

Proposed
Swedish climate strategy



Content

| | |
|---|-----------|
| Introduction..... | 1 |
| Summary..... | 3 |
| Proposed Swedish climate strategy | 4 |
| Measures, policy instruments and tasks in the action programme | 6 |
| Effects of a changed climate | 9 |
| Emissions of greenhouse gases in Sweden..... | 9 |
| International efforts to solve the climate problem..... | 10 |
| Objectives, instruments, duties and organization..... | 11 |
| Basic scenarios for Sweden in 2010 | 13 |
| Carbon dioxide tax and emissions trading..... | 13 |
| 2 Proposed Swedish climate strategy..... | 17 |
| 2.1 Central areas for the strategy..... | 17 |
| 2.2 Proposed short- and long-term national objectives | 18 |
| 2.3 Considerations..... | 23 |
| 2.3.1 International collaboration and ratification of the Kyoto Protocol..... | 23 |
| 2.3.2 Long time horizon..... | 25 |
| 2.3.3 Bearing on other policy areas..... | 27 |
| 2.4 Timing of the initiatives | 29 |
| 2.5 Choice of measures and instruments..... | 30 |
| 2.6 Action programme..... | 32 |
| 2.6.1 Central issues in the joint international work..... | 33 |
| 2.6.2 Central measures in the base package | 33 |
| 2.6.3 Central measures in the supplementary package..... | 35 |
| 2.7 Timetable for implementation | 36 |
| 2.8 Implementation and responsibilities | 37 |
| 2.9 State expenditures and financing..... | 39 |
| 2.9.1 Proposed expenditures..... | 39 |
| 2.9.2 Financing options..... | 40 |
| Appendix 1 Compilation of all measures and proposals in the base package | 43 |
| Appendix 2 Compilation of costs and effects of measures..... | 49 |

Introduction

The following parts of the results of the climate committee are translated to English:

- Summary.
- Chapter 2, a description of the strategy as a whole.
- Appendix 1, a compilation of all measures and proposals in the base package.
- Appendix 2, a compilation of the costs and effects of measures.

The committee's proposals will be circulated among Swedish agencies, municipalities and organizations. The Government plans to present a Bill, and they can change our proposals, to the Swedish Parliament, Riksdagen, probably during the autumn of 2000.

Summary

The quantity of greenhouse gases in the atmosphere has increased sharply in the past century, contributing towards an increase in the mean temperature on the earth and other climate-related changes.

The threat of climate change is one of the most complex problems facing mankind. The process of climate change is global, long-term and takes place with considerable inertia.

Today's emissions contribute towards further increasing concentrations of greenhouse gases in the atmosphere, worsening the situation. The higher the concentrations become, the longer time will be required to get them back to a less risky level.

Sweden has ratified the 1992 UN Framework Convention on Climate Change. The ultimate objective of the Convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The developed countries are also charged to adopt measures to prevent climatic impact.

A protocol linked to the Convention was drawn up in Kyoto in 1997. In brief, the Kyoto Protocol provides that the developed countries shall reduce their greenhouse gas emissions by approximately 5 % by 2010, compared with 1990 levels. Quantitative emission restrictions have not been imposed on the developing countries.

Carbon dioxide is one of the six greenhouse gases dealt with in the protocol. Carbon dioxide is a gas that is formed by combustion of fossil fuels in particular. More than 75 % of the world's energy production is based on fossil fuels, and most vehicles are powered by fossil fuel. Other gases included in the Kyoto Protocol are methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. These other gases account together for 25 % of the greenhouse gas emissions in the world.

Proposed Swedish climate strategy

Sweden's proposed climate strategy comprises objectives and an action programme for achieving them. The action programme includes measures, policy instruments and planning as well as organisational proposals for implementation. The strategy relates to the period up to 2050. The action programme covers the period up to 2010. The strategy and the action programme should be evaluated, revised and extended at specified times.

The following long-term objective is proposed:

A decrease in emissions of greenhouse gases in Sweden of approximately 50 per cent on 1990 levels by 2050, with further reductions thereafter. Emissions in 2050 may not exceed 4.0–4.5 tonnes per year per capita, measured in carbon dioxide equivalent.

This means that current targets for *Limited climatic impact* remain in place. These have been established on the basis of joint statements by the EU's environmental ministers. However, the picture has been somewhat altered by the inclusion of all gases. The goal for 2050 should be to achieve stabilisation of the six greenhouse gases specified in the Kyoto Protocol at about 550 ppm of carbon dioxide equivalent. Sweden should seek to promote this target at international level.

The 2050 objective is based on the need to achieve a radical decrease in atmospheric emissions of greenhouse gases in developed countries by 2100.

The following short-term objective is proposed for 2008–2012:

Emissions of greenhouse gases for Sweden shall, as a mean value for the period 2008 to 2012, be 2 % lower than emissions in 1990, counted as tonnes of carbon dioxide equivalent.

The objectives includes the six greenhouse gases according to the definitions of the Kyoto Protocol and the IPCC. Measures adopted beyond the country's boundaries shall be supplemental. Considerable emission reductions shall take place within the country's boundaries.

The following interim objective is proposed for 2005:

Emissions of greenhouse gases in Sweden, in tonnes of carbon dioxide equivalent, shall remain at 1990 levels, with further reductions thereafter. This target covers the six greenhouse gases as defined in the Kyoto Protocol and the IPCC.

The strategy

The strategy is based on two primary considerations: the need for international collaboration and the need for a long-term approach combined with integration with other policy areas.

Global climate change can only be addressed by a coordinated global strategy in which developed countries, which have been and continue to be responsible for a large proportion of all emissions, reduce their emissions substantially. International collaboration is therefore essential, and Sweden must take an active part in international efforts.

A strategy with a long-term perspective must allow flexibility, take account of the need to distribute burdens equitably among countries and generations, and prioritise measures aimed at infrastructural change. Changes must be predicated on the capacity of the democratic system to deal with them and on the prospects of effecting the necessary transformations in practice.

That said, we must ensure that no time is lost in commencing this transformation. This will require immediate steps. The consequences of climate change will affect future generations most of all. The Committee believes that the pace of transition to a climatically sustainable society must be stepped up. It is essential that developed countries set a good example so that developing countries will in turn be disposed to accept future requirements on emission reductions. It is thus of the utmost importance to avoid delay in implementing emission abatement measures.

As implementation of Sweden's strategy proposals will affect the whole of society, it will also be necessary to consider the implications for other policy areas. The Committee believes that climate-related considerations should be an inherent component of all proposals drawn up in other policy areas affected by implementation of climate policy.

The Committee proposes that educational, administrative and economic instruments should be used to achieve the proposed goals. The action programme includes both short- and long-term measures for achieving them. The proposals also include procedures for follow-up and evaluation as well as dates for upcoming climate policy decisions. The dates proposed are 2004 and 2008.

The Committee's proposals are aimed at involving all of society in the implementation of climate policy. The proposals are predicated on the implementation of information initiatives aimed at communicating policy objectives to the public, and on the adoption of measures in all sectors of society to reduce greenhouse gas emissions. Increased knowledge and awareness are vital in enlisting the support and participation of the public in facilitating the necessary changes.

The Committee proposes that coordination within the Swedish Government Offices be strengthened and that a special Climate Council be established at government agency level. Further efforts at regional and local level should be supported by state subsidies and climate policy programmes to ensure that implementation is based on local conditions.

It is the opinion of the Committee that ratification of the Kyoto Protocol would be facilitated by further clarification of certain parts of the Protocol. This applies particularly to flexible mechanisms, sinks, the gases (sulphur hexafluoride, perfluorocarbons and hydrofluorocarbons) and the provisions relating to follow-up and sanctions. If the ratification process is to commence without delay Sweden should work actively to bring about the necessary clarification when the parties to the climate convention meet for negotiations.

In summary, the proposed strategy represents the first steps towards broad implementation in Sweden. Its aim is to ensure that Sweden assumes its share of the responsibility – internationally, by participating and contributing experience gained from our endeavours, and nationally, by adopting measures to reduce emissions of greenhouse gases.

Measures, policy instruments and tasks in the action programme

Measures within various sectors of society are included in the Committee's proposed action programme. Altogether, more than 100 measures are proposed in a "base package". These measures and proposals are presented in Appendix 1. Those measures whose costs and emissions reductions have been possible to quantify are presented in Appendix 2.

The proposals cover both what action Sweden should take internationally, and what measures should be adopted within the country. The proposals aim at reducing emissions of greenhouse gases and improving energy efficiency in a large number of areas.

The proposed measures have been divided into different packages: base and supplementary packages. The base package contains both measures aimed at achieving emissions reductions within a couple of

years, and measures that lead to positive effects in the long term. It also includes proposals for research aimed at obtaining more information as a basis for deciding on further measures. The measures in the base package can be approved immediately. Financing of the measures is proposed through 2004.

The supplementary package contains measures and instruments aimed at bringing about further emissions reductions, but requiring more information before a decision can be made. Examples are measures that are dependent on the outcome of international negotiations, such as use of the Kyoto Protocol's flexible mechanisms and taking sinks into account. The supplementary package contains proposals for different measures that can be chosen later as regards both scope and combination of these measures.

Many of the measures which we proposed also lead to positive effects for other environmental objectives. In certain cases, however, there is a risk that conflicts may arise with other environmental objectives. In such cases it is urgent that the measures be implemented in such a manner that any adverse environmental impact is minimized.

Information associated with demonstration projects and investment grants are important parts of the proposed measures. A reservation for the suggested subsidies and grants is that they must be approved by the European Commission, taking into account the EU's government aid rules.

Certain proposals call for tighter controls. These are mainly aimed at the residential, industrial and commercial sector. The controls call for measures aimed at a long-term adaptation, such as lower energy consumption in buildings and phase-out of the three industrial gases.

Estimates by the National Energy Administration indicate that the proposed measures could lead to a reduction of emissions by about 2.4 million tonnes of carbon dioxide equivalent, compared with the emissions picture in 2010 without these proposed measures. The measures are also estimated to contribute to a reduction in electricity consumption by in the order of 3–7 TWh. The proposal also calls for greater investments in wind power to produce 3–5 TWh in 2010, in addition to present-day programmes. Furthermore, a number of measures and research initiatives are proposed which could probably lead to considerable emissions reductions, although it is impossible to specify by exactly how much at this time.

It is estimated that the base package will lead to additional state expenditures between now and 2004 of SEK 1.2–1.6 billion per annum. Altogether, it is estimated that expenditures for the base package up to 2010 will amount to approximately SEK 11 billion. State expenditures for the wind power programme are included, but complete data are

lacking, and expenditures after 2005 may be higher. Alternative proposals are being submitted for financing of the state's increased expenditures for the period up to and including 2004.

The outcomes of the quantified measures in the base package are shown in Table 1.

Table 1 Outcome of quantified measures in base package

| Basic scenario, 2010 | STEM | KI |
|---|------|---------|
| <i>Without measures</i> | | |
| Mt carbon dioxide equivalent | 74.6 | 81.6 |
| Change compared with 1990, % | +5 | +15 |
| Net imports of electricity in 2010, TWh | 5.2 | no data |
| <i>With measures in base package</i> | | |
| Mt carbon dioxide equivalent | 72.2 | <79.2 |
| Change compared with 1990, % | +1.5 | <+13 |
| Net imports of electricity in 2010, TWh | <0 | no data |

Besides the quantified measures, additional measures are needed to reduce emissions by between approximately 3 and 10 million tonnes of carbon dioxide equivalent in order for the emissions level in 2010 to be 2 % lower than in 1990.

Among the measures included in our proposals, and for which data are lacking to calculate the emissions reduction, are information initiatives, aid to the local climate programmes, addenda to the Environmental Code, policy instruments which will eventually lead to a phase-out of the three industrial gases, transfer of goods from road to rail by intermodal subsidy, public procurement, social planning, energy plans, etc. Nor do the estimates of emissions reductions include the measures in the supplementary package, such as emissions trading, changes in the energy and carbon dioxide tax, flexible mechanisms and sinks.

Effects of a changed climate

The earth's mean temperature has increased by an average of 0.3–0.4°C during the past half century, and there is much to indicate that this is the fastest warming of the earth to occur since the last ice age. Today there is widespread agreement in the scientific community that the ongoing process of climate change is largely due to human impact. Simulations of the climate of the future show that if nothing is done to check this trend, the earth's mean temperature will increase by an additional 1–3.5°C by 2100.

In all likelihood, this change will lead to serious social, economic and ecological consequences. Even if atmospheric emissions of greenhouse gases are stabilized at the current level, the concentrations in the atmosphere will increase for several hundred years due to the gases' long residence time in the atmosphere.

Climate change will not leave any part of the world unaffected, but certain regions will be impacted harder than others by the direct effects. Analyses indicate that the ongoing climate change will not have as serious consequences for Sweden as for certain other parts of the world. However, the climate scenarios contain great uncertainties, and the risk of unforeseen courses of events leading to serious consequences, even for Sweden, cannot be ruled out.

Emissions of greenhouse gases in Sweden

Emissions of greenhouse gases in Sweden, according to the definitions of the Climate Convention, amounted to 70.8 million tonnes of carbon dioxide equivalent in 1990. Emissions in 1998 were 75.1 million tonnes. Aggregate greenhouse gas emissions thereby increased by approximately 6 % during this period. Carbon dioxide emissions increased by about 3 % during the 1990s. Methane emissions have decreased and nitrous oxide emissions are unchanged, while emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride are believed to have increased during the same period.

Carbon dioxide emissions comprise approximately 80 % of total emissions of greenhouse in Sweden, counted as carbon dioxide equivalent. Carbon dioxide emissions from the energy sector declined by approximately 40 % between 1970 and 1998.

The biggest sources of methane emissions are agriculture, primarily enteric fermentation from ruminant cattle, and waste landfills. Combustion also gives rise to methane. Methane emissions comprise approximately 8 % of total greenhouse gas emissions in Sweden, measured as carbon dioxide equivalent.

Nitrous oxide is emitted from agricultural land and manure, and is formed in various combustion processes and the manufacture of commercial fertilizer. Nitrous oxide is also formed in catalytic converters used to reduce automotive emissions. Nitrous oxide emissions comprise approximately 10 % of total greenhouse gas emissions in Sweden, measured as carbon dioxide equivalent.

The three other gases – hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride – comprise a smaller, but growing, portion of the total emissions. Work is under way to devise methods for estimating the

emissions of these gases, but the estimates that have been made indicate a relatively sharp increase in the emissions of these gases.

The table below shows emissions of the six greenhouse gas in 1990 and 1998, according to emissions source.

Table 2 Greenhouse gas emissions in Sweden in 1990 and 1998, million tonnes of carbon dioxide equivalent

| Sector | 1990 | 1998 |
|--|-------------|--------------------------|
| Energy and transformation industries, refineries | 9.1 | 10.1 |
| Fuel combustion industries | 13.9 | 13.4 |
| Industrial processes | 6.0 | 9.4 |
| Transport | 20.0 | 22.1 |
| Fuel combustion, residential, commercial and institutional | 11.1 | 10.2 |
| Agriculture | 8.6 | 8.3 |
| Waste disposal | 1.8 | 1.3 |
| Miscellaneous | 0.3 | 0.3 |
| Total | 70.8 | 75.1¹⁾ |

¹⁾ revised to 74.8 million tonnes in report to Climate Convention, NV, 2000b

Source: Swedish Environmental Protection Agency, 1999

International efforts to solve the climate problem

The climate problem is global in scope. International efforts will be crucial to a great extent in determining how Sweden can and ought to act.

An important judgement question in the international work is how Sweden should act with regard to flexible mechanisms and in the matter of how sinks are to be taken into account. Flexible mechanisms include e.g. measures adopted in foreign countries for whose emissions reductions credit can be taken, and trading in emission rights. Sinks absorb carbon dioxide in soil and forest. Flexible mechanisms and sinks are options offered by the Climate Convention and the Kyoto Protocol to individual countries for the purpose of bringing about emissions reductions at reasonable costs. It is important that the coming international negotiations clarify rules and treatment of sinks and flexible mechanisms.

The Committee believes that Sweden should advocate a minimum level of energy taxes and carbon dioxide tax in the EU. The Committee deems it essential that decisions on environmental taxes in the EU be made with a qualified majority.

The Committee proposes a coherent action programme for how Sweden should proceed in the complicated international issues.

Objectives, instruments, duties and organization

Current objectives call for a stabilization of carbon dioxide emissions from fossil fuels at the 1990 level in 2000, followed by a reduction, in accordance with the Climate Convention. Beyond this there are objectives calling for emissions reductions of the other greenhouse gases defined in the Kyoto Protocol. There are objectives in national transport policy that largely coincide with the national carbon dioxide target. The objective for the transport sector extends to 2010, which is a difference compared with the national objective. Objective formulation in the energy sector has a qualitative orientation, which includes energy production with low climatic impact.

The Committee is of the opinion that the work of reducing greenhouse gas emissions is in a build-up phase within a number of societal sectors. The Committee submits a number of proposals aimed at improving the underlying database.

The Committee proposes a more detailed definition of the duties and responsibilities of government agencies, as well as procedures for follow-up and evaluation. These duties are to collect data annually within the different spheres of responsibility and evaluate the options for achieving emissions reductions within each sector so that the national objectives can be achieved and the international commitments can be met. Based on the options open to each agency, measures shall be adopted and followed up and results reported.

The policy instruments at the disposal of the state can be divided into three categories: administrative instruments (i.e. regulations, directives and prohibitions), economic instruments and informative instruments (for example research and development, and information).

These instruments have also been used in the area of climate policy. The application of economic instruments has helped to limit carbon dioxide emissions. At the same time, levies of taxes and various types of subsidies have varied widely over time. Research and development initiatives are of a long-term character, and it is difficult at the present time to estimate the effects of efforts to date.

A reorientation of all sectors of society towards a reduced usage of fossil fuels could entail considerable changes for both private citizens and business enterprises. Consequently, the policy instruments used should be long-term and relatively stable over time so that credibility can be created for the climate policy. The Committee considers it is

essential to make use of all the aforementioned instruments to achieve a reduction in greenhouse gas emissions.

Strictly from the viewpoint of resource conservation, the choice of policy instruments is simple: correctly designed, general economic instruments are the most effective.

Different political objectives must be weighed against each other in both the short and long term. Economic instruments will continue to be important. The Committee has concluded that a variety of climate policy instruments will have to be used to achieve the objectives.

The Committee considers it urgent to try information activities as a means of encouraging involvement at all levels of society. It is essential that both private citizens and companies be informed on how their use of fossil fuels can be reduced. Information is also essential in the dialogue between legislators and citizens.

Information activities should therefore be carried out at all levels and in collaboration with e.g. adult education and trade organizations. The purpose is to raise the level of knowledge and awareness so that people will understand the importance of carrying out the necessary measures and changes.

Administrative instruments aimed, for example, at defining duties and responsibilities for the implementation of the climate policy are essential tools for state control of e.g. government agencies. The duties of government agencies in conjunction with the implementation of climate policy should therefore be stipulated in instructions and appropriations letters for the agencies that are particularly important in this context. Furthermore, administrative instruments are essential in the review of applications for, and issuance of, permits for various types of activities.

The administrative structure for climate policy embraces many sectors of society, and responsibility for implementing measures is distributed among many hands. A strong coordination of climate policy on the central level is needed to achieve the objectives: a reduction of greenhouse gas emissions.

The Committee is of the opinion that the regions must decide for themselves whether regional objectives are useful to promote regional and local initiatives.

The Committee believes it is particularly important that the climate issue be given the proper attention at all levels of society if both short- and long-term objectives are to be achieved. The state should, to a greater extent, support local projects aimed at reducing greenhouse gas emissions and/or increasing efficiency in energy usage. It is also important that the general public, companies and organizations collaborate in these efforts. The Committee proposes financial support to local climate programmes (KLIMP) be devised for the purpose of

identifying and implementing cost-effective measures to reduce greenhouse gas emissions and energy use.

Basic scenarios for Sweden in 2010

The National Energy Administration and the National Institute of Economic Research have made projections, called basic scenarios, for 2010 as regards emissions and energy use. The basic scenarios are based on parliamentary decisions and projections of the consequences of these decisions. The scenarios should be regarded as possible courses of development based on assumed premises.

If we do not adopt additional measures compared with today, the basic scenarios show that greenhouse gas emissions in Sweden will increase by 2010 compared with 1990.

Emissions in 2010 are estimated to amount to between 75 and 82 million tonnes of carbon dioxide equivalent, depending on premises and analysis methods. This represents an increase ranging from 5 to 15 % compared with 1990, when greenhouse gas emissions were 71 million tonnes of carbon dioxide equivalent.

If Sweden is to reduce its greenhouse gas emissions in 2010 by 2 % compared with 1990, measures are required that lead to emissions that are between 5 and 12 million tonnes less than in the basic scenarios.

Carbon dioxide tax and emissions trading

A tax on carbon dioxide emissions, or a system of trading in emission rights, are ways of providing an incentive for reduction of carbon dioxide emissions. These economic instruments are considered to be cost-effective ways of achieving emissions reductions.

The effects of raising the carbon dioxide tax have been analyzed using the basic scenarios. According to the analyses, an increase in the carbon dioxide tax from the current level of SEK 0.37 per kg of carbon dioxide to between SEK 1.10 and 1.25 would be needed to achieve an emissions reduction of 2 % between 1990 and 2010. If other instruments are also used to reduce emissions, a lower tax level will probably be sufficient to achieve the objective.

A unilateral Swedish increase of the carbon dioxide tax leads to lower GDP growth. The analysis provides some support for the supposition the Swedish cost picture would be improved if vigorous measures were adopted internationally to comply with the Kyoto Protocol.

An increased carbon dioxide tax also has effects on the restructuring of the economy so that non-energy-intensive industry expands at the expense of energy-intensive industry. The analysis shows that the effect on the total costs of industry is relatively small, whereas the cost increase may be substantial within certain sectors. International measures may result in a less extreme restructuring of Swedish industry.

Households are affected by a increase of the carbon dioxide tax in the form of changes in consumption and real income. Since one purpose of environmental policy is to achieve higher environmental quality, changes in human behaviour are more or less necessary. The analysis shows that the increased tax burden, considered in relation to income or expenditures, is greater for low-income households. The increase in absolute costs (actual money terms) for high-income households is greater, however. Further, the analysis shows that the costs increase with size of household.

A sharp increase in the carbon dioxide tax may have considerable regional and local effects. The analysis shows that the direct effect on households is greatest in northern Sweden and in rural areas. Moreover, the most fuel-dependent industries are located in these regions.

An review of the energy tax system is being conducted within the Government Offices. The Committee's general viewpoint is that the energy tax system should be pollution-controlling, particularly from a climate viewpoint.

There is much evidence to suggest that carbon dioxide emissions increase with economic growth. The Committee therefore believes that the carbon dioxide tax ought to be index-linked to GDP growth.

So-called tradable emission rights can be said to be a combination between a quantitative regulation, in the form of a "ceiling" on total emissions, and an economic instrument. The cost of emissions reductions, in terms of reduced GDP growth, are lower in the case of a national system of emissions trading compared with the current carbon dioxide tax system. A system with international trading in emission rights leads to further efficiency gains, which shows the potential of emissions trading.

The structural effects that can arise in a national system of emissions trading differ fundamentally from the effects that arise as a consequence of a tax.

With international emissions trading, emissions in Sweden may increase, since the reduction may in part occur elsewhere. This may have an adverse effect on other environmental objectives.

Owing to the global nature of the climate problem, the Committee believes that a system of emissions trading where as many countries as

possible take part is a good long-range strategy to address the problem. In a shorter perspective, the aim should be to take part in an EU system or European system of emissions trading. A special technical committee should be appointed to provide proposals for the design of an emissions trading system, where the option of a national system should also be examined if the European system takes too long to implement.

2 Proposed Swedish climate strategy

2.1 Central areas for the strategy

The climate strategy stipulates objectives and an action programme for achieving them. The action programme includes measures, policy instruments, organization and a timetable for implementation of the strategy. The strategy relates to the period up to 2050, while the action programme covers the period up to 2010. To take changed premises into account, the strategy and the action programme should be evaluated, revised and extended at specified times.

We are the first committee to have studied measures for several sectors of society and several greenhouse gases. In our judgement, the work we have initiated is just the beginning of what needs to be done and the great changes that will be necessary. We see before us a long series of committees that will have to elaborate and progressively develop the objectives, the strategy and the action programme.

The purpose of this report is to lay a foundation for a long-range climate policy with both short- and long-term objectives. Measures and instruments within a number of areas are proposed to achieve the objectives. This chapter deals with the considerations and proposals that comprise the foundation of the strategy.

2.2 Proposed short- and long-term national objectives

The Committee's proposals for objectives

Long-term objective for 2050

Emissions of greenhouse gases in Sweden in 2050 should decrease by approximately 50 % compared to emissions in 1990, with further reductions thereafter. Emissions in 2050 may not exceed 4.0–4.5 tonnes per year per capita, measured as carbon dioxide equivalent.

The current environmental quality objective, "*Limited climatic impact*", remains in place, but the implications are changed by the inclusion of all gases. The concentration of the six greenhouse gases specified in the Kyoto Protocol should be stabilized at about 550 ppm of carbon dioxide equivalent. Sweden should seek to promote this target in international contexts.

Short-term objective for the period 2008–2012

Emissions of greenhouse gases in Sweden shall, as a mean value for the period 2008 to 2012, be 2 % lower than emissions in 1990, counted as tonnes of carbon dioxide equivalent. This target includes the six greenhouse gases according to the definitions of the Kyoto Protocol and the IPCC. Measures adopted beyond the country's boundaries shall be supplementary. Considerable emissions reductions shall take place within the country's boundaries.

Interim objective for 2005

Emissions of greenhouse gases in Sweden shall be unchanged compared with the 1990 level, measured as carbon dioxide equivalent, with further reductions thereafter. Emissions in 2005 shall be normal-year-corrected according to Swedish methodology. This target covers the six greenhouse gases as defined in the Kyoto Protocol and the IPCC.

Short- and long-term objectives

The Committee wishes to emphasize that the proposed objectives may be subject to reconsideration. They may need to be revised in view of new knowledge as regards both the climate problem as more specific data is gathered and the feasibility for society of making the necessary changes to avoid the threatening consequences of the greenhouse effect. The outcome of international negotiations and of measures in other countries are of central importance in the revision of both objectives and the measures needed to achieve the objectives.

Long-term objective for 2050

The current trend of largely unchanged increases in greenhouse gas emissions must be reversed during the next 50 years and the emissions reduced, so that a stabilization of the atmospheric concentration of the greenhouse gases is achieved in the latter part of this century.

It is above all the industrialized countries' emissions of greenhouse gases to the atmosphere that must be reduced radically by 2100. Global climate change can only be mitigated by a coordinated global strategy entailing that the developed countries in particular, who have caused and are causing the most emissions, reduce their emissions substantially.

The developing countries have only accounted for approximately 20 % of the accumulated atmospheric emissions since the 19th century. They account for less than 40 % of the present-day emissions, despite the fact that their population is nearly four times that of the developed countries. A global strategy therefore needs to be devised based on a policy of international solidarity where the developed countries make radical emissions reductions. Otherwise, the developing countries will scarcely accept any form of commitment.

The threat of global climate change forces us to think in an unaccustomed time perspective. There is therefore a clear need to formulate climate policy objectives with a time horizon of about 50 years. Measures adopted today will not have full effect for one or two decades. International agreements on necessary measures are also time-consuming. A 50-year perspective therefore appears reasonable.

The Committee's assessment is that formulating objectives for what needs to be achieved by 2050 makes us better equipped to achieve significant emissions reductions. A long-range objective sends important signals that a process of adjustment must be initiated and that it is essential to think in terms of equity between generations.

Within the EU, the Council has stated that the mean temperature should not exceed 2°C above the pre-industrial level, and that carbon

dioxide levels below 550 ppm should serve as a target for global limitation and reduction measures. A significant reduction of global emissions and common reduction measures to achieve this will therefore be necessary for another century or more.

In Sweden, the following environmental quality objective has been formulated regarding "*Limited climatic impact*":

The concentration of greenhouse gases in the atmosphere shall, in accordance with the UN Framework Convention on Climate Change, be stabilized at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved in such a way and within a time-frame sufficient to allow biological diversity to be preserved, to secure food production and to ensure that other objectives for sustainable development are not jeopardized. Sweden has, together with other countries, a responsibility for achieving this global objective (Gov. Bill 1997/98:145).

According to the Government, the environmental quality objective entails focusing policy measures on stabilizing the atmospheric concentration of carbon dioxide at a level below 550 ppm and ensuring that the concentrations of the other greenhouse gases do not increase.

The Committee observes that a stabilization of the concentration of greenhouse gases at a level higher than 600 ppm would pose a grave risk for disruptions in the global climate.

In view of the share of other greenhouse gases in the total increase, and against the background of the global situation, the Committee considers that the objective of only stabilizing carbon dioxide at 550 ppm entails excessive risks. The objective of stabilizing the concentration of the other greenhouse gases at the present-day level could, on the other hand, require unrealistic reductions in the emissions of other greenhouse gases. It is therefore more appropriate to formulate a collective objective for all greenhouse gases covered by the Kyoto Protocol: that the total atmospheric concentration of greenhouse gases should lie below the level that poses considerable risk for serious disruption of the climate.

The Committee therefore proposes that the environmental quality objective remain in place, but that its implications be changed by the inclusion of all gases. The objective should therefore be to achieve a stabilization of the six greenhouse gases specified in the Kyoto Protocol at about 550 ppm of carbon dioxide equivalent. The Committee proposes that Sweden should advocate this objective in international contexts.

This means that the concentration of carbon dioxide shall not exceed approximately 500 ppm. This objective entails that Swedish emissions of carbon dioxide and other greenhouse gases covered by the Kyoto Protocol may not exceed 4.0–4.5 tonnes per capita, measured as carbon

dioxide equivalent, compared with the current level of 8.3 tonnes per capita. Our greenhouse gas emissions thus need to be reduced by approximately 50 % by 2050, compared to the 1990 level, with further reductions thereafter.

The assumptions on which the proposed target are based are firstly that the population of Sweden is more or less constant during these 50 years, and secondly that an equalization between developed and developing countries can be achieved by the middle of this century.

In summary, the Committee finds that if the objective of stabilizing the concentration of the greenhouse gases at a level of 550 ppm of carbon dioxide equivalent, i.e. the level we are now proposing, is to be realized, it is necessary that the developed countries begin their efforts to reduce these emissions immediately.

Reducing greenhouse gas emissions in Sweden by nearly 50 % by 2050 means that the reduction after 2010 needs to be intensified, even assuming that Sweden reduces its emissions by 2 % by 2010. The pace of the adjustment process will depend on how well other countries succeed in meeting their commitments.

Short-term objective for the period 2008-2012

The Riksdag (Swedish Parliament) has established the current objective, that emissions of all climate-affecting gases shall be limited and that carbon dioxide emissions from fossil fuels shall be stabilized at the 1990 level by 2000, with further reduction thereafter. In conjunction with the passage of the environmental quality objective of "*Limited climatic impact*" by the Riksdag, the previously approved emissions targets were confirmed.

The EU's commitment under the Kyoto Protocol entails that the EU, which is a party in international contexts, shall reduce emissions by 8 %, compared to the 1990 level, during the period 2008–2012. According to the EU's burden sharing, i.e. the distribution of the EU's emissions reduction commitment among the member states, emissions in Sweden may increase by 4 % during this period.

The Committee is not of the opinion that the EU's internal distribution of burden warrants a departure by Sweden from the Riksdag's decision to reduce greenhouse gas emissions. In keeping with arguments advanced in conjunction with the Committee's proposal for a long-term objective, we do not believe Sweden should increase its emissions when global efforts are being aimed at getting the developed countries to reduce their emissions.

The Committee proposes as a short-term objective that emissions of greenhouse gases in Sweden shall, as a mean value for the period 2008

to 2012, be 2 % lower than emissions in 1990, counted as tonnes of carbon dioxide equivalent. This objective includes the six greenhouse gases in accordance with the Kyoto Protocol's and the IPCC's definitions. Measures adopted beyond the country's boundaries shall be supplementary. Considerable emissions reductions shall take place within the country's boundaries.

This assessment is based on the need for considerable emissions reductions over a long time. We believe that a continued reduction is necessary to meet long-term commitments. This also sends the right signals indicating that political decisions will be aimed at continued emissions reductions, equivalent to a halving of the emissions in 50 years.

It is urgent that investments in private enterprise, households and public activities be made with a view towards the need to reduce greenhouse gas emissions. The purpose is to reduce the risk that we will become locked into structures that bind us for a long time. It is also essential that technological development be promoted by sending clear signals to both the business sector as well as research and development bodies in the form of objectives that require intensified efforts to reduce greenhouse gas emissions.

The Committee considers it appropriate that the time for the objective coincide with the period covered by the Kyoto Protocol, and that ten years is an appropriate period for a short-term objective regarding emissions reductions.

All factors considered, the Committee considers our proposed objective, that emissions should decrease by 2 % compared with 1990, to be realistic as a short-term objective.

The level we propose for 2008–2012 entails that Sweden will, with ample margin, meet the commitment agreed upon in the EU's internal distribution of burden for the period 2008–2012. This does not mean that Sweden should renegotiate its share in the EU's burden sharing.

Interim objective for 2005

The Committee believes there is good reason to formulate an interim objective for 2005. The purpose is to ensure that the short-term objective is achieved. Fulfilment of the interim objective thereby determines what other policy measures and instruments are needed to achieve the objective for the period 2008–2012. Assessments of goal fulfilment should be made on the basis of forecasts made in 2003 or 2004. The emissions figure for 2005 shall be normal-year-corrected according to Swedish methodology in view of the fact that a single year is chosen for measuring national objective fulfilment.

2.3 Considerations

The considerations that lie at the basis of the strategy are dealt with in this section. The climate problem is global, everyone contributes to the problem and all countries can be affected, although to varying degrees. The climate problem also involves considerations of welfare between the generations, requiring long-term solutions. A strategy should therefore be based on international collaboration and a long time horizon. To be successful, the climate policy must be integrated with other policy areas, and incentives must be created for the broad participation of all members of society.

2.3.1 International collaboration and ratification of the Kyoto Protocol

Extensive global measures are needed to achieve the goals. We therefore propose that Sweden should continue to participate actively at the international level in order to pursue the policies we consider to be most important and share Swedish experience of policies, measures and results of efforts to reduce greenhouse gas emissions.

What Sweden should do internationally

It is the opinion of the Committee that ratification of the Kyoto Protocol would be facilitated by further clarification of certain parts of the rules of the Protocol. This is particularly true with regard to flexible mechanisms, sinks, the industrial gases (sulphur hexafluoride, perfluorocarbons and hydrofluorocarbons) and the provisions pertaining to follow-up and sanctions. Sweden should therefore work actively to bring about such clarification when the parties to the Climate Convention meet for negotiations in November 2000 (COP 6) so that the ratification process can be commenced without delay.

The EU's commitment in the Kyoto Protocol entails a reduction of the Union's collective emissions by 8 % during the period 1990–2008/12.²

¹ COP – Conference of the Parties. The parties to the Climate Convention meet regularly to discuss and negotiate matters pertaining to the Kyoto Protocol. For a more detailed description, see Chapter 7, "International work in the climate field".

² The target of 8% for the EU as a whole has been shared among the member states with regard to various economic development patterns. If the agreement on how the emissions reductions are to be shared is translated into a legal document, the

If COP 6 has satisfactory results, an EU decision for ratification, including a formal confirmation of internal burden sharing, will be able to be taken in the spring of 2001. This is a prerequisite for meeting the EU goal of ratifying the Kyoto Protocol by 2002.

The Committee assumes that the negotiations can be carried to a successful conclusion so that Sweden can ratify the Kyoto Protocol in 2002.

The Committee believes Sweden should be a driving force internationally to stabilize greenhouse gas emissions at a sustainable level and to take the needs of the developing countries into consideration.

The issue of sinks is also of central importance in the international negotiations. Sinks are processes, activities or mechanisms that absorb greenhouse gases from the atmosphere and store them in various reservoirs. The term "sink" is usually used for uptake of carbon dioxide from the atmosphere via photosynthesis to reservoirs in forest and agricultural land.

It is our opinion that Sweden should, in future negotiations, advocate the inclusion of sinks in a manner that does not distort the commitments in the Kyoto Protocol. Given this restriction, Sweden should advocate the inclusion of sinks in a manner that is neutral and perceived as fair, and which takes account of methodological uncertainties. This means that sinks utilized by parties to meet their commitments should reflect an actual sink for forestry as a whole.

Preparations for transition to trading in emission rights

When the Kyoto Protocol enters into force, we believe that emissions trading (trading in emission rights) and other flexible mechanisms described in the Kyoto Protocol ought to form a part of the global solution to the climate problem. We believe that this ought to improve the chances of finding cost-effective global solutions for reducing emissions. It is still too early to determine the pace at which this can take place, and we believe that if emissions trading is introduced within the EU, it may facilitate realization of the global system.

We therefore propose that Sweden should be a driving force within the EU for the introduction of European trading in emission rights for greenhouse gases in an ever-widening sphere of emission sources. Furthermore, Sweden should advocate the principle that countries not members of the European Community should also be allowed to join the

Kyoto Protocol can be jointly ratified by the member states and by the EC.

system, and that a European system should be introduced earlier than 2005.

We therefore propose that Swedish preparations should be intensified for introducing emissions trading for all emissions of carbon dioxide, with the aim of also including other greenhouse gases as soon as possible. The option of a national system should also be examined if the European system takes too long to implement or is not of large enough scope. Furthermore, in the light of the uncertainty in the timetable of the international negotiations, the system should allow for the option of inviting other countries in northern Europe to participate.

2.3.2 Long time horizon

The risk of global climate change is forcing us to plan with a much longer time horizon than is normal in society.

The long-term emissions target for 2050 calls for a halving of greenhouse emissions, requiring great changes in society, even if they can be mitigated by measures beyond the boundaries of the country.

With a time horizon of 2050 for the long-term objective, it must be borne in mind that in this interim at least 12 general elections will have been held, given the current term of office of members of parliament. The democratic system must be up to the challenge of implementing the strategy, entailing far-reaching changes of the way society works. What kind of strategy is required to bring about such long-term and radical changes?

First and foremost, the strategy must permit flexibility. All parts of the strategy must be regularly reconsidered so that new knowledge and new international agreements can be taken into account. This can be ensured by follow-up of the whole strategy every fourth year or so with climate policy decisions regarding objectives and further measures.

Secondly, the needs of different countries and the interests of different generations must guide us in both present-day decisions and coming decisions throughout the time period. This has been a guiding principle in our work and should continue to guide the choice of objectives.

Thirdly, the measures needed will affect societal structures that are binding over a long period of time, and investments must be long-term so that emissions of greenhouse gases are minimized. Furthermore, research and development must be stimulated.

These requirements are predicated on the ability of the democratic system to bring about the necessary changes. This in turn requires a population that has been made to understand why such changes are necessary.

It will probably be difficult to reduce emissions in the future as well. It is therefore necessary to prioritize measures that will enable us to continue reducing emissions far below the current level over a time span of 50 years. Many types of measures that lead to positive results in a longer time perspective will not lead to such great effects or will have high costs during the next ten years, but may nevertheless be important for the long-term transformation.

As mentioned above, we wish to emphasize the necessity of a massive effort to disseminate knowledge regarding the climate problem and regarding how the general public, companies and organizations can contribute. The initiatives that are now being proposed to meet the threat against the climate therefore need to be accompanied by a broad information campaign. At the same time, a broad package of measures will be launched and implemented on an escalating timetable. The contents of the package among other things include the following components of a long-term nature.

The physical planning of society, location of human settlements, and design of buildings and such social infrastructure as will affect the magnitude of our emissions perhaps a hundred years ahead in time must be reviewed. It is also important that the further expansion of the transport infrastructure be aimed at facilitating the development of environmentally responsible transport, and at preparations for eventually reducing the use of fossil fuels by half.

In the energy field, further attention must also be given to energy conservation and to converting the energy supply system to renewable energy sources.

Technology breakthroughs for energy supply and transportation are desirable, and development efforts are being conducted on many fronts. We consider research to be vital for future progress in this field. Research, along with economic incentives, contributes towards the emergence and implementation of new technology.

Attention should be given in current and future policymaking in other policy areas as well to the long-term consequences of decisions in terms of whether they lead to increased or reduced emissions of greenhouse gases or improvements in energy efficiency. Policy decisions with long-term consequences for human settlements and infrastructure give signals for the future. They lock resource use for a long time to come and influence human behaviour. It is therefore of particular importance that long-term decisions in policy areas of importance for greenhouse gas emissions be subject to thorough strategic environmental assessment at the highest level and broad democratic consensus-building.

2.3.3 Bearing on other policy areas

Most policy areas have a direct or indirect bearing on climate policy.

Those policy areas that are particularly important from a climate policy perspective are energy, transport and communication, business, agriculture and forestry, and consumer and finance policy. Conflicting objectives in the different policy areas may necessitate weighing together of different interests. One example of this is the fact that economic policy, including tax policy, affects consumption. Increased prosperity generally leads to increased consumption, which today means increased use of fossil fuels, energy and transport. Property tax influences incentives for making energy savings, and energy and carbon dioxide taxes on fuels can influence new car buyers to choose a fuel-efficient model.

We wish to emphasize that all of these policy areas should be taken into consideration in forging a future climate policy. So far, however, interest in greenhouse gas emissions has mainly been focused on the energy and transport sectors.

The energy policy bill (Gov. Bill 1996/97:84) *A sustainable energy supply* has been an important point of departure for our work. There are many relationships between the climate issue and energy policy as regards use of fossil fuels for heating or electricity generation. We have found that our assignment has not included a review of the entire energy policy, but has limited us to those energy aspects that we deem to have the greatest influence on use of fossil fuels. We have therefore chosen to discuss options for replacing fossil fuels with renewable fuels in heating and electricity generation. Of the scenarios we have studied, we have observed that demand for electricity is projected to increase and judge that energy efficiency improvements for the purpose of reducing consumption of both electricity and heat can in the long term facilitate the changeover to an energy supply based on renewable energy sources, so that the use of fossil fuels for heating or electricity generation does not have to increase further down the road.

According to the Committee's terms of reference, we should also take account of what has been set forth in the Government Bill *Transport policy for sustainable development* (1997/98:56). Since this bill was framed, international commitments have grown in importance, and transport-related carbon dioxide emissions are estimated to be increasing faster than was then projected.

Furthermore, a strategic analysis has been presented of infrastructure planning for the period 2002–2011, where the alternatives that involve further road construction may lead to increased emissions compared with if the roads are not built. Although the increase in road capacity is not as important as economic growth for the increase of

transport-related emissions, the infrastructure expansion we choose will nevertheless be of importance for travel patterns and choice of transport mode for a long time to come. Further policy instruments may therefore be needed to limit these emissions.

Owing to the changes in premises that have occurred since the transport policy bill, we judge that there is a need for measures to limit emissions from transport. We are therefore submitting several proposals aimed at reducing these emissions. However, it has not been possible within the limited time available to carry out an exhaustive analysis of the potential for emissions reductions in the transport sector.

It is urgent to identify interests and policy instruments within all policy areas that conflict with the implementation of the climate policy, so that conflicting objectives can be clarified. Responsibility for weighing such conflicting interests and policy areas against each other lies at the political level, i.e. with the Government and the Riksdag.

To ensure that climate aspects are taken into consideration in the aforementioned areas, we believe that the terms of reference given to committees that deal with issues may or can affect the greenhouse gas emissions should include climate policy considerations as a part of the commission.

Another important aspect of the work of integrating the climate issue in all policy areas is that government agencies and state activities should take steps in their own organizations aimed at reducing emissions by e.g. energy conservation and – in procurements of vehicles, transport services, travel, premises and contractors – by choosing options that entail low greenhouse gas emissions and good energy conservation.

Furthermore, it is important that responsibilities and duties be defined for those agencies that are of particular importance for climate policy.

2.4 Timing of the initiatives

There are many reasons why measures cannot be delayed. The most important is the risk of severe climate effects. If and when they occur, it may take a very long time to restore previous conditions. The emissions trend points toward continued increases, and if we delay adopting measures, it may be even more costly to make the necessary adjustments from a higher level.

Most countries in Europe are now working intensively on their action programmes. These programmes, and the potency of the policy instruments being used to implement them, may affect competitive conditions for companies within and between countries. These measures are being adopted in parallel with our own, and it is

consequently important that there be an interaction, so that the Swedish measures can be adjusted according to what is happening elsewhere. At the same time, it is necessary for achieving global success that countries pursuing active climate efforts can serve as a good example, and we believe Sweden can play an important role in this respect.

As described above, we believe that Sweden still needs to coordinate the pace of its programmes with measures elsewhere, but this does not mean we should wait until we know more. The precautionary principle applies here.

Due to technological progress, the costs per kilogram of emissions reduction may fall in the future, which could be used as an excuse to wait to adopt measures until they become cheaper. At the same time, we believe that tougher requirements may stimulate the development of new and cheaper technology, which may in turn lead to new products and greater export earnings.

Besides the need to provide good examples for other countries, the most compelling reason not to delay measures is that current emissions are further adding to the total quantity of greenhouse gases in the atmosphere and thereby worsening the situation. The higher the concentrations become, the longer time will be needed to get them back to a less risky level.

Viewed in the perspective beyond 2050, climate scientists believe that emissions must be reduced further to achieve a situation that is sustainable in the long term.

All factors considered, we therefore conclude that further measures cannot wait and that the pace of the transition should be stepped up.

2.5 Choice of measures and instruments

The Committee is of the opinion that administrative, economic and informative instruments are needed for implementation of the strategy.

In order to achieve the objective for 2008–2012, we have studied a large number of possible measures proposed by government agencies. We have made an evaluation of these measures, mainly with respect to cost-effectiveness, effects for enterprises and households, conflicting environmental objectives, and potential for energy conservation. Certain proposals have been rejected mainly for cost reasons. The majority of the measures should be introduced as soon as possible, since the costs are reasonable in relation to the need for emissions reductions and they improve the prospects for more permanent solutions. We submit proposals for measures and instruments that are summarized in Appendix 1.

In this context, the Committee would also like to note that the proposals for measures offered by the government agencies cannot be considered to represent a complete catalogue of measures. Certain agencies have proposed broad packages of measures, others have been more sparing with their proposals. There is therefore a considerable need for further research and analysis by the concerned agencies. This supplementary work must be commenced promptly so that the necessary information will be available for future adjustments and revisions of objectives and measures.

Provided that far-reaching measures are introduced, largely in keeping with the government agency proposals, scenarios studies indicate that the emissions level in 2010 may vary between 1.5 % and 13 % above the 1990 level. Several possible emissions-reducing measures included in our proposal should contribute to further emissions reduction beyond this, but quantitative figures are lacking. Moreover, it should be possible for the agencies to come up with proposals for further measures.

This is however far from sufficient to achieve the short-term objective for 2008–12 and thereafter the long-term objective. Besides proposals for measures, additional policy instruments are therefore needed, mainly economic ones, in order for the short-term objective to be achieved.

The additional policy instruments that are being considered are raised taxes, for example energy and carbon dioxide tax, and the introduction of flexible mechanisms, such as emissions trading, described in the Kyoto Protocol.

The Committee considers emissions trading and other flexible mechanisms described in the Kyoto Protocol to be a part of the global solution to the climate problem. As far as emissions trading is concerned, it is not expected to be able to be applied globally before 2008. However, emissions trading could become a reality earlier within limited regions, for example the EU. If the EU system is long in coming or not sufficiently widespread, a national emissions trading system should be considered.

A great deal of uncertainty exists concerning the rules, the scope and the design of an emissions trading system, as well as a timetable for introduction, so we do not wish at this time to recommend this system as the only general solution for the coming decade.

To find a good and lasting solution, the nature of the different policy instruments and their combined effects and interaction must first be clarified. The timetable for further steps will therefore largely be determined by when the rules for emissions trading are decided on

within the framework of international negotiations and initiatives within the EU.

Further enquiries regarding flexible mechanisms, including emissions trading, ongoing enquiries regarding the energy tax system, and the outcome of immediately adopted measures will therefore determine how the different policy instruments will be combined with each other. In the judgement of the Committee, this should be able to be clarified within two to three years, after which a final proposal can be formulated.

Against the background of what has been said here, the Committee believes that it should be possible to make a decision regarding changed energy or carbon dioxide tax and emissions trading and a combination of these measures during 2003–2004. The Committee is anxious that the enquiries required on both a national and international level be conducted as quickly as possible. The Committee considers it advantageous if the timetable can be shortened. The combination and the potency of the policy instruments should be guided by the prospects of meeting the interim target for 2005. Developments in the next few years will form a basis for a forecast of emissions in 2005.

The Committee is convinced that, in addition to the package of measures proposed to be put into effect immediately, substantially strengthened policy instruments will be required in the form of changed energy or carbon dioxide tax and emissions trading if the short-term target of a 2 % reduction compared with 1990 is to be met, followed by further emissions reductions.

We find that a massive information campaign is necessary to create understanding for the changes in instruments that are required. It is also essential that people be made to understand the relationship between the climate problem and the use of oil and petrol or other activities that cause climate-affecting emissions.

It is also important in the long perspective that the message that measures and instruments will be needed for a long time be spread to everyone – public bodies, enterprises and households – so that they in turn can behave in a way that contribute towards the changeover, e.g. by taking steps to reduce the use of fossil fuels. If individuals and companies are given information on coming changes at an early stage, they will be able to make their own decisions on when and how they should respond.

For these reasons, greater knowledge is needed at all levels and in all sectors of society for the purpose of increasing awareness of the problems of climate change and what measures can be taken to reduce the risks.

2.6 Action programme

The action programme consists of international efforts and national measures. The more far-reaching changes, such as introduction of emissions trading or changes in energy or carbon dioxide tax, require a period of preparation and information to the general public and the business sector.

To implement the action programme we propose a base package of measures that can be approved and introduced more or less immediately, plus a supplementary package of measures to be implemented later on.

The supplementary package includes measures and instruments that permit further emissions reductions beyond the base package, but require further consideration. The solution of having certain measures in a supplementary package makes it possible to choose the scope and combination of these measures at a later time.

Assessments of the prospects of meeting the interim objective for 2005 will determine the composition and scope of the policy instruments in the supplementary package. Naturally, an assessment will then also be made of the prospects of meeting the short-term objective for the period 2008–2012.

In a review conducted every fourth year, major Swedish climate policy decisions can be projected for 2004 and 2008. Decisions will have to be made not later than 2008 for follow-up of the Climate Convention with new future objectives. Decisions regarding further measures will be made at future follow-ups after that.

2.6.1 Central issues in the joint international work

Based on the above considerations, the committee presents the following proposal for the focus of Swedish efforts in the joint international work.

- Provided that international negotiations resolve outstanding questions in accordance with the agreed-upon timetable, Sweden will be able to ratify the Kyoto Protocol in 2002.
- Sweden shall be a driving force in the international work to reduce greenhouse gas emissions to a sustainable level.
- When the Kyoto Protocol enters into force, we presume that emissions trading and other flexible mechanisms described in the Kyoto Protocol will be a part of the global solution to the climate problem.

- Sweden should be a driving force within the EU for the introduction of European trading in emission rights for greenhouse gases, and for allowing countries outside the Union in the system to join the system.

2.6.2 Central measures in the base package

Based on the above considerations, the Committee submits the following proposals for central measures in the base package, involving initiatives throughout society.

- A broad-based information campaign is carried out aimed at the general public and the rest of society regarding the greenhouse effect and ways in which climate effects can be limited by individual measures, as well as the necessity of tougher policy instruments. The information should be formulated in collaboration with public agencies, the business community and trade-union organizations, municipalities and non-governmental organizations.
- An extensive package of measures and policy instruments based on the proposals of different agencies is put into effect.
- Government agencies draw up plans within their spheres to reduce greenhouse gas emissions and conserve energy. The purpose is to set in motion a process to explore the potential for measures, submit proposals, identify policy instruments, implement and follow up adopted measures.
- Enquiries and planning of additional measures are commenced so that current climate measures are expanded to embrace all sectors of society and all greenhouse gases covered in the Kyoto Protocol.
- State activities should also reduce emissions by means of e.g. energy conservation measures in their own operations and – in procurements of vehicles, transport services, travel, premises and contractors – by choosing options that entail low greenhouse gas emissions and energy conservation. It is important to give attention to the climate issue in the development of environmental management systems in state activities as well.
- Work with different forms of environmental agreements with the business sector is developed and evaluated.
- Swedish preparations are intensified to introduce emissions trading for greenhouse gases which, in addition to the EU's proposals in the Green Paper, also include carbon dioxide emissions from additional sectors such as the transport sector and the industrial, residential and commercial sector, with the aim of also including emissions of other greenhouse gases as soon as possible. These preparations should

include the option of a national system, if the EU system takes too long to implement or is not of large enough scope.

- Swedish preparations for implementation of other flexible mechanisms described in the Kyoto Protocol.
- The coordination of efforts at Government level should be strengthened for planning and management of implementation of the future national climate policy.
- It is proposed that a Climate Council be established at the government agency level.

2.6.3 Central measures in the supplementary package

Measures in the supplementary package will be of interest when the outcome of the base package is known and when the effectiveness of the different policy instruments has become clear. Based on the above considerations, the Committee submits the following proposals for central measures in the supplementary package.

The following measures are included in the supplementary package:

- introduction of the following policy instruments, singly or in combination:
 - emissions trading,
 - changed energy or carbon dioxide tax,
 - other flexible mechanisms described in the Kyoto Protocol,
- possible broadening or amendment of measures adopted previously,
- implementation of proposals for measures submitted by government agencies,
- implementation of environmental agreements,
- implementation of measures for sinks according to the Kyoto Protocol,
- broadened use of biofuels,
- implementation of other enquiries.

2.7 Timetable for implementation

Swedish activities are intended unless otherwise specified.

| Year | Activity |
|-----------------------------------|--|
| 2000 (Spring) | Report of Climate Committee. |
| 2000 (Autumn) | Budget bill includes appropriations for measures that are commenced in 2001. Bill on climate strategy is submitted to Riksdag. |
| 2000 (December) and 2001 (Spring) | Decision by Riksdag on budget bill and special climate policy bill. |
| 2001 | Implementation of base package is commenced. |
| 2002 | Kyoto Protocol is ratified. |
| 2002 (Autumn) | Preparations for next climate policy decision are commenced. |
| 2003 | Proposals for further measures are submitted. |
| 2004 | Bill and decision on future action programme. |
| 2004-2005 | Supplementary package is introduced. |
| 2005 | Reporting to the Climate Convention on "demonstrable progress" in accordance with Article 3.2 of the Kyoto Protocol. |
| 2007-2008 | Third climate policy decision. |

The timetable should be regarded as an explanation of the chronology of different initiatives, and measures may be adopted earlier if there is reason for this. As previously stated, the Committee considers that measures should be implemented at the pace that is possible in view of the fact that different measures are connected to and dependent on each other and interact for the purpose of achieving the short-term objective for the period 2008–2012.

2.8 Implementation and responsibilities

The purpose of the implementation of the national strategy to reduce greenhouse gas emissions is that we in Sweden should shoulder our

share of the responsibility for reducing the risks of serious climate change.

Implementation entails that virtually all sectors of society will be more or less affected by our proposals. Such a strategy requires a clear division of responsibilities, collaboration, coordination, and follow-up and evaluation. These requirements lead to certain observations concerning, and proposals for division of, duties and responsibilities.

The decision of the Riksdag regarding the national climate policy also involves a weighing-together of different policy areas. Implementing the strategy involves complex trade-offs between preventing problems from becoming very serious and allowing for an increase in prosperity. Striking a balance between short- and long-term needs, between the environment and the economy, and between different measures and their socio-economic consequences will require careful consideration and adequate information.

A balance must also be struck between economic development in a 10-year versus a 100-year perspective, and between the different groups that will adopt and pay for the measures. Such considerations and policy stands are political and must be made at a political level. Climate policy should therefore be reviewed at least once during each term of parliament. One way to do this would be to appoint a new Climate Committee for each term.

Feedback of the results of the climate policy pursued, based on follow-up and evaluation, is particularly urgent. This feedback should focus on whether the objectives are attained by the measures adopted and policy instruments used so that Sweden is able to fulfil its international commitments.

This reporting is important both for the further decisions of the Riksdag and for the Riksdag's dialogue with the citizens.

The Government bears overall responsibility for implementation of the strategy. The Government reports to the Riksdag on results, what changes or additional measures should be adopted, and whether the objectives/targets need to be revised.

Implementation will require careful coordination within the Government Offices, since several ministries and many agencies are involved. For this reason, the committee proposes that coordination within the Government Offices be strengthened. The committee recommends an organizational solution that ensures a clear political influence and provides sufficient secretariat resources for the purpose.

The reasons for the proposal are the international commitments, the need for coordination of measures between several policy areas, the long-term view that characterizes the decisions, and the balance that must be struck between objectives within and between policy areas.

Many agencies are vital to the implementation of the strategy. The agencies have contributed their input to the Committee with regard to proposals for measures. One experience of the Committee's work is that the agencies' work has contributed to a buildup of knowledge at the concerned agencies. The Committee considers it essential that the agencies continue their work of refining proposals for measures and instruments.

The Committee proposes that concerned agencies be given a clear responsibility to report emissions statistics and submit proposals for measures and instruments, and to provide feedback in the form of results. The statistics should be specified in instructions and appropriations letters.

The Committee proposes that a Climate Council be established consisting of the agencies that most involved in the implementation of the climate policy. The Committee should be advisory and support the Swedish Environmental Protection Agency in its current agency duties regarding implementation of the climate policy and subsequent reporting. The Council should thereby assist in gathering data for an overall evaluation and to ensure implementation of the climate policy.

The regional and local levels are essential in an implementation of the climate policy. County administrative boards, county councils and municipalities are knowledgeable in their sphere of responsibility regarding what constructive and cost-effective initiatives can be taken to reduce greenhouse gas emissions and energy use. As the state's coordinating bodies in the counties, the county administrative boards have an important role in monitoring the climate issue within e.g. the county's economic sector and within energy and transport planning.

In summary, the Committee's proposal aims at the adoption of measures in all sectors of society to reduce climate gas emissions. The administrative and economic instruments, along with information, apply to the whole of society in the implementation of the climate policy. Different information activities will be carried out so that both households and business entities can make decisions in the light of the need to reduce greenhouse gas emissions. Such information should enhance knowledge and awareness and thereby encourage participation so that the necessary measures can be implemented in both the short and long run.

2.9 State expenditures and financing

Expenditures for proposed measures

The costs of the base package for the budget years 2001–2004 are estimated at about SEK 1,200, 1,300 1,600 and 1,600 million, respectively. The cost of the measures in the base package for the entire period 2001–2020 is estimated at SEK 11,000 million. We believe that more accurate cost calculations should be made in conjunction with the budget process.

An intensification of the climate work with information activities, aid for long-range changes and greater work within agencies entails increased state expenditures. Approximate changes in state expenditures for measures in the base package from 2001 through 2004 and financing options are described below. Financing of measures from 2005 is dependent on what main instruments will be chosen from the supplementary package, above all emissions trading and changes in energy and carbon dioxide taxes.

2.9.1 Proposed expenditures

The calculation of state expenditures for our proposals is based on the agencies' estimates of how much the measures will cost the state. In some cases, figures have been taken from other sources or calculated by the Committee in accordance with the descriptions in Chapters 3–13. We wish to emphasize that the figures are uncertain and we therefore judge that more accurate cost estimates for the measures need to be made by each agency in dialogue with the Government Offices. Priorities may need to be reallocated within each expenditure area, and in the budget process among different expenditure areas.

In calculating appropriations and the extent of the emissions abatement work for 2001, it is urgent to get under way quickly in order to achieve emissions reductions by 2003–2005. At the same time, the time for planning and start-up will probably be relatively short for the concerned agencies. We therefore consider it need to underscore the importance of more accurate cost calculations, projection of potential results for each measure, and planning for follow-up of results.

The expenditures for the budget years 2001, 2002, 2003 and 2004 have been estimated at about SEK 1,200, 1,300 1,600 and 1,600 million, respectively.

We would like to emphasize that many of the measures we propose may also contribute to achieving other environmental objectives, and the costs should be regarded in this perspective. We have not distributed the costs between the climate objective and other objectives, but charge the entire cost to the climate objective in our calculations. Particulars on effects on other environmental objectives are given in Appendix 4 to this report.

Table 2.1 shows approximate figures for state expenditures for the years up to and including 2010 stemming from the proposed measures and instruments in the base package. A more detailed account of state expenditures for the individual measures is given in Appendix 2.

Table 2.1 Approximate scope of state expenditures for measures and instruments in the base package, SEK millions

| | 2001 | 2002 | 2003 | 2004 | Period 2005-2010 | Total for period 2001-2010 |
|--|--------------|--------------|--------------|--------------|---------------------------|----------------------------------|
| Energy and transformation industries, refineries | 100 | 150 | 300 | 300 | 1,850 ¹⁾ | 2,700 ¹⁾ |
| Industry | 90 | 110 | 110 | 110 | 100 | 520 |
| Residential, commercial and institutional | 30 | 70 | 160 | 160 | 370 | 790 |
| Transport | 180 | 220 | 280 | 430 | 2,980 | 4,090 |
| Other measures and instruments | 760 | 760 | 750 | 650 | 0 | 2,920 |
| Total sum | 1,200 | 1,300 | 1,600 | 1,600 | 5,300¹⁾ | 11,000¹⁾ |

¹⁾ expenditures for the wind power programme are included, but complete data are lacking, so state expenditures after 2005 may be higher.

The summed column refers to all measures in the base package. Several will also be in effect during the period 2005–10. The costs may change after 2004, depending on what measures are chosen at the time.

2.9.2 Financing options

The Committee describes alternative options for financing, which provide considerably more funds than the expenditures entailed by our proposals.

Options

In the final choice of financing, we recommend that the climatic impact of the financing alternative be taken into consideration as much as possible.

An increase in the energy tax on electricity by 1 öre/kWh (100 öre = SEK 1) would bring an additional SEK 620 million into the national treasury in 2001, SEK 560 million in 2002, SEK 540 million in 2003 and SEK 560 million in 2004. The permanent effect will be slightly lower. This can enter into force from January 2001, provided it has been dealt within in the budget bill.

In order to prevent carbon dioxide emissions from increasing as a result of general economic growth, the indexation of the carbon dioxide tax should be tied to the GDP. This can be done in the same way as for calculation of the percentage target for foreign aid. Assuming that the nominal GDP is 1 percentage point higher than the CPI, revenue should increase by SEK 580 million each year. With another construction, the amounts could of course be slightly different. This question requires study, and depending on its magnitude the change could take place with the indexation for 2002 or 2003.

Differentiated sales tax could be imposed on new cars with regard to their carbon dioxide emissions. Assuming a mean value of SEK 5,000 per new car, this would generate annual revenue of about SEK 1,100 million for the public sector. The strengthening of the public treasury is estimated to amount to SEK 1,260 million in 2003 and SEK 1,100 million in 2004, provided the proposal enters into force in 2003.

If the vehicle tax is increased for all cars, including diesel-powered, by SEK 200 per car, tax revenues will increase by nearly SEK 730 million per year. This can enter into force from 2001. It is proposed that the increase in the vehicle tax be differentiated according to consumption of fossil fuel for cars put into service from 1 January 2001. (The differentiation cannot be imposed on older cars due to an EC directive that says that the car manufacturers cannot be required to furnish emissions figures for these older cars). Differentiation requires study and could be introduced later than an increase.

Remaining appropriations of around SEK 1,000 million for the local investment programmes are transferred to the climate programmes (KLIMP).

Costs in conjunction with bodily injuries in traffic accidents are transferred to the compulsory third-party insurance, reducing state expenditures. Depending on which costs are transferred, the state budget would be relieved of between SEK 2,100 and 3,800 million (Riksdagens Utredningstjänst Dnr 1997:2170). The measure would also encourage a smoother driving style, which also affects emissions. The

possibilities of EU aid for measures in the strategy should be explored. The financing alternatives have been compiled in the following table.

Table 2.2 Financing options, SEK millions per year

| Financing option | 2001 | 2002 | 2003 | 2004 |
|---|-------|-------|-------|-------|
| Increased electricity tax (tax on electric power), assume increase of 1 öre/kWh | 620 | 560 | 540 | 560 |
| Indexation of the general carbon dioxide tax is tied to the GDP from 2002. | 0 | 580 | 1,160 | 1,740 |
| Differentiated sales tax on new cars. The tax increases with increasing carbon dioxide emissions. | | | 1,260 | 1,100 |
| Increased vehicle tax on all cars. The vehicle tax is differentiated according to carbon dioxide emissions for cars put into service from 1 January 2001. For older cars, the current system provides some incentive. | 800 | 800 | 800 | 800 |
| Transfer of appropriations from local investment programmes, SEK 1,000 million, to distribute during 2001, 2002, 2003. | 200 | 400 | 400 | 0 |
| Changes in motor third-party insurance | 2,100 | 2,100 | 2,100 | 2,100 |

The committee has considered it reasonable to describe alternative options to the Government, which has an overview and can coordinate with other enquiries and thereby choose the alternative that is best overall.