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CONDITIONS FOR GREENING THE DUTCH ECONOMY

POLICY STUDIES

Conditions for greening the Dutch economy

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Conditions for greening the Dutch economy is a translation of the Dutch report *'Voorwaarden voor de vergroening van de economie in Nederland' (original publication: 2012)*

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This publication is a translation of the Dutch report 'Voorwaarden voor de vergroening van de economie in Nederland' (2012), which was published prior to the Dutch Government Agreement of the new Cabinet (October 2012). Therefore this publication does not include particulars from that Agreement. In addition, please note that a few intended measures as announced in the so-called Spring Agreement have not come to pass or have been amended. Moreover, the theme of sustainable growth has since been adopted as one of the cornerstones of the current Dutch Cabinet (Rutte II).

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Abstract

Greening the economy is considered to be one of the major worldwide challenges of the coming decades. Greening is about limiting the use of natural resources and sparing the environment. By taking into account the limits of the natural capital we can safeguard prosperity in the long term. Greening is important for the Netherlands, too. Using energy, raw materials, land and water more efficiently will make the Dutch economy less vulnerable and the environment cleaner. Focusing on green growth is thus not so much the short-term answer to the present economic crisis but rather a long-term contribution to strengthening the structure of the Dutch economy. This strengthening is not something that will happen of its own accord but requires an active role on the part of the government together with the business sector and the general public. A long-term vision for greening the economy forms an important first step. How to measure progress is another important element in aiming for the goal of green growth. A different set of rules will also be required in order to steer society towards greening. The cost of environmental pollution, for example, should be better reflected in prices. Abolishing subsidies and tax incentives that stand in the way of this greening process is also part of this. Implementing tax proposals of this kind, of course, requires weighing many factors. The government could also create better conditions for the development and application of innovations that spare the environment. This report sets out some of the requirements for greening the Dutch economy and suggests ways in which these could be implemented in some areas. At the same time, the document identifies those areas in need of further investigation to gain a better overview of what 'going for green growth' would mean for the Netherlands and what this requires.

Introduction

A lasting recovery of the Dutch economy would require structural reforms in various areas of society. This applies, for example, to the gridlocked housing market, keeping the soaring costs of health care under control, and funding future pension commitments. At least as challenging in the next 20 to 30 years, will be the greening of the economy. The challenge is a global one, as the world's population will grow to 9 billion people, all of whom will want a better quality of life. Economic growth is essential to alleviate poverty and raise living standards worldwide. This means that over the coming decades more people will want to have more energy, water, resources and food. Continuing in the same old way will place a huge burden on our natural resources. The rapid climate change, the continuing loss of biodiversity and the ever growing demand for raw materials all mean that we are running large risks, globally. The challenge therefore is to turn the necessary growth into 'green growth': growth that makes more efficient use of natural resources and causes considerably less harm to nature and the environment. The continued availability of the goods and services provided by nature is an important precondition for a form of economic growth that is sustainable in the long term.

Scope and content of this report

This document first sets out the global context and the importance of moving towards a greening of the economy (Chapter 2). Part of this is how the concepts of 'greening the economy' and 'green growth' are related to one another. Subsequently, the main questions will be considered:

- How important is it for the Netherlands to green its economy?
- What conditions are necessary for greening the Dutch economy?

Chapter 3 zooms in on the benefits and risks of greening the Dutch economy. What opportunities does greening have to offer Dutch businesses? What would be the benefits to society? Would a greening strategy also expose nature and the economy to risks? And what dilemmas and trade-offs would this create?

Green growth will not happen of its own accord. Chapter 4 provides an overview of some of the necessary conditions for the greening of the Dutch economy, together with suggestions for first steps that could be taken in some areas. These steps include incorporating environmental use in product prices (Section 4.1), removing perverse incentives (Section 4.2), the use of dynamic regulation (Section 4.3), the development and application of innovations that spare the environment (Section 4.4), how the energy available to society could be utilised in a better way (Section 4.5), and how progress along the path to greening can be measured (Section 4.6). An active government will be needed to create these conditions, together with a new form of interaction between government, the business community and the general public.

ONE

Some of the conditions for greening will require international coordination and agreement. In this document we have not considered what form such an agreement – European or global – could take. What we have aimed to do, however, is apply to the Dutch situation the instruments for promoting green growth as these have been put forward in various international forums.

This document does not provide a blueprint for green growth in the Netherlands. It offers a first impression of the importance of greening for the Dutch economy, what the necessary conditions are for this and what knowledge issues it raises.

TWO

Global importance of greening

The impact on natural resources is increasing

The global demand for raw materials, energy food and water will greatly increase in the coming decades. This will largely be caused by the increase in the world population and economic growth. According to the latest OECD projections (2012a) the population will grow from the present 7 billion to more than 9 billion by 2050. The size of the world economy will increase fourfold over the next 40 years alone. The share in the world economy held by the BRIICS countries (Brazil, Russia, India, Indonesia, China and South Africa) is greatly increasing. In these countries, a large new middle class is emerging with changing patterns of consumption. This is expressed in the demand for better housing, more cars, more electrical equipment, more food and more meat in the diet.

This growth is by no means always green. Without additional policy, worldwide energy consumption up to 2050 is expected to increase by 60% to 80%. Oil, coal and gas will continue to dominate. Greenhouse gas emissions will therefore also rise by 60% (OECD, 2012a). Premature deaths due to exposure to particulate matter as a result of urban air pollution are expected to double (OECD, 2012a). The global demand for water is estimated to increase by 55% between 2000 and 2050. This means that, by 2050, an estimated 2.3 billion people will live in areas with considerable water stress (OECD, 2012a). According to the OECD, due to more wide-scale and intensive farming, growing infrastructure and increased pollution (e.g. due to excessive nitrogen deposition), terrestrial biodiversity is likely to decline by a further 10%.

Negative consequences for future economic growth

Unfortunately, we do not know precisely when what resources will become so scarce that this will start to cause real problems. What we do know is that resource scarcity in the short term can quickly lead to price rises, protectionism and geopolitical tensions. We also know that at the moment the use of the environment is only partly priced into products, if at all. We also know that climate change will bring greater costs in the future. By taking action now, we can avoid greater costs later. By investing a few per cent of the world's GDP today, we could help to avoid the much higher costs of climate change in later years (Stern, 2006). A similar situation applies to biodiversity. Taking biodiversity and ecosystem services into account in decisions concerning infrastructure, land use and water supply, for example, can result in lower costs. The economic importance of biodiversity is underestimated and the cost of biodiversity loss has so far hardly been accounted for (TEEB, 2009).

Rockström et al. (2009) have made an attempt to indicate where the limits of the Earth's carrying capacity may lay. This hinges on nine themes. For three of these – global climate, global biodiversity and the global nitrogen cycle – humanity has already crossed the limit, according to the authors. Limits, however, cannot be determined exactly and are surrounded by major uncertainties. The value of the concept of limits to the planet lies mainly in making explicit the idea of a finite carrying capacity. This study and others clearly show that the current ecological trends are not sustainable. Continuing in the same way means

that the natural capital will become a limiting factor in future economic growth. Continuing the current economic trend will mean that ever more financial resources and manpower will be needed to maintain the energy supply at its present level, to provide enough clean water, to have sufficient productive agricultural land, prevent flooding, keep the air clean (enough), and to continue to supply industry with the necessary raw materials (OECD, 2012b). A growing world population and everyone's goal of better living standards, however, means that eventually 'business as usual' will no longer be tenable.

Greening of the economy and green growth

The challenge of bringing about a greening of the economy is recognised worldwide, as indicated in publications, such as by the OECD (2011), UNEP (2011a) and the World Bank (2012). A green economy was also one of the main themes on the agenda of Rio+20, the global summit on sustainable development held in June 2012. In the Dutch context the CPB Netherlands Bureau for Economic Policy Analysis has indicated that for the Netherlands and for the world as a whole 'ultimately green growth is the only route by which humanity has any prospect of a lasting improvement in living standards' (Stolwijk, 2011).

Green growth is only possible if there is a radical improvement in efficiency. A more efficient use of raw materials, energy, land and water in the production of goods is therefore an essential part of any strategy aimed at green growth, along with the smart use of the services freely provided by nature. This requires the continuing availability of renewable resources as well as the regulating functions of nature, such as a stable climate; clean air, water and soil; flood protection; waste management, pest control and pollination. Green is only really green if ecological risks are reduced and the depletion of natural resources is prevented. Greening the economy is the process required to achieve green growth. Greening touches upon both the economic system and the economic process. The economic system relates to the quantity and quality of the available stocks. This encompasses more than just the scale, composition and quality of the infrastructure, the working population, the manufacturing equipment, homes and retail outlets, it is also about the climate; air, water and soil quality; fish stocks and the area of land covered by trees. In the economic process the opportunities offered by these stocks are utilised: transforming them into products and services, for example, for building, learning, healing, transport, and recreation. All these activities have an impact on the economic system. The amount and quality of the stocks will change as a result. When equipment for the elderly, cars and more pigs, for example, are added into the equation, the quality of the air, water and soil declines. Greening the economy means that more and more use will be made of mainly renewable stocks of natural resources in the economic system for activities which provide the products and services which are wanted, and that in the economic process constant and vigorous efforts must be made to utilise these resources as efficiently as possible. If this can take place within the carrying capacity of nature, then this will safeguard a certain basic supply of natural resources on which future generations can also base their prosperity and wellbeing. For the present generation, greening mainly means making more efficient use of natural resources, substituting environmentally polluting forms of energy and materials with cleaner alternatives, limiting emissions for the benefit of human health and nature, and a much more efficient use of land and water.

Different emphases in international studies

Incidentally, in their reports on the greening of the economy and green growth, the various international institutions place the emphasis in different areas. The UNEP in its approach to greening, for example, focuses on the necessary investments in ten sectors (UNEP, 2011a) including transport, agriculture, energy supply, the built environment, waste and water. These investments will help to lift the economic crisis and at the same time counteract polluting emissions and the loss of biodiversity, as well as make energy and raw material use more efficient. The OECD in its strategy on green growth presents a policy framework and a toolbox with instruments for achieving green growth (OECD, 2011). The European Commission creates roadmaps to arrive at a European economy which makes efficient use of natural resources (EC, 2011a). The World Bank also has issued a framework for green growth (Hallegatte et al., 2011) which emphasises that green growth should focus on what needs to happen in the next five to ten years (World Bank, 2012). In its approach to greening, the UNEP specifically includes the social aspects. It also states that a green economy is vitally important in reducing poverty. Because it is the least developed countries that are often most affected by the degradation of the environment and natural systems. Although the OECD takes the social consequences into account in its green growth strategy, it does not make the link with poverty. Central to all these approaches is protection of the natural capital which is the basis for future economic growth, or rather achieving economic growth within the limits of the Earth's carrying capacity. At the same time these institutions recommend those short term activities which will help to increase productivity, strengthen investor faith in clean technologies, open up new markets, contribute to tax harmonisation and reduce ecological risks (see also OECD, 2012b).

Green growth demands a radical improvement in efficiency

Green growth combines economic development with a better quality environment. This requires an absolute decoupling of economic growth and environmental pressure, that is to say, an increase in production and consumption together with a decline in the use of the environment. The task is a huge one: the Netherlands would have to reduce its greenhouse gas emissions by a factor four or five (80-90%) relative to the present situation. The International Resource Panel of the UNEP thinks that a similar reduction in global resource consumption will be necessary (UNEP, 2011b). This requires a radical improvement in the efficiency with which energy, materials, water and land are used. This is technically feasible (PBL, 2012a) but by no means easy. For example, over the last 20 or 30 years there have been major improvements in energy efficiency and agricultural productivity worldwide, but global energy consumption and land use has continued to grow. The increase in the world population and the growth in consumption were therefore greater than the efficiencies achieved. Added to this, following the introduction of new and cleaner technologies, changes in consumer behaviour reduce some of the efficiency benefits achieved. This 'rebound effect' with low-energy technologies leads to the evolution of new needs which in turn counteract the savings. This, for example, applies to LED lighting, which is more economical than ordinary or low-energy light bulbs, but which in practice is now also used to light the garden or exterior of the house. Money that is saved because the home is better insulated is then spent on other (possibly polluting) forms of consumption. A second explanation lies in the fact that businesses can only influence a small part of the emissions. Production chains are complex and there are numerous parties involved in different countries. One party alone cannot make any difference, a commitment made by many is necessary for effective solutions. Unilever has calculated, for example, that the production and transport of about 70% of its products contributes around 5% to the greenhouse gas emissions of these products over their entire product life cycle, while the input of raw materials and consumer use together account for more than 90% of the greenhouse gas emissions (Unilever, 2012). Without becoming preoccupied by these figures, both the 'rebound effect' and Unilever's calculations would seem to argue that we need to take the entire production chain over the entire product life cycle into account. The effect of consumer behaviour also specifically needs to be included here. A clear leverage point for limiting the effects of consumption is to make economic chains more sustainable. In this way the greening of manufacturing and consumption in the Netherlands would also contribute to sustainable development elsewhere.

Making more efficient use of natural resources is therefore important but does not automatically lead to an absolute decoupling of environmental pressure and economic growth. However, absolute decoupling will not be enough on its own. Because green growth demands a form of development which ensures that the natural capital is not depleted.

Resistance to green growth among developing countries

The production chains of many goods currently extend across many countries. Specialisation and international trade play a major role in a production system organised around cost cutting. Trade barriers for products to green the economy are sometimes difficult to distinguish, however, from measures which have the effect of discriminating against producers and manufacturers in other countries (UNCTAD, 2011). The threat of green protectionism – under the pretext of promoting the green growth of national manufacturers or differentiating between countries – is one of the reasons why many non-western countries are critical of green growth. There is a fear that aiming for green growth will frustrate the development opportunities of these countries. The developing countries believe that green criteria and standards of various kinds will hinder their trading and saddle them with additional costs.

International diffusion of technology is very important to the possibility of cleaner and more efficient manufacturing. This will enable businesses in developing countries to improve their environmental performance more quickly by 'leap-frogging' to reach a comparable level with western companies. Besides renewable energy, agriculture is an important sector where developing countries would have great benefit from speeding up the distribution of technology, such as more efficient equipment and crop varieties which need less pesticides or artificial fertiliser. One obstacle to speeding up the diffusion of green technology is that this is often in the hands of private businesses that have no interest in making these technologies available at low cost. Ways to deal with this are mandatory public availability of innovations which have been supported with public funding, and programmes for the exchange of green technology. In international discussions – including at the recent world summit in Rio – it appears that income distribution and inequality issues are still a prevailing concern. Greening measures could also give rise to undesired distribution effects. It will be necessary to find a solution to these issues to create public support for greening.

Nevertheless, green growth is actually a matter of some urgency for many developing countries. They not only have the most to lose due to the degradation of nature and ecosystems, but they are also less able to cope with

rising and ever more volatile prices for food and raw materials.

To conclude

Working towards green growth can help to avoid a hard collision with nature's limits. This is in the interests of both the poor and the developing countries, as well as the developed world. For non-western countries this relates to better agricultural yields, for example, more stable incomes and greater certainty that production can be sustained because over-exploitation is prevented. On top of this, in principle, these countries will have an opportunity to avoid dirty technologies and can start using cleaner alternatives immediately. Western countries also have an interest in using natural resources more efficiently and avoiding pressure on nature and the environment if that improves public health (cleaner air), for example, and provides substitutes for scarce raw materials. It is such that there are opportunities for all countries to green their economies, without curbing economic growth (World Bank, 2012).

There is no standard formula for greening the economy. The approach required depends, among other things, on the level of economic development, the current environmental pressure, the policy thus far pursued, and the existing institutional framework. It is a matter of catalysing innovation and investments aimed at sustainable growth and in response to new economic opportunities. In a number of countries green growth is already more than just an idea. South Korea, Denmark, Germany and even China are all working hard on greening their economies. This is also shown by their sales figures for clean energy technologies. This represents a global market of almost 200 billion euros in total which grew by roughly 10% in 2011. China, which has the largest market share, saw growth of almost 30% in 2011, while growth in South Korea, the USA and India was almost 20% in 2011 (Van der Slot et al., 2012). Measured in terms of the share of clean energy technologies in the overall economy, the top three are Denmark, China and Germany. By comparison, sales of renewable energy technologies in the Netherlands declined by 14% in 2011 (Van der Slot et al., 2012). For an innovation-led country such as the Netherlands the green growth approach may also offer potential to make better use of the opportunities available in the up-and-coming markets for technologies which spare the environment, such as clean energy technology.

THREE

Importance of greening for the Netherlands

Scarcity of raw materials, loss of biodiversity, water shortages and climate change are forcing us to transform the world economy. Greening safeguards long-term economic growth by preventing the depletion of natural resources as well as costly and irreversible environmental damage. There are threats facing the Netherlands, too. Green investment is necessary to make the Netherlands more resilient to these threats. These come at a price. This requires a careful consideration of the short-term costs weighed against the long-term benefits. It is quite possible that green growth will be profitable in the short term, too. In this section we will first consider some of the risks to the Netherlands if the economy does not become greener. Thereafter we will look at the main benefits of greening the economy and identify some of the dilemmas that this will raise.

3.1 Risks

Dependence on raw materials

Dependence on raw materials If nothing changes, the Netherlands – similar to many other countries – will remain highly dependent on fossil fuels for energy and other raw materials (see also OECD, 2012a). For example, in the Netherlands we consume more than 200 million barrels of oil a year. At a price of 100 euros per barrel, the cost of this represents approx. 4% of our gross domestic product (GDP). The prices of many raw materials have risen rapidly in recent years, particularly as a result of the strong growth of the emerging economies. As a result, scarcity has again become prominent on the political agenda. Higher energy and raw material prices have an adverse impact on economic growth. A 20% higher oil price in the Netherlands will lead to 0.4% reduction in economic growth in the short term. Higher oil prices raise the production costs of businesses resulting in higher prices for goods and services. Higher prices have an adverse impact on the actual disposable income of families and therefore their consumption. Lower consumption has a negative knock-on effect on investment. Lower consumption and lower investment leads to reduced production and rising unemployment, which in turn leads to further knock-on effects in terms of consumption and economic growth (CPB, 2010). Oil and raw material prices are expected to remain high in the future, due to the growing global demand, on the one hand, and the growing uncertainty about availability, on the other hand. The changing geo-political situation further aggravates concerns about scarcity. Europe no longer calls the shots, raw material markets are largely non-transparent and are governed by protectionist measures. As a trading nation which is particularly dependent on imports and exports, this makes the Netherlands vulnerable.

Energy-intensity improvements over the past decades have led to countries being less vulnerable to high or fluctuating prices. The energy intensity is the amount of energy a country uses per unit of GDP. Compared with the period before the first oil crisis 40 years ago, the Netherlands now only needs half of the energy it once did

to generate one unit of GDP. The resource intensity has also improved. While the Dutch economy grew by almost 40% between 1996 and 2008, the resource intensity dropped by roughly a quarter (CBS, 2011). Of all the waste generated in the Netherlands about 85% is recycled or has a useful application (CBS, PBL and WUR, 2012) while the average in Europe for recycling is around 40%. Nearly 100% of all the building and demolition waste in the Netherlands is recycled.

Nevertheless, for specific flows the Dutch economy continues to be dependent on raw materials that either are becoming scarce or for which the availability cannot always be counted on. In its 'Raw Materials Initiative' the EU has provided a list of 41 candidate raw materials, identifying 14 critical raw materials which are of economic importance and where there is a real risk of supply disruption. These include beryllium, gallium, indium, PGMs (platinum group metals) and rare earth metals (EC, 2011b). The Netherlands has added phosphate, gold and tin to the list of potential candidates. Although this list is certainly useful, it is also somewhat arbitrary. The selection is focused mainly on new technologies and the short-term risks. The criteria that were used to estimate the economic risks are also somewhat arbitrary.

The Dutch food system is fairly robust in terms of the availability of food. Europe (and the Netherlands) is largely self-sufficient in terms of food and livestock feed, with the exception of soy and vegetable oils. There are production surpluses and the purchasing power in Europe is sufficient to be able to obtain food on foreign markets. The European food system would therefore appear to be able to cope with disruptions (WUR, 2008).

The ecological risks for the Netherlands are relatively small

Environmental pollution, climate change and loss of biodiversity will also affect the Netherlands. Doing nothing means that the Netherlands will also be faced with the 'cost of inaction'.

The consequences in terms of climate change would, for the time being, appear to be manageable for the Netherlands, certainly compared with other countries (PBL, 2012b). Some effects will be positive, such as an increase in agricultural production and more days which are favourable for recreation. Other effects will be negative, such as an increase in the amount of flood water and a decline in the quality of the surface water and nature. A rapid rise in sea level and an increase in the peak discharge rates of the rivers as a result of climate change have not as yet been observed in the Netherlands, but will certainly come. The trends in climate change and its effects are expected to continue. The adverse effects of climate change are largely associated with changes in the frequency with which extreme weather conditions occur (i.e. drought, storms and heat waves). Furthermore, there is a greater chance of new or recurring pests and diseases, with disastrous consequences in agriculture and for public health. At the current rate the gradual changes taking place in the climate would essentially appear to be manageable for the Netherlands. Adapting to a changing climate will, of course, continue to demand substantial investments.

In general terms, the Netherlands does indeed meet the European standards on air quality, but this does not mean that there are no longer any risks to public health (Smeets, 2012). According to the OECD 'Environmental Outlook to 2050' (2012a) mortality due to air pollution may even be one of the most significant causes of environment-related deaths, even in developed countries.

Biodiversity in the Netherlands has seriously declined over the past century or so. Natural capital has been exchanged for economic growth, for example, in the form of a large agricultural sector and plentiful infrastructure. The diversity of ecosystems and species in the Netherlands has given way to a cultural landscape with not many immediate risks. Agriculture in the Netherlands is highly intensive but is based on robust systems (largely a combination of peat and sandy soils). This agriculture however is highly dependent on external fertilisers and pest control which in turn creates other problems, such as too much nitrogen in the soil and groundwater. Essentially the risks inside the Netherlands are small. A large part of the natural capital that is needed for consumption and production within the Netherlands lies outside its national borders. The Netherlands imports many renewable resources from abroad; for example, for the processing and transit of products such as wood, coffee, palm oil, soy and cacao. The production of these raw materials abroad causes considerable damage to the quality of the environment there.

3.2 Benefits

Making more efficient use of energy and materials has a positive effect

Reducing the energy intensity of the Dutch economy will lead to lower expenditure on energy and lower greenhouse gas emissions. By making more efficient use of energy and materials certain companies would become less sensitive to price fluctuations and disruptions in the supply of energy and other vital raw materials. The International Energy Agency (IEA) has shown that radical energy cutbacks together with a

transition to a low-carbon energy system halts the growing demand for energy, leads to reduced imports of fossil fuels in particular, strengthens the economy and drastically reduces greenhouse gas emissions. It pays to invest in clean energy. Every additional euro which is invested generates three times as much in future savings on fuel (IEA, 2012).

Benefits of better air quality

Greening has benefits in the form of cleaner air and thus offers the possibility of improving public health. Recent Dutch research has shown that with a further reduction in air pollution the benefits will be considerably greater than the costs (Smeets, 2012). Dutch citizens will live longer and be healthier due to the additional emission reductions. Nature in the Netherlands will also suffer less damage. If technically feasible measures are applied to improve the environmental quality more than the present European standards, the net benefit to the Netherlands could amount to almost 600 million euros per year. Recent research in the United States has shown that the cost of air pollution is high (Muller et al., 2012). The sectors which cause relatively the most environmental damage are agriculture and the utilities. For coal-fired power stations and waste incineration plants the contribution to the economy may even be negative when corrected for the cost of air pollution (Muller et al., 2012).

Benefits for nature and the economy

Greening the Dutch economy could mean that the services provided by nature are acknowledged as such and used in a sustainable manner. Nature can contribute to greening on the one hand, and on the other hand benefit from it, too. Nature is involved in water storage, water safety, water treatment, pest control, carbon sequestration and preventing erosion in agriculture. Stream valleys, peatland areas and rivers could contribute so much to reducing flood drainage problems that this could become a thing of the past in cities. Beaches, dunes and vegetated mud flats can contribute to the coastal defences. Treatment wetlands could help to reduce nutrient levels in the surface water in low lying areas to a level which is comparable with the water quality objectives of the Water Framework Directive (WFD). In large parts of the lowland peat areas groundwater depletion can be halted and the peat can again start to bind carbon dioxide instead of releasing it as emissions. At sea more use can be made of the opportunities offered by wind energy and aquaculture, and fishing can take place in a sustainable manner. Organic pest control reduces the need for pesticides and prevents environmental damage. The Netherlands can benefit by managing its natural capital more shrewdly; for example, by linking the policies on nature, land use and water. Nature areas can be used for recreation and species conservation while facilitating water treatment and providing water safety. Nature can benefit from this (e.g. greater natural dynamics, higher water table) and on balance these sorts of solutions can also turn out to be cheaper (PBL, 2012c).

Indirect benefits of greening the economy; thinking in terms of chains

The Dutch economy is driven by chains which extend beyond its national borders. That is why a thorough analysis also needs to be made of the ecological risks posed by the present growth on an international basis. The Dutch claim on the world's raw materials is disproportionately high, and the greenhouse gas emissions caused by Dutch consumption, per capita, are well above the world average (CBS et al., 2009). The Netherlands, thus, makes a relatively large contribution to the unsustainable character of today's global growth. It is largely other countries than the Netherlands which are affected by the consequences. Climate change, water scarcity and biodiversity mostly affect the poorest and most vulnerable people in developing countries.

The Netherlands has more than just a moral responsibility to do something about this. The problems elsewhere in the world could also have a backlash on the Netherlands when the raw material supply chains for production by businesses are disrupted due to rising tensions or migration. In addition to which, sustainable economic growth in developing countries could result in more exports to these countries from the Netherlands.

Importance of green growth for businesses

When energy and raw materials become more expensive, companies are among the first to notice this. It is, therefore, not surprising that it is precisely those companies which must make these long -term investments and not remain chained to fossil fuels that are taking the lead in advocating greening. Companies such as Unilever and DSM, for example, are already working on making substantially more efficient use of the energy, raw materials, water and land involved in their production processes. Thereby recognising the importance of sustainable economic growth. This is also expressed in the aim of the World Business Council for Sustainable Development (WBCSD) to halve CO_2 emissions by 2050, by means of a transition to low-carbon energy systems, by halting deforestation and by doubling agricultural production by 2050 without using more land and water (WBCSD, 2010). Companies that know how to manufacture more efficiently can gain a competitive advantage. This is particularly important in those sectors which use relatively more energy and raw materials, such as building and construction, energy supply, industry, traffic and transport, and agriculture. It

is also becoming apparent that a sustainability profile will be a criterion for the issuing of permits: 'ecology is a license to operate', in which companies that cannot demonstrate the sustainability effects of their activities will price themselves out of the market (Hajer, 2011; KPMG, 2012).

Greening the economy will demand huge investments over the coming years. The difficult financing situation currently faced by many banks and governments in Europe constitutes an extra hurdle to such investments for the time being. At the same time clean technologies for the coming decades are the growth markets. For example, the renewable energy sector is expected to become one of the biggest industrial sectors of the future (KPMG, 2012). WBCSD estimates that by 2050 the market opportunities for sustainable products will amount to somewhere between USD 3 and 10 trillion per year (WBCSD, 2010).

Opportunities for Dutch trade and industry

The global trend towards greening offers opportunities for Dutch businesses in various sectors. It is therefore also important that the present Top Sectors policy indicates how the opportunities for green growth could be utilised in the Netherlands. Agriculture worldwide could be greened with Dutch expertise, and Dutch offshore industry could play a key role in wind farms at sea. A specific example is the 'whizz wheel', a Dutch invention which can cut the electricity consumption of a refrigeration system by half. With many small and medium-sized businesses, the Netherlands is among the world's best in agriculture in areas such as organic pest control and seed breeding for flowers and vegetables. There are also opportunities for the Netherlands in the recovery of minerals from manure, not least because of the environmental pressure that this causes in this country. Low-energy greenhouses and low-emission animal housing are other potential export products for the Netherlands. A final example is the opportunities presented by the recycling of waste. The Netherlands has relatively a lot of expertise in separation technologies and good logistics to be able to play an important role here. Giving additional attention to the critical raw materials – such as phosphates and earth metals – would be an obvious choice, although this would require further investigation.

The considerable pressure on space in the Netherlands provides an incentive for combined use. Compared with other countries the Netherlands has a better understanding and more experience in solving such integrated issues. Various other countries – including China – are more than capable of building technologically advanced dykes, dams and bridges, but the Netherlands is more advanced in the creation of integrated plans and designs in which water quality, water safety, water storage, nature and a bio-based economy go hand in hand. This is already a Dutch export product and has potential for further development.

The Netherlands therefore has an interest in greening the economy. The Dutch economy is essentially highly dependent on the import of energy and other natural resources. This makes the Netherlands vulnerable to price rises and supply disruptions. Greening will strengthen the economic system in the sense that production and consumption processes will involve fewer natural resources. By making energy consumption and the use of other materials more efficient, the Dutch economy can become more resilient. At the same time greening the economy will create a cleaner environment. Green growth also offers real opportunities for Dutch businesses. In which sectors these opportunities lie, how great they are and how they can be utilised are still open questions.

3.3 Dilemmas and trade-offs

Greening requires balancing the short term against the long term

Green growth comes at a price. Investing in greening will be at the expense of today's income, but in return offers a better income in the future. Greening therefore requires taking a long-term view. There are trade-offs between the costs now and the benefits in the long term. For example, major investments are required now the environmental effects of which will only become apparent at a much later date. Measures to limit climate change and biodiversity loss will only show an effect after a long time. The climate system will take decades to respond to today's emissions and it takes decades before a forest is fully grown. Such delays in the benefits to be gained means that the necessary investments are not very popular. This is true of private citizens, who see a return period of more than five years as already too long. And to a lesser extent governments, too, because government ministers like to see results within their period of office. This obstacle to investing in improving nature and the environment is even greater if the investor sees little or no return on their investment (the 'split incentive'). As an example, a tenant would benefit from the improved comfort and reduced energy bills which investing in home insulation would bring, but is reluctant to invest any funds in achieving such benefits because the increase in the value of the property goes to someone else.

For companies the attractiveness of alternative investment opportunities also plays a part. For example, it is often the case that companies do not invest in profitable technologies which spare the environment because other investment opportunities offer a higher return. A higher price for environmental consumption (see Section 4.1) would make investing in technologies which spare the environment more profitable.

Green growth as a means of strengthening the economy

New knowledge in the form of alternatives to dirty or scarce resources, for example, could potentially be beneficial to economic growth in the future. Green growth should therefore not be seen as the short-term solution to the present economic crisis in the Netherlands. Green growth in the Netherlands is not expected to lead to a great many more jobs. The Netherlands has a relatively low level of unemployment and the future expectation is that there is more likely to be a shortage of labour than a surplus. Employment in the longer term will mainly be determined by the level of participation and institutional factors, such as social security and the tax system. Focusing on green growth will lead to new knowledge and the technologies and products which this will bring, employment and new sectors, but at the same time other sectors will shrink in this process of creative destruction (Stolwijk, 2011). It will lead to a shift from 'brown' to 'green' jobs and, eventually, to a more robust economy. Advantages for one sector often go hand in hand with disadvantages for another. It is not always possible to determine in advance what the macro-economic outcome will be.

Win–win situations?

The cost of greening can be managed. The World Bank has indicated that if sensible policy measures are taken, this does not have to be at the expense of growth in the short term (World Bank, 2012). This could be a practical mix of environmental pricing, removing subsidies which harm the environment, dynamic regulation and innovation policy (see Section 4). There may be benefits to this even in the short term, such as an improvement in public health and reduced spending on raw materials. Past experience with waste prevention and energy conservation have shown that win–win situations are quite possible, although not limitless. In practice, there will also be trade-offs between investments made now and the longer term effects. Nevertheless, there are conceivable win–win situations. Investing in environmental quality or energy savings could also have short-term benefits. There will be an immediate improvement in the air quality of a city, for example, if a substantial part of the passenger transport is provided by electric vehicles. Policy which promotes green growth can therefore bring the short-term and long-term interests closer together.

FOUR

Conditions for greening

Green growth will not be achieved at the press of a button. Nor is there any blueprint for the implementation of green growth in different countries. New planning philosophies concentrate much more on achieving a social goal ('green growth' means less CO_2, efficient use of resources and no serious environmental impacts), and subsequently spur on innovation and consistently give priority to activities that bring the intended ideal closer within reach. What then are the most important conditions to achieve such green growth? This section outlines some of the necessary conditions for greening the Dutch economy and suggests some ways in which these could be introduced in some areas.

4.1 Environmental pricing

At the moment the actual cost of environmental consumption is hardly priced into products, if at all. As a result businesses and the general public take the adverse impact on the environment of their behaviour and actions insufficiently into account. These 'negative external impacts', as they are known, are not included in the basic price assumed by the market and other parties. In other words, the cost to society is much higher than the private cost. To make the market function better the government could include these hidden costs to society through environmental pricing (e.g. levies, tradable rights) or by setting standards (e.g. licensing, legislation). In this way the use of environment will again be taken into account in the decisions taken by the parties concerned. Provided that this environmental policy is enforced and that this can be done at a reasonable price, the external cost of environmental consumption can be internalised.

A systematically higher price will encourage businesses to use energy and natural resources more efficiently. This will make investing in technologies which spare the environment more attractive and wasting energy and resources will become more costly. Eventually this could give businesses an advantage. A higher price for energy and raw materials or emission rights will reduce demand more quickly thereby making investment in alternatives more profitable sooner. The price incentive is currently often still low and too volatile to achieve this. The current price level of the EU Emissions Trading System for CO_2 (EU ETS), for example, offers little incentive to invest in clean technology. Certainly in the short term, there will be not much reaction on the demand side to a price rise (the price elasticity is low).

Environmental pricing does not have to lead to higher taxes for companies and private citizens either. For example, if the government revenue generated from the environmental pricing is fed back into the system through lower income tax and corporation tax. It is, of course, also possible to generate additional revenue for the Treasury through green taxes or by auctioning emission rights.

There is some conflict between achieving environmental benefits and generating stable tax revenues. Economists

speak of a 'trade-off relationship'. For example, if a tax leads to less energy being used and tax rates remain unchanged, then over the course of time tax revenues will decline. Thus, what is good for the environment will not always be good for the Treasury. This applies not only to green taxes but also, for instance, to the excise duty on alcohol and tobacco.

Share of environmental taxation is relatively large in the Netherlands

Environmental taxes make an effective contribution to environmental policy. Without the excise duties on petrol, diesel and LPG, for example, vehicle emissions would be higher than they are now. For many decades taxes have been levied in the Netherlands which have a positive impact on the environment. Green taxes generated a revenue of some 20 billion euros in the Netherlands in 2010; putting the Netherlands among the frontrunners in Europe. Roughly three quarters of this tax revenue is generated by excise duties on mineral oils (petrol and diesel) and by vehicle taxes. Of the remaining environmental taxes, the energy tax is by far the largest. The revenue from this has risen from around 400 million euros in 1996 to 4.2 billion euros in 2010 (De Vries, 2012). The energy tax now contributes more than 20% to the total revenue from environmental taxes. The increased revenue from the energy tax is the result of raising the tax rates and widening the tax base. In the Spring Coalition Agreement the tax rates on natural gas were raised across the board, which will generate more than 365 million euros in extra revenue for the government (Ministry of Finance, 2012). The energy tax was initially a levy on non-bulk consumers of electricity and gas. To avoid harming the competitive position of Dutch industry, bulk consumers were made exempt through rapidly digressing band rates. The energy tax was mainly intended to have a regulating effect for the purpose of energy conservation and to promote sustainable energy sources. The revenue generated by the energy tax has been pumped back into the system by lowering direct taxes, such as payroll and income tax, as well as corporation tax. Both the economy and the environment benefit as result.

The revenue from environmental taxes is added to the general public funds. Besides this, there are also dedicated environmental levies. These are specifically intended to finance certain items of public expenditure on the environment. In this way the income generated by the pollution of surface waters levy is also spent on combating the pollution of surface waters. Local government is responsible for collecting most of the levies earmarked to finance environmental activities. The revenue generated by these levies in 2010 was more than 4 billion euros (CBS, PBL and WUR, 2011).

The remaining environmental taxes were largely abolished by the previous Rutte government. These were the levies on packaging, waste disposal, tap water and groundwater which together amounted to more than 750 million euros. The aim to create a simpler, more solid and fraud-proof tax system led to the abolition of these 'minor' environmental taxes. The consequence of scrapping these taxes is that the total revenue in green taxes is likely to drop slightly. Although it was stated in the recently agreed Spring Coalition Agreement that the tax on tap water, amounting to 125 million euros, would not be abolished (Ministry of Finance, 2012).

Some options for further greening the tax system

Most environmental taxes in the Netherlands have a relatively low elasticity (Blom et al., 2010). This means that there is still room to raise rates without an immediate fallback in the tax revenue. This offers opportunities for further greening the tax system and collecting a larger share of the total tax revenue with green taxes and levies. A kilometre levy for freight traffic, for example, similar to the German system (LKW MAUT). It could further be considered not to abolish the waste disposal tax, but to reintroduce it and widen it from a levy on the disposal of waste to a levy on the disposal and incineration of waste. This would provide an added incentive for the recycling of raw materials. At their present rates the other 'small' environmental levies do not have much of a regulating effect. The choice here appears to be either to abolish them or to greatly increase the rates, as was suggested by the Tax System Study Committee for the packaging tax (Studiecommissie Belastingstelsel, 2010). This tax would then have a regulating effect and at the same time encourage the use of less packaging. The relevant factors to be considered in general terms when deciding on a further greening of the tax system have been systematically explored in a separate PBL publication (Vollebergh, 2012).

In the European context steps could also be made towards taxing raw materials which have a major environmental impact, such as animal feed and palm oil. One challenge here is how to deal with variations in the environmental impact due to differences in the production processes. This could be achieved, for example, through a tax differentiation between sustainable and non-sustainable products.

4.2 Abolishing perverse incentives

Similar to most other countries, the Netherlands still has some pricing incentives which have unintended and undesirable effects on the environment. These often relate to exemptions and reduced rates for specific taxes.

Such subsidies or tax exemptions with an unintended adverse impact on nature and the environment are often referred to as environmentally harmful subsidies. Such environmentally harmful subsidies give the wrong pricing signal: environmental pollution is not penalised but rewarded. The rate paid by bulk consumers of electricity and gas, for example, is only a fraction of what private consumers pay. Given the huge rate differences, it is not surprising that the least savings have been achieved in the sectors paying the least amount in energy tax (De Buck et al., 2010). Because of this wrong pricing signal in terms of the environment, the OECD, UNEP and World Bank are in favour of abolishing environmentally harmful subsidies. In its 'Resource Efficiency Roadmap' the European Commission specifically calls for the abolition of all environmentally harmful subsidies (EC, 2011a).

OECD countries provide USD 45 to 57 billion in subsidies for fossil fuel energy. This is more than the total amount in subsidies provided for renewable energy in these countries. Abolishing environmentally harmful subsidies would not only benefit government finances but also lead to an increase in the national income (OECD, 2012a). In the Netherlands the advocacy group, De Groene Zaak, is among those who for some time have argued for perverse price incentives which encourage the use of fossil fuels to be abolished (De Groene Zaak, 2011a). Abolishing environmentally harmful subsidies is just one part of 'better environmental pricing' and will make use of the environment relatively more expensive, which in turn will reduce the environmental pressure.

Abolishing environmentally harmful subsidies means weighing many factors

The abolition of environmentally harmful subsidies will lead to lower government expenditure or increased tax revenue for the government and a reduction in the environmental pressure. Against this, however, abolishing these subsidies will have adverse effects elsewhere in society. If environmentally harmful subsidies are abolished there will, by definition, also be losers if there is no flanking policy. Because the subsidy or the tax benefit was provided at the time for a particular purpose. The reduced rates for bulk consumers of electricity and gas, for example, are intended to maintain or strengthen the competitive position of the sector concerned. Removing such an advantage would require renewed political consideration of all the consequences. It may be that the sector can deal with this competitive drawback better than in the past or that the interests of competitive strength and environmental quality are perceived differently now, due to a shift in public and political preferences over time. Besides the benefits for the environment and the Treasury, it is also a matter of identifying and taking into account how economic development will be affected in terms of the impact on economic growth, employment, disposable income and competitive position. The recent discussion in the Netherlands about abolition of the tax exemption on commuting shows how a reconsideration of the balance between different goals can raise the political temperature. Here the benefits for the Treasury, emissions and traffic congestion need to be offset against the redistribution effects and the adverse impact on the flexibility of the labour market due to a greater reluctance to live far from work and the relatively small supply of homes in the vicinity of the workplace.

Environmentally harmful subsidies in the Netherlands

Abolishing all environmentally harmful subsides could provide the national Treasury with as much as 10 billion euros a year (Drissen et al., 2011). Improving environmental quality could thus also make a substantial contribution to balancing the national budget. It is difficult to determine the precise amount as this depends on the definitions and calculation method used. The amounts referred to therefore essentially provide an order of magnitude. It is often difficult to estimate the scale of the environmental effects and the consequences in terms of economic development, because this requires specialist knowledge which is not always available in one place. These aspects have therefore not been considered in this document. Environmentally harmful subsidies are found mainly in the sectors of energy, traffic and transport, and agriculture. More than half of the potential revenue for the Treasury which could be raised by abolishing environmentally harmful subsidies relates to subsidies, exemptions or reduced tax rates which the Netherlands can abolish for itself. However, with regard to a number of environmentally harmful subsidies it would be wise or even necessary to abolish these in a European context or on a global scale.

The recently agreed Spring Coalition Agreement has already abolished some environmentally harmful subsidies. This fits in with the aim of greening the economy. These include the abolition of the tax exemption for commuting, the exemption in the coal tax and the low excise duty on red diesel (also used for tractors, generators and road maintenance vehicles). The tax exemption on commuting was a specific topic of debate in the run up to the general election. This tax exemption represents a sum of 1.4 billion euros. Whether and how this exemption will change will become clear as or after the new government has been formed. Increasing the excise duty on red diesel to the same level as on ordinary diesel and abolishing the coal tax exemption for power plants will lead to additional revenue of

approximately 250 and 115 million euros, respectively (Ministry of Finance, 2012).

Environmentally harmful subsidies that could be abolished in the Netherlands

There are various other environmentally harmful subsidies which the Netherlands can unilaterally abolish. These include, for example:

- The present tax advantage for vans relative to cars. The possible revenue for the Treasury of such a measure has been estimated at 0.5 to 2 billion euros. The amount partly depends on the question of whether the tax on small trucks would also be changed and what form an equivalent motor vehicle purchase tax (BPM) and road tax would take.
- Transferring meat, dairy and fish from the low to the high VAT tax rate could raise 1.1 to 1.3 billion euros (updated further to Van Drissen et al., 2011, using Statline). It would appear useful to tax these foods, as meat, fish and dairy cause more than average environmental harm. However it should be noted that past research has shown that shifting meat from the low to the high VAT rate will have only a limited environmental effect. Because the cost of meat constitutes only a small part of the total amount of consumer spending. The cultivation of decorative plants also could be moved from the low to the high VAT rate; this would generate around 0.3 billion euros.
- In the Netherlands there would appear to be some room to increase the energy tax for the middle category of businesses. In real terms these are businesses using more than 170,000 m^3 of gas or consuming more than 10,000 kWh of electricity per year, but less than bulk users. These companies generally compete far less on international markets than some of the energy-intensive industries. However, it is still unclear which of these companies are subject to the ETS and which are not.
- In greenhouse horticulture the low rates for the energy tax still apply. This involves a sum of 0.1 to 0.17 billion euros (Drissen et al., 2011).
- Finally, abolishing the tax exemption for vintage cars could be considered. The road tax exemption for vintage vehicles was introduced for vintage car enthusiasts as these vehicles are not often driven on the road. In the meantime the number of vintage cars that have started to be used for everyday transport has rapidly increased. These are often cars which because of the exemption are only imported into the Netherlands if they are 25 years old. At the moment some 300,000 vehicles are covered by the vintage car scheme. If the road tax exemption for all vintage vehicles were to be abolished, this would generate 0.15 to 0.3 billion euros (Drissen et al., 2011).

Environmentally harmful subsidies for which abolition in European context would be more effective

It would it be better to abolish several environmentally harmful subsidies in the European context. This applies to the low rate for bulk energy consumers, for example, because abolition in just the Netherlands could affect production and employment. This also applies to low or missing taxes in aviation (excise duty on kerosene and VAT on airline tickets) and for inland and maritime shipping (excise duties and VAT on fuel oil), because of the international agreements on these and the international nature of aviation and shipping.

- Ecofys and CE have calculated in the past that removing the adverse external effects caused by the low energy tax on bulk consumers would generate revenue of 1.5 billion euros for gas and 0.3 billion for electricity (De Visser et al., 2011).
- The abolition of the excise duty exemption on kerosene for the aviation industry could generate revenue of 1 to 1.7 billion euros for the Netherlands (Ministry of Finance, 2011; De Visser et al., 2011). Removing the VAT exemption on airline tickets could also be considered.
- Abolishing the excise duty and VAT exemptions for shipping could generate additional tax revenue for the Netherlands of between 0.5 and 0.8 billion euros (De Visser et al., 2011; Ministry of Finance, 2011).

The exemption for the aviation industry was originally introduced to stimulate growth in the sector. The exemptions for the aviation and shipping sectors are currently maintained mainly for reasons of international competitiveness. Not to harm the competitive position of Dutch or European industry, agreements would have to be made, at least at the European level and ideally worldwide, about pricing in the aviation and shipping sectors.

European harmonisation would help to avoid border effects within Europe. This would also not stand in the way of Dutch companies competing on equal terms with businesses in other European countries. Where this relates to subsidies or grants given to companies which fall under the EU Emissions Trading System (ETS) for CO_2 there is also a good chance that the emissions room created as a result will lead to a reduction in the CO_2 price. This will provide other European companies with an opportunity to buy additional emission rights. For companies subject to the ETS, abolition of a subsidy will only result in a reduction in CO_2 emissions if the European emission ceiling is lowered accordingly at the same time. The consequences of additional policy aimed at ETS sectors - on top of the ETS - would therefore also be an important point for consideration. To what extent could policy accumulation possibly lead to undesirable effects?

In this way additional legislation could undermine effectiveness in the ETS sectors.

4.3 Dynamic regulation

Pricing alone is not enough

Better environmental pricing is an important first step towards greening the economy. At the same time it should be realised that environmental pricing alone will not be enough. The World Bank gives various reasons for this (Hallegatte et al., 2011). In practice a perfectly functioning market seldom exists. Pricing therefore is also not the 'silver bullet' which will solve all the environmental problems. For example, the price elasticity is often low, there are limited options for substitution and both consumers and manufacturers are often stuck in their routines. Car drivers, for example, often perceive few opportunities to respond to higher fuel prices because they see no transport alternatives. Furthermore, in practice it often turns out to be difficult to introduce the theoretically necessary price increases because of the resistance that this triggers in society. It is also difficult to estimate the correct price which is necessary to achieve the desired balance in society between production and the environmental pressure that this causes. Finally, implementing environmental pricing in practice will often require a great deal of technical expertise and institutional capacity (Hallegatte et al., 2011). In such cases it may be easier to introduce and enforce legislation and standards.

Regulation has played an important role in major reductions

Pricing therefore is no panacea. Certainly not when faced with the challenge of reducing resource consumption and greenhouse gases by a factor 4 or 5 and effectively protecting species and valuable ecosystems. The last wild tuna may well sell for a million dollars but to protect species, regulation may be the more obvious approach. Standards could also be set for the energy consumption of products such as electrical appliances or cars, for example, which also happens in practice.

Regulation has played an important role in those cases in the Netherlands where emission reductions of more than 80% have been achieved, such as for air pollution and waste. Between 1980 and 2010, for example, emissions of sulphur dioxide were reduced by 85% due to the introduction of emission standards for power plants, refineries and other industry, by making the catalytic converter obligatory in cars in Europe and by making it mandatory for companies to apply the best available technologies in new plant installations (PBL, 2010a). To further reduce nitrogen emissions by North Sea shipping, stricter emission standards are also currently being considered. Recent PBL research has shown that the health benefits of such standards are greater than the costs to the shipping sector (Hammingh et al., 2012).

Dynamic regulation fosters innovation

Applying the best available technologies neatly fits in with the concept of dynamic regulation. In this way the government can make better use of the momentum in society. Because by setting dynamic standards performance requirements can be tightened up over time. An example of this is the Japanese Top Runner programme in which the Japanese government regularly takes the best-performing companies as a benchmark for setting the energy and environmental standards for products and equipment. In this way innovative companies are rewarded and companies which lag behind are penalised. In the European Union the Integrated Pollution Prevention and Control (IPPC) directive could provide a useful approach in making it mandatory for companies to apply the best available technology. The same applies concerning the publication of stricter standards in the Netherlands for new housing in the future. In agriculture, the Netherlands also could apply dynamic standards; for example, by tightening up the standards for low-emission animal housing over time.

In the Netherlands the energy investment allowance scheme (EIA), the environmental investment tax scheme for businesses (MIA) and the random depreciation of environmental investments scheme (VAMIL) are all examples of subsidy schemes for technologies which are aimed at sparing the environment. Only investments in technologies which are not (or not yet) viable are eligible for these subsidies. By working with dynamic lists, this approach is in line with the goal of dynamic regulation and innovation would always be promoted.

Companies which are leading the way in implementing green technologies are asking the government to create a market bottom by setting minimum standards that those lagging behind are also required to meet. At the same time these companies are asking for more effective environmental pricing. Both measures will contribute to achieving a more level playing field. Clear agreements on emission standards will also contribute to innovation and its dissemination. For example, there was a notable peak in patent filing around the time when the Helsinki and Oslo protocols on sulphur dioxide and the Kyoto Protocol on climate were signed. Dynamic regulation tailored to green innovation can also help to bridge the 'valley of death': the experience that the dissemination of innovative solutions often strands somewhere between the brilliant idea and getting the physical product onto the market. The targeted use of dynamic regulation is just

one of the alternatives available to the government in putting together a successful business case for promoting green technology. The constant drive for improvement can become a competitive theme, as we have seen with the energy labels in the white goods market.

4.4 Sustainable innovation

Innovation as a cornerstone for green growth

It is unquestionable that innovation will be vital to green the economy. The challenge is to keep looking for new ways to make more efficient use of energy and materials in the production process, as well as the wide-scale application of existing efficient technologies and substitution. Innovation is also necessary to support agriculture under wetter conditions; innovation in the organisational sense to be able to make sustainable use of ecosystem services.

Above all, innovation has to come from the commercial sector. Dutch companies already see opportunities in rapidly growing world markets for green technology and are responding to them. To be able to achieve or maintain a competitive advantage companies are focusing on research and development (R&D) to improve efficiency or find a substitute for the environmentally harmful input. Later, those who have green technology will have a cost benefit in the face of rising prices for energy and raw materials. From the green growth perspective we are now at the start of a 'green race' (see also the section on policy coordination and competition in CBS et al., 2011). Because green technology has a competitive advantage if it is the winning technology. Companies such as Unilever and DSM are already preparing for this by focusing on reducing the use of energy, raw materials, land and water in products and making the production chain more sustainable.

Conditions for sustainable innovation

In general terms, the preconditions that are necessary and desirable for innovations which spare the environment are similar to those for regular innovation, such as a stable macroeconomic policy and sufficient competition, as well as openness to international trade and foreign investment (OECD, 2011). Innovation also demands a patent system which works well, sufficient stable private and public investment in R&D, as well as companies and research institutes that can work together well. Greening the economy, in the long term, will lead to an economic system that is less polluting to the environment. But this requires innovation and dynamics, induced by legislation and standards, or by a stable price that, in the long term, factors in pollution and depletion. The last of these is still insufficiently the case, including in the ETS. The present low price per tonne CO_2 and the wide price fluctuations create long-term uncertainty for investors (PBL, 2010b). Because the positive external effects of invention and diffusion have not yet been included, the present costs of new green technologies are higher than those of the technologies which have already been rolled out on a large scale. In some cases this justifies a government stimulus for green innovations which are finding it difficult to find their way to the market.

Innovation policy must be customised and learn from experience

The government can encourage innovation which spares the environment in various ways. This can be done with targeted subsidies, guarantees and tax benefits, removing legislation which hinders innovation, organising and investing in the physical infrastructure and the knowledge infrastructure, imposing standards and setting an example by purchasing sustainably. In view of the wide differences between sectors and the obstacles to be removed, a customised approach would be most suitable. There may well also be some lessons which can be learned from past Dutch experience and case studies.

For example, in numerous renewable energy technologies the Netherlands has strong position in fundamental knowledge, but we are insufficiently aware of this to be able to turn it into patents and economic activity (Van der Slot et al., 2010). A more stable subsidy policy than has thus far been pursued would support this. In the Netherlands, too, most of the subsidies are available for the R&D phase, with relatively few for market introduction. It furthermore appears that the home market is still underdeveloped for renewable energy technologies (Pols et al., 2010). What the optimum distribution of public funds should be over the various phases in the successive processes of invention and dissemination, is something which requires further study. The cooperation between research institutes and companies in the energy sector could also be improved. The present organisation of the knowledge infrastructure in the agro-complex between businesses, research institutes and the government could serve as an example for this. Central to this cooperation is 'developing a shared vision and long-term agreements arising from this, financial commitment by all the parties, linking education to the commercial sector and the close involvement of businesses in pure and applied research' (Ministry of Economic Affairs, 2011). NGOs also play a vital role in the international environmental domain - for example, the Round Table for Responsible Soy Association.

Finally, the lack of sufficient capital in the scale-up phase between demonstration projects and market roll-out is one of the main reasons for the extent of the 'valley of death' in the Netherlands. For some time now, the frontrunners in the Netherlands have argued for a specific set of financial instruments in the form of guarantees, loans and participating interests to facilitate the funding of innovations that spare the environment (De Groene Zaak, 2011b). Central, regional and local government authorities have already gained experience with this; for example, by providing guarantees for insulation projects and through government participation in district heating networks (De Groene Zaak, 2011c). It has also being investigated to what extent a revolving fund for sustainable investment and better opportunities to finance greening projects with pension funds, for example, could offer a solution to the funding problems referred to here. In a revolving fund the loaned money which is repaid returns to the fund thereby making it available again for further investments. In the Spring Coalition Agreement it was agreed that a revolving fund would be created for energy conservation in the built environment (Ministry of Finance, 2012).

An important question in innovation is whether it is possible to identify 'winning' technologies, concepts or products at an early stage. By definition, there is only room for a few 'first movers' who are able to cash in on the premium for taking the lead (Stolwijk, 2011). For the government to stimulate specific technologies to help national companies to gain a 'first mover' advantage is therefore a strategy with risks attached to it. This leads to the strategic question of whether and in what areas the Netherlands wishes to take the lead by actively investing in companies which make products that spare the environment, and in which areas it would actually be better to wait until the cost of the technologies drops before importing them. Which sectors offer the best opportunities and what this could generate in terms of turnover, jobs and environmental pressure, are questions which still need to be answered.

Top sectors contributing to greening

To improve the competitive strength of the Netherlands, top sectors play a central role in the present policy. These are economic sectors which are knowledge-intensive, export oriented and which can make an important contribution to solving issues in society (Ministry of Economic Affairs, 2011). There are nine top sectors altogether, including water, agro and food, high-tech, chemicals, energy and logistics. Attracting the head offices of international corporations is another focus, while the bio-based economy is also seen as a promising cross-sector theme which, by extension, also touches on competitive strength and issues surrounding energy security, climate and raw materials. Some 2.8 billion euros has been earmarked in 2012 for the research and development of innovative products and services in the top sectors. This sum will be contributed jointly by the private sector and the government and has been laid down in innovation agreements in which the research institutes were also involved. In the top sector energy, in the innovation agreement it has been decided to pursue the themes of energy conservation in industry and the built environment, gas, smart grids, wind farms at sea, solar energy and bio-energy (Topsector Energie, 2012). There is thus a specific focus here on innovation which spares the environment. Other top sectors will also focus specifically on sustainable innovation and the production of 'more with less'. The top sector policy is therefore contributing to green growth in the Netherlands. The precise contribution that the top sector policy will make, however, cannot yet be determined. Because it focuses on sectors which are already important to the Dutch economy, there is also a chance that the opportunities for innovation as well as the innovative power beyond these sectors may have been overlooked.

Sustainable purchasing strengthens the market for sustainable products

The government can help to create markets for sustainable products by acting as a 'launching customer'. The importance of this purchasing power should not be underestimated. The government as a whole in the Netherlands purchases goods worth more than more than 50 billion euros a year (Rijksoverheid, 2012b). By setting standards for these products the market for sustainable products will be given a boost. The purchasing of central government is already almost fully sustainable. Setting criteria for sustainable products is an important part of this. Should these be only minimum requirements for products, or will ambitious criteria also be applied to encourage green frontrunners? One way of doing this would be to include the cost over the entire life cycle in the award criteria; that is the total cost of ownership, rather than only looking at the purchase price (De Groene Zaak, 2011b). In this way, products would be bought which score well over the entire life cycle which might not necessarily be the products with the lowest purchase price.

4.5 Using the energetic society

Greening has the greatest chance of success if it has broad public support. The value attached to greening is already included in many economic analyses. Companies respond to changing consumer needs, for example, through the introduction of labels for various types of products. The extent to which greening is also considered to be

something of real value in society, will also give it momentum.

Green dot on the horizon

In order to stimulate societal parties to act, it is important that the government is clear about its ambitions. Green growth is something which takes time and therefore requires a long-term vision. By putting a 'green dot on the horizon' central government commits itself to green growth which it supports with stable policy and, at the same time, is prepared to learn from past experience (Hajer, 2011). This can serve as a guideline and provide businesses and financiers with clarity. The roles are changing. It is no longer simply a matter of the government calculating how much wind energy is required and then installing it. It is mainly a question of creating the right conditions by which ordinary citizens, businesses and local and regional governments can and want to achieve the targets for renewable energy. The first step is making it clear that green growth is a long-term objective. If the government explicitly expresses its long term goal, this will remove the uncertainty for banks and they will be more inclined to finance innovations which contribute to green growth. That the government takes a clearer position is therefore a necessary condition for green investment.

But this is not all. The government could, for example, play a specific role in making better use of the existing infrastructure and in the creation of new infrastructure. This relates not only to the physical infrastructure in the form of smart grids and electricity metres, but also the institutional infrastructure. For example, what rules will apply when electricity is fed back into the network? When renewable energy is given priority here, it is likely that the supply of renewable energy will grow. Will private citizens be permitted to supply self-generated electricity to the network at the hourly rate in force, or will they be paid a flat rate irrespective of the time? And will private citizens also have to pay an hourly rate for the electricity consumed? Although the consequences of such choices are not yet clear, it is quite conceivable that the combination of green technology and such rules would lead to a considerable change in behaviour patterns. Stability, in the sense of a 'no surprises' policy that provides an ongoing incentive for greening, is an important element, as is removing legislation which stands in the way of green growth. Typical of all these steering elements is that the government does not impose from 'top down' the best way to achieve green growth, but leaves it open to society to offer smart solutions which promote green growth.

Different relationship between government and society

For complex issues such as the greening of the economy, there are no ideal solutions which can be worked out on the drawing board. Making the transition to a green economy requires experimentation, learning by doing (Hajer, 2011). This requires a different form of interaction between government, the business community and the general public, as well as research institutes and NGOs. In a modern and well-informed society top-down decisions are rarely seen as the best and often encounter resistance in society. This applies all the more where the public and companies consider the rules to be restrictive and not offering any benefits. As set out above, the government takes prime responsibility for setting the goals - in which public debate and support are also essential elements. But the route to achieving those goals will have to be discovered by society (i.e. businesses, the public, umbrella and sector organisations, regional and local government) through trial and error. To facilitate this, the government will have to create room for experiments, for example, by issuing temporary permits, allowing exceptions to the rules, removing restrictive regulations, or by coordinating processes which will release the momentum in society. Openness is important in this context, as this will enable a rich body of knowledge and experience to be drawn on.

Green Deals: initial results

The above approach was taken in the Dutch Green Deals policy. To promote green growth the government supports public initiatives with Green Deals. This means that some of the responsibility for achieving green growth shifts to society, which in turn creates more room for the question of how green growth can be achieved. The government plays mainly a facilitating role in this. The large number of proposals put forward for Green Deals - more than 200 in the first round - shows that society is keenly interested in green growth. With the Green Deals central government is working towards removing the obstacles which the initiators encounter in practice. Green Deals are a useful supplement to the existing channels for gaining a better overview of the obstacles encountered 'in the field' and thus in helping to find solutions as well (Elzenga and Kruitwagen, 2012). The Green Deals could also have a knock-on effect on other activities.

The Green Deals which are aimed at energy conservation in the built environment are experimental in nature and set out to test possible solutions. Restrictive legislation is not such a great problem here. But what is lacking is knowledge about how to set up the process of persuading home owners, in particular, to reduce their energy consumption. By experimenting with different

arrangements the government wants to find out which forms of communication, removing concerns and funding are most successful. What is new here is that the arrangements which are being tested were not devised by the government but by the parties involved.

Evaluation of the Green Deals in the area of energy has also shown that removing obstructive regulations cannot always be done in isolation (Elzenga and Kruitwagen, 2012). Rules may have been laid down, for example, in EU directives. And Green Deals which are intended to promote renewable energy need to take the amended Renewable Energy Production Incentive Scheme (SDE+) into account. Sometimes Green Deals also reveal fundamental choices. Civil society organisations, for example, consider the present tax regime for the generation of solar energy to be restrictive. This is because the tax benefit applies only to individual households that wish to have solar panels installed on the roofs of their homes; the same does not apply to organisations, such as housing associations. A widening of the tax benefit to include housing associations could have a considerable impact on government finance. This shows what kind of difficult choices the government is faced with. What do we want as a society? To generate renewable energy at the lowest possible cost to society or do we want to encourage dynamism and give free reign to the ideas held by some people in society on how to achieve green growth, even if that involves a greater cost to society?

4.6 The importance of measuring progress in different terms

Because the effects of greening the economy often only become visible at later point in time, it is necessary to make a more explicit link between the short and the long term. What this requires is not only more involvement on the part of society in deciding on what is important, but also a different method of measuring progress. The economy is not just about the activities in the economic process, such as building, transport, healing and recreation, but also about the stocks available to the economic system. This means not only looking at GDP but also keeping an eye on the declining fish stocks in the ocean, as well as the extractable stocks of fossil fuels and the level of pollutants in air, water and soil.

All the international organisations which are involved with green growth recognise that this requires a broader perspective. Measuring progress differently is a huge challenge not just for statisticians and planning agencies, but also needs to be discussed and supported by the public and politicians. The aim is to select a set of indicators which will enable all the relevant aspects of greening to be monitored over time. This will probably create too many indicators for managers and the political decision-making process. Therefore some main indicators will have to be distilled from among this set from which politicians and society can see whether the greening process is 'moving in the right direction'.

Naturally, there can be no definitive set of main indicators. Given that such a choice cannot be made objectively, there will always be differences of opinion about it. The same applies to the number of indicators. An index is often a good means of communication because it converts all the effects into one measure (e.g. the consumer confidence index). The summation of the various issues however requires a weighting of the subjective elements. Reducing various activities to a number can also have a concealing effect. If, for example, the trend in climate change were to improve and the trend for biodiversity were to worsen, in an index this could end up showing a stable result. For this and other reasons, in their study 'Measurement of Economic Performance and Social Progress', Stiglitz, Sen and Fitoussi (2009) argued in favour of working with a set of indicators which shows the extent of sustainable development. In the Netherlands, too, the progress made in sustainable development is reported in the Monitor Duurzaam Nederland [Sustainability Monitor for the Netherlands] using a set of indicators. PBL sees this as the most suitable approach for measuring the progress made in green growth.

Starting points for the selection of the main indicators

In selecting the main indicators, it is important that they are easily communicable: it must be possible to explain why these indicators are important. Other criteria are that the topics must be of particular importance to society, topics which are relevant to green growth and on which there are sufficient measured data available. It is also likely to be important in the political context that the process or state which the main indicators reveal can to some extent be influenced. From this perspective, indicators which are slow to react, such as the temperature rise in climate change and the extinction of species in biodiversity, are likely to be less suitable. In order to arrive at a reasonably sound choice of main indicators we have outlined some further considerations:

- In measuring progress in the greening of the economy it is necessary to look at the effects on both the environment and the economy. Therefore, apart from establishing the availability of the natural capital, it is also essential to focus on the economic opportunities. This could be done, for instance, by looking at

investments in technologies which spare the environment.
- Green growth requires a complete decoupling of economic growth and environmental pressure. For green growth therefore it is not enough just to monitor how efficient the conversion of energy and materials is per production unit. It is also important to have an overview of what this means in terms of environmental pressure and environmental quality in absolute levels of greenhouse gas emissions, nutrient surpluses and loss of biodiversity.
- To measure progress in the greening of the economy it is also necessary to establish the relationship with other parts of the world, for example, by showing how much is claimed in terms of land, resources and water, as well as greenhouse gas emissions elsewhere, due to consumption in the Netherlands. There is growing international interest in revealing effects which are related to both production and consumption. This is also shown by the indicators proposed by the OECD for measuring green growth.

The above points argue in favour of a limited set of main indicators for green growth. In the PBL's view, this means that to measure green growth both relative and absolute 'ecological' indicators are necessary, alongside one or two indicators which show to what extent green activities are increasing in scale.

Selection of main indicators by EU and OECD

Settling on some easily communicable indicators which should provide an overview of progress made in the greening of the economy forms an important part of the 'Resource Efficiency Strategy' of the EU and the 'Green Growth Strategy' of the OECD. The EU proposes working with just one provisional main indicator - that of national resource consumption linked to GDP. This indicator does provide an overview of the efficient use of resources, but only a limited view of the underlying policy-relevant issues. For example, this indicator identifies gravel and sand as relevant materials because they hold a large share in the volume. However, these are not really scarce, and the environmental pressure caused by these materials is relatively small. Besides the main indicator, the EU would like to include some complementary indicators for essential natural stocks, such as water, land, materials and carbon, caused by European consumption.

The OECD has, for the time being, selected a small set of six or seven main indicators. This provides an overview of how efficiently energy and natural resources are used (in both production and consumption), the depletion of renewable and non-renewable stocks, the impact on biodiversity (changes in land use), and health risks (exposure to particulates); there is also an indicator aimed at the economic opportunities and policy responses. A main indicator is still being sought for this last category. The main indicators for green growth currently proposed by the OECD fit in well with the starting points outlined here. These include both relative and absolute environmental indicators and apart from greening, also zoom in on growth.

To be able to include the economic opportunities and policy responses at main indicator level, the obvious two topics to focus on which, according to the OECD, are vital to achieving green growth, are environmental pricing and innovation. For environmental pricing PBL considers it relevant to include the greening of the tax system, and the share which green taxes contribute to the total tax revenue as a main indicator. For innovation PBL suggests looking at the investments made in environmentally friendly technologies (i.e. which save energy and raw materials). For this last indicator, however, it is unclear whether the necessary data are available for all OECD countries. Monitoring investments instead of patents or R&D has the advantage that this looks at investments which actually contribute to the transition to a greener economy.

In terms of the economic opportunities, the number of green jobs would certainly be a possible avenue. This indicator, however, has the major drawback that it only covers a small part of the intended changes. Because greening the economy is about the more efficient use of energy and natural resources in all sectors. The difference between 'brown' and 'green' does not show this. Furthermore, it is often argued in the debate that green growth will generate more employment. In practice it more often results in a shift between sectors. Because this indicator can be wrongly interpreted in various ways, it may be less useful to include the number of green jobs as a main indicator. The same applies to an indicator which measures the added value in green sectors.

To conclude: greening as a common interest

From a global viewpoint greening the economy is essential, efficient and affordable (World Bank, 2012). The Netherlands also has an interest in greening the economy. Because the more efficient use of energy and resources will help to strengthen the Dutch economy and bring benefits. For companies therefore this means less dependence on energy and raw material suppliers abroad and less sensitivity to price increases. For society cleaner air is an important benefit which can occur due to the greening of the economy, and which will reduce losses due to sickness. Protecting biodiversity is another important benefit to society from greening. The conceptual framework for a greening of the economy is therefore promising as a charter to guide, inspire and bring together the business community, the general public and government (Hajer, 2011). The market and the government need one another to be able to take steps towards a greener economy and to seize the opportunities that this presents. Compared with some of our neighbouring countries (e.g. Germany, Denmark, Great Britain), the Netherlands appears extremely hesitant. This could put the Netherlands at a disadvantage in what is seen as one of the biggest growth markets today.

In practice, investment costs will generally be incurred well in advance of any benefits, certainly when it comes to climate and biodiversity. There is however a trade-off between doing nothing now and repairing or accepting the damage later, or investing now in combating emissions and conserving nature and thus limiting or preventing future damage. Alongside this, in practice the investor is not always the party that actually benefits from the investment and there are obstacles in the present legislation. Working on greening the economy will help to solve these problems. Taking nature and the environment into account in the economic system through pricing, continuing to search for cleaner alternatives through sustainable innovation, the tightening up of technology standards over time and joining forces to find workable solutions: these are the various avenues which together will bring green growth within reach.

In this report we have considered some important conditions for the greening of the economy and briefly examined some of them in relation to the Netherlands. In doing so, we have looked closely at the role of the government. Greening requires, first and foremost, a long term vision on the part of the government, stable policy and a willingness to learn from past experience. Creating the right conditions for the development and application of innovations which spare the environment is vital to achieving this greening. This requires intervention at various levels of scale. Environmental pricing and setting environmental standards which are tightened up over the course of time (dynamic regulation) often require an international approach. It has been indicated how the Dutch tax system can be made more green and that there are also various ways in which environmentally harmful subsidies can be curtailed and abolished in the Netherlands. Besides this the government has a particular

role to play in the matter of in what direction the infrastructure should develop in view of its green aspirations. At a local level there are already many experiments taking place which could contribute to a low-carbon society. These range, for example, from charging stations for electric vehicles provided by municipalities to facilitating the financing of sustainable innovations by acting as a guarantor for a set period of time.

Greening the economy also requires a different form of interaction between the government, business community and general public. For the government this means, firstly, developing and promulgating a compelling vision and, secondly, creating a 'new predictability' in terms of what it expects from the public and businesses. For the commercial sector, this means making changes to its operations and business models. Among the general public, too, it is important that greening the economy is seen as helping to maintain quality of life. This calls for different ways to measure progress.

Outstanding questions

This document gives an impression of some of the conditions which will be important to achieving green growth in the Netherlands. There are quite a few questions left over, however, which require further investigation. These are both specific questions related to a sector or theme, as well as questions which cut across sectors or themes. Identifying unanswered questions can help to create an agenda while also serving as input for the debate on green growth in the Netherlands. These questions include:

- Which sectors would benefit most from greening in order to reduce their vulnerability?
- Which sectors offer the best opportunities for the Netherlands and what will this generate in terms of revenue, jobs and environmental pressure?
- How will society be affected by a further greening of the tax system?
- Apart from the consequences for the Treasury and the environment, what other effects may arise from tax shifts, including the consequences of the accumulation of measures and interactions between the various instruments?
- Which emissions and resources are most promising in terms of further environmental pricing and what would be the best tax base for this?
- What specific contribution could the top sectors make to the greening the Dutch economy?

It is important to gain an idea of the answers to these and other questions. We do not need to wait for all the answers, however, to give a boost to the greening the Dutch economy.

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