



*Summary*

**Environmental  
Balance 2002**  
Accounting for the  
Dutch environment

**rivm**

National Institute  
for Public Health and  
the Environment



# ENVIRONMENTAL BALANCE 2002

## Summary

**Office for Environmental Assessment - RIVM**

*with the cooperation of:*

Transport Research Centre (AVV)

Alterra b.v.

Statistics Netherlands (CBS)

Netherlands Bureau of Economic Analysis (CPB)

Netherlands Energy Research Foundation (ECN)

Royal Dutch Meteorological Institute (KNMI)

Agricultural Economics Research Institute (LEI)

National Aviation and Space Exploration Laboratory (NLR)

National Institute for Coastal and Sea Research (RIKZ)

National Institute for Inland Water Management and Wastewater Treatment (RIZA)

Social and Cultural Planning Office (SCP)



## Foreword

The Environmental Balance describes trends in the state of the environment in the Netherlands and the effectiveness of the policies pursued. It also evaluates the degree to which the stated goals of environmental policy have been achieved.

Environmental Balance 2002 places special focus on the relationship between economy and environment and the role national and international policy plays here. Furthermore Environmental Balance 2002 describes the environment in the urban and rural area and also climate change. Where possible assessments are included to indicate, whether current policies are sufficient to achieve the targets for 2010.

The Statistics on environmental quality are, with a few exceptions, based on measurements. Models are used to project local measurements on a larger spatial scale, so as to analyse monitoring trends and identify relationships between emissions, environmental quality and impacts.

This summary is also available on the internet at <http://rivm.nl/environmentalbalance>. Detailed figures can be found in the Environmental Data Compendium 2001 for the Netherlands, a joint publication by RIVM and Statistics Netherlands (CBS). This Compendium is also available on the internet at [www.environmentaldata.nl](http://www.environmentaldata.nl). The 2002 version of the Environmental Data Compendium is only available in Dutch ([www.milieucompendium.nl](http://www.milieucompendium.nl)). Environmental Balance 2002 (in Dutch) has been produced with the assistance of many other Dutch research institutes.

## The environment in perspective

- Regulations are of overriding importance in achieving an absolute reduction in environmental pressure in the Netherlands.
- The Dutch public thinks it is the government's task to solve environmental problems.
- Noise abatement policy has an effect; quiet asphalt road surfaces and lower speed limits are cost-effective measures.
- The probability of an air disaster or major explosion occurring in the Netherlands has almost certainly risen.
- EU regulations work; air quality, in particular, is continuing to improve.
- Levels of eutrophication are declining, but populations of sensitive species are still declining.
- Dutch policy complies with the EU emission ceiling for ammonia (2010) but not for other acidifying substances.
- CO<sub>2</sub> emissions in the Netherlands continue to rise.
- The CO<sub>2</sub> emissions related to Dutch consumption are shifting to other countries via increasing imports of consumer goods.
- Total emissions of greenhouse gases in the Netherlands are stabilizing; it is not yet certain that the targets agreed in Kyoto can be met.
- The strong growth in imports of green electricity has not been accompanied by a significant expansion of renewable energy generation in the contributing countries.



*Environment and the economy in the rural area.*

## **International environmental policy proves effective**

If the economy is to grow and if, at the same time, the pressure on the environment is to be reduced to a level within the carrying capacities of ecosystems, a vigorous environmental policy will be needed.

During the last 20 to 30 years considerable progress has been made in tackling a large number of environmental problems. This has been made possible by international regulations: for example, the production of ozone depleting substances has been banned, and motor vehicles and combustion plants are subject to stringent European environmental standards, which has led to reductions in soil acidity that have, for the moment, removed the threat of widespread forest die-back. Despite this, biodiversity in the Netherlands is still in decline. This is due, among other factors, to nutrient surpluses and a loss of habitat area. In the Netherlands – the most crowded of all the EU countries in terms of population density, industrial production and vehicle and livestock numbers – European regulations are widely felt to be restrictive and costly. However, the open borders (not only for travel but also for pollution) and the principle of ‘equality before the law’ (equality of European emission standards, but also of limit values for air, water and food quality) make a European approach to environmental problems just as unavoidable as cost-effective.

Persistent environmental problems continue to occur at levels where ‘Brussels’ is less active: the local accumulation of environmental problems, and global issues such as climate change and the loss of plant and animal species. Neither local nor global environmental problems can be seen in isolation from the problem of social inequality. In urban areas, the lower income groups are affected by noise nuisance, local air pollution and lack of green space more than on average when compared to others. Climate policy and species protection can be tackled more effectively with the cooperation of developing countries, but this will not happen if living standards in these countries do not improve. A policy for sustainable development implies tackling environmental issues and social deprivation collectively, both globally and locally.

## **Environment and economy**

National and international environmental regulations have led to a reduction in a range of pressures on the environment and to improvements in environmental quality, all during a period of economic growth. Health risks, in general, have consequently declined. Despite the fall in emissions, though, the quality of nature in the Netherlands has deteriorated further as pollutants continue to accumulate in soils, sediments and plant communities. Each year about 2.5% of the gross national product (GNP) is spent on environmental measures. Even the most stringent environmental measures do not cause a reduction in GNP, but at the most, a few tenths of one per cent less economic growth.

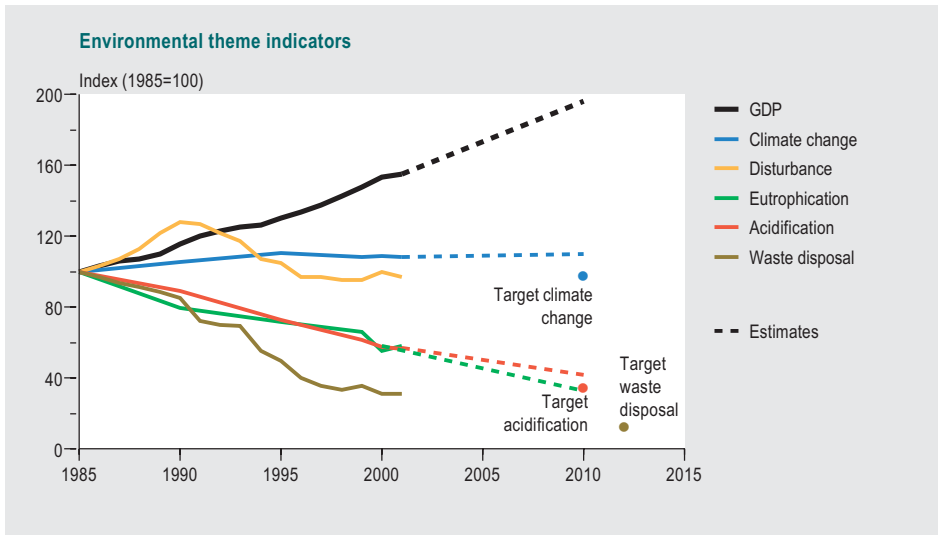


Figure 1 Environmental pressure per theme in relation to changes in GDP, 1985-2010.

### ***(Inter)national regulations essential for an absolute reduction in environmental pressure***

Dutch environmental policies focus heavily on manufacturers taking technical measures to reduce pollution. An historical analysis of the files on seven environmental issues shows that the economic ‘resistance’ to taking technical measures can be overcome in different ways, depending on the environmental and economic ambitions of the public and private sectors.

International regulations are very important in dispelling resistance by companies that compete internationally and, so, are influential in the design and effectiveness of policy. Now, about 80% of the environmental regulations in the Netherlands are directed by ‘Brussels’. Climate policy is not in this category; the European Union delegates the implementation of climate policy to the member states.

When the international context is weak the government often adopts a strategy of entering into voluntary agreements (covenants), with industry or introduces modest financial incentives. This gets environmental problems onto the business agenda, and has led to the adoption of cheaper measures. But such an approach has proved inadequate to solve persistent environmental problems, the still rising CO<sub>2</sub> emissions being a good example. Measures to combat imminent and urgent environmental problems (i.e. those endangering public health) enjoy widespread support as people are then less averse to direct regulation and the recovery of costs. Examples are sewage treatment, modern waste incinerators and catalytic converters in cars.

When affordable technical measures are not available, or will not become available soon enough to reduce environmental pressures, a political balance must be struck



between interests of economic activities and interests of environmental quality. The contributions made by these activities to the economy and the perceived significance of the risks to nature and human health finally determine whether there will be sufficient support for the application of firm policy instruments (see box).

#### Decoupling environment and economy at Schiphol problematic

Under the currently proposed conditions, further growth of Schiphol Amsterdam Airport into a 'mainport' is not compatible with an improvement in environmental quality around the airport (the so-called 'double objective'). To date, Schiphol has never made an explicit choice between economy and environment. Over time, though, a number of environmental regulations have been dropped or replaced by less stringent environmental standards, allowing the double

objective to be formally maintained. A policy decision is needed to enforce the environmental standards with the present runway configuration and a restriction on growth, to radically revise the runway configuration to remove the need to fly over the densely populated area of Amsterdam, or to relax the environmental standards in recognition of the economic importance of Schiphol.

#### Public expects government to solve environmental problems

Public concern about the environment has declined sharply during the last ten years; crime levels and the health service are now considered to be more important. Most people see environmental issues as a collective problem, with the government taking a leading role in tackling them. Trends in consumption are still towards greater use of electricity and increasing car and air travel. A relatively large proportion of additional income is spent on these categories.

The rise in imports of consumer goods means that CO<sub>2</sub> emissions from their manufacture in the exporting countries will rise too (Figure 2). These emissions occur in

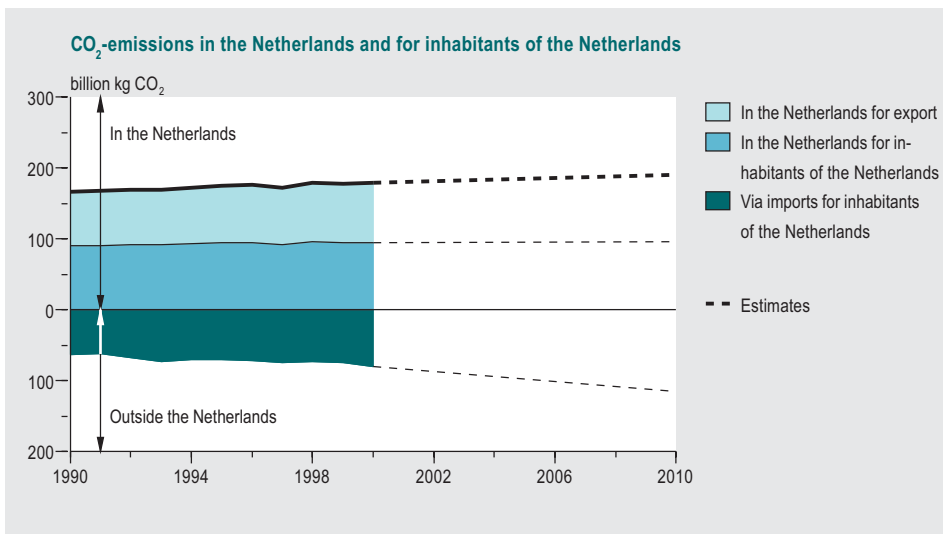


Figure 2 CO<sub>2</sub> emissions in and outside the Netherlands for the country's inhabitants, 1990–2010.

countries that generate electricity much less efficiently than the Netherlands. Almost half of the emissions associated with consumption in the Netherlands (45 billion kg CO<sub>2</sub>-eq.) is not covered by the Kyoto Protocol; even so, the Netherlands can contribute to a reduction in these emission via the Kyoto Mechanisms.

The area of land used in other countries for consumption in the Netherlands amounts to about three times the area of the Netherlands. The potential effects on biodiversity are great but hard to determine. Despite this, (non-sustainable) land use plays no role in policies on trade and international cooperation. Sustainable initiatives such as 'fair trade' products have a small market share (a few products with a market share of 1 to 5%) but can stimulate further 'greening' of 'conventional' products.

Just as environmental policies for products contain different policy instruments in different economic sectors, a consumer-oriented environmental policy could take account of the various types of consumers. The effectiveness of policy instruments for 'pioneers' will be different than the effectiveness for 'laggards'.

## The urban environment

Traffic is the most important cause of local environmental problems in the Netherlands. Traffic causes noise and air pollution, and is the major factor in external safety. Health problems caused by air pollution and noise occur mainly in heavily trafficked urban areas.



*Environment and economy in the urban area: Rotterdam Overschie, residential area next to the Kleinpolderplein interchange.*

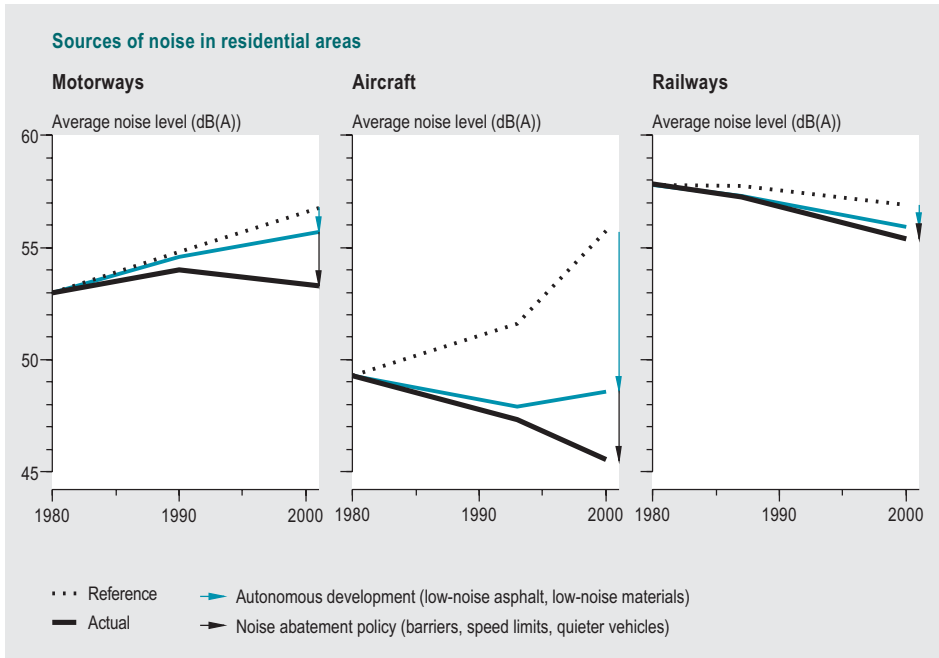


Figure 3 Average received noise levels in residential areas from motorways, aircraft and railways, 1980-2001.

### **Noise abatement policy has effects**

In residential areas, exposure to noise from motorway, rail and air traffic has declined slightly since 1980 (Figure 3). The erection of noise barriers, the use of highly pervious asphalt and quieter lorries have all helped to reduce average motorway noise levels in residential areas, despite the doubling of traffic volumes. To maintain this trend an effective noise abatement policy will still be needed in future because the volume of traffic is expected to continue to rise. Renewal of the aircraft fleet and optimization of runway use and flight paths have reduced average levels of aircraft noise in residential areas, despite a quadrupling of the number of flights. The noisiest aircraft are no longer permitted to use the airport.

### **Low-noise asphalt and speed restrictions more cost-effective than noise barriers**

Although noise abatement policies are having an effect, a considerable number of homes in the Netherlands still experience high levels of noise, and city centre traffic noise, in particular, has not been reduced at all. Received noise levels at 40,000 to 60,000 dwellings in the Netherlands exceed 70 dB(A), the limit value for 2010 laid down in the Fourth National Environmental Policy Plan (NEPP4). Extra measures are needed to meet this limit value. Low-noise asphalt and reduced speed limits are more cost-effective than erecting noise barriers; instead of just solving local problems they can reduce noise levels throughout a wider urban area.

***The air is becoming cleaner***

Air quality in the Netherlands is continuing to improve. Peak ozone concentrations are falling off and average concentrations of NO<sub>2</sub> and particulate matter have fallen during the last ten years by 30% and 20%, respectively, as a result of lower emissions in the Netherlands and Europe. It is not yet possible to obtain a full picture of the health benefits this has brought. Indications are growing that air pollution from road traffic plays a dominant role in causing health problems, but this is not certain. Although a policy for reducing emissions of fine particulates is defensible from a precautionary perspective, it is not necessarily the most cost-effective approach.

The policy being pursued is insufficient to ensure compliance with EU limit values for NO<sub>2</sub> and particulate matter and European air quality standards will be exceeded in urban areas. For many years the 'Kleinpolderplein' interchange near Rotterdam has been a major source of air pollution. So the reduction of the speed limit on the A13 motorway to 80 km/h in the Rotterdam Overschie residential area in May 2002 was welcome. Calculations indicate that this has led to a small improvement in air quality. Local noise levels have fallen more quickly.

***Air disaster or a major explosion in the Netherlands more likely***

The probability of a disaster occurring in the Netherlands has almost certainly risen during the last ten years. Offices and dwellings are still regularly built in the risk zones because safety policies are not always incorporated into land-use plans. The implementation and enforcement of external safety policies have so far been found wanting, partly owing to a shortage of funds.

**Rural areas*****Less acid and nitrogen pollution of European ecosystems, but ecological recovery slow***

During the last 20 years the deposition of sulphur has decreased throughout Europe by an average of more than 50% and nitrogen deposition has declined by about 20%. This



*Clean surface water (left) and surface water showing effects of eutrophication in the duckweed growth (right).*

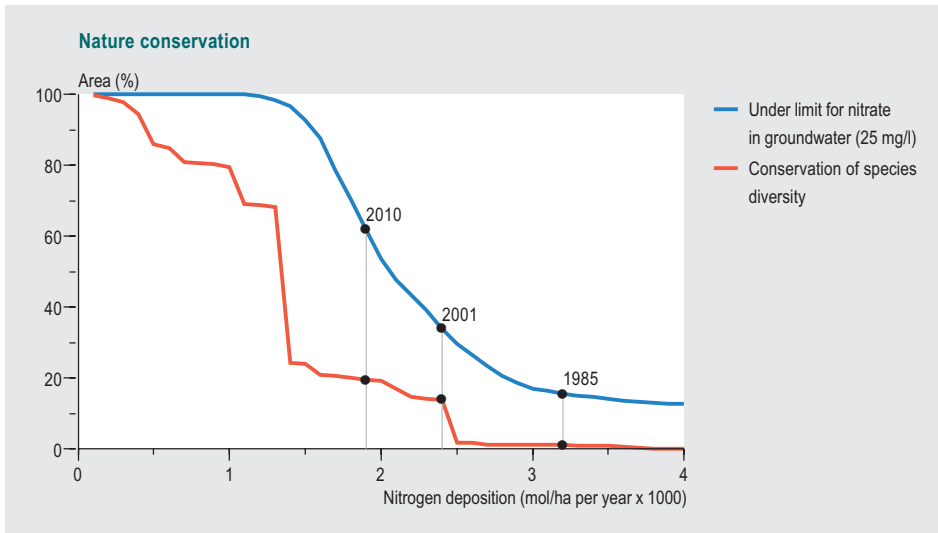


Figure 4 Percentage of the total nature area where species diversity is protected from excess nitrogen deposition and where groundwater is protected from nitrate leaching, 1985-2010.

has led to widespread improvements in the chemical composition of water in soil, groundwater, streams and lakes. Although such improvements have been achieved in the Netherlands, present levels of deposition are not nearly low enough to guarantee protection to all ecosystems. In Scandinavia and Germany large areas still have to be limed to combat the impacts of acid deposition. In the Netherlands natural vegetation can be restored on heaths and in woods only after turf stripping, and similar preparatory measures also have to be taken for the restoration of 'wet' ecosystems. Implementation of adopted policies can increase the proportion of the total nature area protected against lowering of the groundwater table, eutrophication and acidification to about 20% in 2010 (Figure 4). Generic policy on emissions is reducing average nitrogen deposition on nature areas, making targeted (regional) removal of emission sources increasingly effective.

### **Nutrient surplus declining**

Excess nitrogen remains a persistent environmental problem, although the surplus is declining. The concentrations of ammonia ( $\text{NH}_3$ ) and nitrogen oxide ( $\text{NH}_x$ ) in the air are falling, as is the deposition of these substances on nature areas. With the introduction of closure schemes and the compulsory nutrient declaration system MINAS, the national herd has contracted, the amount of manure produced has decreased and agriculture has become more nutrient efficient (Figure 5). Falling manure production leads not only to smaller nutrient surpluses in the soil but also to lower  $\text{NH}_3$  emissions. For example, the Closure scheme for livestock farmers has been instrumental in reducing the amount of (phosphate in) manure by 7% and  $\text{NH}_3$  emissions by 6%.

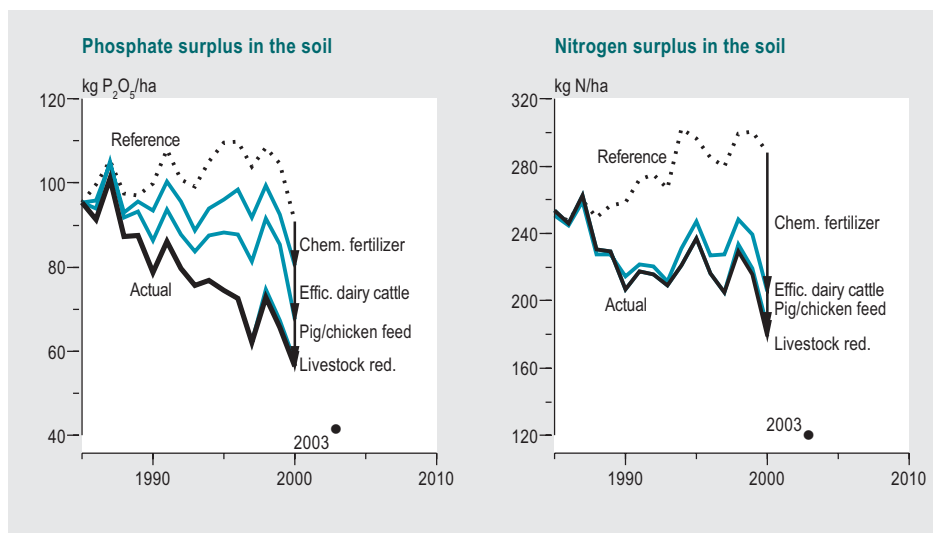


Figure 5 Breakdown of the reductions in phosphate and nitrogen surpluses in agricultural soils from 1985–2000 and the surplus when the loss standards for 2003 come into force.

### Environmental quality measurements confirm emission trends

The reduction in emissions of volatile organic compounds (VOC),  $\text{NO}_x$ , particulate matter, benzene, sulphur dioxide ( $\text{SO}_2$ ) and  $\text{NH}_3$  is confirmed by data from the Netherlands National Air Quality Monitoring Network. The declining levels of nitrogen deposition in nature areas is confirmed by measurements of nitrogen

concentration in the soil and groundwater. It is not clear, though, how agricultural emissions affect the quality of the smaller water bodies. Model calculations indicate that the effect, so far, of the nutrient surplus reductions on the quality of surface waters has been negligible.

### ***$\text{NH}_3$ emissions to meet EU ceiling (2010), additional policy needed for other acidifying emissions***

$\text{NH}_3$  emissions in 2010 are expected to stay under the EU emission ceiling. Although emissions of  $\text{SO}_2$ ,  $\text{NO}_x$  and VOC are expected to continue falling, additional policy is needed to bring them under the emission ceilings. The targets for acidification have been tightened up in the NEPP4, making additional policy measures necessary to achieve them.

## Climate change

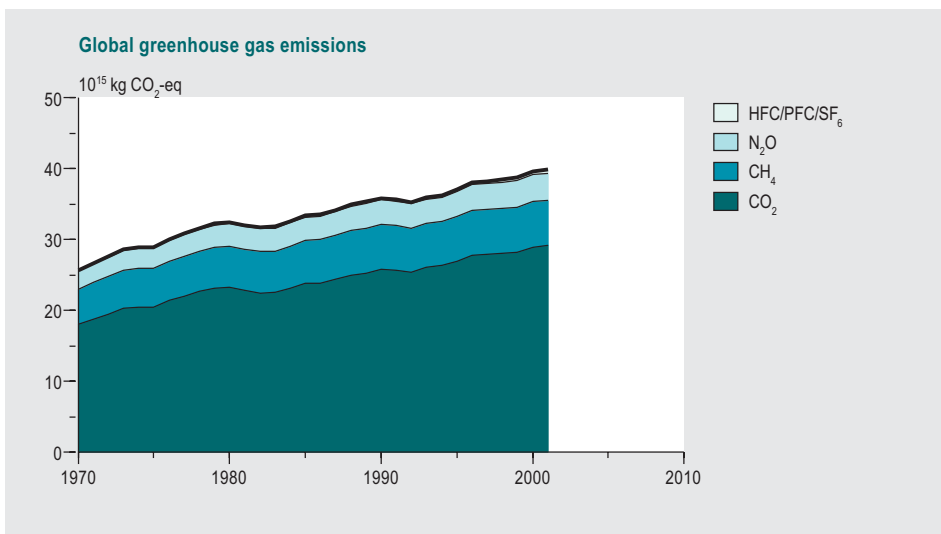
### ***Global climate change and continuing growth in greenhouse gas emissions***

Global greenhouse gas emissions in 2000 were 20% higher than in 1990. Most of this increase was caused by a rise in fuel combustion for transport and a growth in electricity consumption. Although associated changes in climate and impacts on ecosystems look increasingly likely, the scientific uncertainties surrounding the influence of human actions and natural factors will inevitably persist.



*Energy production from coal and wind: power station in Vlissingen-East.*

The Kyoto agreements for 2010 represent an initial and, from the point of view of protecting the global climate system, modest step in the reduction of greenhouse gases. The United States' withdrawal from the Kyoto Protocol, in particular, will have as consequence that the greenhouse gas emissions from the industrialized countries in 2010 will not decline by 5% from the 1990 level as originally intended, but will rise by 5 to 20%.



*Figure 6 Global emission of greenhouse gases, 1970-2001.*

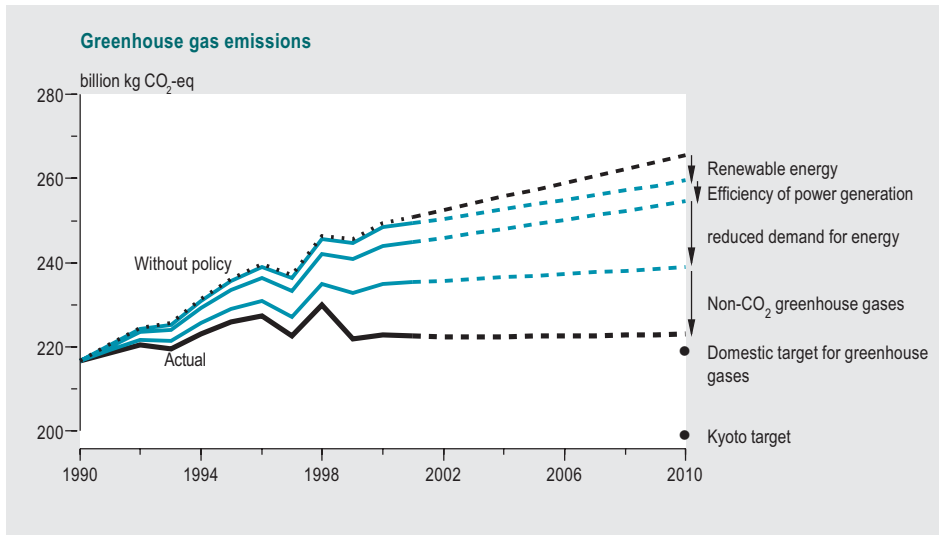


Figure 7 Effects of greenhouse gas policy in the Netherlands, 1990-2010.

### ***CO<sub>2</sub> emissions in the Netherlands are rising, non-CO<sub>2</sub> greenhouse gas emissions are falling***

Emissions of CO<sub>2</sub> in the Netherlands have risen by an average of 1% per year since 1990. Even in 2001, a year in which economic growth declined by 1%, CO<sub>2</sub> emissions rose because of increasing electricity consumption. Implementation of environmental policies has brought down emissions of the greenhouse gases, methane, nitrous oxide and fluorine gases, leading to a stabilization of total greenhouse gas emissions in the last few years. In the absence of an environmental policy, the greenhouse gas emissions in 2000 would have been about 10% higher (Figure 7).

### ***Uncertainties about meeting Kyoto targets***

Under currently adopted policies, the domestic targets for the Netherlands under the Kyoto agreement may be exceeded by about 3 billion kg, and possibly more under the policies proposed in the Netherlands new cabinet's Strategy agreement, depending on the details. If the cabinet wants to be more certain of achieving the domestic targets, extra climate measures will have to be prepared during this term of office because of the time needed to introduce new policy measures. An alternative is to achieve larger emission reductions in other countries. Good progress is being made (via the Kyoto Mechanisms) with the drawing up of contracts for CO<sub>2</sub> reductions in countries abroad. The advantage of domestic measures is that they help, at the same time, to reduce emissions of nitrogen oxides, and so lower the costs of controlling acidification.



### **Strong growth in green electricity imports, but marginal increase in renewable power generation**

Ten years of financial incentives for renewable energy have raised the share of total energy generated from about 0.7 to 1.6% in 2000. Most of this increase has come from the combustion of biomass and a sharp rise in imports of renewable electricity from neighbouring countries, which has been encouraged by the fiscal incentives. Most of the government funds involved go to the power companies and producers of renewable energy in other countries; here, funds have not been found to be invested in new renewable energy production.

Despite various forms of financial incentives, bringing new wind turbines on stream is proving

to be difficult. The total installed wind generating capacity in the Netherlands at the end of 2001 was 488 MW, with a CO<sub>2</sub> reduction effect of about 0.5 billion kg. The main barriers are the limited availability of designated sites for wind turbines in provincial and municipal land-use plans and the time-consuming planning and appeals procedures for adopting new sites. Depending on the level of support from public authorities, additional wind power generation capacity on land could reduce CO<sub>2</sub> by a further 0.5 to 1.0 billion kg at most. Offshore generating capacity could reduce CO<sub>2</sub> emissions by 2 to a maximum of 10 billion kg.

*Key statistics on environmental quality in the Netherlands*

	Unit	1990	2000	2001	2010 target NEPP4
<b>Emissions</b>					
<i>Climate change</i>					
CO <sub>2</sub> <sup>1)</sup>	billion kg	166	180	183	
Total greenhouse gases <sup>1)</sup>	billion kg CO <sub>2</sub> -eq	217	223	223	199/219 <sup>2)</sup>
<i>Acidification</i>					
SO <sub>2</sub>	million kg	202	92	89	46
NO <sub>x</sub>	million kg	570	413	410	231
VOC	million kg	492	278	271	155 <sup>3)</sup>
NH <sub>3</sub>	million kg	232	152	148	100
<i>Eutrophication</i>					
Phosphorus	million kg	75	48	51	
Nitrogen	million kg	413	343	366	
<b>Environmental quality</b>					
<i>Acidification</i>					
Acid deposition	mol/ha	4600	3000	2850	2150 <sup>4)</sup>
<i>Eutrophication</i>					
Total nitrogen deposition	mol/ha	2900	2400	2300	1550 <sup>4)</sup>
P surface water	mg P/l	0.2–0.5	0.1–0.3		0.15
N surface water	mg N/l	4–5	4–5.5		2.2
<i>Unconfined groundwater</i>					
Nature areas	mg N/l	30	20		
Sandy soils	mg N/l	150	125		
<i>Air quality<sup>5)</sup></i>					
Exposure to fine particulates	µg/m <sup>3</sup>	42 <sup>6)</sup>	31	31	
Exposure to NO <sub>2</sub>	µg/m <sup>3</sup>	27	21	21	
Exposure ozone					
Days when standard is exceeded		47	13	14	
Population experiencing noise nuisance	%	50	43	42	
<b>Waste</b>					
Landfill	billion kg	14	5	5	2 <sup>7)</sup>
<b>Environmental costs</b>					
Environmental costs/GDP	%	1.9	2.5	2.4	
<b>Nature</b>					
Area protected against acidification and eutrophication	%	1	10	10	20–30 <sup>8)</sup>
<b>Index of change (1980=100)</b>					
Gross Domestic Product		115	153	155	
Vehicle-km travelled by road		120	157	160	
Energy consumption		113	126	128	
Waste production		108	125	125	

1) Temperature corrected.

2) Domestic Kyoto target.

3) On condition that EU directives are adopted for products containing VOC and for motorized bicycles, otherwise a target of 163 million kg.

4) Average for all nature areas in the Netherlands.

5) National average, considerable exceedances of standards may occur locally.

6) 1992.

7) Target in the Waste Management Plan for 2012.

8) Level of protection derived from deposition targets.