Making markets work for environmental policies

– achieving cost-effective solutions




The Danish Government

2003

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Foreword

A clean and healthy environment is an essential part of any modern society. That is why we want to take care of the environment and respect the carrying capacity of nature. Our goal is for Denmark to be one of the leading industrialised countries in reducing pollution.

The Danish Government has an ambitious and responsible environmental policy. We have clear goals, which we want to adhere to. At the same time, there is a need for innovation in environmental policy. There needs to be less regulatory control, and more room for free initiative. We all have a responsibility towards our surroundings.

Making markets work for environmental policies is about making better use of market forces to solve environmental problems, in order to achieve cost-effective solutions. *The climate strategy* is a good example. Cost-effective instruments must be central in the measures taken.

"Making markets work for environmental policies – achieving cost-effective solutions" is the beginning of a process in which major environmental issues will be evaluated in turn, with the aim of changing tack. Governance via the creation of flexible framework conditions and the price mechanism will create better conditions for enterprises and consumers to take responsibility for solving an increasing amount of tasks within the field of environmental politics. It is therefore important that the costs associated with pollution are reflected, as far as possible, in prices.

This report discusses three main elements: Economic instruments, the market for cleaner products, and technological development and innovation. The aim is for the combination of these different mechanisms to push the market in the right direction, in the most efficient and cheapest way possible.

The goal is clear: to achieve cost-effective solutions to environmental problems.

The Danish Government, 2003




Summary

Making markets work for environmental policies – achieving cost-effective solutions

The government intends to breathe new life into environmental policy. This report on "Making markets work for environmental policies" is an important step in this process. Making markets work for environmental policies is about making better use of market-based mechanisms to solve environmental problems and ensure that we achieve cost-effective solutions.

The guiding principle has to be free initiative. The government will set the framework for measures to protect the environment, so that the market can work out the best solutions for it-self – from both an economic and an environmental perspective. The responsibility of residents and enterprises is an important driving force for environmental initiatives.

As far as possible, prices must reflect the socio-economic costs, including the environmental effects. Possible focus areas in making markets work for environmental policies include: restructuring environmental taxes to be more effective, tradable permits, and a number of voluntary instruments such as eco-labelling and technological innovation.

An ambitious and responsible environmental policy will meet the environmental goals set – both nationally and internationally. A significant part of the environmental legislation in Denmark represents the implementation of EU or other international regulations.

In future, the government will let market-based instruments and the principle of improved cost-effectiveness guide its environmental policy. This report on making markets work for environmental policies is the beginning of a process, in which major environmental issues will be evaluated in turn, with the aim of changing tack. The "Climate Strategy" marks the beginning of this process, and other issues such as waste management, the aquatic environment, and pesticides are on the way.

Specific initiatives and environmental issues

The *"Climate Strategy"* is an example of what the government hopes to achieve by making markets work for environmental policies, and also illustrates how tradable permits can be used in practice. Environmental goals must be achieved in a cost-effective manner, using the right combination of instruments.

In general, the government will seek to restructure taxes to be more environmentally and cost effective. The government will carry out regular evaluations of environmental taxes. A number of analyses are already in progress. The government is also working towards the greatest possible level of international coordination for market-based instruments. Examples of this include the European Commission's proposed directive on Environmental Liability and the EU's Energy Taxation Directive.

The government will work for better documentation and information about cleaner products at European level, to inform the free choices of enterprises and consumers. The life-cycle perspective is crucial.

Innovative environmental technology is crucial in achieving cost-effective solutions to environmental problems, and is also a growth area in the knowledge-based economy. The government has presented a *"Knowledge Strategy"*, which aims to enhance the transition to a knowledge society. Improved cooperation between knowledge institutions and enterprises can promote the formation of competitive networks in the environment sector.

Environmental policy initiatives must be based on scientific and socio-economic analyses, for example, cost-benefit analyses.

Five central environmental challenges are discussed in this report on making markets work for environmental policies: climate change, the aquatic environment, waste, chemicals and products, and nature and forests.

Regarding *climate*, Denmark is obligated to fulfil the requirements of the Kyoto Protocol and internal burden sharing in the EU. The most important future instruments will be the use of flexible mechanisms and the EU's Emissions Trading Directive. Reductions to greenhouse gas emissions must be achieved in the most cost-effective way possible.

Clean *surface and ground water* is an important resource. It is the government's intention to create clear incentives to encourage cost-effectiveness and greater competition in water supply and waste management. Further contamination of the aquatic environment must be prevented and the environmental and health impacts from earlier contamination must be reduced. A restructuring of the EU's Common Agricultural Policy subsidy schemes has high priority and will lead to a reduction in environmental impacts.

The issue of *waste* management is characterised by too little competition and too much bureaucracy. The government wants to see a more efficient and cost-aware waste management sector, with a high environment profile. This goal is to be achieved by simplifying regulations, increasing fee transparency, outsourcing, and producer responsibility.

The government's most important goal with regards to *chemicals* is that by 2020 there should no longer be any products or goods on the market containing chemicals with particularly problematic health or environmental impacts. The most important measures being considered, both nationally and in the EU, are knowledge-building and analysis, information and producer responsibility.

The *nature* area must be regulated in a socio-economically reasonable manner. The rationalisation of resource utilisation through financial partnerships and joint local influence, ensuring a balance between the desires of the population and conditions for site owners and business, are important measures.

Table 1:
The most important changes of direction

Economic instruments	• Restructure taxes to be more environmentally and cost effective • Regular evaluation of existing environmental taxes • Promote the use of tradable permits • Increase the use and international coordination of market-based instruments • Promote the EU's work with environmental liability • A solid knowledge and decision base for economic instruments
The market for cleaner products	• Clear, visible and reliable information about cleaner products in the EU, including life-cycle assessments and eco-labelling • Innovation and distribution of environmentally-friendly products • Partnerships and dialogue with market players regarding cleaner products
Technological development and innovation	• Partnerships to help promote the formation of competitive knowledge environments • Green technological foresight • Draw environmental technology innovation into research and development activities within specific technology areas • New research results must be translated into commercial applications to a greater extent
Climate	• Flexible mechanisms: permit trading between countries, joint implementation (JI) and clean development mechanism (CDM) • Permit regulation and permit trading via the EU's Emissions Trading Directive
Water	• Changes in the organisation of the water resources sector, including deregulation and outsourcing • Transparent fees and taxes • Greater use of economic instruments combined with reduced administrative burdens in accordance with the Action Plan for the Aquatic Environment III
Waste	• Changes to the organisation of the waste management sector, including deregulation and outsourcing • Transparent fees • Producer responsibility
Chemicals	• Producer and importer responsibility • Information for enterprises and the retail sector • Greater knowledge-building concerning the effects on people and the environment • Better organisation of taxes
Nature and forests	• Optimise resource usage through financial partnerships • Joint ownership of nature




Introduction

The government intends to make better use of market forces in environmental policy to achieve environmental policy goals. The price mechanism and governance via the creation of flexible framework conditions can stimulate the responsibility of enterprises and the population to solve or help solve more environmental tasks.

The government platform 2001 *"Growth, welfare – renewal"* highlights the need to make the market work for environmental policies: *With the aim of achieving cost-effective solutions, the government will prepare a report on "making markets work for environmental policies", analysing the practical options for using market-oriented tools to promote a better environment.*

"Making markets work for environmental policies" means using market forces to solve environmental problems. There are various ways market players can be influenced to consider the environment: economic instruments (taxes, tradable permits, subsidies, environmental liability, etc.), which influence market prices directly, or by creating framework conditions (general regulations, voluntary instruments such as agreements, information, eco-labelling, product declarations and technological innovation) for the players, to give them the opportunity to choose their own specific solutions.

This report on making markets work for environmental policies needs to be seen in the specific context of the government's goal of achieving cost-effective solutions. The aim is to improve environmental measures, either by achieving more with the same resources, or by achieving the same result for less.

Change of direction in environmental policy

The government intends to breathe new life into environmental policies. In future, the aim of achieving cost-effective solutions and increased use of market-based instruments will be the guiding principles. This will be achieved via a review of a number of environmental policy issues. At the same time, however, the government has a number of commitments resulting from activities currently under way, EU regulations, and other international obligations. In some areas, therefore, in practice, the change in environmental policy will take place over a number of years.

A clean and healthy environment is an essential part of any modern society. A green market economy has to be founded in respect for our natural resources. The challenge is to unify human activity with good environmental protection. The government wants Denmark to be one of the leading countries in reducing pollution, and wants to achieve its ambitious environmental goals in the most cost-effective manner. Denmark must also fulfil its international obligations and participate in international cooperation based on realistic goals. The national strategy for sustainable development from June 2002 contains a number of environmental goals for Denmark which derive largely from international goals.

The OECD report: *"Environmental Performance Review – Denmark"* from 1999, recommends that Denmark increase its use of economic analyses and instruments in environmental policy, and points out that there is potential in Denmark for improving the environmental effects and cost-effectiveness of environmental taxes.

To date, environmental policy has been largely organised using administrative rules – typically competent authority approvals and monitoring. The traditional methods of regulation in the form of requirements and standards for emissions and technologies are not necessarily the most effective, and are not suited to solving all types of environmental problems. Further-more, there is a risk of inappropriate bureaucracy developing around the administration of the regulations.

The difference from the way environmental policy was previously conducted will lie in the choice of instruments. The government will critically review traditional instruments and increase the use of market-based instruments in the organisation of environmental policy.

An important step towards "making markets work for environmental policies" will therefore be to extend the practical use of market-based instruments. Economic instruments such as taxes, tradable permits, etc., provide consumers and enterprises with a financial incentive to reduce their environmental impact. Flexibility is achieved that makes it possible to limit the environmental impact where it can be done most effectively.

Initiatives and objectives for the use of economic instruments need to be evaluated in the light of the government's tax freeze. The government's platform 2001 *"Growth, welfare – renewal"* states that, *"The tax freeze does not prevent the essential restructuring of taxes. If there are compelling reasons for introducing or increasing a tax or charge, this will be done in such a way that the increased revenue is used, in full, to reduce another tax or charge. The same principle will be employed if, for environmental reasons, it is desirable to introduce or increase an environmental tax."* Restructuring of taxes will only be considered when it is a cost-effective instrument for improving environmental initiatives.

The responsibility demonstrated by enterprises and the population must be given room to operate freely. Solving environmental problems in the most socio-economically appropriate way will require initiative, motivation, and innovation from citizens and enterprises.

Regarding environmental monitoring, greater rewards should be given in future to enterprises which conduct themselves in an environmentally responsible manner. There needs to be greater correspondence between the service enterprises receive in the form of supervision, and what they pay for this service, so that the fee seems more just and transparent.

Private individuals also have a responsibility to take care of the environment. That this responsibility is being taken seriously is evident, for example, in local activities to improve the environment and protect nature, and in the consumers' demands for environmentally-friendly products.

Making markets work for environmental policies

"Making markets work for environmental policies" is about how the market can solve environmental problems. This is a better approach to solving environmental problems than the more traditional regulation of individual players, which is administratively more burdensome. *"Making markets work for environmental policies"* is about enterprises and consumers giving consideration to the environment in their daily decisions about consumption, production, and investment. The guiding principle has to be free initiative. The government will lay down the framework conditions for these measures, so that the market can work out the best solutions for itself – from both an economic and environmental perspective.

The challenge is to increase the use of market-based instruments in general, and to combine them so they influence market players to consider the environment in a way that ensures the most effective and cheapest environmental initiatives for society. The OECD points out that many environmental problems can best be handled using a broad range of instruments, with the exact combination of instruments being critical for their combined effectiveness. It is therefore important to view these instruments in context and across sectors. At the same time, each sector is responsible for integrating environmental considerations into their own policies(1).

Primary principles for making markets work for environmental policies

- Environmental goals must be achieved as cost-effectively as possible.
- The initiatives must be considered as a whole, across sectors and instruments.
- The overall economic growth of all sectors in society must occur without a corresponding growth in environmental impacts.
- The right framework conditions and incentives must be in place to ensure that the market contributes to solving environmental problems on its own initiative.
- The environment can be used as a competition parameter for enterprises, and be a driving force for innovation and technological development.
- The 'polluter pays' principle is central. A number of other considerations, including enterprise competitiveness, are also important.
- There is a need for carefully documented analyses of goals and the socio-economic advantages and disadvantages of potential measures.
- International efforts to make the market work for environmental policies need to be increased.
- Forward-looking initiatives in the areas of education, research, and innovation can contribute to improving environmental competencies in Danish enterprises and research and knowledge institutions.
- The responsibility of enterprises and the population must be furthered.

(1) cf. article 6 of the EU Treaty

Factors that affect the development of a green market economy

- Income development and relative prices.
- Consumer preferences.
- Direct and indirect regulation, including orders, bans, permitted emissions levels, owner-ship, environmental taxes, tradable permits, subsidies, etc.
- International frameworks for the regulation of environmental factors.
- Expectations for future environmental regulation and long-term environment goals.
- Knowledge, skills, and information.
- Technological development and infrastructure.
- Globalisation of production and trade.

To date, adequate use has not been made of price setting for environmental goods and natural resources. Therefore, in the future, prices must reflect the costs to society as far as possible, including the value of the environmental effects from production and consumption. The principle that the 'polluter pays' is important and applies equally in Denmark and the EU. A number of other considerations, including enterprise competitiveness, are also important.

As part of the process of making markets work for environmental policies, it will therefore be necessary to base initiatives on socio-economic analyses weighing up the advantages and disadvantages of the various instruments and between different focus areas.

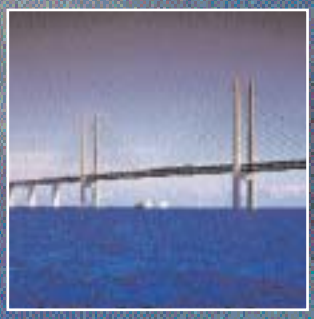
The market for environmentally-friendly products and production processes represents a significant potential growth area for Danish enterprises, both on the domestic and global markets. As already mentioned, an increasing number of enterprises are integrating environmental considerations into their commercial foundations as a competition parameter. This is contributing to increased innovation and renewal of products and production processes in an environmentally-friendly direction.

Consumers, investors, and employees are increasingly focusing their attention on how each enterprise's products affect the environment during production, use, and later disposal. This trend is expected to continue and will encourage enterprises to be ready to adapt in response to consumers' environmental demands, and enable them to document their efforts in relation to the environmental properties of their products.

As a consequence of globalisation, markets, communication, and the development and introduction of new technologies are increasingly transcending national boundaries. Globalisation is also leading to greater competition. Enterprises are constantly competing to be the first to introduce new ideas and to reduce the time between the appearance of new technological knowledge and the development and production of new products. This increased competition improves the potential for using the market to create cheaper and better solutions to environmental problems.

At the same time, globalisation of the markets leads to an increasing proportion of environmental impact being linked to the consumption and disposal of products which cross national borders. This increases the importance of voluntary environmental initiatives as a supplement to regulation, and makes it necessary to direct a larger proportion of environmental efforts towards forums such as the EU and WTO, where the frameworks for the global market are determined.

Globalisation also carries with it new economic and social challenges. In order to tackle these, in the Lisbon Strategy, the EU has set itself the goal of becoming the most dynamic knowledge-based economy by 2010. Initiatives to make the market work for environmental policies should, overall, be structured so that they contribute to this goal. The EU has highlighted environmental technology development as a good foundation for unifying efforts to promote a better environment with efforts to take the EU strongly into the future global knowledge society.

Changes of direction in environmental policy

An ambitious and responsible environmental policy will meet the environmental goals set – both nationally and internationally. The government takes this responsibility seriously. One example is the climate goal of reducing emissions of greenhouse gasses by 21 per cent in 2008-2012, compared to 1990 levels.

The Danish environment goals are described in a number of strategies and action plans and are implemented via Acts and Statutory Orders. The important goals for sustainable development are summarised in Denmark's national strategy for sustainable development.

Table 2 shows the overall environmental goals and the new instruments the government plans to focus on in its efforts to make the market work for environmental policies, along with examples of existing instruments. For each of the new instruments, details are given of the government's intended proposals. The new instruments are part of a process to make the market work for environmental policies, and will thus continue after the year indicated. A more detailed presentation of each of the five priority areas (climate change, water, waste, chemicals, and nature and forests) is given after the table, later in the chapter. The instruments, objectives, and initiatives already under way in each area are mentioned. The issues have been chosen on the basis of the weighting they have in environmental policy, including expenses and environmental impact.

To a certain extent, our goals and obligations derive from the international conventions and protocols being implemented in Danish legislation. In addition, a significant proportion of our goals and obligations represents the implementation of the EU's environmental regulation. In the period from 1994 to 2000, over three hundred environmental legislative acts have been adopted in the EU, each requiring transposition in Danish law.

The EU's overall long-term environmental goals for the next 10 years are stated, for example, in the EU's Sixth Environment Action Programme, adopted by the EU's Environment Ministers in March 2002.

Table 2:
General environmental goals, focus on new instruments and examples of existing mechanisms

Priority areas	*General environmental goal*	*Focus on new instruments*	*Examples of existing instruments*
Climate	• Limit emissions of green house gasses by 21 per cent in 2008-2012 compared to 1990 levels (the Kyoto Protocol)	• Flexible mechanisms: permit trading between countries, JI and CDM (DKK 130 million allocated in Finance Act 03) • Permit regulation and trading via the EU's Emissions Trading Directive (final adoption, mid 2003)	• Renewable energy in the electricity supply sector • Decentralised combined heat and power • Energy labelling • Electricity saving scheme • Environmental taxes on fuels • R&D in renewable energy
Water	• Prevent and combat contamination of groundwater and surface water	• Changes to the way the waste-water sector is organised, including deregulation and out-sourcing (proposal mid 2004) • Transparent fees and taxes (proposal mid 2004) • Greater use of financial instruments combined with reductions in administration in accordance with the Action Plan for the Aquatic Environment III (political negotiations expected to start in early 2004)	• Measures aimed at wastewater, nitrogen and pesticides • Wastewater charges • Tighter fertiliser regulations • Pesticide tax • Information • Approval schemes • Increased afforestation • Establishment of wetlands • More organic land use • Identification of particularly sensitive land use areas
Waste	• Decouple growth in the volume of waste from economic growth • Increase recycling • Increase the quality of waste management • Waste must be less dangerous	• Changes to the way the waste management sector is organised, including deregulation and outsourcing (proposal late 2004) • Producer responsibility (2004) • Transparent fees (2003)	• The waste tax • Product specific taxes and fees • The Consolidated Act on Waste • Deposit schemes • Information • Voluntary agreements • Grants for the development of processing technology
Chemicals	• In 2020 there must be no products or goods on the market containing chemicals with particularly problematic health or environmental impacts	• Producer and importer responsibility (expected to be implemented in 2004/2005) • Better information for enterprises and the retail sector (ongoing) • Further knowledge building regarding the effects on Man and the environment (follow up to future EU regulation, 2004/2005) • Better organisation of taxes	• Risk assessment • Approval schemes • Bans • List of undesirable substances • Taxes • Voluntary agreements • Information
Nature and forests	• Protect, preserve, reablish and develop the functional capacity of the natural systems and the natural habitats, including the genetic resource diversity, with the aim of stopping the loss if biodiversity in the EU and globally by 2010	• Optimise resource usage through financial partnerships (2003) • Joint ownership of nature (2003)	• Grants for afforestation and wetlands • Land-use regulation. • Preservation, protection provisions, etc. • Environmental impact assessment (EIA) • Advising and providing information about good, multi-faceted forestry operations

Climate changes

In order to combat global warming resulting from greenhouse gas emissions (carbon dioxide (CO_2), methane, nitrous oxide, and three industrial greenhouse gasses), the Kyoto Protocol from 1997 sets specific goals for the reduction of greenhouse gasses to be fulfilled in 2008-2012. Denmark has committed itself to reducing its average annual greenhouse gas emissions in the period 2008-2012 by 21 per cent compared to the base year, 1990. This is an ambitious goal, requiring the selection of cost-effective solutions.

If no new initiatives are pursued, it is estimated that the CO_2 shortfall will amount to approx. 20-25 million tons of CO_2 equivalents annually, or approx. 25-30 per cent of the total Danish greenhouse gas emissions. The CO_2 shortfall is the difference between the estimated emissions in the absence of further initiatives and the Danish reduction targets. The costs to society of correcting the shortfall are estimated at between DKK 1-2 billion and DKK 4-5 billion per annum in the five-year period 2008-2012 – depending on which instruments are employed. The instruments employed to date have been national initiatives in the form of energy and transport taxes, subsidies for energy savings and renewable energy, grants for the development of energy technologies, tradable CO_2 emissions permits in Denmark ($^1/_2$ million tonnes in 2001), combined production of heating and power, energy labelling, etc. A more cost-effective solution must also incorporate international instruments and ensure greater choice for enterprises.

Objectives

The government is giving high priority to the cost-effective fulfilment of Denmark's climate obligations. Given that it matters little to the environment whereabouts in the world greenhouse gasses are reduced, the key focus will be on reducing emissions in the most cost-effective area. Thus the options for making use of international "flexible mechanisms" must also be exploited. The decision base appears in the government's recently published report: "A cost-effective climate strategy". Given that the cost range is estimated to be between DKK 1-5 billion annually, it is obvious that the cheapest solutions have to be preferred.

The flexible mechanisms under the Kyoto Protocol are:

- international emissions permit trading,
- implementation of projects to reduce emissions of greenhouse gasses in *Eastern Europe* – "Joint Implementation" (JI), and
- implementation of projects to reduce emissions of greenhouse gasses in *developing countries* – "Clean Development Mechanisms " (CDM).

Consensus has been reached in the EU's Environment Council regarding a proposed directive on trading CO_2 emissions permits between EU Member States. The directive will involve the introduction of CO_2 permits for enterprises in the energy sector – primarily electricity supply utilities – and a number of energy-intensive industries, from 2005. Each year, these enterprises will be allocated a number of permits, and will be able to buy and sell permits in trading with other enterprises anywhere in the EU. The permit system is intended to work together with the project mechanisms. It will thus be up to each enterprise to choose whether they can most effectively meet their own emissions shortfalls through their own reduction initiatives, or by financing reduction initiatives abroad – depending on which is most cost-effective.

Reduction measures will largely be based on the use of flexible mechanisms. Preliminary estimates suggest that the price for permits and project credits (JI and CDM) is unlikely to exceed DKK 100 per tonne CO_2 in the period 2008-2012. A price in the range of DKK 40-60 per tonne CO_2 is most likely. However, there is a large degree of uncertainty associated with this estimate. It is also based on the assumption that USA will not ratify the Kyoto Protocol. A price level of less than DKK 100 per tonne CO_2 means that the flexible mechanisms will lead to greater reductions in CO_2 per DKK than most domestic mechanisms.

A few national reduction measures are considered to be competitive with the flexible mechanisms in terms of cost – and in some cases, perhaps even cheaper. This applies particularly to limitations for electricity production based on fossil fuels, and a number of energy-savings measures, etc. Most of the remaining national measures involve higher costs. For example, expansions to the use of offshore wind turbines or biomass as a fuel are currently associated with costs of just under DKK 300 per tonne CO_2.

In order to ensure consistency in reduction measures across sectors, a yardstick has been determined as a basis for implementing domestic initiatives. This yardstick is a CO_2 price of DKK 120 per tonne. This will facilitate a balanced approach between the sectors in Denmark for which domestic instruments outside the permit system might possibly be employed.

This approach requires that the government is only involved in the overall management of the market. Enterprises must act on the basis of prices and permit limitations, so that the market decides where and how activities should be implemented, i.e. in which sectors, and whether at the domestic or international level.

In order to show the way and "kick-start" one market, the government has allocated DKK 130 million in 2003 to purchase credits and establish project reductions in Eastern Europe.

The essence of the change of tack on climate change is that initiatives now have to be implemented in the most economical way, while also involving the international market in the form of flexible mechanisms. The narrow focus on individual national measures is being changed to a broader focus, in which the most important mechanism will be the implementation of the Emissions Trading Directive as a general instrument, enabling enterprises to choose the most cost-effective specific measures.

Initiatives

- Provide the necessary foundation to make significant use of the Kyoto Protocol's flexible mechanisms.
- Activate cost-effective national initiatives to reduce greenhouse gas emissions.
- Implement the EU's Emissions Trading Directive, including permits for the electricity sector and the energy intensive industrial sectors.
- Allocate DKK 130 million in the 2003 Budget to purchase credits and implement specific projects in Eastern Europe via joint implementation.
- Distribute the remaining financial burden across the sectors in a balanced way, based on the extent to which each sector has already contributed to reducing greenhouse gasses, and based on economic, competition, and administrative considerations.

The aquatic environment

Clean surface and ground water is an important resource, and water quality has great significance for the population and for use in trade and industry. Water-related tasks represent approx. 25 per cent of the total expenses for environmental initiatives, amounting to DKK 10 billion annually.

Water resource management and services are characterised by being primarily user-financed via payment for drinking water and wastewater treatment. Numerous facilities are involved, and the operational tasks are well-defined and delimited. Payments for water resource services vary significantly from municipality to municipality. The government wants to see a user-financed system in which enterprises and residents pay for the service they receive.

Industry, towns, and agriculture are contributing to the rapid spread of chemicals into the aquatic environment, damaging the environment and health. Levels of nitrogen and phosphorus leaching are also still considered to be too high. The consequences range from the continued contamination of groundwater to oxygen-depletion problems in coastal regions.

Agriculture has a key role to play in the long-term, cost-effective solution of these nutrient-related problems, and is already making an effort. The ongoing development of the agricultural sector contributes to maintaining the need for dynamic environmental initiatives.

Pesticide residual contamination in water borings – especially in private wells and drillings, is a problem. This is primarily the result of pesticides which have already been phased out, but once the groundwater has been contaminated, the damage cannot be undone.

Objectives

The government intends to create clear incentives to encourage increased cost-effectiveness and greater competition in this area. The organisation of the water supply and wastewater management sectors must therefore be reviewed and assessed in order to achieve greater cost-effectiveness.

The aquatic environment initiatives will be a collection of measures to

- prevent further contamination of the aquatic environment resulting from society's activities,
- ensure the operation and maintenance of sewers and waste water treatment plants, and
- reduce the environmental and health impacts from contamination from earlier periods. The government's guiding principle is that the initiatives must be economically appropriate.

One important general element is that the EU has adopted a new Water Framework Directive for water resource initiatives. The directive replaces a number of earlier individual directives and in this respect represents a deregulation of the area. Amongst other things, the directive aims at ensuring joint and more binding efforts in the area of transboundary contamination. This problem is relevant, for example, in relation to the protection of Danish coastal waters, which are affected by activities in the entire drainage area.

The Water Framework Directive requires Denmark to make greater efforts to protect the aquatic environment, especially in heavily impacted aquatic environments such as the Limfjord and Mariager fjords. The Water Framework Directive should be implemented in a way that leads to the improved cost-effectiveness of environmental policies. The government is therefore investigating the possibility of using the new directive to implement more cost-effective initiatives in the entire area of water services and water resource management. In order to prepare for this, a number of economic and organisational analyses of the water sector have been launched and are expected to be completed in 2004.

Public wastewater management costs approx. DKK 5 billion annually for operation, maintenance, and renovation of sewers and treatment plants. These activities are primarily carried out by the municipalities and are fully user-financed. The government has the goal of greater transparency for residents and enterprises in terms of what they are paying for.

Investigations suggest that the municipalities are delaying maintenance and renovation of the sewer network to an extent that is economically inappropriate. There is therefore a need for greater transparency in relation to municipal expenditure on wastewater treatment, for more competition within the municipal wastewater-management sector, and to consider merging the small municipal entities into larger companies with the expertise and resources to carry out the necessary renovation and provide the necessary services.

The options for organising the task differently should therefore be investigated, for example, separating the municipalities' supervisory and operational roles. The options for outsourcing the operation and maintenance of sewers and treatment plants should also be considered. It is believed that outsourcing the provision of these services would create a better basis for Danish enterprises to develop products, technology, and expertise to help do the work better and more cost-effectively.

The government will invite the parties of the Folketing to the negotiation of Action Plan for the Aquatic Environment III. The central goal is to renew and improve efforts to reduce the impact from nitrogen and phosphorus from agriculture, and to ensure that Denmark fulfils the EU requirements in this area.

In order to provide a good decision basis for Action Plan for the Aquatic Environment III, three working groups have been established to analyse the use of various types of measures, including market-based mechanisms. General consideration will be given to whether (and how) regulation of the area can be simplified and made more transparent for agriculture, and how it can be structured to give maximum scope to each farmer to choose the most cost-effective solutions. Assessments will also be made of the options for replacing regulation with financial instruments, including taxes and tradable permits. The possibility of introducing taxes on nutrient losses or tradable nitrogen permits will be evaluated.

A reform of the EU's Common Agricultural Policy subsidy schemes has high priority and will reduce environmental impacts. If the direct connection between subsidies and the scale of production can be broken, this may in itself lead to a more environmentally-friendly utilisation of resources. The government will strive to ensure that EU budget resources from direct subsidies are transferred to initiatives in rural areas, including nature and environment activities and food safety.

An evaluation of the Action Plan for Pesticides II will be carried out in 2003. This will include an assessment of goal performance and the instruments utilised, as well as an assessment of the economic consequences of the plan.

To ensure priority efforts are made across all areas, the government will incorporate all aspects of the use of pesticides into the new pesticide strategy. This will make it possible to see the future initiatives in context and help target them to the areas in which the environmental and health impacts are greatest. This broad approach will also make it easier to select the most economically effective measures.

Organic production makes an important contribution to improving sustainable development in agricultural production. The government would like to see the organic sector continue to develop, based on consumer demand and common EU regulations. The 'Export strategy for organic products' prepared by the Organic Foods Council has provided the Ministry of Food, Agriculture and Fisheries, the organic organisations, and enterprises, with a solid foundation for future market-based initiatives to promote exports of organic food.

Initiatives

- The financing and organisation of all water services and water resource management initiatives is to be analysed and restructured as part of the implementation of the Water Framework Directive – to help ensure, amongst other things, that economically appropriate solutions are found.
- Furthermore, principles and regulations for the management of contamination from the past, which is threatening the aquatic environment, drinking water, etc., will be reassessed to find cheaper solutions.
- The organisation of the wastewater sector is to be investigated and assessed to ensure that sewers, treatment plants, etc., are renovated in a more cost-effective manner and rate than is the case today.
- A thorough decision base is to be prepared for the Action Plan for the Aquatic Environment III, incorporating the use of more flexible and cost-effective solutions to the problems of nutrient leaching, for example, taxes and tradable permits.
- A new pesticide strategy is to be prepared.
- The EU's Common Agricultural Policy needs to be adjusted to support the market-orientation of activities, and to provide greater incentives to develop more environmentally-friendly operating methods.

Waste

Economic development and our production and consumption patterns have a great impact on the volume and composition of waste. Today, waste management facilities have to process very complex products. As a result, our waste processing plants require everlarger capital investment.

Waste management is an important part of environmental policy. The cost associated with the collection and processing of waste accounts for almost one-third of total public environmental expenditure.

Most of the tasks are user-financed and subject to the principle of cost coverage. The municipalities have practical responsibility for the services and charge a waste-disposal fee to cover the costs associated with the waste management attended by the municipalities, but the costs vary greatly between municipalities.

The area of waste management is characterised by too little competition and too much bureaucracy. It is too difficult for citizens and enterprises to see what they are getting for their money when they dispose of their waste, and there is a lack of incentives to make the sector more cost-effective. Individuals and enterprises whish to have more choices and more flexible schemes.

Objectives

The government wants to see a more efficient and cost-aware waste management sector, with a high environment profile. This goal is to be achieved by simplifying regulations, increasing fee transparency, outsourcing, and producer responsibility.

Today there are more than 8,000 municipal rules and regulations in the area of waste management. This complexity is a significant barrier to the entry of private players into the market, and is a clear burden for carriers and enterprises that operate across municipalities in particular. A simplification of the municipal waste management regulations would lead to better competition conditions for players and make it easier to compare fees between municipalities.

There is a potential for efficiency improvements in the area of incineration and landfilling. The advantages and disadvantages associated with various degrees of deregulation of landfilling and incineration facilities are currently being investigated. Deregulation and outsourcing do not intrinsically make market players give greater consideration to the environment, as, for example, a tax does. But deregulation and outsourcing can lead to greater competition, and hence improved efficiency. They are instruments that can help realise the potential for rationalisation already observed.

These projects have been initiated by the working group for the organisation of the waste management sector, appointed by the government. At the end of 2004, this working group must make recommendations for how the organisation of the waste management sector can be made more efficient. One example of an efficiency gain from deregulation might be that certain waste fractions could be referred to a particular type of processing, e.g. incineration, rather than to a particular facility, as is the case today.

Producer responsibility can be economically appropriate in a number of areas, for example, for cars and electronic goods. When producers or importers have responsibility for handling the disposal of their products, they will seek to reduce their waste management costs by producing environmentally friendly products. Producer responsibility means that producers are given responsibility for organising and financing waste management.

Increasing product complexity and processing requirements are placing demands on the development of new processing technologies. Some technologies are now mature enough to be used in full-scale under market conditions. This development is essential in order to achieve better and cheaper waste management in the future.

In addition to these initiatives to ensure a more efficient waste management sector, the government is preparing a new waste management strategy for the period 2005-2008.

This new strategy will focus on reducing the volume of waste and its environmental impact, but the government also emphasises that changes to current initiatives will only be made if there are socio-economic benefits. The strategy will define the framework for future municipal waste management planning and set out the national waste management goals and instruments compulsory for EU Member States in a more concrete form.

Under the new strategy, the government will place greater focus on the magnitude of the environmental problems and the negative socio-economic impacts associated with waste, rather than simply on waste volumes. The central instruments will be taxes, producer responsibility, voluntary agreements, and information.

The decision base for new initiatives must be supported by environmental and socio-economic analyses, to ensure that environmental benefits are weighed against costs in a structured way and that the most cost-effective solution is chosen.

Investigations are also needed to determine whether the waste tax can become a more targeted instrument. This will be done by examining whether the tax rates adequately support waste policy. An alternative to taxes could be tradable permits, and the options for using such permits are also being investigated.

Voluntary agreements have been established in the area of waste management, for example, relating to the processing of used tyres and refrigerators containing CFC's, selective demolition of buildings, and transport packaging recycling. The possibilities for making use of voluntary agreements in other areas will be examined.

Initiatives

- The entire waste management sector must function efficiently so that we achieve our environmental goals in the best and cheapest way possible.
- Citizens and enterprises need to be able to see what they are paying for. Waste management fees must truly represent costs and be comparable, and the fee rules must be clarified.
- Greater competition can be achieved by further separating the municipalities' authority and operational roles, so that the environment and costs are given priority over concerns about their own facilities.
- The options for deregulating and outsourcing incineration and landfill facilities must be investigated.
- Producer responsibility must be introduced for motor vehicles, electronics/electronic goods, and other waste fractions for which it is environmentally and economically beneficial.
- A new waste strategy 2005-08 will be presented in spring 2003.
- Waste tax charges must be investigated to see if they adequately support waste policy.
- More socio-economic analyses must be carried out for the area of waste management.

Chemicals and products

In Denmark, approx. 20,000 different chemical substances and around 100,000 preparations are used. Added to this are the chemicals contained in approx. 200,000 industrial goods.

For most chemicals, there is currently insufficient knowledge about their impacts on human health and the environment, and we do not know enough about which chemicals are contained in the products we purchase and use.

The EU chemical regulations are basically a harmonisation of the legislation in all the Member States, and the Danish chemical regulations are therefore often directly linked to international regulations, agreements or cooperation.

The current Danish regulations employ administrative instruments in the form of bans, restrictions on uses, and approvals, supplemented by voluntary agreements and information. Due to the harmonisation of legislation, there is not much room, domestically, to introduce restrictions on use. Any such national regulations must be well-documented and must accommodate the rules concerning the free movement of goods. At the same time, the instruments that least distort competition must be used. These might be, for example, taxes on chemicals.

Objectives

The government's most important goal is that by 2020 there should no longer be any products or goods on the market containing chemicals with particularly problematic health or environmental impacts(2). The chemicals used in society must not cause undesirable effects such as cancer, reduced fertility, or genetic changes, and must not impact on sensitive ecosystems. The most important mechanisms being considered, both domestically and in the EU, are knowledge-building, analysis, and information.

In the EU, it has so far been the task of the Member States to investigate and assess the risk of chemicals before any regulations are introduced. This work is extensive, and information about product contents and properties is not always available to the authorities. Therefore, in early 2003, the Commission will present a proposal for a completely new way of regulating chemicals, promising clear efficiency improvements.

The most significant change is that, in future, the chemical industry will be required to investigate and evaluate chemicals itself. The authorities will continue to be responsible for the actual approval process. Once industry, rather than the authorities, is responsible for ensuring chemicals can be produced and used safely, it can be expected that environmental improvements will be arranged in the best and cheapest way possible. The industry has detailed knowledge about the production of the chemicals and their properties, etc., and it can therefore determine how the risk can be limited.

(2) The goals are stated in the government's national strategy for sustainable development ("A Shared Future – Balanced Development", June 2002) and in its proposed 'Strategy and action plan for environmental factors and health' (January 2003).

The EU will also soon introduce an authorisation scheme for particularly dangerous substances. This implies that industry will no longer be automatically permitted to use particularly dangerous substances, but will have to seek approval and prove that it is safe to use the notified chemicals. Danish enterprises that produce, import, or use chemicals will gain a competitive advantage if they are informed of the new EU chemical regulations as early as possible, so that they can plan the most costeffective approach ahead of time.

Once the new EU chemical regulations are in place, it is expected that the need to introduce purely national regulations restricting uses will fall dramatically. Denmark has previously introduced a number of national chemical regulations in areas not yet covered by any EU regulations. This has been very burdensome, not just at the administrative level, but also for Danish enterprises.

There is particular focus in Denmark on the analysis of chemicals in consumer products and endocrine disrupters, since uncertainty about the possible harmful impacts from these substances on humans and the environment is causing concern. Efforts are being focused on investigating the extent to which consumers are exposed to chemicals, analysing where the particularly problematic substances are found, and informing consumers, purchasers, and the retail sector about the findings.

The "List of undesirable substances" is to be updated in 2003. This list identifies the substances future initiatives will be directed towards, including substances expected to be covered by the forthcoming EU authorisation scheme. Danish enterprises need to be able to see an advantage in changing to less harmful substances.

The "List of undesirable substances" will highlight a group of high priority substances/substance groups for which specific initiatives are required to reduce their application. The initiatives will be planned separately for each priority substance/substance group. The mechanisms are most often product-related, for example, recommendations to consumers to use eco-labelled products which either do not contain the undesirable substances, or do so only in small quantities.

Initiatives

The new EU regulations:

- More cost-effective regulation of the use of chemicals.
- Greater knowledge regarding the effects of chemicals on human health and the environment.
- Greater responsibility for producers and importers.
- Substances with documented, endocrine-disrupting effects will be covered by an authorisation scheme.

National market-oriented initiatives:

- National regulations banning or restricting the use of chemicals will only be introduced in cases where there is a clearly documented special need.
- More and better information to Danish enterprises and consumers about new knowledge.
- Analysis of undesirable chemicals in consumer products.
- New version of the "List of undesirable substances", focusing and integrating international initiatives.

Forests and nature

The development of the Danish society throughout the last century has led to increasingly difficult conditions for nature. In order to ensure an appropriate level of conservation, Denmark has made use of a diversified regulation of its natural resources.

This regulation is supplemented by a number of international obligations which place demands on Denmark's nature conservation efforts. The challenge is to continue to optimise and rationalise the total regulation of nature conservation within these frameworks, in an economically reasonable manner.

There is also a need to ensure a reasonable balance between the requirements and wishes of the population, and conditions for land owners, associated enterprises, and total land use.

Objectives

The majority of the country's open spaces and nature areas are privately owned, and the government will seek to supplement existing regulations or replace them with self-regulating or self-financing measures.

The government is also emphasising the increased involvement of local stakeholders and better dialogue with residents about the content and quality of nature conservation.

One model for market-based regulation of nature conservation could be to introduce the right for owners to charge a fee for access to heaths, forests, and beaches. However, the model is not directly feasible, since it is in fundamental conflict with the established right of public access.

Therefore, the initiatives relating to private land owners must be directed towards other options for creating or exposing marketable assets. The regulations thus need to be simplified to increase opportunities for owners to produce and sell natural assets to a greater extent (hunts, horse riding, and other nature activities).

Work on labelling of forestry products needs to be further developed in cooperation with businesses and organisations, assuming it is found to be possible to obtain higher prices for labelled products.

In a proposed EU directive on environmental liability, the 'polluter pays' principle is expected to be extended to cover damage to biodiversity and nature. The implementation of this directive is expected to provide opportunity for partial market-based regulation through the establishment of private insurance schemes to manage compensation payments and measures.

As far as the government's activities in the area of nature conservation/biodiversity are concerned, initiatives will be based on socio-economic principles.

In order to achieve more comprehensive results, in future, the provision of public assets in the form of public forests and nature areas, with recreation, communication and information facilities, and activities, will be based to a greater extent on partnerships and joint ownership between public and private stakeholders. One example is municipal cofinancing of afforestation projects, where a positive economic synergy effect is achieved between two environmental goals – clean drinking water and public nature recreation areas.

Initiatives

- Simplify and revise regulations with the aim of creating better opportunities for land owners to produce and market nature-related services.
- Evaluate existing regulations and investigate the possibilities for local decision processes based on the involvement of direct stakeholders.
- Support for market-based eco-labels where these are economically sound.
- Optimise the use of resources with the aid of socio-economic analyses of the forest and nature conservation area.
- Optimize resource usage through financial partnerships.




Market-based instruments

Three forms of market-based instruments are examined below: *economic instruments* such as taxes, subsidies and tradable permits, *voluntary instruments* in the market for cleaner products, such as eco-labelling and product declarations, and *technological innovation*. The three types of instrument are described below, including their areas of application, current experience, and perspectives on their future use.

Economic instruments

Prices do not always reflect the scope of the environmental impact associated with production and consumption. The goal of employing economic instruments is to include pollution in the calculation of prices. This is consistent with the 'polluter pays' principle. Taxes encourage producers, investors, and consumers to act in a more sustainable manner, as they decide which goods or services to produce, invest in, or purchase.

Table 3:
Economic instruments

Economic instrument	*Mechanism*	*Controls via*	*Area of application*
Taxes	The "cost" of pollution, forcing producers to include pollution in their calculation of production expenses	Price	International/national/(local)
Tradable permits	Emissions permits can be traded between enterprises to limit emissions in the most cost-effective way	Quantity	International/national/local
Joint implementation	Bilateral implementation of pollution reduction across national borders, to reduce pollution in the most cost-effective way	Quantity	International
Tilskud	Financial support for research and development, technology, etc., or to improve framework conditions	Price	International/national/local
Voluntary agreements	Voluntary reductions of emissions, in exchange for being exempted from a tax	Quantity	National/local
User charges	Direct payment for a compulsory service to make an actual expense visible	Price	National/local
Environmental liability	Obligation to restore damage to environmental assets, or pay compensation if the damage caused cannot be restored	Price (via insurance)	National

Under the right conditions the market can contribute to a certain flexibility for enterprises to reduce environmental impacts cost-effectively. Economic instruments provide an incentive for enterprises to demand cleaner and improved technologies, and can therefore provide an important driving force for the development of new technologies.

A cost-effective environmental policy should be based on a mixture of economic instruments, including taxes, tradable permits, joint implementation, subsidies, voluntary agreements, user charges and environmental liability, cf. table 3.

Privatisation and outsourcing are not economic instruments that in themselves affect price and quantity but they can be measures that contribute to cost-effectiveness. Privatising or outsourcing services can lead to more efficient organisation and can reduce the public sector's monopoly-like position in the market, thus creating a more economically efficient, active market.

Compared to other countries, economic instruments are being used quite extensively in Denmark. The majority of economic instruments are based on taxes and subsidies. Tradable permits are being used to some extent.

There is a generally increasing trend for economic instruments such as taxes and tradable permits to be used in industrialised countries, as they are considered to have a number of advantages over other forms of regulation, not least that they are cost-effective. The EU cooperation is also moving in the direction of using market-based instruments. The government supports the international expansion and coordination of the use of market-based instruments, especially within the EU. This is consistent with the government's desire to see common minimum rates introduced for environmental taxes in the EU.

The tax freeze, together with international regulation considerations, distribution effects, etc., places some constraints on the economic instruments that can be used in Danish environmental policy. It is important to be aware that the structuring of economic instruments will often be subject to other considerations, such as enterprise competitiveness, ease of administration, and the desire to achieve a certain level of revenue. Furthermore, the cooperation within the EU and other international agreements define the frameworks for the use of economic instruments in Denmark. These include, for example, regulations on government subsidies and agreements on minimum tax rates.

Not all environmental problems can be solved by economic instruments. One example is highly dangerous substances, where it is crucial that certain threshold limits are not exceeded.

The basic idea of the government's tax freeze is that no taxes or charges are to be increased. However, environmental considerations can justify the introduction of a new environmental tax or increases to existing taxes. Any increase in revenue must be used to reduce another tax or charge. Changes to environmental taxes will only be considered in situations where it is clear that taxes are the most appropriate instrument.

Some experience already exists to be further built upon. Previously conducted evaluations and less comprehensive studies and estimates have shown that, in general, the effects of the Danish environmental taxes have been positive. In some cases, the environmental effect has been great, even for modest taxes. For example, the tax differentiation between diesel containing sulphur and diesel low in sulphur content. In other cases, it can be difficult to ascertain whether the tax has had an environmental effect, for example, the tax on PVC. If environmental taxes have to be changed or new ones introduced in future, a solid decision base will first be established, including well-supported analyses of goals and instruments.

The difference in the effects on the environment from various taxes depends, for example, on the size of the taxes, administrative considerations, opportunities for isolating the effects of the tax, and the ability of the players to react. A number of these factors can change over time, creating a basis for structuring more environmentally effective taxes. In general, environmental taxes leading to positive environmental effects will yield diminishing revenue over time as consumers and enterprises change their behaviour to consume less of the resource subject to the tax.

In Denmark, there are 24 environment-oriented taxes, that is, pollution, energy, and transport and resource taxes. These environment-oriented taxes yielded revenue of DKK 63 billion in 2001. Only about 1.5 per cent of the total tax revenue derives from pollution and resource taxes. Pollution taxes are the taxes which have been introduced on the basis of purely environmental considerations. Other taxes have primarily been grounded in fiscal considerations, that is, they have been aimed at achieving a certain level of tax revenue. The taxes designed with a clear environmental objective in mind have generally led to significant environmental improvements. But for a number of taxes, there is potential to achieve greater environmental effects by changing the design of the taxes. The options for making these taxes more environmentally and cost-effective, without conflicting with other important considerations, will be subject to ongoing review, while bearing in mind the premises of the tax freeze.

The government is continually working to reduce the extent of subsidies. The subsidies that remain must have the objective of creating better framework conditions for the market to make production and consumption choices leading to reduced environmental impact, and must be aimed at environmentally-friendly agriculture, reductions in the environmental impact from energy production and consumption, and, to a lesser extent, the development of cleaner products.

Tradable permits have many advantages in relation to achieving environment goals in a cost-effective manner. A system of tradable permits provides for healthy, internal pricesetting by determining the scope of pollution reduction and letting the market decide the price for this. Tradable permits are an interesting mechanism that can be considered when the administrative consequences reasonable.

Denmark was the first country in the world to establish a system of tradable emissions permits for CO_2 emissions from electricity production. The electricity supply companies have been allocated an annual CO_2 permit, up until 2004. If an emissions permit is exceeded, a fine of DKK 40/tonne CO_2 must be paid to the government.

The Danish climate strategy is now giving crucial focus to the use of tradable permits via the EU's Emissions Trading Directive and the flexible mechanisms of the Kyoto Protocol. As an example of the latter Denmark entered into a contract with Romania in March 2003 regarding the first Danish joint implementation project.

Experience with the use of voluntary agreements has shown that they are suitable for achieving nature and environmental goals in a number of cases. In order to work appropriately, these agreements must be precisely formulated and be mutually binding for the parties involved. Their use must depend on a specific assessment for each area.

It is important that new applications or extensions to existing applications for economic instruments are based on solid scientific evidence and cost-benefit analyses. Cost-benefit analyses are not a new discipline. However, a number of methodological approaches particularly linked to the environment, such as the valuation of the social costs of pollution, are still under development. Focus will be given to ensuring that research and investigation activities support the development of well-founded decision bases. It is also important that the necessary data exist for evaluating the advantages and disadvantages of the instruments.

Initiatives and objectives

Based on previous experience with the use of economic instruments to regulate environmental and natural resources, the following initiatives and objectives have been identified within a number of focus areas:

More environmentally and cost-effective taxes

- Analyses of selected environment-oriented taxes in Denmark have been initiated. The costs and environmental effects of the wastewater tax are being evaluated. This work will be completed in mid 2003. An analysis of waste management tax rates will be initiated in 2003.
- The existing environmental taxes will be subject to ongoing evaluation. There appears to be a particular need in the initial phase to examine taxes in the area of waste management and chemicals use. These evaluations need to assess the advantages and costs associated with the existing taxes, and with alternative designs for these tax structures. Alternatives to be considered include benchmarking, differentiated rates, and a base deduction.

Subsidy schemes should be designed to take environmental considerations into account

- Some subsidy schemes have negative environmental effects. This is the case, for example, for some of the industry tax concessions introduced due to competition concerns, which indirectly function as subsidies for these enterprises. The long term strategy should therefore involve phasing out or changing such indirect subsidies and the need to consider effects on competition, etc., should be regularly reassessed(3).

Increased international use of economic instruments

- International coordination of market-based mechanisms is important. The EU's energy taxation directive is in the process of being negotiated, which is a step towards minimum tax rates for the environment and energy. Consensus has been reached in the EU Environment Council regarding a proposed directive on emissions permit trading. This reflects united efforts within the EU to reduce greenhouse gas emissions in a cost-effective manner.
- The European Commission has presented a proposal for a directive on environmental liability, to help prevent and remediate environmental damage. Denmark supports the adoption of a directive on regulation of environmental damage and will seek to ensure that the liability under the proposed directive is clear and predictable enough to provide the basis for developing an insurance market to cover the polluter's liability.

(3) This means, for example, in the climate area that the interplay between taxes/tax concessions and permit regulations must be evaluated. Some of the enterprises that presently receive a reduction in their CO_2 tax will be covered by the permit scheme, and others will not.

Increased domestic use of economic instruments

- The Ministry of Transport has appointed an inter-ministerial committee to examine, amongst other things, the consequences for Danish goods transport resulting from the future German kilometre tax and the European Commission's future framework directive on infrastructure taxes. The committee will present a knowledge base to help enhance the Danish position in relation to subsequent negotiations in the EU concerning tax regulations for heavy vehicles. The committee will present its report in mid 2003.

There needs to be a solid knowledge and decision base for economic instruments

- Environment policy initiatives must be based on scientific and socio-economic analyses, for example, cost-benefit analyses. Research and investigation initiatives should support the development of welldefined decision bases. The Ministry of the Environment, the Ministry of Transport, the Ministry of Economic and Business Affairs, and the Ministry of Food, Agriculture and Fisheries are working to improve the methodological foundation for carrying out cost-benefit analyses of environmental conditions, particularly with the aim of guiding the use of economic instruments.

The market for cleaner products

Product development, production, transport, and marketing are increasingly transcending national borders. Many products are based on subcomponents supplied from other countries. The environmental impacts of each product will therefore often take place in many countries.

Given the free movement of goods within the single European market and on the world market, it is difficult to regulate products directly via administrative regulations – beyond certain minimum requirements. In many cases, it will not be sufficient to use domestic economic instruments (taxes etc.) either, because subcomponents from many different countries are involved, and because customers are also spread across a similar number of countries. The use of a number of voluntary instruments can be an appropriate supplement, with the aim of ensuring the continued development and marketing of products undergoing gradual environmental improvements throughout their entire life cycle.

Danish enterprises must have access to relevant knowledge and good framework conditions in order to establish adequate competence. The instruments involved here are primarily voluntary, and are best developed in cooperation between the government and the private sector.

The instruments relate to the promotion of innovation and the spread of environmentally friendly products and technologies. Market transparency can be increased via trustworthy information to consumers, for example, the "Swan" and "Flower" eco-labels.

At the Johannesburg summit business and industry reconfirmed their interest in achieving sustainable development. It is necessary to enter into partnerships and establish new forms of dialogue between the market players and authorities. Greater involvement by enterprises and consumers creates a good framework for knowledge sharing in all stages of the supply, marketing, and demand for cleaner products. In the product area, positive experience has been gained with new forms of dialogue and cooperation which involve all the relevant players on the market, give joint ownership to the initiatives and achieve tangible results.

International initiatives will gain increasing significance in a global economy. Efforts must focus on initiatives that promote the EU's development of integrated product policy and follow up on the Johannesburg goal of sustainable production and consumption patterns. The increased use of producer responsibility in specific productsgroups with particular environmental or resource problems is an option that is increasingly being employed in the EU.

Initiatives and objectives

Better documentation and information about cleaner products on a European basis

Under the framework of the EU's work with Integrated Product Policy (IPP), the Ministry of the Environment will seek to:

- Establish a common European methodological foundation for life-cycle assessment of products and information about products' environmental impacts.
- Achieve an approximation of the national eco-labels in Europe to the EU flower, so that private consumers have a simple, visible, and trustworthy eco-label upon which to base their free consumer choices.
- Achieve better cohesion between the environmental information tools in the product chain.

Better cooperation in the market for cleaner products

- Future cleaner product initiatives will include focus on innovation and the dissemination of environmentally friendly products. The initiatives will target particular productgroups with economic and environmental significance. An analysis has been initiated to provide a basis for selecting these areas. Focus will also be on partnerships and dialogue with market players concerning the supply, marketing, and demand for cleaner products.

Technological development and innovation

Globalisation and rapid technological development have lead to increased competition between enterprises. In many sectors, the average lifetime for products, services, and technologies is much shorter than it was just 10 years ago. For example, in 1950, 90 per cent of the market-leading enterprises were able to survive for 10 years(4). Today, only 20 per cent are able to remain in the market over a ten-year period. These figures illustrate the more extensive and rapid changes taking place in the market and the need to remain on the technological leading edge.

Distinction is made between three types of environmental technology: end-of-pipe technologies, cleaner technologies, and environmentally effective technological systems. It is expected that in future, all three types of environmental technology will come to play a significant role in the area of the environment. Cleaner technologies are forging ahead, replacing end-of-pipe technologies to a certain extent. But there continues to be a need for end-of-pipe and waste management technologies in the short and medium term. In the long term, the goal is to minimise the consumption and production of chemicals that are harmful to health and the environment.

The development of end-of-pipe technologies is often closely linked to the development of cleaner technology. It is therefore important that Danish enterprises have access to end-of-pipe and waste management technology competencies, in order for them to be able to develop cleaner technology. There is increasing international interest in the development of environmentally-effective technological systems, due to, for example, the growing significance of climate change and increasing transport-related environmental problems. The majority of the technology used in Denmark will be developed in other countries. International cooperation is therefore important.

The global market for environmental technology is estimated to be at least Euro 550 billion(5) and is seen as a growth area. The value of Danish exports to this market has grown to over DKK 15 million annually, and is also characterised by high growth(6). The European Commission's report on sustainable development for environmental technology(7) from March 2002 concluded that the market for environmental technology represents between 2.3 and 3 per cent of the EU's total GDP. Of this amount, capital expenses constitute 30 per cent, while the remainder is operating expenses. The European Union is the largest export market for Danish environmental technology. The future market for environmental technology will depend particularly on the developments in business and innovation policy and environmental policy.

(4) Holten Larsen, M. and Schultz, M., Den udtryksfulde virksomhed, 1998

(5) This is a minimum figure.It does not include plant for the production of renewable energy, including wind turbines, biogas plants, etc., because the statistical summaries do not make it possible to distinguish these items from other energy technology.

(6) In contrast to the EU summary, this figure includes technology based on renewable energy, including wind turbines.

(7) Report from the European Commission, "Environmental technology for sustainable development", Brussels, 13.03.2002, COM (2002) 122 final

The EU has set itself the goal of becoming the most knowledge-intensive and dynamic economy in the world by 2010. In pursuit of this goal, funds have been set aside in the EU's Sixth Framework Programme for Research, Technological Development and Demonstration, for research into sustainable energy and transport technologies, including technologies to exploit renewable energy sources, hydrogen cars and fuel cells.

The government's strategy – "The Danish Growth Strategy" concludes that Denmark is not quite able to keep up with the leading countries in terms of innovation and technological renewal. The challenge is to increase both public and private research and development efforts and ensure that research and new knowledge is better exploited commercially. The OECD's comparative analyses also point out that Denmark could become better at converting new research results into commercial applications.

In a number of areas, the existing Danish domestic market for environmental technology solutions is not large enough to develop competitive enterprises on the global market. Municipalities and utility companies are often small, and lack the necessary competencies and tradition for a development-oriented approach to solving environmental problems.

The government has historically made large investments in end-of-pipe and resource management technologies, for example, in relation to wastewater and waste. More than DKK 9 billion has been invested in wastewater treatment plants under the Action Plan for the Aquatic Environment I.

Compliance with environmental legislation will also require that private enterprises and government institutions invest in end-of-pipe technologies and in the use of cleaner technology. The requirement to use the Best Available Technology (BAT) is also an important component of the EU directive "Integrated Pollution Prevention and Control" that regulates industrial enterprises.

Based on long-term environmental policy goals, the EU has determined emissions standards in specific areas, to come into effect over a set number of years. These emissions standards are based on the employment of expected future technology developments. Thus the development of environmental regulation and the development of technological innovation contribute to each other. Environmental legislation rarely stipulates detailed requirements for the use of specific technologies. Rather the market selects the most suitable environmental technologies, and enterprises play a key role in innovation.

Experience has shown that sector policies have great significance for the development of environmentally effective technological systems. A restructuring of technological systems is dependent on the framework conditions for the sector's development (for example, in the form of investments in infrastructure) supporting the introduction of new and more environmentally friendly technological systems.

Initiatives and objectives

- Environmental technology innovation is a growth area in the knowledge economy, for which Denmark has significant strengths. Large sums of money are being invested in environmental technology innovation in the EU, and Danish enterprises and research institutions should participate in this knowledge building. An important element will be to strengthen cooperation with partners in the EU, including joint financing in relation to European initiatives. The government has presented a strategy *"Knowledge in Growth"* which aims to assist Denmark's transition to a knowledge based society. In this strategy, emphasis is given to improving the knowledge infrastructure in Denmark. This is to be achieved in part through increased focus on the interplay between enterprises and knowledge institutions, and mutually between enterprises. Such development-oriented "partnerships" might help to promote the formation of competitive environmental knowledge environments, which would improve the foundation for participation in international research and development projects and promote more cohesive and internationally-oriented innovation initiatives.

- One of the recent environmental innovation policy initiatives is the preparation of green technological foresight. The Ministry of Science, Technology and Innovation is carrying out a technological foresight project in the years 2001-2004. A technological foresight analyses the expectations of various players regarding the future direction of technological development, and is a tool for targeting and prioritising environmental technology innovation initiatives. It will be relevant to prepare specific technological foresights in selected areas where significant commercial and environmental perspectives are anticipated.

- As part of the strategic targeting of elements of the Danish research and innovation efforts, there is a need to identify how environmental technology innovation can be incorporated into research and development within specific technology areas, such as nanotechnology.

- In order to achieve better and less expensive environmental solutions it is important that research and new knowledge is better exploited commercially, and that prospective technologies are commercialised. The action plan for strengthening the interaction between Danish trade and industry and knowledge institutions, to be presented by the government in 2003, will contribute to this.