



REGERINGSKANSLIET

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CSD 14 – National reporting

Atmosphere/Air pollution

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1. Background

1.1 The Johannesburg Plan of Implementation

The Johannesburg Plan of implementation urged States to make progress in the formulation and elaboration of National Strategies for Sustainable Development (NSDS) and begin their implementation by 2005. Sweden adopted in 2002 a National Strategy for Sustainable Development.

The document on the National Strategy for Sustainable Development presents the Swedish report on NSDS for CSD 14 in the thematic area Atmosphere/Air pollution.

1.2 Environmental Policy Integration at EU Level

The European Union (EU) has a comprehensive legislation in the environmental field. Most of the initiatives emanates from the Environment Directorate. But over time gradually the different sectors have been increasingly preoccupied with the environmental aspects of their activities.

Integration of environmental aspects into other policy areas has been a priority for the EU since the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. Article 6 of the EC treaty states that environmental considerations should be integrated in the Community policy, with the aim to promote sustainable development. To put into effect this Article the so-called Cardiff process for Environmental Integration into Sector Policies was initiated in 1998. Nine sectors have hitherto been included in the Cardiff process, Transport, Energy, Agriculture, Industry, Internal market, Development, Ecofin, Fisheries, and General Affairs.

Since the start of the Cardiff process, Sweden has emphasised the importance of environmental integration. The work with environmental integration at EU-level is an important part in promoting sustainable development, i.e. a tool to reach the objectives set by the Council of Europe at the meetings in Lisbon and Gothenburg.

It is also important to, when possible, act simultaneously with the process ongoing at EU-level and national level. If it is possible to coordinate processes at different levels, advantages of coordination can be collected.

The Swedish Environmental Protection Agency is a central environmental authority under the Swedish Government. According to its instructions, laid down by the Government, its main tasks are to co-ordinate and promote environmental

work on both a national and international level. The Agency's most important tasks are to:

- propose targets, measures and control instruments for environmental policy and environmental protection activities. (Development of environmental work)
- carry out environmental policy decisions on government grants, application of law etc. (Implementation of environmental policy)
- follow up and assess the environmental situation and environmental efforts

The Agency has about 500 employees representing various skills and professional competence (information officers, technicians, lawyers, scientists, social scientists etc).

2. Decision making process

2.1 The Responsibility of Central Authorities

The Ministry of Sustainable Development is responsible for the overall coordination of the government's work on sustainable development. Specific areas of responsibility include environment, water, energy, climate change, construction and housing.

In Sweden the concept of sectoral responsibility is implied and includes as a very important part the authorities responsibility for the ecological dimension of sustainable development. It is stated in a regulation applying to government authorities that the agencies are to observe requirements of environmental considerations in its operation.

The Government has in several bills underlined and developed its view on environmental responsibility within policy areas with a particular high impact on the environment, such as forestry, energy, fisheries and agriculture as well as transport. For some of the authorities it is stated in their appropriation directives that environmental goals are an explicit part of their given mandate.

2.2 Special responsibility for some central authorities ¹

In 1998 the authorities' responsibility for environmental issues was taken a step further. 24 government authorities were then specifically commissioned to take a responsibility for the ecological dimension of sustainable development.

3. Air pollution

3.1 Monitoring air quality

The Swedish national monitoring programme on air quality and deposition is mainly designed to comply with the demands of present and prospected EU-directives and national targets decided by the Swedish government. The needs of international fora such as CLRTAP (UN convention on Long-range Transboundary Air Pollution), AMAP (Arctic Monitoring), OSPAR (North-east Atlantic sea) and HELCOM (the Baltic Sea) also have a major impact on the programme design.

The table below indicates that the acidification, eutrophication and human health are the major aspects served by the monitoring activities. Over the last years monitoring of harmful substances such as bromated flame retardants and pesticides have increased. The annual cost for the national monitoring programme is about 1 million € per year. The programme runs by the Swedish Environmental Protection Agency using consulting firms, governmental bodies and universities to develop methods, perform sampling, carry through analyses and write reports on the situation.

The national programme has its advantages to produce long-term trends. The strong dependence on EC directives and national targets has a certain impact on flexibility, which in turn may mean difficulties to take on board other needs for air and deposition monitoring.

In addition to the national program, counties perform their own air and deposition monitoring. Monitoring of acid deposition is of major concern and in most cases the only activity run on a long-time perspective. Most other programmes are performed for a few months up to a few years, which implies a certain ability to

¹ The Swedish International Development Cooperation Agency, the National Social Insurance Board, the National Board of Health and Welfare, the Swedish National Railway Administration, the Swedish National Road Administration, Swedish Maritime Administration, the Swedish Civil Aviation Administration, the National Agency for Education, the Swedish Board of Agriculture, the National Board of Fisheries, the Swedish National Labour Market Administration, the Swedish Work Environment Authority, The National Heritage Board, the Swedish Business Development Agency, the Geological Survey of Sweden, The National Board of Forestry, the National Board of Trade, the Swedish Energy Agency The National Board of Housing, Building and Planning, the Swedish Consumer Agency, the National Chemicals Inspectorate, the Swedish Environmental Protection Agency, the Swedish Armed Forces, the Swedish Rescue Services Agency

take on board new needs of monitoring. The county programme naturally focus on county needs, but also pay substantial attention to follow up targets set by the government.

Monitoring program of air quality and deposition of rural areas are mainly within the responsibility of national authority or counties, whereas air pollution of urban areas is mainly a task for municipalities. The latter monitoring activity give strong focus on air quality related to human health.

Over the last fifteen years, more than two third of the Swedish municipalities have performed air quality monitoring for substances considered in EU-directives. To support these activities governmental bodies in cooperation have developed a model which will facilitate assessment of concentrations of air pollutants.

In total, the annual costs for air quality and deposition monitoring in Sweden can be estimated to about 7 Million €per year (including cost for personal, planning and machinery investments).

3.1.1 Present situation in urban areas

Air quality of Swedish cities has improved only slightly over the last five to six years, following a period of about twenty-five years of amelioration. The decreased pace of improvement can probably be explained by insufficient emission reductions and other impact of road traffic, energy use and energy production such as wood heating.

Air pollution in cities is estimated to cause the premature death of one thousand people in Sweden annually. This figure might be higher. Most health problems are due to ground level ozone and particulate matter. EU and national standards for particulate matter, ground level ozone and nitrogen dioxide are those standards most difficult to achieve. Many Swedish cities may have problems to comply with the EU-standard for particulate matter in streets with dense traffic.

The prospects for ground level ozone and particulate matter concentrations in cities does not look promising for the coming years, whereas concentrations of benzene and other VOCs seem to drop. Lead concentrations in air have probably dropped by more than 90 percent since the 1970s and is now considered to have minor influence of human health in Sweden.

3.1.2 Present situation rural areas

But for ground level ozone and possibly particulate matter, *air quality* of rural areas does not cause major health problems in Sweden. Concentrations of sulphur in air are however to still high to avoid damage of objects of cultural heritage.

Peak concentrations of ground level ozone have dropped while mean concentrations still are rising, as in many other countries of the Northern

Hemisphere. The concentrations of ground-level ozone is a health problem for the Swedish people and also a factor for economic loss due to damage to crops.

Although considerable decreases have been experienced over the last twenty years, *deposition* of air pollutants is still a major problem for Sweden including surrounding marine areas. Acid deposition remains too high to allow a development in line with governmental targets. More than 90% of the deposition is due to air emissions in other countries.

Efforts to reduce emissions in Sweden are however also needed. The reduced input of air-borne nutrients, particularly nitrogen, has so far not resulted in a substantial improvement of highly eutrophic Baltic sea.

Deposition of heavy metals, such as mercury, and POPs (persistent organic pollutants), such as dioxins, are too high to allow for major improvement with respect to human health.

Table: The Swedish national monitoring programme 2001-2005 for air quality and deposition of air pollutants.

| Subprogramme | Problems addressed | Main purpose (to follow up and serve) |
|---|---|--|
| Air- and deposition chemistry | Acidification, Eutrophication, Health, Ozone, Cultural heritage | EC-directives, air pollution convention, marine conventions, and national targets |
| Air- and deposition network | Acidification, Eutrophication, Ozone, Health, Biological diversity, Crops | National and district targets |
| Metals of air and in deposition | Metals, Health | EC-directives, air pollution convention, arctic monitoring, marine conventions, and national targets |
| Modelling acid and eutrophic deposition | Acidification, Eutrophication | Air pollution convention and national targets |
| POPs of air and in deposition | Persistent organic pollutants, Health | EC-directives, arctic monitoring, air pollution and marine conventions, and national targets |
| Through fall in forested areas | Acidification, Eutrophication, Ozone | National and district targets |
| Deposition at high altitudes | Acidification, Biological diversity | National and district targets |
| Hazardous substances in urban areas | Persistent organic pollutants, Ozone formation, Health | EC-directives, national law and targets |
| Pesticides in deposition | Persistent organic pollutants, Health | EC-directives, arctic monitoring, air pollution convention, national targets and laws |

3.2 Handling of air pollution accidents

If levels of air pollution exceed *limits for information or warning* the local municipality or the Swedish Environmental Protection Agency are responsible to

inform the public. This is regulated in the ordinance Environmental Quality Standards for air (2001:527).

In Sweden the levels of air pollution have never been so high so that the paragraphs in this regulation about information and alarm have been used.

If the different levels of air pollution have exceeded the different levels described in the Environmental Quality standards (2001:527) the Authorities and municipalities have to ensure that the standards are kept when planning, supervising and giving permits. An action plan should be established if needed.

If an accident occurs e.g. gas leakage, fire in industries which causes a rise of the levels of pollution, the responsible authority to handle the situation are the rescue services.

4 Transport items

4.1 Policy to improve fuel quality

An investigation initiated by the Swedish Government has proposed that Sweden should adopt the environmental objective that 5,75% of all fuel used should be biofuel in year 2010. This objective is in accordance with the indicative goals applied in the EU. A very important tool to achieve this goal is to increase the blend of biofuel and petrol from 5% to a possible 10%. In Sweden the Government, the competent authorities and the oil industry supports such a change.

The most convenient way and the most cost-effective way to increase the use of biofuels is to use a blend of biofuel and petrol. During discussions in the EU Sweden has proposed a change of the specification for petrol so that the allowed volume percentage of ethanol raises from 5% to 10%.

The development of biofuels has a very high priority in Sweden. The driving force for the extended use of biofuel is mainly the environmental climate goals. The Swedish Protection Agency is therefore also supporting the next generation of biofuels, e.g. DME, Fischer/Tropsch diesel fuel, methanol and hydrogen.

Within the EU Sweden has argued for a change of the specifications for diesel fuel, i.e. for a decrease of the polycyclic aromatic hydro carbons.

4.2 Leaded fuel

All petrol in Sweden is unleaded since summer 1994. Sales and production of leaded petrol is also banned since 1995. The phase out of leaded petrol has caused environmental benefits not only connected to the lead and its health effects. The use of "scavengers" has been faced out as well. The scavengers are toxic substances containing chlorine or other halogens which might cause creation of dioxins in the engine.

In accordance with directive 98/70/ec of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC the use of leaded petrol is banned in European Member States since 1 January 2000.

4.3 Policy for a sustainable transport system

4.3.1 The Swedish transport policy objectives and the subsidiary objectives

The Parliament and the Government have decided that Swedish transport policy is to be guided by an overall objective and six subsidiary objectives. The overall objective of transport policy is to ensure socially and economically efficient and long-term sustainable transport resources for the public and industry throughout Sweden. The objective is intended to achieve a transport system, which is environmentally, economically, culturally and socially sustainable.

There are six subsidiary objectives linked to the overall objectives. These concern an accessible transport system, regional development, gender equality, high transport quality, safety and the environment. All these objectives are intended to be long-term and continuous in a longer time perspective.

The development of the overall objective can only be followed up to a limited extent. The subsidiary objectives where there is primarily access to information that can be followed up are investments and the cost accountability of transport. SIKAs (Swedish Institute for Transport and Communication Analysis) follow-ups show that there are clear indications that the present Swedish transport system does not use the resources available in such a way as to provide the greatest possible benefit to society.

The results therefore indicate that there is plenty of scope to improve goal compliance within the area of socio-economic efficiency. However, the development towards long-term sustainability and the distribution effects of the present transport resources are difficult to assess. As regards the subsidiary objectives, SIKAs notes that developments in many areas cause concern.

This applies to road safety where the zero vision still seems remote, and, in the field of the environment, increasing emissions of carbon dioxide and an increase in the number of people disturbed by noise. However, the trend has been positive for the subsidiary objectives of an accessible transport system and high quality transport, while the development of the subsidiary objectives for regional development and gender equality are less certain. (Source: Swedish institute for transport and communications analysis follow-up of the Swedish transport policy objectives may 2004).

4.4 Emission limit values for vehicles

Sweden has applied requirements on exhaust-emission control systems since the middle of the 1970's, and the requirements have been tightened gradually. The Swedish regulations governing vehicle emissions currently apply to cars, light commercial vehicles, small buses and heavy-duty trucks and buses.

Vehicles that run on petrol (light vehicles only) and diesel and gas (all vehicles) fuels have to comply. The regulations are based on the provisions stipulated in the *Act on Motor Vehicle Emission Control and Motor Fuels* (2001:1080) and the *Motor Vehicle Emission Control Ordinance* (2001:1085).

The Swedish parliament and the Government, respectively, decide on these statutes. The legislation is founded on the manufacturer's product responsibility, a requirement on the durability of the emission-control system and regulations covering the follow-up of these requirements in the form of durability checks and vehicle inspections.

Since Sweden joined the European Union, the requirements have been based on community vehicle emission directives. In Sweden a national system for the environmental classification of new vehicles is applied since 1992.

5. Environmental quality objectives

In 1999, the Swedish Parliament adopted 15 national environmental quality objectives, to be attained by the year 2020 (2050 in the case of the objective 'Reduced Climate Impact'). The environmental quality objectives create a transparent and stable framework for environmental programmes and initiatives, and serve to guide such efforts at various levels in society.

Between 2001 and 2003, in a series of decisions, the Swedish Parliament laid down 71 interim targets. These targets flesh out the environmental quality objectives by describing the situation in a given year, usually 2010. In 2005 the Swedish Government presented a first comprehensive evaluation of efforts to attain the fifteen national in an Environmental Objectives Bill. The Government proposes adding a new sixteenth environmental quality objective relating to biological diversity as a complement to the existing objectives.

The Environmental objective Clean air: Good progress has been made towards the interim targets under this objective. However, in a few places, including Stockholm and Göteborg, the target for nitrogen dioxide levels in air will be difficult to meet if planned measures are not carried out. Particulates in air are a major health concern. Action at both a local and a European level is urgently needed to get to grips with this problem. As long as particulate concentrations remain unacceptable from a health point of view, this environmental quality objective will not be achieved, even if satisfactory progress is made towards the interim targets.

Natural acidification only: Acidification affects both surface waters and soil and groundwater. Measured against the Environmental Protection Agency's environmental quality criteria, 10% of Sweden's lakes (not treated with lime) with an area of more than four hectares were acidified in 2000, a decrease compared with 1995. The trend towards more severe acidification of forest soils has probably been reversed. To meet the interim target for nitrogen oxide emissions, further measures will be needed to reduce emissions from vehicles, ships and mobile machinery.

As a basis for measures to attain the environmental objectives, three action strategies have been adopted. One aim of these strategies is to provide an overview of different measures and of how they can interact with or counteract one another. The strategy related to air pollution is :

- A strategy for more efficient energy use and transport – in order to reduce emissions from the energy and transport sectors.

Important elements in this strategy with a view to reducing emissions from the energy and transport sectors are; improvements in energy efficiency, incentives for a transition to renewable sources of energy, vehicle taxes based on environmental performance.

5.1 Physical planning and the role of air pollution

5.1.1 Overall Planning

The physical planning contributes to development in sustainable way through planning structures that are more efficiently and more energy saving. This type of planning has increased during the last decade and still do. We can find physical plans dealing issues like good opportunities for public transport and point out good zones for railways and special streets for busses. The plans can also include cycle ways and streets or ways for safety walking.

5.1.2 Concrete progress

The National Board of Housing, Building and Planning and the Swedish Environmental Protection Agency in co-operation with several municipalities and regional authorities worked together in a project called SAMS (community planning with ecologically goals in Sweden) which was co-financed by the EU environmental fund, LIFE . The project ran for three years and was concluded in the autumn of 2000. Seven local and five regional authorities were involved.

The main purpose of the theoretical frame of reference for the project was to create a platform on which to develop practical procedures for integrating environmental issues into spatial community planning. One of the results of the project was a proposal for procedures in comprehensive spatial planning. The municipalities, which carried out the case studies, differed in certain respects, depending on their development status, population density and capacity for planning and environment. The orientation of their case studies differed too.

A case-study focused on planning as a means of contributing to a good living environment by decreasing the environmental impact of traffic. Another municipality studied the ways in which planning can help to improve the conditions for cycle and public transport in order to reduce the environmental impact made by the use of cars. 14 indicators were developed to measure the availability and quality of cycle and public transport.

Geographic Information Systems (GIS) were used to compare planning alternatives by using indicators. A third study was an application of the ecological footprint approach, i.e. calculation of the area needed by the local inhabitants for supplies of food and energy.

A special thematic study dealt with the uses of environmental objectives and indicators in spatial planning, with special reference to the application of various structures in relation to the objectives. An in-depth study dealt with bio-energy and closing cycles between town and country sought to identify the needs and possibilities of increasing local production of biofuels and promoting the rule of planning in this connection.

It is difficult to see the results of this project. To follow up the project there have been some seminars in the area of project. Many municipalities have mentioned that they know the project and some other knowing parts of the results from the project.

5.1.3 Best practice

One of the best practices is from one of the municipality in the SAMS project mentioned above, Helsingborg. This municipality has carried out some comprehensive plans where they try to stimulate and show options to walk, to cycle and to take buses instead going by own car. Among many things in this planning it is important to integrate and combine these different ways to move, and in Helsingborg they have done this.

Helsingborg is situated in south of Sweden with the highest density of population. Many of the environmental problems regarding the items indicated in this report can be found here. In Sweden each region has to carry out a transport plan about each sixth year. The region in south Sweden, Skåne has carried out a plan for the transport with special option that shows how a plan could look out if a large amount of the money (75%) in region was invested in railways.

The planners in Skåne region has also been made a rather far-reaching strategic environmental assessment. The results of this work and documents have contributed to discussions and better transport planning reducing the use of energy and the air pollution.

5.1.4 Relevant trends, constraints, challenges and emerging issues

We can see that the confidence in physical planning solving the environmental problems are shifting from a time to an other. As mentioned in the first section the use of physical planning is increasing. In the spirit of this for example a new section was established in the Swedish EPA to better handle this issue.

A problem in Sweden is that the physical planning dealing cross-cutting issues are made in the municipalities. The municipalities often include smaller areas than are needed to handle the environmental problems. Besides the transport plans mentioned above it should therefore be good if there was a physical cross-cutting planning on regional or county level. Another problem is that the physical comprehensive plans in the municipalities are not binding.

Anyhow in the last years some projects have started to look at a more integrated regional physical planning. Earlier in Sweden we have a running process on regional development programmes, a programme for each county should be made.

Actually these programmes are not physical, but they are in the field of regional planning and hopefully these programmes could be integrated in physical planning and/or be developed in an more physical and environmental way. An overall problem is however that the development tends to be more economic than environmental.

5.1.5 Indicators

The SAMS project mentioned earlier has developed close to 300 indicators of various kinds. It is a question of both pure field indicators and planning indicators. Planning indicators can be formulated in the majority of cases so that they can also be used to assess the current situation, i.e. they can also work as field indicators.

In the project it was found that for most of the indicators a good deal of work still remains if they are to be used in practice. They need to be delimited, key concepts must be defined and data/material requirements need to be established.

The SAMS project selected 12 main groups of planning indicators which have been adjudged to be of general use in all municipalities. In each group, one or more planning indicators are more specifically formulated, as follow below. To read more look at EPA´s website, www.naturvardsverket.se, “planning with environmental objectives” (chose English (flag) and click on the book “A guide” and look at pages 78-80).

1. *Availability of public transport* (Proportion of the population that can travel by public transport to a certain point in X minutes or less or proportion of the population (in urban areas) that have X metres or less to a bus stop or train/underground station).

2. *Accessibility by bicycle and on foot* (Availability of adjacent, separate walkways and cycle-paths. The indicator availability of adjacent, separate walkways/cycle-paths can be supplemented by illustrating aspects such as cut-through routes, navigability, continuity and the barrier effect, for more information, see the Helsingborg case study report).
3. *Accessibility of recreational areas* (Walking distance between the housing area and green area or Number of barriers between housing and green areas).
4. *Noisy building areas and green areas* (Proportion of noisy housing units, max X dB(A) outside and X dB(A) indoors).
5. *Re-use of exploited land* (Number of new building areas that are built on previously exploited land).
6. *Building areas with sustainable energy supply* (Proportion of built-up areas with sustainable energy supply).
7. *Access to park land* (Area of park land per inhabitant).
8. *Access to forests, meadows and wetlands* (Proportion of forests, meadows and wetlands compared to total land use).
9. *Protected green areas* (Proportion of protected green areas).
10. *Biological diversity* (Protection of special and valuable biotopes).
11. *Exploited coasts and shorelines* (Proportion of exploited coasts and shorelines).
12. *Protected areas for long-term water supply* (Proportion of protected areas with regard to their significance for long-term water supply).

5.2 Incentive to achieve national air quality objectives

5.2.1 National air quality objectives

In April 1999 the Swedish Parliament adopted environmental quality objectives relating to fifteen areas, describing what quality and state of the environment and natural and cultural resources of Sweden are ecologically sustainable in the long term. The overall goal is to hand over a sustainable society to the next generation the timetable is set at 2020 (2050 for the climate objective).

For each general objective, specific targets were set out which were approved by the Parliament in November 2001 (2001/02:130). All sectors are obliged to work according to the objectives. Central objectives for air quality are the objectives *Reduce the Climate impact*, *Clean air*, *Natural acidification only*, *A non-toxic environment*, *Zero eutrophication* and *A good built environment*.

To reach the objectives, the Swedish EPA is formulating a strategy for appropriate measures to obtain an efficient use of energy and transports. The national objectives are transformed to regional objectives all over the country.

Several kinds of steps have been taken to reduce emissions of air pollutants in Sweden, such as:

- expansion of district heating in urban areas.
- introduction of fees on emissions of nitrogen oxides for energy production in combustion plants (4.5 €per kg NO_x expressed as NO₂).
- stricter requirements on emissions from industrial activities and heat or/and power plants.
- more stringent requirements on sulphur content in heating oils, diesel oil and petrol (since 1970s) and introduction of tax on sulphur 1991.
- differentiated harbour- and fairway fees, and tightened demands on emission and discharges from shipping (i.e. sulphur content of oils for ships).
- differentiated taxes and environmental classification of vehicle fuels, diesel and petrol (1990s).
- stricter requirements on vehicle emissions (light duty vehicles, catalytic converters 1989).
- environment zones for heavy duty vehicles (> 3.5 tons) and buses in urban areas. Vehicles older than eight years not allowed if not equipped with accepted exhaust emission control systems.
- environmental approbation system for new fireplaces and furnaces used for heating with firewood or other solid fuels.

5.2.2 The Environmental Code

Nearly all legislation concerning environment and health are gathered in the Environmental Code, adopted in 1998. The over all objective with the Code is to support a sustainable development and ensure that present and future generations will have a healthy and sound environment. The Code consists of 15 acts and 33 chapters and it entered into force the 1 of January 1999. The Code contains the fundamental environmental rules, more detailed provisions are laid down in ordinances issued by the Government.

When the Environmental Code came into force the Environmental Quality Standards (EQS) were introduced. EQS set limitvalues or target values for the environmental standard. They are adopted in order to address actual or potential environmental problems and to achieve environmental objectives.

The existing EQS for air quality are for nitrogen dioxide, sulphur dioxide, lead and particles (PM10), benzene, carbon monoxide and ozone. Authorities and municipalities have to ensure that the standards are kept when planning, supervising and giving permits. An actionplanshould be established if needed.

In December 2004 The Swedish Government took a decision to launch an action programme for particulates and nitrogen dioxides in the Stockholm region to meet the EQS. The decision was also taken for nitrogen dioxide in the Gothenburg region to meet EQS.

The governmental decision was based on suggestions from the County Administrative Boards of Stockholm and that of Västra Götaland (Gothenburg

region). The decision implies that the Counties in question are to update the Action programmes before 2006; and then establish them. The action programmes involves i.e. the following measures:

- better accessibility and service for public transports
- increased number of park and ride schemes
- traffic restrictions for heavy duty vehicles in one street (Hornsgatan)
- reduced use of studded tyres by means of information reduction of traffic volume
- emergency action (vacuum cleaning, dust binding by saline solutions, speed reductions)
- improved road surface
- washed grit for anti-skidding
- improved street-cleaning under conditions without snow (includes grit clearance, early spring-cleaning)
- overhaul of parking policies including parking-fees

6. LRTAP and Montreal protocol

6.1 Transboundary air pollution (statistics and effects)

Transboundary air pollution is a major environmental problem in Sweden. It contribute to acidification, eutrophication, increased levels of ground-level ozone and particulates. Sweden has signed and ratified all eight LRTAP protocols (the Convention on Long Range Transboundary Air Pollution). Sweden is actively participating in almost all different LRTAP working groups and task forces. The Swedish ASTA research program has had and will have an important impact on the work done in LRTAP.

The organization, the work done and the agreements reached within LRTAP have a strong impact on the corresponding work within the European Union. EU 25 form a major part of the countries in LRTAP. EU has also developed legislation and directives which are very much the same as the LRTAP protocols and vice versa. Some of the EU directives are parts of the LRTAP protocols as annexes to the protocols.

For Sweden the most important protocol is the Gothenburg protocol and the corresponding EU emission ceilings directive. They mean a substantial reduction of emissions in Europe of sulphur oxides, nitrogen oxides, volatile organic compounds and ammonia till 2010. The reduction of emissions will then lead to reduction of environmental and health effects in Sweden.

But it is not a final solution. There is work going on in the LRTAP and EU contexts to develop a revised Gothenburg protocol and emission ceilings directive. The Commission will in June 2005 make a proposal for a thematic strategy on air pollution strategy(CAFE).

The driving force besides problems with acidification, eutrophication and ozone is the significant health impact due to particulates. The decision to come will mean further reduction of emissions in Europe and also the environmental and health impact in Sweden.

POPs and heavy metals are also transboundary air pollution problems in Europe and in Sweden and Sweden has signed and ratified the LRTAP, POPs and Heavy Metals protocols and they are now being implemented. These protocols means also reduced emissions in Europe and less impact on the environment in Sweden.

The Nordic Council has had a program on transboundary air pollution since 1985 and it is still running.

6.2 Programme for ozone reduction (Montreal protocol)

Termination of ODS

Production and use of ozone depleting substances is regulated on national level through ordinance (SFS 2002/187) regarding substances depleting the ozone layer and supplement Regulation 2037/2000/EC of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.

With certain exceptions all vocational manufacture, operation, conveyance and placing on the market of chlorofluorocarbon (CFC), bromodifluoromethane (HBFC), hydrochlorofluorocarbon (HCFC), halons, carbon tetrachloride, 1,1,1-trichloroethane, methyl bromide and bromochloromethane (CBM) are banned.

Termination of CFC as refrigerant fluid initiated 1995 with prohibition of installation followed by a prohibition of refilling 1998 and prohibition of use 2000 with exception for stationary units with a refilling capacity of the refrigerant fluid of less than 900 gram, the operation is allowed during the unit's whole lifetime.

The termination of HCFC began year 1998 when the prohibition of installation came into force followed by the prohibition of refilling the 1 January 2002. The prohibition of the use of HCFC has still to be decided. The prohibition of the use of halon is in force since 1 January 1998.

Remaining areas of termination are those areas where an exception from prohibition is granted or where dispensations are given. These areas are defence activities, a restricted number of commercial installations (dispensations granted for the use of HCFC for cooling of industrial processes, and the cooling down to low temperatures) and halon in fire [extinguishers](#), for certain military applications as well as aircrafts. A low quantity of CFC is also used as a blowing agent for medical asthma inhalers for certain groups of patients.

7. Research and Development

7.1 Models for dispersion of air pollution – application

Different kinds of models to estimate air quality are often used for a variety of purposes. The most simple application is a table where air quality in the vicinity of a road can be roughly estimated based on traffic readings, road width and some standard modifiers like distance and height of surrounding buildings.

A more sophisticated tool on a national bases has recently been introduced as a tool for local authorities. It is comprised of an internet based simple dispersion model where regional and long-range transported contribution is added in the model. Emission databases are as default regional and national databases. However the user can enter data for better modelling at the local scale. The system is to be used for a first check of compliance with air quality standards.

Other more sophisticated models are used in larger cities and some regions where extensive local emission databases have been set up.

Models have been used for a variety of purposes in addition to compliance checking with air quality standards for example: Modelling of air quality changes in response to different abatement strategies; Assessment of human exposure to particular air pollutants in research studies; Modelling of emission plumes in response to accidents.

8. Financing

8.1 Financing of R&D programme

Presently, there are four important research programmes running in the field of air pollution in Sweden namely:

- International and National Abatement Strategies for Transboundary Air Pollution (ASTA),
- Swedish National Air and Health Effects Programme (SNAP),
- Biofuels Health and Environment (BHM) and
- Emissions Research Council EMFO.

8.1.1 The ASTA Programme

The objective of the ASTA Programme is to produce scientific knowledge, data and modelling tools in support of international measures to control transboundary air pollution in Europe and to develop national strategies and measures in various sectors that are affected by transboundary air pollution. This means:

- to strengthen and secure the future supply of Swedish expertise and scientific knowledge for the purposes of international negotiations on environmental agreements and national strategies,
- to build a consensus on research findings through international networks,

- to provide information about and visualise the regional air pollution problem in order to increase policymakers understanding of the issues and
- to promote a better understanding of the interface between science and politics.

The Swedish ASTA programme carries out research on acidification of soil and water, the effects of nitrogen input on forest ecosystems, the effects of ground level ozone on vegetation and regional transport and concentrations of particulate air pollution.

The first phase started in 1999, ASTA now continues with a second phase 2003-2006. The effects of increased extraction of forest biofuels are also studied in conjunction with the effects of acidification of soil and water and the effects of nitrogen input.

The Programme takes account of relevant international and national initiatives in the form of conventions, EC Directives and changes in strategies and approaches on the part of industry, public authorities and the general public.

8.1.2 The SNAP Programme

The SNAP Programme has been proposed by representatives from the Institute of Environmental Medicine at the Karolinska Institute, Occupational and Environmental Health at Stockholm County Council, Occupational and Environmental Medicine at the Universities of Gothenburg and Lund, respectively, Air and Noise Control at the Stockholm Environmental Protection Administration, the Stockholm - Uppsala Air Quality Management Association, and the Swedish Environmental Research Institute (IVL). The name is an acronym of the English title "Swedish National Air Pollution and Health Effects Program" (SNAP).

The principal scope of SNAP is to provide new information pertinent to the quantitative risk assessment of adverse health effects from air pollution. The information will be useful in the development of national and international guidelines as well as other preventive measures both on local and global scales. A secondary scope is to create and improve co-operation among national research teams within the field of air pollution.

Thus, great effort will be given to repeated communication and possibilities for interaction with national, regional and local authorities, institutions, and industry, as well as with other researchers. SNAP will also promote training of researchers and experts in this field, and thus contribute to a high quality of the research on environment and health in Sweden.

The program will specifically aim at addressing the following issues:

- to develop, improve and validate models for exposure assessment in epidemiologic air pollution studies.

- to evaluate the health effects associated with different pollutants in urban air, and quantitatively assess the risk for various health outcomes related to different air pollutants.
- to estimate the national public health impact of exposure to ambient air pollution.
- to explore different aspects of exposure to air pollution on health, e.g. different dose metrics and time-windows of exposure.
- to study the impact on health outcomes in both single - and multi-pollutant models.
- to identify susceptible subgroups for health effects from air pollution.
- to investigate potential interactions with other factors in relation to health effects from air pollution.
- to elucidate some biological mechanisms for an association between air pollution and various health outcomes.
- to produce, disseminate, and communicate valid and high quality data on air pollution and health to be used by national, regional, and local authorities and others in their preventive public health work.
- to promote co-operation and integration between Swedish research groups, and promote their involvement in international collaborations.

8.1.3 Biofuels Health and Environment (BHM)

This recently ended programme has covered emissions and health effects of biofuels. Development of equipment with lower emissions. In the program the emissions from different biofuel heating equipment has been characterized.

Important conclusions have been to demonstrate the benefits of using modern low emission type wood stoves or wood pellet burners compared to traditional wood boilers currently used.

Other important contributions have been the characterisation of biofuel emissions and development of source specific characteristics. Mapping and modelling of pollutants of biomass origin in a typical town have demonstrated the relatively large contribution from this source.

8.1.4 Emissions Research Council EMFO

The emission research programme, EMFO, is a sector-wide research competence to develop vehicles and vehicle components with emission levels that are sustainable in the long term.

The programme is to contribute to producing knowledge and making this knowledge available for use in research, development and education. This knowledge will then help Swedish industry and Swedish authorities to develop programme in the field of emissions from road vehicles, tractors and large machinery. Both industry and authorities are taking part in the programme.

The aim of the EMFO is to offer academia, industry and authorities access to necessary knowledge pioneering solutions that are necessary if vehicle technology

is to develop in the desired direction. One important task is to coordinate activities within the programme with both national and international research in the field.

Research on emissions from road transport and machinery

The programme includes research into emissions generated by vehicles in use, such as air pollution and noise. This incorporates emissions from both vehicles that use public roads and also tractors and larger machinery. Research on air pollution also covers exhaust fumes or vaporisation and the spread of particulate matter caused by tyre and road surface wear. Noise can be both noise from engines or drive systems and the noise of tyres on the road surface.

Research areas include private cars, lorries and buses, and also motorcycles, mopeds, tractors and larger machinery. For the purposes of this document tractor refers to the vehicle type described in the directive 2000/25/EC. Larger machinery means vehicles included in the directive 97/68/EC, i.e. with an engine power of at least 18 kW.

The programme targets research into issues relating to emissions and the development and demonstration of technologies. The development of prototypes and new products is however not financed by the programme. One important task for the programme is to coordinate activities within the programme with both national and international research in the field.

Objectives for EMFO in the short and long term are to

- through national coordination create a strong research environment that meets the future needs from industry and society for knowledge and skills create a meeting place for representatives from different interests and disciplines
- strengthen the interaction between institutes of higher education, research institutes, authorities and industry.

Objectives for EMFO in the long term, 5-10 years, are to

8.1.5 LRTAP - EMEP

Sweden is contributing to the LRTAP- EMEP programme by about half a million €a year. Sweden is also contributing to the LRTAP effects programme by about one million €a year.

9. Co-operation Mutual Environmental Benefits

The Swedish Environmental Protection Agency's involvement in global development includes projects funded from the Swedish Government's development assistance budget and other joint projects with individual countries. The focus for Swedish assistance to Central and Eastern European countries has

been primarily on Sweden's "immediate surroundings", i.e. the countries bordering the Baltic Sea.

Since 1988, concern for the environment has been one of the main objectives of Swedish development assistance, coordinated by Sida (the Swedish International Development Cooperation Agency). Swedish EPA's development cooperation projects are intended to promote an overall view of environmental policy and protection and help to develop efficient and effective environmental authorities in the partner countries.

Goals for Swedish EPA's environmental support to recipient countries are related to the HELCOM Action Programme for the Baltic Sea and, in recent years, the Baltic 21 programme for sustainable development.

The Swedish EPA has been working to facilitate Estonia, Latvia, Lithuania and Poland's entry into the EU by assisting these countries to develop institutions and institutional capacity at the policy, management and enforcement levels. The EU membership of the Baltic States and Poland (1 May 2004) signifies a phasing out of Swedish EPA's cooperation projects with these countries.

The cooperation continues in new forms, for example within the EU and other international organisations, building on the extensive contacts and shared experiences from the project cooperation. Joint action to transfer the experience and knowledge gained to neighbouring countries is also being discussed. In addition, Swedish EPA is also cooperating with Russia, Belarus and Ukraine in a similar way.

10. Case study of successful national atmosphere/air pollution programme/strategy

In two cases the Swedish Government has decided on action plans for the cities Stockholm and Gothenburg with the aim to reduce particulates (PM10) and NOx. See chapter 5.2.1.

11. Webb sites

www.slb.nu

City of Stockholm Environment and health administration / Stockholm – Uppsala air Quality management.

www.ab.lst.se

County of Stockholm. Action programme to reach environmental quality standards (EQS).

www.o.lst.se

County of Västra Götaland. Action programme to reach environmental quality standards (EQS).

www.vv.se

Swedish Road Administration.

<http://www.internat.naturvardsverket.se>

Swedish Environmental Protection Agency.

<http://www.regeringen.se/content/1/c6/02/54/57/86c2efb7.pdf>

Swedish Government.

www.sweden.gov.se/sb/d/2066

Ministry of Sustainable Development.

<http://miljomal.nu/english/objectives.php>

Environmental Protecting Agency, Environmental objectives