Swedish National Reporting to the UN Commission on Sustainable Development CSD18-19

Chemicals, Waste management, Sustainable consumption and production, Transport and Mining

Contents

Summary

Based on the national commitments made during the World Summit on Sustainable Development held in Johannesburg in 2002, Sweden has devised a national sustainability strategy, which underwent further development in 2004 and 2006. Over the period 2007 – 2009 the Swedish Government set up a national Sustainability Commission which has primarily focused on the issue of climate change. The Government additionally appointed an International Climate Commission focused on climate and development issues.

Work on sustainable development for Sweden has not only been accorded high priority, it also permeates all policy areas. The national strategy on sustainable development is closely linked, for example, to global development policy, in which world poverty reduction is a key element. Sweden plays an active role in the EU in advancing common EU policy for sustainable development.

It has been active in work on sustainable consumption and production since the World Summit on Sustainable Development in Johannesburg. It has, for instance, established an international working group on sustainable lifestyles with the aim of putting the 'Marrakech process' into practice and contributing to the development of a ten-year framework of programmes for sustainable consumption and production. Sweden also hosted the Third International Expert Meeting on Sustainable Consumption and Production held in Stockholm in 2007. A change in unsustainable consumption and production patterns is essential in order to meet a number of challenges such as mitigating climate change, bring about a resource-efficient economy (Green Economy) and reduce poverty. Work on sustainable development and production should involve efforts by a number of different actors, for instance governments creating frameworks and tools to make it easier for companies and households and other actors to behave sustainably: the business community providing information and sustainable products and services to the market and working through its supply chains, non-governmental organisations disseminating information and creating common platforms, and households making sustainable choices.

In the area of chemicals, Sweden considers the following issues to be of strategic importance to the development of sustainable chemicals management:

- Phase-out of substances of global concern
- Improved information on chemicals in articles through international cooperation
- Knowledge building on the health and environmental properties of chemical substances
- Continuous reduction in health and environmental risks of chemical substances

The following issues are of strategic importance to the development of sustainable waste management:

- prevention of waste
- reduced landfilling of waste

- better and increased sustainable recycling of waste
- transboundary transportation of waste under the Basel Convention
- safe management of hazardous waste

The following issues are of particular significance in continued work on sustainable consumption and production:

- The work of the Government in creating necessary conditions for and facilitating sustainable behaviour (including efficient infrastructure/physical planning)
- Continued legislative activity
- Development of economic instruments
- Technological development
- Changes in behaviour/sustainable lifestyles and consumption
- Product information
- Green public procurement
- The impact of our consumption in other countries
- Wastage in the food chain
- The involvement of the business community and working through the supply chains

The following actions are of strategic importance to the development of a sustainable transport system:

- Coordinate the whole travel chain or transportation better and adapt it to the needs of users
- Speed up the introduction of new transport technology for safer and more environmentally friendly transportation across borders
- Put a price on carbon dioxide emissions
- Develop sustainable transport solutions in cities as a part of an integrated sustainable urban development

The following issues are of strategic importance to the development of the mining industry and for sustainable extraction:

- Access to geological information
- Good flow in exploration for new deposits
- Research and development
- Training and availability of labour
- Simple and clear rules
- Enhanced infrastructure
- Global development of the mining industry

During its Presidency, Sweden will focus among other things on climate and an eco-efficient economy, two issues that in many ways touch on these areas.

1. Background

1.1 A strategy for sustainable development

Sweden has been actively involved in UN environmental work over a long period and more recently in its work on sustainable development. In 1992 the Earth Summit took place in Rio, laying the foundation for important principles on development and the environment. At the follow-up conference held in New York in 1997, agreement was reached on an action programme for development and the environment, Agenda 21, and fundamental principles relating to sustainable development for forests. All Swedish municipalities have taken decisions on local Agenda 21 programmes. Based on the Rio conference, a new world summit on sustainable development was held in Johannesburg in 2002. A political declaration and an implementation plan for sustainable development were adopted with the aim of all development having to be sustainable on the basis of economic, social and environmental values. During this summit each country undertook to implement national strategies on sustainable development by 2005.

The first Swedish national strategy was presented to Parliament in 2002 (Government Communication 2001/02:172). This was revised in 2004 on the basis of the commitments made at the Johannesburg conference. The strategy then underwent further development in 2006, with the focus on four challenges: building society sustainably, stimulating good health on equal terms, meeting the demographic challenge and promoting sustainable growth (Government Communication 2005/06:126).

An advisory Commission on Sustainable Development was established to strengthen cooperation and deepen the analysis of issues related to sustainable development. The Commission, whose members come from the business community, non-governmental organisations and the Government, developed cross-sectoral action strategies for sustainable development focused on climate change over the period 2007-2009.

1.2 The link between the national strategy for sustainable development and global development policy

The principal purpose of global development policy is for all policy areas to contribute to the objective of sustainable global development. Measures in each policy area should be formulated so that they are economically, socially and environmentally sustainable, while the perspective of poor people on development and the rights perspective are also taken into account. Economic growth and sustainable use of natural resources have been highlighted as key factors in global development and poverty reduction.

Environment and climate are one of six global challenges focused on in particular in global development policy. Chemicals management is one of three particularly prioritised focal areas of environment and climate. Chemical

substances are necessary in a modern society, but deficient chemicals management leads to serious health and environmental problems. Chemical compounds do not respect national boundaries and are transported in the air and water and through trading of goods. This is a global problem that must be tackled in collaboration with other countries. Better information on the chemical content of articles is needed, for example so that they can be managed when they become waste.

A growing proportion of the use and production of hazardous chemicals takes place in poor countries with deficient chemicals control, with the result that people and the environment in these countries are exposed to unacceptable risks. The poorest people are often hit hardest, in part because they often work in an exposed environment and lack information about the risks of hazardous chemicals. There is also a risk of the earth's natural resources and biodiversity being adversely affected by hazardous chemicals. Inadequate knowledge of chemicals and weak chemicals control may also have economic consequences for countries that export chemicals or articles containing chemicals. Requirements in the area of chemicals control are becoming stricter in many parts of the world, and may represent obstacles to trade. For those who import products it is safer to trade with companies that have good control over their use of chemicals. Stronger chemicals control in developing countries may contribute towards companies in these countries preserving or enhancing their competitiveness in the world market.

There is a risk of chemical issues undermining efforts to achieve fair and sustainable global development, and tackling these issues necessitates a broad approach in several policy areas such as environmental, agricultural, business, labour market, development assistance and health policy. It is therefore necessary for authorities to work together on this issue. The environmental sector should also work together with those responsible for labour market and health issues to achieve success in the area of chemicals.

Sweden supports countries wishing to develop national chemicals control. In the EU, Sweden presses for strong legislation and good application of the rules for example in REACH and the pesticides regulations, and consequently for limited use of hazardous chemicals.

Sweden is continuing to make active efforts under the Basel Convention for control of transboundary transportation and final disposal of hazardous waste, as well as pressing for information on chemical substances in articles to be improved internationally and in that way contributing to reduced environmental and health risks throughout the product lifecycle.

1.3 International work in the framework of sustainable development

As a complement to national strategy and other international strategies, a Nordic strategy on sustainable development was created on the basis of the Nordic Council of Ministers' Declaration on a Sustainable Nordic Region in

1998. The strategy was revised in 2008 and has been developed into a policy document that governs Nordic cooperation under the Nordic Council of Ministers. The strategy includes the cross-sectoral issues of climate, consumption and production, the future of the welfare society, training and research, the participation of the population and local strategies.

Further cooperation in the framework of sustainable development takes place between the countries around the Baltic Sea, Agenda 21 for the Baltic Sea Region – Baltic 21. The aim is to create an eco-region for sustainable development. Sweden assumed the presidency of Baltic 21 in the autumn of 2006 and held it until the summer of 2008. The presidency is now held by Denmark. Cooperation in the Baltic Sea Region also takes place under the Helsinki Convention on the protection of the Baltic Sea environment. Sweden has long been proactive in this work, and in the autumn of 2007 an action plan for the Baltic Sea was adopted. There is equivalent cooperation in the North-East Atlantic through the Oslo-Paris Convention.

Swedish efforts for global sustainable development signify active participation in several international processes such as the Marrakech process on sustainable production and consumption patterns and the Lisbon strategy on sustainable growth and employment (Government Communication 2005/06:23). The first EU strategy on sustainable development was adopted at the European Council meeting in Gothenburg in 2001. As a result of the adoption of a new EU strategy in June 2006, the strategy has been enhanced by the identification of seven challenges: climate change and clean energy, sustainable transport, sustainable production and consumption, conservation and management of natural resources, public health, social integration and global challenges in connection with poverty. The links between the EU level and the national level are strengthened by the Member States having to follow up and report relevant measures to the European Commission in June 2007. The second follow-up is now being done during the Swedish presidency in the autumn of 2009 on the basis of a report from the European Commission. The report is being prepared in a temporary working group for a decision by the European Council in December 2009.

With its analytical capacity and the possibility of exchange of experience between the Member States, the OECD has clear advantages in contributing to the global work on sustainable development from an economic, social and environmental perspective. In the OECD group Annual Meeting for Sustainable Development Experts, Sweden is urging the OECD to step up its work on sustainable development and cross-sectoral solutions in its core activity. The OECD also works on research on sustainable consumption and has just completed an extensive project involving a large number of research scientists from various countries. The project is now being evaluated to identify needs for further research in a second round.

Global demand for more energy-efficient technology and resource-efficient solutions and systems is expected to increase sharply in the future. More than 100,000 visits, many from abroad, are made annually to Swedish facilities to study water, waste or energy systems. Promotion of Swedish exports takes place both in Sweden and abroad, through the Ministry of Foreign Affairs and missions abroad (embassies and consulates), as well as the Swedish Trade Council. The task of the Swedish Trade Council is to make it easier for Swedish companies to expand internationally, and in 2008 the Government gave the Swedish Trade Council a specific remit to work towards increased exports of environmental technology, focusing in particular on small and medium-sized Swedish enterprises.

The state-owned venture capital company Swedfund International AB is a development player which through investments in developing countries and countries in Eastern Europe is intended to contribute to attaining the objectives of Swedish global development policy and Swedish development cooperation. Swedfund will contribute through its operations to sustainable development, good business culture and good working conditions. The investments made possible with Swedfund as a source of finance contribute to generating economic growth, through increased employment, technology and knowledge transfer and increased tax revenues.

2. Tools for policy implementation

2.1 Laws/regulations

National rules are of great significance to the competitiveness of the Member States in a common EU market. The role of legislation is in particular to influence environmental and sustainability work through the establishment of a minimum level that all actors in society have to reach. A large proportion of Swedish environmental legislation is based on European environmental law. In some cases Sweden has set more stringent requirements than the Community rules, on environmental grounds.

Principles under the Environmental Code

The general rules on consideration in the Environmental Code have to be followed in action that may have an impact on the environment or on human health, unless the action is of negligible significance with respect to the aims of the Code. The rules on general consideration enshrine several fundamental principles.

The *precautionary principle* means that even the risk of harm and inconvenience entails an obligation to take the measures needed for effects on health and the environment to be prevented, obstructed or counteracted. The obligation thus does not just relate to observed harm or inconvenience, and precautions have to be taken as soon as there is reason to assume that harm or inconvenience arises.

The *principle of product choice* means that the use or sale of chemical products or biotechnical organisms that may pose a risk to human health or the environment must be avoided if the products can be replaced by other, less hazardous products. This also applies to articles that contain or have been treated with a chemical product or a biotechnical organism.

The *polluter-pays principle* has now been adopted internationally. Anyone who has taken action that has caused harm to the environment is responsible for the harm being remedied under the Environmental Code. This applies regardless of whether the activity has been closed down or transferred. The obligation applies until the inconvenience has ceased.
Best available technology is to be used in commercial activity to prevent harm and inconvenience to human health and the environment.

The *management principle* means that all activity is to be pursued and all action taken so that materials and energy are used as effectively as possible and consumption and waste are minimised. As far as raw materials and products are concerned, the management principle is closely linked in various ways to the principle of the natural cycle. The best effects are obtained in construction and manufacturing.

The *principle of the eco- cycle* means that what is extracted from nature has to be capable of being used, reused, recycled and disposed of in a sustainable way with the lowest possible consumption of resources and without harming nature.

There is a large quantity of legislation in Sweden concerned with consumption and production. The Environmental Code is the key set of rules, containing provisions on, among other things, chemicals and waste. The rules in the area of waste are wide-ranging. EU rules apply through the Framework Directive on Waste, which contains the definition of the term waste and the classification of hazardous waste. In addition there are EU rules on landfilling, incineration, packaging, cars, batteries and electronics. There are overarching provisions on waste in Swedish legislation in Chapter 15 of the Environmental Code and in the Waste Ordinance. In addition there are several ordinances containing rules on various methods of treatment and producer responsibility.

Statutory producer responsibility has been introduced in Sweden to move in the direction of more environmentally sound products in the following areas: packaging, waste paper, cars, tyres, batteries, radioactive waste and spent nuclear fuel, as well as electrical and electronic products. Producer responsibility means that the producers among other things are responsible for disposing of the products when they become waste as this gives them an incentive to design the products in an environmentally sound way so that they are easy to recycle. There are also rules linked to the producer responsibility on the content of hazardous substances, responsibility for information and collection and recycling targets. It may be noted that these measures have made consumers more environmentally aware and committed with regard to waste management. The measures have also increased recycling and have consequently brought about a sharp reduction in landfilling. Today only 4% of the household waste is sent to landfill.

The Planning and Building Act (1987:10) is another set of rules, aimed among other things at efficient land use and energy-efficient building. Reduced climate impact is an important task in physical planning. Conscious control of the development of the built environment is of great significance for future transport dependence and energy consumption, as the built environment changes slowly, and a transport-generating and energy-demanding structure of the built environment has long-term consequences. Emissions with a climate impact can be minimised through integrated and forward-looking physical planning with low-transport and energy-efficient community planning.
The Annual Accounts Act (1995:1554) contains a requirement that businesses requiring a permit or notification under environmental legislation should report the impact of the business on the external environment, which is intended to meet the needs of the financial sector for information on these issues. An amendment to the Annual Accounts Act regarding rules on the contents of the directors' report came into effect in 2005. The amendment means that the directors' report has to contain a description of material risks and factors of uncertainty faced by the

company. It also means that the provisions on the contents of the directors' report are supplemented by a requirement that disclosures of a non-financial nature must be presented if the disclosures are required to understand the development, position or financial results of the company. Environmental and personnel issues are examples of such disclosures.

The Community's Eco-Management and Audit Scheme (EMAS) was established in 1993 and revised for the second time in 2008-2009. The revision means that organisations outside the Community may take part in the scheme. The Commission will also take the initiative to draw up reference documents as a benchmark for efficient management systems.

A number of sets of rules supporting sustainable product development have been developed in the EU. These include the RoHS and WEEE directives on electrical and electronic products, REACH on chemicals and the Ecodesign Directive, which covers all energy-related products.

2.2 Economic instruments

The term economic instruments is used to mean policy instruments that affect the cost to companies and households of their production and consumption choices. Unlike administrative instruments such as legislation, they do not regulate the behaviour of companies/households but make use of price signals and then leave it up to the actors to choose how to behave.

Economic instruments that internalise the environmental costs that arise in the production of various goods and services represent the primary tool with which to bring about sustainable development. Clear price signals in the market create incentives for those companies and private individuals that have an adverse impact on the environment to take measures to reduce this impact. Carbon dioxide tax, energy tax, sulphur tax, nitrogen oxides charge and carbon dioxide emissions trading are examples of instruments that have generated significant emission reductions in a cost-effective way in Sweden. Most of these instruments also generate tax revenue for central government, which can be used to finance the lowering of other taxes such as income tax.

Energy and carbon dioxide taxes have proved to be a successful and effective way of reducing emissions. Greenhouse gas emissions fell by nine per cent between 1990 and 2007. GDP grew by 48 per cent over the same period. Calculations show that total greenhouse gas emissions would have been 20 per cent higher in 2010 than in 1990 if taxes had stayed at the 1990 level.

It has also been found by experience that relatively small differentiations in a charging scheme can have significant effects. It appears that the signal, for example in the shape of environmental differentiation that favours the environmentally best alternatives, is just as important as the absolute amounts. Another lesson learned is that a combination of different instruments is often required to bring about changes. The tax relief for renewable vehicle fuels, the green car rebate and reduced benefit values for green cars, for example, have

led to a dramatic rise in sales of fuel-efficient cars and cars that can run on renewable fuels.

Another successful example is the congestion tax for central Stockholm which was permanently introduced with effect from 1 August 2007 in order to reduce congestion and improve the environment. Traffic levels have fallen by an average of 18 per cent since the tax was introduced.

With regard to goods and services that have a positive impact on the environment, mention can be made of payments for wetlands, catch crops and protection zones in agricultural areas. Tax relief with regard to increased energy efficiency and biofuels creates incentives for the transition to a sustainable society.

Since the early 1980s Sweden has had a deposit scheme for beverage packaging (glass bottles, PET bottles and aluminium cans) to promote collection, reuse and recycling of the material in packaging. These schemes have been very successful: 100% of reusable PET bottles were reused in 2007, while 98% of recyclable PET bottles were recycled. 87% of aluminium cans were recycled in the same year.

A landfill tax was introduced in 2000. The aim was to create economic incentives to deal with waste by reuse, material recovery, material utilisation or incineration with energy recovery. Landfill tax has had some impact on the rate for household waste management and on the costs of treating waste. In addition, the tax has had a guiding effect, so that the volume of waste sent to landfill has fallen and the volume incinerated and recycled has risen.

The municipalities' billing for household waste management in many cases has been used to guide households towards desired behaviour. Many municipalities have, for instance, chosen to introduce differentiated charges in order to increase the separation of recyclable material. The differentiation may be dependent on the separation of food waste or frequency of collection.

Sweden's tax on cadmium in commercial fertiliser is judged to have had a clearly favourable effect in reducing the input of cadmium to Swedish arable land and in bringing cadmium inputs down to the low level they are at today, and thus also in reducing the risk of adverse health effects.

The Swedish tax on pesticides has only contributed to a small decrease in sales of pesticides as the rate of tax is too low to have a marked effect on use. The tax may, however, have worked as an indirect steering tool, for example through the financing of information campaigns.

To reduce health and environmental risks with chemicals there is a need for knowledge on where they exist and in what quantities they occur. The Swedish Products Register provides an overview of chemicals in Sweden and is therefore

an important tool with which to check chemicals and an aid to attaining the environmental quality objective A Non-Toxic Environment. The register is funded by an annual charge paid by companies manufacturing or importing more than 1 tonne of chemicals.

Anyone wishing to place a pesticide on the market in Sweden has to apply for approval, and a charge is levied on approvals, changes in terms of approval and exemptions. An annual fee based on the volume used is also charged.

2.3 Indicators for sustainable development

Sweden has devised indicators of sustainable development linked to the Swedish strategy for sustainable development. In cooperation with Statistics Sweden and several government agencies, twelve measurable indicators have been selected in six thematic areas – health, sustainable consumption and production, economic development, social cohesion, environment and climate, as well as global development. The indicators provide a basis for the follow-up of measures, information and debate. They were most recently updated in 2006.

2.4 The environmental quality objectives

The Swedish Parliament has adopted sixteen ambitious environmental quality objectives. They are formulated on the basis of the environmental impact nature tolerates and define the state of the Swedish environment to be aimed for. The long-term objective is to hand over to the next generation a society in which the major environmental problems have been solved. The objectives indicate the direction for Sweden's environmental efforts nationally but also internationally in order to achieve a sustainable society. Environmental work in Sweden has been structured and made more efficient through the environmental quality objectives and the system built up around them. This has also made environmental work easier internationally.

2.5 Training and capacity building

Research, training and capacity building are essential in developing knowledge on sustainable development for the needs of present and future generations. Many important future issues must be solved by collaboration between many countries and between researchers from various scientific disciplines.

The subject of chemistry in Swedish schools is based on everyday life, and in this perspective highlights issues relating to natural resources and health. According to the curriculum, schoolchildren have to acquire knowledge of natural and industrial processes, the production of various materials and their uses and how reuse and recycling are used to organise resource management. In primary and lower secondary school knowledge of chemistry is developed in order to be able to understand, argue on and decide on issues related for example to industrial processes, products, product use and energy utilisation or to propose measures on issues related to the environment and health. After the fifth year of school, pupils have to have an insight into how chemical

knowledge can be used in discussions on resource and environmental issues and how knowledge of chemistry can be used to improve our living conditions. They also have to have an insight into the risks of chemicals in the home, and how they are labelled and should be handled. After the ninth year of school, partly with the aid of examples, pupils have to be able to illustrate how chemical knowledge has been used to improve our living conditions and how this knowledge has been misused. They have to know how to handle common chemicals and combustible substances safely and be able to hold discussions on use of resources in their private lives and in society.

PRIO is a web-based tool developed by the Swedish Chemicals Agency to support companies' capacity building. PRIO is aimed among others at environmental managers, purchasers and product developers who wish to exert influence and take preventive action to reduce the risks from chemicals to human health and the environment. The tool may also represent a source of knowledge for environmental and health inspectors, environmental auditors, risk analysts or those who in some other way can influence the use and handling of chemicals, for example through strategic decisions.

There is still a great lack of knowledge on the environmental impact of pharmaceutical substances. Work is in progress in a unique environmental strategy research project in Sweden, MistraPharma, with the aim of identifying which of the 12,000 pharmaceutical substances currently available on the Swedish market can pose a significant risk to aquatic organisms. The project is also aimed at recommending techniques for improved wastewater treatment, improving strategies and indicators so that pharmaceutical substances capable of causing adverse environmental effects can be identified at an early stage and at strengthening cooperation nationally and internationally. The programme has a budget of SEK 42m.

The objective of a research programme on emissions from articles is to increase scientific understanding of emissions from articles with the aim of supporting the development of Swedish and European action programmes. Technical, scientific and social aspects that contribute to the magnitude of the problem complex are identified in close collaboration with government agencies and other stakeholders. A selection strategy is being developed under the programme for the identification of problematic chemicals, articles and patterns of use, and a number of case-study chemicals are selected, after which the emissions of these chemicals are quantified and related to other sources. The customers' perception of the risks associated with emissions of organic substances is examined, as well as their attitudes to information on these risks. Various voluntary and legislative problem-reduction strategies are analysed and a road map and indicators adapted to the environmental objective of A Non-Toxic Environment are drawn up. The programme, which is due to continue for three years and have a budget of SEK 16m, is intended to clarify how great the problem of chemicals being dispersed to the environment via articles actually is.

There are also a few projects in the area of chemicals aimed at developing alternatives to hazardous biocides, for instance in antifouling paints, as well as a project known as Greenchem. The objective of Greenchem is for the basis of the chemical industry to move from fossil raw materials to renewable raw materials, for example with the aid of biotechnology, for the production of "green chemicals".
There is also an initiative for research on the risks associated with nanomaterials.

The research programme Sustainable Waste Management is aimed at identifying instruments and other strategic decisions that make possible to continue the trend towards more sustainable waste management. The researchers study environmental, economic, cultural and social aspects of the waste system, focusing on waste prevention, reuse and material recovery, including biological treatment. The studies are conducted by macroeconomists, ethnologists and an environmental psychologist in collaboration with systems analysts and futures researchers. The researchers review existing and potential policy instruments and formulate promising alternatives. They evaluate these by combining and enhancing existing models, methods and databases from economics, waste system analysis and environmental system analysis: partial and general equilibrium models, lifecycle assessments, substance and material flow models etc. They study systems for separation at source of generation and collection, with the aim of developing knowledge required to adapt them to consumers, organisations and companies. This is done both by the quantitative methods of environmental psychology and by qualitative cultural analysis. The researchers also study the processes of the recycling industry with the aim of identifying opportunities to improve their environmental performance. The programme develops future scenarios both to produce background data for the evaluations of the policy instruments and to illustrate threats and solutions to the sustainability problems of waste management. The programme is intended to contribute to attaining the environmental quality objectives A Non-Toxic Environment, A Good Built Environment and Reduced Climate Impact. The Swedish Environmental Protection Agency has earmarked SEK 16 million for the programme for the period 2006 to 2012.

Research and development and access to well trained personnel in all areas are strategic issues for the development of the mining industry in connection with long-term sustainable use of metals and mineral resources.

2.6 Forms of collaboration for sustainable development

Rapid global urbanisation means that an ever greater proportion of the world's population live in cities and built-up areas. Cities are becoming increasingly important for economic development and quality of life, but also for the environment. Development in the cities in particular is becoming important in meeting the climate challenge. The built environment and transport in cities

account for a large proportion of energy use. There is growing demand in both industrialised and developing countries for know-how and technology to bring about sustainable urban development.

Through a focus on environmental issues and enhanced collaboration between local authorities and industry, Sweden has established a high level of know-how to bring about sustainable urban development, with several examples that have attracted wide international attention. As part of the promotion of Swedish environmental technology exports, the Swedish Trade Council, on behalf of the Government together with the environmental technology industry, has developed the marketing concept and communication platform SymbioCity (www.symbiocity.org). This platform markets Swedish sustainability, various solutions and combinations of such solutions in larger systems and Swedish companies: consultancies, entrepreneurs and suppliers of Swedish products and services.

There is great interest from other countries in acquiring Swedish know-how. An example is China, where close cooperation on environmental technology, renewable energy and sustainable urban development has been established. It is important, however, that new examples of best practice are added, both for work on the environment and climate in Sweden and for further enhanced international collaboration. To reinforce this trend, the Government has therefore appointed a Delegation on Sustainable Cities for the period 2008 to 2010. This Delegation is intended to bring central government, industry and local authorities together in a national platform for sustainable urban development. Part of the purpose is to stimulate urban development projects that both contribute to an improved environment and reduced impact on climate and assist Swedish exports of environmental technology. The aspiration is to use leading-edge technology and forward-looking planning to put into practice visions for future cities and sustainable living solutions in individual urban blocks, districts and neighbourhoods.

The Government has earmarked SEK 340 million in the 2009-2010 budget for financial grants. The aid can be given to companies and municipalities for measures that contribute to the creation of attractive and sustainable urban environments with reduced climate impact. The aid may relate to new-build or refurbishment measures and may include measures in the areas of energy, water, waste and transport, but also in other sectors. There is a special focus on urban development projects that appreciably reduce greenhouse gas emissions. These projects are additionally intended to serve as models for integrated sustainable urban planning and applied environmental technology and facilitate dissemination of knowledge and exports of environmental technology.

Another example of forms of collaboration between policy areas is that during its presidency of the EU Sweden will be holding several informal ministerial meetings on a common theme: an eco-efficient economy. The Ministry of

Enterprise, Energy and Communications and the Ministry of the Environment are arranging the informal meetings of energy and environment ministers in Åre on 23-24 July and 24-25 July 2009, as well as the subsequent informal meeting of competitiveness ministers in Umeå on 14-16 October. The challenge is to embark on a new development route that attracts investment and creates employment and prosperity and that enables us to cope with rising and widely varying prices for energy and raw materials and eliminates climate change and environmental degradation. This requires a coherent policy and collaboration between policy areas as well as between actors.

A logistics forum was established by the Government in 2007 as an advisory body chaired by the Minister for Infrastructure, Åsa Torstensson. The Logistics Forum is intended as a place for the exchange of experience, views and advice between representatives of the various stakeholders in the area of logistics. The Logistics Forum has around 25 members representing large transport buyers/goods owners, the transport industry and research in the area of logistics and transport. The Logistics Forum has taken the initiative to develop Green Corridors as a project and form of cooperation, see Chapter 7.

Another form of cooperation between the public sector and industry is Climate-Neutral Freight Transport by Road. This began in the autumn of 2006 as a cooperative venture between four large players in road transport, Schenker, Volvo Trucks, Preem and the Swedish Road Administration, together with the Gothenburg Environmental Science Centre at Chalmers and Gothenburg University. Ten new members have joined in the past year. The long-term aim for cooperation is for Swedish freight transport by road to become carbon-neutral. As a first interim target, the climate impact of typical Swedish freight transport by road is to be reduced by half by 2020. The Swedish Road Administration is assisting with the administration of the project, which has a ten-person board and a chair elected annually. All participating members must be active, and the commitments made by the various actors under the project have to be followed up and reported.

3. Summary analysis and strategy for specific themes

3.1 Chemicals

Phase-out of substances of global concern

Sweden considers that substances causing serious global concern should be phased out from uses involving high risk. Work at international level is needed to identify, prioritise and control substances whose use today poses environmental and health risks from a global perspective.

It is very important to implement and enhance international agreements for safe handling of chemicals in Sweden and globally. Certain chemical substances have particularly hazardous properties and may be difficult or even impossible to manage without appreciable risks to humans or the environment. Strong global measures have been taken against the production and use for example of ozone-depleting substances (the Montreal Protocol). The production and use of certain persistent organic pollutants has also been made the subject of tight regulation under the Stockholm Convention. The Rotterdam Convention sets forth requirements for information to the recipient country before certain substances may be exported. An overarching problem with several conventions on chemicals is that to date it has not been possible to agree on strong compliance mechanisms. There is also a lack of instruments for international measures for many substances with properties that pose risks to health and the environment. This may apply for example to organic substances that are persistent and toxic without meeting the criteria for POPs under the Stockholm Convention or certain metals with properties hazardous to health and the environment. Sweden welcomes the decision by the UN Environment Programme (UNEP) in the spring of 2009 to negotiate a binding agreement by 2013 to limit emissions and trading in mercury. A goal for international work on chemicals should be for substances of global concern to be phased out from uses involving high risk. Work is needed at international level to identify and prioritise such substances. The results can form the basis of safe handling and phase-out primarily from uses where the substances to a great extent are dispersed in the environment and there is limited possibility of recycling.

Improved information on chemicals in articles through international cooperation

Sweden has made considerable progress in dealing with large local point emissions, for example from wastewater systems, industrial plants and waste management. The difficulties faced in Swedish work on chemicals control today are principally due to the diffuse emissions of substances harmful to the environment and health from articles, to unintended substances being formed in industrial and combustion processes that may be emitted in flue gases and waste, and to persistent and bioaccumulative substances already dispersed in the environment remaining for a long period. Diffuse sources such as chemicals in articles have increased in significance.

The information on chemical substances in articles should be improved through international cooperation. International trading in articles containing

hazardous chemicals entails significant global dispersal of hazardous substances. Opportunities for the substances to be managed safely throughout the lifecycle of the article are improved by access to information. Increased access to information on chemicals in the management chain also makes possible increased material recovery, reduced quantities of waste and reduced risks to health and the environment.

Today international requirements for information transfer do not cover hazardous substances that are transported globally in articles and that can be emitted from the articles during use and at the waste stage. This applies for example to hazardous substances in toys, electronics and textiles. The increased turnover of consumer goods signifies increased diffuse dispersal of chemical substances in both the use and waste stages. This diffuse dispersal also signifies increased exposure to a number of different substances, the aggregate effect of which has been inadequately investigated. In most cases it is not intended that the substances contained in the articles will be released during use. There are, however, examples of this happening, for example in washing (nonylphenol, silver). A large proportion of the articles consumed in Sweden are produced in countries where there may be inadequate control and consideration of environmental and working conditions. The problems concerning the substances in articles therefore also relate to lifestyle, sustainable development and global fairness, as well as direct risks to health and the environment.

Human and environmental exposure to certain chemicals takes place predominantly during the use or disposal of the article. There are examples of hazardous substances in articles having caused serious effects, for example in children exposed to lead in jewellery or toys. Risks associated with the extensive trade in discarded electronics have attracted attention in several contexts, such as in an African study conducted by UNEP with Swedish support as part of the scientific evaluations of lead and cadmium. As the production and trade chains for articles are often long and may pass through various countries, efforts to improve access to information on the substances in articles, for example by developing information systems, need to be made at the international level.

The objective in the global chemicals strategy SAICM (Strategic Approach to International Chemicals Management) adopted in 2006 is for all actors to have access to knowledge and information on hazardous substances by 2020 so that these can be assessed and managed in a safe way throughout their lifecycle. This objective covers information on chemicals in articles. If it is to be possible for this objective to become reality, there is a need for specific work to identify and prioritise substances, product groups, the needs of various actors for information and possible ways of providing and disseminating information, as well as an analysis of costs and benefits.

On a Swedish initiative, the EU notified the issue of the need for international collaboration to increase knowledge and access to information on the presence of hazardous substances in articles as what is known as an Emerging Policy Issue in SAICM. Proposals for international work were drawn up after an informal international workshop held in February 2009, which was arranged by the UN Environment Programme (UNEP) with support from Sweden, Japan and the Nordic Council of Ministers. A consensus emerged at the workshop, attended by more than 60 countries and stakeholder organisations, companies, industrial sectors and research institutes, that international trade leads to hazardous chemicals in articles being dispersed, which may pose global problems. A conclusion from the workshop was that access to information on substances contained in articles must be improved to make it possible for the substances to be managed more safely by affected actors throughout the article's lifecycle.

Sweden welcomes the fact that SAICM has decided that information on chemicals in articles should be an Emerging Policy Issue. This happened at the second high-level meeting of SAICM, the International Conference on Chemicals Management (ICCM2) in May 2009, when the proposal was discussed as one of four prioritised policy issues. The parties unanimously decided that there is a need for global efforts to improve access to information on chemicals in articles (e.g. computers, textiles, toys, furniture) and therefore to launch a project directed by UNEP. The project will gather and review information on existing information systems on chemicals in articles and analyse various actors' needs for information, after which an analysis will be made of the need for further information systems. A recommendation will made under the project on future work for discussion at a preparatory working group meeting in 2011 and for a decision at the next ICCM which is due to be held in 2012.

Knowledge building on the health and environmental properties of chemical substances

The majority of rules on chemicals today are common throughout the EU. The EU's new legislation on chemicals, REACH, replaces a large proportion of the rules in the area of chemicals that applied before 1 June 2007 in Sweden and the EU. Several parts of REACH offer opportunities for improved and more effective control of chemicals. Knowledge of the properties and dispersal of chemical substances is essential if we are to understand the ways in which the substances could harm public health and the environment and to enable us to prevent harm from occurring. The requirements for knowledge in REACH mean that companies to a greater extent than previously must develop knowledge of the health and environmental hazards of chemical substances. This information will be collated in a database at the European Chemicals Agency which for the most part will be accessible for the general public. Countries outside the EU can thus also benefit from the information in the database. Sweden is pressing for the knowledge requirement to be gradually

increased in REACH in conjunction with other reviews and updates and through strict application of the legislation.

Continuous decrease in health and environmental risks of chemical substances

The information produced according to the registration requirements in REACH
provides what is needed for risk reduction throughout the product chain. Companies, public-sector actors and individual consumers all have an opportunity to choose the substances needed and to reject unsuitable, unnecessary and hazardous substances. REACH also lays the foundation for safe management of substances throughout the production chain as manufacturers and importers of substances have responsibility for carrying out risk assessments and recommending risk-management measures to companies that use these chemicals.

The Swedish Chemicals Agency's web-based tool PRIO, which is aimed in particular at small and medium-sized companies, can make it easier for companies to adapt to the requirements of legislation and support their development. The Swedish Chemicals Agency has also launched information initiatives on REACH and skills-enhancing measures for example in the form of dialogues between authorities and industry.

There are general rules on consideration in Swedish environmental legislation that have to be followed, as a measure may have consequences for health or the environment. One of these is the principle of product choice, which means that the use and sale of chemical products that may pose a risk to health or the environment have to be avoided if the products can be replaced by other less hazardous products. The precautionary principle means that precautions have to be taken as soon as there is reason to assume that an activity or measure may cause harm or inconvenience to human health or the environment.
New risks may arise as a result of technical development. Rapid development in nanotechnology means that research on health and environmental risks are judged to be particularly important in this field.

Increased diffuse dispersal, for example through articles, signifies exposure to a number of different substances, the aggregate effect of which needs to be investigated more closely.

3.2. Waste management

Prevention of waste

Our production and consumption lead to large quantities of waste. An important element in work on eco-cycles is therefore sustainable waste management. Articles that circulate in society contain large quantities of

different materials. Many are energy-demanding to produce and contain substances that exist in limited quantities. It is therefore necessary that we manage joint resources in a long-term manner to achieve sustainable cycles in society. Many articles additionally contain substances that are toxic or hazardous and should not be released into the environment. This necessitates phasing out the most harmful substances and handling correctly those substances that continue to be used. There is a eco-cycle strategy in Sweden linked to the Swedish environmental objectives. The strategy is aimed at bringing about a society with non-toxic and resource-efficient cycles. This includes prevention of waste, changed patterns of consumption, more efficient production methods and waste management with a greater focus on recycling. The natural cycle strategy looks at materials and products throughout their lifecycle in order to provide as complete a picture as possible of their environmental impact. Consumption of energy for a product also has to be weighed into the assessment. Sweden considers it necessary for the volume of waste to decrease if we are to come close to sustainable management of waste. Producers must already take account of a product's environmental impact in a lifecycle perspective when it is manufactured. Design and material selection, as well as energy consumption in manufacturing and use must be taken into account. In addition, sustainable cycles can only be achieved if a greater proportion of waste can be reused and recycled. This saves both materials and energy, while also reducing the use of hazardous chemicals and environmental problems in waste management. One aspect of this work is focusing on issues relating to chemicals in articles within SAICM.

Reduced landfilling of waste together with increased sustainable recycling of waste

Waste can be both a resource and an environmental problem. Sweden considers that waste management that works poorly involves considerable wastage of valuable material and can lead to environmental and health problems. In cases where waste management does not work, this can lead to problems related to sanitation and health, as well as soil and water pollution.

The aim as far as possible is to make use of the resources contained in waste. At the same time, it is important to reduce adverse effects in the form of emissions of methane gas from landfills and carbon dioxide from combustion, as well as emissions of heavy metals and organic environmental pollutants. There is a hierarchy for how waste is to be managed in EU legislation. This primarily means that we have to try to produce as little and as non-hazardous waste as possible. Material recycling is prioritised over energy recycling for waste that nevertheless arises, where this is environmentally justified. The waste ultimately has to be disposed of by landfilling. There are no obvious answers as to what method is preferable for all types of waste in choosing material recovery and incineration. Several analyses generally support material recovery that lets materials and nutrients enter a cycle. Sweden considers the waste hierarchy to represent a good starting point for achieving sustainable waste management.

An all-embracing perspective on the area of waste is required to attain sustainable waste management. Various measures that reduce the volumes of waste and control waste streams according to the hierarchy for different methods of treatment are required. The key is to increase the material recovery of waste. Recycled raw material saves energy compared with the use of new raw material, in addition to which material recycling often leads to lower emissions than other methods of treatment. When producers start to recover material a valuable link also arises to environmentally oriented product development in order to improve the efficiency of manufacturing. Several measures have been taken to promote biological treatment, in part to reduce greenhouse gas emissions from landfills and be able to make use of the plant nutrients contained in food waste. The ban on landfilling organic waste and the targets for increased biological treatment of food waste and for waste from the food industry have been most effective.

Transboundary movements of waste under the Basel Convention

The Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal is a global convention that was adopted in 1989 and came into force in 1992. The fundamental purpose of the Convention is to protect human health and the environment against harm that can be caused by movements and disposal of hazardous waste and other waste. The Convention regulates transboundary movements of waste, and the parties to the Convention have undertaken to manage hazardous waste and other waste in an environmentally correct manner. Sweden considers it important to comply with the rules in the Basel Convention and the amendment banning exports of hazardous waste from OECD countries to non-OECD countries (ban amendment) in order to reduce the negative aspects of transboundary movements of waste. As a consequence of the question of when an end-of-life product is to be classified as waste, problems in relation to transboundary movements have arisen in particular with regard to electronics, cars, refrigerators and also end-of-life ships. The problems associated with these movements are that large quantities of hazardous waste accumulate in countries that do not have the capacity or knowledge to deal with waste in an environmentally correct way. This can lead to risks to the environment and human health in these countries. Sweden views this problem as serious and welcomes the initiatives taken under the Basel Convention to discuss solutions.

Safe management of hazardous waste

Sweden considers an important element of the work of guiding waste management in the direction of sustainability to be reducing the amount of hazardous waste. Substances that pose a health hazard or are harmful in some other way must be removed from the cycle. Incorrect management of hazardous waste can pose a great risk of harm to humans and the environment. It is therefore important not to mix it with other waste but to present it separately to professional waste receivers. Some of the characteristics that distinguish hazardous waste are that it may be toxic, carcinogenic, corrosive,

harmful to the foetus, ecotoxic, infectious or combustible. The hazardous substances in hazardous waste must not be dispersed in nature or be allowed to be re-introduced into the cycle of society. Examples of such hazardous substances are heavy metals such as mercury, lead and cadmium and stable organic compounds such as PCBs and dioxins. Sweden therefore considers it self-evident from the environmental point of views that hazardous waste has to be kept separate from other types of waste as far as possible and that separation at source of generation is necessary in this context. Only then can the hazardous substances be separated out and dealt with in the best possible way from the points of view of the environment and health. Waste that is not separated at source of generation must as far as possible be separated at the next link in the chain, in order to avoid diffuse dispersal of hazardous substances contained in waste.

3.3 Sustainable consumption and production

Concrete actions taken and specific progress made in implementation
Although Sweden does not have a specific action plan for SCP, a number of concrete measures are taken to change unsustainable consumption and production patterns in various areas such as agriculture, transport, product development and waste management/recycling, building/housing, but also linked to health issues (smart food/physical activity). The focus continues to be on products and production. Recent studies from the Swedish Environmental Protection Agency and elsewhere show, however, that measures must also be taken on the demand side to achieve good results.

Lessons learned
Sweden wishes to highlight the following areas in particular as central to continued work on sustainable consumption and production:

* Legislation continues to play an important role in efforts to make articles and services environmentally sound, but should be combined to a greater extent with *economic instruments*. By internalising environmental costs and increasing the use of economic instruments, more powerful incentives are given to producers and consumers to change their behaviour in the short and long terms.

* To achieve sustainable consumption and production patterns there is a need for
technological development, but the switch is progressing too slowly, particularly in the housing sector. At the same time, efficiency improvements are counteracted by a simultaneous increase in consumption. It is therefore very important to also work on *behavioural changes*. Sweden and other developed countries should additionally strengthen technology transfer to developing countries (leapfrogging).

* Greater knowledge and clearer information on the *contents of products* and

their *environmental performance* is important to provide incentives for environmentally sound product development and to enable consumers to make environmentally sound choices. It is therefore important to obtain data on environmental impact over the whole of the product's lifecycle and to develop clear and effective systems for reporting this information. Among other things there is a need to develop information on chemicals in articles.

* It is important that *green public procurement* makes more of a breakthrough in Sweden, the EU and globally. This is an instrument for increased sustainable consumption and production whose impact is greatly dependent on public-sector actors.

* Efforts must be expanded to switch to sustainable lifestyles/sustainable consumption. For this purpose there is a need not just for information and training but for a number of measures by central government in particular to make it easier for consumers/households to behave sustainably. There is a need for example for effective physical planning in which the infrastructure makes sustainable housing, travel and good opportunities for recycling possible.

* The impact of our consumption in other countries is an important aspect that should no longer be ignored. This information is very often lacking when the total consumption and environmental impact of countries are calculated, with the result that the picture is not complete. Our consumption can create jobs and increased wealth but also have an adverse social and environmental impact.

* Wastage of food in the value chain results in unnecessary losses of water and energy. In developing countries this wastage is largely due to inefficient methods of production, poor-quality and time-consuming transportation and storage of products. In developed countries there is substantial wastage in the actual handling of food products in shops and households.

* The involvement of industry continues to be important. Companies have great responsibility to supply the market with sustainable products (environmental and social aspects). Environmental initiatives should be expanded to cover the whole or the greater part of the value chain. This requires greater cooperation between companies and their suppliers. A number of actors have acquired a more important role, such as the retail trade and media/advertisers who have a great impact on the consumption and lifestyles of households.

Recent trends and emerging issues

A number of studies both in and outside Sweden show that new technology and knowledge and product development (the supply side) are not sufficient for the switch to sustainable consumption and production. There is also a need for change on the demand side – there has to be demand for sustainable products and services. System changes, new business models, new ways of

planning our communities and also courageous decision-makers and creative entrepreneurs are needed for this to be achieved.

Major constraints and challenges

A great challenge is to view the economic crises as an opportunity for sustainable development. A major constraint in SCP work is the lack of understanding of the role SCP plays in mitigating climate change and in contributing to a green economy and reduced poverty.

3.4. Transport

Concrete actions taken and specific progress made in implementation

Travel and transport contribute to a desirable social trend that entails increased freedom to live and spend our time where we want and at the same time have access to a good labour market. Reducing travel is therefore not an objective in itself. At the same time it is crucial that the transport system is designed so that the need for travel and transport can be met in a way that stimulates and creates good conditions for solutions that are more climate-smart, energy-efficient and safe.

The aim should be for it to be possible for cars and other vehicles to be used without having an adverse impact on climate and the environment. Road vehicles that run only on fossil fuels should be phased out and replaced by vehicles that are not dependent on such fuels. Sweden has set a target of having a vehicle fleet that is not dependent on fossil fuels by 2030.

A number of different measures need to be taken to reduce greenhouse gas emissions from the transport sector. There is no single measure that solves the whole problem. Energy efficiency in road vehicles, aircraft and ships needs to increase, fossil fuels need to be replaced by renewable fuels and energy carriers, such as electricity and hydrogen gas, the various modes of transport need to be utilised and coordinated more effectively and travel by public transport needs to be encouraged. It must also be more attractive to travellers and transport buyers to choose climate-efficient alternatives. Society as a whole needs to become more transport-efficient, so that climate-efficient choices are made easier.

Incentives for all the changes mentioned above are created by using instruments with a general effect, such as taxes on fossil fuels and emissions trading. Instruments with general effects need, however, to be supplemented by targeted instruments, for example in the form of emissions requirements and standards, as well as support for the development of new technology, in order to clear the way for the technical changes that need to be made. Long-term investments in infrastructure and other spatial planning need to be focused on creating the necessary conditions for the development of an increasingly energy-efficient transport system.

Significant work to reduce the dependence of the transport sector on fossil fuels has already been initiated and a broad range of policy instruments are already in place (see Chapter 7).

Lessons learned

Economic instruments in the shape of taxes, charges and rebates have proved powerful. The experience obtained is that relatively small differentiations in a charging scheme can have significant effects. It appears that the signal, for example in the shape of environmental differentiation that favours the

environmentally best alternatives, is just as important as the absolute amounts. Another lesson learned is that a combination of different instruments is often required to bring about changes. The lowering of tax for renewable vehicle fuels, the green car rebate and lowered benefit values for green cars, for example, have led to a dramatic rise in sales of fuel-efficient cars and cars that can run on renewable fuels.

An important principle of transport policy is that it is travellers or transport buyers themselves who choose what form their travel or transport should take. The switch to a sustainable transport system should therefore, in addition to economic instruments, be based on the commitment that exists today among the public and companies. More and more people are also taking increased responsibility for reducing the climate impact of their transport choices. Haulage firms are training their drivers in eco-driving, which results in gains both for the climate and for the company in the shape of reduced fuel costs. Added to this are other benefits such as increased road safety and a better working environment. Transport buyers require carriers to have quality-assured their transport from the point of view of the environment and road safety. Many companies and organisations have set targets and made commitments for climate impact reduction.

The significance of international cooperation cannot be overestimated. The Government's intention is that Sweden should be a driver in EU efforts and other international activity. Transport, like environmental problems, is not confined by national borders. Successful international cooperation is crucial if energy efficiency is to be increased, dependence on fossil fuels is to be broken and the environmental impact of traffic is to be reduced.

Recent trends and emerging issues

The transport system today is almost entirely dependent on fossil fuels and is dominated by road transport. Emissions from domestic transport accounted for almost 32 per cent of total emissions in Sweden in 2007, which is a high proportion in international terms. The proportion for the EU15 is around 21 per cent. The most significant explanation for the high proportion accounted for by transport in Sweden is that our production of power and heating, in contrast to other countries, is largely fossil-free

Greenhouse gas emissions (principally carbon dioxide) from domestic transport have increased by around 12 per cent in Sweden since 1990 as transport volumes have increased and despite vehicles having become more fuel-efficient. The increase is principally due to growth in the volume of truck traffic. In absolute terms, however, emissions from cars continue to dominate.

The rate of increase has, however, fallen in recent years as a result of the increased introduction of biofuels. In 2008 carbon dioxide emissions from the transport sector fell by 1.6 per cent. Renewable fuels accounted for around 5 per cent of energy use by transport in 2008, principally as a low blend in petrol and

diesel. Cars have become more energy-efficient and emit less and less carbon dioxide per kilometre. The proportion of green cars has risen. Around a third of all new cars sold in Sweden today are green cars. The term green cars means fuel-efficient petrol and diesel cars with carbon dioxide emissions not exceeding 120 g/km or cars that can run on a renewable fuel.

Major constraints and challenges

The climate issue is a great challenge, but also offers great opportunities for the transport sector. More energy-efficient vehicles and other transport solutions must be developed. Oil must be replaced by non-fossil energy sources. Demand for climate-efficient transport solutions will increase. It must therefore be easy for travellers and transport buyers to choose the climate-efficient alternatives. All modes of transport will continue to be needed in the future, but they will have to work together in a significantly better way than at present. The infrastructure needs to be developed so that it supports intermodal transport solutions. Sustainable transport solutions in cities have to be developed as a part of an integrated sustainable urban development. There are also great opportunities to develop and export climate-efficient solutions.

3.5 Mining

Initiatives in enterprise policy are focused on assisting towards more and growing companies, simplification of the regulatory framework and markets that work effectively. A focus on the green issues in enterprise policy must contribute to meeting the climate challenge and at the same time be used as a lever for new jobs and growth.

A fundamental condition to be met is that ore deposits are managed in a long-term sustainable way. Sweden is one of the largest mining nations in the EU. Swedish ore directly creates employment for around 4,000 people. Most of these jobs are in the more sparsely populated parts of the country. The mining industry is of great significance to the development of these regions. The mining of ore is an ecologically sensitive issue. It is therefore important to have rules (Minerals Act, Environmental Code and other laws) that provide good conditions for a strong mineral sector with responsible companies while individuals and ecological interests are also respected.

The following issues are of strategic importance to the development of the Swedish mining industry and for sustainable extraction.

Access to geological information

There is no state exploration in Sweden. The Geological Survey of Sweden makes fundamental geological information of high quality available to companies carrying out exploration. When companies hand back areas they have had permits to explore, without this having led to any mining, their basic information has to be entered into geological databases so that new exploring companies do not need to start again from scratch.

Good flow in exploration for new deposits

Statistics show that there is one new mine per 200 exploration permits. The Swedish bedrock is marketed both nationally and internationally to obtain a good flow in exploration. The Mineral Information Office at the Geological Survey of Sweden is a one-stop shop for exploration-related information.

Research and development

Grants for strategic research on sustainable utilisation of natural resources have increased by SEK 70 million in research and development policy. The development of effective and sustainable solutions for modern society's needs for metals and minerals poses a challenge. It makes great demands on a technology that prioritises resource-efficient production of raw materials, innovative products with high added value and minimised impact on health and the environment. There is a need for a continued long-term effort in cooperation with industry to exploit the potential that exists both nationally and regionally for the development of these raw-material assets. The efforts should be focused on technology, for instance to find new deposits and new methods of extraction and production that result in increased resource efficiency and minimised environmental impact.

Training and availability of labour

The need for the supply of skills varies over time and therefore requires continuous monitoring and updating. Central government plays a key role in providing and being responsible for training and regulations, while industry plays an important role by working on image issues in order to attract skills by offering work placements. To enable effective interaction to take place between the various actors it is appropriate for industry in dialogue with universities and colleges, as well as other training coordinators, to try to find ways of reviewing and ensuring that subjects that are relevant and in demand are included in the training courses offered. Cooperation with other mining nations is required in order to attain critical mass and make it possible to maintain relevant training.

Enhanced infrastructure

Continuous work is required to develop the transport infrastructure in such a way that ore producers can transport their raw materials to their customers in an environmentally friendly and sustainable way. This favours both raw-material suppliers and manufacturing industry.

4. Chemicals

Assessment of chemical risks

Sweden's work on the assessment of chemical risks

The Swedish Parliament has adopted sixteen ambitious environmental quality objectives. One of these environmental quality objectives is A Non-Toxic Environment, which is concerned with chemical substances. This objective means that the environment must be free from man-made or extracted compounds and metals that represent a threat to human health or biological diversity. The basic purpose of work on A Non-Toxic Environment is to prevent harm to human health or the environment from chemical substances, products and articles. The work takes place in coordination with other environmental quality objectives in a common action strategy for non-toxic and resource-efficient cycles, which aims to reduce the use of natural resources, reduce emissions of environmental toxins and create energy- and material-efficient cycles. The quantity and hazardousness of chemicals can only be influenced to a limited degree by national measures, and much of Sweden's work in this area is focused on pursuing the issues regionally in the EU and internationally. The Swedish Chemicals Agency (KemI) is Sweden's central supervisory agency with responsibility for chemical control and is the government agency responsible for the environmental quality objective A Non-Toxic Environment.

The most important task of preventive chemicals control is to prevent harm from occurring to humans and the environment. Knowledge is required to accomplish this. Knowledge of the properties and dispersal of chemical substances is essential if we are to understand the ways in which the substances could harm public health and the environment and prevent harm from occurring. This knowledge needs to be passed on to those who use the chemical substances and products so that they can do so safely. The knowledge requirements in the EU's new chemicals regulation means that companies have to develop knowledge of the health and environmental hazards of chemical substances to a greater extent than previously. Sweden is pressing for the required level of knowledge to be gradually raised in REACH in conjunction with various reviews and updates and through strict application of the legislation. The Swedish Government has established a national REACH Council, to promote information and collaboration between industry, government agencies and other affected stakeholders on issues concerned with national implementation of REACH. Training initiatives relating to REACH are also coordinated here.

New risks may arise as a result of technical development. Because of the rapid development in nanotechnology, research on health and environmental risks is regarded as particularly important in this field. The Swedish Chemicals Agency, acting on behalf of the Government, has collated knowledge on the risks associated with nanotechnology and has proposed measures. The Agency is

continuing to monitor development in this area and is taking part in the development of new test methods in order to assess health and environmental risks. This work is principally focused on knowledge building and knowledge dissemination with regard to nanotechnology and on assisting in the development of appropriate test methods. This work takes place mainly in the OECD.

Sweden has developed a functioning system to monitor the state of the environment and identify changes. This environmental monitoring involves repeated systematically arranged studies that point to the state of and changes in the air, in water and in the sea. It is a tool for assessing changes principally in what we already know and can refer back to, but work is also constantly in progress to find potential new environmental toxins. The studies make it possible to detect whether certain chemical substances can cause health and environmental problems. They also provide an opportunity to see whether previously known environmental threats emerge in new places or in new contexts and also to identify new, previously unknown environmental threats. The long time series that exist nationally for measured effects on top predators such as white-tailed eagles, seals and otters can also be used to identify new environmental threats.

Knowledge of the health and environmental hazards of chemicals, together with knowledge of the use of chemicals, leads to ways of preventing new health and environmental problems in the future and remedying problems that have already arisen. Sweden has a good source of knowledge on the use of chemicals in the national products register of the Swedish Chemicals Agency. Under national legislation, chemicals have to be registered when the product is manufactured in Sweden or imported into Sweden from another country. Information is supplied directly from responsible companies to the central register. The register can provide a snapshot of current chemical use. Flow analyses show how individual substances are used in Sweden and in what products particular substances are present. Trends can be viewed over several years. This can provide a picture of what substances can be expected to be dispersed in society and gradually in waste and sewage treatment plants and makes effective follow-up and evaluation of measures possible.

EU rules for the assessment of chemical risks

The majority of rules on chemicals today are common throughout the EU. Sweden has been a Member State of the EU since 1995 and the laws that apply in the EU thus also do so in Sweden, either through implementation in Swedish legislation or through a directly applicable Regulation. Swedish authorities monitor and continuously take part in the work of the Commission's expert groups and in Council working groups, in order to be able to influence the drafting of legislation.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of

Chemicals (REAC) is legislation on chemicals that replaces a large proportion of the rules that applied in Sweden and the EU prior to 1 June 2007. During the years when REACH was being developed, Sweden was closely involved in working groups and negotiations and continues to be heavily involved in the application and updating of REACH. Sweden was particularly active in pursuing issues concerned with stringent requirements for knowledge of chemical substances and information on the content of hazardous chemical substances in articles.

REACH is based on the principle that it is manufacturers, importers and downstream users who are responsible for making sure that substances they develop, place on the market or use do not harm human health or the environment. The provisions cover chemical substances, both as such and as part of a mixture. Responsibility for making risk assessments and conducting tests is borne by industry, which also has to supply information on the substance to the European Chemicals Agency (ECHA). The information on chemical substances developed in REACH must be passed on to those who use the substance so that the user can manage any risks in a safe manner. Where waste is recycled and the recycling process means that a new substance, preparation or article is formed, this is covered by the requirements contained in REACH in exactly the same way as other substances, preparations or articles.

Certain substances of very high concern for health and the environment will only be used with special permission. A first list of proposals for such substances has now been published on the ECHA website (www.echa.eu). Sweden has contributed two of the proposals (HBCDD and DEHP) and is continuing with preparations in order to add more substances to the list. The objective in this authorisation procedure is to gradually replace those substances that have the properties of greatest concern for health and the environment with safer alternative substances or techniques.

Articles are covered by certain new requirements, but in themselves mainly fall outside REACH. The risk assessments made according to REACH will cover the use of a chemical substance in articles and the exposure this can lead to. Suppliers of articles are required to provide information to those who use the article professionally if substances of very high concern are present above a certain percentage by weight. Consumers are also given the right to receive such information on request.

A steadily increasing proportion of the production of articles today takes place in countries outside the EU. Sweden therefore considers there to be a need for work at the international level to identify and prioritise substances transported through the global trade in articles. On a Swedish initiative, the EU has notified the issue of the need for international collaboration to increase knowledge and information on the presence of hazardous substances in articles, and SAICM decided in May 2009 that this should be an 'emerging policy issue'.

Prior to REACH coming into force, Sweden was active in EU work on risk assessment of both new and existing substances under the previously applicable rules. Sweden was the rapporteur for four substances in the EU programme for existing substances (HBCDD, DEHP, diantimony trioxide and piperazine). At the same time, Sweden has actively taken part in and commented on the risk assessments of chemical substances by other countries. It has also been active in a working group that has assessed the persistent, bioaccumulative and toxic properties of chemical substances. The designated substances may come into consideration for various restrictions or permit appraisal under REACH on the basis of their particularly hazardous properties.

The globally harmonised system for the classification and labelling of chemicals (GHS) adopted by the UN has been introduced into EU legislation in the form of a regulation on the classification, labelling and packaging of substances and mixtures (CLP), which came into force on 20 January 2009. This Regulation is the EU response to the UN's request in Johannesburg in 2002 for all the world's nations to introduce rules based on GHS. Swedish companies have to have migrated to CLP for substances by 1 December 2010 and for mixtures by 1 June 2015.

The European Chemicals Agency (ECHA) will establish and administer a public classification and labelling register in the form of a database to which manufacturers and importers are obliged to report their classifications of substances with effect from 1 December 2010. The register will cover all substances registered under the REACH Regulation and all substances that are placed on the market and fulfil the criteria to be classified as hazardous according to CLP, either in themselves or in a mixture above the concentration limits that cause the mixture to be classified as hazardous.

A new plant protection product regulation that governs the placing on the market of plant protection products has been negotiated and was approved by the European Parliament in January 2009. This Regulation will replace the current Directive 91/414/EEC. The new rules agree in several major areas with previous Swedish rules and principles for the testing of pesticides, as a result of Sweden having actively pursued this issues. The Biocides Directive, which came into effect in 2000, is aimed at harmonising the internal market for biocidal products. Application of the Directive entails requirements for the approval of 23 different product types, eleven of which are new for Sweden. The requirement for approval contributes to raising the level of protection for health and the environment. A revision of the Directive has started. Sweden is actively taking part in the joint programme for the risk assessment of plant protection products and biocides which is taking place in the EU and is implementing national initiatives.

Sound management of hazardous chemicals

The use of chemicals is an important aspect of society and is often needed to obtain a desired function in many products and services. But incorrect

handling can lead to costly harm to health and the environment. Knowledge of the health and environmental hazards of chemical substances is essential to safe handling in manufacturing, use and recycling and at the waste stage. Sweden has written an obligation into national legislation for all who run a business to carry out the protective measures and take the precautions needed to prevent harm to human health or the environment.

Sweden has made considerable progress in dealing with large local point emissions, for example from wastewater systems, industrial plants and waste management. In our endeavour to recycle and reuse valuable resources, for example in the form of sludge and filler, we must take account of the risk of the accumulation of and exposure to undesirable/toxic substances in our local environment and in products. A number of national measures have been taken in the area of waste, see the chapter on waste management. The difficulties in Swedish work on chemicals control today are principally due to the diffuse dispersal of substances harmful to the environment and health from articles, to unintended substances being formed in industrial and combustion processes that may be emitted in flue gases and waste, and to persistent and bioaccumulative substances already dispersed in the environment remaining for a long period. Diffuse sources such as chemicals in articles have increased in significance.

Phase-out and risk reduction of hazardous chemicals

Chemical substances with properties of very high concern are difficult to handle safely. Even small amounts can be harmful to humans and the environment. Sweden has therefore introduced a statutory requirement for companies to replace substances of very high concern as far as possible with less hazardous alternatives capable of fulfilling the same function or need. To reduce the risks associated with chemicals and phase out the most hazardous substances of all, Sweden continuously works on a number of different policy instruments: development of rules on restriction, supervision and enforcement of rules, information and dialogue with particular industries. Some examples are given below of important risk-reducing measures and activities undertaken in Sweden.

Sweden has a long tradition of successfully implementing national phase-out or severe restriction of hazardous substances such as PCBs, mercury, trichloroethylene and ozone-depleting substances. Work done in the past 20 years to reduce the risks of using pesticides in Sweden has been very successful, and a number of substances used previously are now no longer permitted. Since it became a member of the EU, Sweden has worked actively on risk limitation in relevant EU Directives and Regulations. Under the EU's previous *existing substances programme*, Sweden has taken risk-limiting measures for substances of very high concern such as phthalates and cadmium. Examples of substances where Sweden has pressed for phase-out in the *Limitations Directive* are flame retardants such as penta- and octabromodiphenyl ether, tributyltin, nickel, phthalates, mercury and PFOS.

Under the environmental quality objective A Protective Ozone Layer, the use of ozone-depleting substances is to be phased out in Sweden within a generation. This is one of the environmental objectives on which Sweden has made great progress in taking action.. There is no production of ozone-depleting substances in Sweden, but these substances have been used in several different areas. Phase-out has therefore been focused on the use of these substances in the manufacturing for example of foamed plastic, new installation of equipment, topping up existing equipment and use as a working medium in existing equipment. A ban on the use of HCFCs is one of the few remaining measures Sweden can take to phase out remaining ozone-depleting substances nationally. A ban on installation and manufacturing for HCFCs came into effect in Sweden in 1998. Since 2002 there has also been a ban on topping up HCFCs for maintenance and servicing. Sweden has recently notified a proposal for a national ban on the use of HCFCs to be applied from 1 January 2015.

Under the work on the *Ecodesign Directive,* Sweden has contributed to the requirement for information on the mercury content of low-energy lamps to be declared through labelling on the packaging. This is necessary so that low-energy lamps can be recycled without mercury escaping into the environment. The *RoHS Directive* prohibits the use of mercury, cadmium, lead, hexavalent chromium and the flame retardants PBB and PBDE in new electrical and electronic products placed on the EU market after 1 July 2006. Sweden has accorded high priority to the revision of the *Toys Directive* in order to limit the use of substances hazardous to the environment and to health in toys. The now revised Directive signifies a ban on toys containing certain hazardous fragrances, certain hazardous metals and substances classified as carcinogenic, mutagenic or toxic to reproduction.

The EU's current chemicals legislation *REACH* offers opportunities for the EU to act jointly against a large number of substances of very high concern through rules on authorisation and restriction. Permission from the ECHA is required for the use of substances of very high concern that have been prioritised in REACH. All other use of these substances will be prohibited. There will also be opportunities to introduce further restrictions for other hazardous substances. REACH also lays the foundation for safe handling of substances throughout the production chain as manufacturers and importers of substances are made responsible for carrying out risk assessments and recommending risk-management measures to companies using chemicals.

PRIO is a web-based tool to assist companies in work on risk reduction. It was launched by the Swedish Chemicals Agency in 2004 to improve knowledge of chemicals and how they should be handled. PRIO is also available in an English version on the Swedish Chemicals Agency website (www.kemi.se). PRIO can be used to search for substances and obtain information about environmental and health hazards, obtain information about those chemicals that must be

prioritised for early phase-out, find substances contained in substance groups and various product groups and obtain assistance in developing routines for purchasing, product development and risk management. PRIO can also be used for guidance in risk reduction work and as a database in which to search directly. The database contains around 4400 substances, all of which have properties that fulfil certain selection criteria. The criteria are drawn up on the basis of the national environmental objective A Non-Toxic Environment and REACH. PRIO was recently evaluated in relation to how the tool is used, who uses it and what effects it may have contributed to. Those questioned feel that PRIO among other things has contributed to increased knowledge of chemicals and how they are handled and that PRIO can be used in methodical risk reduction activity.

Dialogues between authorities and industry may drive increased awareness in industry of the need for information on the chemical content of articles and of risk reduction. Dialogues with a number of sectors has largely focused on products that contain substances of very high concern. In a dialogue conducted in 2008 with the textile industry, it emerged that importers in particular had limited knowledge of chemical issues and of the content of chemical substances in their own articles. The situation has improved since then, partly as a consequence of the Swedish Chemicals Agency arranging a seminar for the sector and producing information

Several different industrial sectors in Sweden have *developed their own systems to reduce risks associated with chemicals*. An example of this is BASTA, a sector-wide tool developed on the initiative of the construction sector. More than 45,000 different materials are used in the construction sector, many of which contain hazardous substances. BASTA identifies construction products that do not contain substances of very high concern. The tool has been developed in cooperation with Swedish government agencies, and the criteria in BASTA are partly based on the criteria in PRIO. The system makes it easier for purchasers in building companies to buy articles that do not contain substances of very high concern. The idea is that suppliers should be able to have their products registered in BASTA if they fulfil the BASTA requirements, so that the construction companies can then more easily find the “right” products.

In 2004 the Government expressed a desire for improved environmental information for pharmaceutical products, which led to the trade association of the pharmaceutical industry taking the initiative to develop a system for voluntary environmental classification of pharmaceutical substances.. The environmental information is based on data from the pharmaceutical companies. The project is taking place in cooperation between authorities, university researchers and pharmaceutical companies. The Swedish Environmental Research Institute (IVL) acts as an independent reviewer of all environmental data. The first environmental classifications were published in October 2005, and this work will continue until all the groups of

pharmaceutical products have been examined, which is expected to be the end of 2010.

Work to reduce risks associated with chemicals

The new plant protection products regulation dating from January 2009 is aimed among other things at raising the level of protection. The 'substitution principle' has been introduced, offering increased opportunities to require problematic products to be replaced by other safer products or methods. It will not be possible for substances of very high concern to be approved under the new regulation. The Council and the European Parliament agreed in January 2009 on a new framework directive to achieve sustainable use of pesticides in the Community. The Directive is made up of minimum rules that provide an important basis on which to implement significant risk-reduction measures for the use of pesticides. Among its most important aspects, mention can be made of requirements for Member States to introduce national action plans to reduce the risks associated with pesticides. A proposal for a Swedish action plan to achieve sustainable use of pesticides was drawn up in 2008. From the Swedish point of view, the Directive largely means confirming the measures that were already in place previously. There is a register at the Swedish Chemicals Agency containing data on approved and previously approved pesticide preparations in Sweden.

Following an appeal by Sweden against the decision of the European Commission to approve paraquat, an acutely toxic herbicide, the European Court of Justice in July 2007 found in Sweden's favour and declared the decision invalid. The European Court of Justice found that the approval of paraquat contravened Community rules on requirements for the production of human and animal health. The judgment was a victory for Sweden's interpretation of the rules contained in the Plant Protection Products Directive and for its restrictive position on the risks associated with plant protection products.

Sweden has for many years actively pursued and contributed to the establishment of a ban on using a group of active substances with potent endocrine-disrupting properties, as well as substances with persistent and bioaccumulative (PBT) properties in plant protection products for use in the EU. This applies to vinclozolin, procymidone and fenarimol and to lindane, trifluralin and endosulphan respectively.

Significance of supervision

An effective and competent supervisory organisation is an important instrument with which to attain the environmental objectives Sweden strives to achieve. The Swedish Chemicals Agency has supervisory guidance in the form of seminars, written guidance material (Advice and Tips, factsheets, website) and supports the inspectors of the municipalities and county administrative boards in various contexts. Swedish Chemical Agency supervision is often

carried out in the form of collaborative projects with the municipalities. Most inspections relate to chemical products, but in recent years KemI has increased its supervisory efforts in relation to pesticides and chemical substances in articles, for instance rules on hazardous substances in electronics and articles containing perfluorinated substances.

More than 80 per cent of the companies which KemI is responsible for supervising import the products into Sweden from other countries. Supervision is a national matter, despite REACH and most other rules on chemicals being harmonised in the EU. KemI therefore cooperates with other supervisory authorities in the EU in various inspection projects. This cooperation partly takes place through the ECHA Forum for Information Exchange on Application of REACH, which coordinates and develops chemical supervision in the EU. The REACH Forum has adopted a three-year work programme for the period 2008-2010, which was drawn up by a working group chaired by Sweden. In 2009 Sweden is taking part in the first joint supervisory project focused on the supervision of substance manufacturers/importers subject to the requirement of pre-registration. The Swedish Chemicals Agency also cooperates with the other Nordic countries on joint inspection projects.

5. Waste management

Prevention and minimisation and environmentally sound management of hazardous wastes

Policy measures for the prevention and minimisation of hazardous wastes

The Swedish view has been that the volume and hazardousness of waste can only be influenced to a limited degree by measures taken at the waste stage. Measures to reduce the hazardousness and volume of waste should be primarily taken as part of work on products and chemicals. An important condition to be met to enable the risks to be reduced at the waste stage is that the actors concerned are aware which substances can be hazardous to the environment and health and which of these hazardous substances are contained in the articles they manufacture, handle or buy. The sharply increased turnover of consumer goods with broader ranges of similar products and products with a shorter life, are important factors for example in the problems associated with electronic waste that contains hazardous chemical substances. Clothing is another example of articles with a short life, large quantities going to general waste management. The most effective way of reducing chemical risks is to take action at the start of a chain of production and handling, as all later stages, including the waste stage, are affected. The flow of information in production and handling chains is, however, often inadequate, and there are several factors underlying this. The chains of production and trade for articles are often long and can pass through several different countries. There are trading companies here that are not manufacturers of either chemicals or articles and only market and trade in articles. It can therefore be difficult for a purchaser in Sweden to trace back and obtain answers to questions about production methods in many supplier links. Work to improve access to information about the substances in articles, for example by introducing information requirements, therefore needs to be pursued at international level.

Sweden's efforts to reduce the hazardousness of waste by limiting the use of substances of very high concern leads to products that affect human health or the environment in a less harmful way throughout their lifecycle. Another instrument is the product choice rule in the Environmental Code (Chapter 2 Section 4), which states that anyone who undertakes or intends to undertake an activity has to avoid using chemical products or biotechnical organisms that may be feared to pose risks to human health or the environment, if they can be replaced by such products or organisms as may be assumed to be less hazardous. The same requirement applies to goods that contain or are treated with a chemical product or biotechnical organism.

A large and growing waste stream consists of waste from electrical and electronic products. The turnover of new products is rapid. Some of the products, for example computers and television sets, become hazardous waste

when they are discarded, and control of the route this waste takes is often deficient or difficult to implement. An important measure would be to make sure at the time of manufacturing that as little hazardous material as possible is used and additionally to make the products easy to dismantle. The RoHS Directive regulating the use of certain substances in electrical and electronic products is a particularly important instrument in this respect.

In addition, Sweden has taken active steps to reduce the hazardousness of waste through its efforts to reduce the use of hazardous chemicals internationally. This is discussed in more detail in the section on chemicals.

Transfer of environmentally sound technologies and know-how on clean technologies and low-waste production

Waste management and recycling is the largest field in the environmental technology sector. This is also where the largest increases in turnover and exports are to be found. In 2007 turnover was nearly SEK 50bn, an increase of 24% on 2006. Exports in the same year totalled nearly SEK 11bn, an increase of 29% compared with 2006. Information is lacking on technology transfer regarding hazardous waste and methods to limit the creation, hazardousness or treatment of hazardous waste.

Initiatives to treat, recycle, reuse and dispose of wastes at the source of generation and regulatory mechanisms (Polluter-pays principle)

Swedish environmental law contains overarching rules on consideration and the principles to apply to all activity that has an impact on the environment or human health. Among these is the requirement that a person who pursues an activity or takes a measure has to be economical with raw materials and energy and utilise the opportunities for reuse and recycling. Renewable energy sources are primarily to be used.

Producer responsibility for products that become hazardous waste at the waste stage applies to electrical and electronic products, cars and batteries. The purpose of collecting electrical waste is to prevent hazardous substances ending up in the wrong place. Producer responsibility is formulated so that those who manufacture electronics or import electronics into Sweden bear responsibility for collection and disposal. Importers and manufacturers have to ensure that there is collection in all municipalities for those electrical products that are usually used in households. They have to bear the cost of recycling and treatment, while the municipality is responsible for the manning of recycling centres. The producers have to manufacture products that contain less environmentally hazardous components and that are easier to recycle and treat. In 2006 the quantity of electrical waste collected per head of population was 16 kg, which is a very good result in comparison with other EU Member States. The target in the EU Directive on producer responsibility for electrical and electronic products is 4 kg per head of population. The purpose of producer responsibility for cars is to:

• reduce emissions of environmentally hazardous liquids, products and refrigerants from end-of-life vehicles
• increase the recycling of metals, plastics, rubber, textiles etc. from end-of-use vehicles,
• increase the recycling of components from end-of-life vehicles and
• reduce the volume of waste from end-of-life vehicles sent to landfill

A producer has to take an end-of-life vehicle without payment, has to make it easy for people wishing to hand over end-of-life vehicles to the producer to do so and is obliged to ensure that the car is disposed of by an authorised vehicle scrapper. The car producer is responsible for the satisfactory working of the system to reuse and recycle cars. This responsibility includes reporting, guidance and fulfilling the reuse and recycling targets. A producer has to ensure that at least 85% of the weight of the car be reused or recycled. The target for 2015 is that at least 95% of the car's weight is reused or recycled. In 2006 the proportion of the weight of scrapped cars reused or recycled was 86%, which means that the target set has been achieved.

On 1 January 2009 producer responsibility for batteries was introduced in Sweden as a consequence of an EU Directive. The producer's responsibility is to ensure that batteries are collected, disposed of and recycled in an environmentally acceptable way. The producer is whoever first places a battery on the Swedish market by commercially supplying a battery. Spent batteries have been separately collected in Sweden since the 1980s. A new development in this context is that all batteries have to be collected and recycled, including non-environmentally hazardous ones that were previously sent to landfill. As producer responsibility for batteries has been introduced so recently, there are no figures on results achieved.

Procedures for environmental impact assessment, taking into account the cradle-to-grave approach

Material-flow analyses provide a basis for being able to follow the impact of different substances from cradle to grave. Material-flow analyses provide knowledge on hazardous substances introduced into society through products. It is then possible to judge whether these hazardous substances reach the waste stage on the basis of knowledge of the life of different articles.

Statistics Sweden is developing statistics on material flows. Among other things it will be studying the flow of lead in more detail. Basic studies of the flows of a number of heavy metals in society have been carried out previously, for instance in the Swedish Environmental Protection Agency's research programme "Metals in Town and Country".

The 'Articles Guide' (Varuguiden) being developed by the Swedish Chemicals Agency is another example of a system for gathering information on hazardous substances in articles.

Recovery, reuse and recycling of hazardous wastes and their transformation into useful material

In 2006 around 33% of the total volume of hazardous waste arising was treated by material recovery. The predominant types of waste include contaminated soils used as construction material after treatment, batteries sent for recovery of metals, discarded equipment sent for remelting, for example in copper smeltworks and waste from incineration used as construction material. Another good example of the transformation of hazardous waste into a useful product is the regeneration of waste oil to obtain new base oil. Under the EU waste directive, waste oil is primarily to be regenerated if it is possible to do so according to the waste hierarchy in consideration of technical, economic and organisational constraints. Sweden does not have its own facility for the regeneration of waste oil, but exports waste oil to another EU Member State. This processing of Swedish waste oil has increased steadily in recent years from around 1,400 tonnes in 2001 to around 25,000 tonnes in 2007.

Phase-out of toxic, persistent and bio-accumulative waste

Sweden has been successful to date in its efforts to phase out the use of mercury, and is well advanced in an international comparison. In the early 1990s instruments and electrical components containing mercury were banned, and an export ban was introduced for mercury and chemical compounds and preparations containing mercury. Sweden was early in introducing restrictions on the level of mercury of batteries.

On 15 January 2009 the Government decided on a general ban on mercury, as well as articles containing mercury, to come into effect on 1 June 2009. The ban means that mercury, mercury compounds and preparations may not be placed on the Swedish market, used in Sweden or commercially exported from Sweden. Articles containing mercury may not be placed on the Swedish market or professionally exported from Sweden. The ban on use does not apply to articles containing mercury if the articles have already been used for the first time. On the other hand, the article may not be transferred elsewhere, i.e. placed on the market or exported form Sweden. Nor may it be topped up with new mercury.

Mercury fallout over Sweden is principally due to long-range transportation by air from the rest of Europe, but also from other parts of the world. Despite mercury fallout having decreased in Sweden in recent decades, this is not sufficient to prevent an increase in mercury levels in the environment. Levels are, for example, increasing by around 0.5 per cent annually in the top layer of forest soil. The Swedish Environmental Protection Agency estimates that mercury fallout needs to decrease by 80 per cent if levels in fish that do not exceed the WHO/FAO limit of 0.5 mg mercury/kg fish are to be achieved in the longer term.

The largest source of mercury emissions to air globally is the burning of coal. Other emission sources include, for example, smeltworks, crematoria (amalgam fillings) and waste incineration (mercury in products).

Mercury is also dispersed directly to soil and water for example through emissions from industrial sites, leaching from rubbish tips and through the spreading of sewage sludge. Sweden was early with programmes for the phase-out of PCBs. A start was made in the early 1970s on this phase-out, which comprises requirements for inventories, decontamination, restrictions on or prohibitions of PCBs in transformers, capacitors, PCB products in building such as sealant, flooring compounds, sealed glazing units and other products that may contain PCBs, such as cables. PCB levels in the environment have previously decreased but are no longer doing so. Following EU decisions on bans or restrictions for certain chemical substances, Sweden has implemented these bans in its own legislation. The bans or restrictions relate for instance to cadmium substances, chlorinated solvents, heavy metals in packaging materials, ammunition containing lead and textile detergents containing phosphates. In addition, as indicated above there has been a ban since 1 July 2006 on manufacturing electrical products containing mercury, cadmium, lead, hexavalent chromium and the flame retardants PBB and PBDE.

Environmentally sound waste disposal and treatment

Waste can be both a resource and an environmental problem. Waste management that works poorly signifies great wastage of valuable material and can also lead to environmental and health problems. The aim as far as possible is to make use of the resources contained in waste. At the same time, it is important to reduce adverse effects in the form of emissions of methane gas from landfills and carbon dioxide from combustion, as well emissions of heavy metals and organic environmental toxins. There is a hierarchy for the management of waste. This primarily means that we have to try to produce as little and as non-hazardous waste as possible. Material recycling is prioritised over energy recycling for waste that nevertheless arises, where this is environmentally justified. The waste ultimately has to be disposed of by landfilling. There are no obvious answers as to what method is preferable for all types of waste in the choice between material recycling and incineration. Several analyses generally support material recovery that causes materials and nutrients to enter a cycle.

An important element in efforts to deal with waste is a clear consumer perspective. It must be simple for households to separate and hand over their waste so that the proportion of waste that is recycled is increased. Information on the purpose and benefit of household participation is also important. An overarching change that is required if we are to approach ecological management of waste is a reduction in the volume of waste and its hazardousness. This cannot be attained just through measures at the waste stage and is largely dependent on a change in the production and consumption of articles. Volumes of waste today are increasing in line with economic

growth. A fundamental requirement to enable the goal of sustainable cycles to be achieved is more resource-efficient production and consumption that breaks this relationship. Companies that design and manufacture products have great responsibility for reviewing the environmental impact of their products throughout their lifecycles, using more recovered material and thinking about the future recycling of their products. Consumers also have an important role to play in the choice of products and how to use them.

Inventories of hazardous waste production, their treatment/disposal, and contaminated sites

Nearly 2.8 million tonnes of hazardous waste accrued in 2006, according to Report 5868 Waste in Sweden 2006 produced by Svenska MiljöEmissionsData (SMED) on behalf of the Swedish Environmental Protection Agency. The largest categories of waste were hazardous mineral waste, 480,000 tonnes (including PAH asphalt), end-of-life vehicles, 470,000 tonnes, contaminated soil and dredging material, 435,00 tonnes, chemical residues and deposits, 300,000 tonnes, and hazardous waste from incineration, 300,000 tonnes. The sectors that generated most hazardous waste were building and households. The volume in the building sector is 890,000 tonnes, of which contaminated soil and dredging material accounts for 400,000 tonnes and hazardous mineral waste (mostly PAH asphalt) 460,000 tonnes. Households accounted for 489,000 tonnes of hazardous waste. The greater part of this was 305,000 tonnes of end-of-life vehicles and 139,000 tonnes of discarded equipment (mainly electrical scrap) classified as hazardous waste. Other sectors that generated large quantities of hazardous waste were:

- production of metal and metal products, 340,000 tonnes
- supply of gas, steam, hot water and heating, 190,000 tonnes
- manufacturing of chemicals, rubber and plastic, 111 000 tonnes.

According to study, approximately 1 million tonnes of hazardous waste was treated. The remaining volume of hazardous waste was treated in such a way that it is not included in the actual report or consists of a type of waste that is not included in the reporting with regard to treatment, for example end-of-life vehicles. Of the treated waste, 33% or 339,000 tonnes went for recycling. A large proportion of the recycling consists of the treatment of uncontaminated soil, waste from incineration and mineral waste which after any pre-treatment is used as construction material or as material to cap landfills.

Around 312,000 tonnes of hazardous waste was incinerated: 209,000 tonnes as energy recovery (R1) and 103,000 tonnes as disposal (D10), although energy is also extracted in that case. Around 378,000 tonnes of hazardous waste was landfilled. This was largely made up of waste from incineration (including filter dust from metal smelting), contaminated soil and sewage sludge from industrial sites (including metal hydroxide sludge).

The total quantities of hazardous waste have apparently increased in recent years. The increase has probably not been as great it may appear as different

methods and limitations have been applied in the collection of statistics in the most recent surveys and the results are thus not comparable.

More than 80,000 sites have been identified as potentially contaminated. Work to determine and estimate the number of contaminated sites in the country takes place in several stages and is mainly done by the county administrative boards. The identification of contaminated sites is considered to be more or less complete, as the number of identified potentially contaminated sites has been relatively constant in recent years. New locations may be discovered while work on contaminated sites is in progress. An identified potentially contaminated site need not be polluted in practice or need remedial action. The number of actually contaminated sites is thus probably lower than the number of identified sites. Of the identified sites, it is estimated that 1,500 could pose very great risks to human health and the environment (risk class 1) and around 15,000 great risks (risk class 2). It is primarily these sites that must be investigated for remediation.

It is stated in the Swedish Environmental Protection Agency's report "Lägesbeskrivning av efterbehandlingsarbetet i landet 2008" ("Status report on remediation work in Sweden in 2008") (M2009/760/Kk) that by 31 August 2008 a total of 1,010 sites had been remediated and closed, of which around 30 with grants and around 980 sites at the operator's expense through supervisory activity. Another approximately 220 sites had been remediated, but follow-up was still in progress. Twenty-eight of the sites were grant-funded locations and 193 were locations subject to supervision. Locations subject to supervision mean contaminated sites with a known wholly or partially responsible operator, and grant-funded locations mean sites with a responsible operator who is unknown or who no longer exists. In addition, partial measures are in progress or have been carried out on a large number of sites in the framework of enforcement activity. Many contaminated sites, particularly in the metropolitan regions, are remediated in conjunction with development, for example when an industrial site is converted into a residential area.

Establishment of combined treatment/disposal facilities for hazardous wastes in small- and medium-sized industries

It happens that small and medium-sized industries treat their own hazardous waste for example through physico-chemical processes or the distillation of polluted solvents or by similar methods. It may also happen that small and medium-sized industries treat hazardous waste from others if the waste that has arisen externally is of a type similar to their own. There are no general regulations or similar rules for this. Each facility must apply for its own permit for the activity, including waste treatment, under the Environmental Code.

Dissemination of scientific and technical information dealing with various health and environmental aspects of hazardous wastes

Several extensive campaigns on separate collection of discarded batteries have been conducted in Sweden. The first one was carried out in the 1980s and

related only to hazardous batteries. The campaigns were aimed at various target groups and were regarded as successful. The requirement for separate collection of batteries now covers all types of batteries.

Most local authorities have information targeted at households on the collection of household hazardous waste. The information covers different types of hazardous waste, why it is hazardous and how it should be handled. The local authorities, which have the sole right to collect hazardous waste from households, use various systems for the collection of this waste.

It is estimated that 26,000 tonnes of hazardous waste was collected from households in 2004, averaging 2.9 kg per person. At the same time there are calculations showing that between 4,000 and 6,000 tonnes of hazardous waste is placed in domestic refuse every year.

Preventing illegal international traffic in hazardous wastes

Sweden is a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. It reports annually to the Convention's secretariat on volumes and types of waste transported across borders to and from Sweden. Cases of illegal traffic in waste are also reported.

Sweden has implemented the Basel Convention and its prohibition of hazardous waste movements to countries outside the EU and the OECD through Regulation 1013/2006/EC. The Swedish Environmental Protection Agency is what is known as the competent authority, while county administrative boards and municipalities are inspection and enforcement authorities. Sweden takes part in the European network IMPEL (European Union Network for the Implementation and Enforcement of Environmental Law) and its cluster on transfrontier shipments of waste (IMPEL-TFS). Joint inspections of transfrontier shipments of waste are organised in this forum, principally in ports but also on the road. Projects concerning shipments of electronic scrap are of special relevance at present. There is discussion in particular of how illegal transfrontier shipments of electronic waste to countries in Asia and Africa could be prevented. Sweden takes part in and supports the partnership programme PACE (Partnership for Action on Computing Equipment) under the Basel Convention.

The issue of illegal transfrontier shipments is also relevant with regard to ships sent for dismantling and recycling, particularly in Asia. The handling of hazardous waste at these places is highly unsuitable from the point of view of the working environment, nor is it appropriate from the point of view of either the environment or health. Sweden views the problem seriously and welcomes the recently adopted international IMO convention on ship recycling. Before the convention comes into effect it is important to comply with the currently applicable rules in the Basel Convention with regard to ships when they become waste. Sweden considers it important for the ship if possible to be cleared of hazardous waste (provided this does not affect maritime safety)

before it is sent for recycling, in order to comply with the ban in the Basel Convention on shipping hazardous waste to non-OECD countries.

Environmentally sound management of solid (non-hazardous) wastes and sewage, in the context of integrated planning and management of land resources

Policies aimed at waste prevention and minimisation, reuse and recycling

Waste management in Sweden has changed substantially since the mid-1990s. Landfilling of household waste has fallen by 85 per cent since 1994. In 1994 the proportion of household waste sent to landfill was 40 per cent. Today only four per cent of household waste goes to landfill. The rest of the waste is sent for material or energy recovery. On the other hand, the trend has not been so favourable with regard to preventing waste. The volume of household waste has increased by 35 per cent since 1994.

The increased level of recycling is the result of a consistent strategy for landfilling to diminish and recycling to increase. Important objectives and instruments for this trend have been the environmental objectives for waste, producer responsibility for different product groups, the requirement for municipal waste planning, the ban on landfilling combustible and organic waste and the landfill tax. These instruments and a few others are described below. Some of these instruments are also intended to reduce volumes of waste. The description below concludes with a section on the application of sewage sludge to arable land.

Environmental objectives

The overall objective of environmental work is to be able to hand over to the next generation a society in which the major environmental problems have been solved. On this basis, the Swedish Parliament has adopted sixteen national environmental quality objectives and 72 interim targets. The interim targets for waste are as follows:

The total quantity of waste generated will not increase and maximum use will be made of its resource potential while minimising health and environmental effects and associated risks. In particular:

- The quantity of waste sent to landfill, excluding mining waste, will be reduced by at least 50% by 2005 compared with 1994.
- By 2010 at least at least 50% of all household waste will be recycled through materials recovery, including biological treatment.
- By 2010 at least 35% of food waste from households, restaurants, caterers and retail premises will be recovered by means of biological treatment. This target refers to food waste separated at source for both home composting and centralised treatment,
- By 2010 food waste and comparable wastes from food processing plants etc. will be recovered by means of biological treatment. This target relates to waste

that is not mixed with other wastes and that is of such a quality as to be suitable, following treatment, for recycling into crop production.
• By 2015 at least 60% of phosphorus compounds present in wastewater will be recovered for use on productive land. At least half of this amount should be returned to arable land.

The interim target for waste has achieved a great breakthrough among Swedish municipalities, which is evident for instance in the municipal waste plans. The expansion of separate collection of food waste for biological treatment has come about largely as a result of there being a national target for this.

Producer responsibility
Producer responsibility exists for several products (packaging, waste paper, cars, tyres, batteries and electrical and electronic products). The purpose of producer responsibility is to reduce the quantity of waste, increase recycling and achieve more environmentally sound product development. In addition to this there are what are known as voluntary commitments on producer responsibility in three product groups (office paper, agricultural plastic and building and demolition waste).

Producer responsibility has been successful insofar as materials recovery has increased. The targets for recycling of packaging are met in all cases except for metal packaging. The significance producer responsibility has had in reducing the hazardousness of waste is described in the section on hazardous waste. The results of producer responsibility for electrical and electronic products and cars are also described there. Producer responsibility for packaging has not meant a decrease in the total quantities of packaging. On the other hand, the quantity of packaging per kg of article has decreased, partly as a result of lighter packaging materials.

An important reason why Swedish households separate at source of generation is that they wish to contribute to a better environment and an ecocycle-based society. It is therefore essential that they receive clear feedback on the results of separation at source of generation and recycling. Well formulated information is the single most important factor in attaining good results for household waste.

Swedish experience also indicates that the level of service in the collection of packaging waste and waste paper should not be closely regulated centrally but should be formulated locally. To attain good results and provide households with good service it is crucial that the parties have constructive cooperation with common goals. This has previously been lacking, but since January 2009 there has been an agreement between producers and local authorities to join forces in further improving recycling results and raising the level of service in

collection systems. Information and cooperation are thus very important for producer responsibility for packaging to work well in Sweden.

Municipal waste planning
Since 1991 all municipalities have a waste plan that covers all types of waste and the measures needed to manage waste appropriately from the points of view of the environment and resources. The plans frequently include targets and strategies for different waste streams but often focus on household waste. Waste planning has meant that the municipalities have taken great responsibility for improving the management of household waste. Many have, for example, built up extensive systems for separation at source of generation and recycling of various types of waste. On the other hand, these plans do not guide the management of commercial waste to any great extent, as the municipalities are not responsible for this waste. Several municipalities have recently drawn attention to the issue of waste prevention in their plans. An example of such a measure is to make it easier to dispose of second-hand articles. It is possible to hand in second-hand articles for sale at certain municipal recycling centres.

Prohibition of landfilling combustible and organic waste
The landfilling of separated combustible waste has been prohibited in Sweden since 2002 and the landfilling of organic waste since 2005. The purpose of these bans is to improve the conservation of resources and reduce environmental impact. Certain types of waste should be landfilled for various reasons, for example because the substances contained in the waste should not be dispersed or because recycling is not possible in practice. Waste with a very low content of organic matter does not have significant environmental impact in landfilling. These types of waste are therefore exempt from the bans.

If there is a lack of capacity for recycling the waste, the county administrative boards can permit dispensations from the ban. Landfilling by dispensation has gradually decreased as capacity for other treatment of waste has increased. The Swedish Environmental Protection Agency estimates that by around 2012 there will be sufficient treatment capacity for landfilling by dispensation to cease.

Landfill tax
A tax on the landfilling of waste was introduced in 2000. The purpose of the tax is to reduce landfilling. The tax is levied at SEK 435 per tonne. Waste that should be landfilled for environmental reasons is exempted.

The tax has been used as an instrument for reducing landfilling and increasing recycling. It has unfortunately also contributed to such recycling as is not the environmentally best way of treating waste. This applies to waste containing hazardous substances used for various civil engineering purposes, for example in roadbuilding. This increases the risk of hazardous substances being dispersed to the environment.

State investment aid
Over the period 1998 – 2002 central government grants were distributed to local investment programmes (LIPs) in more than half the municipalities in Sweden. Some of the grants were made to waste-related measures such as the expansion of digestion and composting. Landfilling as a consequence of measures in LIPs has meant a decrease of around 462,000 tonnes in the landfilling of waste. LIPs were succeeded by climate investment programmes (Klimp). The aim was to reduce greenhouse gas emissions. Grants to Klimp programmes were awarded over the period 2003 – 2008, A third of Klimp grants have gone to measures to increase production and the use of biogas from waste.

Sewage sludge
Sludge has been spread on arable land for many years, but the practice has been questioned. 'Moratoria on sludge' have been introduced twice following recommendations by the Federation of Swedish Farmers to its members not to spread the sludge owing to fears that it contains toxic substances. Before the second sludge moratorium in the 1990s, up to 30-35 per cent of sewage sludge was spread on arable land. The proportion that is spread has now started to rise again, and stands at around 15%. As indicated by the interim target for waste, there is an objective for phosphorus in sewage sludge to be returned to productive land. In recent years efforts to return phosphorus to arable land have largely been concerned with a dialogue between various parties affected in order to reduce non-degradable components in sewage.

Development of environmentally sound disposal facilities, including technology to convert waste into energy, such as, for example, through utilisation of landfill methane
The landfilling of waste and rules relating to this are briefly described in this section. The collection of landfill gas is also discussed. As Sweden is well advanced with regard to utilising the energy from waste through waste incineration and digestion, we describe this in more detail. The section begins with a brief paragraph describing the overarching rules in the Environmental Code applying to all environmentally hazardous activity. Finally there is a section on the expansion of sewage treatment plants in Sweden.

The Environmental Code
The central environmental legislation in Sweden is brought together in the Environmental Code. All activities (including for example facilities for waste incineration, landfilling and biological treatment) are covered by the general rules on consideration in the Environmental Code. One of the rules on consideration states that rational use must be made of raw materials and energy and that the possibility of reuse and recycling must be utilised. Other significant rules on consideration apply to requirements for knowledge, precautions and product choice. The general rules on consideration are to be applied in permit appraisal, supervision and self-inspection.

Landfilling

In 2001 the European Directive on the landfilling of waste was incorporated into Swedish legislation (the Landfill Ordinance), which has tightened up the requirements for landfills in Sweden. The new ordinance imposes stricter requirements, for instance regarding the underlying geological barrier of landfills, bottom sealing, final capping and collection and treatment of leachate. The requirements differ depending on what type of waste the landfill receives. In addition to the Landfill Ordinance there is a regulation containing reception criteria which mean that stricter requirements can now be set on knowledge of the properties of waste for the producer of waste. This regulation is also a consequence of provisions at EU level. A large number of landfills have been closed or are in the process of being closed because waste sent to landfill is decreasing and the environmental requirements at the landfills have been tightened up.

Collection of landfill gas

The Landfill Ordinance requires landfills that receive biodegradable waste to collect landfill gas. The requirements also cover the sampling and measurement of the gas. In addition, the gas has to be treated and utilised. If the gas cannot be used for energy recovery, it has to be flared off. Methane is collected from around 60 active and about 10 closed landfills. The landfill gas is used for heating, electricity production and vehicle fuel. The landfill gas is flared to some extent. As a result of the decrease in the landfilling of organic waste, the collection of landfill gas has also decreased. The collected quantity of gas from municipal landfills fell from 508,000 MWh in 2003 to 342,000 MWh in 2007. Another way of preventing the loss of methane from landfills is to lay a methane-oxidising layer, an area that is still under development.

Waste incineration

The requirements for waste incineration are based on a European Directive. The requirements have not brought a need for any major adjustments for Swedish plants as similar requirements already existed in Sweden before the Directive came into force. Some reconstruction has, however, been needed to ensure that the requirements relating to dioxins, carbon monoxide and hydrogen chloride are safely met.

Energy utilisation through the incineration of waste is the most common method used for the treatment of household waste in Sweden. Just under half (47%) of household waste is incinerated. The volume of waste going for incineration has increased in recent years, partly due to the landfilling of combustible and organic waste now being prohibited. Around 2.2 million tonnes of household waste was incinerated in 2007. Around 2.3 million tonnes of waste of other types was incinerated in the same plants. In addition to incineration in “normal waste incineration plants”, waste other than household waste is burnt by “co-incineration”. This takes place in particular industries, in

particular the cement industry and the pulp and paper industry, and in some thermal power plants/combined heat and power plants. The energy generated in incineration becomes heat and to some extent electricity. Energy totalling 13.6 TWh was extracted at plants incinerating household waste in 2007, of which 12.2 TWh heat and 1.5 TWh electricity. The heat from combustion of waste meets around 20 per cent of the total district heating need in Sweden. District heating networks in Sweden are well developed, and a very large proportion of the energy can therefore be utilised in comparison with many other countries. The high level of energy utilisation is also due to many of the plants being equipped with flue-gas condensation and heat exchangers.

Emissions to air from waste incineration today are low. Attention was drawn to problems with dioxin emissions in the mid-1980s. Dioxin emissions have since decreased by 98% and emissions of hydrogen chloride, mercury, cadmium lead and dust have decreased by 90-95%. The reduced emissions are a consequence of increased waste control, a better incineration process and more effective cleaning technology.

Incineration leaves behind residues consisting of slag from the furnace, 15-20 per cent by weight of the quantity of waste supplied, and flue-gas scrubbing residues, 3-5 per cent by weight. Metal is separated from the slag at most plants. The slag is then used principally as construction material at landfills. Flue-gas scrubbing residues, on the other hand, are hazardous waste and are landfilled according to special rules.

Since Sweden is particularly in need of heat and energy during the winter, waste is stored at several facilities during part of the year (summer time) by what is known as baling, but also in open storages. Energy can then be extracted from the waste during the cold part of the year.

Digestion

There are no EU rules for digestion and other biological treatment of waste. Larger facilities for biological treatment have to undergo permit appraisal according to the Environmental Code. There is guidance from the Swedish Environmental Protection Agency on what should be done in the appraisal and supervision of biological treatment. In addition to requirements from the authorities, the waste industry (Swedish Waste Management) has undertaken to regularly check for leakage of methane from biogas plants and plants that further upgrade biogas. For those emissions that cannot be dealt with directly, plants have to draw up a plan for further action. The digestion of waste is increasing due to several factors, but perhaps principally as a consequence of the environmental objective for biological treatment of food waste and state investment aid. More or less all digestion plants have received investment aid. Of incoming substrates to digestion plants, around 15% are food waste, while the remainder consists of wastes from the food industry and of manure. Smaller quantities of food waste are also received by sewage treatment plants for digestion. Both biogas and a digestion residue are obtained in the digestion

of waste. The biogas is used for the production of heating and electricity and as a vehicle fuel after the gas has been upgraded. The digestion residue is returned to agriculture as a biofertiliser. Plants that produce biofertiliser can quality-assure their product through certification which has been established by the Swedish Testing and Research Institute. Certification makes demands on the whole waste management chain, from incoming waste to use.

Sweden is notable for its substantial use of one of the most environmentally friendly fuels, biogas, as a vehicle fuel. This trend has been supported by investment aid also having gone to biogas vehicles at filling stations. Despite an increase in biogas production from waste, most production of biogas takes place through the digestion of sludge at sewage treatment plants (50%). The collection of landfill gas also accounts for a large share (28%), but production is decreasing here as almost no new organic waste is being placed in landfills. The digestion plants for waste account for 15%. There are also smaller on-farm facilities for digestion, principally of manure.

Sewage treatment
Around 85 per cent of the Swedish population live in areas connected to municipal sewage treatment. The remainder of the population live in properties with private sewers. Between 1971 and 1979 the Swedish state invested around SEK 1.5 billion (equivalent to around SEK 11 billion in today's money) in the expansion of municipal sewage treatment plants. Around 1.3 billion cubic metres of water is received annually by the municipal sewage treatment plants. It brings with it 7,000 tonnes of phosphorus, 40,000 tonnes of nitrogen and 200,000 tonnes of organic matter.

Since the late 1990s, a special nitrogen treatment stage has been added to the major sewage treatment plants along the coast in southern Sweden, from the Norwegian border to Norrtälje. Just over half of all sewage underwent this extra nitrogen treatment in 2005. Chemical precipitation of phosphorus is effective: on average just over 95 per cent of the incoming phosphorus is removed. Conventional biological-chemical treatment removes around 40 per cent of the nitrogen. The proportion removed rises to around 70 per cent with the extra nitrogen treatment stage. The average rate of nitrogen removal nationally is just under 60 per cent.

It is relatively poorly understood how treatment functions in wastewater that is not connected to municipal sewage treatment plants. Only around 60 per cent of wastewater is of an acceptable standard according to the requirements of the Environmental Code.

The most common treatment techniques are infiltration or trickling beds. In some areas the local authority requires a closed tank. A gully, sludge separation alone or a caisson do not provide sufficient treatment if the system receives toilet waste.

Radioactive wastes and their environmentally sound management (safe storage, transportation and disposal of radioactive waste)

A product liability system has been in place since the early 1980s for *the residual products of the nuclear fuel cycle.* It covers both technical safety and personal radiation safety and financial security for final disposal. For those parts of the system that have not yet been implemented there are statutory requirements for the nuclear power industry to carry out a research and development programme. The programme, together with calculations of the costs of implementation, is examined and evaluated every three years. Funding for future costs is provided under central government control.

Spent nuclear fuel is temporarily stored in a national interim storage facility (Clab) awaiting the establishment of a final storage facility. The plant has been in operation since 1985. The nuclear power industry plans to submit an application for permission to erect a final storage facility for spent fuel in 2010.

Very low-level waste is finally deposited where appropriate in special landfills alongside the nuclear facilities where it has been produced.

A particular type of *low and medium-level waste* is deposited in a national final repository (SFR), which has been in operation sine 1988. A project to expand SFR so that it can also receive waste from the demolition of nuclear facilities has recently been initiated. It is planned that the facility will be ready to receive low and medium-level demolition waste around 2020.

Another type of *low and medium-level operational and demolition waste* is placed in interim storage while the establishment of a special final repository is awaited. It is planned that the facility will be ready to receive waste around 2045.

A special *transport system* (transport ships and special transport vehicles) has been established by the nuclear industry to carry out transportation so that applicable rules on safety and radiation protection are met.

Radioactive residue from non-nuclear activity (hospitals, research institutions and industrial sites) is handled in consideration of its relative hazardousness. Residues from non-nuclear activity are placed – or are planned to be placed – in final storage facilities for residue from nuclear activities.

6. Sustainable consumption and production

Generic issues relating to the inclusion of SCP in national policies

Inclusion of SCP in development planning

The Swedish Environmental Protection Agency has worked for 15 years on development cooperation (financed through development assistance), where the focus is on developing the institutions and regulations of partner countries. Development cooperation is largely demand-driven, and there is no direct demand yet for cooperation relating to sustainable consumption and production. But as the development cooperation work has to contribute to "fair and sustainable global development" and the countries are supported in their efforts to utilise natural resources in a sustainable way, some of the projects relate to work on sustainable production.

An example of how work on sustainable production is included in development cooperation is the project initiated in September 2006 between the Swedish Environmental Protection Agency and the Chinese Ministry of Environmental Protection (MEP). An exchange of experience has taken place between the Swedish Environmental Protection Agency and MEP with the aim of increasing MEP's capacity and competence to use various policy instruments to promote the development of environmentally friendly enterprise and environmentally sound products, as well as in particular improving voluntary commitments in the form of a special system of awards for companies that go further than legislation requires. The Swedish Environmental Protection Agency has also drawn up recommendations for ways in which MEP can further develop its efforts to make industry environmentally sound, for instance by improving relations with both regional and local environmental authorities and with industry, improving the implementation of legislation and increasing public participation. MEP is working on the development of an implementation plan to show how it intends to proceed with the recommendations. Implementation of the recommendations is expected to contribute to reduced emissions and more environmentally sound products.

Inclusion of SCP in national strategies, policies, laws, regulations, and guidelines

Sweden has not devised any particular national strategy or action plan for sustainable consumption and production (SCP). Decisions have instead been taken to integrate aspects of SCP into other strategies, political proposals and government communications, bills etc. in a number of different areas such as transport/infrastructure, forestry and agriculture, climate, national environmental objectives etc. There is an interdepartmental working group to discuss and offer suggestions on current SCP issues nationally, in the EU and internationally. There is also an internal working report in the Swedish Government Offices that presents various measures particularly in the areas of food, transport and building/housing, as well as proposals for new measures.

The intention is to use this document to integrate SCP aspects when new government bills, communications etc. are presented. Sweden considers this to be a relatively successful strategy as SCP is a very clear interdisciplinary issue and concerns a number of different ministries and policy areas.

Green public procurement policies, laws and regulations

Environmentally sound public procurement is a market-based, powerful instrument in efforts to guide society towards long-term sustainable consumption and therefore production. Environmental requirements in public procurement can contribute to strong competitiveness for Sweden in future markets with strict environmental requirements. In addition, it can act as a driver in speeding up the development of environmental technology, which is also judged to be a future market. The Government presented Sweden's first action plan for green public procurement in 2007.

The Swedish Environmental Management Council endeavours to contribute to sustainable development by supporting companies and public administration in its environmental work in a strategic and cost-effective way. With three principal tools and services, the Swedish Environmental Management Council offers guidance on sustainable procurement, environmental management and environmentally related product information. The Swedish Environmental Management Council has received a boost to its income of around SEK 10 million in 2007 and SEK 6 million in 2008 and 2009. In 2008 the Swedish Competition Agency presented a document on environmental requirements, and the Swedish National Financial Management Authority has trained authorities that enter into framework contracts in the area of green public procurement.

With effect from 1 February 2009, government agencies may only purchase green cars that additionally fulfil stringent road-safety requirements. When the government agencies procure taxi travel or hire cars, it is also green cars that have to be chosen.

An example of an initiative at regional level is Stockholm County Council, which has had an extensive programme for its procurement ever since 1990 with a view to phasing out hazardous chemicals as such and in the products it buys, for example plasticisers in gloves. There are examples of suppliers having changed their production so that they can continue to sell to the county council.

Instruments for sustainable consumption

Many initiatives have been taken over the years to reduce the environmental impact of our consumption. A number of products have been made more environmentally sound and energy-efficient. At the same time the volume of consumption has risen, which means that the environmental benefit achieved per unit has been largely offset by increased volume. The challenge is to deal with the environmental impact of the growing demand for goods and services. The supply must become environmentally sound in order to achieve

sustainable consumption patterns, but it is also important that changes in consumer behaviour in the direction of a more sustainable lifestyle are brought about. The Swedish Environmental Protection Agency is working to develop and evaluate instruments for sustainable production and consumption focused on the ecological dimension. The significance of consumption for sustainable development has increasingly come into focus in recent years.

Awareness-raising programmes/campaigns on SCP

Knowledge of and access to good information are essential if consumers are to be able to make environmentally sound choices and in the longer term alter their behaviour. Activities to raise awareness of the importance of sustainable consumption and production patterns in different target groups has been conducted by a number of different actors in Sweden: non-governmental organisations, municipalities, county councils and government agencies. Some examples of ways in which the Swedish Environmental Protection Agency works on the facts-based dissemination of information with the aim of informing the public are given below.

Climate information

Demand for information on climate change and climate measures has increased in recent years. Several Swedish government agencies communicate the climate issue in their particular areas of responsibility on behalf of the Government. The Swedish Environmental Protection Agency has worked on climate information over a long period, the aim in recent years having been to raise the level of knowledge of the causes and consequences of climate change, disseminate the latest research findings on the topic, highlight ways of reducing greenhouse gas emissions and increase understanding of the adjustments that will be necessary in society in the longer term for sustainable development. This has been done for instance through newsletters, climate information on the Internet, press releases and the annual conference Klimatforum.

The “Climate and Consumption” project was conducted at the Swedish Environmental Protection Agency in 2008 with the focus on adopting a comprehensive approach and producing new facts about the significance of Swedish consumption for the climate issue. One of the aims of the project was to make facts about the climate impact of consumption available to the public. Studies have attracted strong interest, and information has been disseminated at more than ten seminars nationally and internationally, Since 2002 the Swedish Environmental Protection Agency has conducted surveys of attitudes and knowledge which show that since the surveys began an increase has taken place in the public's commitment to and interest in the issue of climate change.

Energy efficiency

An energy efficiency campaign (www.blienergismart.se) in which several government agencies take part was launched in 2007 to increase knowledge of energy-efficiency measures in Swedish households and to highlight that every single initiative is significant.

The information is primarily disseminated by participation in central and local events. The follow-up made in 2007 shows that the information campaign has resulted in increased knowledge of the concept of energy efficiency and that households are taking measures to reduce their energy use more. The follow-up also showed that the principal driving force in reducing energy use was economic and not environmental.

Battery collection

Another example of a successful information initiative are the battery collection campaigns. In conjunction with the entry into effect of a new Batteries Ordinance in 1997, and with the objective of all batteries being collected, the Battery Collection Project (Batteriinsamlingen) began as a cooperative venture between the Swedish Environmental Protection Agency, the Swedish Association of Local Authorities and Regions, Swedish Waste Management and the Swedish Battery Association. The Battery Collection Project's campaigns aim to raise the level of knowledge and awareness among consumers of the Batteries Ordinance, batteries and their environmental impact. The information has been disseminated among other ways through major campaigns in the media and through the Battery Collection Project's collection tours around the country. The campaigns have had a clear effect on consumers' knowledge of batteries, and have led to an increase in rate of collection. It is estimated that 60-70% of non-environmentally hazardous batteries were collected in 2006. Breaks in the campaigns have shown a sharp decline in awareness, knowledge and behaviour, and it is therefore important to have regular information. Since Sweden has introduced producer responsibility for batteries from the beginning of 2008, responsibility for collection, sorting, recycling and information now rests with the producers.

The information brochure "How to Burn"

An example of the dissemination of information on a smaller scale aimed at a specific target group is the information brochure "Elda rätt" ("How to Burn"). Emissions from small-scale wood burning contain harmful and carcinogenic substances and pose a health problem in Sweden. Most of the emissions arise as a result of incomplete combustion. The information brochure "How to Burn" has been produced to inform home-owners about wood burning and cost-effective measures to reduce emissions.

The brochures provides households with information on the purchase and installation of wood-fired boilers and advice and tips on more efficient and environmentally friendly burning. Unfortunately there is no evaluation showing what effect the information has, but there is great demand for the brochure and a new version is being prepared.

Policies and/or infrastructure to support citizens' choices for responsible consumption of products and services, including consumer information tools

Consumers are a heterogeneous group with different preferences and different circumstances with regard to changing their consumption patterns. There are

therefore several difficulties in designing effective instruments aimed at consumers. To begin with, it is important to understand the significance of consumption for the environment, but knowledge of what guides consumers' behaviour is also important.

Instruments for environmentally smart and resource-efficient consumption

A project conducted by the Swedish Environmental Protection Agency in 2008 studied how Swedish household consumption influences global greenhouse gas emissions.
Emissions due to Swedish consumption are found to be 25 per cent higher than greenhouse gas emissions in Sweden. Private consumption accounts for just over 80 per cent of total consumption-related emissions. The activities of greatest significance for greenhouse gas emissions are linked to transport (car and air travel), housing (heating and use of electricity) and foods (meat consumption). It is principally in these areas that measures and instruments are important if we are to reduce greenhouse gas emissions.

A study has been made in the project on the climate impact of consumption of the requirements that need to be met in order to influence behaviour in a climate-smart direction. Household behaviour in relation to instruments has also been examined in the research programme SHARP (see p. 13). The results from both these sources provides an important fount of knowledge for continued work on reducing the environmental impact of households. Some of the following conclusions can be drawn from these two reports on the design of instruments aimed at consumers:

Problem awareness, the perception that what one does has significance, social impact and reasonable sacrifices are factors that influence the willingness of households to take personal responsibility for the environment. It is therefore important to clarify the links between behaviour and lifestyle with an environmental impact and convert this into readily available information, as well as highlighting examples of best practice.

Although environmental awareness, and thus the moral standard, is high among households, SHARP points out that there is a limit to what can be achieved with individual responsibility. Collective measures that facilitate environmentally friendly behaviour, such as investments in infrastructure and physical planning, are therefore of great significance.

There is a need for a combination of information-related and economic instruments to bring about quicker changes in behaviour.

Economic instruments for sustainable consumption

The production and consumption of products and services today takes place to a great extent without taking account of the socioeconomic costs it gives rise to in the form of harm to the environment and human health. The purpose of economic instruments is to include in the calculation these adverse effects that

arise when the article or service is produced, used and finally disposed of, which means that it becomes economically worthwhile for companies and households to take account of the environmental impact of products and services. Some successful examples of Swedish economic instruments are the various taxes on fuel.

Sweden at present has three principal taxes on fuel: energy, carbon dioxide and sulphur tax. The purpose of the energy tax and the tax on carbon dioxide is to internalise the external costs of carbon dioxide emissions. Both taxes lead to a reduction in the use of fossil fuel, and greenhouse gas emissions consequently also decline. The sulphur tax is aimed at reducing the use of fuel with high sulphur levels. The evaluations made show that the taxes have met their purpose and greenhouse gas and sulphur dioxide emissions have fallen sharply since the taxes were introduced.

An alternative to using an environmental tax may be to subsidise a more environmentally friendly alternative for a period in order to create greater demand. The green car rebate of SEK 10,000 introduced in 2007 is an example of such a subsidy. The purpose of the green car rebate is to encourage private individuals, when buying a new car, to choose a fuel-efficient vehicle or one that runs on renewable fuels. The rebate has been successful and has contributed considerably to the current situation where more than one in three new cars sold is a green car. Because the rebate is considered to have fulfilled its purpose, it comes to an end on 30 June 2009. To provide a continued incentive to purchase green cars, the Swedish Government has proposed that these cars should instead be exempt from vehicle tax for five years from the time of purchase.

Another example of a subsidy is the conversion grant introduced in January 2006 to encourage owners of detached houses to replace oil-fired boilers with pellets, heat pumps or district heating. It was intended that the grant would be available for four years, and a total of SEK 450 million had been earmarked. As applications for a total of SEK 460 million had already been received after 11 months, the application period was terminated early. The effectiveness of this instrument is, however, judged to be low as it is only seen as leading to a speeding-up of development and does not ultimately lead to more conversions taking place.

Ecolabelling

There are several independent and reputable ecolabels in Sweden aimed at providing consumers with clear environmental information about products and services, while boosting environmentally sound product development. There is a challenge for ecolabelling in providing consumers with useful and reliable information in a purchasing situation where several different environmental aspects, which sometimes clash, have to be taken into account.

The Swan is the official Nordic ecolabelling scheme and is today one of the best-known brands in the Nordic Region. The vision of the Swan ecolabel is a

sustainable society with sustainable consumption. On behalf of the Government, SIS Miljömärkning pursues Swedish work on the Swan and also on the EU's official ecolabel the EU Flower. In the spring of 2009 agreement was reached on a revised regulation for the EU's Flower ecolabel. The aspiration is for significantly more products than at present to feature this label and for consumer awareness of the label to increase. A revised ecolabel is one of several measures in the package for sustainable consumption and production presented by the European Commission in the summer of 2008.

The Swan, which is largely self-financing, has developed criteria for 66 different product groups where articles and services are examined on the basis of their environmental impact throughout their lifecycle, from raw material to waste. Development is driven by constantly revising and raising the criteria. The number of Swan licences in the Nordic Region is approximately 1430, and there are around 900 in Sweden (in 2007). This can be compared with 25 product groups with 473 licences for the EU Flower in those countries that are involved in the EU Flower. According to the climate investigation of the Swan ecolabel conducted in 2005 many of the Swan label criteria are relevant to greenhouse gas emissions. It was found, however, that there were product groups for which more requirements could be laid down. Greater focus has been put on the climate impact of goods and services in the strategy for 2008-2010, and climate impact is one of the key aspects assessed when a product or service is to be ecolabelled under the Swan scheme. Product groups with a great environmental impact, where labelling can lead to significant improvements, have been included in recent years. An example of such a product group is vehicle fuels, where the Swan ecolabel was introduced in 2008.

The evaluation of the Swan conducted in 2008 shows that the level of public trust in the Swan is high and has continued to increase over the years. The evaluation also shows that the criteria are significant for the environment and that they have improved since the previous evaluation. According to an international study that included 200 different labels, databases and product lists, the Swan was judged to be one of the most reliable systems of all in measuring the environmental performance of products.

"Good Environmental Choice" is another label for environmentally sound products and services where the criteria are based on a comprehensive perspective, from production to waste, and requirements are set for the raw materials and chemicals used in production. "EU ecological production" covers agricultural products and foods produced and certified according to rules set forth in Council Regulation (EC) No 834/2007, which came into force on 1 January 2009.

The KRAV label is another established labelling system in Sweden covering the environment, animal welfare, health and social responsibility, and applies to organically produced food. KRAV complies with EU rules and also contains supplementary rules. Another labelling scheme is the Swedish Seal, which guarantees that food raw materials and flowers that are labelled have been

produced and grown on Swedish farms where strict requirements are met with regard to safe foods, good animal welfare, environmental responsibility and open landscapes. KRAV and the Swedish Seal have now been working to develop qualitative climate criteria. KRAV has decided to integrate the climate criteria for different product groups into its ordinary labelling, while the Swedish Seal scheme has decided instead to make the climate criteria an addition to its established labelling.

There are also other initiatives to indicate climate impact. Since 2008 there have been climate declarations, a quantitative indication of carbon dioxide equivalents. Such declarations have been developed for chicken, hulled grain and flour and are given as kg carbon dioxide equivalents per kg product. There are further initiatives for quantitative labelling, and a British standard and an ISO standard are in preparation.

Environmentally smart food choices

The production and consumption of foods has a significant environmental impact. In a study from 2006, it is estimated that foods and beverages are the cause of 20-30% of several different environmental parameters in private consumption, while the contribution to eutrophication is around 50%. Meat, meat products and dairy products are regarded as particularly significant.

The National Food Administration in cooperation with the Swedish Environmental Protection Agency, the first authority in Europe to do so, has drawn up proposals for dietary advice which in addition to health aspects also takes account of the climate and environmental impact of foods. Environmental considerations relate primarily to the environmental quality objectives Reduced Climate Impact, A Non-Toxic Environment, A Varied Agricultural Landscape, A Rich Diversity of Plant and Animal Life, A Balanced Marine Environment and Flourishing Coastal Areas and Archipelagos, but also the strategy on Non-Toxic and Resource-Efficient Ecocycles. Before the advice is put into practice in the country, Sweden will inform other EU Member States and the Commission through a notification process and give them an opportunity to present their views.

SCP in national priority areas

In future development characterised by continued globalisation, increasing consumption and greater dispersal of hazardous substances it will become increasingly difficult to achieve the Swedish environmental quality objectives whose fulfilment is heavily dependent on what happens in other countries (in particular A Non-Toxic Environment and the climate and eutrophication objectives).

Attention is drawn in the Swedish Environmental Protection Agency's proposals for the national action strategy for non-toxic and resource-efficient ecocycles to the need for factual information on how Swedish consumption affects the state of the environment both nationally and internationally, as well

as to the need for an analysis of how European and international work on sustainable consumption and sustainable lifestyles can contribute to attaining national and international objectives. There is also demand in the strategy for continued development of instruments linked to international labelling of articles with regard to their content of substances that are hazardous to the environment and health. The strategy also points to the need for follow-up measures so that environmental impact can be measured over time (climate, energy use, hazardous substances) as a consequence of Swedish consumption. The strategy identifies the food sector and the building, property and civil-engineering sectors as focal areas for the next four years.

Inclusion of measures and policies to improve the environmental and social impacts of products

The Swedish Environmental Protection Agency has been working to reduce the environmental impact of products since the mid-1990s. Producer responsibility was introduced at that time for selected product groups, which by setting requirements for recycling in particular is intended to reduce the environmental impact at the waste stage, but also in other parts of the lifecycle. The lifecycle perspective is highlighted as a key principle, and a policy framework of instruments and measures to minimise the environmental impact of different parts of the lifecycle was adopted in 2001: Integrated Product Policy (IPP). IPP emphasises the importance of combined consideration of environmental impact in different phases of the lifecycle and of involving key actors in the product chain and its networks.

However, since 2002 the Swedish Environmental Protection Agency has not undertaken any combined policy work to reduce the environmental impact of products in consultation with key actors on the basis of a lifecycle perspective. The focus has instead been on continuing to develop a selection of instruments, for example ecolabelling, public procurement and environmental management systems as well as for the area of waste management, which are judged to be of great significance in attaining the Swedish environmental objectives. Several of these also make a substantial contribution to breaking unsustainable consumption and production patterns, and the aim is to gradually strengthen the lifecycle and consumption perspective in Swedish environmental objective efforts.

Over the period 2003-2008 the Swedish Environmental Protection Agency funded a research programme (FLIPP, see p. 13) focused on product-related instruments and ways in which these can be combined on the basis of a lifecycle perspective to more effectively reduce climate impact, for example, and improve the resource efficiency of products. The programme also analyses difficulties and opportunities with an increased lifecycle perspective among companies and authorities. A general conclusion drawn from the programme is that a smooth flow of sustainability information relating to the chemical content of articles and the environmental impact of products and services between different actors in the product chain is necessary to enable the

environmental impact of product and service systems to be reduced. As most product chains are global, there is a need for global cooperation to make product data available. Another conclusion from the programme is that environmental legislation on products has played a crucial role for the environment, but that legislators to date have taken too much account of trade rules. The programme's researchers feel that legislation will continue to play a decisive role, but needs to be combined with other types of instruments and measures.

GRI reporting for state-owned companies
The Government in 2007 decided on new guidelines for external reporting for state-owned companies, which mean that with effect from 2008 these companies have to present a sustainability report in accordance with GRI (Global Reporting Initiative), which represents international guidelines on sustainability reporting.

Eco-design programmes
The EU's Ecodesign Directive came into effect in Sweden in May 2009 through a Swedish law on ecodesign aimed at promoting efficient energy use and low environmental impact for energy-using products. The Swedish Energy Agency is responsible for implementing the Ecodesign Directive in close cooperation with the Swedish Environmental Protection Agency and the Swedish Chemicals Agency, among others. The focus has been on the aspect of energy use in the implementation measures that have been taken to date. It ought also to be possible for requirements to be set for the content of hazardous chemicals and recycling to enable the full potential of the Directive to be utilised.

Programmes to integrate sustainability in distribution/retailing
Trade, in the form of importers, exporters and distributors, is an important link between consumers and producers and therefore fulfils an important task in passing on and disseminating knowledge on the environmental impact of products to consumers and waste actors, as well as laying down requirements for suppliers and producers. As many actors are involved in this chain, cooperation between actors is important, leading to the establishment of dialogues across sector boundaries, and actors can work together towards common aims that are difficult to achieve separately. The Government has an opportunity to enter into contracts or agreements to make it possible and easier for companies to take environmental and social responsibility.

Retailer Forum within the EU

The Retail Forum was presented by the Commission in July 2008 as part of the EU Action Plan on sustainable consumption and production and sustainable industrial policy. The Forum aims to reduce the environmental impact of the retail sector and its supply chain, promote more sustainable products and better inform consumers about 'green' purchasing opportunities.

Participants will share best practice, discuss how to promote sustainable consumption and tackle barriers that hinder it, and obtain scientific information from relevant bodies to help evaluate environmentally sound products.

The rationale behind the Forum is that retailers are in a position to promote more sustainable consumption through their own actions, through their partnerships with suppliers, and through their daily contact with European consumers.

Membership of the Forum is voluntary and open to all retailers who join the Retailers' Environmental Action Plan (REAP) which includes many company-specific environmental commitments.

The Forum will meet every quarter starting in April 2009.

"Swedish" participants to date are IKEA, ICA (via Royal Ahold) and Lidl. Altogether there are around 25 companies according to the Commission list.

Future trade

The dialogue project Future Trade was initiated in 1998 as a result of the Government's instruction to the Swedish Environmental Advisory Council to devise sustainable strategies in dialogue with the business community. Grocery chains were one of two selected areas. Seventeen companies were involved in the process of devising a common vision and overarching aims for sustainable trade in groceries by 2025. Under the direction of the Ministry of the Environment, an agreement was reached at the end of 2003 between 12 companies (grocery companies, producer companies, transport/communication companies) a municipality, two regions and the Government, and was embodied in a document of commitments with seven sub-groups.

The implementation phase for the dialogue project Future Trade began in 2004. The Swedish Environmental Protection Agency was commissioned by the Government to set up a secretariat whose tasks were to coordinate, follow, evaluate and inform about the work and results of the project.

Workshops and seminars were held under the project at which joint ventures were devised to tackle practical problems and bring about environmental improvements. In addition, a continued dialogue was established between the participants which increased understanding of different needs and problems across sector boundaries. Four projects with differing orientation were carried out. One project resulted in a guide showing a model of how to identify and prioritise hazardous substances in articles at the time of purchasing. The guide and model have been used and disseminated both among the actors and among others as it is practical and easy to assimilate, and in addition facilitates a dialogue with purchasers. Another project tested whether evening

distribution could produce a favourable result in environmental and economic terms. The test shows a clear reduction in time spent and a reduced estimated environmental impact, but if evening distribution is to be successful the business owners too must be in favour of a change. A method to enable the benefit of selling organic products to be presented in the annual report was devised in one of the projects. The fourth project brought together practical experience gathered in e-commerce. The projects were felt by the participants to be positive, partly because they also led to increased understanding between the public sector and the business community, as well as to knowledge transfer and cooperation. The Future Trade project has now been completed.

Links with spatial planning and sustainable city policies

In the national action strategy for management of land, water and the built environment, attention is drawn to the need for environmentally sound spatial and physical planning in order to achieve regional sustainable development. As a result of the planning of large infrastructure projects being based on the environmental quality objectives, there are good prospects for creating good environmental quality in several respects, at the stage of both construction and administration of infrastructure projects. A good example of this is the Hammarby Sjöstad district in Stockholm, although it has proved more difficult in the planning of large road projects, such as the Förbifart Stockholm bypass.

State investment aid

The state investment aid schemes LIP (local investment programmes) and Klimp (climate investment programmes) have been important initiatives in Sweden in promoting and stimulating investments that contribute to sustainable development at local and regional level in the whole environmental area, while at the same time boosting employment and economic growth.

The Swedish Parliament in 1998-2002 set aside SEK 6.2 billion in aid for LIPs, the largest investment ever made in ecological sustainability in Sweden. The purpose of the aid was to increase the speed of the switch-over to a sustainable society with the assistance of the municipalities. The aid was unique as it was up to the municipalities to identify the local environmental problems and apply for money for the solutions they themselves considered effective. In 2002 LIP was replaced by Klimp, whose programmes were to be focused on projects that lead to reduced greenhouse gas emissions and/or reduced energy use. Decisions on the last grants were taken in 2008.

Altogether the two investment aid schemes are estimated to generate environmental and climate investments totalling just over SEK 24 billion. Just over 2,700 projects have been granted aid, and the principal implementers are municipalities and companies. The investment programmes are estimated to reduce annual greenhouse gas emissions by the order of 2 million tonnes of carbon dioxide equivalents, while annual energy use in Sweden is reduced by 3.3 TWh.

The projects under LIP and Klimp have also contributed to creating new sustainable districts, such as Hammarby Sjöstad in Stockholm. The environmental footprint in Hammarby Sjöstad is 30-40 per cent lower than in an average district built in the 1990s. When the district is completed, half the energy used will be produced from sources such as solar cells, solar panels and fuel cells. The quantity of energy supplied to the buildings has decreased as a result of individual metering of heating, water and gas. In addition to significant environmental effects, the investment programmes lead to greater collaboration in local environmental activities through work on a collective investment programme. As part of its efforts to pass on experience and best practice, the Swedish Environmental Protection Agency has built up a database containing all projects.

R&D incentive or support provided

The objective of a sustainable Sweden means that long-term changes in society and environmental issues have to be placed in a wider context. The solutions therefore have to be sought not just in natural science but in an interdisciplinary and multidisciplinary approach in economics, law and other social-science disciplines.

SHARP – basis for formulation of environmental policy for households.

In 2003 – 2008 the Swedish Environmental Protection Agency financed a multidisciplinary research programme in which the role of households in environmental policy was analysed. Under this programme values and attitudes, as well as obstacles and drivers linked to the environmental activities of households in the everyday situation have been studied. The researchers have also attempted to clarify when different environmental policy instruments can be effective and perceived as legitimate from the perspective of households. Activities that have been studied are separation of refuse, car travel and purchase of ecolabelled products. On this basis conclusions have been drawn on how environmental policy should be formulated and what instruments are effective in changing household behaviour in a more environmentally friendly direction. (www.sharpprogram.se).

FLIPP – basis for lifecycle-based decisions for government agencies and companies

Over the period 2003 – 2008 the Swedish Environmental Protection Agency funded a research programme with the aim of developing a basis for whether, when and how central government can contribute to reducing the environmental impact of products at all stages of the lifecycle. An important underlying principle is that no authority or global organisation has control over all stages of a product's lifecycle and that necessary changes cannot be achieved without all the actors in the product chain contributing. The results of the programme are summarised in a synthesis of knowledge on what instruments can be combined on the basis of a lifecycle perspective and a book that describes challenges and opportunities in efforts to reduce the environmental impact of production and consumption. Textile products and electronic

products and their global network relations are analysed in particular. (www.iiiee.lu.se/flipp).

CPM (Centre for Environmental Assessment of Product and Material Systems)

For just over ten years, the Chalmers University of Technology and some large Swedish industrial partners have collaborated in the framework of a competence centre with the aim of preventing the environmental impact of products by strengthening Swedish expertise in the area. The focus has been on the development and application of LCA methodology and data quality (www.cpm.chalmers.se). This activity, which has principally been financed by the government agencies NUTEK and VINNOVA and the participating companies on a 50-50 basis, will come to an end in the spring of 2009, but it is hoped that the cooperation between academia and business can continue in some form in this area. A substantial rise in the adoption of a lifecycle-based approach and use of LCA and other environmental system analyses in industry can be noted over the time the centre has been in operation. This is important, as global companies are best placed to influence the total environmental impact of products by developing new innovative products, imposing environmental requirements on suppliers and also influencing large consumer groups by marketing environmentally sound alternatives.

7. Transport

Transport policy objectives and principles

Policy objectives

The overarching objective of Swedish transport policy is to ensure socioeconomically efficient and long-term sustainable transport provision for the public and the business sector throughout the country.

The overarching objective is supported by two objectives of equal measure: a functional objective of *"Accessibility"* and a consideration objective of *"Safety, environment and health"*(Government Bill 2008/09:93).

Accessibility

The objective of accessibility emphasises that the design, function and use of the transport system should contribute to assuring everyone of fundamental accessibility of good quality and usability and contribute to development capability throughout the country. The transport system has to be gender-equal, in other words meet the transport needs of women and men to an equivalent degree.
The transport system also has to be designed so that it is usable for people with disabilities and so that the safety and mobility of children is improved.

Safety, environment and health

In relation to work on safety, the requirement continues to be to adapt the transport system so that no one is killed or seriously injured as a consequence of traffic accidents. The number of fatalities and serious injuries due to traffic accidents in the different modes of transport must continue to fall. The number of people killed in the road transport system, for example, should be reduced by half and the number of people seriously injured should be reduced by a quarter between 2007 and 2020.

The transport sector has to contribute to the national environmental quality objective *Reduced Climate Impact* being attained by gradually improving energy efficiency in the transport system and breaking the dependence on fossil fuels. In 2030 Sweden should have a vehicle fleet that is independent of fossil fuels. The transport sector should also contribute to other national environmental quality objectives being attained and to reduced ill-health. Priority is given to the interim targets in environmental policy, where development of the transport system is of great significance to the prospects of attaining set objectives.

Policy instruments

The following policy instruments are among the most important ones used to attain the transport policy objectives:
- economic instruments

- laws and regulations
- organisation and control of government agencies
- infrastructure planning
- research, development and demonstration

Five transport policy principles guide the choice of instruments to attain the transport policy objectives:
- customers must be given wide freedom to choose how they wish to travel and how shipments should be made
– decisions should be taken on whether transport provision should be made in decentralised forms,
– collaboration in and between different modes of transport must be promoted,
– the competition between different operators and transport alternatives must be promoted,
– the socioeconomic costs of traffic must be a fundamental aspect when transport policy instruments are designed.

Concrete actions taken and specific progress made in implementation

Programme for a vehicle fleet independent of fossil fuels

Energy and carbon dioxide taxes
Taxation is the primary instrument for reducing carbon dioxide emissions from those parts of society that are not covered by the EU emissions trading scheme, such as road traffic.

Petrol and diesel are subject to energy tax, carbon dioxide tax and value-added tax (VAT). The level of energy tax and carbon dioxide tax is shown in Table 1. Energy and carbon dioxide taxes are adjusted annually in line with the consumer price index. Biofuels at present are completely exempt from energy and carbon dioxide tax. The Government has stated that the general tax exemption should cease no later than the end of 2013, when the state aid approval for the measure from the European Commission expires.

	Energy tax	Carbon dioxide tax	Total (SEK/litre)
Petrol, environmental class 1	3.08	2.44	5.52
Diesel, environmental class 1	1.33	3.01	4.34

Table 1. Tax rates on petrol and diesel in SEK/litre at 1 January 2009.

The Government has given notice in the Climate Policy Bill that the energy tax on diesel should be raised in two stages by a total of SEK 0.40 per litre. A first rise of SEK 0.20 is intended to take effect on 1 January 2011 and a second of SEK 0.20 on 1 January 2011.

Carbon dioxide-based vehicle tax
Vehicle tax for cars manufactured in 2006 or later is differentiated according to the car's carbon dioxide emissions. Vehicle tax for older cars and trucks, buses and motor homes is principally based on the vehicle's weight.

Vehicle tax in the carbon dioxide-based system is levied at a base amount of SEK 360 plus a carbon dioxide charge of SEK 15 per gram of carbon dioxide over 100 grams that the vehicle emits per kilometre in mixed driving. The carbon dioxide charge for cars that can run on a fuel mixture which predominantly consists of ethanol or wholly or partially on a gas other than LPG is SEK 10 per gram of carbon dioxide.

To reinforce the move towards lower carbon dioxide emissions in the carbon dioxide-related vehicle tax, the Government has proposed that the amount charged per gram of carbon dioxide emitted by the car per kilometre be raised from SEK 15 to 20. For cars that can run on ethanol or gas, it is proposed that the current charge of SEK 10 per gram of carbon dioxide should remain.

At the same time it is proposed that the level of emissions at which the carbon dioxide charge starts to be levied be raised to SEK 120 grams of carbon dioxide per kilometre. This provides an added incentive to buy cars with low carbon dioxide emissions.

It is proposed that light goods vehicles, light buses and motor homes be brought within the coverage of the carbon dioxide-based vehicle tax from 1 January 2011. This will only apply to new vehicles.

Tax exemption for green cars
From 1 April 2007 to 30 June 2009 there was a state green car rebate of SEK 10,000 which was paid to private individuals who purchased a green car. The green car rebate has made a great contribution to the sharp increase in sales of fuel-efficient cars and cars capable of running of renewable fuels.

The Government has proposed that new green cars should be exempt from vehicle tax for five years in order to further stimulate purchases of green cars when the rebate scheme comes to an end. The definition of green car used today for the green car rebate should also be the definition that applies to the cars that initially are to be exempt from tax. This means, for example, that petrol and diesel-engined cars emitting no more than 120 grams of carbon dioxide per kilometre in mixed driving will be exempt from vehicle tax.
A difference in comparison with the green car rebate is that all cars are covered, regardless of who the owner is. The definition of green car should be gradually tightened in the future so that the proportion of cars sold that are covered by the tax exemption remains approximately constant. The best cars from the environmental point of view consequently will also be encouraged. It

is proposed that the tax exemption comes into force on 1 January 2010 but applies retrospectively to green cars registered from 1 July 2009.

Reduced benefit values for green cars

When an employer allows an employee to take part of their remuneration in the form of what is known as car benefit, instead of ordinary salary, this, like other benefits, is subject to special taxation of benefits. Someone who chooses a green car as their "benefit car" is subject to lower benefit taxation than someone who chooses another car. As approximately 24 per cent of cars sold in Sweden are benefit cars, this instrument too is significant. Cars that can run on ethanol (E85) are eligible for a reduction in benefit value of 20 per cent in comparison with an equivalent conventional car. Cars that can run on electricity (including hybrid cars) are eligible for a reduction of 40 per cent.

The Swedish vehicle cluster

To ensure that the Swedish vehicle cluster develops and maintains its competitive position as a world leader, particularly in the areas of climate and safety, it is proposed in Government Bill 2008/09:95, *The State as principal for companies with research and development activities and other activity in the vehicle cluster etc.* that vigorous measures be taken to deal with the crisis in the automotive industry. These measures include long-term initiatives both to boost the competitiveness of companies and to meet climate challenges. Initiatives are required for more environmentally sound vehicle technology and fuel development. Such efforts involving central government and companies in the vehicle cluster are crucial.

The intention is to invest on commercial grounds in research and development for example in companies, research institutes and universities. The Government considers that the State shoulder undertake this activity in the form of a company. The new state-owned company will have SEK 3 billion at its disposal.

1 March 2008 marked the start of a new cooperation project to launch the next generation of green cars (the Plug-in Hybrid Electric Vehicle or PHEV project). This is a cooperative effort between Volvo Car Corporation, Vattenfall AB and ETC AB. The project is being carried out with support from the Swedish Energy Agency. It will involve the use of plug-in hybrid models from the car manufacturers, models the car-makers intend to put on the market within a few years. A total of SEK 62 million is being invested in the project, of which the Swedish Energy Agency is contributing SEK 20 million. Another project is concerned with the development of a hybrid bus with up to 35 per cent lower fuel consumption in cooperation with Volvo Buses. The total cost of the project is SEK 466 million, of which the Swedish Energy Agency is providing SEK 116 million.

Obligation for filling stations to supply renewable fuels

Since the spring of 2006 all larger filling stations have been obliged to supply at least one renewable fuel under Law 2005:1248 on the obligation to supply

renewable fuels. The statutory requirement has resulted in particular in an increase in the supply of E85. The number of filling stations stocking ethanol has risen from 300 to 1300 since the law came into effect. By 2010, 60 per cent of all filling stations will be covered by the requirement.

The law has been supplemented by a specially targeted grant for filling stations for renewable fuels other than ethanol, as these are more expensive to build than filling stations for ethanol, see Ordinance (2006:1591) on state aid for the promotion of distribution of renewable fuels. A sum of SEK 150 million was earmarked for 2006-2007, but the Government has since extended the aid.

Increased low blending of biofuels
All Swedish petrol contains 5 per cent ethanol, which is the maximum permitted proportion under the former Fuel Quality Directive. Under the new Directive adopted in December last year it becomes possible to blend up to 10 per cent ethanol into petrol and up to 7 per cent FAME (biodiesel) into diesel. Sweden was prominent in pushing for this decision. The Swedish Government is therefore keen to implement the Directive in Swedish law quickly so that it become possible to blend in 10 per cent ethanol and 7 per cent FAME. The implementation time depends on how the loss of tax revenue can be offset.

Continued investments in second-generation biofuels
In recent years the Swedish State has invested between SEK 120 and 170 million annually in research and development of biofuels. The Swedish Government intends to continue supporting the development and testing of second-generation biofuels. More climate-efficient and cost-effective production of biofuels is of key importance if the EU target of 10 per cent renewable energy for the transport sector is to be met. A commercial breakthrough is dependent on ability to test the technology in pilot plants. The Government is therefore setting aside a further SEK 875 million for the period 2009-2011 for the commercialisation of new energy technology, such as demonstration plants for biofuels.

Abolition of customs tariffs for low-blend ethanol
The EU applies duties on the importing of ethanol. Imports of ethanol for example from Brazil based on sugar cane mean that the carbon dioxide reductions can be made in a more climate-efficient and cost-effective way with biofuels. Sweden considers that customs tariffs for ethanol as a low blend in petrol should be abolished. Approval from the EU is needed before this can be done, and the Government judges that approval can be obtained relatively quickly.

At the same time it is important to monitor closely how increased biofuel production affects the global carbon balance and biodiversity. This is where the EU's sustainability criteria for biofuels come in. Within the EU, Sweden is pressing for sustainability criteria that do not create obstacles to trade and that ensure that biofuels are produced sustainably.

Public procurement of energy-efficient and safe vehicles
With effect from 1 February 2009, government agencies are only permitted to purchase green cars that additionally fulfil stringent road-safety requirements (Ordinance on environmental and road safety requirements for government agency cars and car travel, SFS 2009:1). When the government agencies procure taxi travel or car hire, it is also green cars that have to be chosen. The Government intends the requirements that are imposed to be usable by municipalities, county councils, state-owned companies and the business community.

Binding emission requirements in the EU for car manufacturers
An agreement was reached in December 2008 between the Council and the European Parliament on binding emission requirements for car manufacturers of an average maximum of 130 grams of carbon dioxide per kilometre for new cars. This requirement will be phased in over time between 2012 and 2015. The emissions requirement applies as an average figure for new cars for car manufacturers registered in the EU. In addition, agreement was reached on a long-term target of 95 grams per kilometre by 2020.

The transport infrastructure

The development of the transport infrastructure should be focused on creating communications based on the needs of travellers, businesses and society which at the same time are compatible with ambitious climate and environmental targets. On 30 September 2008 the Government presented the infrastructure bill *Travel and transport in the future – infrastructure for sustainable growth* (Government Bill 2008/09:35) for 2010-2021. This bill forms part of the long-term planning process for measures in the transport infrastructure. The process will lead to new transport infrastructure plans for the period 2010-2021. With investments and designated funds for operation and maintenance, it is estimated that a significant increase in capacity by 2020 is possible for the railways.

An intermodal approach is the key to long-term infrastructure planning.
A transport system that works well utilises all modes of transport in an effective, safe and environmentally sustainable way, both separately and in combination.

Sweden's heavy dependence on trade, together with its geographical position, means that it is necessary to have a clear international perspective when measures that affect the freight transport system are discussed. Sweden is therefore an active party in EU transport policy work and presses in particular for better conditions for international freight transport by road (market opening and harmonisation of systems). Sweden is also urging investments in other countries that link it more closely to the rest of Europe, such as the Fehman-Belt link and the marine motorways on the Baltic and the North Sea. To further ease international transport and reduce its environmental impact, it

is also important for the national priorities to lead to better coordination between the modes of transport and to take account of connections to strategic nodes, such as freight terminals and ports.

Measures to increase cycling
The bicycle is a mode of transport that offers many advantages. Measures that lead to increased travel by bicycle therefore contribute to attaining several social objectives. Increased cycling contributes to reducing the environmental impact of travel, results in less congestion and has positive effects on public health.

After the sharp rise in car use in the early 1960s cycling became dangerous and unpleasant in most traffic environments. The proportion of all journeys made by cycling has gradually fallen, as has the proportion of total distance travelled accounted for by cycling. Cycling as a mode of transport is now the object of analysis primarily at local level. The Government considers that it is now important to strengthen the role of the bicycle again as a natural part of the planning of the transport system, including on the basis of a regional and national perspective. It should be possible to view cycling as an attractive alternative for part or the whole of a journey. To bring this about there is a need for initiatives in a number of areas – infrastructure, planning and follow-up, rules and signposting, organisation and collaboration, knowledge building and communication.

The single most important measure to increase cycling is to create an improved infrastructure for cyclists. Initiatives that can contribute to increased cycling will be considered in the transport infrastructure plans drawn up for the period 2010-2021.

Boost for public transport
Public transport is an important means of fulfilling the transport policy objectives and consequently achieving sustainable growth throughout the country. For the best possible results to be attained, public transport must be adapted to the changes taking place in society.

The railways represent an increasingly important part of public transport. However, they need to be modernised to meet rapidly increasing requirements. The Swedish Government sees increased competition as an important and necessary element in the modernisation of the railway market. Competition in a market that works well can lead to rapid innovation, pressure on prices and effective use of society's resources. It is therefore important that more and competing actors enter the railway market and are given opportunities to offer consumers different transport solutions. The Government hopes that this can lead to increased rail travel, which will also benefit the climate.

The stage-by-stage process is being initiated with abolition of the sole right of SJ AB to provide passenger services on a commercial basis. The market will

then be opened for weekend and public holiday traffic on the State-administered railway network with effect from 1 July 2009. Stage three means that the whole of the Swedish railway network is opened to international passenger traffic from 1 October 2009. This will implement the EU Directive on opening the market to international passenger traffic. Finally the market for passenger traffic on the railway will be opened with effect from 1 October 2010.

To make it easier for travellers to find information on travel alternatives, those who carry out or organise transport services will be obliged to provide information on their services to a common system for information to travellers. In addition, an inquiry has recently proposed that local and regional public transport should be re-organised on the basis of a more extensive right for new operators, for example bus companies, to start up.

Green corridors

Green corridors originate in the European Commission's initiative to develop a greener transport policy that meets the climate challenge and at the same time improves the EU's competitiveness. The Swedish Government wishes to assist towards a strong boost for development in the area of transport through collaboration. EU transport policy can be developed through international partnerships that create green transport corridors to and from the Nordic Region.

A green corridor features sustainable logistic solutions with a proven reduction in environmental and climate impact, high safety, high quality and efficiency. Modes of transport interact optimally in green transport corridors.

The Logistics Forum took the initiative for the development of green corridors as a project and form of cooperation. The Logistics Forum was established by the Government in 2007 as an advisory body chaired by the Minister for Infrastructure, Åsa Torstensson. The Logistics Forum is intended as a place for the exchange of experience, views and advice between representatives of the various stakeholders in the area of logistics. It has around 25 members representing large transport buyers/goods owners, the transport industry and research in the area of logistics and transport.

Urban transport planning and policies

Sustainable transport solutions as an integrated part of sustainable urban development

The challenge of climate change stresses the need for a sustainable development of cities and urban areas. The development of cities, including the location of activities, has to be done in a way that facilitate a development and increased use of climate efficient transport alternatives. This implies *inter alia* a better co-ordination between spatial planning and the planning of the transport system.

The Swedish Government has taken several initiative to promote a sustainable urban development. The Delegation for Sustainable Cities has been appointed by the Government for the period 2008-2010. The Delegation should stimulate work for urban environments that are attractive and function well over the long term, where high quality of life goes hand in hand with a better environment, economic growth, social cohesion and reduced climate impact. The Delegation cooperates with municipalities, market actors and other parties. Work on sustainable urban development builds on integrated cross-sectoral planning, higher levels of ambition and the use of new technology. The Government has given the Delegation for Sustainable Cities the task of managing and awarding the financial support for the development of sustainable cities. SEK 340 million will be available in grant funding for 2009–2010.

Internationally, Swedish knowledge on sustainable urban development and green technology is presented through the concept SymbioCity. SymbioCity is an export platform that brings together Swedish companies with long experience of environmentally friendly construction and sustainable urban planning.

Congestion tax
To reduce congestion and improve the environment, a congestion tax was introduced in Stockholm with effect from 1 August 2007. The revenue is to be used for investments in the road network in the Stockholm region. The scheme was first introduced on a trial basis over the period 3 January - 30 July 2006 and was then evaluated. Advisory referendums on whether a congestion tax should be introduced were also held in the Stockholm region.

Congestion tax is payable for Swedish-registered cars driven into and out of central Stockholm between the hours of 6.30 am and 6.29 pm from Monday to Friday. The tax is not charged on public holidays, the day preceding public holidays or during the month of July. During periods when congestion tax is payable cars are automatically registered at what are known as pay stations. Each vehicle passage into or out of central Stockholm costs SEK 10, 15 or 20, depending on the time of day. The maximum amount payable per day per car is SEK 60.

The number of vehicle passages through the pay stations fell by around 22 per cent during the congestion tax trial period (3 January - 31 July 2006) in comparison with traffic levels in 2005, based on analyses of traffic intensity during April. Following the trial period up to the re-introduction of the congestion tax (1 August 2007) traffic did not ever return to the 2005 level but remained 6-8 per cent lower than the level prior to the trial. Over the period August-October 2007, i.e. after the re-introduction of the congestion tax, traffic levels on average were 18 per cent lower than during the corresponding period of 2005.

Some vehicles are exempt from congestion tax, including emergency vehicles, buses with a total weight of at least 14 tonnes, motorcycles and cars with diplomatic registrations. Cars that can run on electricity or renewable fuels, known as green cars, are also exempt from congestion tax. The exemption for green cars applies for a limited time up to the end of July 2012 and for cars registered before 1 January 2009. Cars registered after this date are not exempt from congestion tax. The reason why the exemption for green cars was limited in time is that congestion tax has to continue to fulfil its main purpose of reducing congestion in the future. The number of green cars in Stockholm has increased rapidly and today accounts for a large proportion of crossings through the pay stations for congestion tax.

Other measures

Ecodriving
There is significant potential to reduce carbon dioxide emissions in all modes of transport by using vehicles, ships and aircraft in a more energy-efficient way. Training in ecodriving of road vehicles can result in a lasting reduction in fuel consumption of 5-15 per cent depending on the drivers' habits prior to training and how well it is followed up. Ecodriving also offers road safety benefits as drivers learn how to plan their driving better. This is also the reason why knowledge of ecodriving is now required both in instruction and examination for all driving licence qualifications. The Government has additionally proposed that knowledge of ecodriving be introduced as a requirement in the EU Driving Licence Directive, for both instruction and examination.

Ecodriving can also be applied to rail traffic. 'Ecodriving Rail' is used, for instance, by Green Cargo, which has also produced a training package in conjunction with the Swedish National Association of Driving Schools. There is also potential in aviation for improved energy efficiency and lower carbon dioxide emissions with the existing aircraft fleet, for instance through straighter flight paths and what is known as green flying. The issue of more environmentally sound piloting of ships is also attracting increasing attention. Initiatives to reduce fuel consumption through ecodriving are being taken, for instance, by ports and shipping companies.

Speed limits on roads
The Government amended the rules in January 2008 to make it possible for decision-making authorities to apply speed limits in steps of 10 in the range of 30-120 kilometres per hour. The reason for doing so is that more speed limits make more efficient use of the road transport system possible. New speed limits can also contribute to reducing the numbers of deaths in road traffic and at the same time make a positive contribution to attaining the carbon dioxide target.

Automatic road safety control is an automatic surveillance system for monitoring speed on sections of road that present a high accident risk and on which, prior to the implementation of road safety cameras, vehicles travelled at speed. The system is being gradually expanded. At the end of 2008 there were around 980 permanent checkpoints and 25 mobile units. The average speed on monitored sections has fallen by about 5-8 per cent, which is favourable in terms of both road safety and meeting the carbon dioxide target.

Aviation

Domestic aviation in Sweden has decreased in extent in recent years. Projections point to a continued decline up to 2020. The reasons for this are largely structural. Several of the airports that have been closed down are close to lines on which high-speed trains were introduced. The Government estimates that with continued expansion of the railways air travel will continue to lose ground to more environmentally sound rail travel.

Aviation will be included in the EU's emissions trading scheme from 2012. Both flights within the EU and flights to and from the EU will be covered by emissions trading.

Emissions from international air travel are not at present included in countries' commitment under the Kyoto Protocol. The Swedish and EU objective is for greenhouse gas emissions from international aviation to be included in the international climate agreement to be adopted in Copenhagen in December 2009.

Shipping

Shipping is an energy-efficient mode of transport. Greenhouse gas emissions per unit of weight and distance are significantly lower than for road transport, for example. The Achilles heel of shipping is emissions of sulphur and nitrogen oxides, which contribute to acidification. Sweden has therefore introduced environmentally differentiated fairway dues and port dues in order to encourage the use of low-sulphur oil and cleaning equipment on ships. Sweden has also been instrumental in the IMO in bringing about tighter emissions requirements for sulphur and nitrogen oxides which were adopted in 2008.

Emissions from international maritime transport are not at present included in countries' commitments under the Kyoto Protocol. The Swedish and EU objective is for greenhouse gas emissions from international shipping to be included in the international climate agreement to be adopted in Copenhagen in December 2009.

8. Mining

Sweden today is one of the European Union's major mining countries but globally is a small mining player. At the end of 2008 there were thirteen mines operating in Sweden. Iron ore is mined at Kiirunavaara and Malmberget in Lapland, while sulphide ore and gold are extracted at other mines.

Our geological conditions offer great potential for new discoveries of mineral deposits. The law regulating mineral exploration and extraction on land is the Minerals Act. This is primarily an industrial policy instrument. Its purpose is to promote the extraction of minerals the Government and Riksdag consider to be industrially exploitable and socio-economically important and whose discovery through exploration and extraction is complicated and resource-intensive. In 1991 state subsidies for exploration were phased out. Since then the amount spent on exploration has risen.

The mineral sector is of vital importance for employment, primarily in the northernmost parts of the country. Two of the largest industrial investments in 2008 and 2009 have been in the mining sector in northern Sweden (LKAB and Boliden Mineral).

There is a cluster of companies in the exploration, mining, process engineering and environmental technology sectors that are world leaders in their field. The Swedish resource base has a long tradition of developing efficient and sustainable solutions to meet the country's metal and mineral needs.

The Swedish mining and ore processing industry has been, and still is, a demanding purchaser of equipment and services. It is also an important driver of national, regional and local economic development. This has helped Sweden to establish a unique international position in the supply of mining equipment.

The objectives and framework of mining and minerals policy

Geological information must contribute to greater knowledge and skills in the business sector and in organisations and be more extensively used for society's needs. This information must provide opportunities for business development and entrepreneurship.

Use must be made of the mineral resources, taking account of long-term sustainable development and the need to generate more job opportunities.

An effective and active system for organising permits, supervision and information must facilitate the exploration and extraction of the mineral substances covered by the Minerals Act.

The instruments available to the Government for the development of mining and minerals policy are the Geological Survey of Sweden, the Mining

Inspectorate, the Minerals Act (1991:45) and the Act on the Continental Shelf (1966:314).

Planning legislation and environmental law are also of key importance for operations and development in this sector.

The Geological Survey of Sweden

The Geological Survey of Sweden is the government authority for geology and minerals issues in Sweden. It undertakes surveys, documents and provides information on bedrock, soil and groundwater in Sweden. The overall objective of its activities is to generate sustainable economic growth and greater employment by encouraging more and growing enterprises.

One of its most important tasks is to meet society's demands for geological information. This information is used, for example, by municipalities, county administrative boards, companies and agencies as a basis for environmental work and for infrastructure planning. It is also used by Swedish and foreign exploration companies seeking new ores, and by building and construction companies.

The Geological Survey of Sweden is responsible for the national environmental quality objective of "High-quality Groundwater" and takes part in work towards the national environmental quality objective of "Good Urban Environment". It is also the authority in charge of phasing out and environmentally assuring the facilities in which the state previously stored emergency oil stocks.

The Geological Survey of Sweden is also active in basic research and applied research in geosciences and administers a research programme for industrial minerals etc. The Geological Survey of Sweden has two advisory bodies for activities in the mining and minerals sector, namely the Advisory Council for Mineral Resources and the Advisory Council for Minerals Exploration. The Geological Survey of Sweden is the governing authority of the Mining Inspectorate, which entails certain administrative tasks.

The Mining Inspectorate

The Mining Inspector is an authority for issues related to the Minerals Act. The Mining Inspector is head of the Mining Inspectorate and appointed by the Government.

The Mining Inspector's task is to assess applications and issue permits required for exploration and exploitation of mineral deposits and to supervise compliance with the law. The Mining Inspectorate also provides information to prospectors and mineral companies, landowners, the general public, county administrative boards and municipalities.

The Mineral Resources Information Office in Malå

The Geological Survey of Sweden runs the Mineral Resources Information Office in Malå (in the county of Västerbotten). The staff have good knowledge and many years' experience of exploration and prospecting. Basic geological information and an extensive drill core archive are available at the Office. Exploration reports on geology, geophysics and geochemistry are collected, stored and made available at the Mineral Resources Information Office.

Swedish Minerals Act (1991:45)

The Act is applicable to exploration and exploitation on land regardless of its ownership, of the following mineral substances (concession minerals):

1. antimony, arsenic, beryllium, lead, caesium, gold, iridium, iron occurring in the bedrock, cobalt, copper, chromium, mercury, lanthanum and lanthanides, lithium, manganese, molybdenum, nickel, niobium, osmium, palladium, platinym, rhodium, rubidium, ruthenium, silver, scandium, strontium, tantalum, tin, titanium, thorium, uranium, vanadium, bismuth, tungsten, yttrium, zink and zirconium,

2. alum shale, andalusite, apatite, brucite, flouorspar, graphite, kyanite, refractory clay or clinkering clay, magnesite, pyrrhotite, nepheline syenite, sillimanite, coal, rock salt or other salt occurring in a similar manner, pyrite, barite and wollastonite.

3. oil, gaseous hydrocarbons and diamonds.

Exploration permits

An exploration permit is granted for a specific area where there is a likelihood of a successful discovery being made. The area should be of suitable shape and size and no larger than may be assumed can be explored by the permit holder in an appropriate manner.

A permit shall not be granted, however, if it is obvious that the applicant does not have the opportunity or intention to conduct appropriate exploration or has previously been shown to be unsuitable for conducting exploration work.

An exploration permit is valid for a period of three years from the date of issue. After that, on application, it may be extended by another period of up to three years if suitable exploration has been carried out within the area. In exceptional cases, the period of validity of the permit may be further extended but for no more than a total of four years, and in extreme cases by a further maximum of five years. This means that the longest possible validity period for any one permit is 15 years if it is proven that extended exploration work has been carried out.

Exploration and exploitation cannot be carried out in national parks. Such activities are also seldom permitted in certain other areas, for example within

200 m of any inhabited building and within certain areas in the Swedish mountains.

Before the beginning of any exploration work that can have a significant impact on the natural environment, notice of consultation has to be made to the County administrative Board in accordance with the provisions of the Environmental Code.
Before exploration work begins, the permit holder must establish a working plan. The plan has to contain a description of the work intended, a timetable and an assessment of the impact on private rights and public interests.

The explorer has to provide security for the compensation of damage and encroachment from exploration work. Before any work can start the sum of security has to be guaranteed.

When an exploration permit is terminated without the granting of an exploitation concession within the exploration area, the permit holder – if he is carrying on exploration work professionally – within three months at the latest has to provide a report of exploration performed to the Swedish Geological Survey.

Exploitation concession

A concession is valid for a definite area, decided on the basis of the extent of the deposit, the purpose of the concession and other circumstances. A concession has to be granted if a mineral deposit has been found which can probably be exploited economically.

The Environmental Code is applicable in matters concerning the granting of a concession, which means, among other things, that an Environmental Impact Assessment has to be contained in an application.

An exploitation concession is granted for a period of 25 years unless the applicant requests a shorter period of time. The concession period is extended by ten years at a time without application if regular exploration is in progress when the period of validity expires. When mining, the holder of an exploitation concession must pay an annual minerals fee to the landowners of the concession area and the state. The fee is 2 parts per thousand (i.e 0.2%) of the average value of the concessions minerals mined, 1.5 part per thousand of which is paid to the landowners to be distributed among them in proportion to their share of the concession area. The remaining 0.5 parts per thousand (0.05%) is paid to the state to be used for research and development in the field of sustainable development of mineral resources.

Continental Shelf Act (1966:314)

In this Act “the continental shelf” means the seabed and its subsoil within public waters and within such an area of the sea outside Sweden’s territorial

limit as the Government may determine in accordance with the Convention on the Continental Shelf, signed in Geneva on 29 April 1958.

"Natural resources of the continental shelf" refers in this Act to the mineral and other nonliving natural resources of the seabed and the subsoil, together with living organisms which, at the harvestable stage, either are immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil.

The right to explore the continental shelf and exploit its natural resources belongs to the State. The Government or such authority as the Government may determine may grant a permit to a person other than the State to explore the continental shelf by means of geophysical measurements, drilling or in any other way and to exploit its natural resources.

Exploration of the continental shelf and exploitation of its natural resources is subject to the provisions of Chapter 2 of the Environmental Code, even when such activities are undertaken outside territorial limits.

Other legislation

Regulations for compliance and monitoring public/stakeholder consultations and participation in decision making related to mining as well as rehabilitation and mine closure planning are incorporated into the Mining Act and in other legislation. Among the acts with provisions affecting the activities referred to in the Minerals Act are:

- Environmental Code
- Planning and Building Act
- Act concerning the Cultural Heritage Management

The rights of the populations of Sami settlements and the Sami as owners and citizens are safeguarded in various ways in Swedish legislation. The rights of the populations of Sami settlements as owners are recognised in the Minerals Act. The populations of Sami settlements being given an opportunity to play an active part in consultation processes is of great significance in enabling reindeer husbandry and mining to work together with respect for each other's circumstances.

Swedish Environmental Code

The Environmental Code is applicable to all citizens and economic operators undertaking operations or measures that conflict with the objectives of the Code. The rules of the Code apply to all whose activities are potentially detrimental to human health or the environment, damage the natural or cultural environment or deplete biological diversity. The rules apply to all kinds of impacts on the natural environment, whether large or small.

They also apply to the housing environment and the built environment and to all other places to which the public has access. All operations that give rise to

emissions to land, water or air are deemed environmentally hazardous and must therefore comply with the rules.

The provisions of the Environmental Code apply to operations and measures that affect the environment and human health even where these are covered by other legislation. Its rules and the provisions of other legislation are thus applicable in parallel.

The purpose of the provisions concerning land management is to specify important areas of interest to community development that are to be given priority when decisions are made concerning land use. The interests referred to in the provisions are to be protected as far as possible from such changes in land use as would be detrimental to them.

The provisions concerning land management take into account both conservation interests and utilisation interests. In specific areas, these conservation and utilisation interests may be designated national interest by the government, which means that they enjoy even stronger protection against modification.

The provisions on national interests apply mostly to very large areas. They are therefore not intended to prevent the development of urban areas and local industry or total defence installations or the extraction of certain substances and materials.

Environmental Impact Assessment
An environmental impact assessment must be prepared by an operator before a permit application related to environmentally-hazardous activity is submitted and must be attached to the application. The cost of preparing such statements is borne by the operator. Together with a regulated consultation process, the assessment should provide the best possible decision guidance data from the point of view of the environment and health.

The purpose of the environmental impact statement process is to detect knowledge gaps and increase understanding of the environmental, health and natural resource issues involved in the project. Environmental impact statements are required under other legislation, such as the Minerals Act.

Fiscal policies
The Swedish tax structure is transparent and efficient and designed to meet the needs of international investors. Corporate income tax is low by international standards and effective rates can be even lower as companies have the option of making deductible annual appropriations to a tax allocation reserve of up to 25 percent of their profit. As of 1 January 2009 the corporate tax rate is 26.3 percent.

Best practices

Systematic environmental work and increased skills in companies, partly in response to legal requirements and financial policy levers, have helped reduce emissions and energy use within the mining and metals industies. The challenge now is to sustain development activities so as to meet the Swedish environmental quality objectives while also reaching targets for growth, greater competitiveness and increased employment. In other words, the three dimensions of the concept of sustainable development – economic, social and ecological – must be taken into account concurrently. Predictable and long-term rules are crucial for continued development.

All aspects of sustainability must be seen in the light of the fact that the mining industry, unlike most others, can only operate where there are suitable mineral deposits. These are deposits that can be extracted in an economically, legally, technically and environmentally acceptable way.

Mining operations impact the environment. Mines, quarries and gravel pits leave scars on nature; residual rock must often be land-filled. Gradual improvements are being made in Sweden and abroad. Abandoned mines and quarries are now being treated in a way that will allow new uses.

Sustainable development is also about reducing the need to mine or quarry new deposits. The principle is not to discard products unnecessarily when they can still be used. When a product is finally disposed of, this must be done in such a way as to allow the material in the product to be recycled.

Research and Development

Research and development is essential for a sustainable mining industry – as for all other industrial operations. It is important to assure sufficient and continuous support for targeted basic research and for more applied research conducted in collaboration with trade and industry. This applies to the entire production chain – from finding new reserves to extraction, production and site remediation.

Applied research in the geosciences is conducted in Sweden at the universities, principally at Gothenburg, Lund, Stockholm, Luleå and Uppsala. In addition, long-standing collaboration takes place between universities, private enterprise, trade associations and public agencies in the form of various innovation centres, sectoral research programmes etc. In addition, the Geological Survey of Sweden awards grants each year for targeted basic research and applied research in the geosciences. In the last few years a proposal concerning a considerable increase in grants has been made, including those for ore geological research. In the minerals sector, a Mining Research Programme is currently in progress (2006-2010) as well as a programme for the industrial minerals, aggregates and dimension stone industries (MinBaS II, 2007-2011), for which the Swedish State is contributing half the funding, provided that the industry contributes at least the same amount.

Priority areas for research include developing multi-dimensional geological models to improve our knowledge of deep-lying ores, thereby increasing available ore reserves. A demand for minerals and metals that were previously of no economic interest increases the need for more detailed knowledge of all types of mineral deposits and greater understanding of the various ore-forming processes. Advanced and deepened knowledge of bedrock geology and refined geophysical monitoring methods can provide greater understanding of the structure and properties of the bedrock and also create new opportunities to locate deposits in areas other than the known ore regions. Greater understanding of rock properties and characteristics is also important as mining depths become ever greater and bring with them a growing importance of worker safety issues as well as technical challenges.

Many complex deposits might be minable if the various constituent metals could be separated out by leaching. This is also of interest from an environmental viewpoint, since unwanted metals can then be removed from the process and isolated as early as the ore dressing phase. The production systems for mining and beneficiation can also be improved by lower energy consumption, better yields and minimised environmental impact. For instance, improved rock disintegration can cut costs and reduce incorporation of rock waste, raise ore yields, improve product quality and reduce spillage. Since metals are not really consumed, there is great potential for recycling. Even today, 40 percent of new steel produced comes from scrap, and there is scope for further recycling of most metals.

Improved infrastructure

An important – often decisive – difference between mining and other industrial operations concerns the scope for location of operations. Normally, an industrial plant can be sited close to existing infrastructure such as roads, railways and ports or energy supply systems. Proximity to customers and sub-contractors and the availability of skilled labour also influence the location chosen.

However, for obvious reasons mining must always be located where the mineral deposits are. Access to strategic infrastructure is therefore often a factor deciding whether or not a given mining operation will be profitable and sustainable.

Global development cooperation

Associated with the Swedish mining and steel industry is a cluster of companies engaged in exploration, extraction, process engineering and environmental technology that are world leaders in their respective fields. Thanks to Sweden's position as a mining nation, with efficient public administration and effective regulation in the field of minernals, it can make a real difference to the efforts of developing countries possessing rich mineral resources to build capacity to achieve fair and sustainable development. This

will help to reduce poverty and stabilise markets. The Swedish Geological Survey, together with the Swedish Development Cooperation Agency (SIDA), has recently started a project "Meeting Point Mining" for development cooperation with mining countries such as South Africa, Botswana and Namibia.

An example of work on sustainable development in the mining industry

LKAB is a world-class mining company, which has two iron ore mines, more than 1000 metres deep in the north of Sweden. It is a world-leading producer of upgraded iron ore products, mainly pellets used in steel manufacturing.

LKAB is increasing its production of iron ore and pellets by investing in new enrichment plants and new head levels in both its mines in Kiruna and Malmberget.

The investments are being made in two small communities, Kiruna and Gällivare/Malmberget. In addition, LKAB's mining method (sub-level caving) has such an impact on the ground that parts of both the towns of Kiruna and Malmberg gradually need to be moved.

This is a long-term process that makes great demands on the mining company, on the municipalities and the county administrative board in Norrbotten and above all on the people affected by the impact of the mining operation.

The Government is following developments closely through Malmfältsgruppen (the 'Orefield Group') under the Minister of Enterprise, Employment and Communications – a high-level forum for dialogue on overarching issues that affect the growth of the mining industry in the two localities. In addition the Government has set up a working group containing officials from various affected ministries. The Group's task is to coordinate the cooperation for effective administration of cases that relate to the planned changes in Kiruna and Gällivare/Malmberget.

The international conference City Move Interdesign was recently held in Gällivare/Malmberget so that 38 participants from 18 countries over a period of two weeks could find specific solutions using modern design methods for a positive, secure and flexible social conversion with the involvement of the population. Special emphasis was put on environmentally sustainable and effective system solutions.

City Move Interdesign recommended that the following procedure be followed when a town has to be moved:

- Involve the population
- Create a realisable vision based on humanistic, social, sustainable, economic and architectural principles
- Draw up a timetable and follow it

- Inform too much rather than too little
- Be prepared to argue, including with opponents
- Highlight positive and hopeful aspects
- Involve the young

This is an example of a way of dealing with an unusual problem with great global relevance. The result can provide a good basis for real and humanistic comprehensive solutions for the sustainable cities of the future.