PBL Netherlands Environmental
Assessment Agency

Changing track, changing tack

DUTCH IDEAS FOR A ROBUST ENVIRONMENTAL POLICY FOR THE 21ST CENTURY

CHANGING TRACK, CHANGING TACK

Dutch ideas for a robust
environmental policy for the 21st century

PBL
Netherlands Environmental Assessment Agency

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Dutch ideas for a robust environmental policy for the 21st century

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Contents

PREFACE 5

TEN ELEMENTS OF A ROBUST ENVIRONMENTAL POLICY FOR THE 21ST CENTURY: A SUMMARY 9

1 TRADITIONAL ENVIRONMENTAL POLICY IS LOSING ITS LUSTRE 13
Limits to success 17
Support for modern environmental policy 22

2 BARRIERS TO MODERNISATION 25

3 TOWARDS MODERNISING ENVIRONMENTAL POLICY 39
Global environmental issues: 2-9-5-50 39
Ongoing traditional environmental issues 45
Responsibility for uncertain environmental issues 49

4 CHANGING TRACKS 51
Different approaches to different problems 52
Large issues require serious proposals 53
Debate necessary 58

REFERENCES 61

NOTES 64

Preface

In the 1980s and 1990s, the Netherlands was a frontrunner in its approach to environmental issues. This was born of necessity. Compared with other countries, in the Netherlands, an unusually high concentration of environmentally harmful activities took place, and continues to take place, per square kilometre. Huge progress has been made in many areas. Issues such as smog, surface water pollution and acid rain have been largely solved, the policy measures still needed today mostly relate to monitoring and enforcement. However, we are faced with new pressing issues, such as climate change, biodiversity loss and resource scarcities. The environmental issues of the 21st century have created a new kind of vulnerability, and this vulnerability requires fundamental policy changes for the Netherlands; changes to a policy that is no longer pioneering, but which is in fact trailing behind in many areas.

PBL thinks it is time to revise Dutch environmental policy. After the successes in the past, the wheel of Dutch environmental policy now seems to be slowing down, while major challenges still lie ahead. The positive evaluation of 40 years of Dutch environmental policy should be seen as a sign that ambitious policies have worked in the past and can work in the future. Yet, what is needed, first and foremost, is to have a national debate on the modernisation of environmental policy. Although the context is specific to the Netherlands, we think this report may also be

recognisable for and of interest to policymakers and politicians abroad. What is more, the analysis shows that adequate environmental protection very much depends on international cooperation.

The problem with current environmental policy relates not only to policy outcomes, but also legitimacy. When asked about the main challenges to society and the main political priorities, the public's concern about 'the environment' is low. In the year 2013, we seem to be faced with 'green fatigue'. Could this be a problem with the 'framing' of the issues? Perhaps the terms 'green growth', 'greening' or 'sustainability' appeal more to some people, or perhaps it is a stakeholder perspective: what can policy, a company or an individual actually do to make a difference? Looking even closer, is the fatigue in fact a form of fatalism?

Traditional environmental conservation focuses on preventing harmful emissions and protecting what nature is left. However, invoking public health or Dutch nature conservation – the usual approaches during the 20th century – is no longer sufficient to achieve the major changes needed to deal with the 'new' vulnerability. Climate change threatens us and our children if we do nothing about it, and greenhouse gas emissions need reducing drastically. If we are to limit global warming we need to achieve a low-carbon energy supply within 40 years. In addition, the international focus is increasingly on a second key question: how to radically reduce the consumption of natural resources.

These developments require us to switch tracks, and change tacks, carefully and unambiguously. The main challenge for environmental policy in the 21st century is to get the general public, industry and government so far that they do not see climate, biodiversity and raw material issues as something that happens to others elsewhere, but are willing to take responsibility for solving the problems. This can be done, by embedding the environment in the operational logic of industry and the general public, and government policy can make a substantial contribution to this. The modernisation of environmental policy requires broad public support. Only then will the general public, industry and government base their activities in areas such as living, the energy supply, food, transport and spatial planning on care for our environment.

The question whether such a renewal of environmental policy will offer economic opportunities for the Netherlands is beyond the scope of this report. However, it is of course a crucial question: how to ensure material prosperity for future generations as we move towards a low-carbon economy and, furthermore, one in which the use of natural resources has been made radically more efficient. In summary, is green growth possible, and what does it mean for our competitive position? This question is the subject of another report on green growth and competitive power, to be published by PBL in late 2013, which will discuss the opportunities that arise from the greening of the economic structure in the Netherlands and the role that innovation may have to play.

We are standing at an environmental policy crossroads; the question is, which path do we choose? Will the Netherlands close the gap and join those in the lead with an innovative new approach to global environmental issues? Or, will we restrict ourselves to persisting with the classical approach, steering the traditional environmental problems towards the monitoring phase as far as possible? Such fundamental choices on environmental policy and its modernisation demand a public debate – one that involves both scientific understanding and practical expertise. With this report, PBL hopes to trigger such a public discourse.

Professor Maarten Hajer
Director

Ten elements of a robust environmental policy for the 21st century: a summary

If we are to deal seriously with the environmental issues of the 21st century, there are various areas in which government, together with industry and the general public, need to switch tracks and revise their approach. This requires a broad public debate, as well as a government that is prepared to accept its responsibilities: it needs to be made much clearer what the outcome will be of *not* dealing with the issues at hand. For example, it would be relevant to explain to the general public the effects of a scenario involving a global temperature rise of four, or even six, degrees.

The Dutch Government and House of Representatives are expected to deliberate on the revision of environmental policy. This PBL report provides an analysis of current environmental policy and outlines some possible elements of a new policy.

1 Switch tracks to clean production and consumption

Break away from polluting routines. View an innovative and clean economy as the 'new normality'. Create a clear, transparent system to stimulate the transition: consider allowing tax revenues from environmentally harmful behaviour to flow directly and visibly to the financing of eco-innovation. Prices must be high enough to encourage environmentally friendly production and innovation in industry. For example, the current CO_2 price of three euros per tonne in the emissions trading

system (ETS) is much too low to contribute to low-carbon innovation. It would also be sensible to take a critical look at environmentally harmful subsidies that keep the price of polluting products low.

2 Focus on achieving the crucial long-term goals

To genuinely deal with the environmental issues of the 21st century, the government needs to focus on sustained solutions for the long term. Policy cannot continue to focus on achieving short-term goals if these have little effect in the long term. Therefore, do not just focus on achieving greenhouse gas reductions of 20%, and 16% renewable energy by 2020. If we need a low-carbon energy supply by 2050 (representing a greenhouse gas reduction of 80%), then innovation is more important than achieving goals for 2020 through the co-firing of biomass in (old) coal-fired power plants. Money could be better used to develop more innovative forms of sustainable energy generation.

3 Form new coalitions of interests and stakeholders

Society is interwoven with nature in many ways, one thread being the resource system that provides us with a wide variety of materials and services. Protecting nature and the environment is therefore in all our interests – though of course the general public, industry and government also have many other interests. Environmental measures will have the greatest chance of success if the government is able to form new coalitions of interests and stakeholders at various levels:

- Coalitions involving the general public, public organisations and industry if measures result in a stronger economy, a lower energy bill and/or better health.
- Coalitions within government, because environmental issues and policy will have a wide-ranging impact in the coming decades, also on living and working, employment, public health and government finances (fiscal greening). This requires the broad support of the whole government.
- Coalitions with other countries, because the Netherlands is in some areas simply too small to achieve the required environmental measures alone, in particular if the effects cross borders and if the competitive position of the Netherlands is at stake. Coalitions of sympathetic countries (coalitions of the willing) can lead the way towards concrete goals and measures.
- Coalitions with international organisations that support a new, robust environmental policy, such as the OECD and, more recently, the World Bank and IMF.

4 Facilitate consumer behavioural change

Other consumer choices can make a considerable contribution to a cleaner, low-carbon society. It is not just about 'sustainable', but also about 'less'. Think, for example, about transport choices (travelling more often by bicycle and less by car), holiday destinations (fewer long-haul flights) and diet (less red meat). These all require consumer behavioural change. Consumers do not want to be forced into environmentally friendly behaviour, but will accept some pressure to avoid the use of polluting products. The government can make use of this by informing consumers about the environmental impact of their consumption; for example,

through energy labels. Leading by example through sustainable purchasing also contributes to the new normality; in particular, if results are widely publicised. The government can also put strict product standards in place to stimulate innovation and behavioural change.

5 Create a natural gas revenue fund to stimulate eco-innovation

Climate change is a huge issue, and therefore requires robust solutions and measures. If innovations and investments in environmentally friendly technologies are to have a better chance in the Netherlands, a fund is required to finance them. A fund fed by the revenues from natural gas is a perfect example of a transition switch: one-off incomes from fossil fuels are used for the sustainable, low-carbon economy of the future. Discussion is required at the EU level about whether to increase the relative proportion of innovation funds in the European budget in order to achieve real breakthroughs.

6 Develop a resource strategy for the Netherlands

In a growing global economy, raw materials will become increasingly scarce. The EU has called on all Member States to develop a resource strategy that focuses on limiting the consumption of natural resources (such as raw materials, fossil fuels, fish and water). The Netherlands has up to now done little to address this. It would, however, be wise to do so, as it is a matter of enlightened self-interest.

7 Focus environmental policy more on impact than emissions

If the Netherlands wants to not just consolidate but also build on the progress made so far, it needs to consider a different approach to environmental policy. For example, the question is not whether we choose to follow the rules applied by the EU. The main issue is whether or not policy has the desired effects in terms of themes such as health, biodiversity conservation, an acceptable living and business environment and the conservation of natural resources for future generations. Certainly when seen in this light, challenges remain that require a firm approach within the Netherlands, in particular with regards to noise nuisance, particulate matter, energy conservation in built-up areas and improving the quality of natural areas.

8 Make industry responsible and liable for environmental impacts

Possible new environmental threats, such as outbreaks of animal disease that may endanger humans, are the concern of national government. In each case, the risk is low, but the potential damage high. The real difficulty, however, is that faced with new, unknown problems, the government is often overtaken by events. Due to globalisation, the world we live in has become less recognisable and less controllable, so that regulations often fail to keep up with rapidly changing technological possibilities. Making industry responsible for the possible impacts of new environmental and safety risks will encourage them to investigate – thoroughly and transparently – whether the activity concerned presents an unacceptable risk to health or the environment. The government can encourage such behaviour; for

example, through changes to liability legislation. This would seem to be a model worth pursuing.

9 Get industry to register natural resource use: green accounting

There is often a lack of insight into the use of raw materials and other natural resources, so that savings opportunities are missed. Transparency would stimulate competition and also enable consumers to see how industry manages the available natural capital. Combining green accounting with the implementation of standards and the taxing of specific material flows could provide an important tool for stimulating sustainability and limiting environmental damage.

10 Invest heavily in enforcement and monitoring

The Netherlands has achieved many successes in recent decades with its policy dealing with traditional environmental issues. However, this is no time to rest on our laurels. If we are to sustain the results achieved, to limit the risks and to ensure real compliance with environmental measures, the government needs to invest heavily in enforcement and monitoring. In addition, the efficiency improvements we can make are not limitless; the Netherlands cannot continue to make savings in enforcement and monitoring without suffering adverse effects.

1 Traditional environmental policy is losing its lustre

Environmental policy challenges in the 21st century

China has to contend with severe smog. In January 2013, the average concentration of particulate matter in Peking was eight times higher than the level considered acceptable by the World Health Organization (WHO).[1] Roads were closed and factories were shut down. In this 'airpocalypse', the Chinese asked themselves whether the price they had to pay for their material well-being was their health.[2]

China is living through our own past: think of the problems in Rijnmond[3] in the 1960s, when the winter smog from the incomplete combustion of coal and oil would colour the air a deep grey. The last severe winter smog was seen in the Netherlands in 1987; a success story of consistent environmental policy. While China suffers from polluted surface water and air polluted with substances harmful to health, the Netherlands has largely left these problems behind. The white foam and stinking algae soup in canals and ditches, the uncontrolled dumping of chemical waste – they are all in the past. In 2013, many visible forms of environmental pollution have all but disappeared.[4] Some Members of Parliament even suggested recently that environmental policy has actually become pretty much obsolete.[5]

China living through our own past:
smog in Peking, January 2013

From the Euromast:
smog in Rijnmond, August 1970

But could we perhaps be mistaken? After all, not *every* environmental issue has been solved. Soil, water and air pollution may be more or less under control, but this does not mean that 'the' environmental problem has been solved. On the one hand, we are faced with chronic problems, such as climate change, increasing competition for various raw materials and global nature loss, including declining soil fertility and dwindling fish stocks. The difficulty in solving these problems is certainly partly due to their international or global nature. The traditional approach, which has been effective in dealing with various environmental problems, does not work here, at the very least because of a lack of effective global government on the world stage. On the other hand, new problems keep cropping up, such as food security issues, possible outbreaks of new infectious diseases such as SARS and Q fever, or nanoplastics in cosmetics which, through the sewers and rivers, ultimately disrupt the marine food chain.

As well as the variety of current environmental issues, changes in society also give pause for thought. They way in which we deal with environmental issues has changed. Most of the Dutch population is well-educated, critical and no longer simply accepts the decisions taken by government. For example, there is increasing opposition to factory farming, people are sympathetic to the idea of wind turbines – although less accepting of them being placed 'in their backyard' – and there is rising opposition to possible shale gas extraction. Not only is the government faced with critical individuals who oppose certain ideas, but also with ordinary citizens and businesses prepared to take the initiative and lead the way. Whereas the government previously needed to encourage the general public and industry to embrace cleaner products and production processes, these same people and businesses are now more and more often taking the lead themselves. Ordinary people and businesses are developing all kinds of environmentally friendly initiatives. In doing so, they often experience the regulations put in place by national and regional governments as a hindrance. This increasingly common exchange of roles[6] is another reason for reconsidering the legitimisation of environmental policy and modus operandi.

In the year 2013, visible environmental problems, such as 'Lekkerkerk' in 1980 – where new housing turned out to have been built on contaminated ground – have all but disappeared

The rationale behind a modern environmental policy

In this report, PBL argues the necessity of modernising environmental policy. The environmental problems of the 21st century make the Netherlands – and the rest of the world – both ecologically and economically vulnerable; for example, given the risks to liveability, public health, spatial investments and resource and energy security. This can also have serious consequences for government finances. The approach that brought about major successes in the past, such as huge improvements in surface water quality and the control of acid rain, will not help us deal with transnational environmental problems to which the Netherlands also contributes, such as climate change, overfishing and the pollution of the world's seas. A new approach is required, supported by a broad social coalition.

Reflection on the modernisation of environmental policy begins with the awareness that our society is completely interwoven with nature. We can think about nature in aesthetic terms of beauty, or moral terms of respect for ecological interactions. However, nature is also a system of resources that provides humans with a wide range of materials and services: from sunlight to petroleum, from fertile soil to drinking water, from minerals to fish. A successful society studies, understands, protects and uses nature to create a high-quality living environment in which good health and prosperity are guaranteed for the long term. The challenge is to do this increasingly intelligently and subtly, to be able to better provide for a world with more and more people. This could be a logical frame of reference for a modern environmental policy.

Such a modern environmental policy demands that we reassess our relationship with the earth as a source of life and prosperity. The system that brought us prosperity in the 20th century was based on the irresponsible use of minerals and fossil fuels stored in the earth's crust, and the careless consumption of theoretically renewable resources such as water, soil and fish. If we persist in this, nature will change in the 21st century from a power that supports society in its pursuit of prosperity and happiness, to a source of social and ecological disorder and potentially high costs. Climate change is no scientific illusion; it is *the* problem of the century.

Many initiatives being taken in society show that it does not need to be like this, and that many people do not want it to be like this. Think of buyers' cooperatives for the purchase of solar panels, energy cooperatives made up of individuals and businesses, or local food production and distribution organisations. There is also good money to be made from such initiatives. It is not the first time that we have made a commercial success of investments in the environment. Think, for example, of water treatment plants, which were first used to clean our surface waters and are now sold all over the world. Water management expertise, born of necessity, is now an export product. Also, the limited space available in the Netherlands has helped inspire farmers to achieve high productivity levels, which has resulted in a strong export position for Dutch agricultural products. Dutch architects and urban planners have also enjoyed international success for many years, and this knowledge export could be put to greater use for the construction of sustainable cities.

In each case, the key words are 'eco-innovation' and 'eco-efficiency'. If we focus on radical improvements to the eco-efficiency of production and consumption processes, this will create opportunities for Dutch people and industry. This in turn requires innovation: we need to develop new concepts, technologies and processes that make nature sustainably productive for society.[7]

The main aim of this report is to encourage an analysis of the purpose and nature of environmental policy in the 21st century. This is what we should be discussing in the Netherlands. Put bluntly: do we want to try to meet national and international obligations with as little pain and effort as possible, or are we going to devote our efforts to addressing the major environmental issues of our time? Environmental policy today is mainly a question of choosing tracks: are we governed by the contents of our purse, or our sustainable earnings capacity? How important is our health and that of the earth that we pass on to future generations?

Limits to success

Three cheers for traditional environmental policy

Environmental concern has always been closely linked to public health. The key words of success used to be 'clean' and 'healthy'. In the 19th century, we constructed an expensive infrastructure of sewers and water pipes to prevent disease. Forty years ago, we saw how our health was threatened by pollution of the air, soil and water. As this pollution caused asthma and cardiovascular disease, resulting in premature death, we spoke of 'environmental health'. Again, we chose to invest in protecting public health. The name of the first environmental policy document, in 1972, speaks volumes: *Environmental Health Priority Memorandum* (*Urgentienota Milieuhygiëne*). And so compartmentalised policy was born, as we got on with cleaning the separate compartments of water, soil and air.

It was a huge challenge. The Dutch economy had grown quickly after the Second World War; so quickly in fact that we created one of the highest densities of environmentally harmful activities in one of the most densely populated countries in the world (see Table 1). Its position at sea and in the delta of several major European rivers as they empty into the North Sea made the Netherlands not just an important transport country for goods along the Rhine and the Meuse, but also the recipient of polluted surface water from the rest of Europe. Through the Netherlands, goods were transported over sea by road to Germany and Belgium and the other countries of the European Union, resulting in heavy road traffic.

Acid rain was a dominant theme in the mid-1980s. The Dutch Government used posters such as this one to convey that message to the general public. It says: Acid rain. Our own fault. Our own concern.

Table 1: Comparison of density of economic activities in selected OECD countries, 1990–1992

Country	Population 1992 (inhabitants/km²)	Production, GDP 1992 (million USD/km²)	Cattle and pigs 1991 (head/km²)	Use of nitrogen fertilisers 1990 (tonnes/km²)	Road vehicle stock 1991 (vehicles/km²)
Netherlands	407	6.7	549	41.5	182
Denmark	120	2.1	276	15.4	45
Germany	224	3.8	144	14.4	111
Japan	329	6.3	43	13.3	160
United States	27	0.6	17	5.3	21
OECD Europe	98	1.4	52	9.7	40

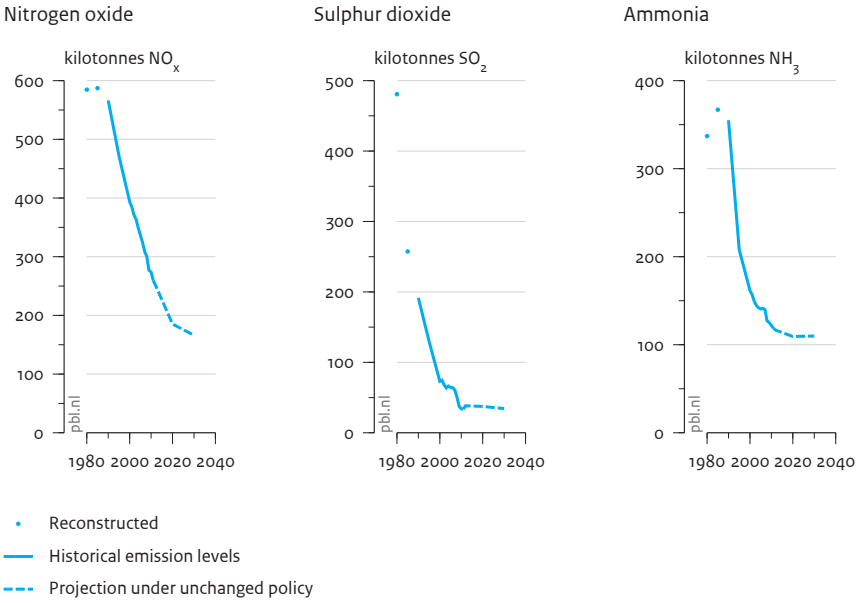
Source: OECD (1995)

When public health is threatened, policy soon receives broad public support and legitimacy. Damage to nature, or threatened damage, comes a close second. There was great concern about this in the mid-1980s, when acid rain threatened the survival of our woodlands. It also became apparent that the quintessential Dutch otter had become extinct in the Netherlands because of the decline in water quality. Minister of the Environment Winsemius (1982–1986) used the momentum to integrate the compartmentalised policy[8] into a thematic approach to acidification (of water and soil), eutrophication (of vulnerable ecosystems), wastefulness (of raw materials), dispersion (of hazardous chemicals) and disposal (of waste). This enabled the better coordination of individual environmental measures. Minister of Agriculture Braks (1982–1990) launched the construction of a National Ecological Network (EHS) in 1990, to enable native flora and fauna to recover. The otter had to return, the forests had to be saved. Climate change was not yet considered a serious environmental issue requiring government action.

The policy process was split up. Scientists assessed the problem[9]; for example, water and groundwater pollution, damage to woodland caused by the increasing use of fossil fuels in industry and traffic, and excessive manure use in agriculture. National government then selected the policy objectives – clean air, no more eutrophication of water, healthy trees – and set the corresponding quality standards for air, water and soil. In consultation with industry[10], the government chose the required measures, such as flue gas desulphurisation or manure incorporation. The inspectorate made sure that these measures were carried out. This integrated, thematic approach reached its peak in the first *National Environmental Policy Plan* (NMP), presented to the House of Representatives by four ministers in 1989. The title of this policy document, *Choose or lose* (*Kiezen of verliezen*), was just as compelling as the *Priority Memorandum* of 1972. The NMP placed the Netherlands on the international map as a leading environmental country.[11] There was faith: we would solve the environmental problems within a generation. It was not only technically achievable; CPB Netherlands Bureau for Economic Policy Analysis had calculated that it was also financially acceptable.[12]

Figure 1

Emission of acidifying substances



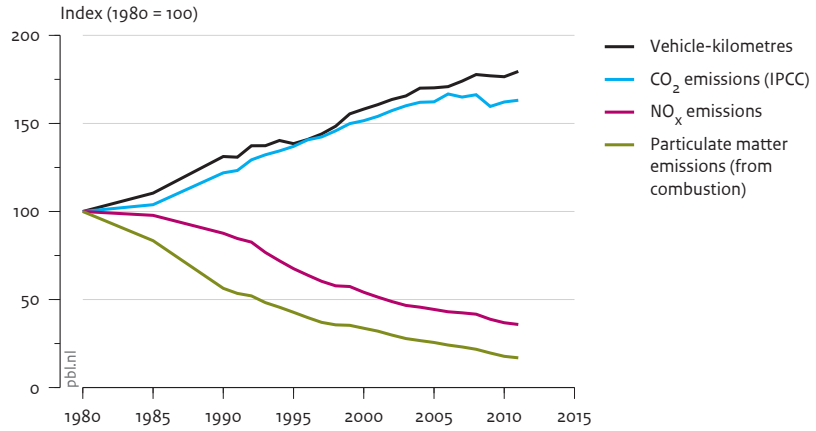
It was partly the role of the Dutch Government that made this traditional approach to environmental issues so successful. After all, the successes of traditional, national environmental policy were made in areas in which the government had real influence. Water pollution, smog, acidification and toxic waste: they were problems that could be solved at the national and European level. This succeeded because governments were able to unite the interests of the most involved stakeholders and because the required measures were affordable.[13]

The decoupling ideal

Environmental policy aims for a complete decoupling: which means that environmental pressure can decline while the economy grows.[14] Looking back, decoupling has indeed been achieved with regard to many environmental issues. This is certainly worth three cheers. However, the success of the traditional approach also shows why a new policy is required. The rate of emission reduction was clearly lower in the last ten years than in the years before (Figure 1). In the case of energy and transport, the efficiency gains made were also partly offset by increasing demand. Cars have become 90% cleaner and 10% more efficient over the last 30 years. However, we drive almost twice as many kilometres and, for many years, have bought more luxury and safer (therefore heavier) cars. As a result, the transport sector lost half of the reductions in NO_x emissions and continued to increase its CO_2 emissions for a long time[15] (Figure 2).

Figure 2

Volume trends and environmental pressure related to road traffic



The large, unfulfilled promise of environmental policy is energy savings. The unshakeable logic of its advocators was, and still is, 'what you save, you don't need to produce'. Energy-savings policy has of course resulted in appliances that are radically more efficient, but has not produced proportionally lower energy consumption. After all, we invent LED lighting, and suddenly we want to light the whole garden. There is also evidence to suggest[16] that people who live in a well-insulated house are less careful or economical with energy than people who live in a 'heat sieve'. This is known as the rebound effect: environmental success is partially negated as the savings are used for more consumption.[17]

The success factors have been clearly identified. Reductions of up to 80% are even achievable if there is a clear political urgency, if the technology is available and if legislation is in place and observed – for example, in the case of emission reductions for SO_2, CFCs and NMVOCs. The covenants agreed with the various industrial sectors, however, never really resulted in high emission reductions, as they were not enforceable. Also, results were not nearly what they could have been because of the difficulties in interagency working between centralised and decentralised government. The agricultural sector turned out to be a notable case. Although decoupling was achieved at the sector level, innovation became bogged down in the manure issue: an effective combination of lack of knowledge on the part of government and a powerful farming lobby.[18] As the remaining emissions are concentrated in the sandy regions of the Netherlands, the environmental pressure on surrounding nature is still too high in these areas.

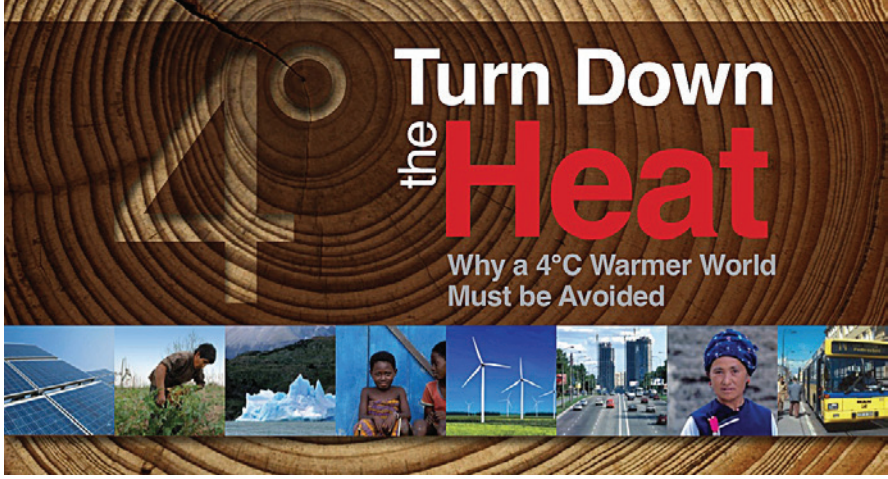
The limits to environmental policy planning

Although the last Environmental Policy Plan (NMP4) dates from 2001, it offers an analysis that is still relevant today. To solve persistent environmental problems, we need systemic change, breakthrough technologies and environmentally aware consumers, as well as market prices that reflect the use of nature and the environment in products and services. However, NMP4 lacked two important strategic insights. First of all, it did not provide a clear vision of effective instrumentation: which policy instruments should be implemented and at what level? What should 'Brussels' do, and what can the Netherlands do alone? Secondly, NMP4 did not include a clear vision of the relationship between the government and society: what can the government still do itself? How can better use be made of the innovative power in society, of energetic individuals and businesses? How can the government encourage unwilling, internationally operating companies to come on board?

Today – in the 21st century – environmental policy needs to be given a different form. The government has, in hindsight, relied too heavily on government processes to achieve systemic change. It did involve public stakeholders and transition processes were implemented – for energy, food, biodiversity (and later transport) – to stimulate breakthrough technologies. However, 12 years later, this has produced too few visible results.[19] Breakthrough technology, transition, innovation: whoever hears these words can also ask themselves whether it is possible to organise them within our consensus-focused administrative and government culture. In fact, game-changers are required: new rules that force a break with existing processes; for example, the adequate pricing of greenhouse gas emissions.

Over the last decades, the Dutch Government has displayed an incredible amount of creativity and perseverance in continuing to find solutions – together with stakeholders – that make maximum use of the available environmental space. This often concerned technology, as well as creative (fertiliser) accounting.[20] The construction of hundreds of kilometres of noise barriers, the burning of chicken manure, the Schiphol airport 'double act': ingenious solutions to enable us to continue our habits as much as possible. However, such solutions have little to do with transition, breakthrough technology or innovation – yet we know that these are what are required to address issues such as climate change.

Various scientists claim that, to maintain our prosperity, we need to lower inputs and emissions by a factor of five.[21] In other words, we are going to have to satisfy our needs with just 20% of the raw materials and emissions we now use. In theory, this is possible: during the last 40 years traditional environmental policy has achieved similar leaps in output efficiency in several important areas. This is a leap that we are going to have to make again, but this time on the input side too, and at the global scale.



Jim Yong Kim (World Bank) on Turn Down the Heat, 'It is my hope that this report shocks us into action.'

In 1990, Dutch environmental policy was an export product. We led environmental awareness and other countries looked to us for innovative solutions. However, it looks as though the pressure to innovate is coming this time not from national government, but from others. It would be fair to say, in 2013, that the Dutch Government is now bringing up the rear, rather than leading the way.

Support for modern environmental policy

Environmental policy affects the whole of society, which is why it needs strong supporters. Without aiming to be exhaustive, PBL has identified three public forces supporting modernisation.

The first is the plea made in favour of greening by international institutes such as the World Bank, the IMF, the IEA and the OECD. The World Bank recently published its report entitled *Turn Down the Heat: Why a 4 °C Warmer World Must be Avoided*. In the preface, the president of the World Bank, Jim Yong Kim, wrote, 'It is my hope that this report shocks us into action.' This influential economic institute calls for radical greening as it recognises the possible disruptive effect of climate change, in particular on the economy and society, and most of all in developing countries. What would the effect be if the not-inconceivable chance that global warming was not limited to two or four degrees in 2100, but as much as six degrees, were to become reality?

The IMF, World Bank, OECD and IEA analyses also display an awareness that national governments stimulate the required greening either not at all or only to a limited extent in their current policies. In fact, 20th century policy sometimes directly opposes effective 21st century policy. The IMF points to the 1 900 billion dollars of environmentally damaging subsidies and fiscal advantages[22] that stimulate environmentally harmful behaviour amongst individuals and industry. PBL has calculated that these subsidies and fiscal advantages total five to ten billion euros per year in the Netherlands.[23]

The second form of support comes from internationally operating companies who increasingly realise that the environment and nature are an integral part of a good business case. This awareness is partly the result of moral considerations, but has largely arisen as these companies have come to realise that ignoring the environment and nature can form an operational risk. For companies such as Unilever, DSM and AkzoNobel, their dependence on raw materials makes them vulnerable to price fluctuations. Furthermore, we only need to think of a world with nine billion people and a growing middle class with its corresponding consumer demands to realise that competition for resources is only going to increase. This is why companies who are ahead of the game are focusing on resource efficiency, to reduce their dependence and to continue to produce a competitive end product. What a contrast this makes with the 1990s, when it was the government who called on industry to take action. Today, a few Dutch companies in the top ten of the Dow Jones Sustainability Index are asking the government to take measures.

Both large international organisations and these sustainability-focused companies are calling for changes to be made to the rules of the game in the economy. Environmental policy could lead the way to a low-carbon economy and radical efficiency improvements in the use of natural resources such as water, fertilisers and earth metals, through regulation and the pricing of the use of the environment.

The energetic society forms the third form of support of a modern environmental policy. This manifests itself in the countless initiatives to take an active part in the transition to a sustainable society. For example, it is no longer possible to keep count of the number of individual and industrial cooperatives set up to generate renewable energy. Cooperatives that bring together companies and environmentally aware individuals are also shooting up like mushrooms. Again, we see a complete reversal: in the 1990s the government had to encourage the public and industry to take action; today this seems to be the other way round.[24] We also see a more proactive attitude from municipalities, who do not wait for orders or a request from national government but want to take action themselves.

In developing policy, it would be sensible to assess the value of these forms of social support. This means that the government too needs to develop a new frame of reference. New environmental policy is not possible without the strong involvement of the Ministries of Finance and Economic Affairs. This is not just because environmental policy requires broad support to be effective, but because the environmental issues of the 21st century have wide-ranging effects, including on government finances, employment and development opportunities for companies.

2 Barriers to modernisation

The government's environmental dilemma

Environmental protection is a typical case of something that we need the government for. After all, environmental quality is a public good: it is important to us all, but we cannot achieve it alone. It is a classic example, therefore, of something requiring government action. However, such reasoning fails to take into account the environmental dilemma faced by the government, which not only has to provide a liveable environment, but also needs to weigh this up against other interests such as income, employment, housing and recreation. Furthermore, it is up to the government to make sure that everyone plays their part to help reach the objective. This, however, is the problem. When push comes to shove, the government often submits to vested interests. The problem is not the word 'interests' – there is nothing wrong with industry warning of the possible negative effects of policy proposals – but the word 'vested'. After all, light bulb manufacturers are not likely to suggest a ban on their own, wasteful, product.

However, neither is the status quo cast in stone. The history of environmental policy shows that a decoupling between production and pollution is possible. In such a case, the interest therefore *changes*. Light bulb manufacturers realise that people no longer want to buy an inefficient bulb that produces more heat than light, and they therefore introduce new products: first the energy-saving light bulb, now LED

LED street lights in Beckumerstraat in Boekelo, municipality of Enschede

lights. However, the light bulb did not simply make way for the superior LED light. The government threat to ban the light bulb, combined with the opportunity to present a sustainable image, were important incentives for manufacturers to introduce a new light that drastically increased the light/heat ratio. Another example is the three-way catalytic converter. Car manufacturers were obliged to install these in cars to reduce NO_x emissions. The car industry protested: a catalytic converter would cost them about 1 500 Dutch guilders per car. Once it became clear that a catalytic converter really did need to be installed, this turned out to be about 850 guilders. Now, a catalytic converter costs about 100 euros.[25] These are examples of environmental policy leading to innovation and new markets. Once policy was presented as indisputable and unchangeable, the creative forces in industry could focus on innovation, producing huge cost savings.

The environmental dilemma often leads the government to look for win-win solutions. Such a solution can arise, for example, if industry and environmental quality can join hands and 'pollution prevention pays'. As clean technologies have become available, environmental policy has contributed towards their relatively rapid and widespread application. Furthermore, the technology becomes cheaper as a result, which increases the rate of implementation. However, with regard to some environmental issues, the desired innovation has so far failed to take place, or is taking place too slowly: energy generation from renewable sources such as wind and the sun being one example. The Netherlands has failed to achieve anything more than a share of just over 4% of renewable energy. It will therefore be a huge challenge to achieve the agreed European target of 14% renewable energy by

2020, let alone the Dutch Government target of 16%. On the one hand, the government itself is causing the uncertainty; for example, by continuing to change the target and the instruments to be used, in its renewable energy policy. This increases the uncertainty in industry regarding the market opportunities of products that may depend on government policy. On the other hand, we see the usual dilemma in the Netherlands with regards to fossil fuel reductions: industry and the general public want to do what is good for the environment, as long as they do not feel the pain too much in their wallets.

The government is actually constantly looking for the 'best practicable means'. It therefore set ambitious environmental targets and hopes that this will force innovation. Unfortunately, however, the government never has sufficient information to be able to do this properly. The brief history of environment policy is littered with examples of companies having presented their innovative and adaptive capacities as being much less than they actually were. This lack of information also makes it easier to put pressure on the government; for example, by harping on about the higher costs resulting from environmental targets, the negative effects on national and international competition, and the ultimate risk of increased bankruptcies and loss of jobs. Through this combination of lack of information and an effective lobby, farmers have succeeded for decades in watering down and delaying fertiliser policies[26] and industry has succeeded in maintaining 'subsidies' on fossil fuels.

In many cases, therefore, the government lacks knowledge of what is technically possible and what may reasonably be demanded of industry. However, negotiators in industry also often underestimate the innovative power available in their own companies.[27] Innovative companies – the front runners – *are* calling for stricter environmental targets, while the traditional companies following on in the peloton are better served by gradual change so they continue to profit from investment in the old technologies for as long as possible.

Government can of course sidestep the risk of economic liability by paying for the development of innovation itself. This is however not without risk, as there is a danger that the government will invest a lot of money in options that ultimately turn out to be unfeasible. Another option is to wait and see which innovations survive when creativity, entrepreneurship and market developments are given free rein, and to accept that pollution will continue for longer than hoped. However, can we afford to do this?

Level playing field helps and hinders

It is of course true that industry sees its competitive position worsen as a result of strict and, especially, unilateral environmental policy. After all, a much more relaxed environmental policy in other countries puts Dutch industry at a disadvantage. It is traditionally companies active in sectors with strong international

competition and small profit margins that experience the most problems, such as the steel industry, intensive livestock farming and road transport.

In such a context, European environmental policy has a much greater effect than national environmental policy. The EU internal market created in 1992 means that, theoretically, economic traffic may pass freely between Member States. To create a level playing field for European companies operating in this internal market, it was necessary to put in place uniform environmental standards, which has encouraged environmental protection. Because the countries that were competing with the Netherlands were also required to meet these standards, their tightening did not lead to a loss of competitive power, jobs and incomes. In addition, new Member States were also required to meet the European environmental standards when joining the EU – standards that they often found very strict. Policy from Brussels has sometimes even had a global effect; for example, many countries outside the EU have adopted the 'euro standards' for car emissions.[28] After all, it makes no sense to make different car engines for different countries. European integration has therefore been good news for the environment.

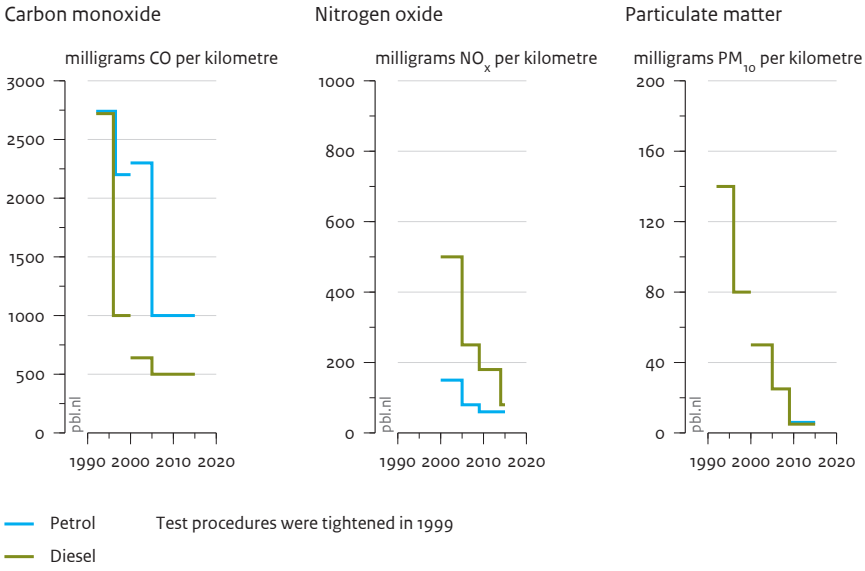
Increasingly tighter emission standards set by the EU determine the playing field within which industry can work (Figure 3). Industry is usually very realistic about this: the government has the right to set the limits of the playing field. Threatened with climate change, it is logical that the government sets a price on CO_2 emissions. The playing field is therefore redefined and industry can continue.

It should be noted that industry continues to insist that the new rules also apply to its competitors. This used to mean that emission reduction targets needed to be formulated at European level. Today, however, industry increasingly calls for global standards. This brings us almost back to square one: there is no global government. It is also unlikely that large steps will be taken in negotiations

Through the LIFE programme, the EU provides financial support for projects that protect nature and the environment.

Figure 3

European emission standard for passenger vehicles



between 193 countries. Even at the European level, the government is finding it more difficult to implement environmental policy, as with 27 countries in the EU it is increasingly difficult to achieve consensus. How different this was in the 1980s and 1990s, when the EU was made up of similarly minded countries and globalisation had not yet reached the level it has today. It seems that there is no longer a *polity* capable of implementing *policy*: no political entity capable of implementing the type of policy changes required.

An example is the opposition to a more effective trading system for CO_2 emission rights. The steel sector and airlines make clever use of the varying interests between different EU Member States.[29] The environmental movement, traditionally relatively effective at the European level, is increasingly coming away empty-handed. Furthermore, the EU now needs to take into account the fact that companies are prepared to move their production processes, and therefore employment, to other countries with more relaxed environmental standards. The result, at the global level, is a negative environmental effect. The government can set standards at the regional level, but not yet globally.

Even so, a certain kind of political fatalism can be detected in such an argument: a government that lacks knowledge; politicians who lack power. Is such fatalism deserved? It is also possible to maintain that the progress made in forming unambiguous policy focusing on eco-innovation has proven itself in those sectors in which industry claimed it would be much too expensive (e.g. the catalytic

converter). Eco-efficiency can therefore be translated into a competitive advantage if increasing demand causes an increase in the price of resources.

In any case, it is sensible to continue to develop Dutch environmental policy in line with the European approach, despite the complex procedures, despite disagreement between Member States and despite the public aversion to a shift of autonomy from The Hague to Brussels. A number of reasons can be given for this. The first is that rules are agreed in Brussels that apply to the second-largest consumer market in the world.[30] The second is that European environment policy reduces the environmental load in the Netherlands. This applies in particular to cross-border issues such as air pollution and water quality. The third reason for maintaining consistency with the European approach and stimulating this from within the Netherlands is the larger mass available in the EU for developing the required breakthrough technologies. After all, Germany may be able to realise an energy transition under its own steam, but the Netherlands is too small to achieve this. The development of breakthrough technologies requires a lot of expertise and money, as well as future market conditions that make it attractive to both manufacturers and consumers to apply the new technologies. With this in mind, the EU, with its strategy focusing on resource efficiency and its innovation programmes, provides interesting opportunities for a transition to a low-carbon society. This strategy does however assume a change in the investment of European resources: in order to achieve a breakthrough it is necessary to consider increasing the relative proportion of innovation funds in the European budget.

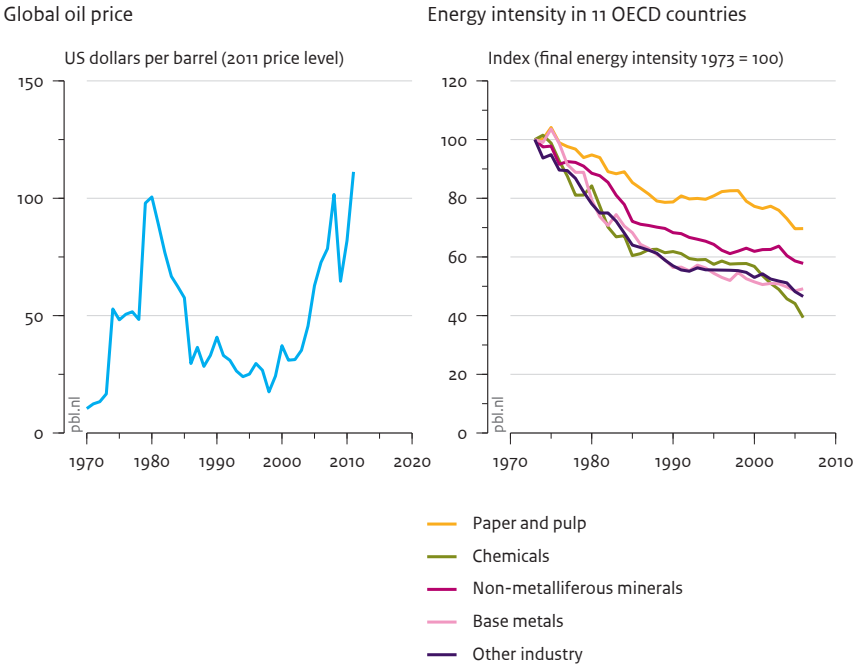
Innovation policy and subsidies

Innovation does not come about by itself. For a long time, it was thought that industry was in the best position to assess which innovations would be commercially successful. However, as long as investment is related to market prices that do not take into account the environmental impact of activities and products, companies will not develop technologies that minimise that environmental impact. After all, when salaries increased, companies invested in labour-replacing automation, and when oil prices rose in the 1970s, companies invested in energy savings (Figure 4).

In summary, therefore, industry only invests in environmental technology once it is sure that investments will provide a return within the foreseeable future. Environmental policy therefore needs to provide such assurance. It can do this by setting emission standards. Another option is to correct for environmental impacts in market prices through levies and subsidies (environmental pricing). Environmental use would therefore mean a higher cost, and environmental savings a lower cost. As well as encouraging the more careful use of natural resources, the government would also create a market for environment-saving technologies. A classic example in the Netherlands is the levy within the framework of the Surface Water Pollution Act in the 1970s, which stimulated large numbers of Dutch companies to develop water treatment plants for their own waste water.[31]

Figure 4

Oil price and energy intensity

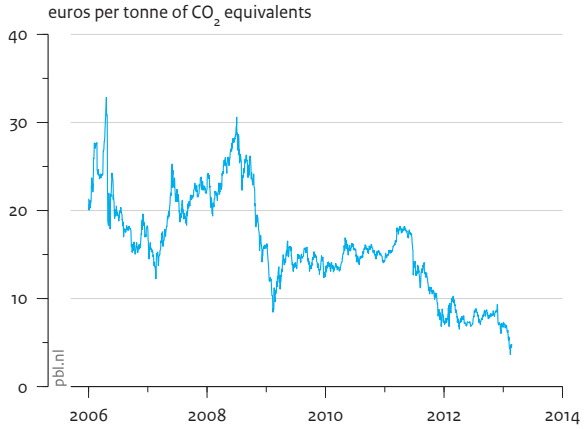


Why not apply such a mechanism to the main environmental issue of our time – climate change? The foundation is already in place; the European trading system for greenhouse gas emission rights – the ETS. This instrument was however made toothless on its introduction by all the political haggling. So many rights were issued that emissions have barely been affected. Combined with the recent economic malaise, this has resulted in such a decrease in the price of emission rights that there is no pricing incentive for innovation. Rather than the intended price of 20 to 30 euros in 2020, the CO_2 emission rights price is currently fluctuating at around 3 euros per tonne (Figure 5) and showing no sign of a substantial increase in the foreseeable future. It would therefore be advisable to (1) increase the annual factor by which emissions must be reduced, and (2) introduce a minimum price to restore the financial incentive.[32]

In the Netherlands, the fiscal stimulation of catalytic convertors and diesel particulate filters – initially prompted by European air quality requirements – has mainly resulted in the more rapid application of technologies that would otherwise have been introduced several years later as a result of EU standards. The fiscal stimulation of energy-efficient cars has been a huge success in the Netherlands; people have indeed bought other makes of car. However, it cost the government so much in lost revenue that the scheme had to be toned down after a few years.[33] The

Figure 5

Price of CO_2 emission rights

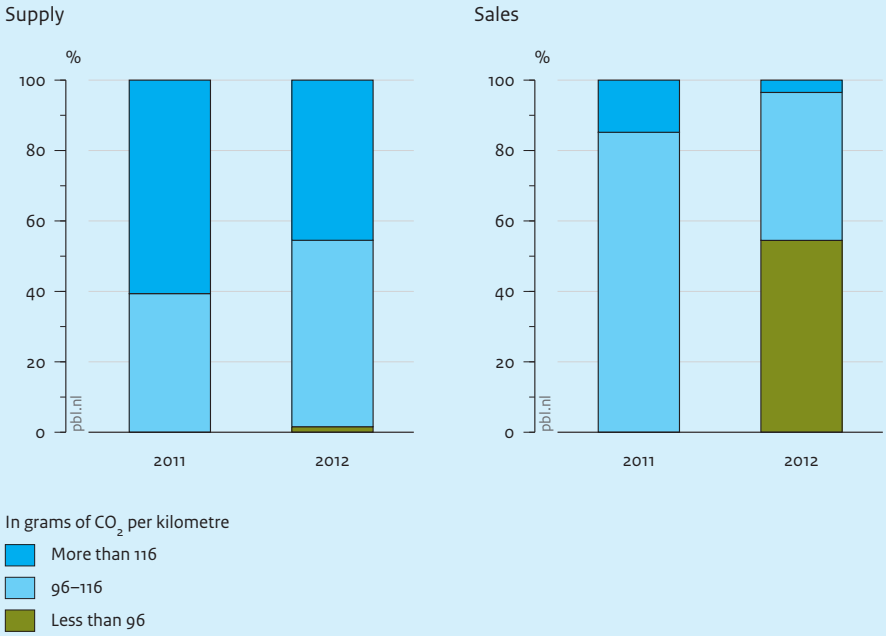


government had not expected that the car industry would be able to sell highly energy-efficient (and therefore tax-exempt) diesel cars within one or two years. Neither had it anticipated that consumers would buy these cars in such large numbers. Almost half of all new diesel cars are now tax-exempt, as shown in Figure 6. However, it would seem that these tax-exempt cars are in fact less energy-efficient than measured under the prescribed test conditions. Recent data show that the new cars use an average of 23% more fuel than that claimed by the manufacturer.[34]

These examples show that it is not easy for national governments to correct market prices for environmental effects. There is often limited financial leeway regarding the implementation of subsidies, and price corrections through levies are effective, but also negatively affect competition, in particular in an open economy such as that of the Netherlands. This however can be compensated for by aligning market corrections internationally; for example, at the EU level. However, even then the stimulation of eco-innovation through price corrections and strict environmental standards often remains limited to the relatively cheap innovations. This is because the implementation of expensive innovations requires large price corrections, which are politically unattainable. Cheap innovations are of course useful, but not enough to reduce the use of natural resources by a factor of five. More, therefore, is required. There is no getting away from the fact that the Netherlands is going to have to review its environmental policy. This will create a 'new normality' that will make it rational to minimise inputs and emissions, and to focus production as much as possible on re-use.

Figure 6

Supply and sales of diesel passenger vehicles in weight class 1150–1350 kg, according to CO_2 class



Financial incentives and the super-fast greening of diesel cars

The possible effect of financial incentives on rapid greening can be demonstrated by the boom in highly energy-efficient diesel cars. The first diagram in Figure 6 shows the medium-weight car models available in Dutch showrooms in 2011 and 2012. The models are divided into different CO_2 emission classes. The second diagram shows the sales for these CO_2 emission classes. In 2011, there were no 'highly energy-efficient' cars available in this segment (<96 g/km), therefore none were sold. A few models had been introduced in 2012 (2% of the supply), and these were sold in huge numbers (50% of the sales). Consumers had not been expected to react in this way to a limited supply of highly energy-efficient cars. The tax benefit was the deciding factor for many buyers.

The dominant view since the 1990s has been that governments should leave business to businesses. As a result, public companies have been privatised and innovation policy has been largely limited to subsidising research and encouraging synergy between knowledge institutions and industry. Although in the spirit of the times, it is clear that this is not a successful recipe for creating breakthrough technologies with market potential. The innovation platforms and transition

arenas put in place by the government from 2001 onwards have also died a quiet death. The aim of these platforms and arenas was to develop a powerful innovation programme with industry within the framework of the energy transition. In addition, subsidies to stimulate renewable energy generation were changed so often[35] that investors no longer dared depend on them. The government increasingly favoured the cheapest solutions, ignoring their limited potential in the long run and leaving the stimulation (and price reduction) of high potential solutions to others.
No example shows the dominance of short-termism in policy as clearly as biomass co-firing. The co-firing of biomass in coal-fired power plants now prevails over stimulating new – in the long term, necessary – innovative forms of renewable energy generation. It has gone so far in the Netherlands that the best manure produced in livestock farming – solid poultry manure – is now burnt under subsidy to produce green electricity. According to the regulations, this solves two environmental problems in one blow: less manure surplus and more renewable energy. The alternative vision is that we are kidding ourselves and that the short-term effects are taking precedence over the sustained stimulation of renewable energy generation and regionally balanced nutrient cycles. Politicians have said they aim to achieve a low-carbon economy by 2050. However, coal-fired power stations are not part of this vision, not even if they include CO_2 storage. If we want to achieve that target, we need a different policy.

The general public

In the 1980s, there were still real environmental problems; problems that we could see, smell or feel, and that politicians could see the terrible effects of and promise their voters they would solve. However, from the 1990s onwards we have been faced with a new generation of problems that lack such visibility. Climate change seems to be an abstract, almost theoretical problem, put on the agenda by scientists, based on data and computer model simulations and acting in the future. One cool spring, such as in 2013, and hardly anyone believes in global warming anymore.

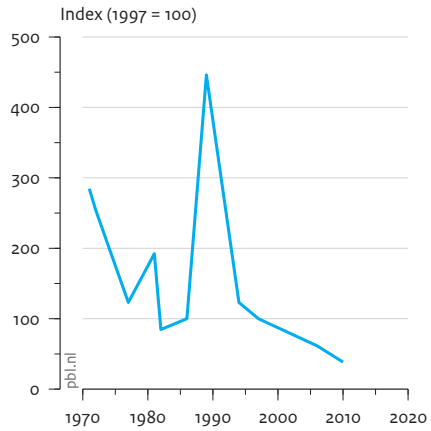
Biodiversity loss is also largely seen as a macro problem, taking place far from the Netherlands, while the general public is more concerned with micro-nature close to home. The emergence of these new environmental issues means that, for many people, environmental policy represents something that happens to other people elsewhere. The quarterly *Burgerperspectieven* survey, carried out by the Netherlands Institute for Social Research (SCP, 2013), shows that the environment is no longer amongst the top five of perceived problems in the Netherlands (Figure 7). Perhaps this is misleading, as 'the environment' is 'out', while 'sustainability' is 'in'?

Combating climate change and biodiversity loss will increasingly require the general public to make real changes in their lives. There is not a single 'green business case' for a completely clean environment imaginable that does not involve lifestyle. Faced with this, politicians and policymakers immediately lose courage. If politicians thought in the 1960s that everyone was entitled to own a car, today the

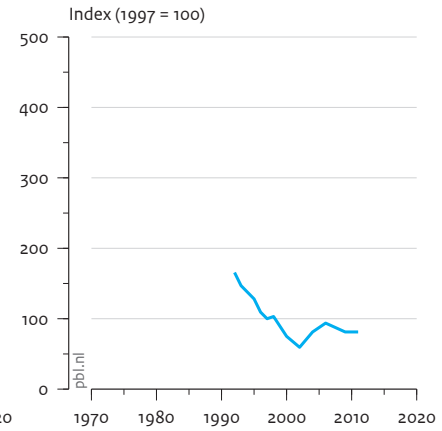
Figure 7

Public interest in the environment

Interest in environmental issues



The environment is named as one of the main political objectives



general public finds nothing unusual in going on several long-haul holidays each year. This is however an achievement with a huge environmental impact. A return flight to New York, calculated in CO_2 emissions, is equivalent to driving on your own in a car for *35 kilometres a day for a whole year* (Figure 8).[36] Furthermore, who in the Netherlands is aware that a Dutch dairy cow emits more greenhouse gases in the production of meat and milk than the average 'sacred cow' on the road? If we are to implement an effective environmental policy it is important to make these 'order of magnitude' issues clear. This would provide an understanding of the main environmental impacts and could result in a reconsideration of the priorities of environmental policy.

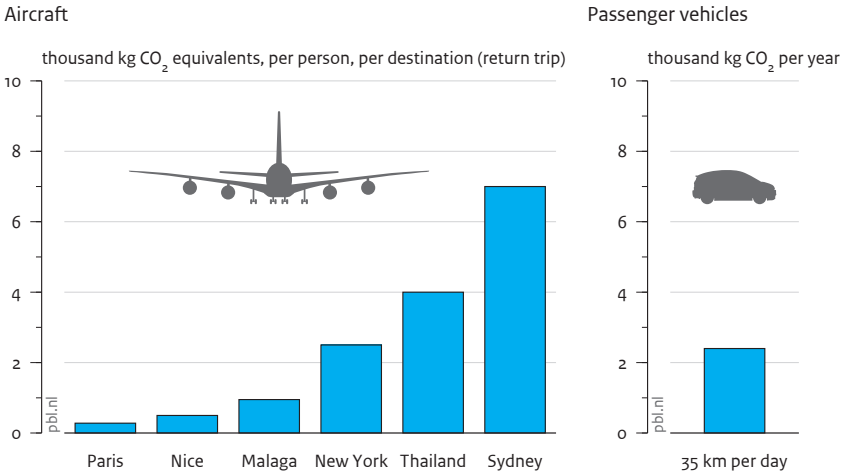
The comparison between a return flight to New York and a whole year's driving shows where the main problem lies. The difference is not in the fuel use per person per kilometre, but in the price. Book on time and a return ticket costs about 600 euros, or 5 euro cents per kilometre. Aviation fuel is therefore many times cheaper than car fuel, which makes flying an attractive option. The environmental costs of air travel are still not reflected in the price. If we do not price the environmental impact of, in this case, aviation fuel, we are simply wasting our time, and lifestyle changes will be very hard to realise.

Experts

Politicians and policymakers can no longer take refuge behind uncertain scientific knowledge. After all, the causes of undesirable environmental impacts are generally well-known. Of course, there is plenty more research to be done, but, in terms of 'order of magnitude', scientists now know enough. Environmental policy therefore requires a 'coming out'.

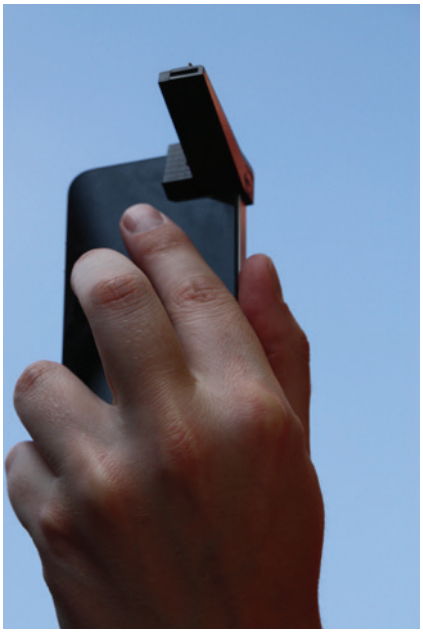
Figure 8

CO_2 emissions from travel, 2011



Science is also going to have to adapt to the times. Environmental policy and politicians have too long relied on a positivistic scientific view. The scientists calculated all the risks and determined the dose-response relationships, based on which politicians set uniform (national) standards. However, there was much less of a scientific focus on the different effects these standards have on different groups of the general public. Furthermore, it is becoming increasingly difficult in our society to define a 'general public'; rather there are lots of different 'publics', each with their own outlook on particular problems. As far as the government is concerned, this all means that it needs to focus its communication on a wide range of groups, while some groups only become apparent once a decision-making process has been completed. Often, the government is faced with a public that has its own ideas about or makes a different assessment of certain risks. It is difficult to translate these wide-ranging ideas into policy proposals that are recognised as legitimate by a broad group of people.

It is also the case that the public no longer blindly accepts scientific findings. Residents near Schiphol airport have started measuring sound levels themselves, as they do not trust the calculations made by the Dutch Aviation Authority. Friends of the Earth Netherlands did not trust air quality data and so set up its own network of monitoring stations.[37] A positive response to this was seen recently, when the National Institute for Public Health and the Environment (RIVM) supplied iPhone owners with a measuring device to create a civilian network able to measure particulate matter concentrations. These examples show that the general public is involved in environmental policy and is critical of its implementation. How can we make use of this engagement in the modernisation of environmental policy?



iPhone with device for measuring particulate matter concentrations

Environmental policy has become, to some extent, a victim of its own success: now that the otter has returned to Dutch waters and the smog has disappeared, part of the social legitimacy for government action has been lost. The air is clean and the water clear. However, the general public and government now need scientists more than ever to identify the complex and 'invisible' issues relating to increasing resource scarcity, biodiversity loss and climate change. This is partly due to the intervention of some climate sceptics, who have effectively cast doubt on broadly accepted scientific facts.[38] However, it is also because of the incredibly abstract and 'grey' definition of the environment. Knowledge is not the same as feeling; understanding not the same as experiencing. Dutch people today are being brought up with the idea that we are living in defiance of the laws of nature. Climate change, biodiversity loss: we all know about the problems, but they remain abstract, they do not affect us. On the other hand, the public does react to a fire in a chemicals factory and food scares: these things affect us, as it concerns what we eat and, even worse, what we have already eaten. Many others also feel uneasy when they hear that the North Pole may soon be ice-free, as this is certain to affect the climate in north-western Europe, although we do not yet know exactly how.

Several travel agencies offer exclusive cruises to the North Pole, from Greenland to Alaska. This northern passage has recently been made possible as a result of climate change.

Environmental policy could certainly earn more support if it were to accept such solid demonstrations of firm underlying trends. However, this requires a complicated balancing act on the part of science. On the one hand, it is clear that policy requires such solid demonstrations to make the issues less abstract, but on the other hand science needs to remain true to its research and not get carried away. At the same time, policy-focused science has the public task to formulate issues that scientists are working on in an understandable manner.

3 Towards modernising environmental policy

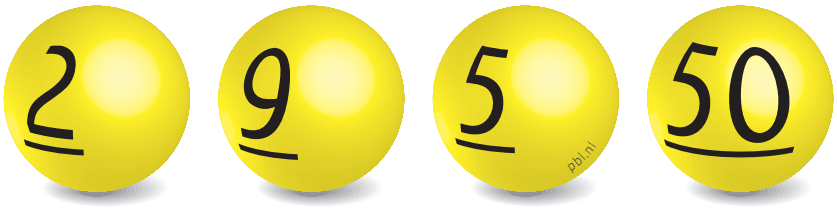
As we have seen, not every environmental issue is the same. To be able to assess the effectiveness of traditional environmental policy, PBL has defined three general categories for the purpose of this analysis: global, traditional and uncertain environmental issues. Each category requires a different approach. In what way can environmental policy be modernised for each of the categories?

Global environmental issues: 2-9-5-50

The present global environmental challenge can be typified as 2-9-5-50: limit global warming to 2 °C for a population of about 9 billion of which an estimated 5 billion belong to the middle class in 2050, and with all the additional consumer demands this entails (Figure 9). Climate, energy, food and water: they are intimately related to each other. We therefore need to take an integral approach to the environmental issues of our time; it is no longer possible to break them up into separate pieces. Increasing raw material prices are causing nature to return to the core of economy. This is exactly why organisations such as the IMF and the World Bank and consulting firms such as McKinsey and KPMG are involved in environmental issues. The following discussion deals with the climate only, not because other environmental issues such as biodiversity loss, land degradation or water scarcity are any less important, but because the climate is here used as an important example of global environmental issues.

Figure 9

Global environmental issues: 2-9-5-50



2 degrees temperature target | 9 billion people world population | 5 billion people in the middle class | in 2050

Today, the effects of climate change are visible worldwide, and therefore sometimes also in the Netherlands: the sea level is rising, species' habitats are shifting, crop yields are changing (increasing at higher latitudes but decreasing closer to the equator), the number of heat waves is increasing, glaciers are retreating (affecting the water supply) and ice is disappearing from the North Pole. If we fail to take action, climate change will continue unabated, the effects named will intensify and precipitation patterns will also change. Less precipitation is expected in tropical areas, where it is already dry, while countries in the wet tropical climates and at higher latitudes will need to deal with more precipitation. In the Netherlands, we can expect more severe autumn storms as the warmer sea water means that tropical storms can reach our shores more easily. Global warming of two degrees will also cause more extreme weather events. Rich countries may be able to deal with the effects, but poor countries will not. Furthermore, a higher temperature rise will only increase the risks named.

Politicians may have set a limit of two degrees, but they have not implemented it in policy. Global greenhouse gas emissions continue to rise, and have even accelerated since 2002. Without new policies in place, emissions will continue to rise steeply, while they need to decrease as of 2020 to remain within the two-degree limit.[39] The current emission reduction pledges are a long way from what is really needed, and we have not even addressed the question whether every country will meet these 'pledges'.

How, therefore, should scientists talk about climate change? We know that climate change is one of the biggest challenges to global prosperity. Even so, we seem unable to translate this knowledge into social action. Many scientists have been calling for 20 years now that it is 'five minutes to midnight'. Meanwhile, the costs of measures to prevent further global warming continue to rise, as does the price of adaptation strategies required in the face of warming that has already taken place. As long as the threatened climate change is couched in scientific terms such as '450 ppm', '2 °C' or 'climate sensitivity', the message will not get through. It may help to think and communicate in terms of risk. For example, it

may be useful to explain to the general public the effects of a scenario involving a global temperature rise of four, or even six, degrees.

Climate change is not a problem to be faced some time in the future, it is happening right now. Politicians may declare themselves in favour of the two-degree target, but the package of measures agreed will not achieve it. If we are to achieve this target, we are going to have to run a marathon, and in record time. The first few kilometres are behind us, but were taken at a walking pace. Big steps need to be taken today.

Environmental policy requires new coalitions

The lip service that is paid to 'making society more sustainable' and the aspirations for a 'clean economy' by 2050 presume an acceleration of these processes today, in order to prevent high costs later and elsewhere. Air pollution in China is also *our* problem. After all, we import the cheap products that are produced in China using polluting technologies. And, through our imports, we feed China's hunger for natural resources, which in turn leads to its urge to expand towards Africa. As far as the environment is concerned, we are all in the same boat.

A car's dashboard shows whether its engine is overheating, or if it is running out of petrol. Similarly, the World Bank, OECD, IEA, EEA, Statistics Netherlands (CBS) and PBL can see on their dashboards that, if we do not take action today, our use of natural resources could soon result in higher prices, price fluctuations and conflicts, as already seen in some regions in the form of tensions over access to fresh water. What can we do to take effective action today?

There are two fundamental insights that we need to appreciate. The first is that there can be no sustainable future in the global context if we, in the developed countries of the world, are not prepared to open some of our achievements up for discussion. The Netherlands can go a long way in green growth, efficiency measures and resource policies, but if the government truly wants to achieve the desired level of sustainability, it at least needs to think about the contribution of and obstacles to behavioural change; for example, in our diet. Secondly, it is not unrealistic to believe that society can make this fundamental transition – a transition, however, that will never take place for environmental reasons *alone*. The fate of the polar bear only motivates a small group in our society. However, combined with the possibility of new jobs, the strengthening of the economy, lower living costs, better health and a better quality of life, it *is* possible to mobilise a much larger group. A combination of benefits can, if the motives are properly explained, create a coalition able to make real change.

More efficient use of resources

Never before have we experienced the kind of global economic growth that is expected over the next 20 years. Growth in China and India is 10 times higher than that seen in Great Britain during the Industrial Revolution, and the population in China and India is currently 200 times higher.[40] Such developments are placing an unprecedented pressure on the earth system. If we fail to take effective measures,

climate change will lead to an equally unprecedented temperature rise, failed harvests, floods and biodiversity loss. Water scarcity and high, fluctuating resource prices will affect trade and could lead to geopolitical tensions. Other than 20 years ago, large, internationally operating companies are also warning of the dangers of ignoring ecology. For them, the supply security of raw materials is at stake.

Recycling car batteries provides reusable lead

If more people in the world want to enjoy greater material prosperity, the use of raw materials is going to have to be made more efficient. This is a global challenge. Market forces will compel industry to make its production more efficient, but is this going to happen quickly enough to prevent possible economic disruption? Governments are responsible for stimulating the required efficient technologies in time to achieve this. McKinsey (2011) shows that investments in a reduced dependency on resources such as energy, water, land and steel[41] can be recouped as long as governments create the right conditions for this to happen. This is not only good for the economy, but the environment can also benefit from the more efficient use of resources.[42]

Encourage eco-innovation

The European Commission has requested for some time that Member States develop a 'resource strategy'; a request that the Netherlands until now has largely ignored. It would seem useful to begin a discussion about the opportunities and threats presented by such a strategy as a central element of Dutch environmental policy: which eco-efficient solutions does the Netherlands want to focus on?

If a resource strategy is to be effective, it is essential that industry develops and implements new technologies that take into account the limited availability of natural resources and the limited capacity of the environment to absorb greenhouse gases and other waste products. Industry is only going to do this if governments create the required favourable circumstances; if governments switch tracks to the consistent, more efficient use of natural resources. This starts with the registration of environmental use: green accounting. Transparent green accounting will increase economic awareness and make it possible to set standards.

Because the world's economic systems are so closely interwoven, government intervention would be most effective if carried out at the global scale. However, the large differences between countries, both in terms of position and interests, means that it is unlikely that global consensus could be reached for such government intervention. This is reflected in the lack of a new, far-reaching global climate agreement.

It therefore seems unlikely that an effective, global, climate treaty will be reached in the next few years. However, there are alternative strategies. International cooperation can also be effective at a smaller scale. For example, the EU could make access to the European market more dependent on meeting product requirements that improve the efficiency of resource use. This is a measure that would undoubtedly lead to legal proceedings with the WTO because of unfair competition. The advantage however would be that the requirement would start an international discussion about resource waste. Within the EU, implementation of the Ecodesign Directive is progressing slowly, and compliance monitoring is not what it could be.[43] Would it not be in the interest of trading nation the Netherlands to take a leading role in this? The energy-intensive industry in particular could vastly improve its energy efficiency, thereby making a considerable contribution to limiting climate change. Through changes both to the ETS and existing energy levies, governments could also stimulate additional energy savings. The previously mentioned rebound effect does not imply that we need not aim for energy efficiency. However, the rebound effect does provide an additional reason to exchange fossil fuels for renewable energy sources. This is because if renewable sources are used, the rebound effect leads to hardly any additional emissions of greenhouse gases and pollutants.[44]

Working together with a few willing EU Member States[45] or other industrialised countries is therefore also a way of stimulating eco-innovation. Dutch technology is already used to develop PV solar panels in China. There are also opportunities in China for Dutch companies in water and air pollution control. It is also worth considering working together with groups of companies that would like to prepare for future resource scarcity, one example being the companies in the World Business Council for Sustainable Development (WBCSD).

Funding required for eco-innovation

The political decision-making process regarding whether or not to intervene in current pricing strategies needs to reflect the urgency of the issues more than is currently the case. However, if innovation cannot be encouraged through market corrections, then governments could find other ways of stimulating innovation. Governments could for example reduce the risk of investment in innovation, through purchasing policies, the granting of credit or the co-financing of selected, high-risk innovation projects. In the United States, for example, where free enterprise is given full rein, where the government takes the smallest role possible and where government spending has been curbed since February 2013, President

If renewable sources such as solar energy are used, the rebound effect leads to hardly any additional emissions.

Obama called in March 2013 for an Energy Security Trust of two billion dollars. The aim of the trust is to make the United States less dependent on oil on the one hand, and to limit the innovation gap compared with China, Germany and Japan on the other. The money is to be used to fund research that presents too high a risk for private companies, but from which everyone will eventually profit. Since the Second World War, similar schemes have been put in place for research into computers, aeroplanes, lasers and biotechnology. In recent years, the American Ministry of Energy has spent hundreds of millions of dollars (through loans and co-financing) on the development of production facilities for solar cells, on electric car batteries and biofuel projects, and on stimulating solar energy applications in homes and industry.[46]

The Netherlands has similar opportunities to support promising eco-innovations. However, such opportunities have received little attention in the government's top sector policy. Through this policy, most funding is assigned to research, and not on diffusing eco-innovation that focuses on cost price reduction. It would be a good idea if the energy agreement that currently is being developed under the auspices of the SER[47] were to include commitments on breakthrough technologies for further development in the Netherlands. As a Dutch version of the Energy Security Trust, the government could consider putting together a fund that is fed partly or fully by natural gas revenues. Such a fund could form a strong basis for the major eco-innovation investments required (including the development of CCS). This is necessary to achieve the objective of a low-carbon economy.

Resource efficiency incentives, market interventions and investment in innovation can be effective. However, they must be supported by a new public vision on the challenges we face and aim to resolve. For too long now, there has been a lack of leadership in this area. Industry and the general public require a sense of stability and direction, and it is largely up to the government to provide this.

Ongoing traditional environmental issues

Closer to home, in the Netherlands, the environment seems – after 40 years of environmental policy – to be in pretty good shape. Traditional environmental policy has drastically reduced many forms of pollution, such as waste processing, acidification, overfertilisation and eutrophication, air pollution, ozone depletion and the dispersion of toxic chemicals. In terms of policy cycle, these issues now appear to be in the monitoring phase. However, this does not mean that we no longer require an environmental policy. It is particularly important in this phase to streamline and improve the efficiency of regulations and compliance monitoring. The government should also take a critical look at the chosen environmental objectives and review them where necessary. It could, for example, investigate whether the cost of tightening standards weighs up against the benefits to society in terms of additional health benefits or quality of nature. Given the persistent discrepancy between policy objectives and effects for a number of environmental issues, it is also necessary to ask why government action is less effective and how this can be improved.

Hold on to results achieved

If we want to make sure that further economic growth does not result in additional pollution, it is important to ensure continued compliance with environmental regulations. However, the increasing complexity of environmental regulations makes higher and higher demands of the enforcement system. Ongoing cuts in supervision and enforcement are also cause for concern. The fact that the government only carries out monitoring at the system level entails a high level of risk. Given the continued aim for a smaller government, it would seem sensible to investigate various ways of improving supervision. Would it be possible, for example, to extend the self-regulation developed for the authorisation of chemicals (REACH) to other areas?

We should however be careful not to be naive about the opportunities provided by self-regulation. If regulations are poorly enforced, environmental crime takes place, as witnessed by recent reports of oil dumping in the North Sea.[48] However, it is possible to implement supervision more intelligently; for example, by involving the general public and consumers in monitoring compliance with environmental regulations. This supervision will also be made easier if industry is more transparent about the environmental impact of its production methods and products; for example, through obligatory and audited environmental reports. Research is also required into the possibilities available to government for simplifying existing, complex environmental regulations, to reduce the workload required to supervise compliance. What role can modern technology play in this?

Health

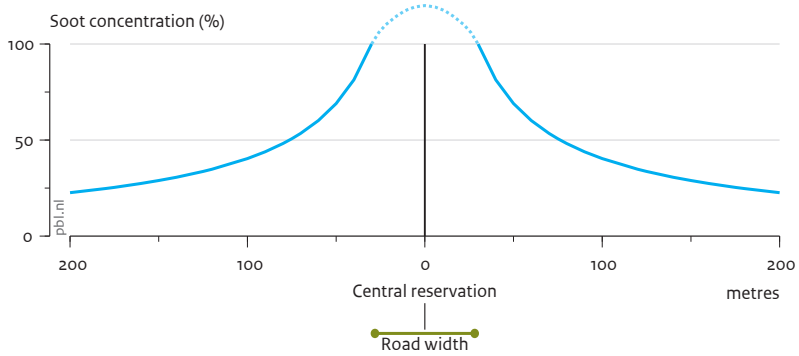
Some pollutants, such as particulates and noise nuisance, still cause considerable damage to health. Although the Netherlands is likely to meet EU standards for exposure to particulates and NO_2, annually, over 100,000 healthy life years are still lost due to polluted air.[49]

Traditional environmental policy can do little to change this, as it focuses too much on meeting standards and too little on preventing undesirable effects. For example, and in contrast to most other environmental standards, air that meets particulate matter and NO_2 standards is not necessarily healthy. The regional health authorities have therefore drawn up their own guidelines for these standards. In recent decades, increasingly sensitive monitoring equipment has become available that can detect smaller and smaller particulate fractions. This has increased understanding of the constituents of the particulate cocktail responsible for health damage. It now seems highly likely that a large proportion of the damaging effect of particulates is caused by soot, or ultrafine particulates, from cars. The highest concentrations of soot are seen in the first 100 metres alongside busy roads, and are roughly halved with each additional 100 metres (Figure 10). Air policy could therefore provide more health benefits if it were to further limit exposure to soot from cars. Zoning and separating road traffic from buildings is, more often than currently realised, an efficient way of achieving health benefits. This observation puts the value of 'emission balancing'[50] within the National Air

Some people still suffer disproportionate health damage; for example, in the Overschie area in Rotterdam, next to the A13 motorway

Figure 10

Road traffic contribution to soot concentrations from edge of road



Quality Cooperation Programme (NSL) in an entirely different light, since NSL considers the emission of PM_{10} particles and does not differentiate between course and finer, more harmful particles. This programme, which has cost two billion euros in taxpayers' money, has been useful for meeting PM_{10} standards set by Brussels, but has resulted in little additional health benefit.

If we broaden our understanding of the environment from concentrations of hazardous substances to also include the physical structure of our surroundings, then other ways can also be found to improve health through environmental policy. For example, greater accessibility of green areas may improve the health of people in towns and cities, as do transport systems that encourage people to walk or cycle rather than travel by car or scooter.

Nature

Environmental policy protects not just the health of people, but also that of plants and animals. Nevertheless, the quality of nature in the Netherlands is still in decline, although the rate of decline has levelled off in recent decades. Excessive nitrogen deposition, the eutrophication of surface waters, nitrate leaching and the desiccation of natural areas are persistent environmental problems. Environmental conditions in 2013 are still insufficient to be able to achieve the nature objectives set in the Netherlands. However, improving these conditions is often at odds with economic development. For example, the opposing interests of nature conservationists and livestock holders have resulted in increasingly complex fertiliser legislation and ammonia regulations: legislation and regulations that are intended to make the most profit possible of permissible emissions. Even so, licensing for new animal housing often runs aground if the resulting additional ammonia deposition on nature areas conflicts with maximum permitted

Nature preferences change

deposition levels. Other options for achieving the required nature quality are usually not discussed. Examples could be to make clear choices, for certain areas, between livestock farming and nature, to increase the resilience of natural areas by increasing their size and avoiding fragmentation within them, or to limit the size of intensive livestock farms.

At the same time, we can ask ourselves what kind of nature we really want in the Netherlands. After all, the answer to this question will largely determine which environmental improvements and spatial structure we require. For example, nature that is used for recreation makes lower demands in terms of environmental improvements than nature that offers protection to internationally unique ecosystems and species. On the other hand, the management and development costs of recreational nature are relatively high. The Netherlands contains internationally unique, large ecosystems, such as the Wadden Sea and the Zeeland delta. Nature is also important in terms of the drinking water supply, the recreational opportunities it provides, and as an objective in the redevelopment of old agricultural or industrial land or rural estates. What is our view on nature? Do we want to explore the playing field based on regulations from Brussels, which have been further elaborated through national policy, or do we take as a starting point the specific nature and landscape values that we find important and want to protect in the Netherlands, only then investigating to what extent European regulations hinder these choices?

Goats on a farm in Vinkel had to be culled in 2009 because of Q fever

Policy integration

The link between environmental policy and spatial policy is strategically important, as shown above. Policy has focused on emission reductions in recent years. Now that this is becoming more difficult, it would make sense to also look at spatial measures, such as zoning and separation. It would seem sensible to supplement mitigation measures in environmental policy with adaptation measures, as with climate policy. The Environment and Planning Act (*Omgevingswet*)[51] policy proposal responds to this need for local measures, with scope for integrated vision and decision-making processes, and with greater consideration of spatial developments. Whether the Environment and Planning Act will in fact result in the required consensus between environmental policy and spatial policy depends on the further development of the underlying legislation and its implementation.

Responsibility for uncertain environmental issues

For many people, the major global environmental issues are something that happens to others, elsewhere. People are however concerned about risks to their physical well-being, such as food security, water security, outbreaks of infectious diseases (SARS, Q fever and MSRA), the effects of new technologies (electromagnetic radiation from mobile phone masts, genetically modified organisms, nanoplastics), and the management of hazardous substances (fireworks, LPG stations). The government is often several steps behind with regard to these issues. As new problems crop up, again and again legislation fails to keep up with the rapid developments in technology. In 2008, the Dutch Scientific Council for Government Policy (WRR) concluded that traditional physical security policy, based on the

theoretical identification of probabilities and effects, required revision.[52] This is because this approach assumes that our surroundings can be understood and controlled. Assuming this ever was the case, the globalisation that has taken place over the last few decades has drastically decreased this understanding and control. Governments can no longer protect the public from every form of physical insecurity, try as they might to meet the expectations made of them.

What can the government do about this? Industry could be expected to make an effort to prevent any possible negative effects of its actions, and the government can encourage this; for example, through changes to liability legislation. If companies can be made liable in retrospect for negligence in the case of environmental and security risks, this would encourage them to identify and control such risks in advance. This reversal of responsibilities is implemented in the REACH legislation in two ways. First of all, in obliging manufacturers to thoroughly test new chemicals for possible negative effects on humans, plants and animals. Secondly, in making industry responsible for the consequences of negligence. This would seem to be a useful model that could also be applied to other forms of unknown risks. This turns out however to be more difficult to implement in practice, as it has not yet been possible to make such liability legally watertight. There is also much discussion about the chemicals that should be included in the REACH legislation. Nanoparticles, for example, are – after years of negotiation – still not included.

4 Changing tracks

Continuing as we are will not solve the large environmental challenges that face us. We need to switch tracks in environmental policy to be able to follow a different route. If we want to make progress, is would be advisable to develop an approach that is in keeping with modern society: globally operating companies and critical, articulate citizens. In this report, PBL provides a few initiatives for such a switch – it is still too early for cut-and-dried recommendations. These initiatives vary according to the type of environmental problem. Incidentally, the modernisation of environmental policy concerns not so much the development of new instruments – the palette of environmental policy instruments is already known. Rather, it is more about rethinking the role of national government, developing promising alliances in a changing society, weighing up different societal objectives, and the link between the environment and other social issues. The Netherlands can seek renewal in various areas, depending on the type of environmental problem.

Different approaches to different problems

Global environmental issues: focus on eco-innovation

Traditional environmental policy has not been very effective in dealing with global issues such as climate change, biodiversity loss and resource scarcity. The main reason for this is that it has not been possible to reach binding agreements about the measures to be taken with all the countries involved. However, global problems do not necessarily need to be solved at the global level. Individual countries or groups of countries can also develop activities to help solve the environmental issues we face. In addition to international coordination (who does what?), innovation is also crucial in this. After all, radical innovations are needed to a) reduce required resource inputs by a factor of five, b) radically reduce hazardous outputs (emissions), and c) develop sustainable alternatives. Industry can go some way to achieving this, but government support can bring it much further.

To increase the speed with which these innovations can be achieved, governments should broaden their selection of innovation tools. They, for example, could reduce their generic stimulation of research and focus their support more on breakthrough technologies that a) can be expected to considerably increase resource efficiency, b) are widely applicable, and c) may become considerably cheaper. This is also important because it gives new companies that wish to implement sustainable production methods a chance to gain a foothold on the 'level playing field' of the market. Traditional environmental policy – theoretical standards, followed by legislation, tradable rights, levies and subsidies to ensure that the standards are within reach – fails to support such newcomers, certainly if their technologies have not yet been widely introduced and are still too expensive to be able to compete on existing markets. This mainly applies to technologies that help achieve the transition to a low-carbon energy supply without requiring more agricultural land.

Traditional environmental issues: from emissions to impact

Much progress has already been made in addressing the traditional environmental issues. The classical approach taken by Dutch environmental policy has been successful. For example, exposure to various substances that are harmful both to human health and nature has decreased by about 80% in the last 25 years. Even so, national biodiversity is still far off target. There are also improvements to be made in public health. Environmental policy therefore needs to focus more on the effects to be achieved (impact) than on the emissions.

If we aim not just to consolidate but also to build on the progress made so far, we need to take a different approach to environmental policy. We therefore need to ask whether some environmental quality objectives require revision. For example, environmental objectives that focus on nature conservation could be aligned to the type of nature that we would like to achieve or maintain in specific areas in the Netherlands.

Besides reviewing the objectives, it is also important to hold onto the results achieved so far through environmental policy. One important issue is how to maintain monitoring and enforcement of policy, despite the pressure to slim down the government system. Simplifying existing environmental regulations could make supervision easier and reduce the cost of compliance for industry and the general public. If it is to do this, then the government needs to take some decisions; for example, regarding the spatial allocation of agricultural and natural areas. Complex regulations are largely the result of an attempt to avoid painful choices in the past.

If it becomes increasingly difficult and costly to reduce emissions, then special measures such as zoning could provide an answer. Also, would it be possible to supplement mitigation measures with adaptation policy, as has been done in climate policy?

Uncertain environmental issues: make initiator responsible

Traditional environmental policy has always been ready to deal with new environmental problems, once research has shown which substances cause what damage and by what mechanism. The government has the important task to take weak signals on possible new environmental threats seriously. This requires a proactive policy. However, this does not always go as well as it could, an example being the Q fever outbreak a few years ago. On the other hand, it is also an illusion to think that the government can protect us from every danger, or is even in a position to fully investigate every weak signal it receives.

With this in mind, therefore, and following the example of the REACH regulations, it would be useful to reconsider the distribution of tasks and responsibilities between public and private parties for new environmental risks. The question is whether it is not better to make initiators responsible for environmental impacts. The initiator would then need to prove that the activity concerned does not place an unacceptable pressure on environmental quality. What possible pitfalls could be involved in making changes to liability legislation? What does this mean for supervision?

Large issues require serious proposals

What possible steps can be taken today to overcome the current deadlock in environmental policy and to switch tracks? Let us begin by saying that the current economic malaise has detracted a lot of political focus onto urgent, short-term issues such as reducing unemployment, kick-starting the housing market and addressing the government budget. In this light, climate change is 'just' an urgent long-term problem, and therefore secondary to the problems currently faced by the general public and industry. A discussion of what is required to deal with the major environmental challenges then quickly leads to proposals that many

consider to be unachievable or unrealistic. However, if we limit ourselves to what seems achievable in the current context, we will lose our chance to achieve a low-carbon energy supply and the radically more efficient use of natural resources. Do we want to risk an average global temperature rise of possibly six degrees, with disastrous consequences in many places? If not, the government needs a clear vision for the long term and the courage and perseverance to see actions through. This requires time and patience.

In other words, the difference between what is required for the long term and what seems to be achievable in the short term must not prevent us from considering measures that take firm steps in the direction of the greening of the economy. A revised environmental policy could help in this, but the Netherlands must be prepared to go considerably further than the current package of measures. Reducing the private motor vehicle tax for energy-efficient cars and banning light bulbs are steps along the roads to a low-carbon economy, but bring it nowhere within reach. Measures that possibly could do this are often only achievable as part of a coalition with other countries.

As far as the role of government is concerned, PBL sees at least five important areas that require vision and in which choices need to be made.

Pricing environmental use

The price tag on pollution or natural resource use is often not high enough. Many people and companies therefore ignore the environmental factor in their day-to-day decisions, as they do not feel it in their pockets. Whichever way you look at it, pricing environmental use is an essential element of a low-carbon society that manages its resources efficiently. This pricing can be implemented in various ways: directly, through levies or the issue of tradable emission rights; or indirectly, through regulation and standards.

As far as pricing is concerned, we certainly do not need to start from scratch. The Netherlands is already one of the leading countries in Europe with regards to green taxes. This does not mean however that improvements cannot be made. For example, the CO_2 price has dropped to about three euros per tonne due to the generous allocation of emission rights and the decline in industrial production due to the economic crisis. As a result, there is little incentive to implement environmentally friendly production methods. Combined with a gradual reduction in the number of available emission rights, implementing a minimum price for emission rights of 25 euros per tonne CO_2, for example, would help the European emissions trading system operate as an effective tool in combating CO_2 emissions, in the long run. The question also arises how to price CO_2 emissions outside the ETS.

Pricing the use of natural resources encourages their more efficient use. One obstacle to this is the tax system that includes various incentives that do quite the opposite: the environmentally harmful subsidies and tax benefits, such as tax exemption for kerosene used in aviation and diesel in shipping. Of course, there is no easy solution to pricing, which needs to be weighed up carefully against other interests, but in the discussion regarding the modernisation of environmental policy, pricing must be considered.

Funding eco-innovation: new natural gas revenue fund

Investment in environmentally friendly production systems requires a lot of capital. The current tight financing situation in the banking sector forms an additional hindrance to such investment. If investment in innovative environmental projects is really to get off the ground, then public resources are essential to work as a 'lubricant' – for example, in the form of guarantees or investment funds ('revolving funds'). Valid arguments were given, at the time, for earmarking some of the profits from natural gas production for investment in the strengthening of the Dutch economy.[53] Norway chose to set up an oil fund for the future, filled using Norwegian oil revenues. Today, it is the biggest government fund in the world, valued at over 500 billion euros and yielding a profit of tens of billions of euros every year.

Dutch natural gas revenues are being used today to finance current needs. Looking to the long term, it would seem sensible to use the revenues from our fossil fuel supply to bring the transition to a low-carbon future for the Netherlands a step closer. The government should investigate the opportunities for setting up a new natural gas revenue fund focusing on eco-innovation.

Eco-innovation to create sustainable cities

It is the responsibility of the General Inspection Service to check for animal diseases and monitor the use of antibiotics

Reporting: green accounting

Is it logical that companies need to report on their financial activities but are not required to provide any account of their use of natural resources? The mandatory registration of natural resource use would increase awareness of the issue in the industrial sector. In the light of a growing world population that is, on average, also becoming wealthier, the pressure on all kinds of natural resources is set to increase. Such an awareness therefore forms an essential step on the road to increasing available natural capital use efficiency by a factor of five.

The concept of green accounting is not entirely new. For example, the Minerals Accounting System (MINAS) was used by farmers towards the end of the 20th century in Dutch agriculture to register the input of the minerals phosphate and nitrogen on their farm (in feed or animals purchased) and the output (in products and fertiliser). This made farmers more aware of their mineral inputs and outputs. Furthermore, because they were taxed on any minerals surplus, farmers looked for ways to reduce this surplus on their farms. Similarly, green accounting at the company level can be a vital tool for stimulating greening; for example, by taxing specific material flows. Of course, everyone – suppliers, middlemen, manufacturers, waste processors and the retail trade – would need to be part of the registration process, to avoid leakage.

Consumer most likely to choose sustainable food if it is not too expensive.

The concept of green accounting needs to be carefully developed, one reason being to minimise the administrative and control burden. At the same time, we must not flinch. As a society, we accept the administration and control (auditor's reports) involved in financial accounting to prevent corruption. In the same way, green accounting can encourage those involved to be careful with, in this case, the raw materials they use.

Supervision

Supervision is an inextricable part of environmental policy. We must not be naive when it comes to self-regulation; compliance with rules needs to be checked. In times of strict spending cuts, supervision needs to be critically examined. Where possible, supervision can of course be carried out more intelligently. However, the Netherlands needs to be very careful in making further spending cuts in supervision, as they can result in high risks.

Another issue concerning supervision is the authorisation allocated to lower levels of government for local, short-term decisions. We must not be blind to the limits to such authorisation. Why, for example, were most municipalities in Brabant unable to check all the farms with air scrubbers, as had been agreed? 'It [the lack of enforcement carried out by municipalities] is bad for the environment and regrettable because it also puts fair competition between farms at risk,' reported Brabant representative Johan van den Hout. Enforcement and supervision are therefore needed to monitor the level playing field.

Consumer awareness

The modernisation of environmental policy also involves consumers of course. Other consumer choices can make a considerable contribution to a low-carbon society. It is not just about 'more sustainable', but also about 'less'. Think, for example, about transport choices (more often by bicycle and less by car), holiday destinations (fewer long-haul flights) and diet (less red meat).

Although many consumers find sustainable consumption important, in practise they only occasionally choose for sustainable products. Also, many people object to obligations proposed by the government – an example being the ban on traditional light bulbs. Under what conditions are consumers prepared to change their behaviour? How can the government respond to this? Freedom of choice is vital in creating support, which is why temptation is often preferable to force. At the same time, consumers have been found to accept some force to discourage the use of polluting products. The government can make use of this by informing consumers about the environmental impact of their consumption; for example, through energy labels. By giving a good example through sustainable purchasing, governments can also contribute to the new normality; in particular, if the results are widely publicised. The government can also enforce strict product standards. If it explains why, it seems that consumers have no problem with this. This is why energy-guzzling plasma televisions are currently disappearing from the market. Consumers do not want every possible choice, but they do want a certain selection of choices. They will accept that products or production processes that clearly harm the environment and nature will be banned.

Debate necessary

PBL would like to use this report to encourage government and society to consider the purpose and the nature of environmental policy in the 21st century. PBL would therefore like to stimulate a debate in society: a broad public debate about what we would like to accomplish through environmental policy, taking into account the results achieved in the past and the challenges we face today, with respect to the near future. How can we shape this policy so that it stimulates general public, industry and government initiatives? To be able to carry out this debate, a general sense of urgency is required.

Such a debate must be open to input from the general public, industry, scientists, politicians, government and anyone else who feels the need to contribute. National government has a special role to play in this, on the one hand because it is one of the parties involved in the debate (due to the subject – implemented and future environmental policy) and, on the other hand, because such a debate must be based on evidence and not on relative positions of power in society. Furthermore, the debate must be fed by the best available knowledge – knowledge provided by scientists and experts (the man on the spot). It is important that the government acknowledges its dual task and carries it out as well and as transparently as possible. It may need to look for a new language with which to conduct the debate; a language in keeping with the 21st century. This may help take the discussion beyond the distrust, cynicism and powerlessness that the general public usually experiences when it comes to global environmental issues.

Fundamental choices

In the year 2013, national environmental policy is faced with a fundamental choice. Do we want to restrict policy to persisting with the classical approach by steering the traditional environmental problems towards the monitoring phase? Or, will the Netherlands take the lead with an innovative new approach to global environmental issues, at the same time contributing to the development of new general earning models that are no longer based on fossil fuels and intensive resource use? Such an approach would broaden the legitimacy of environmental policy: from protecting health to protecting the conditions for wealth and stability. The world is not going to wait for the Netherlands to set such a process in motion. So, is the Netherlands going to join in and move up from its current position in the rear to join the new leaders?

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Notes

1 Particulate matter concentration is expressed as a peak concentration or as a daily average. In January 2013, the daily average varied from 0 to 580 micrograms per cubic metre air in Peking; averaged over the whole month it was about 200 micrograms. The WHO health limit is a daily average of 25 micrograms. This limit was therefore exceeded by a factor of 8 on average in January 2013, with peaks of a factor of 16 and 24 on some days. The peak concentration varied in January between 25 and 900 micrograms, but this should not be compared with the daily average limit – as has been erroneously reported in the media as 40 times exceeding WHO limits instead of 8 times. See: http://www.bloomberg.com/news/2013-01-30/beijing-air-akin-to-living-in-smoking-lounge-chart-of-the-day.html.

2 See http://www.guardian.co.uk/world/2013/feb/16/chinese-struggle-through-airpocalypse-smog. Headline in the Dutch newspaper *de Volkskrant* on 3 April 2013: 'Western expats flee air pollution in Peking'.

3 Rijnmond is an industrial site near Rotterdam with a large petrochemical industry and many harbour activities.

4 The remaining disease burden from pollution is estimated as between one and five percent of the total disease burden. This is caused by exposure to radon, ozone, ultrafine particulate matter, mercury and endocrine disrupting chemicals,

for example. See Knol & Staatsen (2005).

5 See the notes of the Dutch House of Representatives on the discussion of the Ministry of Infrastructure and the Environment budget on 20 November 2012.

6 This exchange of roles in interestingly described, for example, in Jan Rotmans (2012).

7 The opportunities for the Netherlands resulting from a firm focus on the greening of the economic structure will be addressed by PBL in a report on green growth and competitive power, to be published in autumn 2013.

8 Compartmentalised policy considered the environmental compartments of soil, water and air as more or less independent components of the environment that need to be cleaned through policy measures. Compartmentalised policy had little interest in the bio-physical relationships between the compartments or the transport of emissions into other compartments in response to environmental regulations in one compartment. An example of a result of this is the long time it took to recognise that waste incineration resulted in additional air pollution.

9 RIVM's report *Concern for tomorrow* was very influential at that time (1988). It was the first comprehensive overview of all available scientific information on the state of the environment in the Netherlands, the origin and size of environmental pressures and options to reduce them.

10 Consultation between the government, employers and employees about the form and implementation of government policy is based on a long tradition. Since the 1990's, this has been referred to as the 'Polder model' but the essential idea goes back to the Middle Ages, when the Dutch started to reclaim land from the sea by building dykes around pieces of land called polders and pumping water out. Cooperation was necessary to maintain dry feet, even when parties disagreed on other subjects.

11 See de Jong & Captain (1999).

12 See the appendix with the CPB calculation in VROM (1989).

13 For an analysis of the effectiveness of acidification policy, see Buijsman et al. (2010).

14 If it is not possible to achieve sufficient absolute decoupling for the required environmental quality, then relative decoupling (less pollution per unit product) is aimed for, or impact-reducing measures (such as the calcification of acidified woodland and heathland in the 1990s) and adaptation (for example to the effects of climate change).

15 See PBL (2012b: 59–60).

16 The difference in energy consumption between houses with a B label (good insulation) or an F label (poor insulation) turns out to be much less than would be expected based on the technical properties of the houses. This indicates that people in poorly insulated houses heat their homes less, probably to save money. There is no indication that people in insulated, formerly F-label houses, make other decisions about heating their homes than people living in B-label houses. It is therefore likely that the insulation of

F-label houses results in less efficient heating behaviour (the rebound effect), for example because people heat more rooms and to a higher temperature, and leave doors and windows open more often.

17 There is much variation in the discovered 'rebound effects' in the literature. This is largely due to differences in methodology and data. The literature shows that the extent of the rebound effect for energy and transport is higher than 0 – not negligible – but no more than 100%. Little is known about the size of the rebound effect in other fields, and the little data that there is varies even more. For food, for example, estimates vary from 200% (backfire) to a negative rebound effect, depending on whether the assumption is made that improvements in resource efficiency are associated with lower or higher costs to producers and consumers (IVM-PBL, not yet published).

18 Termeer (1993), Frouws (1994), Bloemendaal (1995) and Dietz (2000) have all described (in Dutch) the political battle of farmers against policy measures that sought to resolve the manure problem in the Netherlands. Manure production in the Netherlands grew by 40% between 1970 and 1986 and it took until 2003 to bring it back to 1970 levels. In 1986, some 40% of the phosphate in manure was taken up by crops, leaving the remaining 60% (103 kg/ha) as emissions to the environment. So far, policy measures have succeeded in reducing these emissions to an average of 30 kg/ha in 2010 but the target of 0–5 kg/ha seems out of reach for the foreseeable future. See: http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl0093-Stikstof-en-fosforbalans.html?i=3-17.

19 Examples of studies on the effects of Dutch transition policy are: Rotmans (2011), Kern & Howlett (2009), Kern & Smith (2008) and Nauta (2008).

20 To optimise manure application, an increasingly refined manure standard system was developed over the years. In 1987, there were 3 different standards for manure application; in 2006 there were 650, depending on soil type and crop. For some crops, this was also sub-divided depending on growing period, plant strain, cultivation system and yield. See PBL (2012a: 35).

21 In the book Factor five published in 2009, Ernst von Weizsäcker and his co-authors describe many practical ideas for the radically more efficient use of natural resources. If greenhouse gas emissions are to be 80% less in 2050 compared with 1990, and the economy grows by a factor of 4 during this time, then a much larger reduction than a factor of 5 will be required.

22 See http://www.imf.org/external/np/pp/eng/2013/012813.pdf.

23 See Drissen et al. (2011).

24 See, for example, Jan Rotmans (2012).

25 The first two figures named give an indication of the order of magnitude and are distilled from various documents, including Honig et al. (2000: 30). Actual figures on the costs of catalytic convertors have not been published. The estimate of 100 euros per convertor was made by Jos Dings (2013), director of the organisation Transport and

Environment in Brussels.

26 See the analyses in Termeer (1993), Frouws (1994), Bloemendaal (1995) and Dietz (2000).

27 Haq et al. (2001: 135) conclude in this overview of five case studies that 'one consistent finding is that the potential for innovation in industry is often under-estimated'.

28 See the ADB and Dieselnet sites: http://www.adb.org/documents/guidelines/vehicle emissions/imcho3.pdf and www.dieselnet.com/standards/.

29 In negotiations on the tightening of CO_2 emission standards for cars, the European Commission was unable to withstand pressure from Germany, aiming to protect its car manufacturing industry. In 2006, the EC announced a limit of 120 gram CO_2/km for 2012, but a preliminary assessment carried out in 2008–2010 showed that the German car industry thought that 130 gram CO_2/km was the maximum achievable target. However, once tax incentives were offered, several improvements (such as a start-stop button and tyre pressure indicator) were able to be realised within a year, whereas it had previously been claimed that they would be difficult to achieve.

30 Of the 25,000 billion dollars spent by households worldwide in 2010, 8 200 billion dollars was spent in the United States and 5 700 billion dollars in the EU. Consumer spending in China totalled 1 100 billion dollars. Source: World Bank database, figures in constant dollars, 2000.

31 See Bressers (1983).

32 See PBL (2013a).

33 See Ecorys (2011: 136).

34 See Jos Dings (2013).

35 There were of course good reasons to make the changes, such as removing overlap between old and new regulations, but the unpredictability made investors wary.

36 See PBL (2012b:70–71). A return flight from Amsterdam to New York (11,800 km) produces 2 500 kg CO_2 equivalents, which equals a CO_2 emissions of about 220 grams per person per kilometre. The average Dutch car is used to drive 13,300 km per year (or 36.4 km/day). Based on CO_2 emissions of about 180 grams per kilometre, this produces 2,400 kg CO_2 per year.

37 See Heijne (2012).

38 See Oreskes & Conway (2010). In scientific debate, minority positions should always be treated with respect, and even interest. Scientific development takes place not through consensus but because scientists are always trying to outwit one another. However, it is also important to distinguish the value of this scientific habit from continued, malicious return to already disproved positions. This is why the Platform Communication on Climate Change (PCCC) devoted a whole chapter of *De Staat van het Klimaat 2010* (*The state of the climate, 2010*) (Dorland et al., 2011) to the arguments of climate sceptics – to investigate and assess their tenability. On the one hand, this keeps climate scientists sharp and, on the other, it results in policy-relevant information on the various climate-sceptic positions versus 'established' climate science.

39 See for example Meyer (2009) and Olivier et al. (2012).

40 Annual growth is twice as high. More

important, however, is that the relevant population groups in China and India are 200 times that of in 19th century England. See McKinsey (2011).

41 McKinsey Global Institute (2011: 224).

42 The relationship between resource use and environmental quality is complex. In a static situation, with a constant production level, an increase in resource use efficiency will automatically lead to less pollution. However, if production increases this relationship is less clear. If production increases more quickly than resource use efficiency, then pollution will increase. Without innovation, higher resource prices will result in the reduced use of resources and therefore less pollution. Some forms of innovation (for example relating to recycling) benefit the economy and the environment, while others (relating for example to mining) benefit the economy but not the environment. See PLB (2011) for a more detailed analysis of these relationships.

43 Paul Waide (2013).

44 Energy production using wind turbines, solar cells and other forms of renewable energy do of course require materials, some of which may be scarce. Additional land and water are required for biomass and the negative effects of this on food production and biodiversity could be a reason to limit the use of biomass in energy generation.

45 According to Adriaan Schout (*de Volkskrant*, 27 February 2013), the cabinet would like to explore this option further, as stated in the *Staat van de Unie* Policy Document by Minister Timmermans (Foreign Affairs).

46 Mazzucato (2011: 105–106).

47 The SER (Social Economic Council) is an advisory body to the government with representatives from business, employees and science. It is widely viewed as an outstanding example of institutionalisation of the Dutch Polder Model (see earlier endnote 11).

48 See Vollaard (2013). Only an article in the Dutch newspaper *de Volkskrant*, 4 March 2013, reports the extent of it: half a million litres per year.

49 This relates to the number of healthy life years lost (YOLL) in the Netherlands due to one year of particulate matter emissions. In 2013, this was about 100,000 YOLL; in 2020 (when EU standards are met) it will be about 80,000; see PBL (2012c: Table 5.1, p. 60).

50 In the Netherlands, construction projects are only awarded a permit if they do not result in exceedance of the EU standards for PM_{10} and NO_2. If this seems likely, additional measures may be taken to ensure that PM_{10} and NO_2 concentrations remain at least the same, or decrease, in the region. This is called 'emission balancing' or, more accurately, 'balancing the effects on air quality'. One condition, however, is that the compensatory measures are implemented in the same region as that in which the construction project is to take place, and that they are included in the Dutch National Air Quality Cooperation Programme (NSL). These regions are relatively large, compared to the dispersion area of ultra-fine particles, the most

harmful components of PM_{10}. This means that 'emission balancing' may stabilise people's exposure to PM_{10}, while increasing their exposure to ultra-fine particulates.

51 The Dutch Environment and Planning Act (*Omgevingswet*), currently under development, is intended to ease the start-up of spatial planning projects. The new Act will result in fewer rules and survey costs, while the decision-making process will be made faster. The Act will also be more consistent with EU regulations and there will be more room for private initiatives and for government officials to assess decisions. Fifteen current acts will be included in the new Environment and Planning Act. In addition, the sections of about another 25 acts relating to environmental law will be included in the new Act. In an ex-ante evaluation, PBL (2013b) concluded that the Environment and Planning Act will result in more threats than opportunities for environmental and nature conservation.

52 WRR (2008: 208).

53 The Economic Structure Enhancing Fund (FES) was set up in 1995 to ensure that a part of the revenues from the sale of natural gas was used to invest in strengthening the economic structure. The fund was separate from the national budget, which enabled an additional barrier to be put in place to protect against reductions in government investments in times of cutbacks to the national budget. Initially, the FES was fed with a percentage of the natural gas revenues. Since 2008, the FES has received a fixed income from the natural gas revenues. In 2010, the cabinet decided to abolish the FES fund and allow all natural gas revenues to flow to the treasury.

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Page 14 right: Spaarnestad / Eric Koch
Page 15: Hans Holbein
Page 17: VROM
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It is time to revise Dutch environmental policy. National and local governments, in collaboration with citizens and businesses, will have to change tracks, if we are to structurally address the environmental issues of the 21st century.
In addition to the traditional issues, such as water and air pollution, we are also facing new, pressing issues, such as climate change, biodiversity loss and resource scarcities on a global scale. These issues require strong measures. And how to address the environmental and health risks that are related to new technologies?

In this report, PBL presents a number of ideas for constructing solid environmental policy for the 21st century, involving changes to consumer behaviour, new coalitions of interests and parties, and the set up of an investment fund for eco-innovation. What track will the Netherlands follow? Will it lead the way in innovative approaches to global issues or will it restrict itself to refining the classical approach to traditional environmental issues? With this essay, PBL calls for a broad social debate on these issues.

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