SUPERBS
Case Studies
Volume IV

Urban Environmental Management

Series editor
Lars Rydén

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Preface

The SUPERBS project attempts to make sustainable urban patterns visible and understandable. The project has for this purpose developed eleven model sites where ways to work with sustainability are examined and demonstrated. The character of the model sites varies. Some models are whole cities, like Turku, Uppsala and Kaunas, others are small neighbourhoods like Hågaby and Suchy Dwór, and a few are individual buildings as in Lüneburg and Hamburg. The model sites may be visited.

Each model site is examined by researchers and the resulting case study reports are published in four volumes. At each site, three different aspects of sustainable urban planning and community development have been explored. In addition, some further material from so called resources municipalities where other relevant development patters occur, are included.

The report series has been organised according to four themes, each illustrated by cases from two or several countries: Volume 1 deals with basic patterns of sustainability, Volume 2 with sustainable urban planning, Volume 3 concentrates on participatory approaches and democracy, while Volume 4 deals with environmental management. There is, however, no clear-cut division. Each of the reports has material relevant for all themes.

The purpose of the case studies is first to serve as study material in education on sustainable community development, secondly to be used by others who find the approaches used worth repeating.

In addition to these reports a TV series – City 2000 – is produced with one program from each one of the eleven model sites. The TV series will be the visual companion to the reports and, more than anything else, bring the inhabitants of each place into the picture.

The reports in this volume constitute a considerable amount of work spread out over more than a year. I would like to use this occasion to express my gratitude to all those who after many difficulties finally have put together their results. I hope and believe that the efforts made were well invested. The reports together provide a highly interesting reading on efforts in many different countries in our region to deal with the outstanding problems of our time: environmental pollution, economic and sometimes social decline. It is about how insightful individuals, cities and universities have found new ways to develop meaningful patterns of living, patterns that we may all be proud of and that will last, be sustainable. Thank you for sharing it with us.

Lars Rydén
Series editor

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Mikko Jokinen and Matti Lankiniemi

The manual for Municipal Environmental Audit developed by the Union of Baltic Cities (UBC) in 1996-98 to support the environmental work of cities in the Baltic Sea Region, was used by the two neighbouring Finnish cities Turku and Pori to review their environmental management. Expert teams from the two cities audited the other city in the six selected areas: air pollution monitoring, noise abatement, waste management, water protection, nature protection and biodiversity, and environmental administration. Results from the process are summarised in the article. The environmental administration in both cities confirmed the great value of feed-back from expert colleagues to improve work and routines in environmental management.

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2. Local sustainability indicators – The development and monitoring of six local indicators in Kaunas

Linas Kliucininkas

In order to monitor local sustainable development processes in Kaunas, Lithuania, six indicators, four with a clear environmental profile, were chosen from the set of ten core indicators recommended by the European Sustainable Cities and Towns Campaign. These were citizens' satisfaction with the local community, local air quality, local mobility, local contribution to climate change, availability of public open areas and services, and noise pollution. Backgound descriptions including legal requirements especially in EC Directives, monitoring methodologies, limitations, and preliminary results from monitoring work are reported.

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3. Waste management and nutrient flows in the city of Turku – A detailed N and P flow study to estimate the capacity of biowaste sorting to contribute to nutrient recycling

Toni Tikkanen

A detailed quantitative study of flows of nitrogen and phosphorus in all organic waste in Turku was made to evaluate the potential of recycling of nutrients. Both inputs and outputs in all municipal and private nutrient-containing fluent and solid waste flows were estimated. These included municipal and private sewerage, municipal solid waste, and municipal as well as private compositing. The volume or weight of each of these was measured as well as their content of N and P either measured or estimated using reference values from literature. The total flows for the 171.000 inhabitants and their animals were found to be 3.074 kg of N and 583 kg of P per day. 64 % of the inputs were found in the municipal wastewater, 11 % in private sewerage, 10 % in solid organic waste sent to incineration and 7 % in organic waste sent to landfill. The major flows of output nitrogen included 53 % (1.647 kg/day) to surface waters and 23 % (765 kg/day), to sludge, while for phosphorus 15 % (90 kg/day) went to surface waters and 61 % (368 kg/day) to sludge. Only 1 % of the nutrients was recycled for new agricultural production. If separate sorting of biowaste is achieved (planned for 2005) this figure will increase to 7 % and with maximum recycling amount to 15-16 %.

Toni Tikkanen is a Project Manager working in the Green Know-How network of Turku (www.greenknowhowturku.com)

4. Air pollution and damages to the cultural heritage in cities – The decay of the cultural heritage of Kraków

Wanda Wilczyńska-Michalik

Air pollution is both detrimental for human health and cause corrosion and other deterioration of materials. A detailed study of the effects of air pollution on the stone cultural monuments in Kraków showed the damages to be far reaching and serious. Kraków is badly hit by air pollution both due to an extensive use of coal for combustion in individual homes and power plants, as well as its unfavourable geographical situation. The sculptures studied were made of Libiaż dolomite, Upper Jurassic limestone, Pińczów limestone and Carpathian flysch sandstone, used in the Wawel Castle and the Church of Saints Peter and Paul. Excessive weathering was caused by wet and dry depositon of sulphur and nitrogen oxides, causing formation of gypsum crystals, soot and dust, metal impurities and microbal activites. The mechanisms of pollution-caused weathering were studied by electron microscopy and chemical analysis. The destroyed or badly miscoloured sculptures, have either been replaced by copies, or restored. Costs for restoration work have so far exceeded 40 M PLN.

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5. Health concerns in environmental management – The city of Kaunas' health profile

Juozas Kameneckas

A quantitative and qualitative description of health (the health profile) of the 400.000 inhabitants of Kaunas, the second largest city in Lithuania, was made using available statistics from 1980 up to 2000. Mortality rates, decreasing since the mid 1990s, were comparable to values in Lithuania as a whole and dominated by cardiovascular diseases and outer causes. In 1999 close to 80 % of the population experienced themselves as not having full health. Complaints were dominated by respiratory diseases (close to 30%). Separate studies in 9 districts in the city proved the health situation to be worse in areas with more traffic, close to a power plant, and less greenery, but also less good social status. The City has in its health plan included work to improve the environment, especially decreasing air pollution.

Juozas Kamenecka is a politician and head of the Kaunas healthy city office.

6. Living in the 21st century – The ecological community of Braamwisch

Silvia Schubert

Inhabitants in ecological communities develop integrated strategies for environmentally friendly lifestyles. The eco-community of Braamwish in the northeastern part of Hamburg, Germany, has developed far-reaching ecological strategies in several ways. Braamwish includes 40 houses built 1996-2000, all with low energy construction methods, and extremely good insulation. Much of the heating is made using local solar heating, while green electricty was bought from outside, and to an extent came from local photovoltaic cells. All building materials used were environmentally safe. Toilets were mostly dry composting toilets. Water consumption was considerably reduced without water toilets (about 20.000 liters per year and person), and further reduced by the use of rainwater. Wastewater consists only of grey water, which is treated locally in three reed beds. Kitchen waste is mostly composted in the same bin as toilet waste. The inhabitants cause little environmental impact by traffic as they use car-sharing and in addition, the community is located close to the public transport of Hamburg and needed commodities, such as schools, shops and doctors office, are within walking distance. The social dimension of life in an eco-community is also important as described in this report.

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1. Municipal Environmental Audit

The UBC manual as a tool to develop local environmental management applied in the Finnish cities of Turku and Pori

Mikko Jokinen and Matti Lankiniemi

1.1 THE MUNICIPAL ENVIRONMENTAL AUDIT

1.1.1 The short history of environmental management

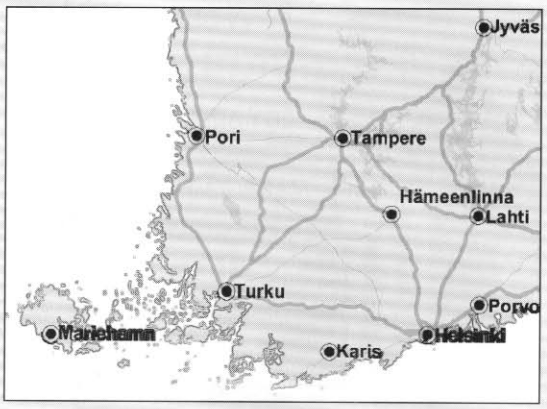
The work to protect our common environment and its ecological status is a relatively new activity in society. In Finland the first steps in this field were taken in the 1960s, when the first waste water treatment plants were built. This was the outcome of The Water Act from 1962. It was the first law in Finland to prohibit water pollution without legal permission and require qualified treatment of sewage waters. Prior to that time, Finland did not have environmental laws, except for the Nature Protection Act from 1922, which introduced a legal base for the establishment of National Parks and other protected areas with values of natural history.

The Finnish Ministry of Environment was established in 1983, and from 1986 the municipalities were obliged to establish their respective bodies and organisations to take care of the environmental duties, spelled out by the rapidly developing environmental legislation. The city of Turku got its environmental department in 1984 and the city of Pori two years later.

Nowadays practically all municipalities have environmental organisations. Their duties and resources depend largely on the municipality. Big cities with much industry and trade have environmental departments with 10–20 specialist staff, whereas smaller countryside municipalities with less duties often only manage to share one environmental expert with neighbourhood municipalities.

There has been very little general guidance from the government, or from other institutions, on how the municipalities should in practice take care of their environmental duties. For that reason the situation in the field is quite varying. Every municipality has arranged its working practices in the best possible way in their respective organisations. This situation – combined with the fact that municipal administration is always lacking money and human resources – raises the question, whether the municipalities have in fact managed to organise their environmental work in such a way, that all the duties have been properly taken care of.

This question was the starting point when the Union of Baltic Cities, UBC, in 1996 started to develop the idea of *Municipal Environmental Audit*. In the UBC project



Southwest coast of Finland.

Turku/Åbo

Turku/Åbo is located on the shore of the Baltic Sea in Southwest Finland. Surrounding Turku there are about 50 municipalities. They are all very small, each with no more than a few hundred inhabitants. Only the city of Turku is larger, with 169,000 inhabitants and an area of 306 km^2.

The region includes a part of the coast of the Baltic Sea, with the beautiful Aboensic archipelago. Turku is a very old cultural centre in Finland – in fact it is Finlands oldest city. Its economic life is mostly centred around service and trade. The three universities and the archiepiscopal site are also important.

Local environmental work in Turku

Sustainability in an area has to be maintained through constant application of sound management principles. Agenda 21 is of specific relevance since it is specifically written to establish and maintain sustainable development with a focus on the local, urban level. Turku is particularly well suited for demonstrating a Local Agenda 21. The city has not only its own experience but also experiences from the entire region, through its coordinating role in several Baltic wide programmes. The Local Agenda 21 work has been carried out in many forms in the Turku region since it formally began in February 1997. The work concentrates on four main topics: transport, water, environmental education and environmental information. In all four sectors the municipalities have tried to find approaches that agree with the sizes of the municipalities.

Pori

The city of Pori was founded on the mouth of the Kokemäenjoki river in 1558. Pori has a population of 76,000.

Since Finland gained her independence in 1917, Pori has been an important, fast-growing city of heavy industry and ports. Rosenlew, Outokumpu, Rauma-Repola, Kemira and other industrial plants needed plenty of fresh labour and the city grew rapidly.

The new age brought new winds of culture. Within a few years, the Pori Jazz Festival grew to become a flourishing international festival. Today, Pori is also a city of students. In Pori's centres of education one can study technology, business and the humanities.

The Pori National Municipal Park embraces the main features of Pori: the fast-flowing Kokemäenjoki river delta, industrial and cultural history, and the living present.

Local environmental work in Pori

In the region of Pori the work with Agenda 21 started in the beginning of 1996. Sustainable development and the environment are of common interest to the municipalities. That is why the Environmental Forum of the Region of Pori was founded to do the work. Collecting of the Agenda was realized in seven working groups dealing with different fields of society and environment: 1. Industry, energy production and transport 2. Land use planning and nature 3. Primary production and nature 4. Living, everyday life and traffic 5. Administration 6. Commerce and consumption 7. Education, information and reserach. All different sectors of society were represented in the working groups.

the main idea was to help cities, especially those on the eastern coast, to develop their environmental performance. After a pilot project in Tallinn, the UBC finalised the Manual and the Work Books for the Baltic Municipal Environmental Audit in 1998. After Tallinn, it was brought into use in Pärnu, Estonia, in 1998–1999 and soon after also Turku and Pori in Finland decided to use the method to develop environmental work in their municipalities.

1.1.2 The background of the MEA-process

Municipal Environmental Audit has its background in the development of environmental management systems in the private business. In the 1990s the progress in this sector was very rapid. The amount of standardisation of environmental management systems (EMS) in companies has been dominated by the ISO 14001 system, which reached 20,000 certified ISO 14001 companies in 2000. EMAS and other systems are far behind in numbers. Most of the organisations which have a certified system are private companies, but there are some municipal organisations as well.

Baltic Municipal Environmental Audit was not aimed to compete with certified management systems at all. The main idea in Baltic MEA was to create a reliable method for municipalities to evaluate and develop their environmental work. Another basic idea was to base the work on the twinning system between cities, so that the experts from twin cities could serve as outsider auditors in the process. The UBC and HELCOM were given the role of verifiers in the process.

The operational scheme for the Baltic MEA is summarised in Figure 1.1.

1.1.3 The structure of the MEA process

Municipalities have in most cases double roles in respect to the environment. Municipalities are important actors in the society; they are major constructors, manufacturers, service producers, purchasers, public traffic producers etc.

On the other hand, municipalities often also constitute the local environmental authorities, in which they should take care of the environmental protection. Sometimes these roles may be conflicting.

In the MEA process the idea is to analyse the situation in the municipality to find out exactly how the city is managing its environmental performance. To make this kind of evaluation, it's important to know what the state of the environment is in the city and what kind of effects the municipality itself has on it. In the MEA process, both the state of the environment and measures relating to get information of that, are evaluated as well as the environmental performance of the city administration, including municipal companies. The context of Municipal Environmental Audit is shown in Figure 1.2.

Because the idea of MEA is to serve the municipality as a development tool, it is important to have a continuity in the process. In practice, this means that there should be a follow-up of the process and, after a certain period, a new audit.

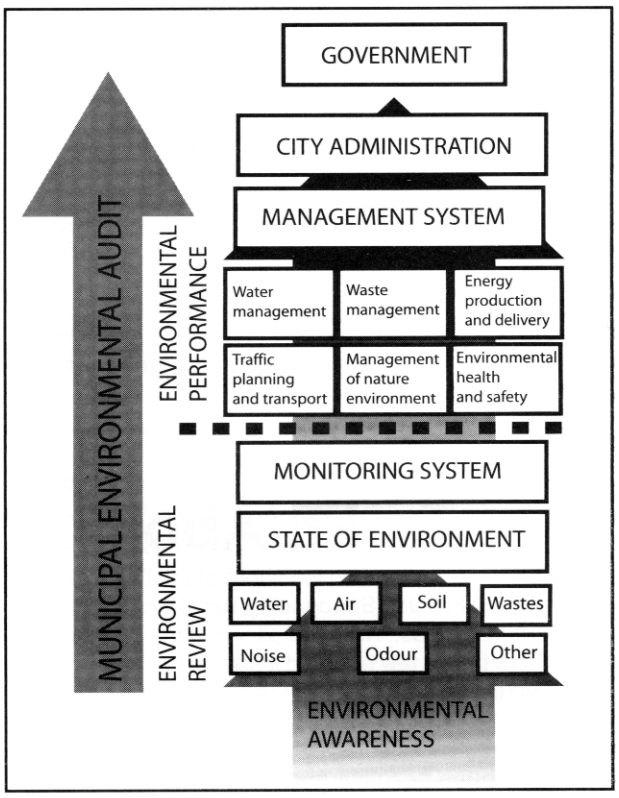


Figure 1.2 Elements of the Baltic municipal environmental audit.

1.2 THE TURKU – PORI EXERCISE

1.2.1 Aims of the exercise

The idea behind the Turku–Pori exercise was to test the UBC MEA-model in Finnish cities. There was not enough resources to carry out the complete MEA process. We decided to concentrate on the environmental sector. We wanted to create partnerships between experts in two neighbouring cities and to help both cities to develop their own activities in the field of environmental protection.

This exercise was carried out mainly in 1999. Some of the reporting took place in 2000.

Pori has a population of 76,000. Turku is larger, with 169,000 inhabitants. Both cities are located on the shore of the Baltic Sea in the south-western part of Finland.

1.2.2 Defining the task

Turku and Pori are both active cities in the Union of Baltic Cities network. Both have the same kind of structure in their environmental administration despite the different sizes of the cities. This gave a good base for a common effort to test the use of the UBC MEA-model as a tool for their development work. Turku is also the chairing city for the Commission of Environment of the UBC.

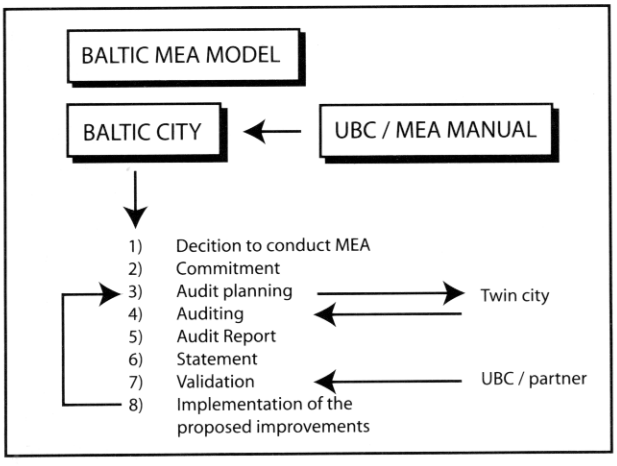


Figure 1.1 The Baltic MEA model.

At first, the cities had a common planning session with the aim to define the framework for the exercise. This was important, because there was only restricted amount of time and human resources to be used. It was agreed that

- only selected sectors will be included;
- both cities will nominate the people who will participate in advance;
- a project manager (full-time) was nominated for four months;
- both cities organise the collection of existing data of each sector in their own city. For each sector no more than 3–4 working days were to be used;
- material was sent to the partner city before the auditing visit and sessions;
- auditors (1–2) should work no more than 2–3 days in audited city. The host city experts were during that time at their disposal;
- 2 working days were allocated for writing the sector reports;
- 2–3 working days for each participating expert were reserved for training and other sessions. This means that altogether there was supposed to be 11–15 working days for each expert.

The sectors which were included into the project were:

a) Air pollution monitoring
b) Noise abatement
c) Waste management and polluted soils
d) Water protection
e) Nature protection and biodiversity
f) Environmental administration

Municipal Environmental Audit (MEA)

Management approaches

To help improve the environmental situation in human settlements analytical tools have been developed such as Environmental Impact Analysis EIA; Life Cycle Analysis LCA; Eco-Management and Audit Scheme EMAS. In addition to these there are also more straightforward management tools, such as ISO 14000. Together they are a part of the systematic, predictive and preventive environmental work, which received a push forward in the report of the Brundtland Commission and the Agenda 21 documents.

There is a wide variety of audit schemes currently in use. The Union of Baltic Cities, UBC, to which some 100 cities in the Baltic Sea region belong, has worked out methods and principles for a municipal environmental audit, MEA. The UBC audit scheme is based on the work of the World Bank which in turn originates from the Eco-Management and Audit Scheme (EMAS) within the EU.

The audit is typically performed against 1) legislation; 2) environmental effects of production processes; 3) management and administration activities; 4) environmental economy, investment related to environment, and planning and 5) communication of results to the public. The basic form of auditing, compliance auditing, where performance is audited against legislation, regulation and codes of conduct, is typical for companies. In the UBC manual, the focus is on environmental management and the auditing is done against self-determined targets. But it may change as municipal environmental management systems are currently subject to international standardization.

Municipal Environmental Audit (MEA)

A manual for MEA in Baltic cities has been published by the UBC. The manual was tested in a MEA process in Tallinn during 1996/97 under the guidance of the city of Turku/Åbo. Training workshops are being held for participants in Latvia, Lithuania, Russia and Poland. The MEA project in Tallinn is a demonstration project as it is the first extensive MEA conducted in the Baltic area. The text below is based on the manual.

Why Municipal Environmental Audit?

In the audit, answers are given to questions specific to a city, such as: How is the city affecting the environment? How healthy is its environment? What are the environmental monitoring parameters and what do they tell us? In other words, we are asking: Is the city performing in an environmentally sound way, and do we get the right answers to environmental questions? This question is usually answered by 'state of the environment reports', which most cities produce regularly. UBC is willing to go one step ahead by asking questions about the environmental performance of the city.

After performing the MEA, a city should realize its weak points in environmental performance and be able to point out the relevant things to change in order to improve the quality of its environment.

Steps of the audit

Auditing is usually visualised as progressing stepwise.

Step 1: Preparatory work. Introducing the audit methods and principles to city officials is crucial in order to achieve the commitment and to secure the final success of the audit. Being audited may be threatening and the auditors should make every effort to achieve a positive approach and commitment. Desirable characteristics for the audit team member are a thorough knowledge of municipal environmental issues and, as far as possible, independence from the management system.

Step 2: Collecting the data. After the field missions are completed, each auditor should prepare a preliminary list of findings and make sure that he or she has put the right questions to the right persons.

Step 3: Analysis of data. The data should be collected in a way that will demonstrate the strengths and weaknesses of the management procedures. Reliability of environmental monitoring systems should be addressed. For example, control values, such as maximum permissible concentrations (MPCs), should be used and time-series changes variation analyzed and shown. Some kind of cost/benefit analysis should be possible after the MEA.

Step 4: Reporting, recommendations and dissemination of auditing. The audit report has three basic purposes 1) to provide management information; 2) to initiate corrective action and 3) to provide documentation of the audit and its findings. The report should include hints on technical solutions. All the findings, suggestions and conclusions from the audit must be mediated to both the governing bodies, management as well as to the public.

Step 5: Follow-up and the audit cycle. The nature of auditing is repetitive, which means that unfavourable findings are followed in the subsequent audits until they are eliminated. If the reporting is properly done, it should initiate corrective actions.

Initial Environmental review

An environmental review report is to have the following parts: 1) current state of the environment and its monitoring; 2) listing of the most important factors stressing the environment; 3) evaluation of the situation and recommendations for future activities. The following is intended as a rough guideline showing only which activities and sectors at least should be considered in MEA.

Water quality, consumption, protection and emissions to water. Water protection legislation; map and categorize industrial water pollution to sources (different type of industry) and volumes; Connections of industry to municipal water purification systems; Diffuse water pollution, riverine water pollution the use of fertilizers in agriculture, and aquaculture.

Air quality, pollution and emissions. Air pollution and emissions of major pollutants from various sources (for example, traffic, industry, power plants and heating centres, private heating, waste incineration, etc.); critical issues involved in abating air pollution; raw material for

production energy production; nature of emissions and the role of district heating; the role of traffic in emissions of NO_x and other components of exhaust gases.

Contamination of soils. Typical suspected places are abandoned military areas and garages and gasoline stations. Responsibilities concerning mapping and treatment of contaminated soils should be described.

Solid wastes. Sources of household and commercial municipal solid waste, hospital waste, industrial waste, hazardous waste (oil, used batteries) and radioactive waste; waste generation, waste management (minimization, recycling, composting, collection, transfer, treatment and disposal), expenditure involved in waste management and policy and regulation implementation and enforcement. Also forestry, mining, use of sand, gravel and stones are to be considered when causing waste build-up.

Noise. Legislation, decisions and recommendations; sources of largest noise and smell and the population subject to them.

Natural, nature protection and green areas. Nature protection and green areas belong to the state of the environment review, but as activities they also belong in the environmental performance, that is, actions that are taken in order to improve the quality of the living environment.

The Environmental Performance

Institutions and management. The auditors should have clear minds about which bodies comprise the municipality and how they are set up. For example, in Tallinn the City Council is a representative body elected by voters among the city inhabitants, the City Government is the executive body formed by the City Council and additionally the city is divided into eight City Districts.

Environmental programmes. For example, in Tallinn the environmental programme is called "The Environmental Concept of the General Plan of the City of Tallinn". In this concept, environmental protection is one of the priorities of the development, at the same level of importance as the economy. The environmental concept is closely linked with the economy, construction (including architecture and planning), municipal services and transport concepts.

City service effects by boards and departments. Usually the cities provide the inhabitants with a variety of services. For example, cultural, social and environmental issues are taken care of by their own boards as well as energy, construction and communications activities having their respective departments.

Water distribution network and related activities should be analyzed when they have significant environmental effects. Information should be gathered on all issues concerning present and future water resources such as water supply, sewage, sanitation services, industrial effluent and pollution control, concentration of pollutants, water quality monitoring and evaluation of its coverage as well as publishing and making available to the public reports on water pollution policy.

Land use and its planning should be analyzed when they have significant environmental effects, as well as the protection of the cultural and natural environment, historical buildings, monuments, archaeological sites.

Energy production and network should be analyzed when they produce significant environmental effects through the services of the operational unit producing the service. A description of energy production and consumption is needed, including heating systems, industry and traffic (diesel and gasoline consumption of cars). Total yearly energy consumption (kWh) should be estimated and a breakdown should be done to show the proportions consumed by heating, cooling and electricity in small houses and industry; types of energy, such as oil, gas, district heating, gasoline, diesel, ethanol (in transport) and renewable energy should be indicated.

Traffic is a topic which should be given attention in several places; it is connected at least to air quality, energy consumption, noise, city planning, environmental health and contamination of soils.

Green areas, nature and biodiversity protection. The effects of local urban development, tourism, industrial development and agriculture on green and nature protection areas should be included. Biodiversity should be given special attention as an emerging concept of international nature protection activity.

Environmental health issues. Human health issues, such as occupational health, noise and quality of drinking water and food may belong to health care organizations and not to the environmental office and therefore they are usually not included in traditional 'state of the environment' reports. They should be part of an audit however.

Environmental budgeting and savings. An important means of understanding the importance of environmental issues in the city is the analysis of environmental expenditure in the government and city budgets and financial systems.

Environmental awareness. Municipal purchasing, general regulations and recommendations in, for example, the traffic department are an important aspect and should be given special attention. Other planning as well as production development should also be infused with life-cycle and sustainability attitudes. It may concern new processing techniques, placing of new plants or buildings and choice of transportation. It should also concern, for example, the buying of new interiors in offices and magazines, new equipment such as computers, copiers, heaters and ventilation as well as paper and light bulbs. Questions to be asked from citizens are: Is the environmental decision-making made public and do citizens have access to it? What kind of environmental training, education, guidance and information have they received?

Material extracted from: "Manual for Municipal Environmental Auditing (MEA) in the Baltic Cities" by Ilppo Vuorinen, Mikko Jokinen and Olli Madekivi, UBC Commission on the Environment, Linnankatu 61, 20100 Turku, Finland. See www.ubc.net. The Baltic Cities Environmental Bulletin No 1, 2003 is a thematic issue on environmental management systems in cities.

1.3 RESULTS AND RECOMMENDATIONS OF THE AUDIT BY SECTORS

1.3.1 Air pollution monitoring

Both cities have done much work in the field of air protection. Basic knowledge of the air quality situation in both cities is good. Pori has a network of 3 air quality measuring stations. In Turku there are 5 different measuring stations and a meteorological station in the network (Figure 1.3).

Synopses of the audit findings and recommendations are presented for both cities.

City of Turku findings:

1. The air quality monitoring system is good and well functioning, but vulnerable in respect to human resources and know-how (only 2 persons know the system). Inside temperature measures are lacking from stations.
2. Build-up of the quality system is on its way.
3. Spring time particle concentrations are high and exceed guidelines regularly.

City of Turku recommendations:

1. Install automatic temperature recorders in each measuring station.
2. Develop the practices to respond to citizens complaints.
3. Spring time street cleaning needs to be intensified.
4. Substitute the system for air quality monitoring staff.

City of Pori findings:

1. Basic knowledge of air quality exists and an air quality monitoring system is being created.
2. Part of the main polluters are reporting on a monthly basis on their emissions to the municipality (in e-form).

City of Pori recommendations:

1. Human resources in air quality monitoring are at minimum level and create unidentified problems and risks in everyday management of the system. This causes risks and under-utilization of the potential of the Dilta system and in quality control.
2. The effective use of Dilta system should be improved, e.g. by increasing the co-operation with Turku Environmental Office.
3. Technical capacity of computers needs improvement, the safe check as well.
4. On-line air quality information system should be implemented.
5. Carbon balance for the city should be calculated.

Figure 1.3. A station for monitoring air pollutants. Photo: L.Rydén.

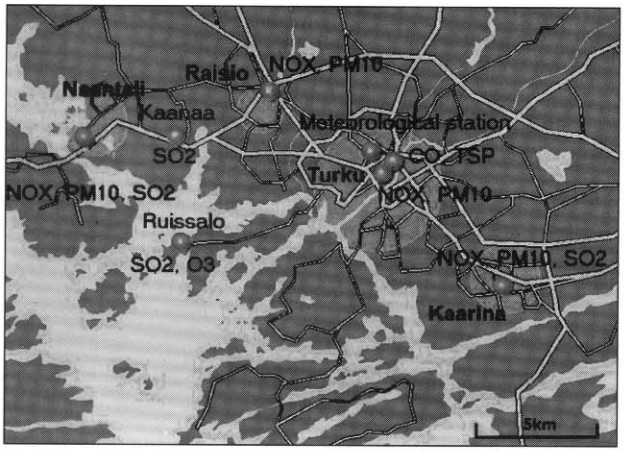


Figure 1.4 Turku air monitoring network.

1.3.2 Noise abatement

In both cities authorities have paid relatively little attention to noise issues. Among the citizens, interest and worry of disturbing noise, temporary and permanent, has strongly increased during the 1990's.

The main findings and recommendations in Turku and Pori were as follows.

City of Turku findings:

1. Administration of noise issues is incoherent and a clearly stated sound policy is lacking.
2. The number of noise notifications and applications is (too) high and requires (too) much administrative work.
3. Co-operation with land-use and traffic planners is not active in noise issues.
4. There is no noise abatement programme for the municipality.

City of Turku recommendations:

1. A comprehensive noise abatement programme including noise abatement rules is needed.
2. Follow-up of recommendations and orders given by the authorities should be strengthened.
3. Improve the use of Internet when processing noise permits (controlling temporary noise).

City of Pori findings:

1. The city has made a noise situation survey, which needs to be updated.
2. There is no noise abatement programme in the municipality.
3. Administrative processes to deal with urban noise problems are poor and need further development.
4. There are 3 motor sport areas in the city with special noise problems.

City of Pori recommendations:

1. Develop a comprehensive noise abatement programme including noise abatement rules.
2. Produce more updated information on noise levels in the city.
3. Integrate noise pollution calculations into the land-use planning.

1.3.3 Waste

Waste issues have played an important role in the work of environmental authorities in both cities. The main target was, firstly, the improvement of waste management practices in enterprises, especially within the manufacturing industry. Secondly, the recycling of renewable waste among the citizens was in focus and during the last few years contaminated soils have kept the authorities busy. The main findings in this sector were as follows.

Figure 1.5 The soil under a gas station is removed as the site is remediated. Photo: Lars Ryden.

City of Turku findings:

1. The city has a well functioning waste management system based on source separation of recyclable waste and heat recovery of burning waste (incineration).

2. The Environmental department has a qualified and well motivated staff.

3. Waste management control and monitoring covers well the municipal duties and needs.

4. Information of polluted soils is relevant and covers also suspected soils (with poor industrial history).

5. Separation of waste is poorly covering biowaste and demolition waste.

6. Collection of hazardous waste is well organised but needs improvement regarding household waste.

7. Information on waste and good waste management practices is reasonably well available in printed form and on the Internet.

City of Turku recommendations:

1. Develop more education and training to make waste separation more efficient among citizens.

2. Introduce penalty fees for those who bring unsorted waste to the landfill.

3. Construct a treatment plant for biowaste.

4. Introduce waste separation rules to cover all houses and households.

5. Make new collection points, stations, for hazardous waste in the downtown area.

6. Indicate polluted soils in the land use maps.

7. Start preparations for biogas extraction in the landfill.

City of Pori findings:

1. The city has a functioning waste management system based on source separation of recyclable waste.

2. Regional co-operation in providing waste management and waste treatment services is not functioning well.

3. Human resources within the environmental sector directed to waste management are small.

4 Staff members have to work as a generalists with only few possibilities for specialisation.

City of Pori recommendations:

1. Start regional co-operation in producing waste management services.

2. Establish digital database of waste producers.

3. Make an inventory and classification of different kind of waste producers.

4. Traine and educate municipal staff in waste issues.

5. Increase the quantity and quality of waste management information, in printed and in digital form (Internet).

1.3.4 Water protection

Both cities are located on the coastal zone of the Baltic Sea. Kokemäenjoki, which is one of the main rivers in Finland, runs through the city of Pori and has a very valuable estuary area. Turku has its Aura river, which is relatively small but important, because it is the main water reserve for the city. Turku is almost entirely lacking lakes, while Pori has several small lakes within its territory.

City of Turku findings:

1. The monitoring programme for Turku waters is extensive and gives a good and reliable picture of the actual situation.

2. The Environmental department has developed indicators to describe the quality of surface waters.

3. Co-operation in the protection of the Aura river has been successful and the Aurajoki Foundation and the information centre in Halinen rapids are positive examples of the work.

4. Turku airport is located and built on a ground water area, which causes problems and threats for local ground water reservoirs.

City of Turku recommendations:

1. More emphasis should be put on reducing nutrient flows to Kakskerranjärvi; a new action programme is needed.

2. The programme to protect Turku ground waters should be updated.

3. Measures to reduce nutrient flows into Aura river should be intensified in co-operation with all municipalities by the river.

4. The remediation programme for the Kakskerranjärvi should be re-evaluated to make the effort more efficient

City of Pori findings:

1. The programme for water quality monitoring is many-sided and gives a good base to estimate the development in the state of surface waters in Pori. Some updating would be welcome, e.g. information on beaches suitability for swimming could be included.

2. Survey of small watercourses is very useful for land-use planning purposes.

3. There exists a relevant plan for the protection of ground waters.

4. The role of the Environmental board and department has been minor in monitoring and evaluating the waste water emissions and influences (compared to the Regional Environmental Agency's role).

5. A need to renovate the existing wastewater treatment plan is foreseen. Planning of the new should be started soon.

6. The sewer system is still partly serving also rain water transport, which especially in winter weakened the cleaning results in the treatment plant.

7. Monitoring of dredging effects has not been very intensive in spite of the potential risks it can cause in spreading harmful substances into the water ecosystem.

8. Waste management services in the harbour need improvement.

9. Management of fishing-waters and fish stocks have been given only little attention.

10. Duties in water protection are shared by 3 persons in the Environmental department.

City of Pori recommendations:

1. The Environmental board and department should develop and strengthen its role in water quality monitoring in co-operation with the Regional Environmental Agency.

2. Co-operation with other municipalities should be increased.

3. Monitoring of water quality should be extended to cover all the watercourses in the city territory.

4. Indicators to understand the monitoring results should be developed.

5. General information of the water quality should be increased and the role of the environmental department as a local expert should be strengthened.

1.3.5 Nature protection and biodiversity

Turku has a major part of Finnish oak forests and groves inside its territory. This has lifted nature protection to a special position in the environmental policy of the city. Pori has one of the most valuable Finnish wetlands on its territory, so in Pori nature protection is highly appreciated.

City of Turku findings:

1. The city has plenty of valuable oak forests, which are mostly established as official nature protection areas based on the Nature Protection Act.
2. Existing knowledge of valuable biodiversity items are mostly included in the land-use plans.
3. Development work has been done to utilise modern GIS-systems in nature protection planning, but the work is partly scientifically orientated.
4. Much human resources are used to take care of the bureaucracy in implementing the tree cutting policy in the down-town area.
5. Gulls are widely trapped and killed in the landfill to reduce gull population in the nearby archipelago.

City of Turku recommendations:

1. Mapping of valuable nature types should extend to all parts of the city territory.
2. Look for a more sustainable solution to solve the gull problem (e.g. by improving the management of the landfill).
3. Make a programme to establish valuable nature monuments as official nature protection objectives
4. Intensify the control and protection of valuable nature habitats by hiring a person for this job.

City of Pori findings:

1. The city has valuable wetlands and meadows which mostly are established as a nature protection areas based on Nature Protection Act.
2. Some of the threatened and rare species inside the territory are in need of a special conservation plan.
3. Existing knowledge of valuable nature items and biodiversity is not always taken into consideration in land-use planning.
4. The city lacks a special action programme to ensure a high level of protection of valuable nature.

City of Pori recommendations:

1. Widen the nature type (with rare and threatened fauna and flora) inventories to cover the whole city territory.
2. Establish a nature conservation database compatible with land-use planners database systems.
3. Increase the protection of nature monuments and valuable habitats owned by the municipality.
4. Extend the management zone of meadows to include the nearby coastal forests as well.

1.3.6 Environmental administration

Both cities have a long tradition in environmental management compared to most other Finnish municipalities. Main findings and recommendations are as follows.

City of Turku findings:

1. The Environmental department has well trained and motivated personnel.
2. Organisation is functioning and basic issues are in good order.
3. Human and economic resources are reasonable.
4. Nature protection sector is especially strong and well planned and managed.
5. International co-operation is active and fruitful and gives good reputation to the city.
6. Co-operation with the universities is fruitful.
7. The municipality lacks an environmental strategy.
8. Noise abatement has been given little attention.

Figure 1.6 An old oak tree is in itself an ecosystem, and host, up to 600 species. Photo: P. Migula.

9. Wages in the Environmental department are low in respect to the educational level and professional competence.

City of Turku recommendations:

1. Increase the co-operation with other departments and other municipalities.
2. Increase the se of GIS-systems and Internet.
3. Reduce the dependence of temporary personnel in the department by recruiting more permanent employees.
4. Develop the means to allocate resources to the right place in right time (produce environmental strategy and action plan).

City of Pori findings:

1. The city council has taken a strong role to support sustainable development in the city.
2. First definitions of a policy were made in 1993, when the council approved its second strategy.
3. The municipality has been active in the regional co-operation with other municipalities resulting in a common regional action programme for sustainability in 1997.
4. Municipal instructions to take environmental requirements into consideration in public purchasing were the first ones in Finland in 1996.
5. The attempt to produce a municipal environmental account was the first of its kind in Finland in 1998.
6. The Environmental department has been active and successful in utilising outside financing sources in their environmental work.

City of Pori recommendations:

1. The sustainability part of the city strategy lacks indicators, which makes the monitoring difficult. Indicators should be developed.
2. Responsibilities of different departments and administrative units are partly unclear or undefined, making the implementation occasional. Define responsibilities more clearly.
3. Increase the resources of the Environmental department, so that it becomes less dependent on outside and temporary financing while taking care of its legal duties.
4. Development of an environmental account in such a way, that it also takes economical aspects into consideration.

1.4 EVALUATION OF THE AUDIT PROCESS

1.4.1. Comments on the audit process

The audit process was afterwards evaluated by both partners. Each of the participating experts gave their own comments which were then summarised. In both cities the audit process was regarded as a good development tool, because:

1) The process made it possible for the experts from both cities and different sectors to meet and to discuss matters on a high professional level, but also very freely and in confidence.
2) Experts felt it refreshing to discuss and debate his/her job with partners who share the same experience and background. Also the possibility to get feedback to one's own ideas and working practices was warmly welcomed by most.
3) The audit process was taken as a good training session which was helpful to better understand systematic working routines, which are important when dealing with quality- and environmental management systems.
4) In the course of the process several such development items where identified, which partners had not realised earlier.

Also some problems occurred. Most of the experts shared the opinion that there was too little time for the process. The planned time schedule was estimated to be realistic, but almost everyone had difficulties to find the agreed time in their calendar. In both environmental offices the staff is heavily loaded by daily working routines and duties and it was not easy to find common time for sector meetings. Also the reporting was slow and drawn out until late autumn, and at times even to the next year, before the reports were finalised. It is obvious, that there should have been a full-time project manager also at the end of the process to finalise all the reports and do the paper work.

Another issue which was evaluated to need more charge was the preparatory work. People should be better trained for the process when they start to implement it for the first time.

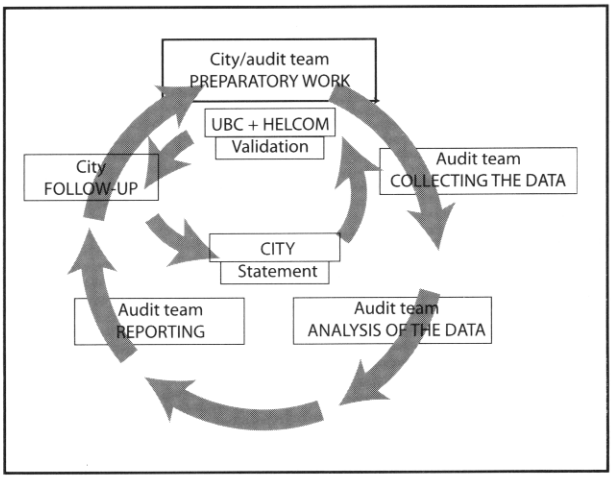


Figure 1.7 An MEA cycle.

1.4.2 Future development of the process

Turku–Pori environmental auditing project showed, that the MEA model developed by the UBC gives a good base for participating cities to develop their environmental administration and more generally their environmental performance. The cities decided to continue the Environmental Auditing Process and repeat the exercise after some three years. The following issues were seen as important in future work:

- Enough time and resources should be allocated for the process;
- More preparatory work is needed to train people and to agree of common approaches (which is especially important for those starting the first audit cycle);
- A revised manual/guidebook (fitted for the Finnish national situation) is needed for the collection of basic data for the evaluation sessions;
- Make participating people understand the real nature of the process (to learn and to develop) and stress the need to be open and honest;
- Well planned instructions and forms for the reporting and the follow-up.

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