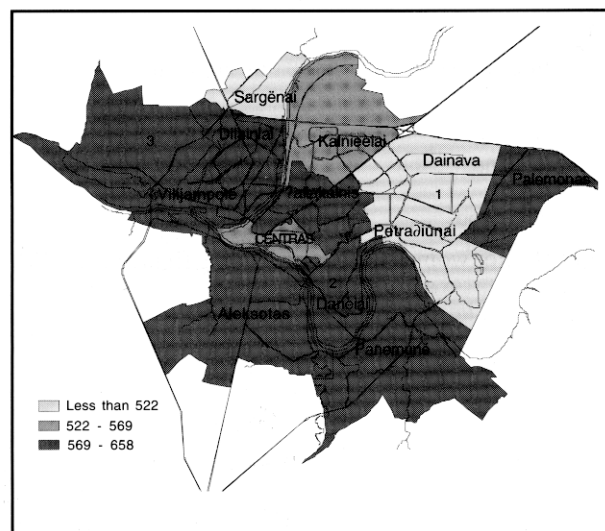

Figure 5.9 Standardized rates of mortality from cardiovascular disease per 100,000 inhabitants by individual district in the city of Kaunas, 1992-1996.
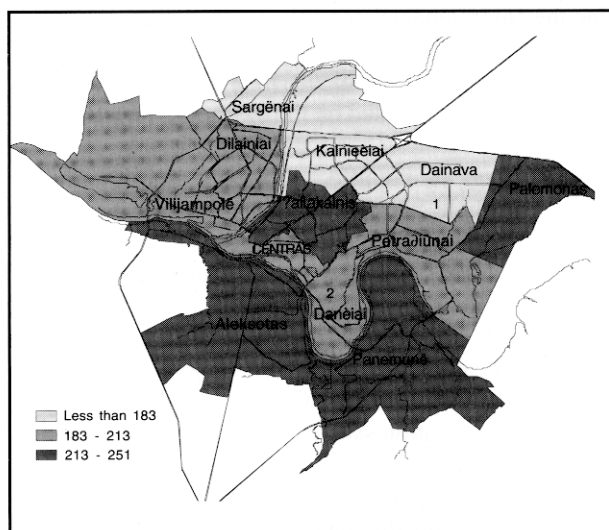

Figure 5.10 Standardized rates of mortality from cancer per 100,000 inhabitants by individual district in the city of Kaunas, 1992-1996.
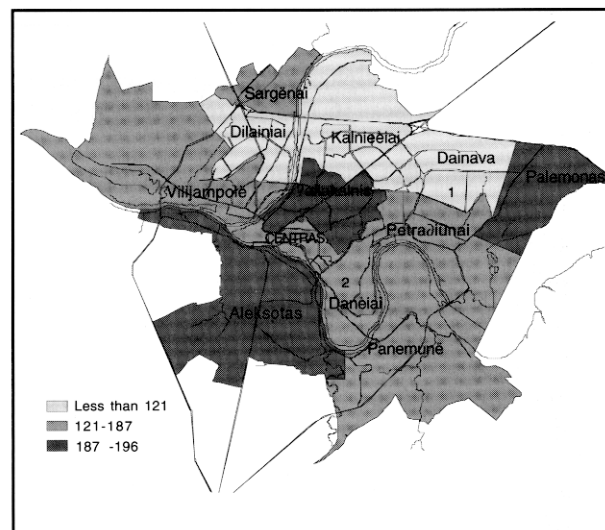

Figure 5.11 Standardized rates of mortality from all external causes per 100,000 inhabitants by individual district in the city of Kaunas, 1992-1996.

76%. CVD constitute 42-64% of the general mortality in the individual districts. Research at the Kaunas Cardiology Institute suggested that the most influential factors affecting mortality and morbidity are increased cholesterol, high blood pressure, smoking, alcohol, overweight and age.

The contribution of the deaths from cancer to the general mortality is 15.8-19.8%. There is a direct relation between the distribution of mortality from cancer (Figure 5.11), and general mortality in the city's districts, with a correlation coefficient of 0.91 and a manifold correlation coefficient of 83%. As expected, the correlation between the districts as to deaths from cancer and CVD is high (correlation coefficient 0.94). The two districts with the lowest percentage of deaths from cancer and CVD are Kalnieciai and Dainava.

Deaths from external causes (Figure 5.11), which constitute 10.5-16.5% of the general mortality, is lowest in Šilainiai, Kalnieciai, and Dainava, and highest in Alekso-tas, Palemonas and Zaliakalnis.

5.3.3 Self-assessment of health Kaunas

The health profile of Kaunas was also investigated by a questionnaire study. The personal evaluation of health does not always conform to the real physical state of health. The subjective evaluation of health corresponds to the objective health indices by 80%. Nevertheless it reflects his/her level of working capacity, fatigue, specific diseases, etc. [14]. In a 1999 self-assessment study a randomly selected sample of 600 men and 600 women in Kaunas were asked [17] to evaluate his/her health within a five grade scale: 1. poor, 2. average, 3. good, 4. very good, 5. excellent. They were also asked to indicate which diseases were troubling them.

The result of the study indicated that more men than women evaluated their health as excellent or very good. (Table 5.1) This agrees with earlier results. Women, more frequently than men, evaluate their health as poor. The respondents were asked about which diseases they were ill with (they were given a list of possible ones) during the

Table 5.1 Self-assessed health status.

Health	Men %	Women %
Poor	1.9	4.2
Average	11.9	18.7
Good	39.3	43.0
Very good	40.8	30.5
Excellent	6.1	3.6

Table 5.2 The frequency of complaints about health in Kaunas city districts (%).

District	Complaints about health %
Dainava	41.1
Aleksotas	59.6
Šilainiai	65.2
Petrasiûnai	65.3
Sanciai	67.9
Kalnieciai	70.9
Zaliakalnis	71.0
Vilijampolë	73.0
Centras	77.8

recent 12 months. The highest percentage of respondents indicated heart diseases (16.1%) and respiratory diseases (15.6%).

There was a direct interrelation between the self-assessment of health and the level of education. The percentage of men that evaluated their health as good or excellent was 3 times higher (42.3 %) in the group with university education than in the group wioth only primary education (13.8%). The corresponding figures for women were 29.4 and 11.5%.

Earlier data about the subjective health of Kaunas city inhabitants were available from Kaunas Healthy city office. In comparison with 1995 the number of the respondents who answered that their health are good was higher in 1999. If in 1995 the number of the respondents who indicated their health as good was 19.5% for men, in 1999 it was 40.8%. There were no considerable changes in the health evaluation of Kaunas city inhabitants from 1983 to 1992 (p>0.05). During three polls 39.1, 39.3, 35.5% of men and 20.5, 19.2, 17.7% of women identified themselves as healthy (absolutely healthy, good health, healthy). While the percentage of men who identified themselves as ill did not change during the period the percentage of women that identify themselves as ill tends to grow – 13.4, 15.4, 19.4%. As a result of the dramatic changes in Lithuania during the 1990s self-assessed health has from 1995 improved considerably.

5.3.4 Differences in self-assessment of health between city districts

The self-assessment of health differed in the different districts (Table 5.2). The lowest percentage of complaints about health came from people living in Dainava district (41%), and Aleksotas districts (60%). Zaliakalnis district had a low figure in almost in all categories of diseases. The highest percentage of respondents having complaints about their health lived in Centras (78%) and Vilijampolë (73%) districts.

Complaints about respiratory diseases was highest in Dainava and Petrasiûnai and lowest in Zaliakalnis.

Comparatively high percentage of respondents indicated that they had musculoskeletal diseases (20.6%), with highest figures for Centras and Vilijampolë districts (33 and 29%) and lowest in Zaliakalnis district.

5.4 THE QUALITY OF THE ENVIRONMENT IN KAUNAS

5.4.1 Monitoring the quality of the environment

The physical environment is one of the main factors affecting our health with an importance comparable to genetic factors, and accounting for some 20% [19]. Work for health improvement in the city has to consider air and water quality, acoustic quality and waste management.

Parameters and indicators for the assessment of Kaunas acoustic and air quality were chosen referring to the recommendations of World Health Organisation and European Environment Agency [20,21]. The parameters define the environmental conditions: the pollution level of air, water; and the noise levels. Indicators show the severity of environmental problems, their significance to citizens. They are calculated on the basis of parameters [21] (Table 5.3).

Inhabitants are not affected by only one air pollutant but by the whole group of them, and by their interaction as well. Therefore air pollution in Kaunas was assessed according to the combined air pollution index. It is derived by summing the concentrations of pollutants, including dust, nitrogen dioxide, sulphur dioxide, formaldehyde and carbon oxide, and assessing their toxicity. A combined air pollution map was constructed using a geographical information system (GIS). As the distribution of pollutants depends on landscape, two mezzoclimatic types, valley and plain, were distinguished. The mechanisms of pollutants distribution and accumulation differ in these zones.

Table 5.3 Parameters and indicators for the assessment of urban environment.

Parameters
Average concentrations of pollutants
Maximum permissible concentrations of level of pollutants (standards)
Combined air pollution index (AUI)
Equivalent sound pressure level (L eq, 24h.)

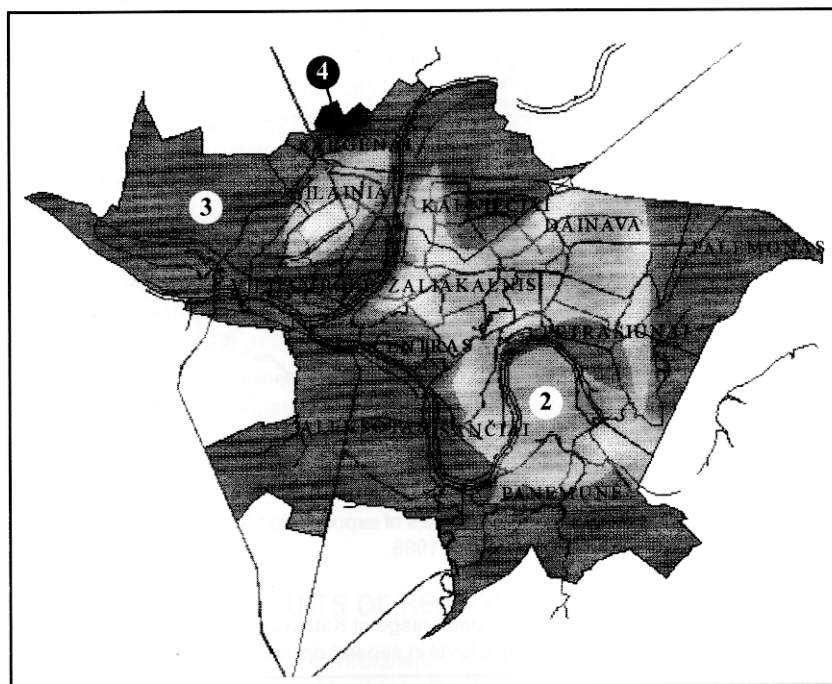| Indicators |
|------------|
| Percentage of children and adults exposed to the maximum acceptable noise level 65 dB(A); |
| Percentage of children and adults getting bad quality water; |
| Percentage of children and adults living within the zones of increased air pollution level |

Figure 5.12 The air pollution zones in Kaunas, 1999: 1. Low pollution; 2. Moderate pollution; 3. High pollution; 4. Very high pollution.

5.4.2 Evaluation of air pollution

Air pollution was expressed using the complex atmosphere pollution index (API). API is a non-dimensional parameter, showing the level of air pollution by different pollutants normalizing it with one particular pollutant. We chose the API for evaluation of the atmospheric pollution used by the Lithuanian Ministry of Environment:

$$API = \sum_{i=1}^{n} C_i * \frac{N_i}{MAC_i}$$

Here

- C_i is a non-dimensional constant for pollutant i, which allows for comparison with pollution by SO_2;
- MAC_i (Maximum Average Concentration) is the average daily MAC for pollutant i;
- N_i is the average concentration of pollutant i.

API is derived after adding up the APIs of dust, NO_2 and SO_2, formaldehyde and carbon monoxide. The complex API becomes the sum of the API of separate pollutants and it indicates the level (SO_2 in MAC units) of the air pollution, that is, it shows how many times the general air pollution exceeds acceptable norms for SO_2.

The classification of zones of the map was done by normalizing all the pollutants according to their MPC (Maximum Permissible Concentrations, or standards). Four zones of combined ambient air pollution were distinguished, namely less than 0.25 MPC, 0.5 MPC, 0.75 MPC, 1.0 MPC, also called 1) Low pollution; 2) Moderate pollution; 3) High pollution; 4) Very high pollution.

5.4.3 Kaunas air pollution map

Kaunas complex air pollution map is presented in Figure 5.12. The data from 1999 in Figure 5.12 were compared to results from 1993 and 1996.

The western part of the city is relatively less polluted (medium pollution zone) and the eastern part is more polluted (hazardous pollution zone). The worse status of the eastern part of the city is caused by the concentration of industry and by the dominating Western and South-western winds.

Sargenai district in the hazardous pollution zone has Sargenai ceramics plant as major dust polluter, Petrasiûnai and Dainava districts are zones of increasing pollution. The main polluter in Petrasiûnai district is Petrasinûai heat plant, and in Dainava district Kaunas heat plant.

All the other districts except Šilainiai are in the most polluted zone. In Centras, Sanciai and Zaliakalnis districts the considerable general pollution occurs due to the pollution with formaldehyde (MAC 1.5-2.0) and ozone (MAC 1.5-2.0). The main polluter is car transport.

The cleanest districts are Aleksotas and Šilainiai.

Centras district has been distinguished as very polluted from 1993 to 1999 and 85-100% of residents are exposed to increased pollution level. Centras is located in Kaunas valley. There is no industry, but the road network is dense, so the main air polluter in this district is transport.
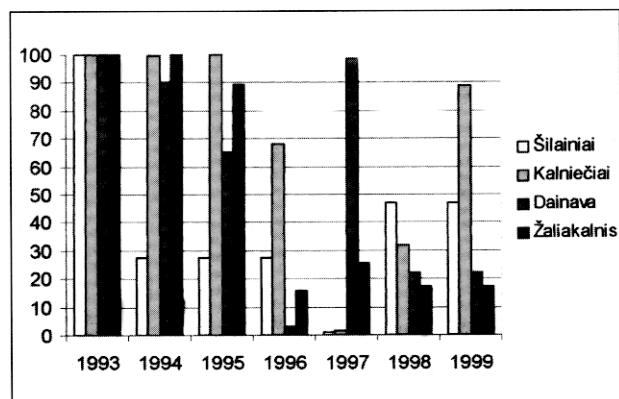

Figure 5.13 The percentage of Kaunas population falling within the high and very high air pollution zones in Šilainiai, Kalnieciai, Dainava and Zaliakalnis districts.

In the other valleys districts, Sanciai and Petrasiûnai, the percentage of population within high and very high air pollution zones decreased up to 1996 and then increased to 1999.

In the two industrial districts Palemonas and Sargenai the percentage of population within high and very high air pollution zones were the same in 1993 and 1999, after a small decrease in 1997.

In the residential districts Šilainiai, Kalnieciai, Zaliakalnis and Dainava (Figure 5.13), which are located on the plain, the percentage of population within high and very high air pollution zones has decreased during the whole period.

In conclusion in both industrial and residential districts there has been a change of population from very high to high pollution zones. The situation in the valley districts (Centras, Sanciai, Vilijampolë), where distribution of pollutants is minimal, is worse than in the plain. Since the main source of air pollution in city is traffic this factor is essential. Moreover, due to the differences of temperatures between the central part of the city and the outskirts pollutants move from industrial districts towards centre, where the population density is higher, and air pollution there becomes a particularly important problem.

5.4.4 Acoustic quality

The percentage of city inhabitants exposed to 65 dB(A) noise in 1997 in separate districts was calculated by assessing the density and the width of noise zones of separate districts (Figure 5.14) [23], using WHO recommendations [21]. Table 5.4 presents the number of adults (more than 16 years) and children up to 16 years of age in different city districts which live in the zones exposed to 65 dB(A) noise.

The zones of 65 dB(A) was compared to estimated traffic volumes in different city districts. The zones of increased noise level depended on the volume of traffic flow. The results seemed to be similar to those of most European cities. 15.7% of Kaunas city population was exposed to 65 dB(A) noise level. In European cities this percentage varies from 10 to 20%.

The largest population exposed to unacceptable levels of noise live in the Centras, Dainava, Zaliakalnis, Kalnieciai, and Vilijampolë districts, with respectively 27.3%, 22.7%, 21.8%, 16.6% and 14.5%. These districts have the most intensive traffic and the highest population density. In ·ilainiai and Petrasiunai districts this percentage is a bit lower (12.7% and 12.6%) but it still exceeds the limit of 10%. In Palemonas and Aleksotas districts unacceptable levels of noise is comparably low (2.5% and 7.7%) coinciding with the low traffic intensity.

5.4.5 Water

Kaunas, lying on the junction of Nemunas and Neris rivers, started to build a wastewater treatment plant in cooperation with foreign companies only in 1992. It has only recently started to work fully. Until then all the sewage waters of the city have been released into the rivers through nine release pipes without any treatment.

The residents of Kaunas are supplied with water from four waterworks. Currently the quality of drinking water
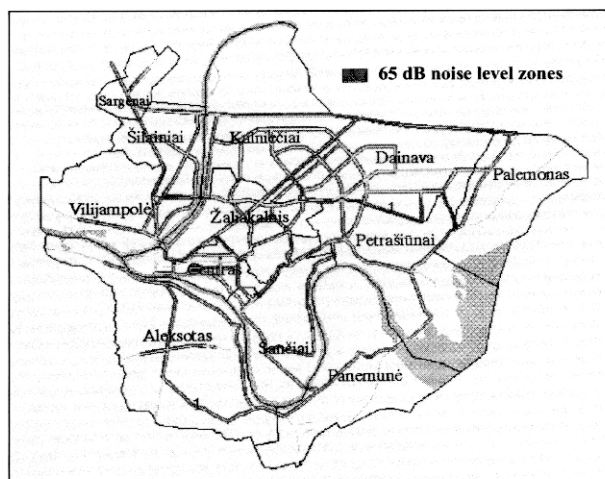

Figure 5.14 The zones of exposure to 65 dB(A) noise level due to traffic in Kaunas in 1998.

Table 5.4 The percentage of Kaunas city inhabitants exposed to 65 dB(A) noise level in separat districts in 1998.

Kaunas City District	Adults %	Children %
Centras	27.3	27.3
Dainava	22.7	22.0
Zaliakalnis	21.8	22.0
Kalnieciai	16.6	16.0
Vilijanmpolë	14.5	13.0
Silainiai	12.7	12.0
Petrasiûnai	12.6	12.0
Sanciai	9.0	9.0
Sargënai	9.0	9.0
Panemunë	9.0	8.0
Aleksotas	7.7	7.7
Palemonas	2.5	2.0

Table 5.5 The percentage of Kaunas city inhabitants using the low water standard in separate districts in 1998.

Kaunas City District	Percentage using low standard water
Sargënai	0
Aleksotas	22
Silainiai	40
Danèiai	52
Vilijanmpolë	62
Centras	68
Palemonas	84
Panemunë	89
Petrasiûnai	89
Zaliakalnis	93
Dainava	98
Kalnieciai	99

doesn't meet the standards according to the chemical pollution parameters. Petrasiuinai waterwork provides the worst quality water where the standards levels for iron and manganese are exceeded. From 60% to 99% of the inhabitants in Dainava, Kalnieciai, Zaliakalnis, Centras, Panemunë, Palemonas, Petrasiûnai, Vilijampolë districts get such drinking water. (Table 5.18)

5.4.6 Green areas

Green areas constitute ecologically important parts of the urban environment. Within the city, where there is a high concentration of people and pollutants, plants improve the urban climate, muffle the noise, capture dust and gases, provide areas for recreation, and contribute to urban design. All these functions can work effectively when green spaces are protected, and the harmful impact of urban environment on them is reduced.

In Kaunas there are 9,160 ha of green areas. This corresponds to make 59% of the total city area, but only 23.8% are used for recreation.

18 city parks, 40 squares and 3 forest parks make one fourth of the city green space. Three areas are under protection: Kaunas Sea regional park, and Jiesia and Versva landscape reservations.

5.5 THE DETERMINANTS OF HEALTH

5.5.1 The importance of the environment – air pollution

The reason for differences of health in Kaunas over time and its different districts are certainly varied and complicated and it is difficult to distinguish them. Here we will focus on the role of environmental and social factors.

Even if the high percentage of the people suffering from respiratory diseases can have different causes, one of them is air pollution. The high morbidity in Dainava and Petrasiunai districts can be explained by the increased air pollution as compared to other districts of the city. Dainava district is situated next to Kaunas thermal electric power station, and has a high traffic intensity. In addition 'Dirbtinis pluostas' factory and the Palemonas Ceramics plant contributes to air pollution in the district. Petrasiunai is the largest industrial area with Petrasiunai thermal electric power station as the main polluter. In addition apartement houses are close to streets with intense traffic in this district. The World Health Organisation has estimated that the morbidity from lung cancer and other respiratory diseases would decrease by 20-30% if air pollution was reduced by half [15].

Also in the centre of the city, Centras, Sanciai, and Vilijampolë districts, with poor health status the situation is similar with poor air quality.

There may also be other environmental factors, such as low quality water, behind a poor health status, especially in the central districts. Such links are however very much more difficult to establish.

5.5.2 The importance of social problems in the city

The social situation is also an important correlate of health. This may be exemplified by the fact that Zaliakalnis and Aleksotas districts, where the health situation is best, also have a better social situation and are dominated by one and two storey houses and comparatively much green areas [16]. On the contrary Šilainiai district is dominated by block houses.

Correlations between health and social factors in Kaunas were investigated in a 1997 questionnaire, when Kaunas residents were asked about their health and 14 listed social problems affecting health. Each respondent

Table 5.6 Results of the questionnaire on the importance of social problems in Kaunas.

Problem	%
Poor health	19.0
Poverty	16.0
Alcohol consumption	13.0
Unemployment	12.0
Dangerous environment	8.0
Bad staffs work	5.5
Stress	5.0
Conflicts	4.8
Poor diet	4.0
Amoral behavior	3.5
Air and water pollution	3.0
Bad household conditions	2.5
Smoking	2.4
Bad medical care	1.0

was asked to give the highest rank for the, from their point of view, most important problem. The worst problem was given ranking 1 (highest rank), less bad 2 etc., while the lowest rank 14 should be given to the problem that in comparison with other 13 was the least severe. In another part of the questionnaire the respondents were asked to rank eight values (or negatively problems) in the same way.

The questionnaire was also given to the politicians, the members of Kaunas City Council, and the executives of municipality administration.

From the results it is clear that majority of respondents gave the highest rank to the problem associated with health and illness (Table 5.6). Poverty is in the second place. Alcoholism got the highest rank by 10% of the responding men and 15% of the women. All other problems got the highest rank much less frequently. 1.6% of women gave the highest rank to the problem of poor household conditions. Only 1.4% of men and 0.8% of women gave the highest rank to the problem of bad health service.

Residents and members of the City Council and administration defined 4 social problems as priorities. These were: health and illness, poverty, unemployment, and unsafe environment (hooliganism and robberies).

The order of these differs slightly between the groups. Residents and administration members indicated health and illness as the most important problem while members of City Council put the poverty on the first place. In residents opinion the problems of alcoholism and stress that are related to health are quite important, and are given rank five and six.

In the value priorities 45% of men and 50% of women indicated the health (good physical and mental state) as the most valuable, while 33% of men and 33% of women said that family well-being is the most valuable for them.

In summary the results of the two methods to investigate the opinions of Kaunas residents about social problems and values both indicate that health (good physical and mental state) is the highest value, and that the problem of poor health, illness is the most important social problem. The result of the questionnaire is used to set priorities for the decision-makers when social problems are managed.

Figure 5.15 Besides measures to reduce pollution and poverty in the city, Kaunas citizens are also encouraged to adopt a healthier lifestyle. Photo:Lars Ryden.

5.5.3 Implementing health promoting measures and programmes

Measures to improve the health profile of the inhabitants of Kaunas are urgently needed, and have been worked on already since several years. Even if the causes of poor health are not easy to identify some measures to promote the health are obvious and important.

One category of measures are those that aims at reducing emissions and polluting effluents. Reducing air pollution is a long-term undertaking and will develop together with proper legal requirements. This will be easier to implement in factories, where filters and changed technology may reduce emissions substantially, than in traffic which will remain a difficulty for a long time.

Improved water will depend on the water works and will develop together with the legal regulation of water.

A second category is measures connected to urban planning. The most straightforward way to reduce the percentage of population exposed to severe air pollution is to separate the large traffic routes from people. This is partly achieved in the long term planning of Kaunas. Already since some years the major street in the centre of the city is car free.

To solve the problem of noise in the Centras, Dainava, Zaliakalnis, and Kalnieciai districts with the highest population density, noise reduction measures and management of traffic flows are needed. The proposed measures might include limitation of traffic through centre, development of public transportation system, and building more paths for bicycles. The measures of noise reduction (acoustic screens) are being used on Kalantos street, and will be applied in other noisy areas such as the crossing of Savanoriu pr. and Tvirtoves al., at the Gimnazijos st., and the hill-side of Savanoriu pr. etc.

The situation regarding the green areas is comparatively good. Care and management of city green areas are today collected and developed in Kaunas City Plantings Programme.

A third category constitutes programmes in the sector of public health. Social programmes to improve health include measures to combat poverty, unemployment, smoking and alcoholism, and to stimulate sports.

THE HEALTH PLAN OF KAUNAS CITY

Kaunas Health Plan consists of programmes for protection of the environment, health promotion, social security and linking environment and health.

A. PROTECTION OF THE ENVIRONMENT

1. Waste
Development of a waste management system and its implementation without risk to the environment, to reduce the amount of waste and ensure waste recycling; separation of hazardous waste.

2. Water
Development of the water supply system, and the waste water treatment plant, to supply citizens with high quality drinking-water.

3. Green areas
Preparation of a management system for green areas, landscape reservation areas, and the 12 city parks, and to arrange a recreation zone in Lampedziai.

4. Energy and ecology
Energy saving and environmental protection, including improvement of power plant efficiency, treatment of flue gas emitted from power stations, improvement of district heating network, and energy efficiency enhancement of residential areas.

5. Transport
Limitation of traffic via the central part of the city, to use acoustic screens, to develop a network of bicycle paths within the city.

B. PROMOTING PUBLIC HEALTH

6. Healthy food
Providing Kaunas inhabitants with safe and healthy food, paying special attention to nutrition of babies, children and sensitive groups; to encourage the inhabitants' willingness and responsibility to choose healthy food.

7. Non-communicable diseases
Promoting a healthy life style, by reducing risk factors (overweight, smoking, hypertonia etc.), though changing the public opinion on health and the individual's responsibility for his/her health.

8. Healthy kindergardens and schools
Health promotion in the kindergardens and schools, developing the knowledge and habits of pupils concerning health; to create an integrated programme for child health together with teachers, physicians, families and the society.

9. Tobacco
Smoking control to reduce and eliminate smoking as a risk factor for human health through the creation of smoking-free environments, ban of smoking in health services, smoking prevention in schools, propagation of non-smoking as a norm of social behaviour, and support to smokers who quit smoking.

10. Healthy life style
Promoting healthy living habits at individual, family and community level, to open the centre of healthy life style in Lampedziai and organize courses for the inhabitants.

11. Caries prevention
Reducing the prevalence and intensity of caries by 30% in children of age 7-12, improving oral hygiene by 30-40%, increasing the number of children brushing their teeth from 52% to 80%.

C. IMPROVING SOCIAL SECURITY

12. Social needs
Studying the social needs of inhabitants and their evaluation of environment and health, to form a municipal social policy.

13. Social care system
Developing the social care system the institutions of social care, e.g. with a home for mentally and physically handicapped youth.

D. LINKING ENVIRONMENTAL PROTECTION AND PUBLIC HEALTH

14. Monitoring
Develop the municipal ecological monitoring, existing since 1993, to assess the impact of antropogenic activities on environment and health; the programme includes studies on the atmosphere (meteorologic factors, noise, pollutants), hydrosphere (surface water, wells, wastewater, rain water), litosphere (soil pollution), biosphere (flora), and the human population (demography, morbidity).

15. Accident prevention
Developing a programme for accident (injuries, road accidents, poisoning, etc.) prevention.

16. Ecological education
Reorganizing the centre of ecology for students, establishing a "green telephone"; to coordinate the ecological education conducted by the state, municipality and non governmental organizations; to establish a Healthy city Institute which to conduct courses for municipality workers in the field of environment, health and social care management.

17. Information systems
Creating an information system on health and environmental management using GIS; publishing annually Kaunas health profile and health plans and analyzing opinions about environment and health management in the city.

5.5.4 The long-term undertaking: Education and a city for all

In the long-term education is importantly contributing to an increased awareness of health issues and knowledge of how to take care of oneself and lead a healthy life.

Included in the aims of the Kaunas school system is that health for all children and young people should be improved, giving them the opportunity to grow and develop to their full physical, mental and social potential.

Pupils of secondary schools can choose at their liking several subjects such as healthy living, ecology, energy saving etc. During other lessons (physical activities, nature, biology, chemistry, housekeeping) the healthy living is propagated and hygiene habits are introduced and being developed, too.

At the moment eight kindergartens participate in the programme "Healthy kindergarten". The "Healthy schools" programme is implemented in three secondary schools: Rasa, J. Jablonskio and Radvileno. The main aim of these programmes is to protect and promote the health of children teaching them to look after their own health consciously.

A special aspect is that children with special needs have possibilities to attend the special pre-school institutions, boarding-schools, or centres of development. In order to reduce the isolation of these pupils some integrated (mixed with children without special needs) groups and classes are opened.

A healthy life should also be possible for individuals with special difficulties. At the moment not enough attention is paid to the needs of disabled persons. There are about 16,000 of them in Kaunas city. Many of them join sport and recreation clubs with special programmes. There are six such clubs at the moment. In 1995, a Council for disabled people was established in Kaunas Municipality. This Council prepared a social integration programme covering the means for a lasting rehabilitation and integration of disabled people of Kaunas. This programme was created through the cooperation of departments of Municipality, Kaunas Medical Academy, Virthuiglis Rehabilitation Clinic, Sport and Recreation Clubs, and Associations for Disabled.

Notes & References

1. *Healthy city plan of the city of Copenhagen 1994-1997.*Copenhagen Health Services, Healthy cities project, 1994, p. 246.
2. *Working together for Glasgow's health*. Glasgow City Health Plan, 1995.
3. *City Health profiles*, Guidance document. ICP HSC 669 B/4. Healthy cities technical symposium, Poznan, 22-23 Sept. 1994., 1994, p.32.
4. B.Gailiusis, I. Kameneckas. Kauno municipalinio ekologinjo monitoringo programa. Kauno "Sveiko miestø projekto" konferencija, 1994.
5. Lietuvos gyventojø kitimo prognoze iki 2015 m. Lietuvos statistikos departamentas, Vilnius, 1996 m.
6. Kalediene R. *Lietuvos gyventojø sveikatos vertinimas remiantis mirtingumo statistika.*K., 1992, p. 193.
7. Misevièiene I. *Pagrindines chronines neinfekcines patologijos epidemiologine situacija ir metodiniai organizaciniai jos pirmines profilaktikos aspektai Lietuvoje.* Dr. dis.autoreferatas, Kaunas, 1991, 50 psl. (rus.).
8. Rastenyte D. *Kauno gyventojø sergamumo ir mirtingumo pagrindinemis sirdies ir kraujagysliø ligomis rodikliø pokyèio kryptys* (oficialiosios statistikos ir registrø duomenimis) Disert. med. kand. laipsniui aguti. K. 1991, p.199.
9. S. Domarkiene, K. Jureniene, D. Rastenyte, R. Radisauskas, J. Kameneckas. *Kauno gyventojø mirtingumas administraciniuose miesto rajonuose oficialiosios statistikos duomenimis.* Kauno m. ekologinis monitoringas '94. Kaunas 1995, p. 74-82.
10. The principal investigators of the MONICA project. WHO MONICA Project: geographic variation in mortality from cardiovascular diseases - baseline data on selection population characteristics and cardiovascular mortality. *World Health Stat. Q.*, 1987.Vol.40, N.2. p. 171-184.
11. Janusauskas A., "Vyrø ir moterø sveikata", Socialiniai sveikatos aspektai (straipsniø rinkinys) Vilnius-Kaunas, 1992. p.18-19.
12. DvedienëL. Barsauskas V., Petrokiene Z. ir kt. *Kenksmingø miesto aplinkos faktoriø àtakos isemines sirdies ligos paplitimui isaiskinimas: Metodinës rekomendacijos.* Kaunas 1989, p. 16.
13. Dvediene L., Jankauskiene K., "Pagyvenusiø ir senø zmoniø sergamumas skirtinguose pagal kenkinksmingumo lygà Kauno miesto rajonuose", Socialiniai sveikatos aspektai (straipsniø rinkinys) Vilnius-Kaunas, 1992. p. 53.
14. Goshtautas A. *Interrelationship between Psychological (Behavioral) and Somatic Ischemic Heart Disease Risk Factors in Kaunas MONICA-Psychosocial Study*. WHO Report ICP/CDV 118, Lugano, June 1990, p. 27.
15. *Health for all targets*, WHO Copenhagen, 1985.
16. Michelson, William. *Man and his urban environment: a sociological approach*, 1976.
17. A. Goshtautas, J. Kameneckas. *Socialinis aplinkos ir subjektyvus sveikatos vertinimas Kauno m. rajonuose pagal Pasaulines Sveikatos Organizacijos reikalavimus.* Kauno sveiko miesto projekto biuras. 1996 m. Kaunas.
18. Appels A., Bosma H., Grabauskas V., Gostautas A., Sturmans F., "Self-Rated Health and Mortality in a Lithuanian and Dutch Population", *Soc. Sci. Med.* 1996.Vol. 42. No 5. p 681-689.
19. *Health 21 — Health for all in the 21st century.* European Health for all Series No. 5 WHO Regional Office for Europe, Copenhagen 1998, ISBN 92 890 1348 6.
20. *Community noise.* Environmental health criteria document, WHO. Copenhagen, 1993.
21. *Europe's environment: The Dobris Assessment*, European Environment Agency. Copenhagen, 1995, p. 676.
22. J. Kameneckas "Geographical information system and urban ecology" *Enviromental research, engineering and management.* Kaunas, Technologija, 1996, N 2, p 1-1O. ISSN 1392-1649.
23. J. Kameneckas, N. Cistovaite "Assesment of Kaunas environment acoustic and air quality", *Environmental research, engineering and management.* Kaunas, Technologija, 1997, N 1(4), p. 16-23. ISSN 1392-1649