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## CONCLUSIONS AND RECOMMENDATIONS

This report examines Denmark's progress since the previous OECD Environmental Performance Review in 1999, and the extent to which the country has met its domestic objectives and honoured its international commitments. The report also reviews Denmark's progress in the context of the OECD Environmental Strategy for the First Decade of the 21<sup>st</sup> Century.\*\* Some 37 recommendations are made that could contribute to further environmental progress in Denmark.

Denmark's economic progress provides the country with high average income per capita and extensive welfare benefits. Its open economy thrives on trade in the EU and globally. It is largely driven by intensive agriculture and fisheries, which support a large agro-food industry and have a large environmental impact. Other severe environmental pressures stem from its transport sector and from its energy supply structure, which continues to rely mainly on fossil fuels. Environmental issues in Denmark also have a strong international dimension due to regional economic and environmental interdependencies (e.g. EU co-operation, North Sea and Baltic Sea pollution, transfrontier air pollution). Denmark is strongly involved in European and global environmental issues and environmental aid.

Over the review period, economic growth and implementation of European Union legislation provided the context for economic and environmental decision-making in Denmark, together with a tax freeze and a major territorial government reform. The implementation of environmental policies is being further devolved to municipal authorities. Environmental policies currently focus on: air pollution, the aquatic environment (nutrient discharges and groundwater contamination), biodiversity, chemical substances, environmental health, and global issues such as climate change. Measures to address these issues rely on a range of diverse, well-established and in some cases innovative policy instruments.

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\*\* The objectives of the Strategy are covered in the following sections of these Conclusions and Recommendations: maintaining the integrity of ecosystems is covered in Section 1; decoupling of environmental pressures from economic growth, in Sections 2.1 and 2.2; and global environmental interdependence, in Section 3.

## 1. Environmental Management

Building on solid environmental legislation largely harmonised with and derived from EU environmental directives, and benefiting from experienced environmental administrations at national and territorial level, environmental management in Denmark is going through a reform period, marked by further devolution of environmental responsibilities to municipalities as well as the creation of regional environmental centres within the Ministry of Environment. This is taking place in the context of an overall territorial government reform, which included the elimination of counties and aggregation of the 271 municipalities into 98, on 1 January 2007.

### *Strengthening the implementation of environmental policies*

Environmental regulations continue to play a major role in Danish environmental policies. Land-use regulations, particularly those applicable to rural and coastal areas, are rigorous, and spatial planning contributes effectively to protection of the environment, nature, landscapes and coastal areas. Stringent waste incineration regulation has been a driving force for the development of cogeneration and district heating. The concept of producer responsibility was embodied in Danish waste legislation (further to EU directives on end-of-life vehicles and on waste electrical and electronic equipment). More generally, Denmark performs very well in transposing and implementing EU environmental legislation. Policy making continues to be open and consultative. Denmark uses economic instruments (environmental charges, environmental taxes, other economic instruments) extensively. The full cost-recovery principle has been tacitly applied in water management for some time and was included in the 2001 Environmental Protection Law. Green taxes apply to air, water and waste management policies. The tax on sulphur emissions (1996) contributed to drastic decreases in SO<sub>2</sub> emissions. The waste water tax (1997) led to a significant reduction of nitrogen, phosphorus and organic matter in waste water. Since the 1999 review, Denmark has introduced several new environmental taxes (e.g. CO<sub>2</sub> tax on gasoline, tax on ozone-depleting greenhouse gases, taxes on PVC and phthalates, tax on mineral phosphorous added to feed). Increasing emphasis is placed on the use of cost-effectiveness analysis in ex-ante evaluations of environmental actions to optimise the mix of instruments applied. Overall, public environmental expenditures are covered by environmental charges or taxes, and the polluter pays principle applies to households and, to a lesser extent, industry.

Despite these excellent environmental policies and many positive trends, Denmark's environmental performance is not always high by OECD standards except for a few indicators (i.e. SO<sub>x</sub> emission intensity, public waste water treatment, energy intensity). The actual results are in the middle range for some indicators (e.g. pesticide use, NO<sub>x</sub> emission intensity), and below OECD standards for others (municipal waste per capita, nitrogenous fertiliser use). Some health indicators are also of concern. This suggests that Denmark's environmental policies have not always been strong enough to counter the pressures exerted on the environment from transport, agriculture, fisheries and other economic activities, as well as from consumption patterns. The effectiveness of economic instruments has been hindered by a series of factors. First, tax concessions should be eliminated (e.g. the very low energy tax paid by industry on electricity consumption, the industry exemption from the water supply tax). Second, their incentive effect should be increased: for example, since 2001, most tax rates have not been adjusted for inflation. Third, their scope could be further extended, although this has become difficult following the tax freeze introduced in 2001. Further, there is uncertainty about the extent to which the full cost-recovery principle (enshrined in the 2001 Environmental Protection Act) is applied to municipal waste collection. It is not clear whether the territorial government reform will allow improvement in enforcement of environmental legislation. The number of environmental inspections has decreased drastically to focus on IPPC facilities. Finally, Denmark's sustainable development strategy has not always been used as a platform to develop environmental strategies, though individual environmental action plans do exist (e.g. National Action Plan for the Aquatic Environment, National Action Plan on Chemicals).

Recommendations:

- further develop the environmental strategic and planning framework with specific environmental quality objectives as well as targets and deadlines, in the context of the sustainable development strategy; pursue efforts to use cost-benefit and cost-effectiveness analyses in policy setting and implementation;
- set up capacity building mechanisms to help municipalities carry out new environmental management tasks resulting from the territorial government reform; foster exchange of expertise among municipalities;
- adjust the rates of green taxes to internalise externalities; reduce tax concessions and the associated administrative cost of their implementation;
- adopt a national action plan for promoting environmental technology based on appropriate economic analysis, and implement it;
- prioritise monitoring of national environmental action plans.

*Air*

Denmark has continued to register progress in managing air pollution and meeting its national and international objectives. Emissions of SO<sub>x</sub>, NO<sub>x</sub> and VOCs were strongly decoupled from economic growth during the review period. SO<sub>2</sub> emission intensity (emissions per unit of GDP) is the lowest in the OECD area, partly due to the tax on SO<sub>2</sub> emission introduced in 1996. CO<sub>2</sub> emissions also were strongly decoupled from economic growth, and CO<sub>2</sub> emission intensity is below the OECD-Europe average. Ammonia emissions from the agricultural sector have also decreased. As a result, Denmark successfully reduced emissions of acid substances in recent years. On the whole, ambient concentrations of criteria air pollutants decreased during the review period. New NO<sub>2</sub> ambient standards were adopted in 1999. Other ambient air quality standards were reviewed and new limit values set (applying in 2005 or 2010 depending on the substance). Denmark adopted a strategy and action plan to protect public health against, inter alia, air pollution in 2003. Monitoring of PM<sub>10</sub> (in cities and urban background) began in 2001. The government is aiming to reduce particulate emissions from traffic in towns by 50% by 2010, notably by introducing low emission zones in city centres. The energy intensity of the Danish economy was improved over the review period and is one of the lowest among OECD countries. Renewable energy represents 25% of total electricity generation. A long-term energy strategy, Energy Strategy 2025, was launched in 2005. Registration tax reductions were introduced for very energy-efficient cars (1999) and for diesel cars equipped with particulate filters (2006).

However, several challenges remain, mainly concerning NO<sub>x</sub> and PM emissions and concentrations. One fifth of the Danish population is exposed to unacceptable air quality. In Copenhagen, PM<sub>10</sub> concentrations exceed the limit value. Emissions of PAHs (polycyclic aromatic hydrocarbons) increased during the review period as a result of increased wood combustion for residential heating. Higher priority should be given to monitoring of hazardous air pollutants. There is a need to know more about the health effects of fine particulates (PM<sub>2.5</sub>). Although private car ownership is low by OECD standards (35 vehicles per 100 persons), the number of diesel-powered cars increased over the review period. Despite investment in public transport infrastructure projects (e.g. the Copenhagen metro, the Copenhagen Circle Line Project), public transport is still losing out to private cars. Background ozone levels are on the rise, and more should be done to reduce NO<sub>x</sub> and VOC domestic emissions and their transboundary transport. Although Copenhagen has the highest rate of cycling of any major European city, Denmark did not have a national policy to develop cycling as a mode of transportation until recently.

Recommendations:

- continue to reduce emissions of NO<sub>x</sub> and VOCs from mobile sources, including through the use of economic instruments in the most cost-effective way;
- strengthen the management of particulate matter, including the monitoring of PM<sub>10</sub> and PM<sub>2.5</sub> concentrations and emissions; develop emission standards for residential wood burning stoves; implement and enforce low emission zones in cities;
- continue to encourage the provision of economically and environmentally attractive public transport systems in urban areas; strengthen transport demand management to limit passenger car use in congested areas (e.g. road pricing, parking fees, spatial planning, intelligent transport systems); implement the Bicycle Strategy 2007; address air pollutant emissions from ships;
- integrate transport and environmental policies; set quantitative targets, further use demand-side management, and facilitate co-operation among state and territorial authorities and concerned parties;
- continue to improve energy efficiency (e.g. transport and building sectors, public sector, distribution companies); review energy taxation to establish appropriate price signals.

***Water***

Use of farm inputs (nitrogen and phosphorus) was decoupled from agricultural production during the review period, following implementation of an instrument mix (economic incentives, voluntary and regulatory measures) under the second Action Plan for the Aquatic Environment 1998-2004 (VMP II). The target of reducing nitrogen leaching by half from 1985 levels was met (in 2003 rather than 1993, the initial deadline). Denmark now complies with requirements of the EU Nitrates Directive. Pesticide use was also decoupled from agricultural production, due to the switch to low-dose agents and to the pesticide tax introduced in the mid-1990s (whose rate has since been increased). Water pricing covers the cost of providing services (user charges) plus some environmental costs (taxes) for both public water supply and waste water treatment. The increase in water prices brought a significant reduction in household water consumption over the review period, but not in industry or agriculture where tax exemptions still apply. Municipal waste water treatment is widely available (89% of the Danish population is connected) and most treatment is advanced (tertiary). Available evidence suggests that drinking water quality was kept high, although monitoring should be further improved, particularly for small waterworks. The pressure on water resources from industry has been reduced, mostly due to delocalisation of industrial production.

However, Denmark still has water quality problems, particularly in lakes and coastal areas (fjords), but also in rivers and groundwater. The new Action Plan for the Aquatic Environment 2005-15 (VMP III) aims to further reduce nitrogen leaching by 13% and to address phosphorus pollution (through a tax on phosphorus added to animal feed). Reduction targets have been set countrywide, but without looking at cost-effectiveness in meeting site-specific water quality objectives; indeed the whole of Denmark's land area is classified as vulnerable under the EU Nitrates Directive, and all Danish waters are sensitive under the EU Urban Waste Water Treatment Directive. There is a need for a holistic (river-basin) approach when addressing water quality and quantity issues, and efforts are needed to compare the cost-effectiveness of measures among households, industry and agriculture sectors. This is the source of major inefficiency in addressing nitrogen pollution. The setting of water quality objectives has been put on hold, pending implementation of the EU Water Framework Directive in 2009. Little has been done to renew sewerage networks and allow separate collection of stormwater, due to the low efficiency in providing water services resulting from the present water pricing regime. Efficiency gains are expected from a water sector reform under preparation, through benchmarking of water utilities and price regulation. There is considerable scope for further efforts on restoration of Danish watercourses, only 2% of which follow a

naturally meandering course. Contaminants other than nitrogen, phosphorus and pesticides have been given too little attention (e.g. heavy metals, toxic chemicals, endocrine disrupters).

Recommendations:

- carry out a comprehensive assessment of the economic efficiency and environmental effectiveness of water pollution abatement measures in different sectors (municipal, industrial, agricultural), in the context of implementation of the EU Water Framework Directive;
- consider the further use of economic instruments to address diffuse pollution; target fiscal incentives to environmental outcomes and improve cost-effectiveness;
- speed up identification of areas at high risk of nutrient and pesticide contamination and take measures to protect them, including establishing groundwater protection zones, 10-metre buffer zones along rivers, and buffer zones around lakes;
- reinforce the interface between water management and nature protection, in the wake of local government reform and pursuant to VMP III objectives; in particular, speed up creation of new wetlands and define ecological quality objectives for rivers;
- move toward river basin management according to the new water districts; in particular, prepare water plans as required by the EU Water Framework Directive;
- increase the efficiency of public water supply and waste water management, in particular by exploiting economies of scale in the wake of local government reform and pursuant to the proposed water reform objectives.

### *Nature and biodiversity*

After the OECD Environmental Performance Review in 1999, Denmark took several steps to emphasise the conservation of biodiversity. It adopted the National Strategy on Biological Diversity (2004) and the Action Plan for Biodiversity and Nature Conservation (2004-09). It prevented housing construction in a widened coastal and dune protection zone (from 100 to 300 metres). In the context of Natura 2000, Denmark has designated 254 special conservation areas and 113 special protection areas, including 27 Ramsar sites, covering 8.4% of its terrestrial areas (i.e. 3 600 km<sup>2</sup>) and 12.3% of its marine areas (i.e. 13 050 km<sup>2</sup>). Environmental monitoring was extended to nature conservation through the creation of the National Monitoring and Assessment Programme for the Aquatic and Terrestrial Environments (NOVANA). A number of species, like the white-tailed eagle, peregrine falcon, common crane, Eurasian spoonbill and corncrake, are starting to return to Denmark. Roe deer and red deer are increasing, as are grey seal populations in the seas. Denmark has initiated seven pilot projects in support of the creation of national parks, although none has been created yet.

However, agriculture (including aquaculture and intensive livestock farming), urbanisation and increased infrastructure development continue to exert negative impacts on nature and biodiversity. The Danish fish catch represents a major part of the total catch from the North Sea. Depleted fish stocks (due to overfishing), recurring fish kills in the Baltic (due to water pollution), and finding of deformed fish and snails changing sex, of fish unfit for human consumption, and of invasive species (some as a result of climate change) all point towards an impoverished and degraded aquatic environment. Further efforts are needed to follow up on several of the 1999 OECD recommendations. The national Action Plan for Nature and Biodiversity Conservation lacks clear time-bound objectives. It has yet to integrate comprehensive biodiversity conservation targets in fisheries and agricultural policies. The management plans for protected areas are incomplete and the goal of increasing the forest cover is behind schedule. Despite NOVANA, Denmark has not fully developed indicators and a monitoring system to evaluate progress toward the 2001 Gothenburg EU Summit objective of halting the decline of biodiversity by 2010. Denmark's next challenge will be to move towards ecosystem-specific quality objectives. This will require cross-sectoral

co-ordination, particularly among landscape and seascape planning, agriculture and fisheries, and urbanisation and infrastructure development. It will also require improved institutional integration, enhanced use of economic instruments and the application of a risk management approach, particularly with regard to climate change impacts. In 2006, the European Commission launched infringement procedures against Denmark over violations of both the Birds and the Habitats Directives.

Recommendations:

- establish national parks in priority conservation areas and clarify their role in relation to other protected areas; complete management plans for all protected areas including the Natura 2000 areas, incorporating biodiversity objectives and ecological integrity indicators, and establish a network of corridors linking them; develop and adopt ecosystem quality objectives for terrestrial and aquatic habitats, including as part of implementation of the EU Habitats and Water Framework Directives;
- develop time-bound objectives for the national nature and biodiversity conservation action plan, including with regard to integration of biodiversity considerations in agriculture, fisheries and other sectoral policies; develop and implement a comprehensive planning system, with a sea use planning component and with cumulative impact assessment and climate change impact scenarios;
- adjust the levels of economic incentives and revise the land use legal framework, so as to enhance biodiversity conservation, production of ecological services (e.g. reduction of nitrogen and phosphorus leaching) and groundwater protection (e.g. in priority contaminated areas) on private land;
- expand restoration projects for major ecosystems, including major rivers and future national parks, to re-establish their capacity to produce ecological services and to support biodiversity;
- accelerate the rate of environmental certification of fish farms.

## 2. Towards Sustainable Development

### *Integration of environmental concerns into economic decisions*

Denmark gives importance to sustainable development nationally and internationally. In 2002 it adopted a national sustainable development strategy which is to be presented to Parliament every four years and followed up through sectoral plans and a set of indicators published in principle every year. Implementation also takes place at the local level through Local Agenda 21. Over the review period, Denmark successfully decoupled environmental pressures from economic growth in several areas, including SO<sub>x</sub> emissions, NO<sub>x</sub> emissions, water abstraction, nitrogen fertiliser use and pesticide use. Energy intensity also decreased during the review period. Institutional integration of environmental concerns into sectoral policies progressed in agriculture (e.g. agri-environmental measures, increase in organic production) and energy policies (e.g. emphasis on climate change, energy efficiency, renewable energy). Three quarters of government bills underwent strategic environmental assessment. At project level, regulations on environmental impact assessment were updated to include an EIA-permit and extended public information. Market-based integration relies on a wide range of economic instruments (i.e. charges, taxes, other instruments), although significant subsidies remain (in agriculture, fisheries, tax concessions to industry).

However, Denmark is faced with numerous environmental challenges resulting from unsustainable consumption patterns (e.g. in waste generation, transport, land use). The generation of household waste is growing nearly twice as fast as the economy, and has reached one of the highest generation rates in the OECD. Greenhouse gas emissions have not been decoupled from private car use. High mobility associated with longer commuting distances generates pressure on peri-urban areas

otherwise needed for agricultural or recreational purposes. With the adoption of the national sustainable development strategy, Denmark no longer has a white paper on environment, and environmental efforts are scattered throughout a large number of programmes, policies and ministries. The environmental strategic and planning framework and associated objectives should be linked to the sustainable development strategy. Little progress has been made in integrating environmental concerns into transport policy at the strategic level. Although the transport sector accounts for a third of final energy consumption in Denmark and is showing the fastest energy growth, it is explicitly excluded from the (June 2005) political agreement on greater energy efficiency. Transport policy mainly aims at increasing or upgrading road infrastructure supply; insufficient effort is made to modernise and increase the efficiency of the Danish railway. Little consideration is given to transport demand management.

Recommendations:

- continue to rely on and, where relevant, expand the use of environmental taxes to internalise externalities; adjust tax rates for inflation;
- continue to examine the existing support schemes from the point of view of their environmental effectiveness and economic efficiency;
- develop a sustainable transport plan, as a follow-up to the forthcoming national sustainable development strategy;
- review existing transport taxes with a view to restructuring them in a more environmentally friendly way (e.g. taxing both car use and ownership; removing the tax break for commuting); consider the introduction of road pricing as a means to halt congestion;
- step up efforts to promote more sustainable consumption patterns (e.g. concerning waste, transportation, land use) by adopting appropriate regulatory and economic instruments, and by focusing on demand management.

***Integration of environmental and social decisions***

Environmental health has received increased attention through the 2003 strategy and action plan on environment and health, as well as through targeted research (e.g. on allergenic substances, endocrine disrupters, impact of traffic on human health). To accelerate their replacement by less dangerous substances, all professional uses of hazardous substances must be registered in the national product register. Cost-benefit analysis and economic valuation methods have been used in several health-related studies and strategies (e.g. on noise, cycling, health effects of air pollution). Concerning environmental democracy, Denmark ratified the Aarhus Convention in 2000. Pursuant to the related EU directives on environmental information, it has harmonised its practices concerning provision of information, public access to information, public participation and access to courts. A wide range of environmental information (data, indicators, state of the environment reports, targeted information brochures) is publicly available and frequently updated. Most Danish municipalities have adopted a Local Agenda 21, and amendments to the Planning Act in 2000 require them to report on implementation every four years. A nationwide Local Agenda 21 network has been created, involving some 200 contact persons. Environmental awareness is enhanced through local and national campaigns, as well as through environmental education at all levels of the education system. In 2006, environmental employment accounted for some 2.2% of total civilian employment in Denmark.

Despite the high level of wealth and living standards in Denmark, several health indicators are of concern: for example, life expectancy is relatively low, the country has some of the OECD's highest rates of mortality from certain forms of cancer, and allergy and respiratory diseases affect about 20% of the population. Some of these problems might relate to environmental factors. Denmark has no explicit targets for fine particles (PM<sub>2.5</sub>), which are known to be dangerous for human health. Little attention has been

given to disparities in pollution exposure, and further attention should be given to promoting access to nature and outdoor recreation and the related health benefits. In 2003 the ambitious targets (set up in 1993) for reducing the number of people exposed to noise were postponed from 2010 to 2020 (as part of the 2003 Road Noise Strategy) due to benefits and costs distribution considerations. Despite the goal of issuing an updated set of sustainable development indicators every year, these indicators were not updated during the last two years. The 1999 OECD recommendation to collect data on private pollution abatement and control expenditure has not been followed up.

Recommendations:

- set up additional targets concerning environmental factors related to health with related indicators; continue to understand better through research and studies the potential links between environmental pollution and chronic illness or child health issues; take action where there is knowledge (e.g. particulate pollution);
- continue to make use of cost-benefit analysis and economic valuation in environmental health policy making; and derive relevant priorities for action;
- include the public health benefits of access to nature and outdoor recreation as an integral part of national environment and health action plans;
- continue to promote environmental democracy through access to environmental information, public participation, and access to courts for citizens and associations (e.g. environmental NGOs);
- assess and reduce disparities in exposure to pollution.

### 3. International Co-operation

Denmark's proactive stance on protecting the environment through international co-operation has played an influential role in a number of international negotiations, particularly in the EU context. Denmark has met or is well on the way to meeting many of its international commitments (e.g. reduced discharges of phosphorous and heavy metals into the Baltic and the North Seas, reduced atmospheric emissions of SO<sub>2</sub> and VOCs). Denmark has phased out or reduced its emissions of ozone-depleting substances ahead of internationally agreed deadlines. Denmark continues to provide a relatively high level of official development assistance (0.81% of GNI in 2005). Environmental management is mainstreamed into a substantial part of bilateral and multilateral regional assistance programmes. Danish export credits are well managed and the environmental risk assessment follows the rules agreed within the OECD. Concerning marine issues, Denmark (recently) ratified the 1978 UN Convention on the Law of the Sea and shows progress in implementing conventions such as MARPOL, London and OSPAR. Illegal oil spills in the Baltic and the North Seas were reduced by half during the review period. Finally, the Greenland Dialogue on climate is welcome.

However, there is room for progress. Concerning climate change, in 2004, Denmark's greenhouse gas emissions had decreased by only 2% compared to 1990 (the base year). This is far from its challenging CO<sub>2</sub> emission reduction target (-21% for 2008-12) under the EU burden sharing agreement. The CO<sub>2</sub> reduction target of the 1990 Energy Plan was not met. Although good progress has been made in reducing greenhouse gas emissions from agriculture, households and the waste sector, much remains to be done and is in progress in the energy, transport and industrial sectors. This is despite the low energy intensity of the Danish economy. Review and revision of energy and transport prices and taxation should be considered. Denmark is one of the few OECD countries that have a carbon tax on energy products, but the CO<sub>2</sub> tax rate was reduced in 2005 to ensure a neutral overall energy tax burden. Further cost-effective domestic efforts will be necessary, given the anticipated allowances under the EU Emission Trading Scheme for the period 2008-12 and the limited scope for expanding the use of the Kyoto Protocol's flexible mechanisms. Afforestation projects are behind schedule with respect to the objective of doubling

the forest area by 2040. Concerning marine issues, although Denmark has been active in many international and regional marine protection fora, fish kills (due mainly to oxygen depletion associated with nutrient discharges) have been reported annually for a long time in Danish coastal areas. The risk of oil spills and maritime accidents along the Danish coast, the Belt and the Øresund is high, with the heavy traffic from shipping and fishing activities. Inappropriate dismantling of Danish end-of-life ships in India became an issue in 2005. Concerning transboundary air pollution, while Denmark has met the 1998 Sofia Declaration target for NO<sub>x</sub> emissions, achieving the Gothenburg target (55% reduction by 2010 from the 1990 level) will require further action.

Recommendations:

- ensure that cost-effective domestic measures will contribute to meet the Kyoto Protocol's greenhouse gas emission reduction target, especially in sectors not covered by the EU Emission Trading Scheme; accelerate afforestation;
- place higher priority on marine protection, including marine ecosystem protection; take further steps to reduce the discharge of toxic substances and nutrients; ensure that Denmark's international commitments are achieved; continue efforts towards appropriate dismantling of Danish end-of-life ships;
- pursue efforts towards the sustainable management of commercial fisheries and aquaculture;
- continue to play an exemplary role in international environmental protection including through development aid; continue to contribute to sustainable development and capacity building in developing countries through environmental technology exports and other measures (e.g. support for environmental education and awareness programmes);
- continue efforts to ensure appropriate implementation of multilateral environmental agreements involving trade (ozone-depleting substances, hazardous substances, chemicals, endangered species);
- accelerate the ratification of international environmental agreements already signed.