Sustainability Monitor for the Netherlands 2009

Explanation of symbols

.	= figure not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil
–	= (between two figures) up to and including
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2007–2008	= 2007 to 2008 inclusive
2007/2008	= average of 2007 up to and including 2008
2007/'08	= crop year, financial year, school year etc. beginning in 2007 and ending in 2008
2005/'06–2007/'08	= crop year, financial year, etc. 2005/'06 to 2007/'08 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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You cannot escape the responsibility of tomorrow by evading it today

Abraham Lincoln

Foreword

The Dutch Cabinet commissioned Statistics Netherlands (CBS), the Netherlands Bureau for Economic Policy Analysis (CPB), the Netherlands Environmental Assessment Agency (PBL) and the Netherlands Institute for Social Research (SCP) to develop a Sustainability Monitor for the Netherlands. The monitor is intended to provide a picture of the sustainability of Dutch society. It shows where the Netherlands is doing well and where, from a sustainability point of view, there are still concerns. On the basis of this information, we want to contribute to the debate with policymakers and researchers on sustainable development in the Netherlands.

The monitor presents a set of indicators which provide an extensive description of sustainable development. The scores for different domains provide a picture of the sustainability of Dutch society in a historical and in a European perspective. On the basis of this, the monitor identifies and analyses concerns for the future.

Finding answers to the question of how society can best realise its sustainability goals is a like quest in an ever changing world full of uncertainties. There are no clear-cut answers to most sustainability questions, on the contrary potential solutions always involve trade-offs. An intervention aimed at sustainability in one direction often has a negative effect in other policy domains. The monitor presents a number of these trade-offs which are important in the formulation of sustainability policy.

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Table of contents

Summary

1. Introduction

'Sustainable development' is the core concept of *Our Common Future*, the report of the UN's Brundtland Commission published in 1987. It was defined as follows: 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' The report showed how economic growth, environmental issues, and poverty and development problems all relate to each other.

Sustainability concerns the scarcity of the resources used to generate welfare. The earth's surface is finite, supplies of natural resources and the absorption capacity of the environment and atmosphere are finite. But a well-educated and healthy population, functioning social networks, public trust, machines and infrastructure, knowledge, and other resources needed for sustainable welfare are also limited in supply.

Because these resources are scarce, the sustainability of present economic welfare is not self-evident; in other words, it is not guaranteed that the present level of welfare can continue to exist until the end of time. Governments therefore have a social responsibility to make and implement sustainability policies, aimed at using available resources in a responsible way. Following from Brundtland's definition, this means that if we use these resources now for our welfare, this may not be at the expense of chances for people living elsewhere, and those yet to be born, to achieve welfare for themselves.

More specifically, this means that people should use natural resources more efficiently; that they should conserve energy and biodiversity; and that they should invest in knowledge and education so that technology can be developed which will enable future generations to realise an acceptable level of welfare with a minimum use of scarce resources and fossil fuels. It also means that people should pay continued attention to improving the social fabric of the community they live in and should promote trust and social participation.

Sustainability is characterised by uncertainty about the future. It concerns the long term, and the longer the term, the greater the uncertainty, especially with regard to demography, technology and knowledge of the robustness of our ecosystems. Because of this uncertainty, a sustainability policy is also in some respects a quest. A quest guided by knowledge and a sense of responsibility for 'elsewhere and later'.

So, is development in the Netherlands sustainable? To answer this key question, the Dutch government asked a number of institutions to develop a monitor for sustainability in the context of its own policy proposals on sustainable development (*Kabinetsbrede Aanpak Duurzame Ontwikkeling*, or *KADO*). As a result Statistics Netherlands, the Netherlands Institute for Social Research/SCP, the Netherlands Bureau for Economic Policy Analysis, and the Netherlands Environmental Assessment Agency have drawn up this Sustainability Monitor for the Netherlands.

2. *Putting 'sustainable development' into practice*

Sustainability is often seen as a 'vague' concept, and is regularly used as an umbrella term. In this monitor, sustainable development – a broad concept and one that is difficult to grasp – is operationalised with the aid of the capital approach. To do this we start out by identifying and describing the resources (natural capital, social capital, human capital and economic capital) required for both present and future generations to pursue welfare. The term welfare is used in a broad sense here, and includes aspects such as leisure time and clean air alongside material welfare.

On the basis of this method, we selected a consistent set of indicators for 12 sustainability themes: Climate and energy; Biodiversity; Soil, air and water; Social participation; Trust; Labour utilisation; Education; Health ; Physical capital; Knowledge; Distribution and inequality; and an International dimension (the global consequences of activities in the Netherlands). Together, these themes show whether – and to what extent – the Netherlands is moving in the right direction as far as sustainable development is concerned. The indicators can be followed in time, so that the 'state of affairs' for sustainability can be established at regular intervals.

3. *Sustainability – the present situation*

The need for government policy

Sustainability is hardly ever the most important motive in the individual pursuit of welfare. There are a number of reasons for this. First of all, an individual person may not have enough information about the consequences of his actions. He may also consciously choose 'here and now' over 'elsewhere and later'. Free-rider behaviour may also play a part: people who live according to sustainability principles make sacrifices from which others can benefit without having to do anything themselves; this reduces the willingness of the latter to adjust their behaviour. The same considerations apply to companies.

To reconcile 'here and now' with 'elsewhere and later', binding agreements – including rules of play – and coordination are needed. This is pre-eminently a task for the government, as it has the possibilities to create institutions that ensure that private individuals and businesses take into account the consequences of their actions that reach further than the 'here and now'.

In an international context, the government itself also benefits from coordination. Unilateral action by the Netherlands in aid of global sustainability burdens Dutch society with the costs, while other countries also benefit from this action. Solutions for these problems require international agreements and institutions. It is not surprising, therefore, that the greatest challenges in the area of sustainability are the global issues (climate change, biodiversity and natural resources).

Sustainability on a national scale

In many respects, the Netherlands is a prosperous country, where public health, average incomes and education levels have all increased considerably since the Second World War. People trust each other and trust national institutions. Dutch companies have built up a large store of knowledge and have a productive labour force at their disposal. The quality of soil, water and air have improved strongly in recent decades, although – as a consequence of high population density – nature and people's health have suffered quite a lot of damage compared with the rest of Europe. Only 15 percent of the original biodiversity remains in the Netherlands. In spite of these negative aspects, the positive trends described above constitute a strong foundation for welfare and sustainability in the Netherlands.

Are there then no sustainability problems in the Netherlands? Of course there are, and they are mainly in the areas of labour and ageing, knowledge, and social cohesion.

Labour and ageing

To achieve sustainable welfare, the potential labour force must be utilised as efficiently as possible. The increasingly ageing population in the Netherlands will put more pressure on both the potential labour supply and participation rates. The consequences this will have for welfare can be compensated, however. Labour productivity can be raised further, for example, and the participation of women, older people and ethnic minorities in the labour process can also be increased. Moreover, at present the Dutch work relatively few hours a week, which also gives room for increase.

Population ageing will also increase pressure on health care spending in coming decades. Competition for financial resources, especially in terms of labour necessary to provide care, which could also be used for other purposes, will therefore become fiercer.

Knowledge

In the long term, labour productivity will only be able to be increased by building up knowledge. A well-functioning education system and active private sector innovation strategies are essential in this respect. Although there are no signs that the Dutch knowledge economy is performing systematically poorly, because of the significance of knowledge for long-term productivity it is important that the points of concern are addressed. In the area of education, drop-out rates, the lack of excellence and teacher shortages are important factors. There are also indications that the quality of education is declining (reading and arithmetic skills). Moreover, there is a noticeable knowledge paradox in the Netherlands: Dutch universities conduct high quality research, but the business sector benefits from this only to a limited extent.

Social cohesion

When asked, a surprisingly high percentage of Dutch people compared with those in the rest of Europe are worried about whether people will still be prepared to help each other out in times of difficulty in the future. This is a sign of concern and doubt about social cohesion in the Netherlands in the future. A large percentage of the population report perceiving tension between ethnic groups, although most of them think that integration problems are mainly a temporary phenomenon. The share of the Dutch population who say they belong to a group that is discriminated against is high compared with the rest of Europe: 7.5 percent. It is difficult to predict how trust between the various groups will develop in the future, as little is known about the mechanisms of this.

Trust, knowledge, participation, income and health are not equally distributed across the population. For most of these aspects, women, ethnic minorities and people with low education levels are at a disadvantage in this respect. The smaller these differences are between groups in society, the better this is for social cohesion, but no critical point can be defined.

Sustainability on a global scale

The Netherlands is just one country in the world. Together, people in the Netherlands have an effect on global sustainability. And vice versa, what happens outside the Netherlands today and tomorrow will have a great effect on sustainability in Dutch society. Clearly, in the long run the Netherlands will not be able to maintain a sustainable way of life in a world that cannot do so. In this context, climate change and the problems facing global biodiversity and natural resources are particularly important. These problems reach beyond the sphere of influence of national institutions and therefore necessitate global agreements and institutions.

Climate change

According to current global trends the temperature will have risen by more than two degrees by the end of this century. Although it is technically possible to limit

the climate problems to no more than a two-degree temperature rise, it has as yet proven impossible to achieve the global agreements required to realise this. Without these global agreements, the benefit of realising the EU climate goal of a 20 percent reduction in the emission of greenhouse gases will be only very limited.

The allocation of emission rights and thus also costs is one of the largest challenges facing global climate negotiations. This also raises the question of the extent to which 'developed' countries will be prepared to contribute to the costs of the collection and storage of CO2 if China and India start consuming cheap coal on a massive scale. This may ensure a reliable supply of energy, but it will intensify climate change.

For the national goals for emission reduction, energy efficiency and sustainable energy in the work programme 'Clean and Efficient' for 2020, the efficiency of measures will increase if EU policy is more stringent. Quite apart from EU policies, there is a lot to be gained in the built areas of the Netherlands.

In view of the small share of global greenhouse gas emitted in the Netherlands, climate change is one problem on which Dutch policy can only have a small effect. Isolated national policy – however stringent and ambitious – will have hardly any effect on the extent of the problem. The limited Dutch influence gives a moral connotation to climate policy.

Biodiversity and natural resources

Increasing prosperity and the growth of the world's population seem to be leading to an inevitable acceleration in the depletion of natural resources. Agriculture places a lot of pressure on the world's land and thus on the world's biodiversity, especially as a result of growing demands for food and wood. Global trends point to a fast decline in biodiversity; and in the future this decline will be even faster.

The Netherlands takes up a relatively large share of natural resources of other countries. In spite of the higher level of consumption, use of space per inhabitant is at a global average level. The reason for this is mainly that both within and outside the Netherlands highly productive agricultural land is used.

To increase global sustainability the efficiency of the production system must be improved. An increase in agricultural productivity across the world would moreover provide prospects both for a decrease in poverty and food problems, and for biodiversity. It would also mean that more production can be realised from a smaller area. This would lead to a smaller demand for agricultural land, which in turn would be beneficial for existing biodiversity. The conservation of forests would also contribute positively to the solution to the climate problem, as forests (with the CO_2 they store) will not then be cleared. The other side of the coin is that

increasing agricultural productivity is often accompanied by an increased use of water, nutrients and pesticides.
Technology on its own will not be enough to stop the loss of biodiversity. Reduced meat consumption, too, may contribute to this. An opposite trend is visible in this respect, however. In developing countries in particular, people are eating more and more meat.

Just as for climate and energy, Dutch opportunities to contribute to halting the global reduction in biodiversity are limited. It can be argued that the Netherlands – in view of its relatively large use of natural resources from vulnerable countries and the wealth this helps create – has a larger responsibility than average to tackle these global problems.

4. Challenges and trade-offs

Sustainable development will not happen of its own accord. The sustainability of the present level of wealth for future generations and the use of resources in ways that are not detrimental to people living outside the Netherlands pose a number of challenges to Dutch society. To make the necessary choices it is important to realise that not all goals can be realised at the same time. Trade-off is a key word in sustainability policy.

If we look at local sustainability first, challenges and trade-offs are concentrated in the areas population ageing, social cohesion and knowledge. Climate change and biodiversity are the main global issues for the Netherlands.

1. Labour force and population ageing. Here the main challenge is to restrict the decrease in labour participation as a result of population ageing by increasing the participation of older people themselves, people with a non-western foreign background and women. In doing this it must be realised that this will be at the expense of leisure time and volunteer work. And that this leisure time also contributes to prosperity.

2. Social cohesion. The term social cohesion means being involved in society and being an active part of social relationships. Social cohesion is an important condition for sustainable welfare. The challenge is not to let people's interest in each other and in society become eroded. Possible risk factors in this respect are the process of individualisation and the increasing variety in ethnic composition of the population. Excessive inequality – and especially income inequality – is also detrimental to social participation. On the other hand, a dynamic technologically advanced society with open borders cannot function without differences in remuneration. There is a trade-off relationship between social

cohesion versus productivity and material production. The trick is to develop a policy that strikes an optimal balance again and again to ensure long-term welfare.

3. Knowledge. The quality of human capital depends to a great extent on the availability of high quality education that quickly incorporates new developments in its programmes. Preserving and advancing this will be an important policy challenge in the coming decades. Precisely because the fruits of this can only be reaped on a longer term there is a trade-off between spending resources to satisfy short-term needs and long-term investment in high quality education.

4. Climate change. The challenge for the Netherlands here lies in finding ways of contributing maximally to a global climate policy. National CO_2 emissions can be reduced in many ways. For example by investing in renewable energy, the introduction or more efficient technologies, imposing higher taxes on CO_2 emissions, stimulating the capture and storage of CO_2 etc. As this involves large investments in the short-term, there is a trade-off with material wealth. The rewards of the Dutch climate policy will only be reaped later. Whatever the case they will be modest for the Netherlands itself.

5. Biodiversity and natural resources. An important challenge for biodiversity is the legal protection of natural areas, especially areas with a high biodiversity value. For the Netherlands this means that areas that are valuable in an international perspective in particular have to be protected. For example: the Netherlands has an international responsibility for a number of species and ecosystems, such as water/ delta ecosystems. Areas with a high biodiversity value which are also suitable for intensive agriculture are most under pressure. These areas are located in tropical regions in particular. Here the trade-off with alternative land use for food and biomass production plays an important part.

Dutch Cabinet's approach to sustainable development (Kabinetsbrede Aanpak Duurzame Ontwikkeling (KADO)

The Dutch Cabinet bases its approach to sustainable development on the elaboration of six themes which are connected to global solidarity and directly related to climate change and biodiversity. Each of these six themes offers opportunities, but to actually realise these, policy choices have to be made. This is illustrated by an example for each theme:

1. For water and climate adaptation, steering spatial development offers the possibility of limiting the vulnerability of the Netherlands to flooding in the long term.
2. To realise the national emission reduction goals in "Clean and Efficient", stringent European policy is necessary for appliances and cars.
3. For biofuels an important challenge is to map the indirect effects of land use, prices and development opportunities in more detail and include these aspects in the policy.

4. A lot still needs to be invested in the construction of infrastructure to capture and store CO_2. On the short term it must be made clear whether this will be publicly or privately financed.
5. In the area of biodiversity, food and meat, there are concerns in the Netherlands about the effects of shifts in diet and changes in the meat and dairy production chain and international competitiveness. On the other hand the intended diet shifts do have positive effects on public health.
6. With respect to sustainable construction and urban development, from a technical point of view there is enough knowledge present or in development to render the built environment in the Netherlands energy neutral by 2050. To realise this, the present 'best practices' must become the standard.

As the KADO themes are elaborated further, we may expect this to result in more opportunities and at the same time provide a better insight into all relevant trade-off relations. This in turn will contribute to the implementation of a more internally consistent overall policy and prevent unnecessary loss in adjacent areas. It may also prompt the introduction of flanking policies to compensate for large negative effects on other areas and specific socio-economic groups.

5. Conclusion

If future generations are also to enjoy sustainable wealth, we must be careful how we use resources. For a number of themes, this monitor shows what the pre-conditions are for maintaining wealth for future generations. It concludes that developments in a number of areas can be labelled as favourable, such as health, education level and trust. Alongside these positive conclusions, there are a number of concerns at a national level (labour and ageing, knowledge and social cohesion). The main problems however, are playing on a global stage (climate change, biodiversity and natural resources). Although the Netherlands claims a disproportionate share of these natural resources, in absolute terms its contribution to these large global problems is small. Moreover, in view of the expected demographic and economic developments the relative contribution of the Netherlands will probably decrease in the coming decades. As there is no way the Netherlands can solve these global problems on its own, sustainability policy for global problems in the Netherlands therefore partly has a moral connotation.

Sustainability policy is about choices. Choices against a background of scarcity and uncertainty. This means that trade-offs come into play. More of one thing implies less of another. As the consequences of the policy often differ widely for different domains, not everybody will come to the same conclusion in the sustainability debate. Therefore in the formulation of a sustainability policy it is essential to take into account which potential trade-offs are likely to arise.

The pursuit of sustainability is characterised by uncertainties. Sustainability is a long-term issue, the longer the term the greater the uncertainties. Uncertainties in the areas of demography, technological developments knowledge of the robustness of our ecosystems are especially important in this respect. These uncertainties make sustainability policy in some respects a quest. A quest in which knowledge about the Netherlands in the world, and a sense of responsibility for 'elsewhere and later' are the leading principles. This monitor hopes to contribute to this quest.

1. Introduction

Sustainability and sustainable development have become established concepts in the course of the last twenty years. A wide variety of activities and products are now also available in a sustainable version. These vary from the purchase of ecologically justified food and fair trade coffee to sustainable construction and DIY activities, and from sustainable investment portfolios to a sustainable energy supply system. The casualness with which the label 'sustainable' is put onto activities and products suggests a consensus on the conditions which sustainable products and activities have to fulfil. If we look more closely, however, there is in fact no such consensus at all. One person may associate sustainable development with how and whether people earn a living, farmers in developing countries for example, who are paid a 'fair' price for a product manufactured without child labour. But this directly raises the issue of when is a price 'fair'. Fairness is a normative concept; it means different things to different people. Someone else may see reducing pressure on nature and the environment as the main issue in the sustainability debate, and will focus on the development of non-fossil fuels and environment–friendly construction techniques. In this case the question is: how much reduction warrants use of the term sustainable? Someone else again sees the development towards sustainability as the prospect of a society in which life is less hectic and stressed, and where social harmony in the community is improved and neighbours get to know each other better and help each other out more. Here, too, it is difficult to indicate concretely and precisely to what extent society is on a sustainable path. In short, in practice, sustainability and sustainable development have many faces. Without exaggerating, we can say that however the term is operationalised, it will raise just as many questions as it provides answers.

1.1 Reason and purpose

In the context of its policy proposals on sustainable development (*Kabinetsbrede Aanpak Duurzame Ontwikkeling*, or *KADO*), the Dutch Cabinet asked the national bureau of statistics (Statistics Netherlands), the planning agencies (the Netherlands Bureau for Economic Policy Analysis, the Netherlands Institute for Social Research/SCP, and the Netherlands Environmental Assessment Agency) to develop a Sustainability Monitor for the Netherlands. The aim of the monitor is to describe just how sustainable Dutch society is. However, as the sustainability debate is extremely broad and has many aspects, that cannot all be dealt with, this first monitor is more limited in its ambitions. More specifically, three goals have been formulated:

1. To obtain an insight into sustainability of Dutch society from a theoretical vision of sustainability.
2. To analyse a number of important concrete sustainability issues.
3. To map out the relationships ('trade-offs') between the various sustainability goals.

The book starts off by presenting a set of important indicators in the discussion of the sustainability of Dutch society (chapter 2). These indicators were selected on the basis of the 'capital approach' theory. Because sustainable development is an inherently dynamic concept, the monitor focuses on developments in time. However, the indicators are also placed in an international perspective which makes it possible to compare Dutch sustainability issues with those in other countries of the European Union. The ultimate purpose of the indicator set of the Sustainability Monitor for the Netherlands is to describe the 'state of the nation'. It will enable people to see where things are going well, and where – from a sustainability point of view – we should be concerned about the future.

The Monitor then examines a number of sustainability themes in more detail (chapters 3–6). The resulting insights are intended to stimulate political and public debate on the vision of and strategy for the main sustainability issues. The problems these chapters examine are particularly related to:
– social cohesion (chapter 3);
– the main current environmental problems (climate change, exhaustion of fossil fuels) (chapter 4) and the reduction in biodiversity (chapter 5);
– the quality and quantity of human capital and the availability of knowledge and physical capital in an ageing society (chapter 6).

Questions that the monitor looks into include:
– In which direction are relevant sustainability developments headed in the medium term?
– How do developments relate to possible long-term goals?
– What are the risks for society if present trends continue?
– To what extent can unwanted developments be turned around?
– To what extent are goals in different domains in conflict with each other?

Obviously, it is not possible to answer these 'large' questions in detail for all the themes in this monitor. The last-mentioned goal of the monitor does receive special attention: the relationships between the various sustainability themes. Can certain developments be said to intensify each other, or are trade-offs necessary? These trade-off effects are discussed in chapter 7.

1.2 *Sustainability, sustainable development and welfare*

Ensuring the continuity of existence has occupied the human race for centuries, although its precise focus is determined by time and place. In ancient times, the threat of a shortage of timber resulted in forestry and timber plantations. Later populations built terp mounds and dykes to keep their feet dry. More recently, Keynesian economic politics and the construction of the welfare state are examples of efforts to stabilise existence. And, since the 1960s, concerns for the quality of the environment have also emerged.

1.2.1 Definition

The concepts sustainability and sustainable development originate in ecology: sustainable use of a stock of fish or a forest means that the number of fish caught of the amount of timber felled never exceeds the number or amount that can be reproduced again naturally. If these 'environmental limits' are respected, future generations will be able to keep on using these natural resources. The Brundtland Commission's report '*Our Common Future*', published in 1987, made the connection with the poverty and development issue (WCED, 1987). This report recognised that poverty constitutes a practical impediment for sustainable use of the physical environment, and that integration of nature conservation and economic development are necessary for sustainable development. This shifted the purely economically inspired concept of 'sustainability' to the more socio-economically based 'sustainable development'. The definition we use in this monitor is the often quoted one formulated by the Brundtland Commission:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

This broad definition of sustainable development, which plays an important part in both policy and politics, is also the starting point for this Monitor. Sustainable development means that other people – those living elsewhere and those living in the future – will be able to meet their own needs.

Studying sustainable development in more detail on the basis of the above-mentioned definition requires insight into both what people need, and what they have at their disposal to meet these needs, i.e. resources or capital. Operationalising the definition of sustainable development does pose some problems, however.

First, for example, it is not easy to establish the conditions under which the needs of the present generation are deemed to be met. The needs are great, some even say insatiable. So there is hardly any point in asking whether all these needs can be met: of course they can't. And certainly not in a finite world, without '*compromising the ability of future generations, to meet their own needs*' (which is an essential component

of the Brundtland definition): every tonne of fossil energy consumed by the present generation, for example, cannot be used by future generations; and every acre of attractive countryside concreted over and used to build homes will not be able to be enjoyed by future generations, etc.

A second – related – problem is connected with uncertainty about future developments. The size of the world's population and the state of technological developments, for example, are important determinants of the extent to which the needs of future generations will be able to be met. Views about how these determinants will develop are highly speculative, however.

Long-term predictions of world population numbers vary strongly and are sensitive to small differences in underlying assumed fertility levels. One example are the forecasts by the United Nations for the expected growth of the world population. Depending on the scenario applied, the prediction ranges from 7.8 billion to 10.8 billion in 2050. The UN's medium scenario assumes that 9 billion people will inhabit the world in 2050 (UN, 2006). The differences are caused by the assumed fertility levels (i.e. the number of children per woman). The global fertility rate has been decreasing for years now and is currently 2.8. The fertility rate of the European Union is well below this, at 1.5 children (CIA, 2008). To put these figures in perspective: 2.1 children per women (the replacement rate) would result in a stabilisation of population numbers in the long run. If the global average number of children drops below 2.1 the world's population will decrease. Varying assumptions about future technological developments, for example in the area of clean energy, nanotechnology and biotechnology, also result in strongly deviating sustainability forecasts.

These and other uncertainties about future developments partly explain the strongly deviating opinions on long-term sustainability prospects for humanity. The optimistic predictions of some futurologists (Kurzweil, 2005) contrast sharply with the sombre expectations encountered mainly among ecologists (see for example the report by the Club of Rome, Meadows *et al.* (1972) and the updated version: Meadows *et al.* (1992).

Using Brundtland's definition to operationalise sustainable development therefore comprises a serious element of 'groping in the dark'.

Because of differences in preferences and views about future developments, a large number of 'sustainable' worlds can be conceived. Various sets of plausible presumptions are possible. But trade-offs are also possible between the various forms of capital available to humanity (see section 1.3) and which result in qualitatively different forms of satisfaction of needs and sustainability. Obviously, possibilities for trade-offs are not endless. They are limited by the condition that

they may not be at the expense of possibilities elsewhere or in the future. Within this approach to sustainability, turning a nature area into agricultural land is not by definition non-sustainable: without agriculture, human life on any meaningful scale would hardly be possible, or in the view of many, it would only be possible to satisfy needs at an unacceptably low level. What is clear is that no objective definition can be given for the exact balance between nature and agriculture in a world that may be labelled sustainable. The contribution by science may lie in providing insights for policy-makers into the so-called trade-off relationships (see chapter 7).

1.2.2 Welfare in a broad sense versus material welfare

Needs satisfaction and the use of scarce resources are central to both sustainable development and the pursuit of welfare. In a formal sense, welfare is determined by extent to which citizen's subjective needs are satisfied. This comprises all the things that we as individuals consider important and in which scarcity plays a role (this is based on the broad concept of welfare explained in Hennipman (1945; 1977) and Heertje (2006)). Welfare is thus not based solely on material goods and services which are mostly included in national income. Factors such as leisure time, social cohesion and the quality of the natural environment also contribute to individual welfare. The literature on the social production function stresses mainly the importance of social community factors (see Van Bruggen, 2001). Although national income, or gross national product (GNP), may not be seen as an indicator for welfare, the concept is sometimes used as such in public and even in scientific debate. Welfare is, as stated above, a much broader concept (see also box 1).

1. National income versus welfare

Although national income (or GNP) is often used to determine the level of welfare, it was never intended as measure of welfare. The environment, a 'fair' distribution of income and wealth, employment, and unpaid labour are all equally legitimate components of welfare, while they are not included in GNP (Peter van de Ven in the Third Chamber, see Lassche, 2006). Simon Kuznets, the founder of the System of National Accounts, too, stressed that national income is not intended as a measure of wellbeing or welfare, but to gain insight into a country's production capacity and income formation (Kuznets, 1962). The most recent System of National Accounts (1993) states in section 2.178: "Neither gross nor net domestic product is a measure of welfare. Domestic product is an indicator of overall production activity." (See also Van den Bergh (2005; 2006)).

National income therefore does not take into account the social and ecological costs incurred by market processes. The costs to society of industrial accidents, industrial disease, pollution etc. are not deducted in the calculation of GNP. Moreover, the contribution of, for example, housework and voluntary work to the national income are also disregarded.

National income describes the elements connected with the formal economy, i.e. things that have a price, either via market processes or government spending. The informal economy, which is also important for a country's welfare, is not taken into consideration. Just as the amount of leisure time, also perceived as welfare, is not a part of national income.

National income is an aggregate, and even production activities that have a negative effect on welfare may well result in a higher national income. Pollution from industrial processes, for example, that affect the health of groups in the population and thus lower the perception of welfare. The medical treatment of these illnesses, on the other hand, contribute positively in the calculation of national income.

Another objection to using national income as an indicator for welfare is that it does not take income distribution into account (Sen, 1979). The last euro of a millionaire counts for exactly the same in the calculation of GNP as the last euro of a vagrant with hardly any income.

In spite of these considerations, the usefulness of national income for policy-making is beyond dispute. Goods and services provided via market processes or via the government are simply a very important part of welfare of the population. Indeed policy-making in today's society would hardly be possible without an insight into developments in national income.

Both welfare and sustainable development are thus concepts which encompass more than only the material aspects of life. Both are related to the extent to which a community is able to satisfy its existing needs. In practice, ecological, economic and social desires are expressly seen as needs.

Because of the emphasis on the interests of 'later' in the sustainability definition, the question of to what extent welfare experienced by the present generation will also be able to be realised in the future may be the most important one for sustainability. In other words: how sustainable is our present welfare? To what extent will future generations be able to realise what the present generation considers as 'welfare'? Because of the above-mentioned uncertainties this question cannot be answered unequivocally and definitively. The best we can do is think through the consequences of today's decisions and actions for the living conditions of tomorrow's generations. This also means that today's sustainability questions will have to be answered on the basis of today's preferences and today's insights. If we also take into account the needs of future generations outside the Netherlands, we must be aware that we may not exceed certain critical limits. The practical problems of defining these critical limits have already been pointed out.

In practice, politicians and policy-makers have to weigh the pros and cons of alternative actions. To realise as many goals as possible in diverging domains requires efficient use of the available resources. Efficient use of resources is often

in conflict with what is generally seen as a fair distribution from a social point of view. This is what Okun (1975) calls 'the big trade-off' of our society. Much of government policy is actually an effort to reconcile the aim for efficiency with a distribution of – for example – welfare that is generally deemed reasonable, both within and between generations.

1.2.3 Composite indicators versus indicator sets

Because of the shortcomings of GNP as a measure for welfare, in the course of time so-called composite indicators or indices have been developed to measure welfare and sustainability (see box 2). Although these indices are often too one-dimensional for practical policy purposes, they can be used to outline interesting trends and to compare national scores with those in other countries. Composite indicators are also powerful means of communication, as – unlike heterogeneous indicator sets – they are easy to interpret. At the same time this is also their greatest drawback. Because a composite index by definition consists of underlying sub-indicators, a weighing process is involved. And as there are usually either no objective weights for such a process, or the process itself is controversial (e.g. expressing environmental damage in terms of money), the composite indicator comprises a certain element of randomness.

For this reason many countries and international organisations have developed 'indicator sets' to measure sustainable development/welfare. Although this method does avoid the weighing problems of composite indicators, it has the drawback that the results are more difficult to communicate. This monitor also uses an indicator set, which describe the various dimensions of sustainable development.

An advantage of indicator sets is that they can be used to analyse relationships between the various sustainability themes, where composite indicators generally conceal these trade-off relationships. The indicator set proposed in this monitor is also used to identify the influence – or the trade-off relationships – between various social goals.

2. *Composite indicators*

Because of the limitations of gross national product (GNP) and national income as indicators for welfare, many researchers have created composite indicators (expressed as one figure). Most of these indicators correct national income or other macro-economic aggregates in one way or another. The following alternative indicators play an important part in the Dutch debate:
Sustainable national income (SNI). This indicator was developed by Hueting (1974). The SNI takes into account the negative effects on the environment of economic activity. This

means that GNP is always higher than the SNI. The difference between the two gives information on the distance between the present level of production and the level of production in a sustainable situation. As this difference becomes smaller in the course of time, development becomes more sustainable. The advantage of the SNI is that is takes into account general equillieum effects (Van den Bergh, 2006). On the negative side, it is limited to effects on nature and the environment, and its operationalisation is based on a number of assumptions.

Sustainable Society Index (SSI). The SSI integrates many aspects of quality of life and sustainability in one figure. The index shows where the problems are and where change is necessary and possible to achieve a sustainable society (Van de Kerk, 2006). What distinguishes the SSI from other composite indicators is that most indices cover a limited area and thus do not give a complete picture of a sustainable society. The SSI comprises many sustainability aspects, which enables it to provide a completer picture of sustainability. The SSI is a simple and clear index. Moreover, it has been computed for 150 countries, thus expanding international comparability. In spite of the communicative value of the SSI, it should be noted that the various aspects are added together with the aid of a weighting scheme.

Ecological Footprint (EF). The EF quantifies the demands humans make on natural resources in terms of biologically productive land (including the corresponding area of land needed to compensate CO_2 in forests) needed to maintain the present consumption pattern and to absorb the ensuing pollution using accepted technology (WNF, 2005; Wackernagel and Rees, 1996; Wiedmann *et al.*, 2006; European Communities, 2006). This indicator provides a powerful and elegant picture of pressure on the environment, although it does only take the environment into account. On the other hand, reservations have been expressed about the theoretical basis of the EF (Van den Bergh and Verbruggen, 1999).

1.3 Capital approach

The selection of indicators for this monitor is based on the capital approach. This approach is internationally recommended as a method to measure sustainability from a theoretical perspective (see e.g. Hass and Moe, 2006; Swiss Federal Statistical Office, (2004; 2005); Telos, 2006; World Bank, 2006). A recent joint rapport of the United Nations, Eurostat and the OECD (UNECE/Eurostat/OECD, 2009) proposed that the method be further developed and introduced in all countries to improve international comparability.

The approach concentrates on four types of capital: economic, natural, human and social capital. These types of capital are the resources available to both present and future generations to realise their needs. The approach builds on insights obtained from the extensive literature on economic growth of the last fifty years, in which sources of welfare growth are central.

1.3.1 The significance of capital

Dutch national planning agencies also have a long tradition in analysing welfare issues from a capital point of view. In the economic production function, production is traditionally linked to capital, while the Netherlands Institute for Social Research/ SCP also uses a theoretical framework for its analyses in which various types of resources are distinguished (Bijl *et al.*, 2007).

What the capital approach boils down to is that welfare is produced by using a community's resources. However, according to Brundtland's definition, use of these resources may not be at the expense of an acceptable quality of life elsewhere and later. By finding out whether, and if so to what extent, our society is using up any of the capital types, we can establish whether sufficient resources will remain for future generations to be able to realise the goals they set themselves, or which are simply essential to survive.

We based our selection of the indicators on the economic and social scientific literature on capital theory. Analysis of sustainability in terms of monitoring the amount of capital is not new. This connection was already made by the founders of modern economic growth theory (Friedman, 1957, p. 10 who in this respect refers to 'Value and Capital' by Sir John Hicks). In this older literature, however, the term 'capital' is restricted in meaning and only conceived in terms of physical capital (e.g. machines, buildings and infrastructure).

Since the 1980s, the concept of capital has expanded however, so that today it includes all relevant resources in a community. Knowledge capital, for example, is now included in economic capital, (measured in terms of investment spending on research and development, see Romer (1986; 1994). Human capital (the education level – see the classic work by Mankiw *et al.* (1992) – and health of the population) is now also counted as one of the important resources of our society. In addition, the capital concept also includes natural capital. There is now an international manual in this field (the co-called International Economic and Environmental Satellite Accounts). It distinguishes natural resources (mineral reserves such as oil, gas, and metals, and biological reserves such as water, soil, forests and fish stocks), land and surface water, and ecosystems.

The World Bank (1997) in particular is increasingly in favour of expanding the capital concept in the direction of social capital (Grootaert, 1997). Social capital refers to social relationships between people in general and networks in particular (Bourdieu, 1986; Putnam, 2000; Fukuyama, 1995). These networks are deemed to play an important role in economic growth processes and welfare development (in terms of the quality of social networks, the extent to which citizens participate in the community and the general trust that is built up within these networks).

The capital or resources approach is interesting for three reasons:

1. Goals can be achieved by using numerous resources, as we shall describe below.
2. As resources are scarce, it is by definition not possible to realise all goals at once. Choosing one goal implies that others will not be realised, or realised in full.
3. The capital approach also provides the possibility to establish whether sufficient resources will remain for future generations, so that they too will be able to realise their goals. This helps to set out the intergenerational aspect of sustainability.

1.3.2 The four types of capital and selected indicators

On the basis of the literature and the expertise of the institutes concerned, the four capital types were divided into ten themes (see figure 1):

1. Natural capital; (A. Climate and energy; B. Biodiversity; D. Soil, water and air);
2. Social capital; (E. Social participation and F. Trust);
3. Human capital; (G. Labour utilisation; H. Education; J. Health);
4. Economic capital; (K. Physical capital; L. Knowledge).

A set of indicators has been built around these themes, with four dimensions. First of all a set of twelve headline indicators is presented (some themes have two key indicators) and a list of 40 sub-indicators. In addition, tables are presented which show how the capital types are distributed in society and what influence Dutch society has on the rest of the world. Chapter 2 looks at the background of the indicator set in more detail.

Although the selection of indicators is primarily based on the capital approach, we also checked whether they cover the relevant themes that play a role in the Dutch sustainability debate. The planning agencies and Statistics Netherlands have longstanding experience in identifying themes that are relevant for an analysis of sustainability. Results from surveys held by the Social and Cultural Planning Office of the Netherlands, the Netherlands Environmental Assessment Agency and Statistics Netherlands on which social issues were most important to the Dutch public were indeed very helpful for the selection. In addition, social topics on the political agenda were also considered. This culminated in the above-mention list of themes. So the list is consistent with the capital approach, and with Dutch social sustainability debate.

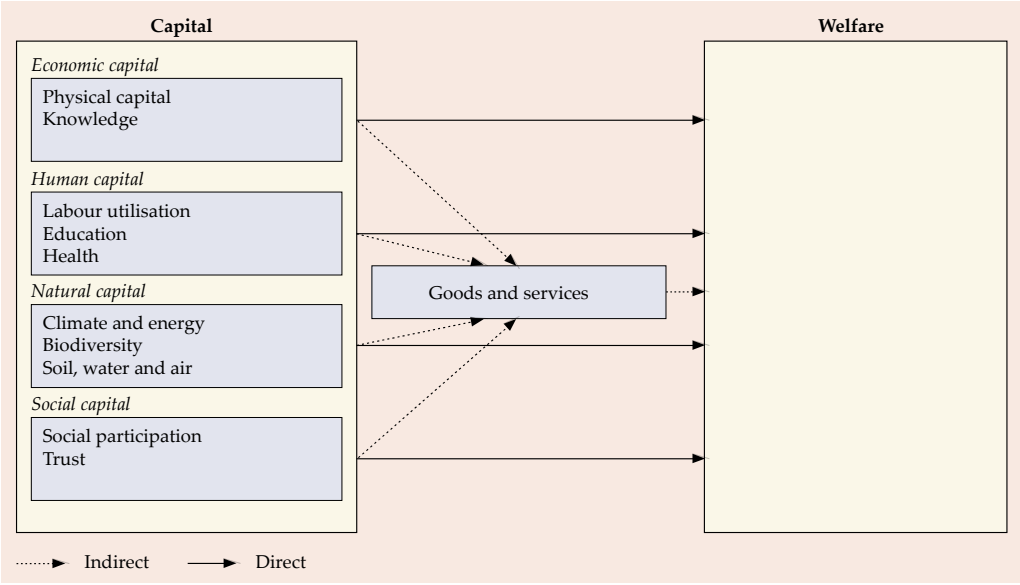
It should be stressed that these are themes that are bound by place and time. In other countries and at other times, other themes will be important. In the future, too, if social needs change other issues will come to the fore. Moreover the list as mentioned above is not complete. Other topics can be conceived which are relevant in society and which may throw light on the sustainability of Dutch society in a longer term. Safety and health, for example. These and other issues may be examined in future editions of this monitor.

1.3.3 Relationship between capital and welfare

As figure 1 shows, all four types of capital have a direct and an indirect effect on welfare:

1. The indirect effect; with the input of the various types of capital, goods and services can be produced. In Brundtland's definition, the one used in this monitor, welfare and sustainability are to an important extent determined by the extent to which material needs are satisfied (food, clothing, housing, etc.).
2. The direct effect; this includes good health and a high level of education as welfare goals in their own right. Being healthy or well educated has a positive effect on personal wellbeing, regardless of the production of goods and services. The same is true of the extent to which individuals are embedded in broader social networks (social capital). This, too, has a welfare increasing effect, regardless of the production of goods and services.

1. Capital and welfare



It is important to keep in mind that the growth of one type of capital may stimulate the growth of other types. Social capital is an example. Social stability results in a good investment climate, which in turn may stimulate growth of many forms of economic capital. This type of complementarity is not restricted to social capital. The economic literature also mentions the complementarity of economic and human capital: investment in new machines often results in increasing the knowledge of workers who operate them (Goldin and Katz, 1999).

The importance of the four types of capital for the generation of welfare requires no further explanation. In essence, the role of capital in the creation of a sustainable society is identical to its role in the generation of welfare. In the case of natural capital it is easy to see why depletion of resources can be viewed as a threat to sustainable development. Ultimately, the continued existence of life on earth depends on the quality of the natural environment, or in other words, the quality of the soil, air, water and climate. Moreover, natural resources such as fossil fuels are still crucial as input in the process of economic development. Obviously, economic and human capital also play an important part in the preservation of our material welfare (see the indirect channels in figure 1). Human capital types such as education and health are important goals in their own right. Future generations, too, must be able to achieve these. Although the significance of social capital for sustainability is undisputable, it does pose the problem of being empirically difficult to measure.

In brief, then, by establishing the extent to which social developments are accompanied by depletion of available economic, human, natural and social resources, and by analysing the underlying processes, we can establish the extent to which societal developments can be characterised as more or less sustainable. Two important aspects should be kept in mind in this respect:

1. In many cases, in their contribution to long-term welfare, certain types of capital can be replaced by other types. It is therefore important to obtain an insight into the extent to which a decrease in one stock leads to an increase in another.
2. When analysing sustainability, the factor technological progress must be taken into consideration: if a community is able to use capital more efficiently, it will be possible to realise the same set of goals using less capital.

1.4 Set-up of this monitor

In a certain sense, sustainable development can be seen as a quest. Each generation must decide anew what goals they want to achieve, and which resources they need to do so. In this quest new technologies will be developed again and again, and so the contents of the sustainability-related tasks of society will change again and again. If we just look at the period since the Second World War, we can see how our thinking about relevant developments for sustainability have changed in the course of the years. Noticeable changes have also occurred in our technological know-how, the size of the world population, and the global balance of power. Such changes also change future expectations and thus social sustainability goals. Themes that are thought to be very relevant today, were hardly on the agendas of past generations, and vice versa. Is the human race capable of switching from fossil energy to more sustainable forms of energy? Will the present process of rapidly decreasing fertility rates – observed in nearly all the world's countries – continue? And will there indeed be a demographic transition that will result in a stabilisation

and subsequent fall in the world population in the second half of this century, with huge consequences for global sustainability issues?

The question of how society can best realise its goals is therefore like a quest in a constantly changing world full of uncertainties. Just how policies should be adjusted and how producers and consumers should change their behaviour to build a society that can be considered pleasant and inhabitable, and can be maintained in the long term, can obviously not be seen in isolation from these great uncertainties. In view of the scarcity of resources humanity will continue to search for clever ways to secure welfare for our generation and for those to come.

Although this monitor is based on the national situation in the Netherlands, it also examines a number of important international distribution issues. The international context of a number of ecological themes will be described, for example. In addition the book also looks at inequality. National trends may seem favourable at first glance, while in reality they conceal an enormous diversity of developments for various socio-economic groups. Substantial increases in social inequality may result in tension and thus put pressure on the durability of existing social structures.

Chapter 2 introduces and discusses the set of sustainability indicators. For each of the four capital themes, indicators are developed which are tracked in time. These figures are used as it were to establish the nation's status with respect to stocks. The resources indicate the opportunities for future generations to generate future welfare. This shows us where we are doing well, and where there are 'concerns for the future'. The relative position of the Netherlands with respect to other EU countries is also determined.

In chapters 3 to 6 a number of 'concerns for the future' are discussed in more depth. On the basis of the general analysis in chapter 2, these theme-based chapters analyse the following subjects in more detail:

- *Participation, trust and inequality (chapter 3)*: public debate is currently focused on issues connected with social participation of citizens and the degree of integration of ethnic minorities. Part of this debate concentrates on whether vital norms and values are still shared, and to what extent groups in the community trust each other and the community as a whole.
- *Climate change and energy use (chapter 4)*: emissions of CO_2 and other greenhouse gases are changing our climate. Energy consumption rates are using up stocks of fossil fuels. Although the welfare of the present generation will be affected only slightly, future generations will probably experience problems as a result of this. The risk of flooding, for example, will increase if no action is taken. Dike reinforcements may involve high costs.
- *Biodiversity (chapter 5)*: the variety of species and the ecosystems based on these are under pressure from land use and climate change. In addition to the

effect of this on direct material welfare (the production of timber, drugs and recreation), the long-term survival of humanity cannot be seen separately from the preservation of these biological systems.
– *Utilisation of labour and knowledge (chapter 6)*: as a result of population ageing, the Netherlands will have to increase labour productivity if future generations are to maintain our present level of material welfare. Ageing and a weak knowledge economy will slowly undermine the possibilities of realising future welfare goals. And in spite of the fact that the Dutch economy has been robust in recent years, compared with some other western countries labour productivity and R&D intensity in the Netherlands are decreasing.

Chapter 6 is followed by an intermezzo in which the Dutch Cabinet's approach to sustainable development (*Kabinetsbrede Aanpak Duurzame Ontwikkeling*, or KADO) is discussed. KADO focuses on six themes which are mainly connected with environmental issues.

The problematical character of broadly defined sustainability implies that no there are no objective and unequivocal answers to most sustainability questions, for the simple reason that almost every answer involves a trade-off. A specific intervention aimed at sustainability in one direction often has a price in another: there's no such thing as a free lunch. These trade-offs are discussed in chapter 7.

This is the first time that the national policy institutes and Statistics Netherlands, each from its own perspective, have worked together on a joint sustainable development report. The broad framework of the cooperation project is related to the broad character of the theme: sustainable development comprises ecological, economic and social dimensions. We certainly do not claim to cover the full range of the sustainability debate with this monitor. On the contrary, we have made a very conscious choice to focus on a small number of themes. We do think that the monitor is first step on the path towards a homogenous consistent framework in which the concept of sustainable development in the Netherlands can be studied in its full range. Indeed we hope that this monitor will contribute to public debate on sustainable development in Dutch society.

2. *Sustainability – the Dutch state of affairs*

2.1 The indicator set explained

This chapter presents the indicators which describe how Dutch society is doing in terms of sustainability. As mentioned in the previous chapter, sustainability is analysed from the perspective of resources or capital. A total of ten themes were distinguished for the four types of capital[1)]:

- Natural capital (A. Climate and energy; B. Biodiversity; D. Soil, water and air);
- Social capital (E. Social participation; F. Trust);
- Human capital (G. Utilisation of labour; H. Education; J. Health);
- Economic capital (K. Physical capital; L. Knowledge).

Four separate tables have been compiled around these themes, each with its own cross section of sustainability issues. The tables are presented on the fold-out back cover of this book.

- Headline indicators (table 1). For each theme, one or two main indicators were chosen. These give an impression of the development of the main resources at national level. The table presents long-term (1950–2005) and short-term (1995–2005) developments in terms of the percentage change on the base year. In addition, the ranking of the Netherlands in the European Union is given for the most recent year.
- Sub-indicators (table 2). In this table the ten themes are broken down further into sub-indicators. The sub-indicators give an insight into variables that policy-makers have at their disposal to influence resources in a favourable direction. The table compares the short-term development (1995–now) in the Netherlands with that in the European Union. In addition, it places the Netherlands in an EU perspective by again giving the most recent ranking of the Netherlands in the EU, and by comparing the Dutch score with the average score in the European Union and with the score of the highest scoring country.
- Distribution and inequality (table 3). As resources are not always evenly distributed across the various groups in society, table 3 breaks down a number of sub-indicators from table 2 further by demographic characteristics: sex, ethnic background and education level.
- International dimension (table 4). As the Netherlands is connected with other countries via its imports and exports, consumption in the Netherlands also has consequences outside the Netherlands. Natural capital in the most vulnerable areas (Africa and the least developed countries) is undergoing rapid depletion. Table 4 shows how much the Netherlands contributes to carbon emissions, loss of biodiversity (as a result of land use) and the exhaustion of natural resources in these vulnerable regions and in the rest of the world.

Some important aspects of the indicator set require further explanation:

1. The relationship between headline indicator and sub-indicators. For most themes there is a clear conceptual relationship between the headline and the sub-indicators. The main indicator measures the stock of capital and thus gives an indication of the amount of a resource (often per capita) available in a society. These stocks change very slowly. What sustainability policy boils down to is to find a way to increase the amount of these resources, or to use them more efficiently to produce welfare. The sub-indicators give policy-makers a handle on how to influence the headline indicators. For example: for the theme education, the education level of the labour force is the headline indicator; this can be increased by, among other things, implementing policies on the education level of young people, school drop-out rates or spending on education. Some sub-indicators are also intended to provide extra information that is not covered by the headline indicator. The headline indicators often reflect complex abstract concepts like 'knowledge', 'health' and 'trust', which can only partly be measured with the aid of our present statistical methods. For example: for the theme education, education level is a good headline indicator, but it does not measure all the aspects of knowledge and skills in the labour force. Therefore indicators for the quality of education (e.g. maths skills) and learning subsequent to the formal education system (lifelong learning) are included as sub-indicators[2)].
2. European rankings. In table 2 the indicators are compared with those in the 27 countries of the European Union (and sometimes with the OECD member countries). It is important to realise that any form of international ranking involves statistical problems, as in practice quality requirements and sampling methods vary from country to country, even though organisations such as Eurostat and the OECD do a lot of work to harmonise figures and methods. Eurostat also sets so-called 'quality profiles' for the indicators. Most indicators used here belong to the highest category in terms of international comparability (see annex). Quite apart from problems of measurement, the question may also be asked how such a ranking should be interpreted. First of all its helps to put the Dutch figures in perspective. Time series for the Netherlands give us a good idea of how an individual indicator is doing, but is, say, a 12 percent school drop-out rate high or low? This question can only be answered by comparing the rate for the Netherlands with those in comparable countries. When interpreting the rankings it is important to keep two things in mind. First, as scores for different countries may be quite close, a low ranking can be overcome quite easily. Second, a low position does not always mean the Netherlands is doing 'badly'. However adequate Dutch energy policy is, for example, it has no effect on the naturally occurring stocks of natural gas in the Netherlands. Also, it is more difficult to raise the participation rate in an ageing society than in a society with relatively many young adults.
3. Highest score. The international comparison in table 2 gives the country with the 'highest score'. In this respect it is important to keep in mind what a positive situation

entails. For some indicators a high value is positive, for others a low value. For per capita greenhouse gas emissions (A1), for example, a low score is a better achievement. The same is true for the following indicators: B2, A3, D1, D2, D3, D4, D5, F2, G5 and H3. The country with the 'highest score' therefore has a relatively favourable situation with respect to welfare. This concerns only the isolated effect of the indicator, as the effects of trade-offs are not yet taken into account. For example, a high score on number of hours worked (E1) is viewed as good. This is because a larger number of hours worked is better for the economy (in terms of increasing GDP). In spite of this increase in material welfare, such an increase in hours worked may lead to a decrease in welfare in a broader sense. It may result in more environmentally unfriendly activities, less leisure time or a decrease in individual social participation.

The annex contains a complete explanation of sources, units and abbreviations of the indicators. Because of the complexity of the indicator set, this chapter uses simplified references to the four tables. For example: T2–A3 refers to table 2 indicator A3 (Energy intensity).

The remainder of this chapter is built up as follows. Sections 2.2–2.5 examine the ten themes of the four capital types. Sections 2.6 and 2.7 look into distribution across specific groups and the international dimension respectively. Section 2.8 contains conclusions for the twelve themes.

2.2 *Natural capital*

2.2.1 *Climate and energy*

Global energy demand has spiralled in the past century, and is set to increase further in the future. Society is especially dependent on energy, as a continuous supply of affordable energy is an important precondition for economic development. This availability is not self-evident, however; stocks of oil and gas will run out eventually. Scarcity will push up prices, and result in a tightening of energy markets. But at the same time, higher energy prices will stimulate the development of new energy-saving technologies and new renewable forms of energy.

One important effect of the present use of fossil fuels is the emission of greenhouse gases and the increasing climate change these cause. Higher temperatures increase the risks of more extreme weather such as storms and drought, and will also result in rising sea levels. Across the world and in the Netherlands the temperature increase will generally have negative effects. One of the greatest challenges now facing us is to reduce the present level of energy use and change the ways energy is generated. In the Netherlands policies have been implemented to reduce Dutch emissions of greenhouse gases. In addition, an effort is being made to improve the

climate durability of the Netherlands. Climate change has been high on the social and political agendas in recent years, both in the Netherlands and internationally.

The two problems – the exhaustion of fossil fuels and the greenhouse effect – are therefore related to each other. Both have been caused by the substantial increase in global use of fossil fuels in recent decades. In the Netherlands, consumption of fossil fuels rose particularly strongly in the period 1950–1970, with the rise of the petrochemical industry, increasing road transport and consumption growth. Economic growth and rising population numbers resulted in a nearly threefold increase in CO_2 emission in the Netherlands between 1950 and 2006, from around 60 to more than 170 Mtonnes. In the same period, the amount of greenhouse gas emitted per person rose by nearly 50 percent (T1–A1). The emission of greenhouse gas according to the Kyoto protocol fell by around 4 percent in the Netherlands in the period 1990–2007 (PBL, 2008a).[3)] Given these developments, the Kyoto target of 6 percent reduction in the period 2008–2012 compared with 1990 does seem feasible.

Dutch per capita greenhouse gas emissions fell by around 12 percent in the period 1995–2006. Although this was a large decrease compared with other countries in the European Union, per capita greenhouse gas emissions in the Netherlands are still higher than the EU average (T2–A1). In its 'Clean and Efficient' programme, the Dutch government has set itself the target of a 30 percent reduction in greenhouse gas emissions by 2020 compared with 1990 (VROM, 2007).

Compared with many other European countries, the Netherlands has large fossil fuel reserves (T2–A2). Since the moment the natural gas (and to a lesser extent oil) deposits were discovered in the mid-twentieth century, they have been used for the Dutch economy. However, only one third of the original energy reserves identified in 1950 are now left (this is the equivalent of an 80 percent reduction per person: T1–A2). Based on the amount of natural gas produced in recent years, at the present rate of consumption the gas reserves in the Netherlands will last for another 20 years or so (CBS, 2008b). The decrease in Dutch and other European mineral energy supplies means Europe will become more and more dependent on other regions, such as Russia and the Middle East.

The Dutch emit a relatively large amount of CO_2 per person. In terms of unit of GDP, however, Dutch energy consumption performs better (T2–A3). This is mainly because of the large services sector and energy-efficient manufacturing industry the Netherlands. The share of the services sector in the total Dutch economy has increased steadily in recent decades and is now just over 70 percent. With the exception of the transport sector, services is a relatively clean sector. This means that a larger part of GDP is generated by activities which use relatively little energy: 'clean' activities. Moreover, Dutch manufacturing is reasonably energy efficient in a European context. If we look at individual companies, they are among the world's

best in terms of energy efficiency. In 2006, however, energy efficiency decreased in the manufacturing industry (Verificatiebureau Benchmarking Energie-efficiency, 2007). Energy intensity in the Netherlands fell by 19 percent in the period 1995–2005. The energy saving rate was 0.9 percent per year in the period 1995–2006 (ECN, 2008). To realise the target of 2 percent energy saving per year by 2020, the present rate of saving will have to double between 2007 and 2020.

The amount of renewable – i.e. sustainable – energy in the Netherlands has increased fivefold between 1990 and 2007 (CBS/PBL, 2008). Most of this was generated by co-firing biomass in electricity plants and by wind turbines. In 2007 the amount of renewable energy in the Netherlands was just under 3 percent of total energy use[4)] (CBS, 2008d) (T2–A4). Compared with other countries in the European Union this is low. The government's goal is to generate 20 percent of the country's total energy requirement from renewable sources by 2020. To realise this, the share will have to increase by a factor seven between 2007 and 2020. For the production of renewable electricity, the performance was more on schedule. In 2006 the sustainable share of total electricity use was around 6 percent (CBS, 2008c). This is only 3 percent points away from the goal of 9 percent of total electricity use from renewable sources in 2010.

In addition to the amount of greenhouse gas emissions in the Netherlands (partly for the benefits of exports), greenhouse gases are also emitted outside the Netherlands to make products that are imported for Dutch consumption. This international dimension is discussed in section 2.7.

Climate change is a prime example of a global problem for which global solutions much be sought. In spite of the high energy use of the Dutch economy, the contribution by the Netherlands to the overall climate-change problem is small. This problem only has a chance of being solved if the largest nations ratify international climate treaties. To limit the temperature rise to 2 degrees (the target of the European Union), other large economies in addition to the European Union, such as the United States, must also reduce their greenhouse gas emissions substantially. Moreover, emerging economies such as China and India, and the OPEC countries, must also join in international climate policy-making (MNP, 2007b).

2.2.2 Biodiversity

Biodiversity comprises variety of species, ecosystems and genes. The development of the human race is dependent to a large degree on ecosystem services, of which energy, water, food and timber are the most important. Directly or indirectly, these natural resources provide the basis for every society. In addition, ecosystems provide other services such as protection against flooding and absorption of carbon. They could then be incorporated in climate policy. By providing these services, biodiversity contributes to the quality of life and to the welfare of the

population. Therefore it is important know how far humanity can continue to clear land and cause losses in biodiversity without this leading to large-scale adverse effects. Although there are still doubts about the precise consequences of the loss of biodiversity, global agreements have been made to cut back the rate of loss of biodiversity substantially. This has presented the world with the task of protecting nature and slowing down the reduction in the variety of species.

The main indicator for biodiversity used here is Mean Species Abundance (MSA). The MSA is a measure for the value of nature and indicates the average quality of types of nature. Average quality is defined as the average occurrence of original characteristic species in these ecosystems.

In global terms, biodiversity is in decline. This is the result of increasing production and increasing consumption, partly because the world population is still growing, and its diet is changing (more meat). The consumption of more food and timber, in particular, is putting increasing pressure on agriculture and thus on existing biodiversity. Climate change and infrastructure (land fragmentation) are emerging threats. According to the MSA indicator, 70 percent of original global biodiversity survives today; in Europe less than 50 percent is still present (MNP, 2007b). In the Netherlands, prosperous and densely populated, no less than 85 percent of original biodiversity has been lost. Biodiversity in the Netherlands halved from 30 to 15 percent between 1950 and 2000. However, more recently the reduction of biodiversity in the Netherlands has been slowing down (T1–B1, T2–B1), and now seems to be bottoming out.

Red Lists show which species of plants and animals are threatened with extinction. Red Lists for species occurring in the Netherlands have become longer since 1995. They include more birds, butterflies, mammals, reptiles and amphibians in particular (T2–B2). Many factors have contributed to the increase in threatened species. One of the main causes is the loss of habitat as a result of agriculture, urbanisation and fragmentation. The quality of the environment has also put more species on the lists. Elsewhere in Europe, too, the number of species on the Red Lists is growing: this is true of butterflies and open farmland birds, but also for other species groups.

If we compare the Netherlands with other European countries on the indicator for preservation, we see that pressure on species is high in the Netherlands (T2–B3). The reason for this is that the total area of natural land and forest is relatively small compared with other European countries (T2–B4). In addition, soil, water and air conditions in the Netherlands are often insufficient to restore wildlife in the long-term (see section 2.2.3). The total natural area in the Netherlands has decreased strongly, particularly in the first half of the twentieth century. Although the trend continued in the second half, especially in certain types of

biotopes, such heath land, moor land and marshland, it did slow down; and the forest area of the Netherlands increased in this period. Since 1990 a plan has been underway to develop a network of connected natural areas: the National Ecological Network (NEN). The aim is to expand the network with another 275,000 hectares in the period 1990–2018. In 2006 about 45 percent of this target had been realised in the space of 16 years. With twelve years to go, the NEN will not be completely realised under the present rate of acquisition and adaptation in 2018 (PBL, 2008b).

The Netherlands also contributes to the loss of biodiversity in the rest of the world, as much of the land used for Dutch consumption is located outside the Netherlands. Section 2.7 looks into the international dimension.

2.2.3 Soil, water and air

Clean air, water and soil contribute to healthy living conditions for humans and other living beings. They are thus important preconditions for biodiversity (see section 2.2.2) and the for the health of the population (see section 2.4.3). Moreover, clean surface water is important for the provision of affordable and safe drinking water, and for recreation and fishing. A decrease in environmental pressure since 1985 has resulted in an improved quality of the environment. Emissions into air, water and soil have been substantially reduced. Not only have acidification and over-fertilisation decreased, pesticide and heavy metal use has also fallen. In spite of this, pressure on the environment in the Netherlands is still high compared with that in other European countries. However, this is hardly surprising as the Netherlands is one of the most densely populated countries of Europe, in terms of people, livestock, industry and motor vehicles.

With respect to health problems, today most attention is devoted to fine particulate matter and ozone. Both in the Netherlands and elsewhere, these substances cause large scale damage to health through air pollution. Fine particulate matter is the main indicator for the theme soil, water and air. Per capita emissions of both fine particulate matter and acidifiers fell sharply in the Netherlands in the period 1995–2006 (T2–D2). This helped to reduce the concentration of fine particulate matter (T2–D1) and improve air quality. As a result, adverse health effects decreased. It has been calculated that 20 percent of the increase in Dutch life expectancy of more than 2 years in the period 1996–2006 is accounted for by improved air quality (PBL, 2008a). However, there are still plenty of local black spots in the Netherlands. In urban areas, for example, no air quality improvement has been measured in recent years as a result a reductions in fine particulate matter. Although current policy will reduce the number of these black spots in the next few years, it will not be enough to eliminate them all. As a consequence of the introduction of the European fine dust norm, a number of construction projects in the Netherlands have been stopped since 2006.

Average air quality in the Netherlands is below the average in the European Union. Indeed the Netherlands does not yet comply with European norms. In Dutch cities, too, air quality is on average poorer than in many other large cities in Europe. Along with Belgium, the Netherlands has the highest level of health risks from air pollution within the European Union. Life expectancy in the Netherlands is an estimated 8 months shorter than in Sweden, purely as a result of air pollution (TFIAM/CIAM, 2007).

Emissions of nitrogen and phosphorus have negative effects on soil conditions and water quality in the Netherlands. Soil quality is important for sustainable arable and livestock farming and is also an important precondition for biodiversity. Fertilisers, pesticides and heavy metals are the main threats to soil and water. The most persistent problem with fertilisers is the build-up of phosphorus. Excessive nitrogen leads to over-fertilisation and acidification in natural areas. About two-thirds of nitrogen comes from agricultural ammonia emissions both from within and outside the Netherlands. The remainder comes from traffic and industry, also both from within and outside the Netherlands.

Nitrogen deposits in the Netherlands decreased between 1995 and 2005 (T2–D3). As a result, the total natural area with large excesses of critical nitrogen loads decreased. Some 30 percent of Dutch natural areas are protected against excess nitrogen deposits. This is about the same as in the rest of Europe. The risk of acidification of natural areas in the Netherlands in 2010 is expected to be 70 percent, which is way above the European average of 11 percent.

Because the land in the Netherlands is used so intensively, a lot of fertiliser and pesticides are used on it. Since the introduction of the Nitrates Directive just over 15 years ago to protect soil and water, net surplus nitrogen and phosphorus (= input through fertilisers minus withdrawal via crops) has increased further in most countries. In the period 1991–2005 the Netherlands had a cumulative surplus of 3,500 kg of nitrogen and 435 kg of phosphorus per hectare, making it the country with the largest cumulative surplus (T2–D4) (Csathó and Radimszky, 2007). Belgium followed in second place. Some countries in central and eastern Europe had negative net surpluses. More recently, surplus nitrogen and phosphorus in the Netherlands has decreased substantially. In 1990 the nitrogen surplus was 209 kg per hectare and in 2007 this had dropped to 149 kg per hectare (CBS, 2008d). For phosphorus the surplus fell from 35 kg to 16 kg per hectare. The main reason was the reduction in the use of manure (MNP, 2007c). But although the annual accumulation is smaller, it is still higher than that in other European countries.
Use of pesticides in the Netherlands has decreased by more than 50 percent since the mid-1980s. Implementation of emission reducing measures and the use of pesticides that are less damaging for the environment have reduced the risks for the environment and for public health by around 85 percent. In spite of this, environmental quality norms (such as those in the Water Framework Directive)

in the Netherlands are still frequently exceeded (PBL, 2008a). In other European countries, too, both use and pressure on the environment have decreased substantially as a result of national and European legislation.

The quality of Dutch national and regional surface waters has improved greatly since 1985 (T2–D5). Nitrogen and phosphorus loads on surface waters fell by 30 and 70 percent respectively, mainly as a result of a reduction in point source emissions in sewerage and industry. Water quality is now importantly determined by emissions from diffuse agricultural sources. As fertiliser input is still larger than crop withdrawal, the improvement in water quality is stagnating. The current quality is still below the targets of the Water Framework Directive. A similar trend is visible across Europe. There, too, improvement of water quality, also mainly realised through better waste water treatment (European Directive on Urban Waste Water Treatment), is still insufficient (EEA, 2005; 2008). Concentrations of nitrogen and phosphorus in Dutch regional waters are higher than the European average.

2.3 *Social capital*

2.3.1 Social participation

Taking part in social life is important in the context of sustainability because of the networks it creates. These networks are important for a number of reasons. They help people to participate successfully in society, for example because they make it easier for them to find a job. In addition, networks are important for sharing values and norms; members of a network are more likely to share common values and norms than those outside a network, as they exchange and share information. By being part of networks that have good or useful relationships with other networks, an individual can develop himself further, or fulfil his potential in other ways. Networks are thus a resource for individuals which help them improve their welfare.

Although network formation often results in positive social developments at an individual level, this is not always the case. Excessive network formation or social cohesion may result in individuals or groups being excluded. In addition, not all social networks are equally desirable: football hooligans or terrorist groups, for example. Although we could speak of bonding social capital, as the networks form a unit, there is no bridging social capital: they do not have mutual relationships with other networks. The relationship between social capital, social networks and sustainability is complex, and not always clear.

The concept of social participation (in this section) does not include paid work (which is discussed in section 2.4.1) or participation in education (section 2.4.2); it concerns voluntary work and care and social contacts with relatives, neighbours and friends.

In the last thirty years, the average time people in the Netherlands spend on social participation has fallen from just under 15 to just under 11 hours (T1–E1). In the same period, the time spent on paid labour rose, from almost 15 hours to almost 20. Generally speaking, the Dutch have been leading increasingly busier lives since 1975: the time spent on fulfilling commitments (paid work, education, care) has increased by more than 3.5 hours, while leisure time (media use, going out and sports, as well as social participation) has decreased by just over 3 hours.

Unpaid labour is a very important element in a functioning society. It includes voluntary activities for clubs and organisations and helping and caring for other people in the community on an informal basis. Voluntary work and membership of clubs and organisations are an expression of people's engagement with society, and they provide the opportunity people to form networks and become involved with each other. It is not easy, however, to measure what and how much voluntary work is done in the Netherlands: there are no unequivocal figures on this topic. As various studies give various percentages of volunteers, it is impossible to tell whether voluntary work in the Netherlands is increasing or decreasing. Compared with other European countries, the Netherlands is in the leading group in terms of both the number of passive members ('subscription payers') and active participants (T2–E2).
In addition to club membership and volunteer work, offering to help other people is also an important aspect of a caring community. Around 20 percent of the Dutch can be described as volunteer carers, although this percentage fluctuates in time. The amount of informal help and care provided in the Netherlands is fairy high in a European perspective.

Other networks consist of contacts with family, friends and colleagues. In 2006, 77 percent of Dutch people said they met up with someone from one of these groups at least once a week (T2–E3), for social – i.e. not work-related – contacts. Compared with other European countries this is reasonably high.

2.3.2 Trust

A society needs a sense of community; citizens must care about what happens in their community and in the world, and about their co-citizens. In a disjointed society, it becomes very difficult for people to feel responsible for solving social problems and implementing proposed measures. The presence of social capital is very important for the liveability of a community. It is important to remember when using the term social capital that a sense of belonging and being able to count on trust and tolerance can greatly benefit people in the short and the long term. Social networks are characteristic of social capital, and in this context the term refers to relationships within and between various social networks, through which members of one network may benefit from the knowledge, skills, authority etc. of another.

Trust is a precondition for the development of social cohesion and social capital in a community. If people do not trust each other, social networks will erode – or even not come into existence at all – the economy will become less efficient and democratic stability will be threatened. According to this mechanism, a decrease in trust may lead to a decline in sustainability, as eroding social networks, a less efficient economy and an unstable democracy will result in fewer opportunities for future generations. Having said this, no absolute threshold can be given of when exactly a community crosses into the danger zone.

The first aspect of trust is related to trust in other people. This so-called generalised trust is an important aspect of a community's social capital. However, it is difficult to capture the above-mentioned theoretical considerations in one or even a few indicators. To find out how networks come into existence, how trust affects this and how norms and values are shared or not requires much deeper research than the scope of this monitor. The indicators addressed here are those also often used in international studies. For generalised trust, the underlying question is: 'In general, do you think that most people can be trusted, or do you think you can't be careful enough? It is a question pertaining to trust people have in other people, including those they do not know. Just over half the Dutch population say they trust other people. This percentage has only fluctuated slightly since 1995. Compared with other European countries the level of trust in other people is fairly high in the Netherlands, although it is lower than in the Scandinavian countries (T2–F1). In other countries, too, the scores have hardly changed since 2002.

Although networks are important for social cohesion in a community, on the downside they can also exclude people. And when they do, discriminating behaviour may surface. Various studies of problems in society have revealed that when asked to name problems, the Dutch public have been placing 'problems with minorities' high on their lists in recent years. It is not clear, however, what the precise problem is: it may be the integration of minorities in the community, but also immigration, the influx of asylumseekers or discrimination. On the one hand the Dutch see a lot more tension between ethnic groups than between rich and poor, or between old and young people, for example. But on the other hand, they are more open-minded about how 'coloured' the Dutch population is becoming. Only a minority thinks that there are too many people with a non-Dutch origin in the Netherlands, and the Dutch are increasingly accepting immigrants in their own sphere of life, for example as neighbours. People seem to have more problems with how immigrants behave in the Netherlands than with the fact that they live here. A majority thinks that immigrants should be more flexible with respect to their own culture, and nearly everyone thinks should make more effort to learn to speak Dutch. Although integration is usually primarily associated with ethnic minorities, the concept is broader and also includes integration of minorities in terms of sexual inclination or religion. In 2006, 7.5 percent of the Dutch population described themselves as belonging to a group that was discriminated against in the Netherlands

(T12–F2). This includes several forms of discrimination: by ethnic background, sexual inclination, language or religion. This is one of the highest percentages in Europe.

The third aspect of trust is the trust the population has in social and political institutions (education, police, business, legal system, trade unions, health care, media, churches and religious organisations, parliament, government employees, European Union). In principle, public trust in institutions is more stable in time than trust in people (including politicians), as institutions are larger and impersonal. When trust in institutions declines, this usually says more about declining trust and decreasing satisfaction in general than the very variable marks awarded to government and politicians. If we compare the answer conveying trust with those conveying distrust, over half the Dutch population trust the above-mentioned institutions. If we compare this with the rest of Europe, it turns out that the Dutch trust institutions more than most other Europeans. Only in Denmark and Finland do the public trust institutions more on average.

2.4 *Human capital*

2.4.1 Labour utilisation

In an ageing society like the Netherlands, there is no guarantee that the factor labour will continue to be sufficiently available in the coming decades. So this, too, is an important sustainability issue. Demographic forecasts show that if present trends continue, the number of people in the labour supply will rise more slowly than the total population. In spite of an increase in labour productivity, material welfare will therefore come under pressure in the future. The following trends play a part in the utilisation of the labour supply.

Total hours worked per person in the Netherlands have decreased since 1950. (T1–G1). Two important reasons for this are reduction in standard working hours, and the increasing popularity of part-time jobs. But ageing has also had an effect. As increased life expectancy is pushing up population numbers, the number of over-65s in particular is growing (T2–G5). The increasing popularity of early retirement has also contributed to the fall in hours worked per person, but this trend has reversed completely since 1995 (T1–G1). The participation of people aged 55–64 years, which had fallen earlier, has been rising again in the last decade. This indeed explains the recent rise in hours worked per person, although the increase in the participation of women has also contributed considerably. In international terms, however, the number of hours worked per person is decidedly small. The explanation is obvious: in no other country do so many people have a part-time job as in the Netherlands. The main indicator can be broken down into a number of components, and of these, labour participation and hours worked (part-time) are discussed below.

Dutch labour participation is relatively high at the moment. Moreover it is rising. Compared with other countries in the European Union, the Dutch score is high, together with the Scandinavian countries, of which Denmark leads the field (T2–G2). The Netherlands' high ranking is mainly the result of the participation of women; this has risen substantially in recent years and is expected to rise further in the near future. Generations of women born after 1950 have higher participation rates than previous generations, and only in 2015 will the older generations, with low participation rates, have definitely left the labour force. The participation rate of older age groups on the labour market is not especially high in the Netherlands, although it too is rising. Recent changes in early retirement schemes will probably push up the average retirement age further in the near future. The Dutch government does not yet intend to increase the official retirement age. Participation of people aged over 65 years is low, and if present policy is continued, is likely to stay low. The relative position of the Netherlands will therefore deviate further and further form the average in the European Union as retirement ages are being or due to be raised (T4–G4).

The high Dutch labour participation rates do not apply equally to all groups in the population. In spite of a substantial increase in participation, women still have clearly lower rates than men (T3–G2). A recent study by the Netherlands Institute for Social Research has shown that this is a persistent phenomenon. It is not only mothers who work part-time, women with no children also prefer not to work full-time (Portegijs *et al.*, 2008). Participation rates for ethnic minorities, too, are still significantly below average (T3–G2). So, while both women and ethnic minorities have improved their position on the labour market in recent years, they will not make up this gap in the near future.

The participation rate of people with low education levels has increased strongly since the beginning of the 1990s. People with low education attainment are generally less productive than other employees, and therefore have a downward effect on average productivity and productivity growth. For the Netherlands this negative effect is modest. The effect on total material welfare is obviously not negative. If all else remains the same, higher participation will always result in a higher per capita income. Moreover, higher participation means that the level of knowledge and skills will be maintained or increased. This intensifies the basis of a sustainable generation of a high level of material welfare.

The high rate of participation in the Netherlands does not mean that in relative terms people work a lot in the Netherlands. This is because Dutch participation is accompanied by a very small – compared with most other countries in the European Union – number of hours worked per worker (T2–G3). In no other European country is part-time work as popular as in the Netherlands. Although it is indeed mostly Dutch women who work part-time, compared with the rest of

the European Union, many Dutch men, too, have a part-time job. This widespread part-time employment results in a lower gross domestic product per capita than if everyone were to work full-time. People who work for fewer hours often also build up less knowledge and experience. And because it is mostly women who work part-time, it is women who will be at a disadvantage on the labour market. Opposite the lower production, however, they have more leisure time and more opportunities for social participation. And although this is not reflected in the national income figures, leisure time also contributes to individual welfare.

2.4.2 Education

Education is important for the productivity of individuals, companies and countries. Empirical research has shown that, on average, one year of education of an individual person results in 5 to 15 percent more wage in his whole career. This higher wage is mainly a reflection of the higher productivity of people with a higher level of education. An increase in the level of education by one year increases GDP by 8 percent (De la Fuente and Domenech, 2006). Additional evidence shows that education also yields non-financial benefits, such as better health. And, after correction for other factors, on the whole people with a higher level education are happier. Moreover, education has a direct effect on the welfare of future generations through the transfer of human capital from parent to child. Recent studies have shown that the education level of parents has a positive effect on the education level of their children, even when genetic factors are taken into account.

In terms of years of education, the level of education in the Netherlands has risen steadily since 1950. From 1995–2005 the increase has been slower when measured as the percentage of the population with senior secondary education (T1–H1). On the basis of the education level of the overall population, the Netherlands is in the middle group, but above average in the European Union (T2–H1).

Although the situation among children and young adults (educational level, drop-out rates) has improved in recent years, the Netherlands is in the middle group in Europe (T2–H2, T2–H3 respectively). These indicators mainly show the quantity of participation in education. The picture for the Netherlands becomes more favourable if the qualitative aspects of education are examined. Education is mainly concerned with the acquisition of knowledge and skills. In other words: what children learn in their education career. This is measured in various international tests such as PISA and TIMMS. The Dutch always score well on these tests (T2–H4). Another, albeit very rough, indicator for the quality of education is the level of youth unemployment. This shows how well Dutch education fits demand on the Dutch labour market. The youth unemployment rate in the Netherlands is one of the lowest in Europe (OECD, 2008a).
Accounting for 5.2 percent of GDP, Dutch spending on education is around the EU average. Denmark spends relatively most on education in Europe (8.3 percent of

GDP); surprisingly enough, Denmark scores lower on all tests than the Netherlands. The Netherlands has a relatively high score for training and courses after formal education (lifelong learning) (T2–H6), but here, too, conclusions should be drawn with caution. Employees may have to undergo training because the moderate quality of formal education has left them with too little knowledge and too few skills. The assessment of this indicator is based mainly on impediments to participate in training: do people participate less than is considered necessary for society because the market or the government fail to provide what is needed? A last comment is that the indicators do not take into account differences in population composition. It is probably easier to achiever higher overall levels of education in countries with a homogeneous population. People in ethnic minority groups are more likely to participate in lifelong learning (T3–H5).

Points of concern in Dutch education are the high drop-out rates, the lack of excellence (see Minne *et al.*, 2007) and impending widespread teacher shortages. Recent figures on reading skills of 15 year-olds also give rise for concern. In 2000, 9.6 percent of Dutch 15 year-olds had poor reading skills, in 2006 this had risen to 15.1 percent. The Netherlands is better than the EU-15, but the development is alarming.

In spite of these areas that need attention, the education level of the labour force has risen in recent decades. The substantial catching up of lower socio-economic groups and women in particular in education have contributed to this. Second generation non-westerners in the Netherlands are achieving higher education levels than their parents. This contribution to the quality improvement in human capital will die a natural death when the distribution of pupils and students in education is in conformity with their capacities. This would mean that compared with the past, one source of economic growth will disappear. Dutch innovation capacity and productivity will benefit from the fact that people are becoming cleverer in the course of time, but not from the elimination of backlogs in education as a result of which capacities were underutilised. The quality of human capital and thus the possibilities this affords the Netherlands to generate sustainable welfare will increasingly depend on high quality education that incorporates new developments quickly in the education supply. A greater emphasis on the quality of education may require extra scarce resources, for example investment in top-quality teachers.

2.4.3 Health

Obviously a long life in good health contributes to welfare. A person's state of health is one of the main factors in how they perceive welfare. Moreover, healthy people can often also contribute more to the economy and the community in a broader sense. At the same time, increased average life expectancy is putting more pressure on social schemes such as the pension system. The welfare of present and future generations is therefore strongly affected by the health of the population. The main indicator

for health, which also gives a long-term insight into future developments, is life expectancy. In addition, the number of healthy years a person can expect to live, and the level of care expenditure are important. Of course these indicators do not cover all aspects of a long and healthy life, but they do give a first rough impression.

Life expectancy at birth in the Netherlands has risen by 12 percent since 1950 (T1–J1). Female life expectancy is a few years higher than male life expectancy (T3–J1) (RIVM, 2008). Life expectancy for Dutch men is one of the highest in the European Union. It is about half a year higher than the average in the EU-15, and as much as two years higher than the average for men in the EU-27. The high life expectancy for Dutch women is in the middle group of Europe, however (T2–J1). Surprisingly enough, Dutch female life expectancy is even 0.7 of a year below the EU-15 average, and hardly higher than the EU-27 average. Compared with other European countries, the increase in life expectancy in the Netherlands in the period 1995–2005 was slight. This relatively small increase is probably connected with the high position the Netherlands occupied in 1995. There are differences between levels of education. Life expectancy is clearly lower than average for people with low education levels.
Using life expectancy as an indicator for health is not without question. Obviously, life expectancy is closely related to health, but it is certainly not a perfect indicator. In addition to total life expectancy, how long people can expect to live in good health is also important. This is more relevant for the number of years people can play an active part in society. An average Dutch person can expect to live to just over 63 years of age in good health. This is not particularly long in a European perspective. An average Maltese person lives to nearly 70 years in good health, although it is unclear to what extent measurement problems account for this difference.

Care expenditure as a percentage of GDP is mainly an indicator of the (relative) size of the care sector. Although a high level of spending on care may correspond with better public health, it may also primarily be a reflection of other factors, such as a high average age of the population. And it can also point to inefficiencies in care provision. Lastly, a large share of the expenditure may be devoted to compensating the negative consequences of an unhealthy lifestyle.

Dutch care spending accounted for 9.2 percent of GDP in 2005 (T2–J3). Both spending and its share in GDP are expected to rise further. The Netherlands Bureau for Economic Policy Analysis (Bos *et al.*, 2004) estimates an increase of total spending on care (including drugs and administrative costs) from 10.3 percent of GDP in 2001 to between 16.8 and 18.7 percent in 2040. In view of the increase realised in recent years, this estimate may even be too modest. It should be noted that the trend of rapidly increasing care spending is not unique to the Netherlands: other rich countries are experiencing the same thing. Care expenditure in the

United States was already 16 percent of GDP in 2007, and is expected to rise further to 20 percent in 2016 (Poisal *et al.*, 2007).

We know from the economic literature that a major part of the increase in health care spending is accounted for by progress in medical technology (Newhouse, 1992; Cutler, 1996). An estimated one half of the increase in Dutch care expenditure in the past is accounted for by technological developments (and socio-cultural trends) (Spaendonck and Douven, 2001). Innovations in the area of health care, including the development of new medical techniques and drugs are almost certain to push up life expectancy further in the future. Statistics Netherlands predict life expectancies of 81.5 years for men, and 84.2 years for women in the Netherlands in 2050.

To realise health goals, trade-offs will be necessary. Where promotion of good health costs time and/or money, this will be time and/or money that cannot be spent on the realisation of other goals. Population ageing may exacerbate this problem in the near future. On the other hand, health may function as a complement to other sustainability themes: a healthy population contributes to high labour and social participation rates, and thus to a continuation of a high level of material and immaterial welfare. It also reduces the extent of the ageing problem. Vice versa, the realisation of other sustainability goals may lead to better health; the reduction of air emissions, for example, has positive effects on public health.

2.5 *Economic capital*

2.5.1 Physical capital

By investing in new machines or buildings, for example, companies contribute to the physical capital goods stock which they use to produce their goods. Some investment is used to replace economically or technologically obsolete means of production, and some is used to expand the stock of capital goods so that more can be produced. In both cases the investment contributes to maintaining or increasing material welfare. The physical stock of capital goods complements other production factors, such as human capital and knowledge. Together, these factors importantly determine private sector labour productivity and the potential level of welfare that market activities can generate. By its nature, there is a limit to the effect the input of physical capital can have, whereas human capital and knowledge via technological progress make a continuous productivity growth possible (see section 2.5.2).[5)]

The limitation of physical capital works according to the following mechanism: in order to produce goods, companies use capital goods and labour in a certain ratio. In a market economy this capital-labour ratio is mainly based on the relative prices of these two production factors. If the relative price of labour rises, companies replace people with machines. This increases production per worker, or labour productivity. However, this increase in labour productivity does not mean that

the company as a whole has become more productive; only the relative input of production factors has changed. The higher capital-labour ratio was also an option before labour prices went up, only then it was not the most profitable mix of capital and labour.[6] If the relative price of labour returns to its former level later on, the capital-labour ratio will decrease again, as will labour productivity.
Long-term economic growth is not affected by the capital-labour ratio, but by technological progress, as this makes it possible, year by year, to use labour more efficiently in the production process. This means that labour productivity can grow continuously, while the relative contribution of investment and capital goods to production remains unchanged. Naturally this state of steady growth is constantly disturbed in practice by all sorts of short-term developments. But in the long term this mechanism does explain developments in physical capital figures: the amount of capital per worker increases with technological progress, while the amount of capital per unit of GDP remains constant. This is why the capital goods stock per capita shows a permanent increase in the period 1950–2005, whereas the capital goods stock per unit of GDP hardly changed (T1–K1 and T2–K2).

Because of the natural limit of the input of capital, for both the physical capital goods stock and investment (T2–K3), the position in the European ranking is only a rough indicator of the assessment of whether – in a European perspective – the economy is doing well as a producer of material welfare. Looking back, wage restriction in the Netherlands in the 1980s and 1990s resulted in a relatively low capital-labour ration at the beginning of this century, in both historical and international terms. As the rapid increase in labour supply is now over, the capital-labour ratio will probably start to rise again: it is becoming increasingly more profitable to replace people by machines. This will probably result in a temporary increase in the rate of labour productivity growth.

In the short term there is a trade-off between labour participation and labour productivity. European labour participation has risen strongly in the last fifteen years, and this has had a downward effect on wages. High unemployment also curbed wage rises. These smaller wage rises resulted in capital being replaced by labour, and thus had a negative effect on the increase in labour productivity. This substitution, as explained above, is only temporary and will only last until the labour market rights itself again. Empirical studies show that in the long term the negative correlation between participation and employment on the one-hand and labour productivity on the other will usually disappear.

2.5.2 Knowledge

Investing in new technology and knowledge by carrying out research and development (R&D) is important for sustainable growth. It includes development of new products and techniques by fundamental and applied research at universities, knowledge institutions and private companies. Unlike physical capital,

technological progress does make continuous growth of productivity and labour productivity possible. Successful innovations result in higher labour productivity: new machines take over part of the activities done by workers, production processes become more efficient and better quality products can be produced.

The level of the knowledge economy has risen substantially in the last fifty years, mainly as a result of high growth rates in the period 1950–1995 (T1–L1). Since 1995, however, the growth has been less visible (T2–L1). The Netherlands is lagging behind the EU average on the scores concerning the development of R&D intensity (T2–L2 and T2–L3). For patents the situation is better; Dutch companies submit relatively many patent applications (T2–L4). To an important extent, the low private sector R&D intensity is accounted for by the economic structure in the Netherlands. Analysis shows that the relatively R&D extensive sector structure in the Netherlands accounts for 60 percent of the gap of Dutch R&D with the average in Europe. The Dutch economy is largely services-based, and in services innovation is not only achieved through R&D (Cornet *et al.*, 2006).

Services also increasingly account for international differences in labour productivity growth rates. Both in the Netherlands and in the US, the growth in market economy labour productivity accelerated in the period 1996–2005 compared with the period 1980–1995. The spurt in the US was much stronger, however. Part of the speed-up was accounted for by commercial services. Productivity in this sector rose considerably as a result of a larger increase in total factor productivity (TFP), and not, or hardly, as a result of a higher contribution from ICT capital.[7)] Plausible explanations for this relatively higher TFP growth include a catch-up effect (TFP in commercial services in the US was perhaps lower than in the Netherlands), more innovations, less regulation and stronger competitiveness in the US, and lastly, effects of scale.

The patents situation is also largely determined by the economic structure. Most patents are owned by the large Dutch multinational companies. Philips is a notable example, but Unilever, DSM, AkzoNobel and Shell also own a lot of patents.

A low score on an input indicator such as R&D as a percentage of GDP may indicate an inferior score of the Dutch innovation system. On the other hand it may also reflect an efficient use of resources. The ratio between input and output is important measure of a system's efficiency. Therefore a more detailed diagnosis is required to draw more definite conclusions. Causality is important in such a diagnosis. High R&D intensity not only results in a high level of welfare, vice versa a high level of welfare may stimulate the demand for knowledge. This is true today, but will also be true tomorrow. Present production levels are mainly the result of past investment. Future production will be partly be determined by today's investment, although it is difficult to pinpoint exactly what the causal relationships are, and how strong they are.

A few years ago, the member states of the European Union already agreed that R&D expenditure should be raised to 3 percent of GDP by 2010. This is to be achieved mainly by increasing private R&D spending. This component of R&D spending has remained stable in recent years (in terms of GDP percentage) while public spending on R&D has fallen sharply (T2–L2 and T2–L3 respectively). The present percentage in the Netherlands is still far from this target. What is going wrong in this respect? And what action should be taken? Empirical studies have shown that the production of knowledge thrives best under efficient financial stimulants and an efficiently organised research process. In itself, the fact that the Dutch economy is R&D extensive in an international perspective does not mean that the government has to play an important role. Empirical studies have revealed that market imperfections play an important role. Private incentives for technological innovation are weaker than socially desirable incentives. This is why government stimulates research with the aid of subsidies, such as those under the Promotion of R&D Act (*Wet Bevordering Speur- en Ontwikkelingswerk (WBSO)*. Whether extra government policy is justified from a welfare perspective, is not immediately clear. Our current knowledge of the effectiveness of additional innovation policy is too limited to establish this.

A number of trade-offs with and intensifying effects on other themes confronting policy-makers are explained below.

Highly qualified knowledge workers are needed for R&D. Stimulating R&D increases the demand for people with high education levels and pushes up their wages. This may lead to an increase in income inequality, which may have an effect on social cohesion.

In principle, patents are instruments to stimulate investment in R&D. The basic idea is that the patent holder can expect temporary monopoly profits, earn back his investment and perhaps make additional profits. The other side of this coin is that as he has a monopoly, the patent holder will not easily sell his knowledge, thus keeping the price artificially high. So although patents do stimulate knowledge creation, they are not a good stimulant for knowledge diffusion. Not much is known about how optimal the present patent system is. In an international perspective the advantages of scale of a collective patent system in Europe are evident. This could substantially lower the costs of acquiring a patent that is valid in all countries of the European Union. However, for all sorts of legal and bureaucratic reasons, such a Community patent still does not exist.

Competitiveness usually has a positive effect on innovation, but not always. Competitiveness may be so strong that companies lose the drive and/or the financial leeway to invest in innovation. As competitiveness increases, spending on innovation then decreases. In such a situation stimulating competitiveness and

innovation are at odds with each other. Empirical study may prove whether this is indeed the case in the Netherlands. Here again, the causal relationships must be clarified: it is very well possible that high competitiveness pushes companies to differentiate and so to create niches to get out of the way of their rivals. Product differentiation may therefore lead to less competitiveness and higher spending on innovation.

2.6 *Distribution and inequality*

The previous sections have examined theme indicators mainly for the Netherlands as a whole. The distribution of social and human capital across various groups in society is just as interesting, however, if not more so: are there differences between men and women, ethnic minorities and native Dutch people, and people with high and low levels of education, with regard to trust, level of education, labour participation and health? These differences are presented in table 3.

Trust is a necessary condition for social cohesion in a community and for the development of social capital. The average mark for trust in the Netherlands is 5.7 (on a scale from 0 which stands for 'you can't be careful enough' to 10 which stands for 'most people are to be trusted'). There is hardly any difference between men and women, but there is between people with a foreign background and native Dutch people (T3–F1). Native Dutch people are more likely to trust most people, while people with a non-western foreign background in particular trust other people less. The largest differences are between levels of education, where the high mark for people with high level of education is most noticeable (6.5).

Education and the level of education completed are very important contributors to human capital. If we look at the percentage of people with a high education level, the gap between women and men has been narrowing in successive cohorts, and has now turned into a lead. The percentage of highly educated women in cohort 1975–1979 is higher than the percentage of men. For the level of education of the overall population, however, there is hardly any difference between men and women (T3–H1). The achievements of pupils from minority groups have improved in recent years, but they still leave primary education quite a way behind their native peers. This is reflected in the ultimately achieved level of education which is still lower than for native Dutch groups, although Turks and Moroccans in particular are catching up. People with a non-western foreign background are more likely to participate in training and courses after formal education (lifelong learning) (T3–H5).

A person's level of education affects the extent to which he or she participates in society. People with a high level of education are more likely to have a job, and spend nearly three times as much time on paid labour as people with lower education

levels (T3–G1). If we leave the unemployed population out of account and look at the number of hours worked by people in work, there is hardly any difference between people with a low and people with a high level of education. Between people with a foreign and people with a native background, too, this difference is minimal (T3–G3). Compared with men, women work about half the hours per week that men do. Part of this difference is spent on social participation, such as voluntary care, volunteer work or visiting friends and family. Women spend nearly two hours more than men on these activities (T3–E1). People with a high and with a low level of education spend around the same amount of time on social participation in spite of the fact that those with a high level of education spend more time on work. In relative terms, too, people with a low level of education take part in the labour process less often than average (T3–G2). Around one third of people without a qualification (who therefore have primary school as maximum level of education) have a paid job. Net participation rates for ethnic minorities and for women are lower than average (T3–G2). For everybody, but particularly for people in these vulnerable groups, it is easier to find a job if the economy is doing well. Between 1996 and 2000/2001, net labour participation among unqualified people with a foreign background and women rose, only to fall again subsequently; in this development, jobs of people with no formal qualifications were the most sensitive to economic change. Women have caught up somewhat: net female participation rose by 12 percent points in the period 1996–2007. It should be mentioned in this respect that an increasing share of working women work part-time, so that in spite of the strong rise in the participation rate, they still work relatively few hours (T3–G3, T3–G1).

These inequalities in participation often result in inequalities in income. For the Netherlands as a whole there has been hardly any change in income inequality as measured by the Gini coefficient in the last decade. Compared with other European countries income inequality in the Netherlands is less than average. Income inequality can also be considered in terms of the extent of poverty in a country. The percentage of poor people in the Netherlands fell slightly between 1995 and 2000. After the tax reforms in 2001 it fell further, but from that moment on it started to rise again as a result of the economic downturn. In a European perspective, however, poverty is low in the Netherlands.

The last socio-economic differences we examine here are those in health. Life expectancy at birth for the Dutch population is rising, but there are differences between population groups. Women live an average 4.4 years longer than men, and people with a low education attainment die earlier than those who have completed higher levels of education (T3–J1). The differences between socio-economic groups are smaller for people with a Turkish or Moroccan background and for Antillean/Aruban women than for the native Dutch population and people with a Surinamese background. Although women do live longer than men, the number of years men and women live in good health is about the same. Differences in healthy life expectancy

between socio-economic groups are larger than those in life expectancy. Men with a low education level live 9.9 years shorter without physical limitations than those with a high level of education; for women this difference is 8.6 years.

Trust, knowledge, participation and health are not equally distributed across groups in society. On most aspects, women, people with a non-western foreign background and people with low education levels are at a disadvantage. Women are mainly ahead in non-material areas such as social participation and health.

2.7 *International dimension*

Although the question of whether the choices made by the present generation influence development opportunities for future generations is an important sustainability issue, it is not the only one. The Netherlands is not an island. How Dutch producers and consumers behave affects the possibilities for people to achieve sustainable welfare elsewhere in the world. Having said this, the Netherlands is a small country, and in absolute terms it contributes little to global problems. Even if we stop all Dutch production and/or consumption, this will not solve any global sustainability issues. On the other hand, the effect of an average Dutch person on sustainability-related problems is often quite substantial in relative terms. This is of course mainly as a result of the relatively high level of per capita production and consumption in the Netherlands. It is this combination of a small absolute but large relative contribution that gives the Netherlands a special responsibility in regard to sustainability policy. This section looks into that responsibility.

The international dimension of sustainability covers a large number of areas, including those of migration and knowledge flows. This section restricts itself to the area of natural capital. It starts by briefly looking into how natural resources are being depleted in various regions of the world. Subsequently, three aspects of international environmental pressure in relation to Dutch production and consumption are discussed, i.e.:

1. exhaustion of energy sources and mineral reserves;
2. CO_2 emissions as a result of consumption by the Dutch and the net carbon emission;
3. loss of biodiversity as a result of land use for Dutch consumption.

A World Bank study (2003) shows at what speed natural resources are being depleted. It appears that especially in the very poorest countries resources are being depleted at an alarming rate. Table 2.1 shows depletion as a percentage of gross national income. Although loss of nature and calculated damage as a result of higher CO_2 emissions are included, the largest item is still the reduction in fossil fuels (T4–N1).

Table 2.1
Annual depletion of natural capital, per region (1970–2004)

	1970/1979	1980/1989	1990/1999	2000/2004
	% of GDP			
World	4.1	4.9	2.2	2.9
OECD	2.2	2.4	0.8	1.1
European Monetary Union	0.6	0.7	0.3	0.3
Least Developed Countries	5.2	3.7	4.6	7.9
Africa	10.0	12.2	7.9	10.8
Latin America	5.3	9.9	4.3	6.8
Southern Asia	4.5	5.8	5.1	4.7

Source: World Bank, 2008.

Surprisingly, the annual global rate at which natural resources are being depleted was substantially higher in the 1970s and 1980s, than it has been since 1990. Equally surprising is that in the poorest countries this depletion rate is not only relatively high, but that it remains high. In the period 2000–2004, claims on Africa's natural capital cost this continent 10.8 percent of its gross national income every year. This was mainly the result of the high prices of natural resources in this period, partly pushed up by the explosive increase in Chinese demand for raw materials.

However, there is still no evidence that development is not sustainable if natural resources are depleted. In principle, income from this exploitation of natural resources can be reinvested in the economy and can be used, for example, to increase the amount of economic or human capital. This is done only on a very limited scale in Africa, however. Even if all other forms of capital are included (economic, social and human capital), gross national income in Africa would still fall by 1.5 percent annually in the period 2000–2004 (World Bank, 2003). Not only does this damage the quality of the natural environment, it also puts pressure on the long-term economic growth potential. Institutional developments in resource-rich communities compound these development problems. Economic studies have shown that institutional arrangements in developing countries which depend on one or two mineral export products for their welfare, the so-called 'point resource economies' focus more on redistribution than on realising higher growth. Recent model-based studies have revealed the economic and political market mechanisms of why profits on investment in natural resources are hardly being re-invested in other forms of capital (Acemoglu *et al.*, 2004).

International environmental pressure as a consequence of Dutch imports of resources
The Netherlands claims a relatively large part of natural resources of other countries. After corrections for transit trade (and divided by the population size), the Netherlands is the sixth largest importer within the European Union of natural

resources; i.e. five EU countries – after correction for the size of their economy – have a larger claim on natural resources from other countries. If only pressure on the environment in the poorest countries is taken into consideration, then the Netherlands comes in ninth. This calculation has also been done for the various types of natural resources. The Netherlands is relatively high on the list for imports of timber (6th) and oil and gas (4th) from the poorest countries.

Traditionally, 80 to 90 percent of mineral exports from the poorest countries are destined for the United States, Europe and Japan. China has joined this group recently. If we look at how much of total Dutch imports are natural resources, it is notable that this share has risen considerably: from around 17 percent at the beginning of the 1960s to nearly 30 percent at the beginning of the 1980s. During the economic recession of the 1980s, it fell sharply, to fluctuate just under 10 percent to the end of the 1990s. In the last decade it has risen substantially again, and now natural resources account for 17 percent of total Dutch imports (T4–C1). It should be mentioned in this respect that only very few of these imports come from the poorest countries. If we look at which regions the natural resources are imported from (T4–C2), we see that the share from the poorest countries decreased in the period 1970–2005. In other words, the Netherlands has imported less and less natural resources from Africa. This has reduced the ecological pressure of the Netherlands on Africa. However, there has been a rise again in recent years.

This does not mean that the trade with the poorest countries is undesirable. Just the opposite, participation of these countries in global trade can have welfare increasing effects for all parties involved. But the nature of the trade relationships must be examined very critically. The figures mentioned in table 2.1 show that it is mainly the very poorest countries whose natural resources are depleting at a fast rate, which means that little will be left for future generations. At the same time, in most countries not enough of the profits from the exploitation of these natural resources is invested in economic activities which will help to generate welfare in the long-term – when the natural resources have been exhausted. In many countries this necessary diversification is not achieved because the political elites themselves earn a lot of money by exploiting and trading natural resources. There are some positive exceptions to this rule, however, such as Botswana, a country rich in natural resources where the profits from these are re-invested in a way that benefits society in a broad sense, thus building a basis for the welfare of future generations. It is important to keep these institutional aspects in mind when starting economic relationships with developing countries.

CO_2 emission from consumption by the Dutch and net carbon emission

The Netherlands has one of the most carbon-intensive economies of western Europe. Its CO_2 intensity is around 30 percent higher than the average in western Europe. To an important extent, this high figure is a consequence of the specific production

structure in the Netherlands, where glasshouse horticulture, petrochemical industry and transport account for a relatively large share of domestic production. But only looking at emissions from domestic production yields an incomplete picture. Greenhouse gas emissions from outside the Netherlands resulting from consumption in the Netherlands, and vice versa, must be added and subtracted to get the net carbon emission.

Just as in other rich countries, per capita consumption-related greenhouse gas emissions in the Netherlands are high compared with those in poor countries. Many west European countries are net exporters of greenhouse gas emissions. In the Netherlands, however, the greenhouse gas emissions for imports and exports are about equal, in spite of the trade surplus and energy intensive exports (CBS 2008b). But the situation is different for CO_2 emissions: in the Netherlands these are larger for the production of goods to be exported than for imported goods intended for Dutch consumption (T4–A5). In spite of this the Netherlands has a negative net CO2 emission with non-western countries in particular. One of the reasons for this is that production processes in these countries are not as clean as in the Netherlands. For Africa and Russia the negative balance is accounted for by high imports of emission intensive resources such as petroleum and natural gas. The Netherlands imports 4.5 billion euro worth of oil from Russia for example. This accounts for about half of the total value of imports from Russia and is the equivalent to the total value of exports to Russia. The negative balance with China is caused by the fact that the Netherlands imports seven times as much from China than it exports to that country.
Are emissions in the Netherlands higher than in comparable countries? If per capita greenhouse gas emissions in the Netherlands are compared with those of an average citizen in the European OECD countries, the Dutch emit about 10 percent more (T4–A6). In this respect, too, the Netherlands stakes a relatively large claim on international environmental land use.

International pressure on biodiversity by land use
The average land use on earth at the moment is 0.8 of a hectare per inhabitant. (Rood *et al.*, 2004). Land use is closely related to the level of consumption: richer countries usually claim more of the world's land than poorer countries. But these differences are smaller than those between greenhouse gas emissions, as land in richer countries is usually used more efficiently and more intensively in rich countries than in poor countries. Dutch land use is lower than in many other rich countries (OECD Europe) (T4–B5). This is mainly because both within and outside its borders, the Netherlands uses high productivity agricultural land.

The total area of land in the rest of the world needed for Dutch consumption, is around three times as large as the total land area of the Netherlands. This area is expected to increase in the future (CPB/MNP/RPB, 2006). Some 45 percent of total

land use outside the Netherlands needed for Dutch consumption is used for food, the remaining 55 percent mainly for timber and timber products. The area of land used for food correlates closely with the demand for meat and dairy products, the production of which requires a relatively large land area. Currently timber used for wood products mainly originates from low-productive temperate and boreal forests. If the increase in demand for timber and biofuels is met by agricultural crops from tropical regions, it will compete with the production of food. The resulting agricultural land expansion will result in a loss of tropical biodiversity. In view of the high productivity of tropical land, under current national and international policy the loss of tropical rain forest would seem to be a realistic future development.

2.8 Conclusions

Climate and energy

The increase in the consumption of fossil energy has resulted in a decrease in oil and gas reserves and a substantial rise in the emission of greenhouse gases in the last fifty years. This is true both across the world, and in the Netherlands. Although overall greenhouse gas emissions in the Netherlands have fallen slightly since 1995, this is not true for CO_2 in the Netherlands, and for the emissions caused by consumption of the Dutch population.

If present global trends continue, the average global temperature will probably rise by more than two degrees this century. Although technically speaking it is possible to limit climate change to a two-degree temperature rise, existing institutional arrangements are as yet inadequate. The Netherlands and the European Union could lead the world in putting such arrangements in place. The European emissions trading programme can serve as an example for the rest of the world. But if the rest of the world lags too far behind the EU (and the Netherlands), the global climate benefit will only be small. The existing European and national package of measures has resulted in large strides towards the emissions reductions of 85 to 95 percent which are required in developed countries by 2050 to curb the temperature rise to two degrees (450 ppm).

Biodiversity

Increasing welfare and population growth seem inevitably to be leading to a rapid loss of natural capital. As a result of the consumption of timber and food in particular, agriculture is placing increasing pressure on nature land across the world, and therefore on the remaining biodiversity. Global biodiversity is still decreasing, and present trends will probably increase the rate at which this is happening.

In the Netherlands, the decrease in biodiversity is now bottoming out. More and more attention is being paid to conserving and expanding natural wildlife. About

15 percent of the country's original biodiversity remains. Present policy may increase this to 20 percent.

Dutch consumption and production systems will have to become more eco-efficient if they are to contribute to global sustainability. Increasing agricultural productivity across the world is a robust option which may help to solve poverty and food problems. This may also stop a further decrease in biodiversity and contribute to the solution of the climate issue by conserving forest-stored CO_2.

Soil, water and air

The quality of air, water and soil in the Netherlands has improved substantially in recent decades. This has had positive consequences for the health of the Dutch population. It has also created conditions for nature to recover. Although current policy has had a good effect on these positive trends, many EU soil, water and air clean-up targets will not be met in the Netherlands. Therefore the damaging effects of air quality on Dutch public health continue to exist. Most of nature in the Netherlands is insufficiently protected to make a sustainable recovery possible. Environmental pressure is high in the Netherlands compared with other European countries. This is not surprising in view of the fact the Netherlands is one of the most densely occupied countries in Europe in terms of people, livestock, industry and motor vehicles.

Social participation

The average time a Dutch person spends on unpaid work, voluntary care and social contacts has fallen from 15 to just under 11 hours a week in the last thirty years; at the same time the average number of hours spent on paid work rose from 15 to 20 a week. Although there is no precise information on the nature and extent of voluntary work in the Netherlands, the Dutch score is still quite high in a European perspective. The amount of time the Dutch spend with family and friends is also among the largest in Europe.

As the population ages, the share of non-active people will increase. The rate at which this will occur partly depends on how successful the policy to postpone retirement is. In the long term, the number of volunteer workers is expected to decrease rather than to increase. In the short term an expected decrease among young people may be compensated by an increase among older people.

Trust

Trust is a precondition for the development of social capital and social cohesion in a community. If citizens do not trust each other, social networks will become eroded or will not even come into existence at all, the economy will become less efficient and democratic stability will come under threat. Compared with the rest of Europe, the Dutch have a high level of trust in each other and in social and political institutions (e.g. the legal system, education and parliament).

In spite of this, a large percentage of the Dutch population feel tension between ethnic groups. This tension seems to be more a result of how people with a foreign background behave rather than the fact that they live here. On the bright side, most Dutch people seem to see integration problems as a phase that will pass. The percentage of Dutch people who see themselves as belonging to a group that is discriminated against is 7.5, quite high in European terms. It is difficult to predict how trust between various groups in Dutch society will develop in the future, as little is known about the mechanisms that play a part in this.

Asked whether people will be willing to help each other out in the future, the percentage of Dutch people who express concerns about this is surprisingly high compared with the rest of Europe. This is a sign of concern and doubts about future social cohesion in the Netherlands.

Labour utilisation

To achieve sustainable welfare, good use must be made of available labour. Although the ageing of the Dutch population will push down labour participation rates, the welfare consequences of this can be compensated. Labour productivity can be raised further, and the participation of women and people from ethnic minorities can also increase further. There is also enough room to raise the average number of hours worked, which is relatively very small in the Netherlands. In the pursuit of increasing the labour supply, it should be kept in mind that along with income, leisure time is also an important component of welfare.

Education

Knowledge contributes to sustainable welfare by increasing labour productivity. But knowledge also plays an important direct role in the solution of sustainability problems. The quality of human capital, and thus the opportunities for the Netherlands to achieve sustainable development, depends strongly on the quality of education. Points of concern in Dutch education are mainly the high drop-out rates, lack of excellence and impending widespread teacher shortages. Productive investment in education would reap positive results. Studies have shown that increasing the labour force's level of education by just one year would have a considerable effect on GDP.

Health

Compared with the rest of the world, the Dutch live long and healthy lives; compared with Europe, this is less so. Health care innovations, including the development of new medical techniques and drugs will very probably push up Dutch life expectancy further. As the population ages, health care spending will come under increasing pressure. This will intensify the competition with financial resources, mainly in the shape of labour needed for care, as this labour can also be used for other goals.

Physical capital

A society cannot provide sustainable welfare for its citizens – by current (western) standards – without an adequate stock of high quality physical capital goods. More than anything, physical capital epitomises existing knowledge to produce efficiently. As the rapid growth in the labour supply has now stopped in the Netherlands, the capital-labour ration will probably increase further in coming decades. This will partly undo the negative effect of the ageing process. There are no serious indications that a shortage of physical capital will impede the pursuit of sustainable welfare in the Netherlands.

Knowledge

Knowledge contributes to higher productivity. This higher productivity may take the shape of a more efficient use of natural resources (fewer resources per product unit) or labour (less labour per product unit). But it may also be reflected in quality improvement and innovation of existing products. An increase in knowledge is essential for the development of a sustainable society. Investment in R&D is investment in knowledge growth. Compared with most other EU countries, R&D investment in the Netherlands is not particularly high. One reason for this is the sector structure of the Dutch economy. The so-called knowledge paradox is characteristic for the Netherlands: although a lot of scientific research is conducted, the business sector does not seem to make much use of it.

Distribution and inequality

Knowledge, labour, health and social participation are not equally distributed across groups in society. This is also true for trust people have in other people. Native born Dutch people trust each other more than people with a non-native background; people with a high level of education trust each other more than those with lower education levels. It is difficult to predict with any certainty how trust between population groups and differences therein will develop in the future. Trust is connected with the amount of social elbow room and the opportunities citizens see for themselves in the future. A good education and being able to participate in the labour market are important conditions for this.

Labour participation is lower for women, people with a low level of education and people with a foreign background than for men, people with a high level of education and native Dutch people. The position of people with a low education level is more sensitive to economic developments than average. Successive cohorts of women have been narrowing the gap with men in terms of education level in recent decades, and now even doing better than men. Of the ethnic minorities, Turks and Moroccans are catching up, although they will not actually close the gap in the near future. Although women live longer than men, the number of years they live in good health is about the same as for men. Trust, knowledge, labour and health are not equally distributed across groups in society. On most aspects women, people with a non-western foreign background and people with

low education levels are behind. In some non-material areas (social participation, health) women are in a more favourable position.

International dimension

The current Dutch economy can only exist by using a relatively large amount of natural capital outside its own borders. The share of natural resources in per capita imports is one of the highest in Europe, although a considerable part of these imports are exported to other European countries once they have been used in the production of other products. An important part of imported natural resources come from low-income countries in Africa, southern Asia and Latin America. Through these imports the Netherlands contributes to the economic development in the exporting countries. But these imports also contribute to loss of nature and increase the risk of climate change. There are also negative effects on the quality of local air, water and soil.

Carbon emissions resulting from consumption by Dutch households is large in global terms. In spite of the high level of consumption, land use per Dutch inhabitant is around the global average, as high productivity agricultural land is used both within and outside the Netherlands. Because of the high population density, the total area of land required to meet Dutch consumption demands is around three times the land area of the Netherlands.

In theory there are three possibilities to reduce the global problems concerning land use, natural resources and energy: reduce consumption; develop more sustainable production methods; and lastly, curb world population growth. Until now, most attempts to find solutions have been based on use of technology. This approach has as yet been insufficient to compensate the effects of increasing consumption and growing population numbers.

Notes in the text

1) An eleventh category (C. Natural Resources) is only included in the international dimension table (table 4) as the Netherlands does not have many mineral reserves apart from its natural gas reserves. Nearly all natural resources are therefore imported.
2) The relationship between headline indicators and sub-indicators is used for all themes except 'climate and energy' and 'soil, water and air', where the relationship has been adapted slightly. The indicator for climate change is emissions of greenhouse gases by Dutch society. Strictly speaking, this is not a measure for the stocks of a capital type, but rather the annual decrease in these stocks. The stocks could be – say – concentrations of greenhouse gases in the atmosphere. As tables 1 and 2 are nationally oriented, they use annual emissions. The theme 'soil, water and air' actually comprises three capital types at the same time. The stock is measured by the quality of the soil, the water and

the air. Instead of three main indicators, the most important one is chosen (fine particulate matter), which is also most related to other themes (e.g. health).

3) It should be stated in this respect that in the same period emissions by Dutch economic activities showed a 3 percent increase. This was mainly caused by the strong growth in international transport of which – under the Kyoto agreement – emissions are not included in Dutch emissions. (CBS, 2008b).

4) As a result of differences in definitions, the figures in this section (for sustainable energy) deviate from those in table 2.

5) Growth accounts (e.g. CBS, 2007a) do show that, seen over a longer period, capital intensity contributes to an increase in labour productivity. However, growth accounts do not give an insight into what causes the increase in labour productivity. In the long term, this increase is based on technological progress. In the growth accounts method this is expressed as a higher total factor productivity or a larger contribution by capital intensity.

6) It is assumed here that companies work at the limit of their production capacity and that there are no so-called X-inefficiencies as a result of which companies with the same input ratios are not all equally productive.

7) Total factor productivity is productivity than cannot be explained by the input of labour and capital.

3. *Participation, trust and inequality*

3.1 Introduction

In 1999 the Dutch journal for the social sector (*Tijdschrift voor de Sociale Sector*) published a special issue on sustainability and social policy. At that time there was already a general recognition that the development of the sustainability concept, which started with ecology and economics, should also comprise a social aspect. It was as yet unclear what this social aspect should entail, however. The insight that unrestrained consumption growth constituted a threat to the survival of the planet, the message of the Club of Rome in its rapport *The limits to growth* in 1972, was primarily restricted to the tension between ecological and economic goals at a global level. The pursuit of economic prosperity was increasingly at odds with conservation of the quality of the environment, and also caused or perpetuated social inequality. A defining moment in sustainability thinking was the publication of the Brundtland Report *Our common future* in 1987, with the now well-known definition (and the basis of the present report): sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition puts the needs of citizens at the forefront of the discussion, and these needs are not necessarily only material ones. Sustainable development should be seen as a process which does not focus on economic development alone, but at the same time includes well-balanced ecological and social development. In fact, sustainable development refers to the quality of life in the broadest possible sense. The difficult thing about the social aspect of sustainability is that it is layered (it pertains to both an individual and a collective level), and that it is reflexive (there is a continuous exchange between what we observe, how we interpret this, and how we behave). Added to this, in a social respect, too, sustainability is a process in which goals are frequently being adjusted, which makes it difficult to measure it with any precision (see Telos, 2006, for an extensive description of social capital in a sustainability perspective).

A number of instrumental and intrinsic considerations make it easy to understand why the social aspects of sustainability deserve attention (De Boer en Duyvendak, 1999). First, because at a global level, environmental targets can only be realised if the West is prepared to invest in developing countries. And not only in commercial projects, but also in education, health care, poverty reduction and good government. Secondly, it is clear that realising goals in the area of environment and global fairness will to some extent hurt countries with prosperous economies. Thinking along these lines, trust in society, both between people themselves, and between people and the government works in favour of sustainability policy. One of the

ways the social aspect can contribute to the realisation of economic and ecological goals is by creating public support.

However, the social aspects of sustainability are not only functional, they are also important in an autonomous sense. A society where trust is inherent, where people feel safe, where social fabric, cohesion and engagement are all strong, and where in addition material security is guaranteed, is an attractive society for people to live in. This situation is beneficial for people's physical and mental well-being, now and in the future. It also provides ample opportunities for a good start for future generations. Children who can grow up in a stable, safe and caring social environment have a greater chance of growing into balanced and social adults than children who are deprived of such advantages. In this respect, upbringing and the inter-generational transfer of values and norms are important aspects of social sustainability in society. To increase the opportunities for people to participate in society, education is crucial. If there is one thing that helps people to become self-sufficient and form discerning and well-informed opinions it is good education. Education can promote active citizenship, if we define citizenship as the willingness and the ability to be part of a community and to contribute actively to that community. Access to good education is therefore an important resource for a sustainable society.

A society needs a sense of community and commitment; citizens need to feel involved with what happens in their society, to their co-citizens and in the world. In a disjointed society, it becomes very difficult for people to feel responsible for solving social problems and implementing proposed measures. The presence of social capital is very important for the liveability of a community. It is important to remember when using the term social capital that a sense of belonging and being able to count on trust and tolerance can greatly benefit people in the short and the long term (Field, 2003; Portes, 1998). Putnam (2000), one of the most influential authors in this area, emphasises that unlike physical or human capital, social capital is not an individual characteristic, but refers to relationships between individuals – social networks and the norm of reciprocity and trustworthiness that these generate. Social capital is a characteristic of social networks, and the term refers to the relationships that exist within and between different social networks, through which members of one network can benefit from the knowledge, skills, authority etc. of another. By being part of networks that have good or useful relationships with other networks, an individual can develop himself further, or fulfil his potential in other ways. Putnam also points out the collective usefulness of social capital: social capital and social trust as a means to solve collective problems. As people are confident that others will do their bit or do something in return, or will do so in the future, a group will be able to achieve more than if each group member were to behave rationally to serve only his or her own individual interests (Putnam, 1993).

Just as most other forms of capital, the amount of social capital may fluctuate. It can increase or decrease in time. This is interesting, because it means that in the long term, future societies may be better in a social respect (more trust, more participation, less inequality) than today's. So ensuring social sustainability is not only ensuring that present social cohesion will be preserved, but also ensuring that this cohesion will increase or improve. Although many discussions of social capital treat it as a good thing, Bourdieu poses that it may also be a means to maintain or even intensify social inequality (Bourdieu, 1983). In his view, social capital explains how some people are in a position to gain access to economic or political power, while others are not. Elite groups exist in the community, which (sometimes consciously) do not want to be in contact, or have only very little contact, with other social groups, and which are perfectly able to develop themselves economically and otherwise. A community with only a limited level of social cohesion is therefore not by definition disadvantageous for all its members. On the other hand, social cohesion can also be excessive: if it excludes individuals or groups, for example. Moreover, not all social networks are equally desirable: consider football hooligans and terrorist groups for example. Although we could speak of bonding social capital, as the networks form a unit, there is no bridging social capital: they do not reciprocate. This is not to say that one form is by definition better than the other, but it does indicate how complex and ambiguous the relationships between social capital, social networks and sustainability are.

Participating in community life is about equal opportunities and equal possibilities. In a certain sense, it is about fairness: the idea that everybody is entitled to a good life (Telos, 2006). Solidarity is important in this respect. Solidarity between individuals is a precondition for trust and network formation, and solidarity between groups prevents inequality. In this respect institutions are important, as they provide access to resources.

In the Dutch welfare state, the government ensures that all its citizens have access to a variety of resources (education, care, income support), and prevents or tempers undesirable (i.e. too large) inequalities in these resources. A low level of solidarity and excessive inequality in a society will undermine the feeling of trust people have in each other, their willingness to participate and the formation of networks which are necessary to realise social cohesion and social capital (Uslaner and Brown, 2005; Telos, 2006).

It should be said that the notions social capital and social cohesion have more powers of expression at local or national level than in global terms. The state of trust between individual citizens and between citizens and their government can be established for a village, a city or even for a nation. The extent to which citizens contribute to a liveable community by doing volunteer work or other forms of social participation can also be established. These concepts become more diffuse

at a global level, however. It is more difficult to conceive a liveable earth in a social respect – peace on earth probably being the ultimate goal – but this has never been achieved in the history of the human race. In addition, the means to realise more social capital and social cohesion on a world scale are more limited. International organisations such as the United Nations fulfil the role of proponent of mutual respect between countries and keeper of the peace and security in the world, but out of necessity this role is limited.

In this chapter we examine empirical material for the two aspects trust and participation, which are at the heart of social capital. We also address social inequality, as this can lead to less social trust and thus to less participation. Participating in a community, in networks and trusting other people and the community and its institutions are components of the community's social capital. They are also viewed as the cement that binds a community: the greater the trust and participation, the more chance a community will have to thrive (Putnam, 2000; Van Oorschot *et al.*, 2006).

To place the Dutch data in some sort of a context, it is important to compare them with those for other countries. How is the Netherlands doing compared with other countries in the European Union? Where data are available and a comparison is relevant, data on social sustainability in other European countries are also presented.

3.2 Trust

Trust is a necessary condition for the development of social cohesion and social capital in a society. If citizens do not trust each other social networks will erode, or not come into existence at all, the economy will become less efficient and democratic stability will come under threat (Newton, 2001). A decrease in trust may thus result in reduced sustainability, as eroding social networks, a less efficient economy and unstable democracy provide fewer opportunities for future generations. Added to this: no threshold can be defined as to when a community threatens to cross into the danger zone. It is impossible to say that below a certain level of trust, the sustainability of a community is in danger. Therefore only trends and changes are presented.

A number of aspects can be distinguished within the general term trust. Trust can refer to other people, and also to institutions in a society. By examining both aspects of trust, we get a picture of the trust people have in the community as a whole. This picture is refined further by selecting indicators which refer to how secure people feel in a community. An important component of security is related to feelings of safety: the less people trust each other and the community, the less

secure and safe they feel. Therefore we look at indications for the feelings of safety that people experience.
Lastly, in the first part of this chapter, we shall look at the relationship between various ethnic groups in society: how do they feel about each other; for example what do Surinamese people think of Moroccans, and how do Turks feel about native Dutch people?

3.2.1 Generalised trust and trust in institutions

The first aspect of trust is the trust people have in each other. This so-called generalised trust is an important aspect of a community's social capital. It is difficult, however, to capture the above-mentioned theoretical considerations in just one or even a few indicators. To gain an insight into how networks come into being, what the role of trust is in this process and how values and norms are shared or not requires much deeper study than is possible in this monitor.

Table 3.1
Trust in other people [1)]

	2002	2004	2006
Denmark	7.0	6.8	7.0
Norway	6.6	6.6	6.8
Finland	6.5	6.5	6.6
Iceland	.	6.4	.
Sweden	6.1	6.1	6.3
Netherlands	**5.7**	**5.8**	**5.8**
Switzerland	5.6	5.7	5.7
United Kingdom	5.1	5.2	5.4
Ireland	5.5	5.8	5.4
Estonia	.	5.2	5.3
Austria	5.1	5.2	5.1
Spain	4.9	4.9	5.1
Luxembourg	5.2	5.0	.
Belgium	4.8	4.8	5.0
Germany	4.7	4.8	4.8
Italy	4.5	.	.
France	4.5	4.5	4.5
Hungary	4.1	4.1	4.3
Slovakia	.	4.0	4.3
Czech Republic	4.3	4.3	.
Cyprus	.	.	4.2
Ukraine	.	4.4	4.1
Poland	3.7	3.6	4.1
Slovenia	4.0	4.1	4.1
Portugal	4.2	3.9	4.1
Greece	3.6	3.8	.
Bulgaria	.	.	3.3

Source: European Social Survey – 2002/2004/2006.
[1)] In marks from 0 – you cannot be careful enough – to 10 – most people can be trusted –, ordered from highest to lowest marks.

Therefore the indicators are restricted to those often used in international studies. For generalised trust we use the question: 'Do you think, in general, that most people can be trusted, or do you think you cannot be careful enough?' The advantage of this indicator is that the present situation in the Netherlands can be compared with that in other countries, and with that in the Netherlands in the past. Moreover, the question pertains to the trust people have in other people, including people they don't know.[1)]

According to the Cultural Changes study by The Netherlands Institute for Social Research/SCP, just over half the Dutch population say that other people can be trusted. This percentage has only fluctuated slightly through the years.[2)]

Compared with other European countries, trust in other people is fairly high in the Netherlands, although it is lower than in the Scandinavian countries (see table 3.1). In other countries, too, scores have remained reasonably stable since 2002.

Table 3.2
Trust in institutions, 2006

	Unlimited + high level of trust	Unlimited + high level + moderate level of trust
	%	
Education	45.1	84.2
Police	32.6	82.3
Business	30.4	81.3
Administration of justice	30.3	73.4
Trade unions	25.4	66.3
Health care system	17.8	71.5
Newspapers	17.8	71.5
Churches/religious organisations	17.3	51.5
House of Representatives	15.2	64.5
Civil servants	12.2	62.4
European Union	11.1	51.4

Source: Netherlands Institute for Social Research/SCP (Culturele Veranderingen 2006).

The second aspect of trust is related to trust in social and political institutions, of which 11 are distinguished (see table 3.2). In principle, trends in trust in institutions are more stable over time than trends in trust in people (including politicians), as institutions are larger and impersonal. When trust in institutions declines, this usually says more about declining trust and decreasing satisfaction in general than the very variable marks awarded to government and politicians.

Of the 11 institutions distinguished, the Dutch trust education and the police the most, and the European Union and civil servants least. If the answers denoting 'trust'

are compared with those denoting 'no trust', over half of the Dutch population trust the institutions concerned.[3] If we raise the bar, and only include answers denoting 'complete trust' and 'high level of trust', all percentages fall below 50. Education still has the trust of 45 percent of the population, civil servants only 12 percent.

The extent of trust varies for various population categories. In particular people with low levels of education, in the centre of the political spectrum and the elderly say they trust social institutions less. The differences between higher and lower levels of education are most noticeable: 17 percent of people with a higher level of education have a low level of trust across the board, for people with low levels of education this is 46 percent (Tammes and Dekker, 2007).
Only a few years ago, the general picture was less rosy. Between 2002 and 2004 in particular, there was a strong decrease in trust in national political institutions. Trust in the government fell by 24 percent points, trust in the House of Representatives by 16 percent points, and trust in political parties by 9 percent points (table 3.3).

Table 3.3
Trust in some public and political institutions, population aged 15 years and older [1]

	Autumn 1997	Spring 1999	Autumn 2001	Spring 2002	Autumn 2003	Spring 2004	Autumn 2004	Autumn 2005	Autumn 2006
More likely to trust than not to trust:	%								
House of Representatives	66	65	71	61	43	45	50	51	54
Dutch government	68	66	73	64	38	40	38	41	49
Political parties	41	41	36	37	28	28	35	34	38
Justice, (national) judicial system	55	61	64	57	51	51	58	61	61
Police	71	72	69	61	60	59	65	73	72
Army	54	71	70	58	55	55	67	68	75
European Union	38	45	66	51	40	40	50	42	45
Average trust in 15 institutions	60	64	61	57	50	50	56	58	60

Source: European Commission (Eurobarometer 1997–2006). Percentages are weighted.
[1] Respondents were asked whether they trusted fifteen institutions (the seven mentioned above plus written media, radio, television, church, trade unions, large businesses, the United Nations and charity organisations); respondents who answered 'don't know' a maximum of five times are counted as not trusting these institutions. In 2006 religious organisations, the internet and consumer organisations replaced the church, large businesses and charity organisations.

These decreases are larger than those in trust in comparable institutions in other European countries (Dekker and Van der Meer, 2004). Immediately before that there was also a strong decrease in trust in the government and the House of Representatives. This development was also observed in other countries (Becker and Dekker, 2005). Roughly speaking, since the turn of the century trust decreased until 2004, and subsequently fluctuated and started to recover slightly.

Table 3.4
Trust in institutions, Europe 2006 and 2008 [1)]

	Average for 15 institutions	Justice	Government		Parliament	
	2006	2006	2006	2008	2006	2008
	%					
Denmark	65	77	53	55	73	76
Finland	64	76	65	61	66	66
Netherlands	**60**	**61**	**49**	**51**	**54**	**56**
Austria	57	75	48	42	55	46
Estonia	57	56	55	56	45	36
Belgium	56	43	52	40	56	48
Luxembourg	56	55	66	55	60	55
Sweden	55	64	48	45	63	60
Malta	55	50	49	56	49	54
Portugal	55	44	38	32	44	39
Slovenia	52	36	44	31	43	31
Ireland	52	47	37	37	39	42
Cyprus	52	63	55	69	54	69
Spain	51	50	43	55	41	54
Greece	51	59	42	34	54	49
Czech Republic	50	37	28	21	20	16
Romania	50	28	29	25	26	22
Slovakia	50	32	41	37	40	34
Germany	48	56	28	36	32	41
France	45	41	25	28	29	35
Italy	45	38	31	15	34	16
Lithuania	44	26	26	17	16	12
United Kingdom	44	47	24	24	31	27
Latvia	44	34	33	15	25	12
Hungary	43	48	26	13	29	15
Poland	42	31	16	26	12	16
Bulgaria	37	17	22	17	15	12

Source: European Commission (Eurobarometer, autumn 2006 and spring 2008).
[1)] Ordered by average in 2006.

The decreasing trust at the beginning of the century occurred in a period of general unrest in the Netherlands. Economic growth was slowing down, and the political arena was a scene of turmoil with the rise and the subsequent assassination of Pim Fortuyn (2002). Outside the Netherlands, too, the world was in upheaval, especially after the events in New York on 9 September 2001. Trust has now apparently returned to its level before this period of turmoil.

If we compare the Netherlands with other European countries for the same social institutions, (reference year 2006), it turns out that on average the Dutch are more trusting than most other countries (table 3.4). Only in Denmark and Finland do people trust institutions slightly more on average. In general terms, the level

of trust is higher in north and west European countries than in east and south European countries.

Although the number of citizens who trusted the government (49 percent) and parliament (54 percent) in 2006 was significantly lower than the average for 15 social institutions (60 percent), in a European perspective these percentages are certainly relatively high. The most recent figures, too, (June 2008) confirm this (unfortunately the average figure for all institutions is not known yet). Moreover, these figures show that trust in both parliament and government have been increasing again in recent years.

Table 3.5
Combination of 'very' and 'fairly' interested in politics

	2002	2004	2006
Denmark	63.1	64.8	67.9
Iceland	.	63.6	.
Netherlands	**66.0**	**61.1**	**63.1**
Sweden	57.5	57.5	61.8
Switzerland	60.6	59.1	56.6
Germany	63.3	56.1	53.8
United Kingdom	52.1	47.3	52.1
Austria	58.7	51.3	50.5
Norway	50.3	49.3	48.0
Finland	46.4	46.0	47.6
Ukraine	.	64.1	47.2
Bulgaria	.	.	46.8
Ireland	46.4	44.5	45.5
France	40.1	37.3	45.2
Belgium	44.9	43.3	44.8
Slovenia	41.9	41.2	43.3
Hungary	46.0	39.8	41.9
Luxembourg	42.9	41.7	.
Estonia	.	37.2	41.6
Poland	40.1	38.3	38.5
Cyprus	.	.	38.1
Slovakia	.	35.9	37.7
Greece	31.5	32.8	.
Italy	32.5	.	.
Portugal	35.9	28.0	28.4
Spain	21.4	28.9	25.8
Czech Republic	31.7	18.7	.

Source: European Social Survey 2002–2006.

Trust of Dutch citizens dipped to its lowest point in 2003, but has recovered slightly since then. If declining trust in parliament and government results in political apathy in the population, the situation can be assumed to be more serious. It was precisely around 2003 that the political engagement of the Dutch population peaked: in the period 1995 to 2006 (self-reported) political engagement was highest

in 2002 and 2004 (Tammes and Dekker, 2007). Compared with other countries, too, political interest is high in the Netherlands (see table 3.5).

3.2.2 Security

So in a European perspective, the Dutch trust each other and social institutions quite a lot, although trust in government and parliament has been dealt a blow. This has not resulted in people feeling less happy, however: the Dutch are among the happiest people in the world. Satisfaction with aspects of their life situation remains high. There is a clear difference between satisfaction with matters close to home, and things that are further away. The SCP formulated it as follows: 'we are satisfied with our own lives, but dissatisfied with society' (Schnabel 2004; Roes, 2003). Not only are the Dutch very happy, their quality of life is also high. The SCP's life situation index (a more objective measurement of quality of life than happiness) has been rising for a number of years now (Boelhouwer, 2007).

A good quality of life, in which people feel comfortable, is important for their bond with society. People have to feel secure in their community. Feeling safe is important in this respect. Low crime rates and a high level of safety – either actual or perceived – are important for a sustainable society. The more people feel safe and protected, the more they will be able and willing to participate actively in society.

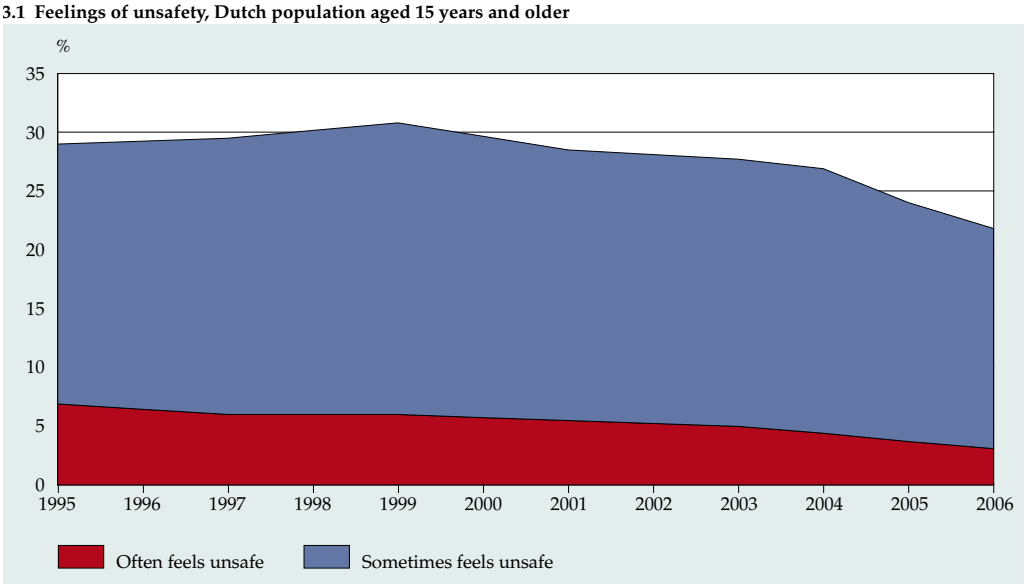
It is often thought that the Dutch are very dissatisfied with respect to crime and safety. However, the figures show that dissatisfaction about safety has diminished in the last ten years. In 1995, 86 percent of the population still thought that 'crime has been increasing in recent years', in 2006 this was down to 64 percent. This decrease is reflected in the percentage of the Dutch population who think that crime is 'a real problem'. In 1995, 84 percent of the population though this was the case, in 2006 this had dropped to 70 percent (Van Noije and Wittebrood, 2007).

However, whether people feel safe not only depends on whether they think crime is a social problem, but particularly also on their personal situation. In 2006, 22 percent of the population said they sometimes did not feel safe. This percentage has not been this low since 1995 (figure 3.1). The share of people who are afraid to be in the house alone (down from 23 percent in 1994 to 16 percent in 2004), or who say their are dangerous places in their neighbourhood also fell (from 35 percent to 29 percent in 2004) (Van Noije and Wittebrood, 2007).

Feelings of fear are apparently a consequence of personal vulnerability, life style and previous victim experiences. Sex and age are important predictors. In contrast with what is generally thought, most older people do not appear to feel unsafe. Young people are much more likely to be afraid of crime. Women clearly feel a lot

less safe than men. And people with a non-western foreign background feel much less safe than people with a native Dutch background. Generally speaking, the study found that the higher the level of education, the safer people feel (Van Noije and Wittebrood, 2007).

3.1 Feelings of unsafety, Dutch population aged 15 years and older



Source: Van Noije and Wittebrood, 2007.

3.2.3 Integration

Asked what they think is the biggest problem in the Netherlands, the Dutch say they are most concerned about the integration of people from ethnic minorities. In 2006 problems concerning ethnic minorities topped the list (mentioned by 39 percent of the population), followed by problems in health care (29 percent) and crime (24 percent) (Tammes and Dekker, 2007; CBS, 2008a). The term 'problems with minorities' includes a wide range of aspects: integration of minorities in society, but also immigration, the influx of refugees and discrimination. It is not clear what exactly 'the problem' is. Moreover, another study showed that the most-mentioned problems in the Netherlands were crime and health care (European Commission, 2007), although here the only ethnic minorities-related possible answer was 'immigration'. Yet another study found that 'living together, norms and values' were the greatest problem, ahead of 'politics and government' and 'integration and immigration' (Dekker and Steenvoorden, 2008). Whatever the case, problems related to ethnic minorities are always high in the polls, however broadly or narrowly the range of problems presented.

That integration is perceived as a problem is also confirmed when citizens are asked whether they feel tension between various population groups. Sixty-one

Table 3.6
Tension between social groups, ordered by tension between racial or ethnic groups [1)]

	Poor and Rich people	Employers and employees	Men and women	Old and young people	Different racial or ethnic groups
France	46	49	12	23	62
Netherlands	**25**	**23**	**9**	**18**	**61**
Belgium	36	34	16	21	60
Greece	58	61	27	27	57
Czech Republic	44	36	7	16	56
Hungary	61	47	11	19	55
Malta	27	33	20	19	50
United Kingdom	23	26	17	17	48
Ireland	28	27	12	15	46
Sweden	24	16	10	10	45
Slovakia	49	42	5	14	43
Spain	32	37	20	14	42
Slovenia	43	49	10	21	42
Austria	30	29	13	22	41
Italy	21	30	7	8	40
Denmark	4	6	7	3	39
Germany	36	34	7	13	38
Finland	21	17	8	9	37
Portugal	24	24	10	10	36
Romania	53	49	17	29	33
Luxembourg	21	22	18	15	25
Poland	52	53	9	17	23
Latvia	44	26	4	19	19
Cyprus	18	18	11	9	16
Estonia	50	20	6	17	13
Bulgaria	54	37	9	17	13
Lithuania	62	53	9	19	10

Source: Alber *et al.* (2004), p.72.
[1)] Percentage of people who say there is 'a lot of tension' between the groups concerned.

percent of the Dutch population say there is a lot of tension between ethnic groups. This is the second highest percentage in Europe, after France. This is therefore a considerable problem for social cohesion in the Netherlands. Asked whether there is tension between rich and poor, men and women, or young and old people, the Dutch population answer negatively (table 3.6). According to one quarter of the Dutch there is tension between rich and poor. Compared with other European countries, the percentages are low.

In spite of the reported tension between ethnic groups, Dutch citizens are not negative about immigration per se. In a comparative European survey in 2007 (a special Eurobarometer on 'social reality'), an 'immigration scale' was constructed on the basis of five questions which comprised a mix of positive aspects of immigration (solves the problem of ageing; provides workers needed in some sectors; enriches Dutch culture) and negative aspects (fewer people feel safe; concerns about unemployment)[4)] The Netherlands had a more positive score on this scale than the average for Europe, and was in sixth place after the Scandinavian countries and just behind France.

Table 3.7
Percentage of people who describe themselves as belonging to a group that is discriminated against

	2002	2004	2006
Italy	2.4	.	.
Ukraine	.	2.4	2.7
Cyprus	.	.	3.2
Denmark	4.4	4.1	3.4
Switzerland	5.0	5.4	3.5
Portugal	2.2	2.1	4.0
Slovenia	5.5	.	4.1
Ireland	5.9	3.5	4.2
Austria	6.0	6.3	4.2
Norway	4.9	6.6	4.3
Czech Republic	3.5	4.5	.
Spain	5.7	5.8	4.5
Poland	3.6	4.6	4.7
Belgium	6.6	6.5	4.9
Germany	4.4	4.4	5.0
Greece	6.9	5.2	.
Luxembourg	5.6	5.4	.
Hungary	5.1	5.2	5.4
Slovakia	.	5.8	6.3
Finland	8.3	6.7	7.4
Netherlands	**7.1**	**6.8**	**7.5**
Sweden	8.0	7.1	7.5
Bulgaria	.	.	7.8
France	9.8	8.9	10.5
United Kingdom	13.6	10.7	13.4
Iceland	.	13.6	.
Estonia	.	9.9	14.3

Source: European Social Survey 2002–2004–2006; percentages are weighted.

Although integration is always assumed to concern ethnic minorities, the concept can be broadened to include minorities in terms of sexual inclination or religion. Networks that generally have a positive effect on social cohesion in a community may have a downside if they exclude people. In those cases, discrimination may arise.

In 2006 7.5 percent of the Dutch population said they would describe themselves as belonging to a group that is discriminated against (see table 3.7). This includes many forms of discrimination, in terms of ethnicity, sexual inclination, language or religion. This is one of the highest percentages in Europe.

In the course of time, opinions of the population on how the country was becoming 'coloured' have become more open-minded. Support for the opinion that too many people of non-Dutch origin are living in the Netherlands was significantly higher in 2000 than in 1995, but fell subsequently (table 3.8). In 2006, 41 percent of the population supported this opinion, the same share as in the mid-1990s. The Dutch have been less opposed to foreigners in the Netherlands in recent years and

are increasingly accepting immigrants in their own sphere of life, for example as neighbours. The percentage of people who said they would not like this to happen rose between 1995 and 2002. In 2004 it fell substantially, and in 2006 it dropped even further (Tammes and Dekker, 2007).

Table 3.8
Opinions on some immigration issues in Dutch society, population aged 16 years and older [1)]

	1995	1996	2000	2002	2004	2006
	%					
Immigration and integration:						
There are too many people with a foreign nationality in the Netherlands	43	40	51	48	47	41
Wouldn't like to have neighbours of a different race	43	46	52	57	44	40
Immigrants should hold on less to their own culture	54	52	60	61	64	61
Immigrants should make more effort to learn to speak Dutch	95	90	96	96	95	95

Source: SCP (Culturele Veranderingen 1995–2006).
1) Percentage who agree with the statement.

The population seem to have more problems with how people from outside the Netherlands behave here, than the actual fact that they live here. The opinion that they should be more open to Dutch culture has gained a lot of support: from 54 percent in 1995 and 60 percent in 2000 to 64 percent in 2004; this increase did not continue to 2006. Support for the opinion that they should make more effort to learn to speak Dutch has remained steady, at 95 percent.

Asylumseekers can be distinguished as a separate group within the group of people with a foreign background. They are an important group in the immigration debate. The percentage of people who thought that there were too many people with a foreign background in the Netherlands fell by 10 percent points between 2000 and 2006. Opinions about whether asylumseekers should be granted residence permits remained stable (table 3.9), although there is a clear difference between political and economic asylumseekers. More than twice as many Dutch people think the government should be more lenient for political asylumseekers, as the number who think that they should be more lenient for economic refugees. The support for leniency for 'imported brides' of first and second-generation immigrants fell, but rose again in 2006. Many more people support the granting of a residence permit for an imported bride for a first-generation than for a second-generation immigrant. There is widespread support in the country for the rule that asylumseekers who have not been granted residence should be deported. This support has been falling slightly in the last years, however.

One interesting way to find out how social cohesion in the Netherlands is developing is to examine what the four largest ethnic groups (Surinamese, Antilleans, Turks and Moroccans) think of each other, and what they think of the native Dutch.

Table 3.9
Opinions on asylumseekers in the Netherlands

	1995	2000	2002	2004	2006
Asylumseekers:					
The government should be lenient with respect to granting resident permits to political asylumseekers	79	79	77	81	82
The government should be lenient with respect to granting resident permits to economic asylumseekers	31	33	32	35	39
The government should be lenient with respect to granting resident permits to spouses of asylumseekers living legally in the Netherlands	67	.	56	55	60
The government should be lenient with respect to granting resident permits to future spouses of sons of asylumseekers living legally in the Netherlands	50	55	33	32	40
Asylumseekers whose application has been rejected should be deported	.	.	85	82	78

Source: SCP (Culturele Veranderingen 1995–2006).

Native Dutch people do not judge all ethnic groups equally, but apply a clear hierarchy. On average they are most negative about Moroccans and Antilleans, and are considerably milder in their judgement of Surinamese (Dagevos and Gijsberts, 2007). Among the ethnic groups themselves, the same division can be seen: on average all foreign groups are least positive about Moroccans and Antilleans and more positive about Turks and Surinamese (table 3.10). Where Moroccans are reasonably positive about Turks, this is much less so the other way around. The same is true for Surinamese and Antilleans: Antilleans are much more positive than vice versa. Compared with figures from 2004/2005 these opinions have hardly changed (Dagevos en Gijsberts, 2007).

Table 3.10
Opinions of ethnic groups on other ethnic groups, on a scale of 0 to 100[1)], persons aged 15 years and older, 2006

	On Turks	On Moroccans	On Surinamese	On Antilleans	On native Dutch	On immigrants	On asylum-seekers
	average scores						
Turks		45	48	37	66	72	43
Moroccans	60		57	49	66	65	55
Surinamese	55	46		48	71	74	53
Antilleans	54	48	62		67	62	54
Native Dutch	55	45	58	48		68	54
Total	56	46	56	45	67	68	52

Source: SCP (Survey Integratie Minderheden 2006). Results are weighted.
[1)] Respondents were asked to indicate what they thought of the various population groups, on a scale of 0 (very negative feelings) to 100 (very positive feelings).

Surprisingly, the four foreign groups are more positive about the native Dutch than about other foreign groups. The opinions of the four foreign groups about native people are also generally more positive than vice versa. Asylumseekers do not have a good reputation among the four ethnic groups, Turks in particular are very negative about them. Asylumseekers are in slightly higher esteem than Moroccans and Antilleans, but lower than Turks and Surinamese. Asylumseekers cannot therefore count on more goodwill from ethnic groups that have been in the Netherlands for a longer period of time than from the native Dutch population. The opinions of native Dutch people about asylumseekers hardly differs from that about groups who have been in the Netherlands for a longer period (with the exception of Moroccans and Antilleans, about whom they are clearly more negative) (Dagevos en Gijsberts, 2007).

3.2.4 Perceived problems for future generations

We have discussed problems in the context of the social capital approach, and two problems which the Dutch see in today's society. But what do the Dutch see as problems for future generations? What problems will their children face? In a special Eurobarometer survey on 'social reality' in 2007, respondents were asked to name the most important problems for future generations (table 3.11). From a list of 17 topics they had to choose three which they saw as the main problems their children would have to face. For the Dutch, the environment was top of list, way ahead of problems also mentioned as urgent today (crime, health care and concerns about neighbourliness). Immigration was mentioned by only 4 percent, and integration by only 15 percent.

In Europe, unemployment came out as the number one problem for the future (mentioned by 40 percent of European citizens), followed by concerns about pensions (30 percent). Compared with other Europeans, the Dutch predict much fewer problems with economic issues in the future, which provides room for other topics to score higher.

One remarkable result is that compared with other European countries, a high percentage (28 percent) of Dutch people say they are worried about whether people will still be willing to help each other out in the future. This is an indication of doubt about social cohesion in the Netherlands.

3.3 Participation

One important aspect of social capital is participation. Trust and participation correlate: the less people trust each other and political and social institutions, the less willing they are to participate. If people do not trust each other, new social networks will not come into existence, and existing ones will disappear. These

networks are important for a number of reasons; they help people to take part in social life, for example by making it easier to find work. In addition, networks are important for sharing values and norms; members of networks are more likely to share common values and norms that outsiders, as information is exchanged and shared. In the framework of sustainability, participation in social life is very important. Participation on the labour market is necessary to keep the economy going. In addition broader social participation results in network formation.

In this section the concept of participation is defined broadly. It includes not only doing paid work, but also volunteer work and participation in education. Education is primarily relevant for young people: by teaching them knowledge and skills it gives them a basis for social participation later in life. The idea of lifelong learning does prove, however, that in principle opportunities for individual development need never end. Indeed, education is important for the innovative power of society.

3.3.1 Labour market participation

Labour market participation can be divided into gross and net labour market participation. Gross participation refers to the share of 15–64 year-olds who work for at least twelve hours a week, or who are not in work but are available to work and are looking for a job of at least 12 hours a week. Between 1996 and 2002 the gross participation rate rose from 64 percent to 68 percent, to remain stable subsequently (table 3.12). The net participation rate shows the share of 15–64 year-olds *who actually have a job* of at least twelve hours a week. Logically, this measure is more sensitive to economic developments than gross participation. Between 1996 and 2002, when the economy improved, the net participation rate rose from 59 percent to 65 percent. The subsequent recession was accompanied by a fall, to 63 percent in 2004 and 2005. In 2006 the share of active participants in the labour process rose again, however, to reach the highest level of the last ten years in 2007 (66 percent). More people have started to work part-time in particular. This was one of the reasons that that the share of full-time workers (at least 36 hours a week) has fallen substantially in the last 10 years. In 1996, 72 percent of the employed labour force worked full-time, in 2006 this share had fallen to 63 percent or 4.5 million people (Vrooman *et al.*, 2007a).

The unemployment rate was lowest (4 percent) in the economic boom years 1999–2002. Between 2002 and 2005 it rose to 7 percent, to fall subsequently to 5 percent in 2007 (table 3.12).

The ratio of economically inactive to economically active people – the I/A-ratio – can be used as a rough indicator for the development in participation in Dutch society (table 3.13). In 1995 there were 78 non-workers for every 100 workers. In the period up to 2002 the I/A ratio decreased to 65, mainly as a result of the increase

Table 3.11
The most important problems Europeans see for future generations

	Pensions	Immigration	Health care	Terrorism	Integration of immigrants	Helping others	Cost of living
	%						
EU25	**30**	**10**	**17**	**23**	**7**	**7**	**26**
Belgium	32	10	18	12	10	10	32
Czech Republic	40	5	21	27	4	13	23
Denmark	9	14	19	39	17	23	6
Germany	47	4	20	21	5	8	12
Estonia	10	6	24	14	5	8	34
Greece	21	7	8	16	8	4	31
Spain	17	22	5	29	4	2	30
France	36	7	13	13	6	6	30
Ireland	15	10	31	15	12	8	31
Italy	30	19	11	28	12	7	32
Cyprus	10	3	7	14	20	9	38
Lithuania	8	9	23	15	2	5	28
Latvia	10	11	38	8	2	7	29
Luxembourg	32	5	12	13	7	5	19
Hungary	14	3	36	6	2	4	48
Malta	40	15	15	12	10	4	31
Netherlands	**16**	**4**	**24**	**23**	**15**	**28**	**15**
Austria	40	19	21	17	15	8	21
Poland	31	6	17	24	3	4	26
Portugal	28	6	27	18	5	4	38
Slovenia	32	4	19	12	4	8	24
Slovakia	24	7	18	34	3	10	24
Finland	21	6	26	19	4	14	16
Sweden	17	7	17	17	10	15	10
United Kingdom	25	13	20	30	5	6	32
Bulgaria	7	7	28	22	5	3	37
Romania	18	12	38	18	3	4	32

Source: Special EUROBAROMETER 273 "European Social Reality" Report 2007.

Table 3.12
Labour supply in the Netherlands

	1996	2000	2001	2002	2003	2004	2005	2006	2007
	%								
Gross participation [1]	64	67	67	68	68	68	68	68	69
Net participation [2] [3]	59	65	65	65	64	63	63	65	66
Unemployment	8	4	4	4	5	7	7	6	5

Source: Statistics Netherlands (StatLine; Labour Force Survey).
[1] Labour force as a percentage of the total population aged 15–64 years.
[2] People with a paid job as a percentage of the total population aged 15–64 years.
[3] These percentages differ from those in table 2 at the back of this book. Here they refer to people who have a job of at least 12 hours a week, while the percentages in table 2 include jobs of at least 1 hour a week (used for international comparisons).

Economic growth	Care for the elderly	Care for the disabled	Unemployment	Crime	Gap between rich and poor	Transport	Education	Environment	Globalisation
10	**10**	**2**	**40**	**25**	**16**	**1**	**18**	**24**	**6**
17	10	2	44	19	15	2	15	26	7
8	8	3	30	26	15	2	7	24	9
8	16	3	9	33	20	2	13	40	9
7	13	2	49	20	30	1	19	17	6
8	6	4	19	31	19	2	33	25	7
19	2	2	66	38	16	0	22	23	10
6	7	1	38	19	7	1	20	27	4
13	7	2	53	11	16	1	25	35	11
11	17	4	19	35	14	9	17	23	10
14	5	2	43	29	10	1	6	17	3
15	6	1	49	46	21	1	30	12	11
21	5	2	24	30	14	1	47	22	7
29	4	2	29	32	9	2	41	10	4
11	6	3	51	22	10	2	25	29	15
25	10	1	52	8	10	2	35	13	6
16	6	4	34	18	9	1	23	21	8
5	**22**	**3**	**11**	**26**	**22**	**3**	**18**	**41**	**6**
8	16	4	39	20	17	2	8	14	7
4	10	3	41	33	17	1	15	12	4
14	7	3	48	22	12	2	25	21	3
6	6	2	43	29	25	2	14	22	11
8	9	3	30	34	24	2	12	27	8
7	27	3	25	29	25	1	8	35	7
9	14	1	37	29	20	2	10	63	8
7	9	3	24	38	7	3	23	28	7
27	7	2	33	28	22	2	23	12	6
31	6	3	22	12	21	3	31	14	5

Table 3.13
Ratio of inactive to active people in labour force

	1995	2000	2001	2002	2003	2004	2005	2006
I/A ratio (x 100)	78.1	66.7	64.6	65.2	65.9	67.3	69.0	68.3
Idem, excl. pensioners	39.3	30.4	29.2	29.3	29.5	29.9	30.5	29.6

Source: Vrooman *et al.*,2007a.

in the number of workers. It subsequently rose slightly, to 2006, after which it fell again (68). The share of over-65s is very significant in the ratio: if we leave this age group out of the calculation, there would have been 30 non-workers for every 100 workers in 2006. Ten years previously, the I/A ratio without the over-65s would have been ten points higher (Vrooman *et al*, 2007a).

3.3.2 *Voluntary work and informal help*

Alongside paid labour, unpaid labour is also very important for a society to function well. Unpaid work includes volunteer work for organisations and clubs, as well as informal help and care for others. It is not easy to measure the nature and size of volunteer work in the Netherlands, though: there are no unequivocal figures. Various studies give various percentages of people who undertake activities on a voluntary basis. Figure 3.2 presents figures from the Cultural Changes study by the SCP. Participation in various volunteer activities hardly fluctuated between 1994 and 2000, but after 2000 it started to rise and fall more severely. Up in 2002 and down in 2004 and 2006, or in other words a sharp drop between 2002 and 2004 (Van den Broek *et al.*, 2007). According to this study about one quarter of the Dutch population did some form of voluntary work. As stated above, other sources give other percentages, so that no clear pronouncements can be made about the development.

Table 3.14
Voluntary work, club membership and informal help in 2002; social contacts in 2006

	Voluntary work	Membership	Informal help	Social contacts
	%			
Norway	26	80	65	78
Sweden	22	86	67	71
Netherlands	**20**	**75**	**76**	**77**
United Kingdom	18	64	61	70
Germany	18	64	78	55
Denmark	17	89	72	74
Belgium	16	62	71	70
France	15	42	–	66
Slovenia	14	45	74	53
Ireland	12	61	58	68
Austria	11	72	81	72
Finland	9	73	54	68
Luxembourg	9	72	56	69[1)]
Hungary	8	25	61	34
Spain	6	32	44	79
Greece	6	23	55	30
Portugal	5	25	67	87
Poland	5	19	52	45
Italy	4	32	44	63[2)]
Switzerland	.	.	85	76
Slovakia	.	.	.	62
Bulgaria	.	.	.	57
Estonia	.	.	.	57
Ukraine	.	.	.	51
Cyprus	.	.	.	44
Czech Republic	.	.	40	44[1)]

Source: European Social Survey 2002, 2004, 2006. Respondents were asked if they were members of, donated to or did voluntary work for one of 11 specified organisations, or another organisation. All respondents answering 'yes' at least once are counted.
[1)] 2004.
[2)] 2002.

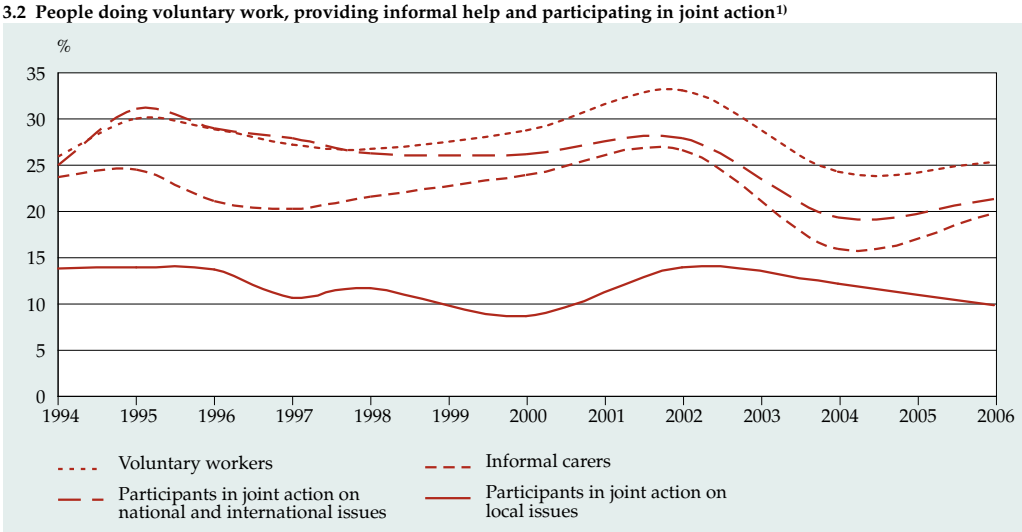
If we compare the Netherlands with other European countries, it is in the top three countries in terms of the number of passive members ('subscription membership') and active participation (table 3.14).

Voluntary work and membership of clubs and associations are indicators of social engagement and provide opportunities for network building and mutual relationships between citizens. Other networks can be formed through contacts people have with family, friends and co-workers. The last column in table 3.14 presents the percentage of people who meet up with someone from one of these groups at least once a week; these figures refer explicitly to the social context of the meeting, not to work-related contacts.

In 2006, 77 percent of the Dutch population had such a meeting at least once a week. This is reasonably high compared with the rest of Europe.

In addition to club membership and voluntary work, offering to help others is an important aspect of a caring community. Figure 3.2 shows that about 20 percent of the Dutch population are informal carers and that this percentage changes in time. The third column in table 3.14 shows that not only the amount of voluntary work, but also the amount of informal help in the Netherlands is fairly high compared with the rest of Europe.

3.2 People doing voluntary work, providing informal help and participating in joint action[1)]



Source: SCP (Culturele Veranderingen 1994–2006).
[1)] Participant in joint action: people who say they have undertaken some activity, along with others, in aid of a local, national or international problem.

In spite of the high scores, not all social groups participate in equal measure. Young people in particular are not very active in unpaid work like informal care. People with low education levels, too, are relatively likely not to do voluntary work, but are not less likely to provide help on an informal basis. They are thus the mirror image of people with high education levels, who do more voluntary work, but are less likely to provide informal care. The group aged 35–64 years are the most active of all age groups in both areas (De Hart and Devilee, 2005).

The various forms of participation correlate: volunteers are more active in informal care than non-volunteers. Social contacts, too, are not isolated, but correlate with social participation. The more active people are, the more social contacts they have (De Hart en Devilee, 2005).

Up to now we have talked about the share of people who participate in society. Although this gives an indication of the number of people who participate, it says nothing about the intensity with which they do so. The intensity of participation can be derived from the amount of time people spend on various forms of participation.[5)] In the last thirty years the average time the Dutch spend on social participation has decreased from just under 15 to just under 11 hours (see table 3.15). At the same time, the amount of time spent on paid work rose from nearly 15 to nearly 20 hours. In general the Dutch have been leading busier lives since 1975: the time spent on commitments (paid work, education, care) has increased by 3.5 hours, while the amount of leisure time (which includes social participation but also media use, going out, sports) dropped by just over 3 hours (Breedveld *et al.*, 2006).

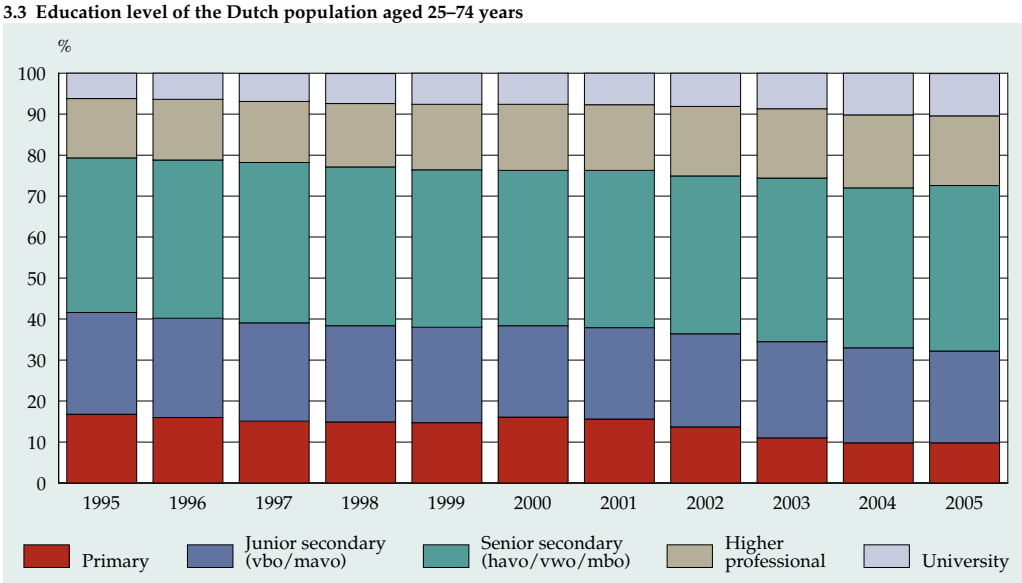
Table 3.15
Time spent on social participation and on paid work

	1975	1980	1985	1990	1995	2000	2005
Social contacts	12.7	12.5	11.5	11.4	10.9	10.1	9.1
Social participation (excl. journey time)	2.0	2.0	2.2	2.1	2.2	1.8	1.8
Total social participation	14.7	14.5	13.7	13.5	13.1	11.9	10.9
Labour (incl. work-related journey time)	14.8	14.0	14.1	16.6	17.3	19.4	19.7

Source: Tijdsbestedingsonderzoek 1975–2005, results processed by SCP.

How people use their time is not the same for the various groups in the population. Obviously, people who work lead busier lives – i.e. they have more commitments – than people who do not work. And combining work with care also results in an extra busy life. A last important trend is that women have been spending more and more time on paid work in the last thirty years; an increase of 6.5 hours, while the increase for men in the same period was 2.6 hours (see www.tijdsbesteding.nl).

3.3 Education level of the Dutch population aged 25–74 years



Source: Statistics Netherlands (Labour Force Survey 1991–2005). Results processed by SCP.

3.3.3 Education participation

Participation in education has been growing in the Netherlands for a number of years now, and each successive birth cohort is leaving the formal education system with a higher level than its predecessor. After formal education, the education level of the cohort increases further as a result of participation in adult education, although the effect of this is small. The result is a continued increase in the level of education of the adult population (Herweijer and Bronneman-Helmers, 2007). Figure 3.3 presents the increase for the period 1995–2005. The share of people with higher education in the population aged 25–74 years was just over 27 percent in 2005, about 7 percent points higher than in 1995. The percentage of people who had only completed primary school fell from 17 percent to just under 10 percent in the same period. In 2005, 71 percent of the age group 25–64 years – the potential labour force – had a basic qualification (at least general senior secondary/pre-university education (*havo/vwo*) or senior secondary vocational education (*mbo*)).

We can break down the increase in the education level in more detail if we look at the youngest birth cohorts (born in 1970–1974 and 1975–1979). The share of people with higher education in these cohorts is now 33 percent and 35 percent, while only 5 percent of them have completed only primary education; 79 percent and 81 percent respectively have a basic qualification (Herweijer and Bronneman-Helmers, 2007). The indicator for early school leavers shows the share of 18–24 year-olds who have not completed senior secondary education and are no longer in education, as a percentage of all 18–24 year-olds. According to the EU indicator, 12.0 percent of

18–24 year-olds had left school without a senior secondary qualification in the Netherlands in 2007 (table 3.16). The average school drop-out rate in the EU-27 is 14.8 percent; so the Netherlands is doing better than the European average. In fact, together with Germany, Luxembourg, France, the United Kingdom and Belgium, the Netherlands is in the middle group with a score that is clearly better than that of the southern European countries, but certainly not as good as those of the Scandinavian countries, Austria and the non-EU countries Switzerland and Norway (Herweijer, 2008). The Dutch score on the indicator for early school leavers has improved in recent years. And the Netherlands is not alone here, but the decrease is stronger than average (EU-15 3.1 percent down; the Netherlands 3.5 percent down).[6)]

Table 3.16
School drop-outs [1)]

	2000	2005	2007
	%		
EU 27	17.6	15.5	14.8
Croatia	.	4.8	3.9
Slovenia	.	4.3	4.3
Poland	.	5.5	5.0
Slovakia	.	5.8	7.2
Switzerland	7.3	9.7	7.6
Finland	8.9	9.3	7.9
Lithuania	16.7	9.2	8.7
Hungary	13.8	12.3	10.9
Austria	10.2	9.0	10.9
Ireland	.	12.3	11.5
Netherlands	15.5	13.6	12.0
Belgium	12.5	13.0	12.3
Denmark	11.6	8.5	12.4
Cyprus	18.5	18.1	12.6
Germany	14.9	13.8	12.7
France	13.3	12.0	12.7
Estonia	14.2	14.0	14.3
Greece	18.2	13.3	14.7
Luxembourg	16.8	13.3	15.1
Latvia	.	11.9	16.0
Bulgaria	.	20.0	16.6
Romania	22.3	20.8	19.2
Italy	25.3	21.9	19.3
Spain	29.1	30.8	31.0
Portugal	42.6	38.6	36.3
Malta	54.2	41.2	37.6
Czech Republic	.	6.4	.
Sweden	7.7	11.7	.
United Kingdom	18.4	14.0	.

Source: Eurostat website (18 August 2008).
[1)] Percentage of 18–24 year-olds who have not completed senior secondary education and are not in education, as a percentage of the total population aged 18–24 years.

3.4 *Social inequality*

Social inequality may lead to less trust and thus to less participation. If differences come into existence between groups in society, the chance of 'bridging social capital' (contacts and trust between groups of citizens from varying backgrounds) lessens. There is a risk that people will turn away from each other or restrict themselves to their own network. In itself this need not be a serious matter, but for a sustainable society it is important that individuals, and groups, remain in contact with each other. This contact is easier when the differences between the groups are not too large, although it is difficult to define what constitutes too large. What is important is that there is a certain degree of equality and solidarity in society.

Social inequality may concern inequality of *opportunities and possibilities* and inequality of *results*. Inequality of opportunities are, for example, inequalities in income and in level of education. Inequality of *results* are differences in socio-economic health differences or housing market segregation. Both forms of inequality may damage social cohesion in society and thus contribute to a reduced sustainability.

3.4.1 Income inequality

There are two standard measures to examine the extent of income inequality: the Gini and the Theil coefficients. For the period 1995–2000 these measures show that income inequality in the Netherlands was almost stable (table 3.18).[7)] After 2000, income inequality decreased somewhat to rise again slightly in 2004. Across the whole of the last decade (and taking into account the break in series) there was hardly any change in the degree of income inequality in the Netherlands (Vrooman *et al.*, 2007a).
Compared with Europe, income inequality in the Netherlands is less than average (table 3.17).

Income inequality can also be observed from the viewpoint of how much poverty there is. To determine the level of poverty in the Netherlands, The Netherlands Institute for Social Research/SCP recently presented two variants. According to the *basic-needs* criterion a person is poor if he or she does not have enough income to pay for what is absolutely necessary to live on in the Netherlands: food and clothing, housing and other obligatory costs. The *modest-but-adequate* criterion is slightly higher; it also allows for a limited amount to be spent on social participation. Unlike the low income threshold which was traditionally used in poverty studies, the new criteria are explicitly related to people's needs (Vrooman *et al.*, 2007a).[8)]
According to the *modest-but-adequate* criterion the share of poor people fell slightly between 1995 and 2000, from 7 percent to 6 percent (table 3.18). After the tax reforms of 2001, it fell further to just over 5 percent. From that moment on, with the economy sliding, poverty started to rise again, to reach just over 6 percent in 2005.On the basis of the *basic-needs* criterion the trend was roughly the same,

although the levels were obviously lower (3 to 4 percent of the Dutch population). In terms of the low income threshold, poverty fell until 2002, then rose again to nearly 9 percent of the population in 2005 (Vrooman *et al.*, 2007a).

Table 3.17
Gini coefficient for European countries [1)]

	1995	2000	2005	2006
EU-15	31	29	30	29
Bulgaria	.	25	25	24
Denmark	20	.	24	24
Slovenia	.	22	24	24
Sweden	.	.	23	24
Czech Republic	.	.	26	25
Austria	27	24	26	25
Netherlands	**29**	**29**	**27**	**26**
Finland	.	24	26	26
Iceland	.	.	25	26
Germany	29	25	26	27
France	29	28	28	27
Belgium	29	30	28	28
Luxembourg	29	26	26	28
Malta	.	30	28	28
Slovakia	.	.	26	28
Cyprus	.	.	29	29
Norway	.	.	28	30
Spain	34	32	32	31
Ireland	33	30	32	32
Italy	33	29	33	32
United Kingdom	32	32	34	32
Estonia	.	36	34	33
Hungary	.	26	28	33
Poland	.	30	36	33
Romania	.	29	31	33
Greece	35	33	33	34
Lithuania	.	31	36	35
Portugal	37	36	38	38
Latvia	.	34	36	39

Source: Eurostat website (18 August 2008).
[1)] Ordered by 2006; 0= perfect equality; 100=perfect inequality – i.e. one person owns all income.

Poverty is not distributed evenly across the population (table 3.18). Three main (and partly overlapping) high-risk groups can be distinguished: benefit claimants (26 percent were poor in 2005 according to the *modest-but-adequate* criterion), single-parent families (23 percent) and people with a non-western foreign background (18 percent). Singles, and children too, have a higher risk of being poor (both around 9 percent). The poverty percentage of the high-risk groups follows the generally downward trend in the period 1995–2004 (Vrooman *et al.*, 2007a).

Table 3.18
Income inequality, personal poverty and wealth

	1995	2000	2000[1)]	2001[1)]	2002[1)]	2003[1)]	2004[1)]	2005[1)]
	coefficient							
Income inequality								
Gini coefficient	0.230	0.229	0.242	0.244	0.241	0.239	0.244	0.242
Theil coefficient	0.086	0.087	0.111	0.109	0.107	0.103	0.110	0.107
	%							
Poverty[2)]								
According to basic-needs criterion	3.4	3.6	3.6	2.9	3.2	3.7	3.5	3.7
According to modest-but-adequate criterion	7.1	6.4	6.5	5.4	5.7	6.3	5.9	6.1
single-parent families	35.8	26.8	25.2	21.5	22	22.3	20.6	22.6
benefit claimants	35.1	30.3	29.2	27.1	26.2	26.9	25.4	26.2
non-western background	29.4	20.2	19.6	17.9	16.9	18.4	17.3	17.9
children (1–17 years)	10.9	9.5	9.9	8.2	8.8	9.5	9	9.1
single people	12.4	10	9.9	9.2	8.8	9.6	8.7	9.6
over-65s	4.9	3.6	3.3	3.3	2.9	2.8	2.4	2.6
According to low-income threshold	12.8	9.8	10.4	8.3	8.1	8.8	8.6	8.9

Source: Statistics Netherlands (Inkomenspanelonderzoek 1995–2005). Results processed by SCP.
1) After revision.

To compare poverty figures in Europe, poverty is defined as the share of people with a standardised disposable household income of less than 60 percent of median income.[9)] According to this calculation method, 16 percent of the population in the 25 countries of the European Union had an income under the poverty threshold in 2006 (table 3.19). The share was much smaller in the Netherlands: only 10 percent of the population was poor according to this definition. This put the Netherlands in first place, along with Iceland and the Czech Republic.

The relative character of the European poverty threshold is reflected in the fact that there is no correlation between the level of average income, and the extent of poverty. Although the populations of Hungary and Slovakia, for example, have to live on a considerably lower income than the population of Luxembourg, Germany and France, in 2005 the extent of poverty was the same for all five countries (Vrooman *et al.*, 2007b).

3.4.2 Inequality in labour market participation

The differences in income are partly related to differences in labour market participation. The average gross labour participation is 69 percent in the Netherlands, net participation is 66 percent. Women, older and young people, people with a non-western foreign background and people with low education levels are less likely than average to have a paid job.

Table 3.19
Poverty in Europe [1)]

	1995	1999	2000	2005	2006
EU25	.	.	.	16	16
EU15	17	15	15	16	16
Czech Republic	.	.	.	10	10
Netherlands	**11**	**11**	**.**	**11**	**10**
Iceland	.	.	.	10	10
Norway	.	.	.	11	11
Denmark	10	10	.	12	12
Slovenia	.	.	.	12	12
Slovakia	.	.	.	13	12
Sweden	.	8	.	9	12
Germany	15	11	10	12	13
France	15	15	16	13	13
Austria	13	12	12	12	13
Finland	.	11	11	12	13
Luxembourg	12	13	12	13	14
Malta	.	.	.	15	14
Belgium	16	13	13	15	15
Cyprus	.	.	.	16	16
Hungary	.	.	.	13	16
Estonia	.	.	.	18	18
Ireland	19	19	20	20	18
Portugal	23	21	21	19	18
Poland	.	.	.	21	19
Romania	.	.	.	18	19
United Kingdom	20	19	19	19	19
Spain	19	19	18	20	20
Italy	20	18	18	19	20
Lithuania	.	.	.	21	20
Greece	22	21	20	20	21
Latvia	.	.	.	19	23

Source: Eurostat website (18 August 2008).
[1)] Percentage of people with a standardised disposable income lower than 60% of the median income (after social transfers).

In the period 1996–2007 the net participation of *women* rose by 12 percent points to 57 percent (table 3.20). Unlike many other groups, their participation did not decrease during the economic slowdown between 2002 and 2005. The annual unemployment rate for women is consistently slightly higher than the overall rate, but shows the same economy-related ups and downs. A growing share of working women work part-time. In 1996 this was 58 percent, in 2005 it was 68 percent. This puts the strong increase in the net participation rate somewhat into perspective, as the increase is not an increase in full-time workers (Vrooman *et al.*, 2007a).
The participation of *older people* (55–64 years) rose continuously from 1996. In that year it was 26 percent, by 2006 it had risen to 42 percent. A 2006 report on the elderly in the Netherlands (*Rapportage ouderen 2006*) showed that this rise, was very strong in an international perspective, for both men and women. Traditionally unemployment among older groups varies slightly with the economy, but is consistently low.

Table 3.20
Labour supply in the Netherlands

	1996	2000	2001	2002	2003	2004	2005	2006	2007
	%								
Gross participation[1)]	63	67	67	68	68	68	68	68	69
Women	50	55	56	57	57	58	59	60	61
55–64 year-olds	28	35	36	39	40	41	42	44	45
15–24 year-olds	45	47	49	48	47	46	44	44	44
Non-western foreign background	51	54	55	55	56	56	56	55	.
Primary education	34	40	39	39	39	39	38	40	.
Junior secondary education	54	55	57	55	55	55	54	53	.
Net participation[2)]	59	64	65	65	64	63	63	65	66
Women	45	52	53	54	54	54	54	56	57
55–64 year-olds	26	34	35	37	38	39	40	42	42
15–24 year-olds	40	44	45	44	42	39	38	39	40
Non-western foreign background	40	48	50	49	47	47	47	47	.
Primary education	29	37	36	36	35	33	33	35	.
Junior secondary education	49	52	54	52	51	51	49	49	.
Unemployment	8	4	4	4	5	7	7	6	5
Women	11	5	5	5	6	7	8	7	6
55–64 year-olds	4	3	2	3	4	5	6	6	5
15–24 year-olds	13	7	7	9	11	14	13	11	9
Non-western foreign background	22	11	9	11	15	16	16	16	.
Primary education	16	8	8	7	8	11	13	13	.
Junior secondary education	9	5	5	6	7	8	9	7	.

Source: Statistics Netherlands (StatLine; Labour Force Survey). Results processed by SCP.
1) Labour force as a percentage of the total population aged 15–64 years.
2) People with a paid job as a percentage of the total population aged 15–64 years.

People with low education levels are less likely than average to have a job. Net participation of people without a qualification (i.e. whose maximum level of education is primary school) is about one third, that of people with a qualification at the lowest level of secondary education about half. Participation rates of both groups rose substantially between 1996 and 2000/2001 (by 8 and 5 percent points respectively), but afterwards they fell again. In 2006, the net participation rate of people with low levels of education rose again, however, to 35 percent. In the group who had completed junior secondary education it remained stable in 2006 at 49 percent. Unemployment rose by more than average for both groups from 2002.
Among people with a *non-western foreign background*[10)] the participation rate rose strongly between 1996 and 2001, from 40 to 50 percent. It subsequently fell back to 47 percent in 2003 and remained at that level to 2006. In spite of an increase since the mid 1990s, participation of this group is still far behind the overall average. The vulnerable position of this group is also reflected in the unemployment rate, which is three to three and a half times that of the native Dutch labour force for the whole period. On the whole, the trend follows the overall trend, but is more volatile.

3.4.3 Inequality in education level

A low education level may have consequences for the rest of a person's life. The percentage of underprivileged pupils is much higher in the cities than in the rest of the country; around half of all primary school pupils in the four biggest cities are underprivileged in terms of the government's policy for this group. Rotterdam leads the field with 60 percent, in Amsterdam (52 percent), The Hague (46 percent) and Utrecht (38 percent) there are fewer underprivileged pupils. By far most of these children belong to one of the ethnic minority groups (Herweijer and Bronneman-Helmers, 2007).

The degree of segregation between various groups can be examined with the aid of a segregation index. This index can be interpreted as the percentage of pupils with a foreign background that would have to change schools to realise an even distribution. If the index is 100 percent, segregation is complete, if it is 0 percent every school has exactly the same ratio of native to foreign pupils. The index values calculated for the Netherlands show that there is a strong segregation between underprivileged pupils with a foreign background and other pupils: 60 to 70 percent of underprivileged pupils with a foreign background in the biggest cities would have to change primary school to realise an even spread. In The Hague and Utrecht segregation according to this measure has increased in the last ten years. In Rotterdam and Amsterdam it has not increased, or increased by much less (table 3.21; Herweijer and Bronneman-Helmers, 2007).

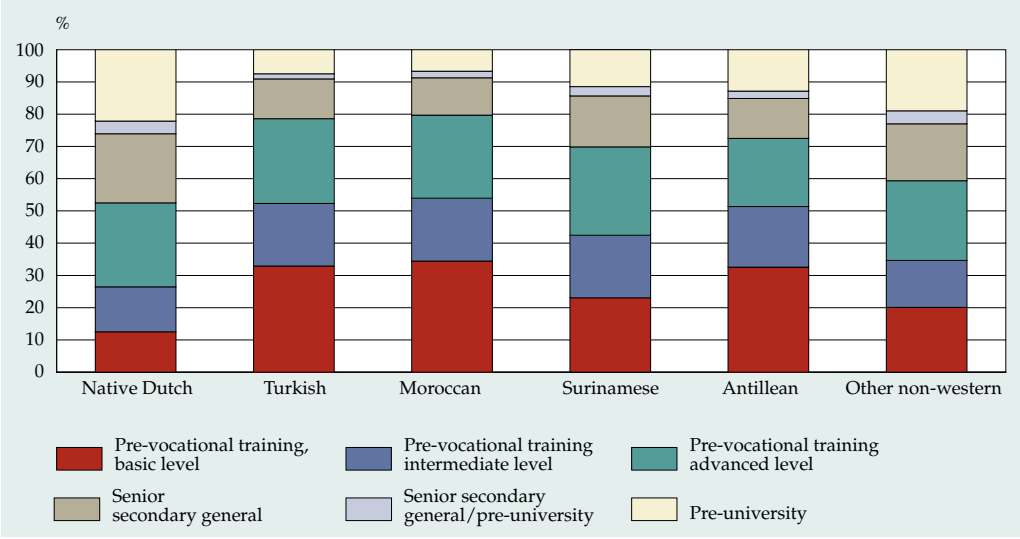
Even though achievements of pupils from minority groups have improved in recent years, they are still behind their native peers when they leave primary education. The level of secondary education they move into is determined by their level of achievement and the recommendation of the primary school. Because of the high percentage of underprivileged pupils, relatively many minority pupils go on to lower levels of secondary education. Recent findings show that there are still substantial differences with native Dutch children in the transfer to secondary education, just as in primary education (figure 3.4).
Turkish and Moroccan pupils are at the greatest disadvantage: although one in five of them are in senior general secondary (*havo*) or pre-university (*vwo*) level education, this is only half the percentage of native Dutch pupils are in these levels. Both groups are strongly overrepresented at the other end of the secondary education scale: one in three Turkish and Moroccan pupils are in the apprenticeship based track of pre-vocational education (*vmbo*). For native Dutch pupils this is one in eight. The differences between the various minority groups are just as interesting as the difference between minority and native pupils, however (Herweijer en Bronneman-Helmers, 2007). Surinamese and Antillean pupils are also at a substantial disadvantage, but less so than Moroccan and Turkish children. And Surinamese pupils do better than their Antillean peers, many of whom are in the apprenticeship track of *vmbo*, just as Turkish and Moroccan pupils.

Table 3.21
Percentage of 'black' primary schools 1) and segregation 2) of underprivileged pupils with a foreign background and other pupils

	1995/'96	2000/'01	2003/'04	2004/'05
	%			
'Black' primary schools				
Amsterdam	28	28	26	26
Rotterdam	30	36	37	35
The Hague	21	22	24	23
Utrecht	11	15	17	17
Four above cities overall	25	28	28	27
Segregation index: underprivileged pupils with a foreign background and other pupils				
Amsterdam	56	58	58	59
Rotterdam	63	64	63	62
The Hague	65	68	71	71
Utrecht	54	61	66	66

Source: Herweijer, 2006a.
1) More than 80% of pupils underprivileged and with a foreign background.
2) 100% = complete segregation, 0% = proportional distribution of native Dutch and foreign background pupils.

3.4 Students in year 3 of secondary education, by education level and ethnic origin (2005/2006) 1)



Source: Statistics Netherlands (StatLine). Results processed by SCP.
1) Excluding agricultural education.

Parents of children in minority groups often have low levels of education. Native Dutch children in the lower socio-economic groups are also underrepresented in *havo/vwo* level education. The school careers of these two groups of pupils cannot

be placed in the same category, however, as the differences between them are too striking. It starts with the recommendation they receive from their primary school. Children with a non-western foreign background used to receive a recommendation for a relatively high level of secondary education, while native Dutch children with a low socio-economic profile often received a recommendation for a lower level than expected on the basis of their achievements. In secondary education, the career of native children from low socio-economic backgrounds takes a different course than that of children from a minority group. Take two underprivileged children with the same Cito assessment score, one native Dutch, the other from an ethnic minority. Partly on the basis of the primary school's recommendation, the native child starts secondary education at a lower level than the minority child, after which his disadvantage increases further. The child with the foreign background manages to improve his position somewhat in the course of secondary education (Herweijer and Bronneman-Helmers, 2007). Recommending that pupils from ethnic minorities start secondary education at a higher level than indicated by their achievements and assessment has now almost disappeared (Herweijer and Bronneman-Helmers, 2007).

The gap between female and male education levels has narrowed with successive cohorts, and women are now even ahead of men. In the cohort 1975–1979 the percentage of women with higher education was already 6 percent points higher than that for men (in 2005 men: 32 percent, women: 38 percent). In the ethnic minority groups, it is mainly Turks and Moroccans who are catching up. They have been closing this substantial gap mainly as a result of a reduction in the number of people with a low level of education. In spite of this there is still a large disparity with native Dutch adults. The number of Turks and Moroccans with higher education is not very large yet, but is set to rise in the next few years as a result of the large increase in the numbers enrolling in higher education. However, for this to happen the high drop-out rates of Turkish and Moroccan students in higher professional education and universities will have to decrease (Herweijer en Bronneman-Helmers, 2007).
Although Surinamese and Antilleans are less behind the native Dutch population than Turks and Moroccans, their education level is rising more slowly than that of the latter groups.

3.4.4 Inequality in health

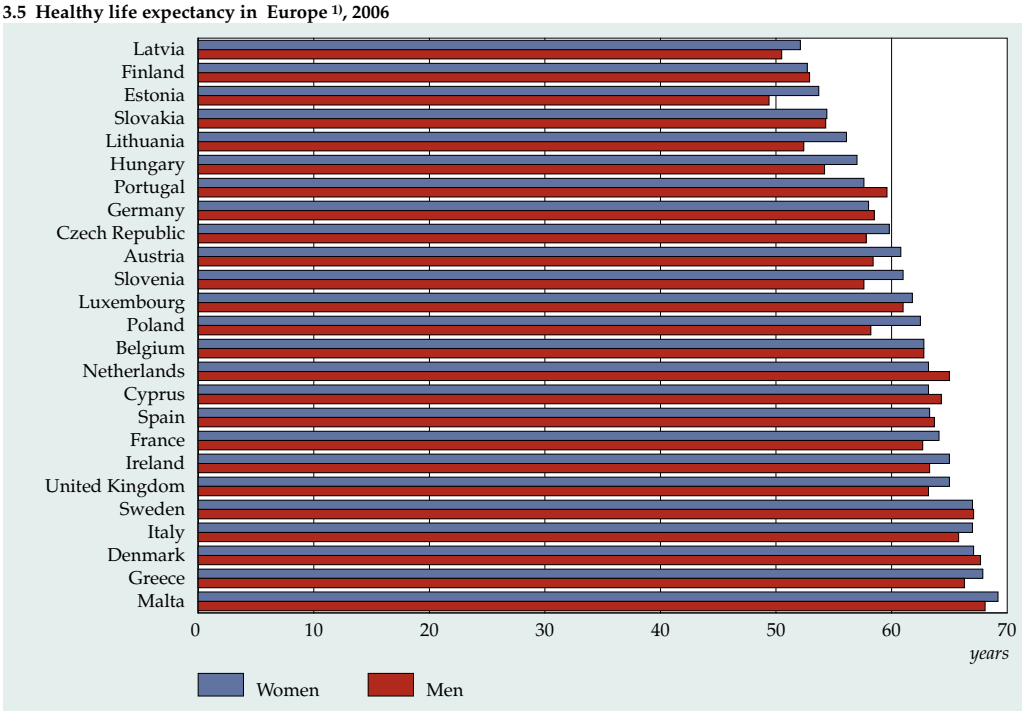
In 2005, life expectancy at birth was 77.2 years for men and 81.6 years for women (RIVM, 2008). So women live 4.4 years longer on average than men. At the age of 65, the remaining life expectancy for women is 3.6 years longer than for men (19.6 years versus 16.0 years). Average Dutch life expectancy at birth continues to rise slowly, but there are differences between population groups. People with a low education level live shorter on average than those with a higher level of education. In the second half of the 1990s, the difference was 2.6 years for women and no less than 4.9 years for men. Mortality differences between socio-economic groups are

also present at older ages (65 years and older). Among Turks and Moroccans and among Antillean/Aruban women the differences are smaller than among native Dutch and Surinamese (Van Campen and Den Draak, 2007).

There are also regional differences in life expectancy in the Netherlands. Life expectancy is relatively low in the four biggest cities (Amsterdam, The Hague, Rotterdam, Utrecht) among other places, while in the rest of the Randstad region where these cities are situated life expectancy is relatively high (Van Campen and Den Draak, 2007).

Although women live for longer than men, they both have about the same lifespan in terms of healthy years. Life expectancy without physical impairments is 69.9 years for men and 69.8 years for women (National Public Health Compass).
The differences in healthy life expectancy between socio-economic groups are larger than those in life expectancy, on the other hand. Men with a low education level live as much as 9.9 years shorter in good health than men with higher education levels; for women the corresponding difference is 8.6 years. After the age of 65, too, there are differences between a socio-economic groups. Regional differences in healthy life expectancy may be up to ten years. Healthy life expectancy is relatively low in Amsterdam, two health districts in the province of Limburg and the health district Rivierenland (Van Campen and Den Draak, 2007).

3.5 Healthy life expectancy in Europe [1], 2006



Source: Eurostat.
[1] EU25.

Healthy life expectancy at birth (HLY) of Dutch men is relatively high compared with the EU-25 countries, while Dutch women are in the mid-range (see figure 3.5). Within the EU HLY at birth varies from 49.4 for Estonian men to 68.3 voor Icelandic men, and 52.1 years for Latvian women to 69.2 for Maltese women.

Healthy life expectancy at birth rose or remained constant for both men and women in most EU countries between 1995 and 2003. In a number of countries, including the Netherlands, however, it fell for women. The HLY for Dutch men rose slightly (RIVM, 2008).

3.5 Conclusions

Social dynamics are hard to predict, certainly as far as personal opinions and attitudes are concerned. Five common processes can be recognised in various domains of personal and social life: individualisation, informalisation, informatisation, internationalisation and intensification (Schnabel, 2004). Although the influence of these processes on society has lasted for years, often decades, and in some cases even for more than a century, it varies in range, level and depth in the course of time. According to Schnabel the five Is manifest themselves in everybody's own lives, in their contacts with each other, and in the community. Added to this, the five processes also incite opposite processes and adverse effects. Individualisation, for example, is often accompanied or followed by an increase in the call for social control and gives rise to questions on the extent to which individual interests and the privacy of individual citizens outweigh the collective interest. And internationalisation may give rise to concerns about the disappearance of a nation's 'own' culture or to confrontations between immigrants and native Dutch people.

This chapter has analysed three sustainability aspects of social capital: trust, participation and social inequality. There is no doubt that the processes denoted here as the five Is have had an effect on these three sustainability aspects. The increased informalisation in society, for example, is reflected in a more critical attitude towards government and the authorities. Decreasing scores for trust in political institutions are a result of this. Ministers and members of parliament are viewed as ordinary citizens who (usually) don't know any better than the average man in the street. The increased labour participation of women is connected with the trend towards individualisation that has been apparent for years now. But it is not very clear how and to what extent these processes influence the three social sustainability aspects; the mechanisms that lead to more or less trust or participation cannot be precisely unravelled. Sometimes demographic aspects play a part, as in labour market participation, but it is not unusual for sudden fluctuations in opinions to flare up, accompanied by mass psychological phenomena and media

attention, whose role should certainly not be underestimated. We must accept that we will not be able to make long-term predictions.

The trust of the Dutch in each other is relatively constant through the years, while their trust in social institutions fluctuates somewhat. When trust in the Netherlands is compared with trust (in the same institutions) in other countries, it is higher in the Netherlands on average than in most other countries. Only in Denmark and Finland is it higher. In general terms, levels of trust are higher in northern and western Europe than in eastern and southern Europe.

Although trust is high in the Dutch population, this does not mean that people do not perceive any problems, or indeed that there are no problems in Dutch society. This is apparent when the Dutch are asked whether they think there is a lot of tension between population groups. Most of the population see no problems between rich and poor, men and women or young and old people. Compared with other countries in Europe the percentages in the Netherlands are low, or in other words, in other countries the population perceives more tension between the various groups in the population.

The picture is completely different, however, with respect to perceived tension between racial or ethnic groups. This is a considerable problem for social cohesion in the Netherlands. Just over six out of ten people (61 percent) in the Netherlands say there is a lot of tension between ethnic groups. This is the second highest percentage in Europe, behind France.

More and more alarm bells have been ringing recently about decreasing feelings of trust among the Dutch population. Although the stability that once characterised the country seems to have disappeared, and the trust figures seem increasingly to resemble opinion polls, the level of trust is still fairly high in a European perspective. The same is true for the trust people have in other people, people they do not know. The high percentage of Dutch people who say they see great tension between ethnic groups seems to be in contradiction with this.
If we look at where exactly this tension stems from, people seem to have problems with how foreigners in the Netherlands behave, rather than the fact that they live here. A majority of the population think they should hold on to their own culture less rigidly, and that they should make more of an effort to learn to speak Dutch. Only a minority think that there are too many foreigners in the Netherlands, or say they would have a problem with foreign neighbours.

Interestingly, the Dutch think that the integration problems will pass. Asked which problems they see for their children and for future generations, they put the environment at the top of the list (40 percent mentioned this issue; only the Swedes score higher with 63 percent), followed by problems that are also considered urgent today (crime, health care, concerns about neighbourliness). The Dutch

population is aware that the environment is in the danger zone. Only 4 percent of the population see immigration as a concern for their children and grandchildren, and 15 percent mention integration. Across Europe, unemployment is seen as the number one problem (mentioned by 40 percent of the European population) for the future, followed by concerns about pensions (30 percent). The environment is in fifth place and is seen as a future problem by one quarter of Europeans.
Another notable result is that, compared with other countries in Europe, a very high percentage of Dutch people (28 percent) are worried about people's willingness to help each other in the future. This is an indication of doubts about social cohesion in Dutch society.

Trust and participation are closely related to each other. The less people trust each other or society as a whole, the less they will want to participate. But participation is not only an individual choice, to some extent people must have the opportunity to participate, for example through paid or voluntary work. The state of the economy and labour market policies have a determining effect in this respect.
Labour market participation largely follows economic developments. Noticeable trends are the decrease in the share of full-time jobs and the related increase in participation of women and older age groups (55 and older). This is also visible in the correlation between employed and non-employed: in 2006 there were 68 non-employed for every 100 employed, compared with 78 to 100 in 1995. As the population grows older, the ratio of non-employed to employed will continue to rise. How fast this happens depends on the success of the implemented policies encouraging people to stay in work longer.

Increased labour participation does not only have advantages. An important downside is the decrease in social participation. Voluntary work and membership of clubs and associations are important in a social capital context, as they provide the opportunity to form networks and build mutual trust between community members. The Netherlands belongs to the top European countries in terms of both passive membership of organisations and active participation. In a recent study on the future of voluntary work (*Toekomstverkenning vrijwilligerswerk*), Dekker *et al.* (2007) conclude that if the present trend continues, the number people doing volunteer work will decrease rather than increase. For the time being, the decrease in the number of young people will be compensated by an increase in older people. At the moment there is little reason to assume that people are less willing to do something for others voluntarily now than they used to be, and that it can only get worse in the future. The future of voluntary work will depend strongly on the available opportunities. There are ongoing developments on both the demand and the supply side which effect not only the popularity and the position of voluntary work in society, but also the vision on this work. The demand for volunteers, for example, is stimulated by the reduction of the welfare state, the socialisation of care and ageing, and the increase in education levels. On the other hand, labour

market shortages, reduced leisure time, a more hectic lifestyle, and an increased supply of leisure facilities are a threat to people's inclination to do voluntary work. These factors are certainly not conducive to the willingness of people to commit themselves for longer periods.

Although the Netherlands is known as an egalitarian country, inequalities between groups of citizens can still definitely be established in important areas of life. This chapter has examined income inequality and poverty, inequality in education levels, and inequality in poor health. Without exception, non-western ethnic groups score noticeably negatively. A large part of social inequality in the Netherlands consists of the disadvantaged position of minority groups.

Poverty is not distributed evenly across the population. Three main (and overlapping) groups can be distinguished: benefit claimants (27 percent of whom were poor in 2004 according to the modest-but-adequate definition), single parent families (23 percent) and people with a non-western foreign background (20 percent). Such high percentages indicate that there are large groups of citizens who cannot fully participate in society. As welfare in the Netherlands is determined to a large extent by global economic developments, it is difficult to predict in which direction the number of poor people will develop.

The percentage of underprivileged pupils is much higher in the cities than in the rest of the country; about half of all primary school pupils in the four biggest cities fall in the category targeted by the government policy for underprivileged groups. By far the majority belong to ethnic minority groups. After primary school, pupils go on to various levels of secondary education on the basis of their performance and a recommendation of the primary school, and it is almost certainly the case that children with a foreign background relatively often end up in the lower levels of secondary education.

As education participation has been growing for many years now, each successive birth cohort leaves the formal education system with a higher education level than its predecessor. While women used to lag behind men in terms of education level, they now have a lead over them. In addition, among the minorities, Turks and Moroccans are now also catching up, although the gap with native Dutch adults is still large.

Education participation in the Netherlands can be expected to remain high in the future, and the average level of education will thus continue to rise. This will strengthen the Netherlands' position as a knowledge economy. But here, too, a downside looms: the increasing level of education may result in a permanent shortage of workers with basic skills. We are already seeing an influx of foreign workers to fill the gap left by a shortage of workers in some sectors.

Women live longer than men, but the number of years they live in good health is about the same. The differences in healthy life expectancy between socio-economic groups are larger than those between overall life expectancy. Men with low

education levels live no less than 9.9 years shorter in good health than those with higher levels of education, for women the difference is 8.6 years. Even at the age of 65 years, differences can be observed between socio-economic groups. These are surprising disparities for a highly developed country with a very accessible system of high quality of health care.

Notes in the text

1) The disadvantage of this question is that it does not distinguish between trust and no trust, and that is can also refer to self-confidence and optimism. For a critical discussion of trust, see also Dekker *et al.* (2006).
2) The figures are from the study by SCP on cultural change in the Netherlands (*Culturele Veranderingen in Nederland*). According to this study, the following percentages of people said they trust most people: in 2006: 51 percent; 2004: 53 percent; 2002: 52 percent; 2000: 47 percent; 1996: 56 percent.
3) The category 'trust' comprises the response categories 'complete trust'; 'high level of trust' and 'some trust'. 'No trust' comprises the response categories 'very little trust' and 'no trust at all'.
4) The exact questions were: The arrival of immigrants in Europe can efficiently solve the problem of Europe's ageing population; The presence of people from other ethnic groups is a cause of insecurity; The presence of people from other ethnic groups increases unemployment in the Netherlands; We need immigrants to work in certain sectors of our economy; People from other ethnic groups are enriching the cultural life of the Netherlands.
5) In addition to the percentage of participants and the time people spend on participation, there is a third important aspect of social participation, namely the quality of it. This aspect is not included in this version of the monitor.
6) One complication with comparisons over time is that in some countries the definitions used in surveys have been changed, which may also result in changes in the percentages of early school-leavers. This is the case for Norway (a fairly strong decrease from 2002 to 2003), Sweden (a rise from 2004 to 2005) and Switzerland (a rise from 2002 to 2003).
7) The Gini coefficient equals the mean absolute difference between incomes, divided by the mean income, and standardised for the number of observations. Its values lie between 0 (complete equality) and 1 (maximum inequality), and it is relatively sensitive to income transfers in the middle segment. The Theil index is defined as the mean of the logarithm of all shares of income, weighted by the shares of income. This measure has value 0 in a situation of complete equality, while the upper limit is given by the logarithm of the number of observations. The Theil index is sensitive to changes at the top and the bottom of the income distribution.

[8] The basic-needs variant takes into account costs for food, clothing, housing (incl. rent, insurances, energy, water, telephone, furniture, home maintenance, and housing-related taxes) and other spending (transport, extra health costs, personal hygiene, detergents, and miscellaneous). Based on the minimum amounts calculated by the National Institute for Budget Information (Nibud), a single person needed a total 667 euro a month to pay for these in 2000. The amounts for all other household types are derived from this by way of so-called equivalence factors. The modest-but-adequate variant also includes some costs for social participation: recreation, library membership, a sports or hobby club, subscriptions to a newspaper and a magazine, and a pet. These thus include costs that are not strictly necessary, but cannot be considered to be a luxury (unlike, say, a foreign holiday or a car). For a single person the amount to cover these costs came to 758 euro per month in 2000. The basic amounts for other years are calculated with the aid of an index: the development of median expenditure on the basic items food, clothing and housing (in the year under review and the two preceding years). Traditionally, the low-income threshold, is based on the income support benefit for a single person in 1979, when this benefit was relatively high in a historical perspective. For other household types the same equivalence factors are used; the basic amounts are adjusted annually with the aid of the consumer price index.

[9] This method of calculating poverty has the advantage that it is very simple. However, it does not take account of what people can actually buy with the standard amount. In one country, 60 percent of the median income may be too little to buy the basic necessities, while in another it may be more than enough. Moreover, a strong increase in welfare will never result in a substantial decrease in poverty if everybody benefits from this to the same degree. Based on this criterion, income redistribution is a very effective way to reduce poverty.

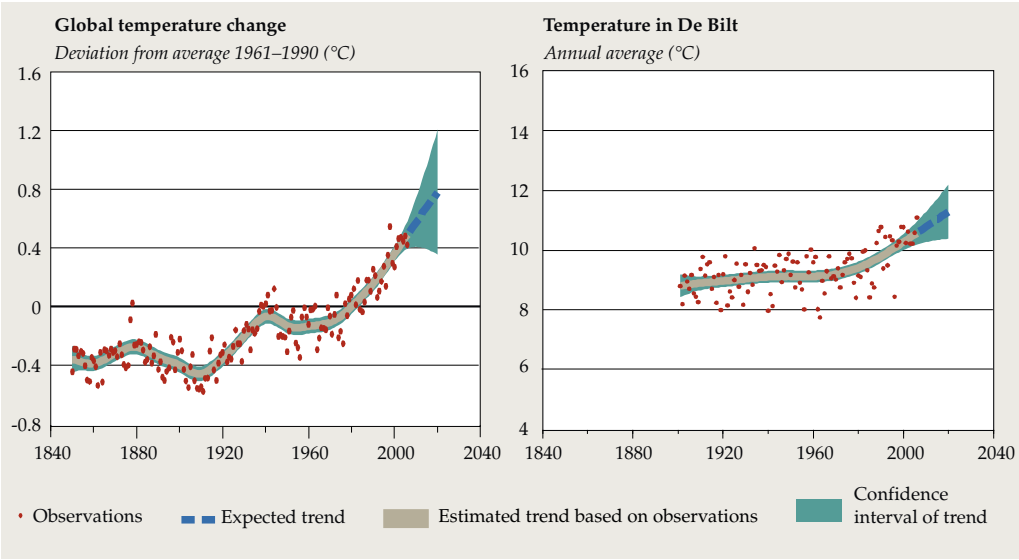
[10] Statistics Netherlands defines everyone of whom at least one parent was born outside the Netherlands as a person with a foreign background. For people not born in the Netherlands (first generation) their country of birth is the country of origin. For the second generation (born in the Netherlands) the mother's country of birth is taken (unless she was born in the Netherlands, in which case the father's country of birth is taken). The category 'people with a non-western foreign background' includes people from Turkey, Africa, Central and South America and Asia (excl. Indonesia and Japan).

4. Climate change and energy consumption

4.1 Introduction

Climate change is high on social and political agendas, certainly since the film *An inconvenient truth* was released and the Nobel Peace Prize was awarded to the Intergovernmental Panel for Climate Change (IPCC) and to Al Gore. According to the IPCC, the human race is responsible for a large part of global warming in the last fifty years, mainly through the use of fossil fuels, but also because of deforestation and the emission of other greenhouse gases, such as methane (IPCC, 2007a).

4.1 Temperature



Source: CRU. Source: KNMI.

The global demand for energy and fossil fuels has increased substantially in the past century and is set to rise further in the future. Societies depend strongly on reliable and affordable energy supplies. Indeed, the availability of a continuous supply of affordable energy is an important precondition for economic development. But this supply may not be taken for granted. At some point in time, oil and gas reserves will run out, and while in more and more countries in the world economic growth requires more and more energy, there is no way to increase the supply rapidly. As a result oil and gas prices are relatively high and energy markets are tight. The downside of current energy consumption levels is the emission of greenhouse gases

and the increasing climate change as a consequence of this. Rising temperatures will increase the threat of extreme weather (such as floods and storms), drought and rising sea levels. Higher temperatures will result in negative affects across the world and thus also in the Netherlands. Indeed, one of the greatest challenges facing the world is to change present energy consumption levels, and the way energy is generated, and thus limit global warming.

There is no way to determine objectively what 'safe limits' are; this depends on how far governments are prepared to go in taking preventive measures to limit the effects of climate change. As yet there is no worldwide consensus on this. In view of the expected effects, the EU has committed to limiting the average global temperature rise to two degrees Celsius (450 ppm) above the pre-industrial level. To realise this, global emissions must start to decrease by 2025 at the latest, and by 2050 emissions in developed countries must be 80–95 percent lower than they were in 1990. For this reason, the European Commission has put forward proposals to cutback greenhouse gas emissions by at least 20 percent of their 1990 level by 2020. If fast-growing economies such as China and India, and other industrialised countries such as the United States go along with this, the EU proposes to raise the bar to 30 percent reduction. The Netherlands has endorsed this ambition and has committed to reducing its emissions by 30 percent (VROM, 2007).

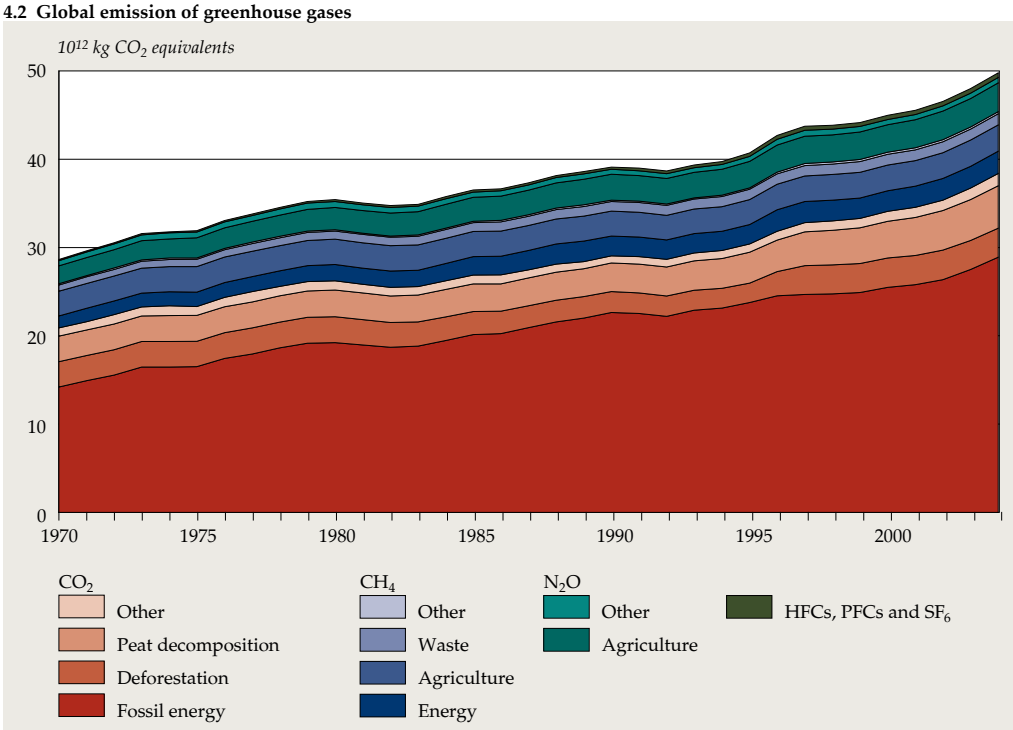
This chapter looks first of all at global energy consumption trends, the underlying causes, greenhouse gas emissions and the consequences of these for climate change. The following section describes the contribution by Dutch consumption to global emissions of greenhouse gases. Section 4.4 focuses on trends in the Netherlands with respect to energy consumption, the underlying causes, greenhouse gas emissions and the consequences of climate change for the Netherlands. The chapter also examines possible measures to achieve the goals.

4.2 Global trends

The Intergovernmental Panel on Climate Change (IPCC) has concluded that human activity has an undeniable effect on the climate. It is becoming increasingly accepted that changes observable at the present – such as rising sea levels, higher average temperatures and changes in precipitation and extreme weather – will continue in the future. The effects of climate change are now clearly noticeable across the world. Glaciers are shrinking, permafrost is thawing, growth seasons – especially in the northern hemisphere – are lengthening, plant and animal species are migrating northwards, insects show earlier activity and birds are laying their eggs earlier and earlier (IPCC, 2007b). The poorer tropical regions of the world are taking the brunt of the effects of climate change; they are confronted by shortages of clean water, floods, disease and crop failures. These

same countries often have little financial and technological resources to adapt to the changing circumstances. As the temperature rises further, the negative effects will become increasingly dominant.

4.2 Global emission of greenhouse gases



Source: Milieu en Natuurcompendium.

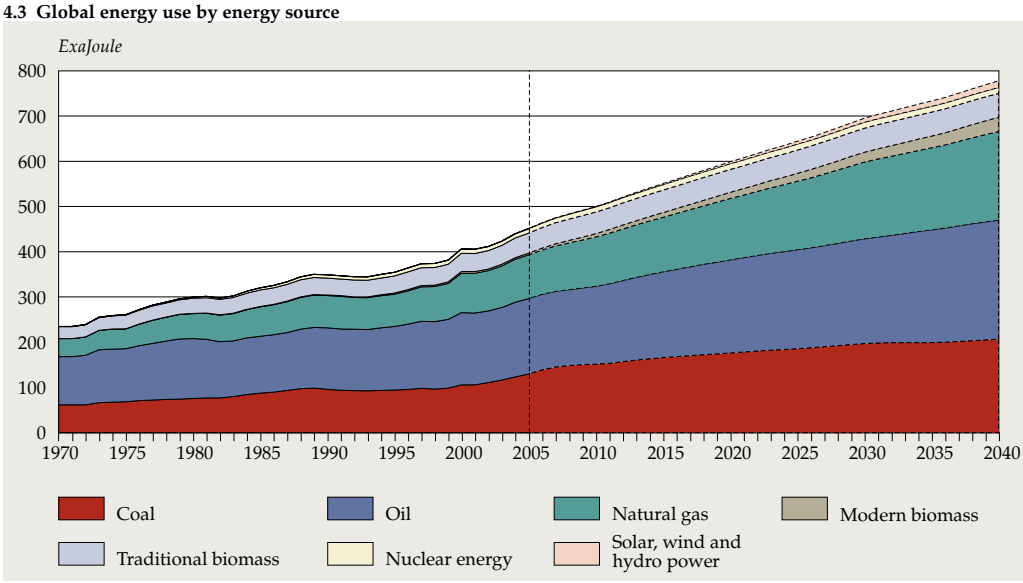
In the last century sea levels worldwide have risen by around 17 centimetres. In the coming century, the IPCC expects them to rise by a further 18 to 59 centimetres as a result of thermal expansion of the seawater, melting glaciers and small ice caps, and the thawing of the large ice caps of Greenland and Antarctica. According to the IPCC, if the collapse of the edges of the Greenland and West Antarctic ice caps continues in this century, sea levels will rise by an extra 10 to 20 centimetres; perhaps by even more, although the IPCC report does not give an upper limit. Worldwide, the temperature has risen by 0.74 of a degree Celsius since the beginning of the last century (IPCC, 2007a). The temperature rise in the Netherlands is taking place twice as fast as that in the world (see figure 4.1). The emission of greenhouse gases and changing land use will also affect the climate in the future. By the end of 21st century, global warming may have reached between 1.1 and 6.4 degrees Celsius (IPCC, 2007a).

It is almost certain that most of the increase in global temperatures since the mid 20th century is the result of an increase in concentrations of greenhouse gases in the atmosphere caused by humans. The increase in the concentration of the main greenhouse gas (CO_2) is the result of the use of fossil fuels and to a lesser extent changes in land use. Consumption of fossil energy accounts for most of climate change: around 60 percent (see figure 4.2). Deforestation and peat decomposition – to harvest timber and to increase the area of land suitable for farming – constitute another important factor, accounting for about 20 percent. This also has consequences on biodiversity (see chapter 5). The other greenhouse gases – such as methane and nitrous oxide mainly from agriculture, and fluorinated gases mostly produced by industry – make up the remaining 20 percent. Ice core analyses have shown that present concentrations of the greenhouse gases carbon dioxide and methane in the atmosphere are the highest they have been in at least 650,000 years. The rate at which the concentration of carbon dioxide has risen in the last 10 years is the highest it has ever been.

The main cause of climate change is the substantial increase in global demand for energy in the last century. This global energy demand will very probably increase further in the future. According to the OECD's Baseline Scenario – which assumes a trebling of global economic growth between 2005 and 2040 – worldwide energy consumption in 2040 will be around 75 percent higher than in 2005 (OECD, 2008b). This is mainly the result of the increase in the world's population and economic growth in fast-growing emerging economies (such as China, India and Brazil), which will account for an increasing share of global energy consumption. Fossil energy is and will remain the predominant source of energy in the coming decades in nearly all the scenarios of the IPCC, the IEA and the OECD (see figure 4.3). World stocks of fossil fuels are expected to be large enough to see us through the coming decades (NPC, 2007). Estimates indicate that if we keep on using energy at the present rate, there is enough oil to last us 150 years, enough gas for 360 years and enough coal for 1,300 years (Milieu en Natuurcompendium, www.milieuennatuurcompendium.nl).

Cheap conventional stocks of gas and oil are becoming scarcer. At the same time, they are not evenly distributed over the world. China and India, for example, have a lot of coal in the ground, but hardly any conventional oil and gas reserves, and in Europe gas reserves are running out. Europe therefore has to import more and more of its gas supply, which will increase its dependence on imported gas from 30 percent in 2005 to more than 60 percent in 2040. The share of Russian gas in the European supply will rise from 25 to 40 percent in the same period. For oil, too, Europe remains dependent on a small group of countries and here, too, it will depend increasingly on imports in the coming years. The Middle East will gain an increasingly dominant role in global oil production. While only one third of all oil came from this region in 2005, the OECD expects this to rise to 44 percent by 2040.

4.3 Global energy use by energy source

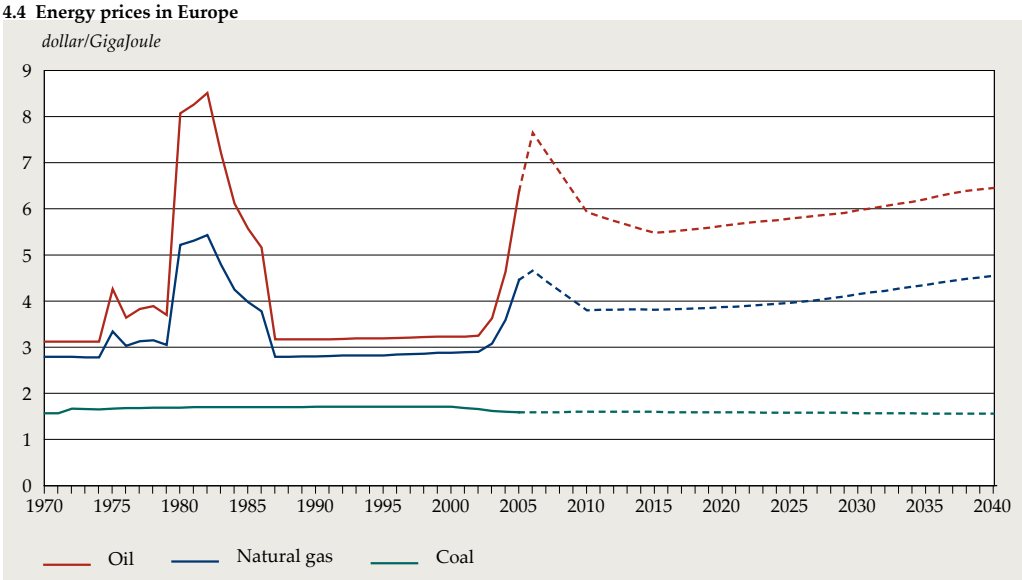


Source: Duurzaamheidsverkenningen (MNP, 2007b).

After the oil crisis in the 1970s, energy prices fell in the 1980s and 1990s. They have been rising substantially again since 2002, and the price of a barrel of crude oil was over 100 dollars in the summer of 2008. The main factors in the high oil prices are the increasing demand from developing countries (especially China and India), the lack of reserve refinery capacity, political uncertainty in the main oil-producing countries, and the limited possibility to adjust demands for oil in the short-term. Most analysts expect prices to fall again somewhat in the medium term (to 2015), but to remain higher than the level in the 1990s (IEA, 2006). The same is true for gas prices, which are linked to oil prices (see figure 4.4). Coal is still a cheap source of energy, and is therefore becoming increasingly interesting as an affordable supply of energy. Developing countries which depend strongly on imported oil are particularly affected by high oil prices (IEA, 2004). And it is the mainly the poor people in these developing countries who are hit hard by higher energy prices, and by government funds being shifted to spending on energy.

To limit the temperature rise to two degrees Celsius, global greenhouse gas emissions must start to decrease before 2025. However, if present trends continue, emissions of these gases will continue to increase substantially. Without the implementation of new and widely endorsed strategies, it will be impossible to achieve the EU target of less than two degrees temperature rise (MNP, 2007a). To realise this target, the following actions will be required:

4.4 Energy prices in Europe



Source: Duurzaamheidsverkenningen (MNP, 2007b).

1. Create a broad and powerful international climate coalition

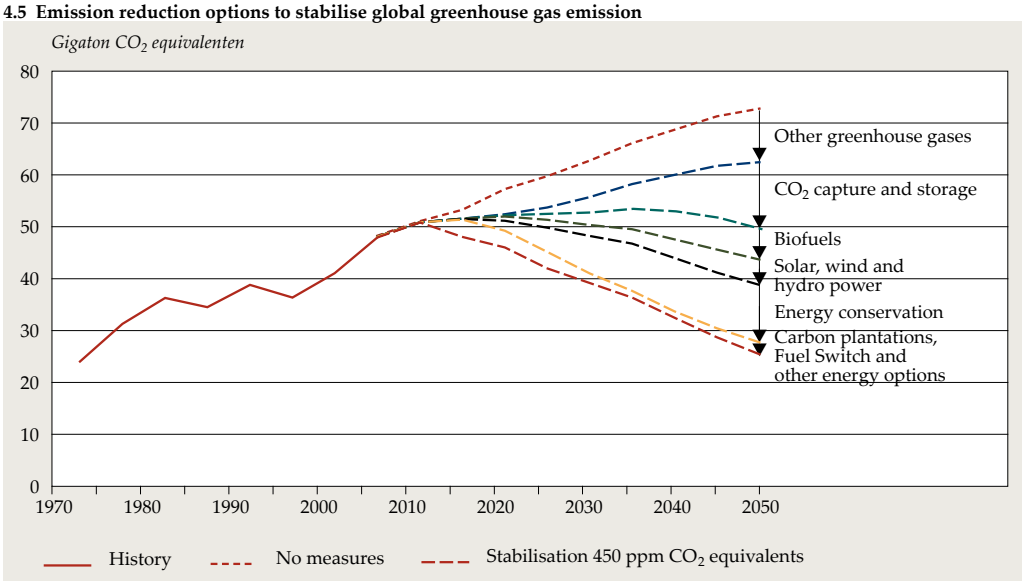
The climate problem can be solved if all the big nations pull their weight. To achieve the European two-degree climate target, all the big economies will have to implement climate policies. In addition to the EU, countries like the United States, emerging economies like China and India, and the OPEC countries must cooperate in international climate policy. The higher the number of participating countries, the lower the global costs will be. Economic mechanisms like emissions trading can be used to minimise the costs (see option 3).

2. Implement a wide range of measures

Implementing climate policy will result in energy conservation, use of alternatives to fossil fuels (e.g. nuclear, biomass, solar and wind-powered energy) and carbon capture and storage. These are the three main possibilities to reduce emissions through energy consumption. Reducing emissions of other greenhouse gases (methane, nitrous oxide and fluorinated gases) is an attractive option to reduce costs in the next two decades. It is still possible to reduce greenhouse gas emissions with existing technology, so that the average global temperature rise will not be more than two degrees (see figure 4.5).

Stopping deforestation is a robust option to limit climate change and loss of biodiversity at the same time (see chapter 6). Although the costs of this option would probably be relatively low, it has proven very difficult to implement up to now. Using biofuels to prevent climate change will result in additional loss of (mainly tropical) nature, and will certainly push up food prices in the short term,

4.5 Emission reduction options to stabilise global greenhouse gas emission



Source: Duurzaamheidsverkenningen (MNP, 2007b).

which would cause problems for the poorest people. In view of these adverse effects, expectations about the contribution of biofuels should be tempered, at least until 2020. And it is uncertain whether second-generation biofuels will actually reduce competition between crops for food and crops for fuel after 2020. Although these crops can also be grown on non-agricultural land, there are doubts about whether they will be, in view of the lower profits.

3. Expand the European emissions trading system

If flexible economic instruments are used, and all the important economies take part, the costs of limiting global temperature rise to two degrees would amount to a few percent of global GDP in 2040. One way to do this would be to expand the present European emissions trading system (ETS) to include other countries, so that the global climate problem can be tackled efficiently. The distribution of carbon credits is very important in this respect. Emerging economies and developing countries are in favour of an equal distribution of carbon credits per inhabitant. This means that countries with high per capita greenhouse gas emissions would have to pay more than countries with low per capita emissions. Emissions trading could then create a money flow to developing countries.

In addition to expansion to other countries –necessary to solve the global climate problem – the ETS can also be expanded within the EU to include sectors that contribute greatly to climate change, such as the transport sector. Alternatively, international carbon dioxide emission norms could be set for cars, an idea that is currently being considered in the EU.

4. Stimulate carbon storage and alternative energy

Many decisions concerning energy options made today do not take future climate policy sufficiently into account. In the future, we will have to use less energy and alternative sources of energy. By the end of the present century, the use of fossil fuels will no longer be an option, with the exception of coal accompanied by carbon capture and storage (CCS). Existing options will no longer suffice, and new technologies will play an important part in the further future. Alternatives are already in place for the present energy system, such as solar energy, nuclear energy, coal with CCS, and wind and hydro-powered electricity. Using currently available technology, 0.3 percent of the surface area of the Sahara (an area roughly the size of the Netherlands) is needed to generate enough solar energy to fulfil the electricity demand (about 50 percent of the total energy consumption) of the EU. The more we invest in these sources, the lower the costs will be, as a result of scale and learning effects (IEA, 2000). The cost price for solar electricity, for example, could be reduced to 4 to 6 cents by 2020, if solar power plants are built in the Sahara (IEA, 2008). Another 1 dollar cent per Kilowatt hour will cover the cost of transport of electricity from the Sahara to Europe. But these alternatives either require substantial institutional changes and investment (solar power plants), or are uncertain (nuclear fusion). Both the large amount of investment involved and the level of uncertainty require that governments play a coordinating role in this respect. Imposing norms for renewable energy and investing in research may bring this technology forward and reduce the related costs. However, this is in conflict with the realisation of the climate goals as cost-effectively as possible in the medium term.

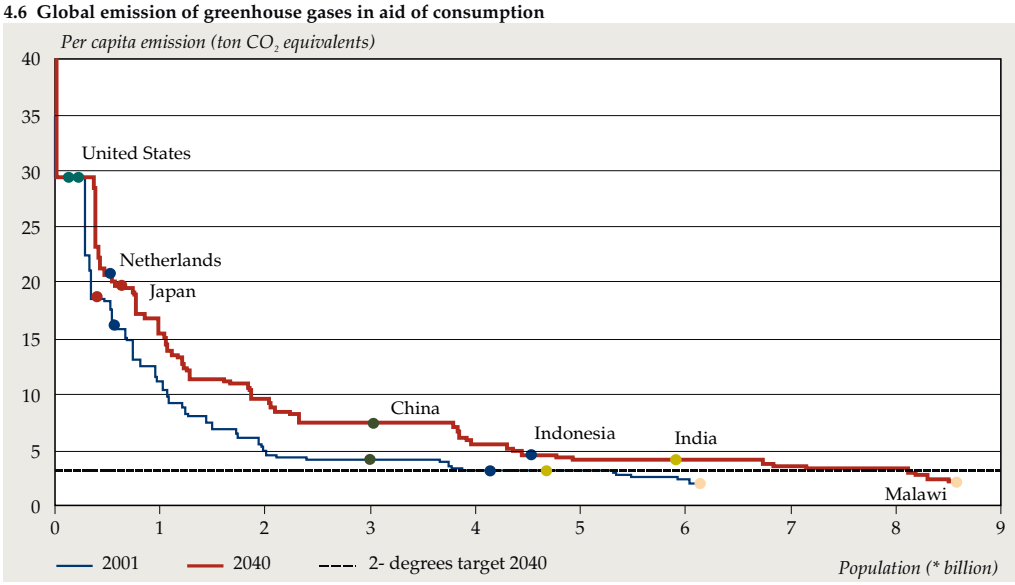
4.3 *The Netherlands in the world*

The Netherlands contributes to global greenhouse gas emissions by producing and consuming goods and services. Emissions can be attributed both to production in a certain country and to consumption in a certain country. At a global level these come to the same emissions, but at the level of an individual country it is useful to examine both approaches. Although for the climate it does not matter where the emissions take place, the two approaches provide different starting points for national policy. Production emissions in the Netherlands are in aid of products for both exports and domestic consumption by households and the government. In addition, the Dutch consume many imported goods, for the production of which greenhouse gases were emitted abroad. As the Netherlands is a small country, its absolute contribution to global climate change and biodiversity loss is only small. However, per inhabitant, just as in other rich countries, consumption-related greenhouse gas emissions are high compared with poor countries (see figure 4.6).

To restrict the global rise in temperature to two degrees (the EU climate target), with a world population of 9 billion, about 3.5 tonnes of CO_2 equivalents per person may

be emitted in 2040. In 2001, the average per capita emission of CO_2 equivalents was 6.7 tonnes. To realise the two-degree target, therefore, greenhouse gas emissions in the developed countries, including the Netherlands, must be reduced drastically (see figure 4.6). If emissions are distributed evenly across the inhabitants of the world in 2040, greenhouse gas emissions on behalf of Dutch consumption will have to be reduced to one fifth of what they are today.

4.6 Global emission of greenhouse gases in aid of consumption



Source: Duurzaamheidsverkenningen (MNP, 2007b).

Emissions of greenhouse gases as a result of the production of goods in the Netherlands have risen by less than production itself. While GDP grew by nearly 45 percent in the Netherlands between 1990 and 2005, the carbon emissions from production rose by around 18 percent. The OECD's Baseline Scenario predicts nearly a doubling of GDP to 2040, and a 30 percent increase of production–related carbon emissions.

Because of a small number of energy intensive production sectors, the Dutch economy is relatively energy intensive. As Dutch export products are energy intensive, CO_2 emissions in the Netherlands are higher for the production of export goods than CO_2 emissions abroad for goods imported for Dutch consumption. If non-carbon greenhouse gases are also included, greenhouse gas emissions for imports and exports are about equal. In many other west European countries, and in the US and Japan, the opposite is the case; they are net exporters of greenhouse gas emissions.

In the last 15 years, the Netherlands has been emitting more for consumption in other countries, than other countries have been emitting for consumption in the Netherlands (CBS, 2007b). This will probably change in the decades to 2040. The Netherlands will export more and more services, and therefore import more and more consumer products. Exports of agricultural, industrial and energy products will therefore increase more slowly than imports of these products (CPB/MNP/RPB, 2006). The fact that carbon dioxide emissions in the Netherlands are expected to increase at a slower rate than production in the coming decades is not only the consequence of improved efficiency, but also of the increase of emissions outside the Netherlands in aid of consumption in the Netherlands. If production moves to other countries with less efficient production processes than the Netherlands, greenhouse gas emissions will rise.

4.4 Trends in the Netherlands

The average temperature in the Netherlands has risen by 1.7 degrees Celsius since 1900 (PBL, 2008a), and the ten warmest years ever have all occurred since 1988. Although the effects of temperature rise for ecosystems, health and town planning are still small, they will increase as the temperature rises further. As climate change causes shifts in plant and animal habitats, the species composition in Dutch wildlife will change: warmth-loving species (dragonflies, reptiles) will benefit, the number of cold-loving species will diminish. Some species will disappear, and others will emerge (see chapter 5).

The effects of global warming on public health are mainly related to extreme weather conditions. For example, the probability of a day with a maximum temperature of 32°C or higher has risen from 13 percent in 1951 to around 75 percent in 2006. Consequently, extra mortality as a result of the heat has increased by a factor 2.5 in this period (Visser, 2007). It is not clear whether more people die because of the heat alone, or as a result of the heat in combination with consequent raised air pollution levels. The number of extremely cold spells is expected to decrease as a result of climate change, which will result in fewer cold-related deaths. It its 2006 climate scenarios, the Royal Netherlands Meteorological Institute (KNMI) predicts that sea levels along the Dutch coast may rise by 35 to 85 centimetres. This is larger than the global average rise foreseen by the IPCC. Current technology enables the Dutch to reinforce its shore protection systems at socially acceptable costs (MNP, 2007b), even if the rate of sea level rise increases to 1.5 metres per century as a result of the increasing melting rates of the large land ice caps.

Future temperature rise will also result in changing patterns of precipitation and river drainage. In 2005 Dutch water boards calculated that if the intensity of heavy showers increases by 10 percent to 2050, more than 35,000 hectares of land will

have to be set aside in the Netherlands to store excess water and prevent flooding from regional surface waters. Rotterdam and Dordrecht are particularly vulnerable cities if sea levels continue to rise, and in the long term, a permanent alternative may have to be found for the drainage of the Rhine. Important alternatives are diverting it to the Zeeland delta to the south (Delta Cie, 2008), and/or to the IJssel and the IJssel Lake (MNP, 2007b), and constructing water storage systems in these regions.

The above-mentioned trends outline the need for adaptive policies to make the Netherlands more 'climate-change proof'. In addition a mitigation policy has been implemented to reduce Dutch greenhouse gas emissions, which are mainly a result of the use of fossil energy sources. Just as other industrialised economies, the Dutch economy is based on significant fossil energy input, with petroleum, natural gas and coal as the main primary energy sources. These are partly used to generate electricity. Up to now electricity production in the only nuclear power plant in the Netherlands (in Borssele) and renewable electricity have accounted for only a very small part of total Dutch electricity production. The use of fossil energy gives rise to various environmental problems; in addition to climate change it also contributes to acidification and air pollution.

Energy consumption in the Netherlands has increased substantially in the last fifty years, mainly as a result of industrial growth, increasing traffic and rising consumption. Economic growth and population increase have nearly trebled carbon emissions in the Netherlands between 1950 and 2006; from around circa 60 Mtonnes to more than 170 Mtonnes. With the rise in income and consumption, per capita carbon emission in the Netherlands has increased by 160 percent since 1950. In the 1980s, in particular, energy consumption rose very quickly, to slow down somewhat subsequently. In the period 1996–2005, for example, annual energy consumption in the Netherlands rose by an average 1.1 percent per year. This is less than economic growth, which was 2.5 percent per year on average in this period. So although the implementation of technical measures has led to improved efficiency, it has not been enough to reduce energy consumption. By way of illustration: the increase in traffic-related energy consumption of was around 30 percent between 1990 and 2006, in spite of the fact that car engines have become more energy efficient. This is because the cars on today's roads are heavier on average and more of them are air conditioned. In industry, too – the largest energy consumer – energy consumption rose by about 7 percent in the period 1990–2006, in spite of improved efficiency.

In 2006 per capita electricity consumption in the Netherlands was more than four times as high as in 1950. The increase was even larger for electricity consumption by households, mainly because of the strong rise in the number of electrical appliances. Washing machines, refrigerators and television sets have become more

or less basic essentials, and nearly all households today have a dishwashers, a tumble dryer and a computer. Many homes now have more than one television set, computer and fridge; and more and more appliances have a standby mode, which means they use electricity 24 hours a day.

As fossil fuels are finite natural resources, energy policy is aimed at more efficient consumption, increasing use of renewable energy sources and energy conservation. These alternatives to fossil energy consumption are also an important component of national climate policy, as using less fossil energy means emitting less greenhouse gas. In addition, climate policy also focuses on the reduction of other greenhouse gases (methane, nitrous oxide and fluorinated gases), buying carbon credits from other countries and carbon capture and storage.

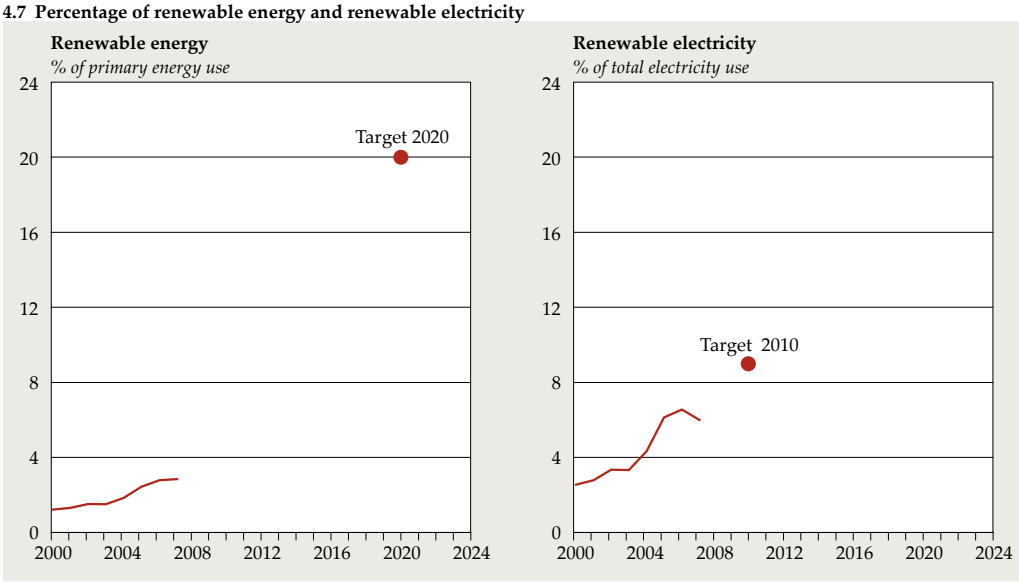
Under the Kyoto agreement, the Netherlands has committed itself to an emissions reduction target of 6 percent of the 1990 level in the period 2008–2012. In this respect, the Kyoto protocol can be viewed as a first modest step by industrialised countries to achieve further global emission reductions. The Dutch government, i.e. the fourth Balkenende Cabinet, has set itself the target of reducing Dutch greenhouse gas emissions by 30 percent (from 1990) by 2020 in the policy document *Clean and efficient* (Schoon en Zuinig, VROM, 2007). This reduction target fits in the route outlined by the IPCC to limit the temperature rise to two degrees. To realise this, its *Fourth Assessment Report* (IPCC, 2007c) sets emission reductions for industrialised countries of 25–40 percent in 2020, and 80–95 percent in 2050. In addition to the reduction target for greenhouse gas emissions, the Dutch Cabinet's *Clean and Efficient* programme aims for a renewable energy supply for 20 percent of total energy use in 2020, and an energy saving rate of 2 percent per year (VROM, 2007).

The volume of renewable energy generated in the Netherlands increased fivefold between 1990 and 2007. In 2007 it accounted for just under 3 percent of total Dutch energy use (see figure 4.7). Biomass – accounting for 1.8 percent of the total energy supply – was the main form of renewable energy in 2007. Most biomass is used to cofire power plants. Wind energy generated enough energy to supply 0.8 percent of Dutch energy consumption in 2007. To realise the target of 20 percent of total energy in 2020, the present share of renewable energy will have to rise by a factor 7. Stringent European policy will have to be put in place if this target is to be met, and moreover, the transport sector will have to increase biofuel use to 20 percent of its total fuel consumption. It is doubtful whether such a high percentage will be able to be realised within the sustainability criteria for biofuels. There are still fears that while the use of biofuels by traffic may not reduce carbon emissions, it will push up food prices and will affect biodiversity (PBL, 2008a).

The percentage of renewable electricity has also risen since the beginning of this century (see figure 4.7); it accounted for about 6 percent of total electricity

consumption in 2007 (CBS, 2008c). By 2010 the aim is to generate 9 percent of total electricity use with renewable sources.

4.7 Percentage of renewable energy and renewable electricity



Source: Milieubalans (PBL, 2008a).

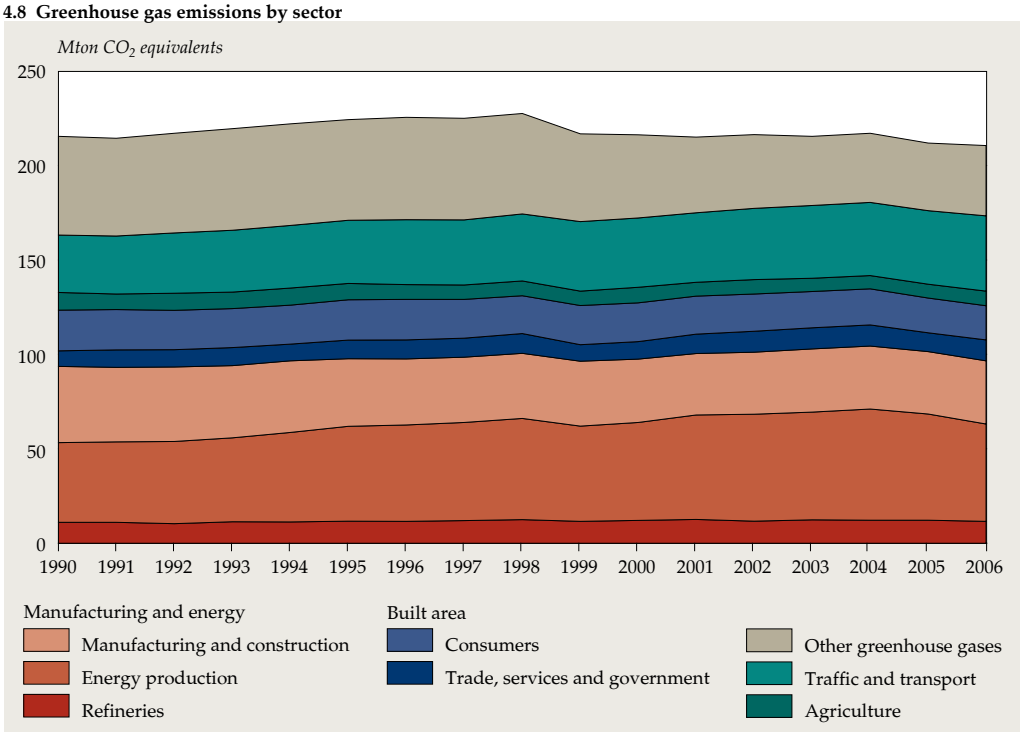
The rate of energy conservation was around 0.9 percent per year in the Netherlands in the period 1995 to 2006 (ECN, 2008). To increase this to 2 percent in 2020, it will have to be more than doubled. Most opportunities to realise this are in the built-up environment and in traffic, but in industry, too, there are possibilities to save more energy. At the European level, strict energy efficiency requirements will have to be implemented for vehicles and appliances to realise the 2 percent energy conservation target (PBL, 2008a).

In 2006, the emission of greenhouse gases amounted to about 209 Mtonnes of CO_2 equivalents, some 3 percent lower than the 216 Mtonnes in 1990 (see figure 4.8). Carbon dioxide emissions rose by 10 Mtonnes in this period, but at the same time the emission of other greenhouse gases fell by 17 Mtonnes. CO_2 emissions rose mainly in the energy sector and in traffic and transport (both by 10 Mtonnes), and fell mainly in manufacturing and construction, and in households (by 6 and 4 Mtonnes respectively).

The implementation of climate, energy and environment policies in the period 1990–2003 has resulted in around 33 Mtonnes of CO_2 equivalents less being emitted than if these measures had not been taken (De Bruijn *et al.*, 2005; Jeeninga *et al.*, 2002). Over half this reduction is the result of energy saving policies, and nearly 40 percent

was realised by the reduction in other greenhouse gases. In the coming decades, too, energy saving is expected to be an important factor in emissions reduction.

4.8 Greenhouse gas emissions by sector



Source: Emissions registration.

In addition to emissions reduction in the Netherlands, carbon credits will be purchased from other countries to achieve the targets. The Dutch government aims to realise its 6 percent Kyoto reduction commitment for the period 2008–2012 by buying 13 Mtonnes of emission reduction credits abroad through the Clean Development Mechanism (CDM) and Joint Implementation (JI) (MinFin, 2008).

If the energy and climate package proposed by the European Commission in January 2008 is adopted, opportunities for national policy will become limited after 2012. For the ETS sectors (large industry sectors, refineries ad power plants), for example, there will be one European emission ceiling instead of the present national emission ceilings. Climate policy will be determined more by Europe than it used to be. This means that member states will no longer have any influence on the contribution of these sectors to their national greenhouse gas balance sheet. Indeed, the European Commission will not impose reduction targets for national greenhouse gas emissions for these sectors for the period after 2012, only for the non-trading sectors. This will make it more complicated to monitor national emissions.

4.5 *Conclusions*

A continued supply of clean and affordable energy is important at both the global and the national level. Up to now, energy needs have been fulfilled with the aid of fossil resources. The general expectation is that fossil energy will remain the dominant energy source in the coming decades. The increase in energy consumption has pushed up emissions of greenhouse gases in the last century, thus accelerating climate change. The regionally varying adverse effects of this – such as reduced drinking water supplies, crop failure, floods and disease – will hit developing countries the hardest. The Netherlands will be confronted with higher temperatures and more extreme weather, but will be able to adapt by maintaining its shore defence systems and creating room to store excess water.

It will take a revolutionary change in present global energy consumption and in the way in which energy is generated to limit global warming. In view of the effects of climate change, the EU is committed to limiting the temperature rise to 2 degrees Celsius. But a global coalition will be needed to achieve this, the EU cannot do it on its own. Although insisting on an accountable target for climate policy – such as the two degree target – is necessary to limit the effects, until now it has prevented countries such as China, India and the US from ratifying the climate treaty. However, depending only on technology, without setting a global emission ceiling is too noncommittal. The challenge in the short term is how to combine these two tracks.

With the shift of the international balance of power to the Far East, the influence of Europe will become smaller and smaller in the coming decades, in terms of its share in the world's population, in the global economy and in total greenhouse gas emissions. International climate policy is all about redistribution: in China and India the increase in the demand for energy will continue to be so large that it is expected that they will mine coal on a massive scale in the future. Will the West help to pay for the costs of carbon capture and storage?

As a global coalition has failed to come into existence, the EU has opted for unilateral action: the European Commission has proposed to cut greenhouse gas emissions by 20 percent of their 1990 level by 2020. If an international agreement is reached, the EU will raise its reduction target to 30 percent of the 1990 level. Although this pioneering work by the EU may provide an important boost for the realisation of global agreements, it is not without risk. Climate policy implemented in Europe alone will require extra investment that may have adverse effects for its competitiveness. On the other hand, there is the first-mover effect, which may result in exports of new technology in the longer term. One condition for this is that markets are created for this new technology; moreover first-mover effects are often only temporary.

Another disadvantage of climate policy restricted to the EU alone is the increasing risk of a transfer effect: an increase in greenhouse gas emissions outside the EU. If energy-intensive industries move out of the EU to countries with less stringent climate rules, emissions in these countries will rise if production processes there are less efficient. The Dutch economy is relatively energy intensive, but also energy efficient. Relocating production outside the Netherlands will probably result in increasing emissions abroad. To gain an insight into these effects it is useful to examine greenhouse gas emissions caused by consumption of the Dutch population, in addition to the emissions inside the country.

Measures aimed at reducing climate change are often beneficial for a continued supply of energy, as they are aimed at reducing energy consumption. This does not apply the other way around, however: mining more coal will guarantee a continued energy supply, as coal reserves are extremely large and occur the world over. But burning coal will have a negative effect on the climate if the resulting CO_2 is not captured and stored. Ensuring the energy supply by improving relations with the suppliers will not lead to less greenhouse gases being emitted either.

Climate policy and clean air policy are connected, as the relevant emissions for both mostly come from the same combustion processes of fossil fuels. Effects on national air quality are relevant in considerations concerning national climate measures versus those to be implemented abroad. In this respect, the inherent positive effects of national climate policy on national air quality (assets), versus the extra costs that would have to be paid for this compared with taking measures outside the own country, should be taken into account.

Use of biofuels may contribute positively to the climate, but using (more) biofuels does involve various trade-offs. On one side of the scales we have a slight reduction in carbon dioxide emissions and diversification of energy sources; on the other, less nature (especially in tropical regions) and rising food prices. Mixing in biofuels for cars also means that long term alternatives will not be developed further, such as fuel-cell and battery-powered cars.

Mobility is energy intensive. In this respect, limiting mobility may contribute a lot to achieving the climate targets. On the other hand, lower costs of traffic and transport have contributed greatly to the national and international exchange of knowledge and goods, and thus to increased productivity.

Lastly, it can be concluded that there is a field of tension between realising the 30 percent reduction in greenhouse gas emissions in 2020 in a cost effective way, and investment in alternatives that are as yet still expensive but are necessary in the long term for a sustainable, less fossil fuel dependent energy supply. This requires a choice between investing more now in long-term alternatives (such as

solar energy), or waiting and investing in existing technology (coal) and transition technology (biofuels). There is a similar field of tension in energy conservation: if the climate target is realised as efficiently as possible, the 20 percent energy saving target for 2020 will not be realised.

This edition of the Sustainability Monitor for the Netherlands does not examine in depth the continued supply of resources and stocks (such as oil and gas, timber, fish, metals and drinking water). This theme may be worked out in a future edition, as the overall stocks problem and the exhaustion thereof is a prime example of a sustainability theme.

5. *Biodiversity*

5.1 Introduction

Life on earth takes a wide variety of forms: flora, fauna, tropical rain forests or Dutch pastures, each form of life, each ecosystem, and each genetic variation is unique and irreplaceable. All these different life forms are captured in the term 'biodiversity' (LNV/OS/VROM, 2008). To survive and develop, mankind is very dependent on ecosystem services, of which energy, water, food and timber are the most important. Either directly or indirectly, these natural resources provide the basis for every community. Ecosystems also provide other services, such as protection against floods and carbon sequestration, which may be incorporated in climate policy. Indeed biodiversity contributes to the quality of life and the wellbeing of humans. In this respect, the term 'critical natural capital' is often used in connection with biodiversity.

Right up to today, humans have been using up more and more land to improve their living conditions, and this trend is set to continue in the next few decades. The increasing land use had been at the expense of ecosystems along with the plant and animal species occurring in them. This is one of the great trade-offs confronting the world: further socioeconomic development (more people, more needs) versus the preservation of biodiversity. The important question is: how far can humans continue to use land and cause biodiversity loss without causing large-scale unwanted effects for ecosystem services? The question of how bad a thing it is that more biodiversity will be lost cannot be answered easily, and certainly not objectively. But we can establish how much land and has already been turned over to agricultural use to meet the increasing demand for food – and more recently for biomass to be used as fuel – and how these trends are developing .

Regardless of the ambiguity with respect to the consequences of biodiversity loss, global agreement has been reached to reduce the rate of this loss substantially. This means the world has set itself the task of protecting nature and bringing extinction of species to a halt. Biodiversity loss is not only perceived as a global problem, but also as an important issue at European and national levels. Europe wants to stop biodiversity loss within its borders by 2010, and as part of this the Netherlands is working hard to realise its National Ecological Network (*Ecologische Hoofdstructuur*) and the designation of Natura 2000 areas, to increase the area of natural habitat again and to protect it. The reason that the European and national targets are more far-reaching than the global ones becomes clear when we take stock of the present situation. While globally about 70 percent of original biodiversity (measured in terms of the Mean Species Abundance (MSA) indicator, see section 5.2) is still

present, in Europe this is less than 50 percent; and in the Netherlands, a prosperous and densely populated country with a small surface area, it is just 15 percent. In other words: 85 percent of the original biodiversity in the Netherlands no longer remains.

This chapter looks mainly at land-based biodiversity. But in water, too, biodiversity is being lost. Just as on land, aquatic biodiversity has been declining in recent decades (MA, 2005; UNEP, 2007), and if no measures are taken, this decline will continue. For marine biodiversity, the main cause of the loss is the fishing industry; trawlers are able to fish at increasingly greater depths and to catch larger volumes of fish. In freshwater, pollution and water management projects are important causes of biodiversity loss.

This chapter examines first the global trend in loss of land-based biodiversity and its causes. In the following section we look at the Dutch contribution to the increasing use of land worldwide and the consequent loss of biodiversity. Subsequently we describe how biodiversity in the Netherlands is developing, in terms of both the area of nature and the quality thereof. Each section also looks at measures that can be taken to realise the goals that have been set.

5.2 Global trends

People need more and more land to grow food, and to construct infrastructure and cities. As a result there is less and less room for nature, and biodiversity is permanently lost. These developments have been caused by a growing population and an increase in per capita consumption. Not only do more people need more food, and thus more land to grow it on, but their also diet changes as their income increases: they eat more and more animal products. More land is needed to produce cattle feed. Alongside this development, the recent rapid increase in the demand for biofuels also means more land is needed to grow fuel crops, which causes additional biodiversity loss. Populations in poor countries in particular are often directly dependent on natural resources and ecosystem services.

Of the total of around 130 million square kilometres of land area in the world, some 60 million square kilometres is suitable for intensive agricultural use. At the moment, 40 million square kilometres of this is already being used for agriculture, of which 15 million to grow arable crops (food crops for humans and livestock, see table 5.1). Another 10 million square kilometres of grass land is used for extensive livestock farming. Overall, therefore, present agricultural use accounts for 50 million of the total 130 million square kilometres of land area. About 80 percent of this is used for the production of animal products. The land ice caps, northern tundra regions and desert areas are hardly used at all. These areas account for

about one fifth of the total land area of the world, but are mostly unsuitable for agriculture and providing ecosystem services. However, in these regions, too, the effects of human activity are visible as a result of oil extraction, pollutant emissions and climate change. The world's total forest area accounts for about 40 million square kilometres and in the tropical regions in particular is at risk of being cleared to make agriculture possible, as it is there that the population and consumption are expected to grow, and in theory it is there that most of the suitable land is available for intensive agriculture. Compared with the area needed for agriculture, buildings and infrastructure require much less land (about 0.5 percent). In many cases, opening up areas increases pressure to use the land profitably.

Table 5.1
Global areas of land use (rounded to 5 mln km$^{2)}$ and the percentage suitable for intensive agriculture

	Mln km^2	Percentage	Percentage suitable for intensive agriculture
Agriculture	50	40	80
of which:			
crops for humans	10		100
grass land	35		70
crops for livestock	5		100
Forest	40	30	50
Desert, ice, tundra etc.	25	20	
Other nature (savannah, etc.)	15	10	20
Urban area	0		
Total	130	100	50

Source: FAO (2006) and MNP (2006a).

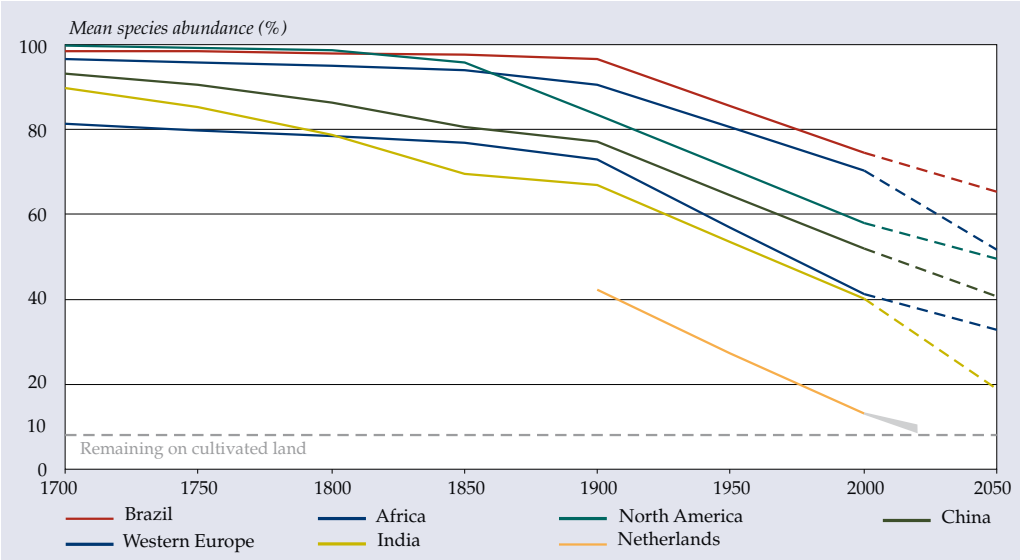
So, mankind is already using two-thirds of the productive land (40 million of the 60 million square kilometres) (FAO, 2006; MNP, 2006a). This has resulted in a reduction of global biodiversity. The world population increased by 70 percent between 1970 and 2005, and global GDP trebled in the same period. As agricultural productivity rose by about 55 percent in this period, the overall increase in the land used was 'only' 5 million square kilometres. Socioeconomic development is therefore realised at the expense of biodiversity. Nature is turned into land to be used for farming or forestry, urban and infrastructure construction further fragment the natural area, and the quality of water and air deteriorates as a result of, for example, nitrate emissions. This is one of the reasons biodiversity has declined in the last centuries. Biodiversity is expressed in terms of 'Mean Species Abundance' (MSA): an indicator for biodiversity which incorporates both the loss in quality and quantity – the area of land. The MSA is one of the indicators used by scientists to characterise biodiversity.

Other indicators used by the Convention on Biological Diversity vary from the area of protected nature to the 'ecological footprint', and from trends in nitrogen deposits to lists of threatened species. We use the MSA here as it is one of the few biodiversity indicators that can also be used to make predictions.

In the last few centuries biodiversity has deteriorated in forests and grassland areas in the moderate climate regions in particular. In Europe and the United States about half the original land area is now used for agriculture (Klein Goldewijk, 2005). On average, 30 percent of original global biodiversity has been lost in the last three centuries (see figure 5.1).

In more general terms, biodiversity is decreasing relatively fast in countries with rapid economic development, a high population density, a relatively small area of productive land and a large agricultural sector. Many production and agricultural activities in emerging economies are undertaken to export products to richer countries: soya exports from Brazil to the EU, for example.

5.1 Biodiversity trends in some countries and regions

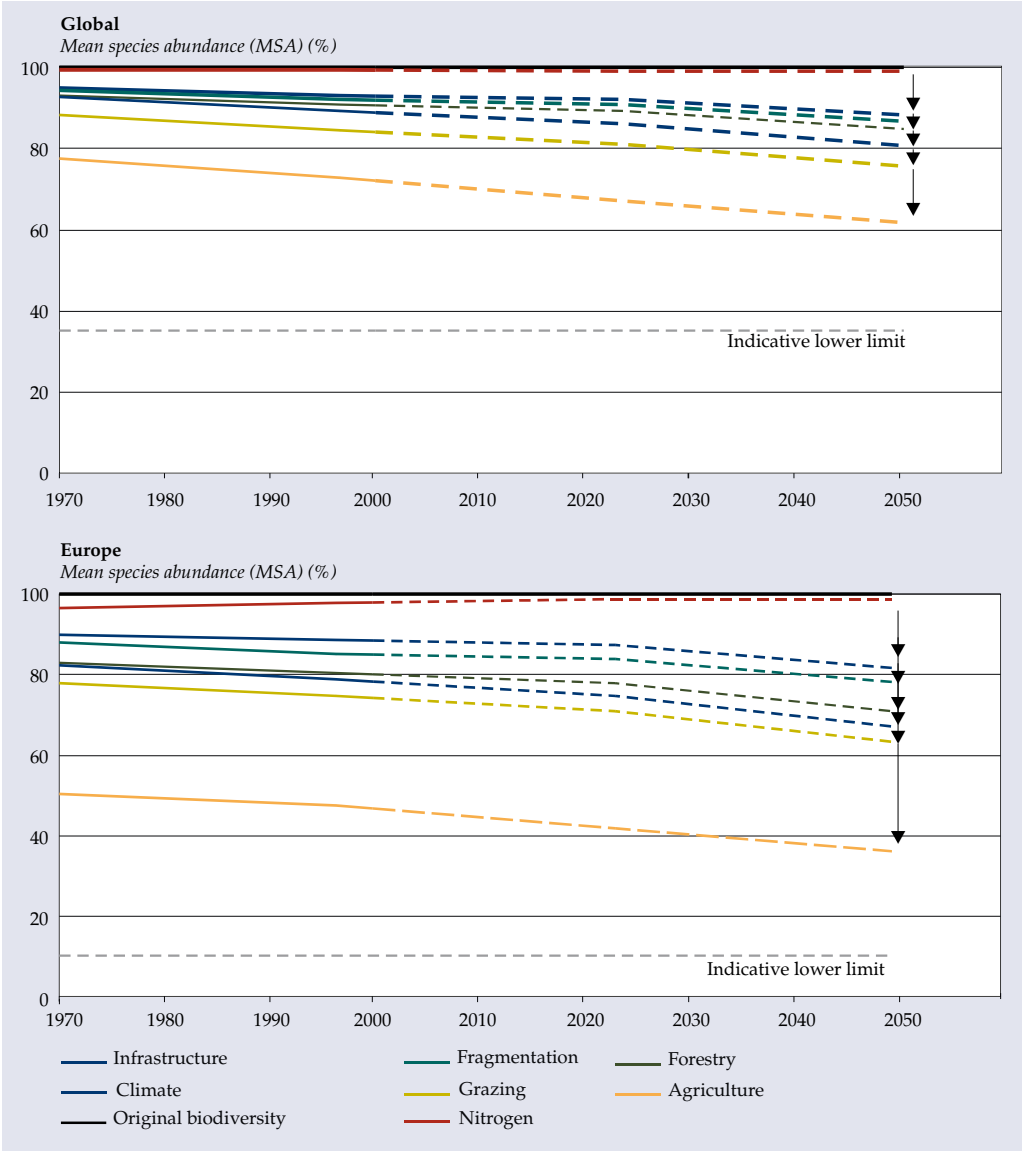


Source: MNP, 2007b.

In the next fifty years biodiversity losses will increase and if no policies are implemented another 10 percent of biodiversity will disappear (OECD, 2008b). Important assumptions underlying the OECD's Baseline scenario predict that in 2040 the world population will have grown to around 9 billion, while per capita income will have doubled from its 2005 level. Agricultural productivity will have to increase by more than 40 percent in the period 2005–2040 to limit the reduction in biodiversity to 10 percent. And even then, most biodiversity will be lost as a

result of agriculture and the further expansion thereof (figures 5.2a and 5.2b). In addition, infrastructure is an important factor for biodiversity loss, especially as a result of the opening up of natural ecosystems. The losses will be largest in the still remaining grass and forest ecosystems.

5.2 Causes of biodiversity loss in the world



Source: MNP, 2007b.

Climate change will become an increasingly important cause of biodiversity loss. As the climate seems to be changing too fast for many ecosystems to cope with, they run a greater risk of becoming weaker (Leemans and Eickhout, 2004). Weakened ecosystems are more vulnerable to invasive species, which will harm biodiversity even more (IPCC, 2007b). In principle, therefore, climate policy will also reduce further loss of biodiversity. An exception to this is the use of agricultural crops for biofuels: this will directly require land – and thus biodiversity – for cultivation, even though in the long term it will contribute to limiting climate change (CBD/MNP, 2007). When natural ecosystems are converted, the direct loss is considerably larger than the 'benefit'.

Another important trend is that people in regions where income has increased are eating more and more animal products. The global per capita demand for animal products rose by about 40 percent between 1970 and 2000, while the demand for vegetable products rose by 'only' around 10 percent (FAO, 2006). The production of meat takes up a lot more land than the production of vegetable products. It takes about 80 times as much land to produce one kilocalorie of beef as to produce one kilocalorie of cereal. In terms of protein, it takes about 10 times as much land to produce cereal-based protein as to produce beef- based protein. For non-grazing livestock, such as chickens, the difference is smaller. This means that an increase in meat consumption will have an extra effect on land use. A global decrease in meat consumption, or even a complete conversion to a vegetarian diet would therefore contribute substantially to preservation of biodiversity. Depending on changes in consumption, worldwide, one fifth to one third of the loss in biodiversity expected in 2050 could be prevented (Stehfest *et al.*, 2008). Eating less meat is also beneficial to the climate as it reduces the emission of greenhouse gases and more carbon remains stored in the forest areas.

So the global trend is that biodiversity is deteriorating more and more. Mainly because more and more is being produced and consumed, but also because the world population continues to grow and its diet is changing (towards more meat consumption). The improved living conditions realised by the human race in the last centuries have been realised at the expense of biodiversity. This trend will continue in the coming decades. With the continued consumption of food and timber in particular, agriculture will continue to place pressure on land and thus on biodiversity.

In the next few decades, further global development will be accompanied by a substantial biodiversity loss, especially in tropical regions. But there are a number of options to restrict the damage as much as possible.

1. Increase agricultural productivity

To reduce biodiversity loss by any significant amount, the rate of expansion of

agricultural land must be slowed down. This means that agricultural productivity, especially in tropical regions, must be increased substantially by using existing technologies such as artificial fertilisation, better irrigation and genetic modification. However, use of artificial fertilisers has other disadvantages for the environment, and the possible consequences of genetic modification are both uncertain and the subject of conflicting views. Although using technology will have many advantages, this alone will not be enough to prevent expansion of agricultural land. To reduce biodiversity loss further other measures are also necessary.

2. *Influence diet*

Eating less meat is a second option to realise conservation of natural land and thus of biodiversity. Reducing consumption of beef in particular, will save up to 25 million square kilometres of land (Stehfest *et al.*, 2008). A diet with moderate meat consumption (based on recommendations in Willet (2001)), would use about one third less agricultural land globally. For many developing countries this means that consumption of meat may increase. For the Netherlands it means that the population would have to consume two-thirds less meat than it does today. There is as yet no widespread support for a reduction in meat consumption, however. And neither do individual consumers make the connection between eating meat and the disappearance of wildlife on the other side of the world. Raising prices has only little effect in a prosperous country like the Netherlands, as meat accounts for only a very small part of total household spending. Even if meat prices were doubled in the Netherlands, this would lead to only a 4 percent reduction of land use.

3. *Via the production chain*

By showing the effects companies processing natural resources have on biodiversity, the international business community can be called to account to conserve biodiversity. Placing demands on suppliers in the whole production chain can reduce the pressure on biodiversity. If there is no level playing field, individual companies are not likely to take far-reaching measures as this may damage their international competitiveness.

4. *Specific nature protection*

In addition to general measures to reduce land use by agriculture, pressure on nature can be reduced by directly protecting specific ecosystems. Although this will not reduce the area of land used for agriculture, it may help to protect certain animal species. Protection of certain areas should be directed at so-called hotspots. These are areas of nature rich in plant and animal species which are also most under pressure with respect to agricultural expansion. As mentioned above, most of these areas are located in the tropics. Nature reserves may also become new sources of income for local populations, for example through tourism. To conserve these areas, local populations must be offered compensation: via systematic and

stable funding for nature protection, transfer of technology to increase agricultural productivity and/or better access to (clean) energy.

5. Improve knowledge of biodiversity

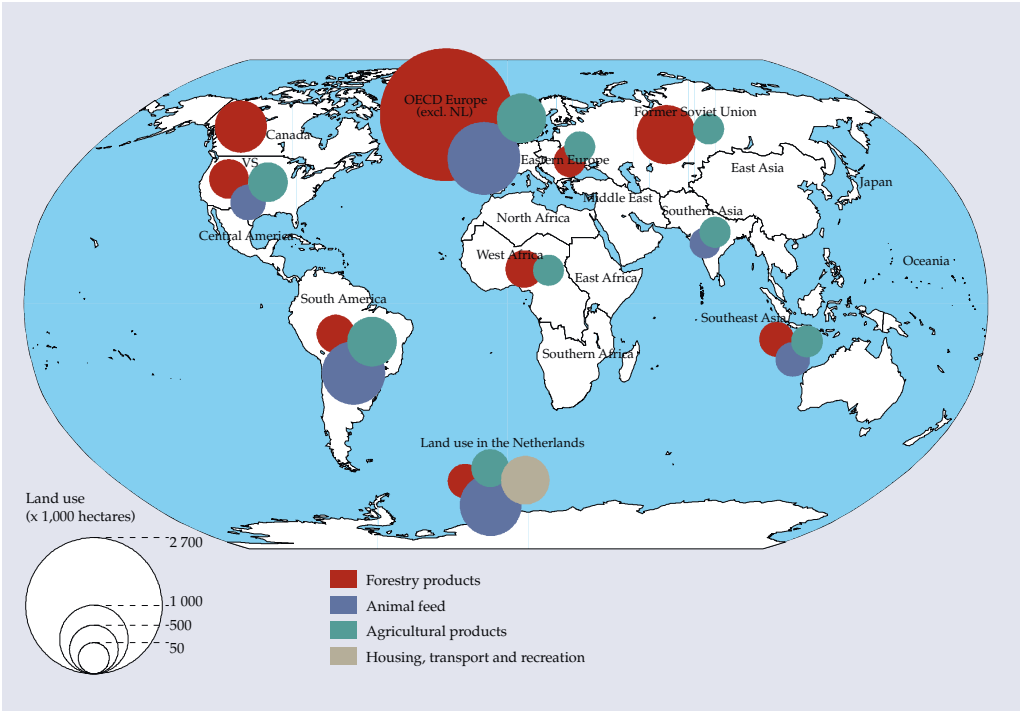
More in-depth scientific insight into and dissemination of knowledge about biodiversity is needed to take further social and political measures. As more stringent polices are implemented to protect biodiversity, people will ask themselves more and more critically why loss of biodiversity is such a bad thing. The Millennium Ecosystem Assessment (MA, 2005) was a first step towards explaining this, but it did not succeed in demonstrating how important biodiversity is for the development of mankind. How damaging is biodiversity loss for the human race? And what are the critical limits? It would seem advisable to set up an equivalent of the Intergovernmental Panel on Climate Change (the international collaborating organisation for climate research and policy) for biodiversity. This would have a greater impact than existing international initiatives. The findings of such a scientific panel could be used to establish how far countries are prepared to go to conserve biodiversity, given the risks, the costs and the benefits.

5.3 *The Netherlands in the world*

Dutch production and consumption contribute to global biodiversity loss as both involve land use. This section looks at the trends in and consequences of Dutch consumption on land use and biodiversity in the rest of the world. The following section describes biodiversity trends in the Netherlands.

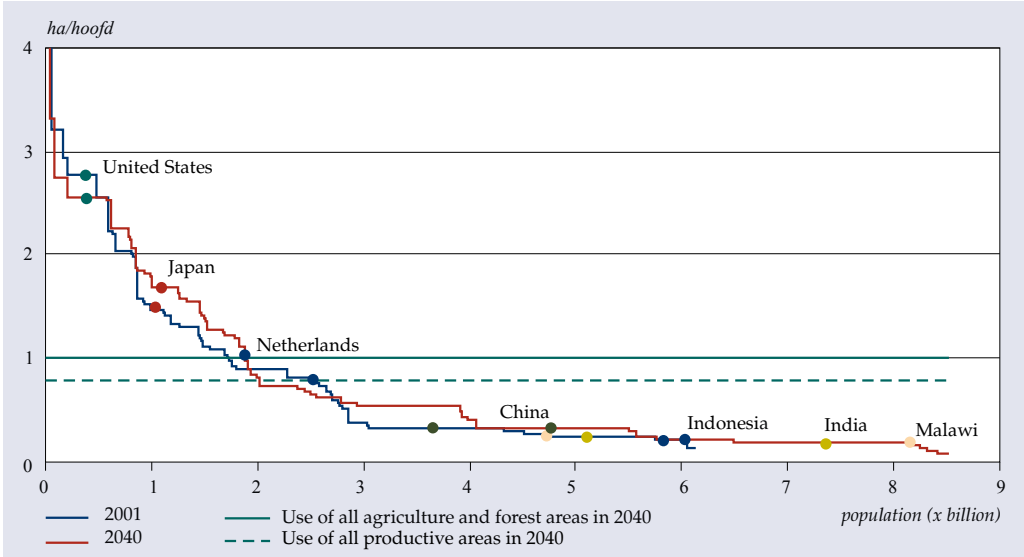
A lot of the land used on behalf of consumption in the Netherlands is located outside the Dutch borders. Dutch consumption contributes to land use and biodiversity loss in the rest of the world via imports of goods and intermediate products required to produce goods (see figure 5.3). As an indicator, the area of land used in aid of Dutch consumption gives a clear picture of the effects on biodiversity elsewhere in the world. The area of land used on behalf of Dutch consumption is equivalent to more than three times the area of the Netherlands, both in the Netherlands and in the rest of the world. This area can be expected to increase further in the future (CPB/MNP/RPB, 2006). About 45 percent of land used on behalf of Dutch consumption is used for food and 55 percent is for timber used to make paper, board and other wood products (MNP, 2007a). The area of land used for food is closely related to the demand for meat and dairy products, which require a relatively large amount of land to produce. In terms of biodiversity, losses outside the Netherlands as a result of Dutch consumption amount to three times the land area of the Netherlands (300 percent MSA). By way of comparison, within the Netherlands, only bout 15 percent of original biodiversity remains.

5.3 Global land use in aid of Dutch consumption, 2000



Source: MNP (2007b) and Rood *et al.* (2004).

5.4 Land use in aid of consumption, per capita, 2001 en 2040



Source: MNP, 2007b.

Land use correlates closely with the level of consumption: richer countries use much more land globally per person than poorer countries. Land in richer countries is usually used more efficiently than land in poorer countries. Land use on behalf of Dutch consumption is now 0.8 of a hectare per person, and will increase in the future according to the OECD's Baseline Scenario (OECD, 2008b). If the Dutch level of consumption were to be the standard for the whole world, and taking into account current OECD population, consumption and technology forecasts, in 2040 all natural grass land and forests in the whole world would have to be converted to agricultural land, which would further deteriorate global biodiversity. Per capita land use in the Netherlands is about the same as the global per capita average (see figure 5.4). Dutch land use is lower than in many other rich countries. This is mainly because both within and outside the Netherlands highly productive land is used to fulfil consumer demands. Partly for this reason, local populations use the remaining extensive land for agricultural production. This means that local populations need more land (and thus more of what is now nature) to generate the same production.

The timber used to made wood products is now harvested from low-productivity forests in moderate and boreal regions. If future higher demands for timber also have to be met from these regions, biodiversity will be lost there, but will not compete with global food production. However, if the greater demand for timber and biofuels is met by agricultural crops in tropical regions, this will compete with the production of food and will also result in tropical biodiversity loss. In view of the high productivity of land in the tropics, this seems to be a realistic picture of the future in a free world market. It also curbs the expectation that much of the biofuel which the EU wants to use in the framework of its energy and climate policy will be produced in the EU itself.

Just as in other countries, environment policy in the Netherlands is aimed primarily at reducing domestic burden on the environment. In addition, where relevant the Netherlands cooperates in international initiatives for stricter environmental requirements for products and services. No further restrictions are usually imposed on the environmental burden outside the Netherlands that is created on behalf of production of the goods it imports. To limit the consequences of consumption in the Netherlands for biodiversity elsewhere in the world, it is important to formulate concrete goals for the environmental burden resulting from the production of these consumption goods. The option of assigning environmental criteria to specific products are limited because of international World Trade Organisation (WTO) and EU agreements and trade pacts. One solution may be agreements between government and enterprise, setting production chain requirements and/or clearly describing the consequences of successive production stages (see policy option 3 in the last section). Moreover, a social dialogue on responsible consumption (less meat) may contribute to reducing land use and biodiversity loss. In its interdepartmental policy document *Biodiversity Works* (2008–2012), the Dutch Cabinet has said it is willing to commit to a number of priorities, i.e.:

1. trade chains and biodiversity (forests, soya, palm oil);
2. paying for biodiversity;
3. biodiversity works (ecosystem services);
4. ecological networks: National Ecological Network and Natura 2000) and international aspects;
5. marine biodiversity and fishery chains.

5.4 National trends

Half the original biodiversity in Europe and more than 85 percent of that in the Netherlands – densely populated as it is – has disappeared as a result of socioeconomic development. The EU and the Netherlands have set themselves the target of stopping further biodiversity loss from 2010. Various directives have been instituted to realise this, such as the Bird and Habitats Directives, which – alongside protection programmes for specific species – are intended to result in a European network of protected nature areas: Natura 2000.

Within the Netherlands, agriculture accounts for by far most of land use: nearly 70 percent of the land area of the Netherlands is agricultural land. A large part of agricultural production is exported, which means that about 45 percent of the Dutch land is used for export products. In addition to agriculture, socioeconomic development also requires land space for homes, factories, offices and infrastructure. Although population growth is low in the Netherlands compared with the rest of the world, the population is still increasing. The number of households is rising even faster. As a result of ageing, the number of single households is increasing, and this group may be expected to rise further in the future. According to three of the four scenarios in Welfare and the Living Environment (CPB/MNP/RPB, 2006), this will push up the demand for housing and increase pressure on available land space.

Since 1990, the Netherlands has been working towards the development of a network of connected nature areas: the National Ecological Network (LNV, 1990). Nearly all the Natura 2000 areas in the Netherlands are incorporated in this network; they can viewed as the jewels in the network's biodiversity crown.

To conserve flora and fauna, high quality habitats are necessary. This means minimum requirements must be fulfilled for environment, water and land, such as size and spatial coherence of habitats. In addition, design, use and management of the habitat determine whether species will be able to live there. The precise requirements of water, environment and land depend on the kind of nature to be preserved.

About three-quarters of Dutch natural land consists of small areas (less than 5,000 hectares). The areas are too small for many species and are insufficiently linked to house viable populations.
Species will only be able to survive if the separate habitats are large enough and if they are part of an ecological network. The likelihood of survival of a species increases strongly if an area can house a larger population. Large habitat units have the following advantages over smaller units:

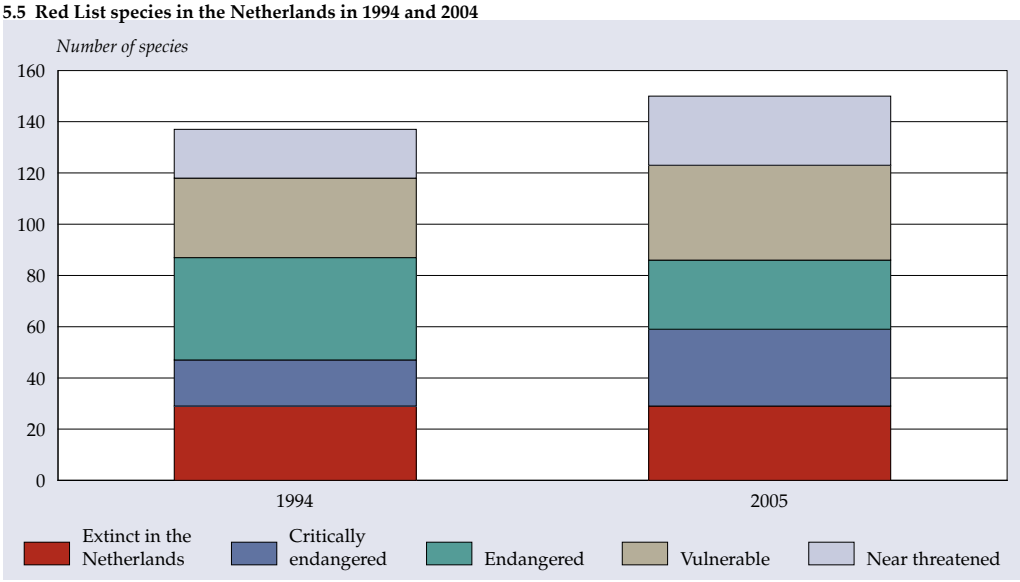
- There is enough room for natural processes such as flooding and sand drift, which is one of the goals of current policy.
- Pressure from the surrounding area on the environment and water conditions is smaller as the distance between natural core areas and functions which cause this pressure – such as agriculture and urbanisation – is larger.
- The larger an area is, the greater the likelihood that the necessary functions will be present.
- Larger areas of nature have more resilience to cope with extreme pressure, such as extreme weather as a result of climate change.
- Species that require a relatively large habitat such as bittern, otter and osprey, have a better chance of survival in large areas.
- It is easier to manage recreational use in large areas, which reduces the risk of disturbance.
- In larger areas people have more opportunity to experience the restfulness and space that they offer.
- The costs for realising suitable conditions are lower for larger units.

The goal is to expand the National Ecological Network by 275,000 hectares by 2018. At the moment 120,000 hectares of this so-called new network (about 45 percent) has been realised. These are areas that have been purchased and made suitable or are under supervision.
The construction of new network areas on former agricultural land has resulted in an expansion of the area of nature by an average 7,700 hectares per year since 1990. But the average growth has dropped to 1,600 hectares per year in recent years, 80 percent less than in the overall period. At the current rate of acquisition and conversion, the network will not be fully realised in 2018. The main obstacles are the expansion of nature types such as grass land and wet heath land (PBL, 2008a). The progress of the realisation of the network is a suitable indicator for policy performance in this area.

One important policy component is that the network is realised as a coherent, i.e. interconnected network of nature areas. Until now in their implementation of the network, central and provincial government have focused on realising the area size targets. If this focus continues, there is a risk that the network will remain too fragmented, and that European agreements and biodiversity targets will therefore not be realised.

Most nature areas in the Netherlands are not only affected by fragmentation, but also by inferior environment quality and/or desiccation, in spite of the fact that conditions for wildlife have improved in recent years. About 17 percent of the desiccated natural area has been restored or partly restored (MNP, 2006b). Acid and nitrogen deposits in nature decreased by 40 and nearly 35 percent respectively between 1990 and 2003, although nitrogen deposits are still too high in three-quarters of nature areas in the Netherlands. Overall environmental policy is committed to further reduction of these emissions, at least until 2020. This is expected to result in a further 10 percent reduction in nitrogen deposits in nature (PBL, 2008b). The expected deposit levels under current policy will still exceed the critical levels for two-thirds of nature in the Netherlands.

5.5 Red List species in the Netherlands in 1994 and 2004



Source: PBL, 2008b.

The ecological quality of regional waters has been established for four water types: brooks and small rivers, lakes, canals, and ditches (Royal Haskoning, 2008; Ligtvoet *et al.*, 2008). For all species groups, with the exception of algae, the present situation in regional and national waters can be classified as 'moderate' to 'poor'. In 5 to 10 percent of water bodies, the situation for aquatic plants, small aquatic animals and fish is qualified as 'good'. On the basis of these provisional results, the situation for algae is 'good' or 'very good' in more than 40 to 60 percent of water bodies. The information for national waters should be considered as an indication only, as water samples in accordance with the European Water Framework Directive have only been taken since 2007. The average ecological quality ratio of all species

groups in regional waters is 38 to 45 percent. This means that the quality is on the boundary between 'poor' and 'moderate'. The quality for rivers and freshwater lakes (national waters) is 39 to 42 percent and is comparable with the average quality of regional waters.

Climate change makes nature more vulnerable for deteriorations in environment quality, desiccation and fragmentation. The average temperature in the Netherlands has risen by more than 1.7°C in the space of just over a century and the average amount of precipitation has also increased. In addition, climate change has resulted in wetter and milder winters and drier summers. These warmer temperatures and changing precipitation patterns also affect the occurrence of species of plants and animals. Climate change is an extra pressure factor on top of poor environment, water and land conditions. Half of Dutch plant species which are affected by both fragmentation and climate change, for example, are showing a negative trend, compared with only 20 percent of those affected by fragmentation alone (MNP, 2007c).

The concept 'quality of nature' may take different meanings. It often refers to the variety of species and ecosystems. Across the world Red Lists are used to indicate how threatened species are doing. The species on these lists are at risk and vulnerable. The Red Lists for species occurring in the Netherlands have grown longer since 1990. Red Lists for birds, butterflies, mammals, reptiles and amphibians have grown by 9 percent. Trends since 2000 for species on the Red List are also often negative: the trend of many rare (target) species (including Red List species) is still declining (see figure 5.5). The increase in the number of species on the Red List means that we are not managing to secure biodiversity yet. Neither will biodiversity loss be brought to a halt by the government's target of 2010. Trends in the Red List species give an indication of the development of biodiversity in the Netherlands

The following policy measures are being taken to stop biodiversity loss in the Netherlands:

1. Realisation of the National Ecological Network

When the National Ecological Network on land is complete in 2018, it will cover nearly 730,000 hectares, accounting for around 20 percent of the land area of the country. This means that the area of nature will increase in the future. Here and there existing nature core areas are expanding, but various smaller nature areas are also being added.

Some small areas which still have a high level of biodiversity, the so-called hotspots, contain plant and animal species that are unique to these areas, or extremely rare, or which can be reintroduced. For the survival of various plant and animal species it is essential to conserve these small areas of nature as well.

2. *Linking nature areas*

At the moment, many nature areas in the Netherlands are still isolated, which means that the planned National Ecological Network remains fragmented. The consequence of this fragmentation is that the spatial conditions for animal species will hardly improve compared with the present situation. Because of fragmentation, pressure on the environment also remains high. If more attention is directed towards the realisation of large units of nature in the realisation of the network – for example by constructing connecting corridors – the biodiversity targets will be feasible if, at the same time, the minimum required environment and water conditions are realised. The core areas in the large units are the Natura 2000 areas the Dutch government has reported to the EU. These contain the 'ecological hotspots' in the Netherlands.

3. *Improving conditions for land-based nature*

Nitrogen deposits will have to be reduced further to improve nature quality in the Netherlands. Agriculture is the largest contributor, but countries outside the Netherlands also contribute substantially to these eutrophication-causing deposits. Just realising the EU emission targets in 2010 as set in the NEC directive for nitrogen oxides, ammonia and sulphur oxides, will not solve the environmental problem. With this level of deposits, only 20 to 30 percent of nature will be protected.

The conservation of the remaining biodiversity in the Netherlands and the realisation of the National Ecological Network will require a lot of land now and in the coming decades. Within the limited land area of the Netherlands room must be found for people to live, work and travel, while at the same time the quality of the environment and the natural habitats must be conserved. To use the available space as efficiently as possible, all these functions and qualities, including extra water storage capacity as a result of climate change, must be considered in relation to each other. The report on sustainability in the Netherlands (*Nederland Later*; MNP, 2007b) shows that many of these requirements can be met. However, uncompromising national directive policymaking is required to realise them. Realisation of environment and water conditions needed for nature requires realisation of EU targets within and outside Dutch boundaries for substances leading to eutrophication and acidification.

5.5 Conclusions

Adequately large areas of natural land and the quality of biodiversity are important. Both at global and a national level, agriculture, fragmentation (especially by infrastructure elements) and climate change are risk factors for both global and national biodiversity. In addition, acidification, eutrophication, desiccation, and limited area size are impediments for high-quality biodiversity in the Netherlands.

Socioeconomic development of the human race has been realised at the cost of biodiversity, both at global and at national level. In global terms, this trend is continuing: as a result of population growth and increasing consumption much of today's nature will be turned over to agriculture and other uses (houses, roads, factories, etc.). Although there is enough land on earth, it is not enough to feed 9 billion people, cultivate biofuels on a large scale to limit climate change, while at the same time conserving global biodiversity.

Developing countries are using more and more land, not only because they are consuming more, but also because what they are consuming takes more land to produce, such as meat. However, developed countries are using much more land than developing countries. The Netherlands accounts for the global average area of land per person, as it uses highly productive land. Increasing agricultural productivity across the world is a powerful option to tackle both poverty and food issues, conserve biodiversity and contribute to reducing climate change (CO_2 storage in forests). Technology alone, however, is not enough to stop biodiversity loss.

Cultivation of biofuel crops requires extra land compared with a world without biofuels. In global terms, this will mean even less land for nature, nature that is already under great pressure from increasing food production. In addition, production of biofuels will push up food prices – at least in the short term – and thus cause problems for the world's poorest populations. The use of (more) biofuels involves various trade-offs: slightly lower CO_2 emissions and diversification of energy sources versus nature (tropical jungle) and production of affordable food.

The effects of Dutch consumption are shifting more and more from effects within to effects outside the Netherlands. These include both direct loss of nature, and indirect loss through adverse effects on biodiversity as a result of increasing emissions in soil, air and water. In many sectors, the Netherlands can produce goods with low emissions per product unit. Intensive livestock farming is an example of this; a shift towards more organic farming would be positive for animal welfare, but it would also use more land. At the same time, production in the Netherlands leads to local emissions, with effects for mainly local health and nature. If less food is produced in the Netherlands, while demand remains the same, agricultural production elsewhere will have to increase. However, elsewhere it would take more land to produce the same amount. In view of the high yields in the Netherlands, relatively large areas will be needed elsewhere. It is not for nothing that nature in – for example – Brazil is under increasing pressure: there, too, there is a lot of highly productive land.

Specific protection and funding of nature outside the Netherlands costs money, and is thus ultimately at the expense of other social goals. These payments are intended

as compensation for not using this land for agricultural production, and for income loss as a result of nature-friendly production methods. The same consideration applies for nature in the Netherlands. Some nature areas in the Netherlands are important in a European perspective, such as the Wadden Sea and other designated Natura 2000 areas. Here too, economic interests have to be weighed against national and international responsibility for biodiversity conservation in these areas. Realisation of the National Ecological Network in the Netherlands will cost money, and claim land on behalf of nature, while land is also needed to live, work, travel and store excess water storage (with a view to climate change). By increasing the coherence between how these various functions are fulfilled, it will be possible to do more with the same area of land. For example, protection against flooding could be combined with nature and landscape development. There are also important links between agriculture on the one hand, and nature and landscape quality on the other.

More and more people in the world are eating meat. As consumption of meat costs a lot more land than consumption of vegetable products, reducing meat consumption will contribute to reducing biodiversity loss, and at the same time be positive for the climate as less greenhouse gases will be emitted and more carbon will remain stored in the forests. However, left to their own devices, people will not eat less meat. To reduce meat consumption, governments will have to intervene, in the shape of high taxes on meat or enforced consumption restrictions. In both cases there is an area of tension between the collective interest of biodiversity and the individual's freedom to choose how much meat to eat.

6. Utilisation of labour and knowledge

6.1 Introduction

A society cannot be sustainable without a minimum level of material welfare. What this level is exactly cannot be defined objectively as it depends among other things on the specific context. The existing level of material welfare is an important element of this context: a drastic drop in material welfare would probably result in a strong increase in the risk of social unrest. And if the decline does not occur in other rich countries, some of the 'carriers' of material welfare would probably emigrate. In short: a drastic fall in material welfare will undermine the sustainability of society.

The importance of this context dependency is also contained in the Brundtland definition, according to which sustainable development must meet the needs of the present generation without compromising the ability of future generations to meet their own needs. But it is evident that the needs of future generations are strongly influenced by needs of the present generation.

If we accept this as a starting point, a relevant question in the sustainability discussion is whether 'our' society will be able – on the whole – to maintain its present level of welfare in the foreseeable future. The answer to this question is complex, as it in fact comprises a large number of other questions, concerning among other things the availability of resources, including energy, international political stability, by how much sea levels will rise, etc.

This chapter is restricted to one single aspect of the question, namely to what extent future developments in labour volume and labour productivity will inhibit or benefit welfare growth in the Netherlands. In answering this question, we implicitly assume that there are no other serious problems with respect to other conditions for a sustainable growth of material welfare.

6.2 Economic growth: the role of labour

Material welfare is defined here as welfare in terms of GDP. It therefore mainly includes marketable goods and services, varying from air tickets to houses, and from organic food products to dental services. It also includes goods and services that are exclusively, or mostly, provided by the government, such as education, infrastructure and the management and maintenance of nature areas. In a strict sense therefore, the adjective 'material' in material welfare is actually incorrect, as non-material services are also included in GDP.

One important aspect of what this chapter defines as 'material welfare', is that producing it often requires paid labour. The available volume of labour thus determines the extent of the potential production of goods and services which make up material welfare. Obviously, this is not the labour supply in absolute, but in relative terms, i.e. labour supply per capita. Section 6.3 looks briefly at the most important labour supply determinants in the coming decades.

It is not only the volume of labour that is important for the production of material welfare, however. The productivity of labour is perhaps even more important. The higher the labour productivity is, the higher the level of welfare it can generate. A (systematic) increase in labour productivity is an indicator of economic growth. In essence, more production per unit of labour is nothing more than making better use of available resources (Romer, 2007). The quality of labour is determined partly by education. So in more abstract terms, economic growth can also be seen as a reflection of the creativity and knowledge of the human race, and of its pursuance of improving its lot.[1)] Section 6.4 examines the determinants and prospects of labour productivity.

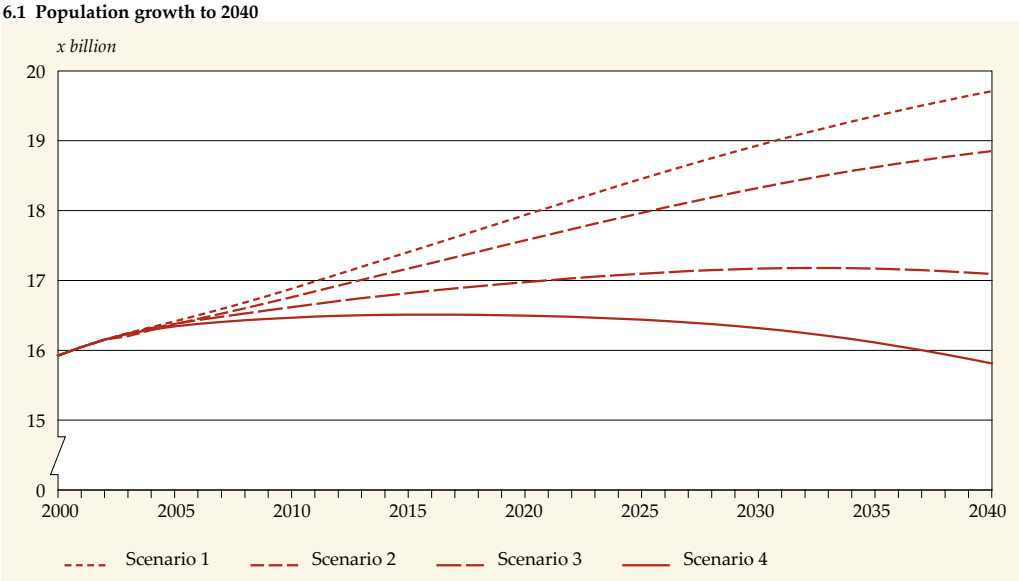
Both sections 6.3 and 6.4 look ahead to the year 2040.

6.3 *Labour supply and participation rate: developments to 2040*

6.3.1 Demography

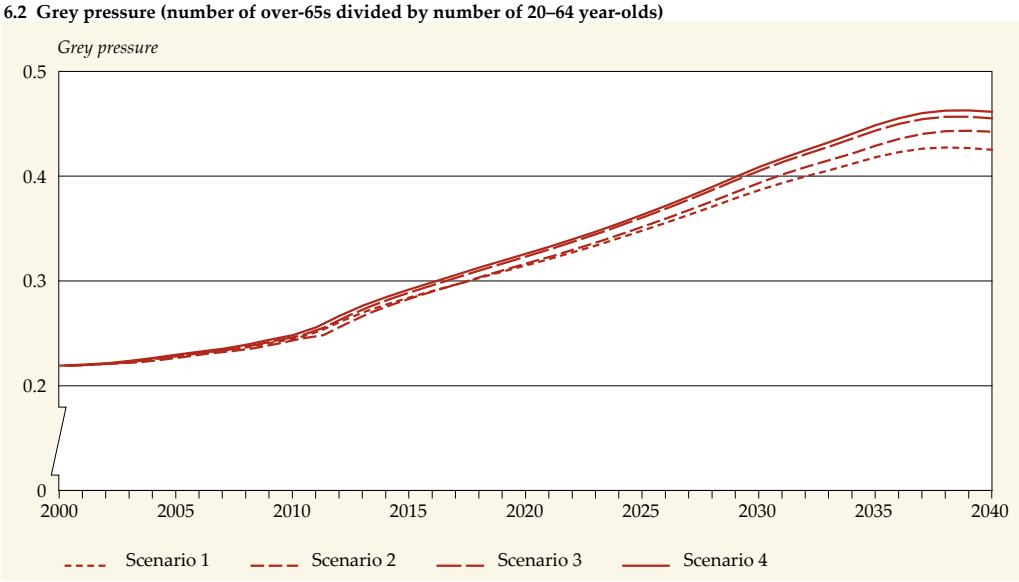
The available volume of labour depends partly on the size of the population. Figure 1 shows four different demographic scenarios,[2)] describing a realistic range of what the Netherlands can expect in demographic terms in the next thirty years. In the high scenario the population will grow to 19.7 million people by 2040, in the low one it will fall to 15.8 million. In the latter scenario the population will be one quarter smaller than in the high scenario. The labour supply will thus also be significantly smaller in the low scenario.[3)] However, the composition of the population is also relevant, as not all population groups participate equally on the labour market; a change in the composition of the population will result in a change in the total participation rate. The ageing process, in particular, is important in this respect. Grey pressure, defined as the number of over-65s divided by the number of 20–64 year-olds, is illustrated in figure 6.2. In all four scenarios this fraction increases in the period to 2040. Depending on the scenario, it will rise from the present 0.23 to between 0.43 and 0.46: i.e. a doubling of over-65s per person aged 20 to 64 years. Another important factor in the scenarios is the role of migration. The differences in total population size between the scenarios are caused mainly by diverging assumptions about immigration. In the coming decades the proportion of immigrants in the population will increase, and thus further 'colour' the composition of the population.

6.1 Population growth to 2040



Source: De Jong en Hildering, 2004.

6.2 Grey pressure (number of over-65s divided by number of 20–64 year-olds)



Source: De Jong and Hilderink, 2004, Statistics Netherlands/RIVM, results processed by CPB.

6.3.2 Labour participation

In addition to the age composition, the participation of the potential labour force is also a determining factor for developments in labour participation. Participation is

defined here as the number of people who work – or want to work – for more than 12 hours a week, divided by the total number of 20–64 year-olds. Some important factors for developments in participation are outlined below (for more details, see Roodenburg and Van Vuuren, 2004).

Cohort effects

Cohort effects are the result of past changes in behaviour of successive generations. If a younger generation behaves differently on the labour market than previous generations, it is initially only visible in the participation rate of young people. It takes around 40 years before the change is also visible in the participation rates of older age groups. The main recent cohort effects have been related to the participation of women. Since the beginning of the 1970s – when the birth cohort of the early 1950s entered the labour market – socio-cultural changes have led to an increasing labour participation of women. As these 'emancipated' women gradually progress to older age groups, they will continue to push up the participation rate of women until around 2015. The rate will then probably stabilise, as the youngest generations of women have shown no further increase in willingness to participate (Euwals *et al.*, 2007). The participation rate of older men will also increase, partly as a result of policy revisions in disability benefits and early retirement schemes. Compared with the cohort effects for women, however, this will only contribute modestly to overall participation growth.

Socio-cultural trends

Socio-cultural trends, too, influence labour participation. These trends determine to an important extent how far participation rates will rise. Cohort effects on the other hand describe the rate of change over generations. Socio-cultural trends include things like individualisation and changing ideas about child care. The largest effects of these developments will be reflected in female participation. Two of the four scenarios assume that the participation rates of Dutch women will grow towards Swedish levels, while in the other two the rates will stabilise at a lower level. The influence of socio-cultural trends and cohort effects on the number of working hours is small: in spite of higher participation rates and female emancipation, the number of hours women work per week has remained quite stable in successive generations (Bosch *et al.*, 2008).

Working hours and part-time work

In no other country is the average number of working hours as low as in the Netherlands (table 6.1). The main reason for this is that in no other country do so many people work part-time. About one in three Dutch people who have a paid a job work for less than 30 hours a week in their main job. Most of these are women: two-thirds of working women work for less than 30 hours a week. Other countries with high part-time rates, such as Germany and the United Kingdom, follow only at a considerable distance. It should also be mentioned in this respect that relatively

many men in the Netherlands also work part-time; but at one in seven the part-time rate for men is still significantly lower than for women.

Table 6.1
Hours worked and part-time jobs in some countries, 2006

	Hours worked [1]	Part-time [2]	Women working part-time
		%	
United States	1,804	12.6	17.8
Italy	1,800	14.9	29.4
Spain	1,764	11.1	21.4
Finland	1,691	11.4	14.9
United Kingdom	1,669	23.4	38.8
Sweden	1,583	13.4	19.0
Denmark	1,577	18.1	25.6
Belgium	1,571	19.3	34.7
France	1,564	13.3	22.9
Germany	1,436	21.9	39.2
Norway	1,407	21.1	32.9
Netherlands	1,391	35.5	59.7

Source: Tables E and F, OECD employment outlook 2007.
[1] Average number of hours worked per worker per year.
[2] People who work for less than 30 hours in their main job.

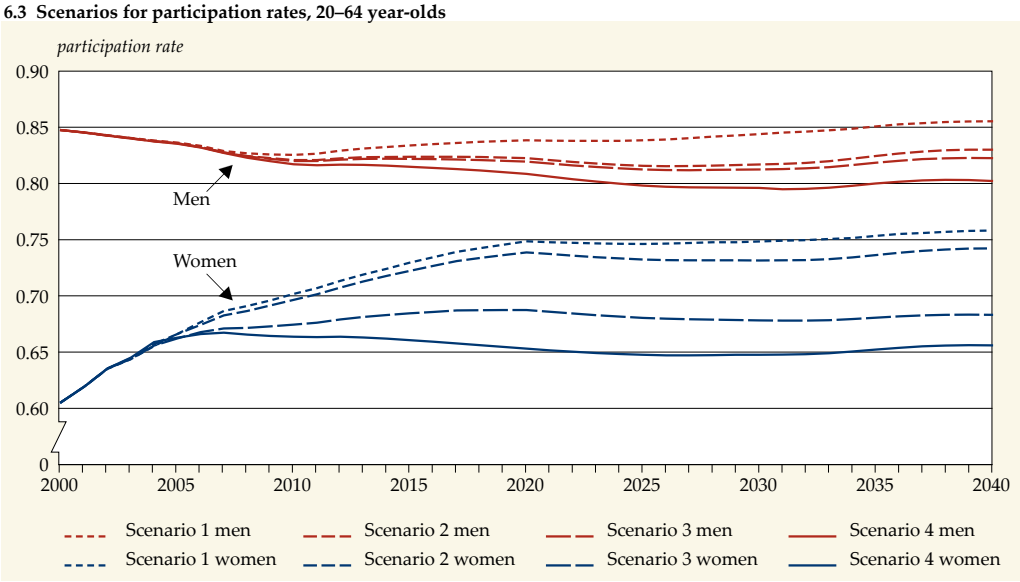
The average number of weekly working hours does differ between the four scenarios, but the variation is smaller than for participation. These moderate differences between the scenarios are the result of the dominant influence of strong individual preferences for part-time work in all the scenarios. An international study by the Netherlands Institute for Social Research/SCP has shown that relatively many women in the Netherlands say they want to work part-time (Portegijs and Keuzenkamp, 2008). Although institutional impediments such as school hours do play a part, relatively few Dutch women say they work part-time in order to care for their children. Moreover, in other countries women with older children more often work full-time than Dutch women, while school hours are then no longer so relevant.

Large numbers of part-time workers result in lower gross domestic product per capita than a situation where everybody works full-time. From an economic point of view, this is not a problem, however, as this lower production is accompanied by more leisure time, and in addition to income, leisure time also contributes to people's welfare.

One noticeable aspect of working hours is that they are not divided evenly between the sexes. This may be the consequence of specialisation and an optimal division of tasks within the household. But in view of the strong rise in the education level of women, where in the youngest generations women have now overtaken men, it is

not clear whether this division of tasks will remain unchanged in the future. In the present situation, women in the Netherlands are less successful in their careers than men, as many of them work part-time and therefore have more difficulty building up experience. This need not be a problem from an economic point of view, as long as the choice for part-time work is a conscious one. But women who choose to work part-time may have a negative effect on the career prospects of women who work full-time and want to continue to do so; their behaviour may create expectations among employers, and cause what we call statistical discrimination. Moreover, at present most employers are men, and actual discrimination may also play a part.

6.3 Scenarios for participation rates, 20–64 year-olds



Source: Roodenburg and Van Vuuren, 2004.

Immigration and integration

Present participation rates of people with an immigrant background in the Netherlands are lower than those of native Dutch people. But the difference between second generation non-westerners and native Dutch people is smaller than for the first generation, although it is still significant (Dagevos and Gijsberts, 2007). The gap between foreigners and native Dutch people may be expected to narrow gradually and eventually disappear, especially as education levels of foreigners are rising faster than those of the native population. For immigration and integration the four scenarios assume varying levels of annual migration, but on top of that also different rates of catching up. In the scenarios with a selective labour migration policy the gap will close more quickly. There is also a mutual dependency between migration and economic growth: migration is a determinant of participation, and thus of production and economic growth; but economic growth also has an effect on the number and education level of migrants (Chorny *et al.*, 2007).

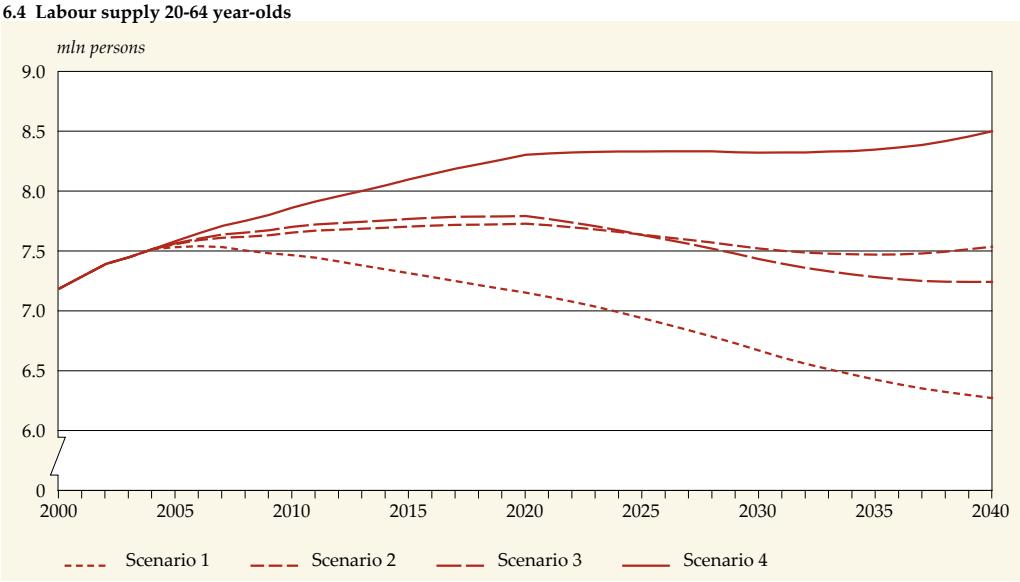
Social security and early retirement

All the scenarios assume that the outflow from labour as a result of disability or early retirement will diminish in time; depending on the scenario only slightly or considerably. Recent government policy has already resulted in a considerably lower inflow into disability benefit schemes, and the hidden unemployment of these schemes has already decreased (Koning and Van Vuuren, 2006). The four scenarios assume that this policy will continue, but with varying effects and success. Policy discouraging early retirement, and especially the conversion of early retirement schemes to actuarially neutral pension schemes, has made it more attractive to work to older ages (Euwals *et al.*, 2005). This policy, too, is assumed to continue in all four scenarios, but again with differing effects and success. Lastly, one of the four scenarios assumes that the entitlement age for state old-age pension will gradually rise from 65 to 67 years.

Resulting participation rates

Figure 6.3 shows the development of participation rates for the four scenarios. The participation rate for men will fall until around 2010. This decrease is mainly caused by the ageing of the male labour force.

6.4 Labour supply 20-64 year-olds



Source: Roodenburg and Van Vuuren, 2004.

After 2010, when the post-war baby boom starts to leave the labour market, there will be a certain stabilisation. The differences between the scenarios are then mainly caused by differences in the extent of social security reforms. These will have an effect on both the average age at which people retire from work, and on the number of people entitled to incapacity benefit.

Naturally, the factors mentioned above also affect participation rates of women. In addition, for women individualisation and child care also play a noticeable part. Figure 6.3 shows that assumptions in this respect may lead to strongly deviating participation rates for women.

6.3.3 Labour supply

The total labour supply is determined by the size and composition of the population, and the corresponding participation rates. Figure 6.4 shows a prediction of the labour supply to 2040 for the four scenarios. In the scenario with the lowest participation rates, the labour supply will be lower than in 2001, at 6.3 million. This is also the scenario with the smallest population. In the scenario with the highest labour participation rates, the labour supply will be an estimated 8.5 million.

Table 6.2
Breakdown of increase in labour supply by sex

	2001–2020		2021–2040	
	Minimum growth	Maximum growth	Minimum growth	Maximum growth
	mln persons			
Demographic effects	–0.4	0.1	–0.8	0.2
of which:				
men	–0.2	0.1	–0.4	0.1
women	–0.2	0.1	–0.4	0.1
Participation effects	0.4	1.1	–0.1	0.1
of which:				
men	0.0	0.2	–0.1	0.1
women	0.4	1.0	–0.1	0.0
Total	0.0	1.2	–0.9	0.3
of which:				
men	–0.3	0.2	–0.5	0.2
women	0.3	1.0	–0.4	0.1

Breakdown by demography and participation

The labour supply consists of a demographic and a participation component. The demographic component reflects the effect of population developments on the labour supply, assuming constant participation rates per population group. The participation component reflects the effect of changes in participation rates. By dividing the population into different categories, the composition of the labour supply can be examined from different perspectives. In table 6.2, the demographic

and participation effects are divided by sex. The figures give the cumulative growth of the labour supply in millions of persons, for the periods 2001–2020 and 2021–2040. The table shows that the increase in female participation will be the main positive impulse for the labour supply. In addition to cohort effects and socio-cultural factors, policy developments also have an effect on female participation in the four scenarios. For men the participation effect ranges from slightly negative to slightly positive, depending on the scenario. The demographic effects are equal for men and women: ranging from negative to slightly positive. There may be a positive demographic effect if population growth is so large that it compensates the negative composition effect (ageing).

Table 6.3
Breakdown of increase in labour supply by ethnic background

	Minimum growth	Maximum growth
	mln persons	
Demographic effects		
Population size	–0.4	1.2
Age composition	–0.8	–0.8
Ethnic composition	–0.3	–0.2
Total demographic effects	**–1.3**	**0.1**
Participation effects		
Native Dutch 15–54 years	0.1	0.4
Native Dutch 55–74 years	0.2	0.6
Non-western foreign background	0.1	0.4
Total participation effects	**0.4**	**1.4**
Total	**–0.9**	**1.5**

Breakdown by ethnic background

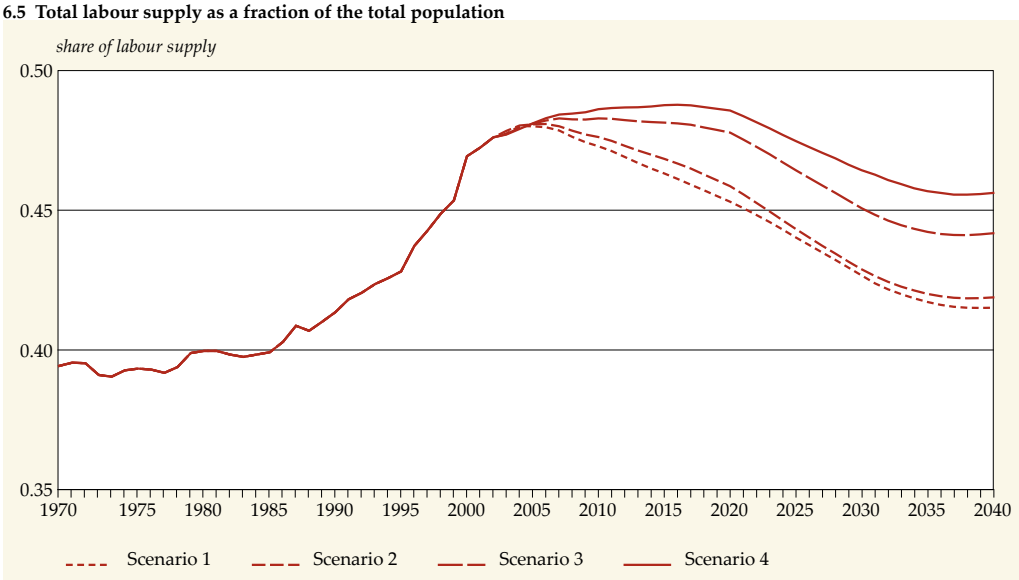
Table 6.3 examines the labour supply further from the perspective of ethnic origin. Here the demographic component is broken down by the effects of change in population size, age composition, and ethnic background. The effect of the ethnic composition is negative; mainly because of the immigration of non-western foreigners, who have a relatively low participation rates. The change in the total participation rate for 15–74 year-olds is attributed to the effects of native Dutch and immigrants in age categories 15–54 and 55–74 years.[4)] The participation effects are

positive in all the scenarios for both immigrants and younger and older native Dutch people. The positive participation effect for non-western immigrants has two causes. Firstly, second and third generation immigrants will close part of the gap with heir native peers in all scenarios. And secondly, some scenarios take into account selective labour migration, which has a favourable effect on the total participation rate.

6.3.4 *Labour supply to population ratio*

In a rapidly ageing population the relative labour supply will decrease systematically. And the smaller the share of working people in the total population, the fewer people there are to pay the premiums[5)] and taxes for collective expenditure on the non-active population. If the participation rate is too low, it will undermine the sustainable continuation of the welfare state. To what extent may we expect this problem to manifest itself in the Netherlands in the coming decades?

6.5 Total labour supply as a fraction of the total population



Source: Roodenburg and Van Vuuren, 2004.

Figure 6.5 sheds some light on this. It shows the development of the total labour supply as a share of the total population. To place this in a historical perspective, the development since 1970 has also been drawn in. The figure shows a noticeable increase in the ratio in the 1990s. Around the turn of the millennium it starts to level out, however. From 2010 the four scenarios all describe a downward trajectory, as the ageing process starts to take effect. In one extreme, there is a mild and gradual decrease, and the 'gain' from the 1990s is largely maintained. In the other extreme, the 'gain' is almost completely lost and the ratio drops back to its 1990 level. After 2035 the effects of the ageing process will have more or less have disappeared and the relative labour supply will stabilise.

In all the scenarios, the labour supply ratio will be higher in 2040 than in 1970. However, this aggregate picture conceals significant underlying differences with the past. In the 1970s, non-active people were mostly women. In 2040 they will be mostly old people. In other words, the increase in female participation (more than) compensates for the ageing effect. The difference in the composition of the labour force does have consequences for the welfare state. In the 1970s the dependants – mostly women – were taken care of, financially, within the family: the men were the breadwinners. The costs of living for the elderly, however, are to a considerable extent paid for by everyone with paid employment. This is certainly true of the apportionment-based systems such as the general old age pension (AOW) and health care spending.

6.4 *Labour productivity: developments to 2040*[6)]

Labour productivity is defined here as the volume of value added per labour-year. The amount of material welfare produced in the Netherlands is then the volume of labour times labour productivity. This simple relationship shows that the development of labour productivity is an important determinant of future welfare. In general terms, labour productivity depends on four factors: the state of the economy, the amount of capital per unit of labour, the composition of the labour force, and the level of knowledge and technology. There is an important difference between the first three factors and the fourth one: the effect of the first three factors is limited by their nature; only increasing knowledge and technological progress enable sustainable growth by continually improving production processes.

6.4.1 Economy, capital and labour force composition

One reason that the first factor, the state of the economy, affects labour productivity is the simple fact that it costs a lot of money to dismiss and then later re-employ workers. Therefore, employers keep their staff levels relatively constant during the economic cycle, and fluctuations in production are generally larger than fluctuations in number of employees. In addition, stocks of capital goods cannot be expanded in the short term; in peak periods, therefore, inefficient and often old equipment and machines have to be used at the cost of relatively high extra labour input, while in slack periods only the newest most efficient machines remain in operation. As the 'sustainability' theme focuses more on the long term, no further attention is paid here to economy-based fluctuations in labour productivity.

The second factor, the amount of capital per unit of labour is mainly determined – ceteris paribus[7)] – by the price ratio of capital to labour. If the relative price of labour rises, employers replace labour by machines. As a result production per worker (i.e. labour productivity) rises. However, this does not mean that a company has

become systematically more productive, as the reduction in labour is only possible by using more capital. Extra capital could have been used before the wage rise, but this would not have resulted in an efficient capital-labour ratio. If the capital price-labour price ratio reverts to its original value, the capital-labour ratio will decrease again, as will labour productivity. The wage restraints in the Netherlands in the last two decades of the twentieth century – which were partly necessary to absorb the rapidly increasing labour supply – had a negative effect on the capital-labour ratio and thus tempered the growth of labour productivity. Now the rapid increase in the labour supply with its restraining influence on wage rises has seems to have passed (see figure 6.4), its negative effect on labour productivity growth has been removed, and the increase may be higher than in the 1980s and 1990s. The capital-labour ratio may even rise again for a time, resulting in a further temporary growth acceleration of labour productivity.

Table 6.4
Education participation in the Netherlands by age and sex

	15–19 years		20–24 years	
	men	women	men	women
	% of the population			
1961	47	24	9	3
1970	56	38	14	4
1980	70	63	20	10
1990	74	72	27	20
2005	85	87	41	38

Source: OECD, 2008a, Education at a glance, Parijs.

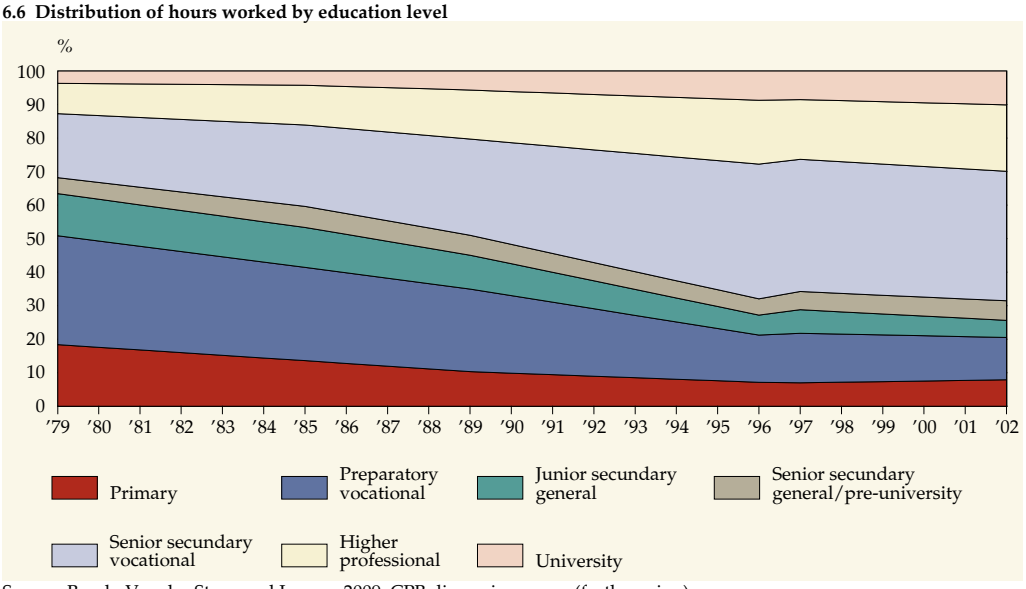
The third factor, the composition of the labour force, plays a part because there are many types of labour, which all contribute in different ways to production. Skilled workers are more productive than unskilled workers, experienced workers are more productive than those with no experience. A large part of the heterogeneity is covered by a breakdown by level of education, age and sex. The characteristic 'sex' is relevant mainly because there are still a number of differences between men and women with the same education and the same age, for example in work experience, areas of training, occupations and full-time/part-time employment. In addition, discrimination may also play a part. Developments in education participation, age composition of the population and labour participation will cause changes in the composition of the labour force by education, age and sex, and thus also in average labour productivity.[8)]

It is difficult to measure the productivity of various types of labour directly. As wage rates are the best indicator, wage data – although far from perfect for this

purpose – are usually used to estimate how changes in the composition of the labour force will affect average labour productivity.
The past increase in the average number of years in education will continue to raise the average level of education for a long time to come. Initial education – participation in regular full-time education before entering the labour market – is an important contributor to the education level of the labour force. The increase in education level is gradual: old, lower educated cohorts leave the labour market and young higher educated cohorts enter it. A one-off continued increase in education participation thus results in a rise in the labour force's education level which will take about half a century. In the Netherlands, the compulsory school attendance age has been raised several times since the Second World War. Voluntary participation in continued education has also risen substantially. Initially it was mainly boys who stayed on in school, while girls lagged behind. Today girls have closed this gap; more girls than boys are now enrolled in higher education.

As a result of these developments in education, the education level of the labour force has risen substantially. Figure 6.6 shows the hours worked by education level for the period 1979–2003. It illustrates that the rate of change has now slowed down considerably. In the future, the education level of the male labour force will increase further, although more slowly than in the past, and the education level of the female labour force will rise faster and for a longer period.[9)]

6.6 Distribution of hours worked by education level



Source: Bosch, Van der Steeg and Lanser, 2009, CPB discussion paper (forthcoming).

The increasing labour participation of women continues to push up the share of women in the labour force. Based on the observed positive differences in wages between men and women with the same education levels and the same age, this shift should result in a decrease in average labour productivity. However, there is reason to believe that in this respect, wage differences in the past are not a reliable indicator of future differences in productivity. Young women who entered the labour market in the last ten to twenty years are more labour market oriented than previous generations of women. This is reflected, for example, in the above-mentioned strong increase in participation in education. It is also reflected in data on wages by education level, age and sex, which show that wage differences between men and women with the same education level and age are diminishing. In the 1990s, for all ages the average – negative – difference of women's wages compared with those of men in the same situation fell from 15 to 12 percent. The decrease was strongest for the age group to thirty years, about 7 percent points. For middle-aged women, aged thirty to fifty, the decrease was about 3 percent points; for the oldest age group alone the difference remains unchanged. Fewer women in the young generations are expected to interrupt their careers, and by the time they are middle-aged, they will have more work experience than the middle-aged women of today. It would seem reasonable to assume that as a consequence of these cohort effects, the wage differences between men and women will gradually diminish even further at older ages too.

The ageing of the labour force, a consequence of the demographic developments, will involve a shift from young inexperienced workers to old experienced workers. Based on the observed age-wage profiles, this shift may result in an increase in average labour productivity. Here, too, it should be commented that firstly, the age-wage profile need not be identical to the age-productivity profile. One theory states that young people earn less and older people more than what they contribute to production; the promise of high wages later in their career is a motive for young employees to work hard. This theory fits in with the fact that many older people who are unfortunate enough to lose their job have difficulty finding a new one: they are too expensive to be used efficiently. If this theory is correct, a productivity increase as a result of ageing will be smaller than wage differences suggest. And secondly, the increase in the labour supply of older people may result in smaller wage rises for older people than for young people (the age-wage profile becomes less steep).

6.4.2 Knowledge and technology

The three processes of increasing education levels, feminisation and ageing are finite and will eventually no longer contribute to changes in labour productivity. Permanent progress will then have to come from advancing knowledge and its expression in improved products and production processes. It will take a well-educated labour force, fed with high quality knowledge in an education system that promptly incorporates new developments to realise a high rate of progress in this way. Fundamental scientific research, often carried out at universities,

leads to new knowledge, blueprints of new products or new techniques to make existing products. Applied scientific research, often conducted within large companies and business-linked institutes, turns these blueprints into products and techniques. These new products and techniques must have advantages over existing ones, otherwise they will not stand a chance on the market. For example, a product may be made with less input and thus at lower costs, or a higher quality product – fetching a higher price – may be made with the same amount of input. In a long term perspective, the outcome of this continual process of (mostly small) improvements is a gradual rise in labour productivity.

Historical figures provide a lot of insight into long-term trends in labour productivity. Table 6.5 shows the developments since 1870. For a historical assessment, the shift of the technological frontier[10)] is the most interesting aspect. In 1870 this frontier was still the United Kingdom. Productivity growth there between 1870 and 1913 was very low in a historical respect, at 1.2 percent per year. In 1913 the United States took over the technological frontier (Maddison, 2001). The growth rate of the technological frontier is remarkably stable. From 1870–1913 it was 1.2 percent per year (growth in the UK) and since then it has been between 1.5 and 2.8 percent per year (growth in the US). Other countries may get left behind for a time and grow more slowly, but in the long term they are expected to catch up again.

Table 6.5
Labour productivity of the total economy

	Netherlands	Europe [1)]	US
	% change per year		
1870 to 1913	1.2	1.6	1.9
1913 to 1950	1.3	1.6	2.5
1950 to 1973	4.8	4.8	2.8
1973 to 1998	1.8	2.3	1.5

Source: Maddison, 2001, table E-8.
[1)] Europe = EU15 without Greece, Portugal and Spain.

Table 6.6 gives an overview of developments in labour productivity in the Netherlands, Europe and the United States from 1950 onwards. Remarkably, here too, the picture for the United States appears to be less volatile than that for Europe. The United States was constantly on the technological frontier in this period. It is easier to move towards the frontier than to shift the frontier itself. After the Second World War, a catching up effect led to a considerably larger rise in labour productivity in the Netherlands and Europe than in the United States. It is important to know a country's position with respect to the frontier to assess its growth possibilities.

Table 6.6
Labour productivity of the total economy

	Netherlands	EU15 [1)]	US
	% change per year		
1950 to 1960	4.2	4.2	2.8
1960 to 1970	4.3	5.2	2.8
1970 to 1980	3.2	3.8	1.4
1980 to 1990	1.9	2.3	1.4
1990 to 1995	1.4	2.2	1.1
1995 to 2003	0.5	1.5	1.9

Source: Calculated from data of the Groningen Growth and Development Centre and The Conference Board (2004).
[1)] To 1990 excl., 1990–1995 and 1995–2003 incl. East Germany.

In the Netherlands, labour productivity growth did not fall below 1.2 percent per year for long periods of time. Even in the period 1913–1950, with two world wars and an economic crisis, growth was still 1.3 percent per year. After the Second World War, labour productivity in the Netherlands grew fast, largely because of the catching up effect with respect to the technological frontier. In the mid-1970s, the Netherlands reached the level of the United States. Europe came within a few percent points of this level in the mid-1990s. This means that not much more catching up growth can be expected from either the Netherlands or Europe. Frontier shifts have now become more important for the Netherlands and Europe, and the United States can be used as a proxy for these.

For a long time, the process of technological progress was treated as a black box in economic analyses. But of course knowledge does not just appear out of thin air, and technological developments and their conversion into new products and techniques do not come about spontaneously. 'Knowledge' is itself a produced good, and the economic literature is increasingly coming to the conclusion that in a number of respects, the market for knowledge works in the same way as that for other goods and services. Technological developments are the outcome of purposeful action taken by economic agents. They invest in human capital and conduct research and development activities. Pure scientific research is primarily driven by curiosity, irrespective of economic motives, and the results are fairly uncertain because of the effects of coincidence and luck; but the extent to which curiosity results in technological progress also depends on how efficiently research is carried out, results are combined and prototypes are prepared for the market. And this is where economic motives do play a part. In one respect there is a difference between knowledge and many other goods and services, i.e. the strong presence of spill-overs – positive external effects. This is why the government has a large involvement in education and (fundamental) research.

Studies have shown that it takes a long time before a real new development, so-called breakthrough technology, makes a significant contribution to economic development. Digital computers, for example, already existed in the 1940s, but have only been contributing substantially to macro-economic growth in the last ten years or so. The implication here is that technologies that are to play an important part in the next few decades have very probably already been developed. Uncertainty about the rate of technological progress to 2040, then, concerns mainly the rate at which existing technologies are implemented; completely new discoveries are less relevant. Positive effects are mainly to be expected from technological discoveries in the past few decades. Also in this respect, the Netherlands has some catching up to do in the area of information and communication technology. This is another reason why labour productivity growth may be expected to speed up in the near future compared with recent years.

6.4.3 Determinants of technological development

A favourable innovation climate and the availability of high quality human capital are conducive to technological development in general. The area of technological development, which is determined partly by economic factors, is also important. Social acceptation of new technologies is an important precondition for their (rapid) implementation. Public debate about controversial technologies such as nuclear energy and genetic engineering should not be aimed at disguising real dangers, but at reaching a rational assessment of the pros and cons, including risks for people and the environment.

Rate of technological development

The innovation climate determines the extent to which innovations have a chance of surviving on the market, or whether they are stimulated by the market. The extent of competition has a non-monotonous effect on the rate of innovation. Weak competition is disadvantageous for innovation, but fierce competition is not favourable either; somewhere between these two there is a level of competition that results in the highest rate of innovation.[11)] In principle, there is a role here for competition-related policymaking. In addition, the policy on patents is also important. Patents offer innovators certain protection against copying, which is necessary to stimulate innovation. However, protection must not be so close that potential rivals no longer stand a chance and become so discouraged that they break off their work. Here, too, it is a question of finding the right balance.

The Dutch structure of research and innovation does not function systematically worse or better than that in other rich countries. The Netherlands scores high on the number and quality of scientific publications. Dutch manufacturing companies apply for a large number of patents, and the share of technologically innovative companies was relatively high in 2000. The Netherlands rates as average on the exchange between science and business. On the other hand, investment in innovation and R&D (both scaled to enable international comparison), and

staff input are average to low. Public spending on R&D is average, but private investment in R&D is low in an international perspective. Further analysis shows that the relatively R&D extensive sector structure in the Netherlands explains 60 percent of the Dutch R&D under-performance in this respect in 2001 (Erken and Ruiter, 2005). Furthermore, costs per scientific publication are high. The services sector generates relatively few new and improved products, and the share of technologically innovative companies was relatively low in 2000.
Extra R&D generates important positive effects. The return of extra R&D for society is estimated to be in the region of 50 to 100 percent above private return. However, empirical research has also shown that it is difficult to develop policies that actually encourage extra innovation. R&D subsidies, for example, are often used to finance projects that would have been carried out by the market anyway.

High quality human capital is advantageous for product and process innovations, including the adoption of foreign innovations. Excellence is required to work at the frontier and to help shift the boundaries of knowledge, but the application of innovations developed by others also requires a high level of knowledge. Human capital can be built up by among other things education, on-the-job training, and experience. Although the benefits of investing in human capital are uncertain at an individual level (CPB, 2002), they are very positive for society as a whole. Indeed, this is why education is so strongly subsidised.
Compared with other rich countries, the Dutch education system performs well on a number of aspects. Dutch students achieve high scores in internationally comparable tests and relatively many of them find work after leaving school. On the other hand, Dutch pupils leave the education system at an early age, and premature school leaving is relatively frequent in the Netherlands. As a result, the education level of the population is low compared with other developed countries. The increase in the share of the population with a degree in higher education is also smaller than in other countries, although this may be connected with the indicator and definition of higher education used in the comparison.

Dutch students remain in education for a shorter period on average than those in a number of other rich countries.[12)] Many Dutch 15–24 year-olds are no longer in education. The percentage of the population with a low education level is relatively large in the Netherlands, and the percentage of those with higher education is relatively small. In the period 1991–2002 the share of the population with a degree in higher education rose from 20 to 24 percent, while the average increase in other developed countries (excl. Germany) was twice this: from 21 to 30 percent. For the group aged 25–34 years the differences are even clearer. On average the share of this group with a degree in higher education rose from 25 to 36 percent for seven of the eight reference countries, while in the Netherlands it rose from 22 to 28 percent. So the increase in the percentage of the population with a degree in higher education is slower than that in other developed countries.

Recent studies have shown that it is mainly high levels of knowledge and skills that are important for productivity, especially in countries that already have a high productivity level. The skills distribution ranks the labour force from left to right according to rising levels of skills. Empirical analysis of the skills distribution shows that the Netherlands does not belong to the best countries on the right-hand side of the distribution. The average level of skills in the Netherlands is high, but this is based mainly on the relatively high level on the left-hand side of the skills distribution. The Dutch position drops if only the right-hand side of the skills distribution is taken into consideration. The Netherlands is not among the top countries at the highest level of skills for either secondary or higher education. Neither is the Netherlands one of the top OECD countries with the highest percentages of graduates from higher education. The findings of the skills distribution are robust for various skills tests and age groups and over time. This robustness may be the result of the structure of Dutch education. The results show that there is room for skills improvement on the right-hand side of the distribution. Therefore, policies aimed at raising Dutch achievements at high and top skills levels in higher education may improve Dutch productivity.

Direction of technological development

Until now we have tacitly assumed that technological developments result in an increase in labour productivity. Indeed, viewed over centuries, real wages have increased substantially, while the return on capital has remained at about the same level. This means that in the long term, technological progress is not neutral but favours the factor labour. Theory on the direction of technological progress is still in its infancy, but the economy would not be the economy if no attention was paid to the role of financial stimulation. Acemoglu (2002) has done some pioneering work in this respect. In his theory, the field of technological progress is the result of activities of innovators who aim for maximum profit. The theory explains why in the long term technological progress is aimed at labour and increases labour productivity, but leaves room for technological progress directed at capital (or other production factors) in transition stages.

Acemoglu's theory assumes well functioning markets for production factors, so that the factor prices reflect scarcity ratios. In practice, markets never work perfectly, and sometimes they do not even exist; this is the case for a number of environment-related goods such as clean air and clean surface water. Agriculture and industry have polluted water with pesticides and effluents, traffic and industry have polluted the air by emitting CO_2, NO_x and other gases, propellants have damaged the ozone layer, traffic and roads pollute the environment with light and noise. Where no markets exist, in some cases an effort can be undertaken to organise them; the introduction of tradable carbon emission quotas is an example of this. Otherwise regulations will have to be introduced to take the unpriced scarcity of the production factors concerned into consideration in decision-making on production and innovation. In as far as such actions are successful, they use up scarce research

capacity for the development of less damaging alternatives. In many cases they will have a negative effect on the growth of labour productivity, although in theory it is possible that they would save so much money that this would more than compensate the costs of innovation and compliance with regulations.[13] Although these actions are usually disadvantageous for short-term material welfare, they may well contribute to a better living environment and thus to welfare in a broad sense.

Table 6.7
Future labour productivity in some sectors of industry

		Regional Communities	Strong Europe	Transatlantic Market	Global Economy
	1980–2001	2002–2040	2002–2040	2002–2040	2002–2040
	% change per year				
Agriculture	3.6	2.6	2.7	3.0	3.8
Manufacturing	2.9	2.1	2.7	2.8	3.4
Commercial services	1.1	1.4	1.8	2.4	2.5
Care	–0.3	0.5	0.6	0.7	1.0
Government	1.2	0.6	1.0	1.2	1.5
Total economy	1.3	1.2	1.5	1.9	2.1

Source: Huizinga and Smid, 2004.

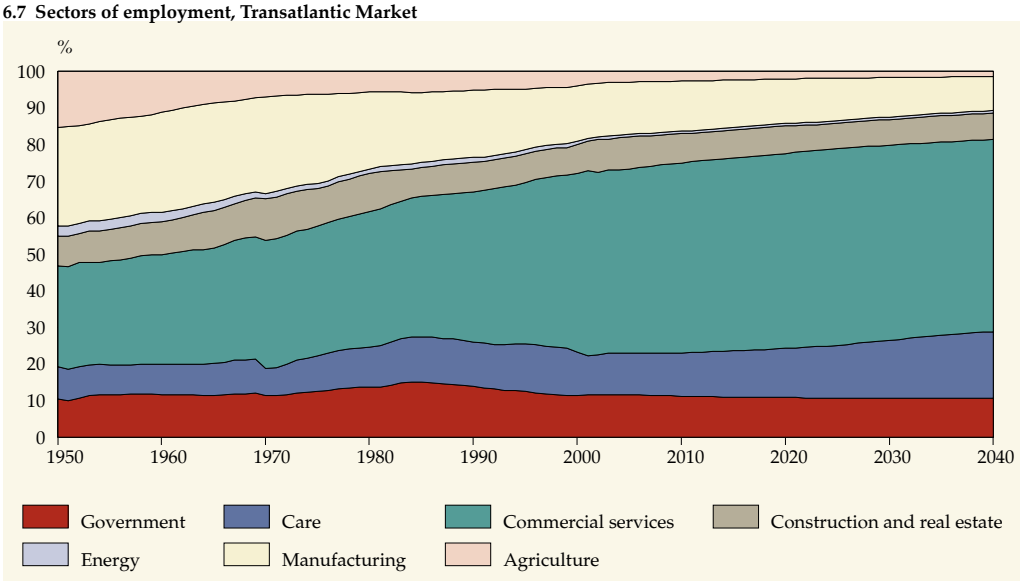
6.4.4 Labour productivity growth in the coming decades

The average increase in labour productivity in the last two decades of the twentieth century was 1.3 percent per year. How high could the growth rate be in the first four decades of this century? The best way to estimate this is with the aid of historical figures. One consideration is the finding that 1 percent per year is a robust lower limit. Another is that the level of labour productivity in the Netherlands is already high, and that there is no room for a substantial, quick catch-up by copying. This leaves us with a scope of only 1 to 2 percent per year. In fact the scenario study *Four perspectives of the Netherlands* (Vier vergezichten op Nederland) assumes macro-economic labour productivity growth rates of between 1.2 percent in the worst case and 2.1 percent in the best case. Table 6.7 presents the growth rates for the four scenarios, along with the corresponding figures for five industry sectors. The differences between the scenarios reflect different assumptions about relevant external factors (see table 5.1 on page 60 of *Four perspectives of the Netherlands*). In the Regional Communities scenario, pressure on the environment is relatively low because economic growth is low. In the Strong Europe scenario, labour productivity growth is curbed by social concerns about environment and safety, which leads to

more stringent norms and stricter enforcement. Less damage to the environment and greater safety are the upside in this scenario.

Even the low 1.2 percent per year labour productivity growth rate in the Regional Communities scenario will result in a cumulative increase of 60 percent in the period to 2040. About half of this will be needed to compensate for the effects of ageing, but there will still be more than 30 percent left to raise per capita material welfare.

6.7 Sectors of employment, Transatlantic Market



Source: Huizinga and Smid, 2004.

What determines the development of industry sectors in the long term? Increasing labour productivity plays an important role. In the long term, this increase will result in a proportional decrease in unit labour costs. The price sensitivity mechanism determines the extent to which a (relative) price decrease will lead to an increase in supply. Another relevant factor is the extent to which demand will rise as a result of an increase in general welfare. And lastly, how domestic costs fare compared with those outside the Netherlands is also important. If a sector faces foreign competitors who produce at lower costs, domestic production will stagnate as Dutch companies go out of business or relocate their production to countries with lower production costs.

The combined effects of demand and supply factors result in substantial shifts in the employment shares of the various sectors. Figure 6.7 shows these shares for the Transatlantic Market scenario. The other scenarios show a similar picture. To place the development in a historical perspective, the figure shows the developments from 1950 to 2040. The relative decrease in employment in agriculture and manufacturing is clearly visible, just as the relative increase in the services and care sectors.

Remarkably, this employment shift is a continuous process over the whole period 1950–2040, and most of it has already taken place, with a surge in the 1970s. The figure reveals an interesting aspect of the question: is a further increase in welfare possible at all, if increasing competition leads to relocating industry to other countries, and thus to loss of employment in certain sectors, such as manufacturing? Economic theory is optimistic in this respect. It even goes as far as to say that international trade leads to shifts in production shares which are favourable in the long term, although initially there will be painful adjustments. The historical development in the Netherlands supports this notion. The substantial shift in employment in recent decades has been accompanied by a substantial increase in welfare.

6.5 *Conclusions*

The central question in this chapter is whether the present level of material welfare will come under pressure from future development in labour volume and labour productivity. The chapter examines the period to 2040. This may seem like a short period, but uncertainties about the key variable 'demography' alone are so large that predictions looking further ahead would be too unreliable.

The main conclusion is that the factor labour will not necessarily be an inhibiting factor for the continuation of the present level of material welfare in the next few decades. As, obviously, the optimistic outcome of the analysis is conditional on the underlying assumptions, the main basic assumptions for the scenarios are summed up below.

Participation rates of most demographic groups, defined by age, sex, and ethnicity, will continue to increase. This increase, which is the result of cohort effects, socio-cultural trends, integration and developments in social security and early retirement, will offset the decrease in average participation caused by ageing and the increase in the share of people with a foreign background. For the labour supply as a fraction of the total population, these developments will result in a return to the level of 1990 in the worst-case scenario, and a return to the level of 2000 in the best scenario.

Labour productivity will continue to grow. The increasing education level of the labour force will contribute to this, although to a lesser extent than in the past. The main contribution will come from advancing knowledge and technological progress. The foundation for future technological progress has probably already been laid: there are still many potential applications for existing innovations. The historical trend supports a robust lower limit of about 1 percent increase in labour productivity per year. Even the worst scenario, with a labour productivity increase of 1.2 percent

per year, will result in a cumulative growth of 60 percent in the period to 2040. About half of this is needed to compensate the effects of ageing, but this still leaves more than 30 percent to raise the per capita level of material welfare.

Notes in the text

1) Economic growth is also often associated with social disruption and plundering the planet. These effects are mainly the result of the (inevitable) poor operation of the market as an arbitrator in establishing whether or not an activity contributes to welfare in a broad sense. As a result, the negative secondary effects of an activity can often be offloaded to uninvolved parties.
2) The scenarios correspond with the 'Regional Communities', 'Transatlantic Market', 'Strong Europe' and 'Global Economy' scenarios; see De Jong and Hilderink (2004).
3) The most recent population forecast of Statistics Netherlands shows that the population in 2040 will be closer to the low than to the high scenario.
4) As this is a breakdown of the total labour supply, – i.e. including young people aged under 20 and older people aged over 65 years – the participation rate for 15–74-year-olds must be taken. However, this is seldom presented, as the most used definitions of the labour supply are 15–64 year-olds or 20–64 year-olds (see also figure 6.3).
5) Excluding premiums for capital-based schemes.
6) This section is based on Huizinga and Smid (2004).
7) The economic influences discussed in the previous paragraph are explicitly not taken into account here.
8) If practically feasible, ethnicity should also be taken into account. Dutch people with a foreign background, who account for an increasing share of the population, remain behind the rest of the population in terms of education and labour market participation.
9) There are no recent figures to support these considerations. The most recent scenarios of the labour force by education are for 1997 (Statistics Netherlands/ CPB, 1997, Population and labour supply: three scenarios to 2020, Sdu Uitgevers, The Hague), and do not look further ahead than 2020. They show that the increase in the education level of the labour force in the period 2000–2020 will indeed be a lot slower than in the past. A rough calculation shows that the contribution to the annual increase of labour productivity would then be just under 0.1 of a percent point, compared with just under 0.5 of a percent point in the period 1979–2000.
10) The technological frontier is formed by the country of industry with the highest productivity, given existing technology.
11) See Aghion, Bloom, Blundell, Griffith and Howitt, 2005. In a nutshell: if competition is weak and then becomes stronger, companies are stimulated to distinguish themselves from their rivals through efficiency advantages; innovation then increases. But companies lagging behind then become less

motivated to catch up, for example because their chance of success decreases. If competition becomes even fiercer, from a certain point the second effect becomes dominant and net innovation in the sector will decrease again.

12) Belgium, Denmark, Germany, Finland, France, Sweden, United Kingdom and the United States.

13) The sector or country that develops the cleaner technology and first applies it may also gain a favourable competitive position.

Intermezzo on the Dutch Cabinet's approach to sustainable development

Introduction

The Dutch Cabinet has recognised that sustainable development touches on nearly all areas of society. Concerns about sustainability, and intergenerational and global division are not restricted to ecological issues alone. In its Cabinet-wide approach to sustainable development (*KADO: Kabinetsbrede Aanpak Sustainable Development*) the Cabinet has opted for a substantive focus on six selected themes:

1. water/climate adaptation;
2. renewable energy;
3. biofuels and development;
4. carbon capture and storage;
5. biodiversity, food and meat;
6. sustainable construction and urban development.

The selection of these themes reflects a focus on issues connected with the physical environment and global solidarity. Within these six themes the Cabinet seeks economic opportunities for the Netherlands. According to the KADO memorandum to the Dutch House of Representatives (VROM, 2008), the above-mentioned topics offer opportunities to intensify the relationship between development cooperation, innovation and environment-related policy. At the same time, the themes also create dilemmas that will lead to public debate. In addition, the Cabinet has also designated 'scarcity' as a strategic theme, i.e. scarcity in relation to geopolitical relationships.

Demarcation of themes

Selecting and delineating the themes is no trivial matter, and in an ideal scenario would result in making visible relationships that are not (or no longer) visible in everyday life. In many cases the themes are important causes of actually experienced problems. The themes can be demarcated in different ways and at different levels. In this book, the focus is on indicators which chart the four forms of capital (natural, social, human and economic). With its six themes, the Cabinet focuses on working out the ecological themes (natural capital) with global consequences, such as climate and energy, and biodiversity, which are examined in this Monitor. The six KADO themes can be said to provide a deeper insight into the key themes of this Monitor. At the same time they provide the possibility of concretely relating a number of key themes with each other to reach more tangible solutions and trade-offs. Analysis of energy and climate, for example, results in the finding that much more can be achieved in the built environment, without

indicating how this can be done and under which preconditions. This requires further analysis of the built environment. Further studies of this and other Cabinet themes could make up chapters of a future edition of the Sustainability Monitor for the Netherlands. This first edition of the Monitor just highlights a number of observations, points of interest and trade-offs for each KADO theme.

Points of interest in the KADO themes

Water and climate adaptation

The Dutch Cabinet's goal with respect to this KADO theme is: 'climate proof organisation of the Netherlands (especially with respect to the spatial dimension), and climate proof sustainable international development (i.e. pertaining to more than the spatial dimension).'

Just how vulnerable the Netherlands is to climate change depends on its capacity to adapt; i.e. how it can adapt to climate change given its present physical and social situation and its institutional frames. Capacity to adapt is determined to an important extent by how quickly a society can respond to climate change, compared with how quickly (and predictably) unwanted consequences of climate change are manifested. The large uncertainties about the extent and rate of climate change require a long-term strategy for adaptation that is robust on the one hand, but at the same time flexible enough to incorporate new insights and to respond to the unexpected on the other. Because of the slowness inherent in adjusting the course of spatial development, it is important to have a long-term development vision, and to have an insight into, for example, whether – and if so when – the course of spatial development needs to be adjusted. Because of the irreversibility of various effects of climate change, the most important decision to be made are those about whether and how urban development should be realised in the coming decades.

In the Netherlands, capacity to adapt has been studied most and is therefore best known for protection against flooding (see MNP, 2007, Deltacommissie 2008). The Netherlands will probably be able to withstand climate change and rising sea levels for a number of centuries to come. The safety of the country appears to be guaranteed to 2100 with respect to rising sea levels and river drainage. Even in the worst-case sea level rise of 1.5 metres per century, flooding will be able to be prevented with existing technology (reinforcing and raising dykes, at a cost of a maximum of 0.15 percent of GDP). After 2100 the scenario becomes more uncertain for rises of more than 1.5 metres; the existing safety structure will no longer be adequate, and neither will the Room for River water strategy. Possible spatial consequences, synergies and trade-offs of strategies for such a potential unexpected strong rise in sea levels still have to be plotted, just as the costs and benefits concerned.

The flexibility of the fresh water supply is limited in the present setting and may lead to considerable problems by the middle of this century as a result of increasing temperature rises and growing precipitation shortages. Future fresh water supplies will be determined by the regional demand for water on the one hand (hotspots: low lying reclaimed land and peat moors) and the water supply from the main system on the other (Ijssel Lake area, the delta area in the southwest). To increase the capacity to adapt with respect to the fresh water supply thus requires a supra-regional approach. Flexibility in the system and costs and benefits of various strategies should be studied further. The choice between keeping the Nieuwe Waterweg (the artificial mouth of the river Rhine) open, and closing it may be crucial for decision-making in the area of fresh water supply, nature, shipping, and the safety of Rotterdam and the Drechtsteden cities in the delta area of the rivers Oude Maas, Noord and Beneden Merwede.

Large scale changes are already taking place in nature. Knowledge about possible effects is limited, however, and systematic points of no return for the functioning of ecosystems cannot be excluded. For surface water, rising water temperatures will increase the risk of blue algae blooms, particularly in lakes and rivers (intensified by emissions of cooling water). Existing nature's capacity to adapt can be considerably increased by: (i) improving the quality of existing areas, among other things by improving attempts to reduce 'other' unfavourable environment effects such as eutrophication, water temperatures and desiccation; (ii) expanding and connecting nature areas; (iii) intensifying international cooperation to connect nature areas more. Taking these aspects into account in the 85,000 hectares of new nature to be designated will contribute to making the Dutch National Ecological Network (*EHS: Ecologische Hoofdstructuur*) more climate proof.

The agriculture, energy and transport sectors can respond well to gradual changes, as they can change crop cultivation and agricultural systems, or replace infrastructure (roads, bridges, energy plants, etc.) in a relatively short term. However, for these themes, not enough is known about potential vulnerability and capacity to adapt in the case of extreme weather conditions and worst case climate change.

Risks connected with disease and plagues are uncertain and unpredictable. Studies of risks and risk control are important in view of the potentially great social disruption accompanying disease and plague. Risk assessment and strategy development require an international approach (surveillance, monitoring, identification, information, vaccine production and storage etc.).

The development of urban areas will be very dynamic in the near future: there are already plans to increase density in, to restructure and to expand urban areas. This means important opportunities in the short term to combine tasks in the area of making the country climate change proof (prevent flooding, heat stress) with

other government policy goals, such as improving the quality of the residential environment, and reducing energy use and greenhouse gas emissions.

Renewable energy

The goal of this KADO theme is to 'take a substantial step towards sustainable energy use by reducing the emission of greenhouse gases by 30 percent in 2020 compared with 1990, doubling the rate of energy conservation from 1 to 2 percent per year in the next few years, increasing the share of renewable energy from 2 to 20 percent of total energy use by 2020, and increasing the supply of renewable energy in developing countries.'

The work programme Clean and Efficient (*Schoon en Zuinig*) (VROM, 2007) describes the national policy instruments the Cabinet wants to use to realise the 2020 targets for emission reduction, renewable energy and energy conservation. This work programme comprises both measures to realise results in the short term (e.g. subsidies and agreements with social organisations), and policy incentives to bring forward implementation of available options currently in a demonstration stage. In addition, the Cabinet wants to improve further innovation projects in aid of long-term energy transition. At the beginning of 2008, the European Commission also proposed an extensive package of energy and climate measures to realise the 2020 targets set by the Council of Europe. This package includes a directive for changing the European Emission Trading System (ETS), so that from 2013 there will be one European emission ceiling instead of the present national ceilings of each EU member state.

As a result of this change, national ceilings will no longer exist for sectors in which trade emission quotas are bought and sold (the so-called ETS sectors), and the EU will no longer set reduction targets for total emissions of member states, but only for non-ETS sectors in member states. It should be mentioned in this respect that the European targets proposed are less far-reaching than the Dutch Cabinet's national targets.

Once the European ceiling is in place from 2013, member states – and therefore also the Dutch government – will no longer be able to influence the contribution of the ETS sectors (large manufacturing companies, refineries and power plants) to the national greenhouse gas balance sheet (PBL, 2008a). As the ETS sectors account for about 50 percent of national greenhouse gas emissions in the Netherlands, it will be more difficult to realise the national target of 30 percent emission reduction. If the package of measures in the Clean and Efficient programme is implemented, the reduction target will be exceeded by a few dozen Mtonnes of CO_2 equivalents; partly because electricity production – which is included in ETS – is expected to rise and the Netherlands will start to export electricity. Under appropriate enforcement, this will not result in emissions in Europe exceeding the ceiling.

Implementation of the Clean and Efficient programme will result in considerable emission reduction in the non-ETS sectors (e.g. traffic, agriculture and households). The stricter EU policy is, the more effective the package of measures will be. For example, the Netherlands is subordinate to the EU with respect to CO_2 emission policy for cars and electrical appliances, as individual member states may not set these emission norms. Therefore, the intended national measure of stimulating the purchase of clean cars will have more effect under a strict European CO_2 norm for cars. To realise the national reduction target of 30 percent, emissions in the non-ETS sectors must be reduced by 27 Mtonnes of CO_2 equivalents in 2020. Under strict European policy, the Clean and Efficient measure will result in an emissions reduction of 18–26 Mtonnes. Under less stringent European policy it will be limited to 14–22 Mtonnes. The reduction will be realised mainly in the built environment and in the transport sector. The gap with the reduction target can be bridged by buying emission reduction quotas from other states (CDM/JI emission allowances).

For energy conservation and renewable energy, too, the effectiveness of Clean and Efficient measures will increase as EU policy is stricter. The annual rate of energy conservation – less than 1 percent on average in recent years – will rise to between 1.4 and 1.9 percent. Only if European requirements for energy efficiency of vehicles and appliances are very strict will the rate rise to 1.9 percent. The share of renewable energy – now fluctuating around 2.8 percent – will rise to 11–17 percent in 2020 as a result of the Clean and Efficient programme. Again, the upper limit will only be realised if European policy is stringent, and if at the same time the share of biofuels in traffic rises to 20 percent. It is uncertain whether such a high percentage will be able to be realised within the sustainability criteria for biomass. At the moment there is not sufficient reason to continue the EU requirement to mix in 10 percent of biofuels in the transport sector by 2020, as there is not enough evidence that this will reduce CO_2 emissions, will not raise food prices and will not affect biodiversity. Moreover, from a climate point of view, the application of bio-energy in the transport sector is not the most efficient option.

Biofuels and development

The aim of this KADO theme is: 'Contribution to sustainable energy consumption by using sustainably produced biofuels. The aim is to make the production of biofuels sustainable and to improve international collaboration in this field, so that all biofuels on international markets are produced using sustainable techniques. To improve sustainability further, studies will also be done on innovative technology and crops.'

Biofuels have been at the centre of much attention in recent years. The European Commission's proposal for a compulsory 10 percent share of renewable energy in the transport sector in 2020 has substantially increased pressure to grow more

biofuel crops in the near future. At the same time, it is clear that for the Netherlands this transport sector target is vital to realise the general target of 20 percent of renewable energy in 2020. From the Dutch perspective, then, it is logical that at the moment various contracts are being negotiated with biomass exporting countries, like Brazil and Indonesia. However, at the same time, scientific literature and public debate are casting more and more doubt on the sustainability of biofuels.

It has been scientifically proven that in setting compulsory targets for biofuel use in the long term (2020) will lead to higher food prices: the goal is inelastic (the target must be realised) and given present technology, food products and other input (land, nutrients, water) are needed to realise this volume of biofuels. Logically speaking, this extra demand on agricultural products will lead to higher prices for agricultural products (see Eickhout *et al.*, 2008a, overview of studies of the effects on prices). The consequences for economic development, poverty and famine in poor countries are less unequivocal, however. Agricultural producers will be able to demand more money for their products and higher prices will also stimulate them more to make agricultural processes more efficient (FAO, 2008). It may also become more profitable again to invest in agriculture, so that the downward trend in investment (IAASTD, 2008) can be turned around. However, importers of agricultural products (urban population, some countries) will have to pay more for their imports and thus spend more of their budget on food. This may lead to higher rates of malnutrition (IFPRI, 2008).

In addition to these long-term effects (2020) biofuels may also have an effect on short-term fluctuations in the prices of natural resources. In 2008, rises and falls in these prices were considerable. Such fluctuations are bad for development, as investors and producers favour a more stable situation, and consumers also tend to lose faith. However, in scientific terms it is as yet uncertain what part biofuels play in these price fluctuations. The World Bank states that biofuels have contributed substantially to price fluctuations (Mitchell, 2008), while others have not yet ventured an opinion on the role of biofuels (Banse *et al.*, 2008).

In terms of the policy options of biofuels for development, agricultural policy is crucial, particularly increasing agricultural productivity, as mentioned earlier in the chapter on biodiversity. However, institutional factors are also essential in the development of agriculture. For example, if local producers do not have access to agricultural markets, they have no motive to produce more. In this perspective it is quite alarming that many cities in developing countries increasingly depend on food imports, while their hinterland does nothing to increase production. The growing gap between urban and rural development in developing countries is of great concern and deserves our undivided attention if opportunities for development are to be taken. Furthermore, the consequences of biofuel use may alter completely if perennial crops are increasingly grown to produce them

('second generation' biofuels). These aspects must be studied further. Meanwhile, to gain a better insight into the effects of biofuels on development, it is important to improve the monitoring and analysis of these effects. Eickhout *et al.* (2008b) present an overview of the most important monitoring data in this respect.

Carbon capture and storage

The aim of this KADO theme is: 'Large scale application of carbon capture and storage (CCS) between 2015 and 2020 in the Rijnmond area and in the north of the Netherlands, as an intermediate step towards a sustainable energy supply.'

In CCS technology, CO_2 emitted from large point sources (power plants and manufacturing companies) is captured and permanently stored in underground geological formations: depleted natural gas and oil reservoirs, for example, or deep aquifers and coal beds. In the Netherlands depleted gas reservoirs will be the main formations used. An expected yearly 35 to 40 Mtonnes of carbon dioxide will be able to be stored there for a period of about 40 years.

The Cabinet considers CCS to be a necessary third main route – alongside energy conservation and renewable energy – to assist the transition to a sustainable energy supply, and so realise the climate goals. The European Commission also views this technology as an indispensable component of climate policy, as fossil fuels will continue to be an important source of energy for decades to come.

Although capturing CO_2 from coal gasification and flue gases (with a CO_2 content of 5 to 15 percent) is technically possible, it is not yet a proven technique on the scale of a large power station (which emits megatonnes of CO_2 per year). Nowhere in the world at the moment is carbon dioxide captured on a large scale from coal gasification gases and power station flue gases, although various demonstration projects of capture techniques are being conducted across the world. Future costs of large scale application of CCS cannot be estimated accurately yet; a lot more practical experience is needed for this. According to a recent report by McKinsey, in 2020 the costs of a large scale CCS project will be between 35 and 50 euro per tonne of CO_2. By 2030 they may be down to 30–45 euro per tonne. The Rotterdam Climate Initiative estimates the costs of large-scale CCS in 2025 at 25–57 euro per tonne.

The European Commission assumes that by 2020, CCS technology will be cost effective under the ETS. The Commission estimates a CO_2 price of 30–40 euro per tonne in the period 2013 to 2020. Before CCS can be applied commercially, the cost effectiveness must be improved to such an extent that the costs of capture, transport and storage of CO_2 are systematically lower than the ETS CO_2 price. European policy aims to contribute to this cost reduction by realising ten to twelve demonstration projects in the EU in the next few years. The Dutch Cabinet has

lobbied the European Commission to select the proposals for two large-scale demonstration projects in the Netherlands (one in Rijnmond and one in the north of the country). However, by mid-December 2008 it was still unclear how these installations were to be funded. The amounts involved are substantial; the ten to twelve installations are expected to cost from 6 to 10 billion euro.

In addition to reducing the costs, other issues also have to be solved before CCS can be applied on a wide scale: the organisation and funding of the CO_2 transport infrastructure and storage, and realisation or adaptation of legislation (e.g. technical requirements, safety of CO_2 transport and storage, availability of potential suitable storage locations). Public approval is also very important to actually realise CCS in the Netherlands.

Biodiversity, food and meat

The long-term aim of this KADO theme is: 'Production and consumption of proteins that contribute to (global) welfare and food security, and remain within the carrying capacity of the ecosystem.'

The relationship between biodiversity, meat and food was explained in detail in the chapter on biodiversity. On a global scale, biodiversity loss is mainly caused by agricultural expansion. Meat consumption plays an important part in this respect, not only for biodiversity, but also for other environmental themes such as climate change (greenhouse gas emissions) and over-fertilisation (nutrients balance sheet). Implementation of a policy on food and meat consumption would result in enormous environmental benefits in the various fields of sustainability (see box). But this does raise the fundamental question of how far the government may go or wants to go in limiting individual freedom in favour of the collective interest.

Meat consumption, climate change and biodiversity

Livestock farming is the direct cause of 10 percent of global greenhouse gas emissions, via laughing gas and methane emitted with manure and through ruminant digestion. In addition, to expand livestock farming, existing, often tropical, forests are cleared, thus also releasing large quantities of CO2. The FAO estimated that total livestock farming accounted for 18 percent of greenhouse gas emissions was in 2006. At the moment, 80 percent of global agricultural land is used for livestock and to grow animal feed. One third of arable land is used to grow crops to feed livestock. The global increase in meat consumption is therefore an important factor in the decrease of global biodiversity.

According to a 'business-as-usual' scenario based on FAO projections, global consumption of meat will double in the period 2000–2050. The meat production of ruminants (cattle,

sheep and goats) takes op most room: around 80 percent of the global area of grass land. The remaining grass land is used for milk production. With the aid of model-based calculations, the effect was then estimated of a healthy diet with modest consumption levels of beef and pork, and 0 to 140 grams of fish, chicken, or eggs per day (the Willett Diet).

If a healthy low-meat diet were to be implemented worldwide (around 10g of beef, 10g of pork, 47g of chicken and eggs, 23g of fish per person per day; on average corresponding to about one third of present consumption of these foodstuffs in the Netherlands), it would have considerable effects on global land use and global greenhouse gas emissions (CO2,CH4 and N2O), and thus on biodiversity and on the climate. Under this healthy diet, the global area of arable land would decrease by 10 percent, and the area of grass land by 40 percent. As a result, global biodiversity loss to 2050 would be around 8 percent instead of around 10 percent. If the healthy diet were implemented, it would be cheaper to realise the two-degree climate target: the costs of climate policy would be 50 percent lower than the reference scenario (Stehfest *et al.*, 2008).

There are three policy options to reduce the impact of food and meat consumption on the environment and biodiversity. (1) Increase agricultural productivity, to realise the same production on a smaller area. (2) Diet changes: by shifting from consumption of land-intensive products (e.g. beef), to less land-intensive products (e.g. chicken meat or vegetable proteins) less land is needed. (3) Changes in the production chain, to produce animal and vegetable products in a more sustainable way with the use of less land.

Agricultural productivity has already been increased considerably in the past. Some 80 percent of the increase in agricultural production up to now has been realised by an increase in crop productivity, and 20 percent by expanding agriculture (Bruinsma, 2003). Productivity can be increased by investing in R&D, educating farmers and making available artificial fertilizers and equipment. Agricultural productivity can be further stimulated by raising food prices, although this will have unwanted effects on poor population groups. Policy options for the Netherlands to improve agricultural productivity in developing countries are still limited, and often implemented through development cooperation programmes. Change will take place only very slowly, especially in remoter regions, where the lack of infrastructure also plays an important part.

Another option – mainly in developed countries – is diet change. In other policy areas (e.g. traffic), experience has shown that it is very difficult to influence consumer behaviour. Very little has been done up to now to explore policy options to change food patterns (MNP, 2007). Possible measures include price incentives,

information and consumer awareness, and collaboration with important players such as supermarket chains. Changes in the production chain are a third option: making this chain more sustainable by, for example, using less soya from Brazil would seem an attractive option for livestock farmers. But alternative feed is not always available, and if it is, it often requires just as much land to be produced (Stolwijk *et al.*, 2007). Like diet change, here too in the short term the most promising policy instrument appears to be consumer awareness on the basis of 'sustainability labels', in cooperation with important actors such as animal feed producers and farmers' unions.

Although there is general consensus on the three options to limit biodiversity loss, there is widespread concern in the Netherlands about the effects of diet shift and production chain changes on the large meat and dairy sector as a whole, and on its international competitiveness. This is a classic dilemma between two policy goals, environment and economy, and choices will have to be made. Another important question concerns possible policy instruments from the perspective of the Netherlands to implement the three options.

Sustainable construction and renovation

'The goal is to make construction and urban development sustainable by innovations in construction processes and in the renovation of existing buildings. By 2020 all new construction projects must be energy neutral.'

As set out in the chapter on climate and energy, there are still many possibilities to conserve energy in the Netherlands, especially in built areas. For example: if all homes in the Netherlands were upgraded to 'Passive House' norms, around 200 PJ of primary energy would be saved directly on heating alone. In addition, in the built environment more energy can also be saved in non-residential buildings, and on other energy-related items such as hot water and consumer appliances.

In technological terms, there is enough potential present or in development to render the built environment in the Netherlands energy neutral by 2050: the built environment will then produce just as much sustainable energy as it uses to heat water, run household appliances, and heat and cool homes and other buildings. This will reduce CO_2 emissions in the built environment by about 80–85 percent compared with 1990. Further technological development and a continuation of energy price developments may make it possible to recover the costs of necessary investment by saving on energy bills. Transition to a sustainable energy system in the built environment is necessary to realise this potential. This transition must be supported by all parties involved. According to a scenario drawn up by ECN and TNO (Opstelten *et al.*, 2008), all available measures are necessary to realise such a transition.

To realise an energy neutral built environment, measures must be taken for both existing buildings and new construction, but also for energy use of household appliances and business machines. Sustainable energy generation must also be realised at neighbourhood level. This means that for the built environment the present 'best practices' must become standard (e.g. the Passive House concept), and that the development of concepts for energy producing new homes and energy saving renovation (75 percent reduction in the share of primary energy use) of existing homes is necessary. Such projects can be expected to earn themselves back in about 15 years. One determining factor for the implementation of these measures is the replacement and renovation rate of homes. Higher replacement renovation rates may reduce the effort required to implement the measures, while lower rates will require extra effort.

The concepts for energy neutral homes comprise a substantial reduction in the energy required to heat water, run appliances and heat and cool rooms, and integrated sustainable energy systems, such as solar panels. Adjusting demand and supply so they correspond more through energy storage and smart use of appliances is also important to support an efficient sustainable energy system.

Last remarks

KADO, the present Dutch Cabinet's approach to sustainable development, focuses on six different themes, all directly related to climate change and biodiversity. For each of the themes opportunities can be identified, but more instruments are needed to realise them. For example:

- Steering spatial development may limit the vulnerability of the Netherlands to flooding in the long-term.
- Realisation of the national emission reduction targets set in the Clean and Efficient work programme will require European policy for appliances and cars.
- Important challenges for the development of biofuels are to chart the indirect effects on land use, prices and development opportunities, and to consider further how these aspects can be incorporated in policy.
- In the Netherlands there is concern about the effects of diet shift and production chain changes on the meat and dairy sectors and their international competitiveness. Choices will have to be made in this respect, and flanking policies and new products will be necessary.
- The construction of infrastructure to capture and store CO_2 still requires a lot of investment. It is unclear who is responsible for this: the public or the private sector.
- To realise an energy neutral built environment, best practices must become standard.

The aim of this intermezzo is not to give an intermediate evaluation of the *KADO* themes; it is not comprehensive enough to do that. Further study is necessary to analyse these themes in more depth; it should examine more broadly and in further detail the relationships of the themes with other economic, social and ecological topics.

7. Trade-offs

The indicators discussed in chapter 2 and the analyses and considerations set out in chapters 3 to 6 show the many aspects of 'broadly defined' sustainability. Together they not only reflect the complex character of sustainability, but in principle also provide a handle to examine in depth the two central questions of this Sustainability Monitor: to what extent can Dutch society be called sustainable? And: is Dutch society moving in a sustainable direction?

The problematical character of (broadly defined) sustainability implies that there are no objective and unequivocal answers to these questions. There are three reasons for this. First, an accurate answer would require aggregation of scores in a very wide range of areas, and there is no objective way to determine precise weights to compile such an aggregation. Secondly, just how sustainable Dutch society is depends strongly on how sustainable the rest of the world is. In sustainability terms, the Netherlands is a small part of a much larger aggregate. The strength of a chain cannot be measured by the quality and strength of just one link. And thirdly, pronouncements on sustainability based on developments in time depend to an important extent on assumptions about developments in technology, demography, the resilience of social and ecological systems, etc. As uncertainty often surrounds these assumptions, pursuing sustainability in terms of concrete effects and within generally accepted margins has a large element of feeling our way in the dark. Therefore, this chapter looks mainly at the room for policymaking with respect to different sustainability aspects. One important characteristic of policymaking is that it nearly always involves trade-offs. Although sometimes synergy effects can be identified, free lunches are the exception. Intervention on behalf of sustainability in one direction often has a price in another. This is especially the case when, as here, sustainability is taken in the broad sense.

7.1 Sustainability and trade-offs

For policies paid for by tax payers, budget restrictions often mean that policymakers have to explicate the trade-offs they make. Policymakers can only spend money once. Intensification in one direction limits possibilities in another. For example, if the government decides to raise taxes to pay for policy interventions, there is not only a trade-off with the disruptive effect of taxes on work and enterprise incentives, but this will also restrict the possibilities for citizens to spend their income as they wish.

Sometimes the trade-offs are less explicit, and interventions in one area have unintended and unforeseen consequences in a completely different area. Examples of this can be found in the current discussions on the consequences of subsidised biofuel use. The original goal of the introduction of biofuels – reduction in CO_2 emissions – has turned out not only to be less effective than assumed, but also to have negative effects on global food supplies and biodiversity.

Some policy measures involve not trade-offs, but synergy effects: an intervention in one direction intensifies sustainability in another. A well-known example are companies which invest in environment-friendly technology at an early stage as a result of strict regulations, and as a result build up a competitive lead in this area. Another example are measures which reduce energy use and are thus also beneficial for the climate and for the energy supply. Where relevant this chapter describes synergy effects, but the focus here is on trade-offs, firstly because there are more of them than of synergy effects, and secondly because trade-offs are the greatest challenge facing policymakers.

Sustainability is sometimes associated with strict preconditions – hard norms which must be satisfied and which may not be compromised. These strict norms are often in the ecology domain: more income may not be exchanged for a few less frog species. In practice, however, these strict norms cannot be set objectively. Although some processes are irreversible, such as the (global) extinction of species or the destruction of a landscape with a unique cultural-historical value, this irreversibility does not mean that a whole society systematically becomes definitely unsustainable. Important questions such as: how many species can we afford to lose as humanity? how much inequality will it take for society to break down? or: what amount of government deficit will completely destroy the nation's faith in government finance? cannot be answered objectively or with any certainty. Sustainable development is a quest bound by time and place to determine – given the uncertainties and costs – how far society is prepared to go to take precautions to prevent unwanted consequences. An example is the EU's goal to limit the consequences of climate change to a temperature rise of 2 degrees.

Most trade-offs involve various dimensions, such as the time at which something happens, the geographical location where it happens and the socio-economic group it affects. With respect to the time dimension, the emphasis in the debate is often on the trade-off between finding solutions for present problems, for example in care or education, versus the concerns of tomorrow, with climate change and ageing as the main challenges. The geographical dimension relates mainly to the effects of choices made in the Netherlands on the situation outside the Dutch borders. For example, biodiversity loss elsewhere as a result of meat consumption by the Dutch population, or relocation of polluting industries to countries with less stringent regulations. In Dutch policy discussions, the effects of policy choices on various

socio-economic groups are also often relevant, with the redistribution effect between high and low incomes as a prime example. Lastly, the tension between the short and the long term, and between the individual and the collective interest deserve attention.

By pointing out the trade-offs and, if possible, making them explicit, this monitor presents a number of main approaches for a policy towards sustainability. More concrete policy options require further worked out studies per subject, for example model-based calculations of the effect of measures to restrict greenhouse gas emissions and the short-term effects on welfare this will have, or cost-benefit analyses of infrastructural projects. The trade-offs – and in some cases synergy effects – of the various types of capital are discussed in the following sections. Trade-offs related to population size are also discussed.

7.2 *Natural capital*

From a sustainability point of view, the main notion of a trade-off is based on the fact that humans, ideally in complete freedom, will always try to mould the environment to fit their own wishes. In practice this means that they want to generate and consume (an increasing amount) of material welfare. But by definition, having things our own way means intervening in our environment. These interventions are seldom valued as only positive. The clash between individual needs (e.g. to travel, to consume) or the need to create a desired lifestyle on the one hand, and preserving the quality and liveability of the environment, especially for future generations, on the other is the core of the trade-off issue with regard to ecological sustainability. Problems relating to climate and biodiversity are especially important in this respect. Economic development and growing consumption demand energy and land, and thus contribute to climate change and biodiversity loss.

In addition, there is the supply problem: is there enough energy and land in view of growing global demand? For the time being energy reserves are sufficient, but they are becoming less affordable. This will affect poor countries in particular, which rely on imported energy. But higher energy prices may also lead to social unrest in Europe. Although there is enough land on earth, it is not enough to feed 9 billion mouths, grow biofuel crops on a large scale in view of climate change, and preserve biodiversity *all at the same time*.

7.2.1 Climate change

Some problems can only be solved at an international level. Climate policy is a prime example. Because of the changing international balance of power as a consequence of demographic and economic developments, the relative influence of the Netherlands in the world is decreasing. And as this influence decreases,

so will the effectiveness of isolated national policy. 'Strict' climate policy in the Netherlands is therefore becoming more of a moral stance.

In the EU, too, a 'strict' climate policy will not be enough if there is no global climate coalition. The EU's present climate policy is a pioneering one, which may provide an important boost for the realisation of international agreements. This is not without risk, however. If the EU goes it alone, the extra investment companies and countries will be required to make will have a negative impact on their competitiveness. Consequently, therefore, the motivation to implement increasingly strict policies will probably quickly decline. The other side of this coin is the 'first mover' effect: strict policies force companies as it were to develop financially feasible alternatives. If this initial first move is later followed by other economies, these companies may benefit.

One great disadvantage of a unilateral EU climate policy is the increasing risk of a rise in greenhouse gas emissions outside the EU. Relocating energy intensive industries to countries with less stringent climate regulations will increase emissions in these countries if production processes there are less efficient. The Dutch economy is relatively energy intensive, but also energy efficient. Moving production away from the Netherlands will result in higher emissions elsewhere. To gain an insight into this mechanism it would be useful to examine the trend in greenhouse gas emissions as a result of consumption by the Dutch population, alongside the emissions caused by actual production in the Netherlands.

Setting and sticking to a climate ceiling, for example the 2-degree target, is necessary to limit climate change effects. But policies such as those in the Netherlands and the EU need not be implemented in countries like China, India and the US. One alternative is to invest in technological progress, although only investing in technology without setting compulsory climate targets is a too non-committal approach. How to combine these two strategies is an important challenge in the short term, but whatever the combination, it will always contain an element of uncertainty: not only is the outcome of technological development too uncertain, the long-term stability of international agreements, too, always remains to be seen.

Redistribution is also an important element in international climate policy: the rising demand for energy in China and India will probably result in large scale coal mining activities in these countries. And the question for developed countries then is how far they are willing to go to help pay for the costs of CO_2 capture and storage. If substantial sums of money are involved, doubts will quickly arise about the amounts of subsidy received by these rivals of producers in rich countries. Climate measures aimed at reducing energy consumption may have a positive effect on the reliability of the energy supply. But this reliability is also benefited by

the use of more coal, which in turn is negative for the climate unless at the same time the resulting CO_2 is captured and stored.

Mobility is energy intensive, therefore restricting mobility could contribute greatly to the realisation of energy goals. On the other hand, increasing traffic and transport trends have contributed greatly to national and international exchange of knowledge and goods, and thus to an increase in productivity.

The use of biofuels provides a modest positive contribution to climate goals. However, because biofuel crops take up so much land, especially the first generation, they compete with food production and biodiversity. Moreover, compulsory mixing in of biofuels with fossil fuels creates an inelastic demand for food resources. If crops fail or food supplies fluctuate as a result of other causes, food prices will increase substantially; and it is mainly the poor – net food importing – countries that will bear the brunt of this. Compulsory mixing in for car fuels will also impede the commercial development of alternatives, for example cars running on fuel cells.

Transition to sustainable energy sources (solar energy) will involve considerable, but as yet uncharted, costs. Such a transition would require drastic adaptations of the existing energy infrastructure, such as power plants, vehicles, the energy transport infrastructure, etc. The cost-effective pursuit of medium-term climate goals will contribute little to the realisation of alternative forms of energy, while these alternative forms are inevitable in the long term. Therefore, policymakers must choose between investing more in existing technology (coal) and transition technology (biofuels), or investing in long-term alternatives such as solar energy or – according to some – nuclear energy. This is not only a choice between the medium and the long term. It also concerns the risk of investing in technologies of which there is little (or no) evidence that they work, and the risks connected with nuclear waste storage.

For the Netherlands and other developed countries it is often cheaper to implement climate measures in developing countries than at home. But once developing countries realise a level of welfare comparable to that in developed countries, they will be confronted by the same relatively expensive climate measures when they implement climate policy. Earlier forms of joint implementation (i.e. rich countries realising their environmental goals cheaply in developing countries) may then as yet be seen as conflicting with a fair global distribution of the climate goal burden.

Another consideration with respect to the implementation of measures at home or abroad is the interrelation of the effects of air and climate. Both at home and abroad the relevant emissions are caused by the same combustion processes of fossil fuel. In choosing whether to take measures in the Netherlands or abroad, the positive

by-effects of domestic climate policy for air quality at home (benefits) versus the extra costs involved should also be taken into account.

7.2.2 Biodiversity

Increasing material welfare often requires extra land. In global terms, rising material welfare goes hand in hand with the use of more and more land for housing, industry and agriculture. Agriculture finds this land in existing nature and/or forest areas. Therefore an increase in material welfare is ultimately at the expense of biodiversity and nature.

In developing countries and the emerging economies in particular, pressure for extra land is high. Population growth is high in these countries, and industrialisation, mobility and meat consumption are all increasing. In absolute terms, direct and indirect land use (i.e. land abroad that is used to produce goods that these countries import) per capita is much lower than in the rich countries. Increasing agricultural productivity per hectare is one way to reduce land use. This is a robust option for both the poverty and the food issues, and for the problem of declining biodiversity. Technology alone is not enough, however, to combat biodiversity loss. Reducing meat consumption may also contribute.

The shift in economic sector structure in developed countries from agriculture and manufacturing to services reduces local pressure on land and the environment. This is not necessarily the case in global terms, however. Most goods produced in the Netherlands have low unit emissions. If less food is produced in the Netherlands while demand remains the same, agricultural production elsewhere will have to increase. But production elsewhere uses more land to get the same results. That is why nature in, for example, Brazil is under great pressure: the land there is very productive too. There is a similar trade-off in organic livestock farming: it takes up more land, but it is better for animal welfare.

Use of (first-generation) biofuels uses up even more land. This extra land is at the expense of the area of nature or forest (see above); nature and forests which are already under great pressure from increasing food production. Although biofuels can be produced with more or less unsustainable methods, there will always be a trade-off between biofuels (and thus slightly lower CO_2 emissions and more diversification of energy sources) and nature (tropical jungle, food production).

Preserving large areas of nature in a densely populated country like the Netherlands takes up land, while land is also needed for farming, working, living, mobility and water storage (in connection with climate change). By improving ways to combine these functions, more can be done with the same amount of land. For example: protection against flooding can be combined with nature and landscape areas; and agriculture can be combined with nature and landscape quality.

Realisation of the National Ecological Network (*EHS*) in the Netherlands costs money. Some nature features in the Netherlands are important in a European perspective, such as the Wadden Sea and other Natura 2000 designated areas. Here, the potential trade-off is between economic interests and national and international responsibility for biodiversity preservation.
Specific protection and funding of nature outside the Netherlands also costs money and is thus also at the expense of other goals; this is to compensate people for not using this land for agricultural production and thus for lost income.

Global diet shifts are an example of the tension between individual freedom of choice (eating more meat) and the collective interest (biodiversity, nature). It will take considerably higher meat prices to reduce global meat consumption substantially, or even slow down the increase.

7.3 Social capital and inequality

Social capital and inequality are the determining factors for social cohesion in a community. Social capital comprises trust and relationships (networks) between people. Trust in the government and in each other and social participation are seen as the cement of the community: they are important for a sense of belonging and safety.

Social cohesion is usually stronger if individual differences in wealth are not too large. On the other hand, government imposed income levelling removes incentives to produce efficiently. This trade-off is at the basis of the familiar trade-off between equality and efficiency. Equality encompasses more than just income distribution; it also comprises the question of how much difference in levels of employment, education, health and health care and exposure to environmental pressure society thinks is acceptable.

In a society engaged in high quality technological development, demand will rise for high educated workers to develop and implement new products and processes. If this higher demand exceeds the supply, wage and income differences will increase. As a result, income inequality also increases, and may clash with the goal of more social cohesion. To realise the latter in spite of this, the tax system can be made more progressive. However, in view of international mobility of high quality labour, increasing tax progression will have a high welfare price tag.

Dutch education scores relatively well in the lower regions of the skills distribution, but less well in the top regions. This may be the consequence of a social preference for a balanced income distribution and social cohesion. However, recent studies have shown that it is mainly the higher levels of knowledge and skills that are

important for productivity growth, especially in countries which already have high production levels. This is indicative of a trade-off of social cohesion versus productivity and material welfare.

As individualisation and increasing freedom of choice may result in fewer people joining clubs and associations in the future, people's involvement with each other in the community will decline. Instead, more volunteer activities funded on a project basis and looser social relationships will emerge. Relationships are more open. This may build bridges between groups with different cultural backgrounds. The shift from a closed to an open community thus involves a tension between decreasing social cohesion within groups and opportunities for increasing social cohesion between groups.

Increasing labour participation reduces the costs of ageing, as it provides a wider basis for public spending on the over-65s. However, clearly more time spent on work means less time to spend on informal care and voluntary work, and thus leads to a decline in social participation (Dekker *et al.*, 2008). An assessment in terms of welfare requires a comparison of the benefits of labour participation with the benefits of informal care and household services.

7.4 Human capital

GDP growth can be realised by increasing labour input and higher labour productivity. The labour supply in the Netherlands will decrease in coming decades as the population continues to age. Continued GDP growth can be safeguarded then by increasing and applying knowledge, research and innovation, in particular. This will result in a continual improvement of products and production processes, and thus push up labour productivity.

7.4.1 Labour volume

Working for more hours increases GDP, but costs free time, which is also valuable for most people. Because of this trade-off there is no immediate reason to assume that working more hours will increase welfare. Policy is needed in cases where (outdated) conventions prevent people from choosing freely how many hours to work, for example: school hours, (free Wednesday afternoons), child care provisions, low tax rates for part-time income, etc.

Part-time work may contribute to the continuation of the 'glass ceiling'. If top jobs (doctors, lawyers, business executives, etc.) can only be obtained through years of experience, women who work part-time deprive themselves of the opportunity to get these jobs. This may be at the expense of social welfare, as the social benefits of high educated women will not be sufficiently realised. Knowledge spillover will

be less than it could be, just as the example these women set for other women. Moreover it confirms the expectations of some employers that women are not suitable for high level jobs.

7.4.2 Quality of labour

Some present labour market conventions are relatively favourable for older people in the Netherlands: wages do not decrease with age and diminishing productivity (unlike in some other countries), more holiday leave is granted for older ages, and the Netherlands also protects older people from being dismissed (Bakker Committee (2008), CPB annexe, section 2.4). Although these favourable conditions may stimulate older people to stay in work longer, they also provide them with little incentive to invest in training and education. The government can encourage them to educate themselves by providing subsidies while at the same time preserving the favourable regulations; alternatively it can abolish the regulations entirely or in part, thus increasing the incentive to invest in education and self-development. For older employees this may lead to a reduction in income and more insecurity.

7.4.3 Education

The education level of the Dutch labour force has increased in recent decades, as lower socio-economic groups and women have been catching up considerably in both education and on the labour market. Second generation immigrants, too, are achieving higher education levels than their parents. This contribution to the average quality improvement of human capital will cease when the composition of pupils in Dutch classrooms corresponds to the capacities of the overall population. When this happens, this source of economic growth will cease to exist. Dutch capacity to innovate and productivity will still benefit from the fact that in general terms people are becoming cleverer, but not from the catching up effect of groups lagging behind in education level – i.e. from underutilisation of capacities. The quality of human capital will then increasingly depend on high quality education incorporating new developments quickly in its programmes. More emphasis on quality of education may demand scarce resources, for example for investment in top quality teachers.

As a result of knowledge spillovers, knowledge migration will raise productivity in receiving countries by more than is reflected in the wages of knowledge workers. The downside of this may be a brain drain from the countries of origin, the developing countries. Added to this, there is the common pool problem: countries are all fishing in the same limited global pool of high educated workers. Although the Netherlands is a relatively attractive location for high educated people, it does have a language disadvantage compared with Anglo-Saxon countries (Chorny *et al.*, 2007). Its income redistribution system also makes the Netherlands a less favourable place for high educated knowledge workers to live and work: their net wages are lower than in countries with less egalitarian redistribution systems

(e.g. Anglo-Saxon countries). Indeed the Bakker Committee (2008) (p. 100) does not expect much quantitative benefit from the improvement of conditions for knowledge migrants to live and work in the Netherlands.

7.5 Economic capital

Although the economy has been referred to often in previous sections, we would still like to touch on two trade-off relationships here.

R&D activities require high educated knowledge workers, so stimulating R&D increases demand for high educated workers, and thus also increases their wages. As a result, income inequality may increase.

Competitiveness has a positive effect on innovation but not in all cases. Competition may be so fierce that companies have no leeway to invest enough in innovation. Stimulating competition and innovation may then clash with each other.

7.6 Population

Trade-offs and challenges related to the size and composition of the population stem from four main developments:
1. natural population growth;
2. migration;
3. increase in the number of households;
4. ageing.

7.6.1 Natural population growth

The average number of children born per woman in the Netherlands, and even more so in the whole EU, is well under the level needed to continue a stable population size in the long term. Fertility rates are decreasing in nearly all countries across the world, even in most developing countries. Economic growth, education – especially of girls and women – and urbanisation are the main determinants of this process. If this trend continues, the total world population will also decrease in the long-term (2050). Disregarding migration, this implies that the population in the Netherlands will start to shrink within the next decades.

In contrast to what is often thought, slower population growth or even a decrease in population size need not be at the expense of material welfare: per capita GDP is the relevant criterion for material welfare, not total GDP. A smaller population does reduce the volume of GDP, but not necessarily the amount of GDP per person in the population.

A decreasing population will result in economic adjustment problems: houses become unoccupied and neighbourhoods may become dilapidated. Demolition and targeted new construction are an option in these cases. These are costly matters, and hard to fund as the houses have not served their natural lifespan and municipalities cannot earn back the costs as easily as with extensive new housing estates.

A smaller population also has advantages. Total mobility diminishes and there is less pressure on nature and the countryside. A smaller population also results in less consumption, and thus a smaller environmental burden. Until now, however, the effect of increased consumption has been greater, which means that the net burden on the environment in terms of land and energy use is increasing.

So, a shrinking population results in social and economic adjustment problems. But it also has systematically positive aspects: lower CO_2 emissions, slower growth of mobility, less pressure on open space and countryside, quality improvement through land restructuring, etc. (CPB/MNP/RPB, 2006).

7.6.2 Migration

Migration is the main uncertainty factor in national population forecasts. Migration does not provide a systematic solution to ageing or labour market shortage, as migrants, too, grow older (Roodenburg *et al.*, 2003; Bakker Committee, 2008, p. 22). Migrants also turn out to adopt the fertility rates of the country they move too quite quickly.

Shortages on the labour market may be relieved temporarily through an influx of foreign workers (e.g. from eastern Europe). This will increase ethnic diversity, and this in turn may stimulate social and economic creativity and dynamics, especially with the arrival of high educated immigrants and when second or third generations achieve the education and participation levels of the native population.

Ethnic diversity may also lead to segregation in the short term as people withdraw into their own ethnic groups. For newcomers there are many good reasons to fall back on their own ethnic group. Compatriots who have already settled in the Netherlands can help them find a place to live, a school for their children and a job. However, if it proves impossible in the long-term to turn the internal orientation of ethnic groups (including the native population) to more external contacts with other groups, this will halt the process of economic integration. In that case the advantages of diversity will not be realised, and mistrust between the groups may become dominant.

The latter may also be accompanied by spatial segregation: accumulation of disadvantaged groups in certain deprived neighbourhoods in the larger cities, and integration in centres of urban growth and spillover towns (see e.g. the Surinamese in Almere).

7.6.3 Growth in the number of households

Even when the total size of the population decreases, individualisation may still push up the number of households. How long this process – which has already been taking place for decades – will continue, and to what extent is uncertain; the WLO scenarios (CPB/MNP/RPB, 2006) show a bandwidth from a decrease to an increase in the number of households.
An increase will – ceteris paribus – also lead to an increase in environmental burden, partly because in practice a number of provisions such as housing, cars, household appliances (e.g. washing machines) are needed for each household.

The increase in the number of households is reflected mainly in the growth in the number of single households. This development is accompanied by an increasing demand for specific types of housing (apartments). As a result of the increased demand, homes will cost more if housing market regulations do not change as well (e.g. mortgage interest tax deduction, conveyance tax, rent regulation, rent subsidies, open space policy). The costs of these distorting regulations will therefore rise. A decrease in the number of households may lead to empty dwellings, certainly if it is concentrated in certain regions or market segments.

The uncertainty surrounding the number of households demands flexible housing construction policies. In concrete terms this means that although enough space must be reserved, planned numbers of homes to be built must be able to be adjusted upwards or downwards without any difficulty (CPB/MNP/RPB, 2006).

7.6.4 Ageing

The average age of the Dutch population is increasing. Ageing, defined as the increase in the percentage of old people in the total population, is fed by two processes. First, the increase in (healthy) life expectancy; and secondly, a decrease in the number of children born per woman. If women have fewer than 2.1 children on average, the population will age systematically, even if mortality rates remain at the same level; i.e. younger cohorts will be systematically smaller than older cohorts.

The crux of the ageing problem is that the basis to provide adequately for the needs of older generations becomes systematically smaller and smaller. In an upside down population pyramid, there is a risk that the implicit intergenerational pact will come apart at the seams. There are simply too few young people (willing) to provide for the production of goods and services for their elders.

The consequence of this is that older people themselves have to make provisions (i.e. save money) to cover their risks. This is reflected in the reduction or disappearance of 'pay as you go' arrangements, where younger generations pay for the public provisions of older ones. Worldwide trends are visible towards supplementary pensions, higher retirement ages and transfers from defined benefit

schemes (where the risk is borne by people still in work) to defined contribution schemes (where the risk is borne by old people themselves). And in the Netherlands, cutbacks have been made in the scheme that covers exceptional medical expenses (AWBZ).

As a result of the increase in private welfare (e.g. the increasing share of the population with a supplementary pension) the support for older people bearing personal risks has increased. However, this is much less the case for socially vulnerable groups.

Adapting the pension system to the ageing population leads to fundamental trade-offs between saving (private nest egg), insurance (pooling risks), intragenerational solidarity (redistribution between poor and rich) and in particular intergenerational solidarity (redistribution between old and young).

7.7 Conclusion

The pursuit of individual welfare does not always take the same path as the pursuit of local or global sustainable development. In principle, this is an important justification for active sustainability policy by the government. An inherent characteristic of sustainability problems is that they concern scarcity. Intervention in one direction often has a price in another. For policy that is funded by taxpayers, budget restrictions often demand explication of the trade-offs: policymakers can spend their money only once. But sometimes the trade-offs are more implicit, as interventions in a specific direction have unintentional and unforeseen consequences in other areas or later in time.

Interventions to protect climate and biodiversity, in particular, involve difficult trade-offs. Not only because of the global nature of these problems, but also because of the high costs of interventions, the varying consequences for the parties involved, the time scale of the effects, and uncertainties about future technological developments.

For resources, energy and land, the problem of stocks is predominant: is there enough for future generations too? Growing scarcity results in higher prices, and this will pose problems for economic development in the poorer importing countries. But rich countries too will be faced with the consequences. Whether there is enough land on earth to feed 9 billion people well, grow biofuels crops on a large scale with a view to the climate, and preserve the present level of biodiversity is no longer a question for many people.

Social cohesion often benefits from a situation in which differences in income and economic prosperity are limited. On the other hand, government imposed income

levelling will remove the incentive to produce efficiently, to work harder, and – for high educated people – to move to or stay in the Netherlands. This trade-off is at the basis of the well-known trade-off between equality and efficiency. An increasing demand for high educated workers may increase income inequality and thus clash with the pursuit of more social cohesion.

Diversity results from migration, freedom of choice and individualisation. Diversity can stimulate social and economic creativity and dynamics. It can also lead to segregation, if people withdraw into their own ethnic groups, and in the longer term this will lead to frictions between various ethnic groups. Increasing freedom of choice and individualisation reduce mutual commitment within communities, but can increase social cohesion between groups through more open relationships.

Because of the relatively low fertility rates, and leaving migration out of account, the population of the Netherlands and most other European countries will decrease in the long term. This may contribute to a reduction in environmental pressure in our region and on land use elsewhere in the world. But a smaller population does bring along economic adjustment problems. The ageing process will reduce the support basis of young people to provide in the needs of their elders. Although higher labour participation rates will expand this basis somewhat, this in turn will be at the expense of free time which is now partly spent on informal care and other voluntary activities.

What is clear is that positive developments in one area often have negative effects in other areas. We can divide the trade-offs into four groups: efficiency versus equality; work versus free time; diversity versus cohesion; and income versus natural resources for future generations.

The fourth group of trade-offs is the most concerning. It can be empirically demonstrated that improving our standard of living in the short-term without taking any counter measures will almost without exception result in damage to the climate system, and an erosion of the capacity of ecosystems to supply goods and services. Most of the negative effects of increasing material welfare on the quality of natural resources have been the consequence of the economic development of the western world. The much larger – in terms of population – poorer part of the world is following the same road to development now, albeit with a delay of about a century. In some countries, China and India for example, this process has started to accelerate: they seem to be catching up the gap with the rich world very quickly. And this is putting even more pressure on the natural resources still available.

Sustainable development is more than taking care of the environment. Its many faceted character confronts policymakers with a series of fundamental trade-offs,

each of which requires a new appraisal of all the pros and cons of range of interests. These varying interests concern 'here and now' versus 'elsewhere and later', but also the tension between individual freedom of choice and the collective interest.

Annex – Statistical basis of the indicators

This annex explains the sources, abbreviations and units of the figures in the four tables of the indicator system introduced in chapter 2. Tables A1–A4 below are similar to the tables in the indicator system. They present codes to show which sources were used for the indicators. In table A5 these codes are linked to metadata about the sources.

Explanation of calculation methods

The following calculation method was used to calculate developments of the indicators (tables 1, 2 and 4). If the unit of the indicator is a percentage, the difference is taken ($x^{2007} – x^{1995}$). For example: the percentage of renewable energy rose from 1.6 to 3.5 percent: an increase of 1.9 percent points (indicator A4 in table 2). If the indicator has a different unit, the change in terms of a percentage compared with the base year is calculated: $100 * ((x^{2007} – x^{1995})/ x^{1995})$. For example: the number of hours spent on social participation fell from 13.1 to 10.9 hours per week: a decrease of 17 percent (calculated as 100 * ((13.1–10.9)/13.1)), (indicator E1 in table 2).

A similar calculation method is used to compare demographic groups with each other (table 3). If the unit of the indicator is a percentage, the difference is taken ($x^{\text{non-western foreign background}} – x^{\text{native Dutch}}$). For example: participation in life-long learning is 20 percent for people with a non-western foreign background, while it is 13 percent for native Dutch people: a difference of 7 percent points (indicator H6 in table 3). If the indicator has a different unit, the difference in terms of a percentage with the reference group is calculated ($100 * (x^{\text{women}} – x^{\text{men}})/x^{\text{men}}$). For example: women score 5.7 on a scale of 1 to 10 for generalised trust. Men score 5.8, a difference of –1.7 percent (indicator F1 in table 3).

Quality and consistency of the figures

The four tables contain many figures from various Dutch and international institutes; in many cases figures (sometimes estimates) collected by international organisations such as the Statistics Office of the EU (Eurostat) and the OECD. These international institutes work hard to guarantee comparability of their figures, but obviously depend on figures supplied by the national statistical institutes concerned (most of Eurostat's figures for the Netherlands are supplied by Statistics Netherlands). Eurostat assigns 'quality profiles' to some indicators – an indication of their quality and international comparability. In this monitor, category A indicators (the highest quality category) were used as much as possible.

Figures from different institutes often differ, even when they measure the same phenomenon. This is sometimes caused by differing definitions, sometimes by adjustments because the figures are used for a different purpose. As international comparability is very important in the four tables of the indicator system, most figures are taken from Eurostat. These figures are not always consistent with figures used in the Netherlands. The figures on labour participation are a good example: in the Netherlands, figures refer to the percentage of people with a paid job of at least 12 hours a week. In Europe all paid jobs of at least 1 hour a week are included. In addition to using different definitions, Eurostat also adjusts figures from Statistics Netherlands on a number of other aspects. There are a great number of these adjustments. The main ones are explained in footnotes to the tables.

Table A1
Headline indicators

	Change		International comparison
	1950–now	1995–now	
	source (period/year compared)		
Natural capital			
Climate and energy			
A1 Greenhouse gas emissions (tonnes CO2-eq. (GWP) pp)	A1a (1950-2006)	A1b (1995-2006)	A1b (2006)
A2 Energy reserves (GJ pp)	A2a (1950-2006)	A2b (1995-2006)	A2b (2006)
Biodiversity			
B1 Mean species abundance (%)	B1 (1950-2003)	B1 (1995-2003)	B3 (2000/2006)
Soil, water and air			
D1 Urban exposure to particulate matter (μg/m3)	Expert opinion	Expert opinion	D1 (2006)
Social capital			
Social participation			
E1 Social participation (hours pw)	.	E1 (1995-2005)	Expert opinion
Trust			
F1 Generalised trust (score out of 10)	.	.	F1 (2006)
F2 Discrimination (%)	.	.	F2 (2006)
Human capital			
Labour utilisation			
G1 Hours worked (hours pp py)	G1a (1950-2005)	G1a (1995-2005)	G1a (2005)
Education			
H1 Education level (% with sse)	H1a (1950-2005)	H1b (1995-2007)	H1b (2007)
Health			
J1 Female life expectancy (years)	J1a (1950-2005)	J1b (1995-2006)	J1b (2006)
Economic capital			
Physical capital			
K1 Capital stock (1,000 euro (2005) pp)	K1 (1950-2007)	K1 (1995-2007)	.
Knowledge			
L1 Knowledge capital (R&D) (1,000 euro (2005) pp)	L1 (1950-2005)	L1 (1995-2005)	.

Table A2
Sub-indicators

	Indicator	Change		International comparison	
				average	ranking and highest score
	source	*period*	*EU definition*	*EU definition*	*year compared (number of countries)*
Natural capital					
Climate and energy					
A1 Greenhouse gas emissions (tonnes CO2-eq. (GWP) pp)	A1b	1995–2006	EU-27	EU-27	2006(27)
A2 Energy reserves (GJ pp)	A2b	1995–2006	EU-27	EU-27	2006(27)
A3 Energy intensity (oil eq. per 1000 euro GDP)	A3	1995–2006	EU-27	EU-27	2006(27)
A4 Renewable energy (%)	A4	1995–2005	EU-27	EU-27	2005(26)
Biodiversity					
B1 Mean species abundance (%)	B1	1995–2003	.	.	.
B2 Red list (number of species)	B2	1994–2005	.	.	.
B3 Preservation of species (%)	B3	.	.	EU-25	2000/2006(25)
B4 Area of nature and forest (%)	B4	1995–2003	.	.	2000(22)
Soil, water and air					
D1 Urban exposure to particulate matter (μg/m3)	D1	.	.	EU-27	2006(23)
D2 Acidifying emissions (kg acid eq. pp)	D2	1995–2006	EU-27	EU-27	2006(27)
D3 Nitrogen deposits (mol per ha. py)	D3	1995–2005	.	.	2005(26)
D4 Phosphorus in soil (kg per ha)	D4	1990/'92–2002/'04	.	.	2002/04(19)
D5 Phosphorus in water (g per l)	D5	1995–2004	.	.	.
Social capital					
Social participation					
E1 Social participation (hours pw)	E1	1995–2005	.	.	.
E2 Voluntary work (%)	E2	.	.	18 countries	2002(18)
E3 Contacts with family and friends (%)	E3	.	.	19 countries	2006(23)
Trust					
F1 Generalised trust (score out of 10)	F1	.	.	19 countries	2006(22)
F2 Feelings of discrimination (%) 2)	F2	.	.	EU-27	2006(23)
F3 Trust in institutions (%)	F3	.	.	19 countries	2006(24)
Human capital					
Labour utilisation					
G1 Hours worked (hours pp py)	G1a	1995–2005	EU-25	EU-25	2005(25)
G2 Labour participation (%)	G2a	1995–2007	EU-27	EU-27	2007(27)
G3 Hours worked by workers (hours pw pwkr)	G3a	1995–2007	EU-27	EU-27	2007(27)
G4 Retirement age (age)	G4	.	.	EU-27	2006(27)
G5 Over-65s (%) 2)	G5	1995–2007	EU-27	EU-27	2007(27)
Education					
H1 Education level (% with sse)	H1b	1996–2007	EU-15	EU-15	2007(27)
H2 Education level of young people (% sse)	H2	1996–2007	EU-15	EU-15	2007(27)
H3 School leavers (%) 2)	H3	1996–2007	EU-15	EU-15	2007(27)
H4 Maths skills (PISA score)	H4	.	.	.	2006(20)
H5 Education expenditure (% GDP)	H5	1997–2005	EU-25	EU-25	2005(27)
H6 Lifelong learning (%)	H6		.	EU-27	2007(27)
Health					
J1 Female life expectancy (years)	J1b	1995–2006	.	.	2006(27)
J2 Healthy female life expectancy (years)	J2	.	.	.	2006(25)
J3 Health expenditure (% GDP)	J3	1995–2005	.	.	2005(17)
Economic capital					
Physical capital					
K1 Capital stock (1,000 euro (2005) pp)	K1	1995–2007	.	.	.
K2 Capital stock per unit of GDP (proportion)	K2	1995–2007	.	.	.
K3 Investment (% GDP)	K3	1995–2007	EU-27	EU-27	2007(27)
Knowledge					
L1 Knowledge capital (R&D) (1,000 euro (2005) pp)	L1	1995–2007	.	.	.
L2 Private sector expenditure on R&D (% GDP)	L2	1995–2007	EU-27	EU-27	2007(27)
L3 Public sector expenditure on R&D (% GDP)	L3	1995–2007	EU-27	EU-27	2007(27)
L4 Patents (number pmp)	L4	1995–2005	EU-27	EU-27	2007(25)

Table A3
Distribution and inequality

	Sex	Ethnic origin		Education level	
	Women	Western foreign background	Non-western foreign background	Middle	High
	source (year compared)				
Social capital					
Social participation					
E1 Social participation (hours pw)	E1 (2005)	.	.	E1 (2005)	E1 (2005)
Trust					
F1 Generalised trust (score out of 10)	F1 (2002)	F1 (2002)	F1 (2002)	F1 (2002)	F1 (2002)
Human capital					
Labour utilisation					
G1 Hours worked (hours pp py)	G1b (2005)	.	.	G1b (2005)	G1b (2005)
G2 Labour participation (%)	G2b (2005)	G2b (2005)	G2b (2005)	G2b (2005)	G2b (2005)
G3 Hours worked by workers (hours pw pwkr)	G3b (2005)	G3b (2005)	G3b (2005)	G3b (2005)	G3b (2005)
Education					
H1 Education level (% with sse)	H1a (2005)	H1a (2005)	H1a (2005)	.	.
H6 Lifelong learning (%)	H6b (2005)	H6b (2005)	H6b (2005)	H6b (2005)	H6b (2005)
Health					
J1 Female life expectancy (years)	J1a (2005)	.	.	J1c (1997/2005)	J1c (1997/2005)

Table A4
International dimension

	Total			Africa			Least Developed Countries		
	1970–2005	1995–2005	2005	1970–2005	1995–2005	2005	1970–2005	1995–2005	2005
	Source (period/year)								
Natural capital									
N1 Depletion of natural capital (% GDP) 1)	N1	N1	N1	N1	N1	N1	N1	N1	N1
of which:									
energy sources (% GDP)	N1	N1	N1	N1	N1	N1	N1	N1	N1
minerals (% GDP)	N1	N1	N1	N1	N1	N1	N1	N1	N1
forest (% GDP)	N1	N1	N1	N1	N1	N1	N1	N1	N1
CO2 emissions (% GDP)	N1	N1	N1	N1	N1	N1	N1	N1	N1
Climate and energy									
A5 CO2 trade balance (mln kg CO2)	.	A5(2005)	A5(2005)	.	.	A5(2005)	.	.	.
A6 GG emissions in aid of consumption	.	.	A6(2001)	.	.	A6(2001)	.	.	.
Biodiversity									
B5 Land use in aid of consumption	.	.	A5(2001)	.	.	A5(2001)	.	.	.
Natural resources									
C1 Imports (% total imports)	C1	C1	C1	C1	C1	C1	C1	C1	C1
C2 Imports from region (% imports of natural resources)	.	.	.	C2	C2	C2	C2	C2	C2

[1] For source N1 the periods 1970–2004 and 1995–2004 were used. The figure for 2004 was used for the value of 2005.

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
A1a	Greenhouse gas emissions	Tonnes of CO_2-equivalents (Global Warming Potential) per person	PBL/CDIAC	Amount of greenhouse gases emitted converted to CO_2 equivalents (according to the Kyoto protocol): carbon dioxide, methane gas, laughing gas and the so-called F-gases. Figures for before 1990 are taken from an experimental series of the PBL.
A1b	Greenhouse gas emissions	Tonnes of CO_2-equivalents (Global Warming Potential) per person	Eurostat	See A1a. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
A2a	Energy reserves	Gigajoules (GJ) per person	Statistics Netherlands	Amounts of proven but not yet exploited oil, coal and natural gas reserves, converted to Gigajoules, and expressed in terms of amount per inhabitant.
A2b	Energy reserves	Gigajoules (GJ) per person	BP	See definition A2a.
A3	Energy intensity	Kilograms of oil equivalents per 1,000 euro of GDP	Eurostat	Gross domestic energy consumption in kilograms of oil equivalents per 1,000 euro of GDP. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
A4	Renewable energy	Percentage of gross energy consumption	Eurostat	Renewable energy as a proportion of the gross energy supply. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
A5	CO_2 trade balance	Million kilograms of CO_2 emissions	Statistics Netherlands	Greenhouse gases that can be attributed to imports minus greenhouse gases that can be attributed to exports (CBS, 2008b)
A6	GG emissions in aid of consumption	Proportion	PBL	Emissions occurring as a result of the consumption of an average inhabitant of the Netherlands compared with an average inhabitant of the European countries of the OECD. Includes both domestic emissions and emissions in other countries. The calculations (by PBL) are based on the GTAP model.
B1	Mean species abundance (MSA)	Percentage	PBL	Biodiversity indicator that incorporates loss of quality and loss of quantity (area reduction). Measured as a percentage of original biodiversity.

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
B2	Red List	Number of species	PBL	List comprising numbers of endangered animal and plant species per country.
B3	Preservation of species	Percentage	LNV	To measure preservation of species, population trends, population sizes and natural distribution of species are used.
B4	Area of nature and forest	Percentage of land area	Eurostat/PBL/Corine	Proportion of land area of the Netherlands that consists of nature and forest.
B5	Land use in aid of consumption	Proportion	PBL	Land used as a result of the consumption of an average inhabitant of the Netherlands compared with an average inhabitant of the European countries of the OECD. Includes both land used in the Netherlands and land used in other countries. The calculations (by PBL) are based on the GTAP model.
C1	Imports of natural resources	Imports of natural resources as a percentage of total imports	VN Comtrade database	Natural resources include product groups 24 (wood, timber, cork), 27 (crude fertilisers and crude minerals), 28 (metalliferous ores and metal scrap), 32 (coal, coke, briquettes), 33 (petroleum and petroleum products) and 34 (gas (natural and manufactured)) according to the SITC (rev. 1) classification. Figures have been corrected for transit trade. For more information see the website of the UN Comtrade database (http://comtrade.un.org)
C2	Imports of natural resources from region	Imports of natural resources from a certain region as a percentage of the total imports of natural resources	VN Comtrade database	See C1.
D1	Urban exposure to particulate matter	Micrograms per cubic metre	Eurostat	Concentration of fine particulate matter to which the urban population is exposed (µg/m3)
D2	Acidifying emissions	Kilograms of acidifying equivalents per person	Eurostat	Emissions of acidifying substances (sulphur dioxide, nitrogen dioxide and ammonia).

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
D3	Nitrogen deposits	Nitrogen deposits (mol) per hectare per year	EMEP	Deposits of nitrogen in nature, as calculated on the basis of the EMEP model. These figures are taken because they are internationally comparable. The EMEP results for the Netherlands are considerably lower than the calculations done by the PBL and presented in Milieubalans (PBL, 2008a).
D4	Phosphorus in soil	Kilograms per hectare per year	OECD	Amount of phosphorus in agricultural soil between 1990 and 2004.
D5	Phosphorus in water	Grams per litre	PBL	Concentration of phosphorus in regional surface waters.
E1	Social participation	Hours per week	SCP (Time use survey)	Average time spent per day on social participation and social contacts (excluding journey time).
E2	Voluntary work	Percentage	European Social Survey	Percentage of people who do voluntary work.
E3	Contacts with family and friends	Percentage	European Social Survey	Percentage of people who meet family, friends or colleagues for social purposes at least once a week.
F1	Generalised trust	Score out of ten 10	European Social Survey	Based on the question: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? Please give a mark between 0 and 10, where 0 means you can't be too careful and 10 means that most people can be trusted."
F2	Feelings of discrimination	Percentage	European Social Survey	Percentage of people in the Netherlands who describe themselves as belonging to a group that is discriminated against

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
F3	Trust in institutions	Percentage	European Commission (Eurobarometer)	Average trust in 15 institutions: press, radio, television, internet, justice, police, army, religious organisations, trade unions, political parties, national parliament, European Union, United Nations, consumer organisations. First the percentage of people who say they trust an institution was calculated for each institution; the average of these percentages was then taken.
G1a	Hours worked	Hours worked per person per year	Eurostat (EUKLEMS)/van Ark and de Jong	Number of hours actually worked per capita. The EUKLEMS data run from 1969 to now. The volume changes are from van Ark and de Jong (1996).
G1b	Hours worked	Hours worked per person per week	SCP (Time use survey)	Average time per day spent on work.
G2a	Labour participation	Percentage of employed people in the labour force	Eurostat	Number of people aged 15–64 years with a paid job (at least 1 hour a week) as a percentage of the labour force (net labour participation rate). Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
G2b	Labour participation	Percentage of employed people in the labour force	Statistics Netherlands	Number of people aged 15–64 years with a paid job (at least 12 hours a week) as a percentage of the labour force (net labour participation rate).
G3a	Hours worked by workers	Hours per week per worker	Eurostat	Average number of hours worked per week, per main job.
G3b	Hours worked by workers	Hours per week per worker	Statistics Netherlands (Labour Force Survey)	Processed results of Statistics Netherlands Labour Force Survey. Average number of hours worked per week, per main job.
G4	Retirement age	Years	Eurostat	Average age at retirement from the labour market.
G5	Over-65s	Percentage aged over 65 years	Eurostat	Percentage of the population older than 65 years.

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
H1a	Years in education	Years in education	Statistics Netherlands/van Ark and de Jong (1996)	The number of years spent in (formal) education. Statistics Netherlands data run from van 1997 to now (Labour Force Survey). These have been combined with data on duration of education from Statistics Netherlands' Speerpunt Onderwijs. For 1950–1995 volume changes from van Ark and de Jong (1996) were used. Figures for 1996 and 1997 are estimates.
H1b	Education level	Percentage	Eurostat	Percentage of the population aged 25–64 years who have completed at least a senior level of secondary education.
H2	Education level of young people	Percentage	Eurostat	Percentage of the population aged 20–24 years who have completed at least a senior level of secondary education. Eurostat has assigned this indicator a "B" quality profile. This means that there may be breaks in series in figures for some countries, or that comparability is not complete.
H3	School leavers	Percentage	Eurostat	Percentage of the population aged 18–24 years whose highest level of completed education is a junior level of secondary education, and who are no longer in education.
H4	Maths skills (PISA)	Score	OECD (Programme for International Student Assessment)	PISA is an annual assessment of the knowledge and skills of 15 year-olds in the areas of reading, mathematics and science.
H5	Education expenditure	Percentage of GDP	Eurostat	Expenditure on education as a percentage of GDP.
H6	Lifelong learning	Percentage	Eurostat	Percentage of the population aged 25–64 years who participated in some form of education or training in the four week preceding the survey.
J1a	Female life expectancy	Years	Eurostat	Number of years a woman is expected to live at birth. As different weights are used, Statistics Netherlands figures (J1b) may differ slightly from Eurostat figures.
J1b	Female life expectancy	Years	Statistics Netherlands	See J1a.

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
J2	Healthy female life expectancy	Years	Eurostat	Number of years a woman is expected to live in good health at birth. Eurostat has assigned this indicator a "B" quality profile. This means that there may be breaks in series in figures for some countries, or that comparability is not complete.
J3	Health expenditure	Expenditure on health care as a percentage of GDP	OECD	Expenditure on health as a percentage of GDP.
K1	Capital stock	Million euro (2005) per person	Statistics Netherlands/van Ark en de Jong (1996)	Most capital stock consists of residential and non-residential buildings, civil engineering works, and machines and installations (physical capital). It also includes smaller components such as intellectual property (e.g. software). For 1950–1952 volume changes are taken from van Ark and de Jong (1996).
K2	Capital stock per unit of GDP	Proportion	Statistics Netherlands/van Ark and de Jong (1996)	Figures from K1 combined with a GDP series form Statistics Netherlands National Accounts (2008c).
K3	Investment	Percentage of GDP	Eurostat	Private sector investment as a percentage of GDP. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
L1	Knowledge capital (R&D)	Million euro (2005) per person	Statistics Netherlands/van Ark and de Jong	Research and Development (R&D) is creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock knowledge to devise new applications (Frascati Manual – OECD, 2002). An experimental series of Statistics Netherlands runs from 1969 to now (van Rooijen-Horsten *et al.*, 2008). For the period 1950–1969 volume changes from van Ark and de Jong (1996) were used.
L2	Private sector expenditure on R&D	Expenditure on R&D by the private sector, as a percentage of GDP	Eurostat	Expenditure on R&D by the private sector as a percentage of GDP. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.

Table A5
Metadata on sources

Code	Indicator	Unit [1)]	Source/institute/study	Explanation
L3	Public sector expenditure on R&D	Expenditure on R&D by the public sector, as a percentage of GDP	Eurostat	Expenditure on R&D by the public sector as a percentage of GDP. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
L4	Patents	Number of patents per million inhabitants	Eurostat	Number of patents granted by the European Patent Office (EPO) per million inhabitants. Eurostat has assigned this indicator an "A" quality profile. This is the highest score for quality and international comparability.
N1	Depletion of natural capital	Percentage of GDP	World Bank	Depletion of natural capital (energy sources, minerals, forests and CO2 emissions) per unit of GDP (World Bank, 2008).

[1)] For units calculated per person/per capita/per inhabitant, Eurostat population data are used (1 January). The average of the year concerned and the subsequent year are the basis for the calculation. For example: for the 1950 figures, data for 1950 and 1951 are used.

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List of abbreviations used in the book

AOW	State old age pension (Algemene Ouderdomswet)
CBD	Convention on Biological Diversity
CBS	Statistics Netherlands (Centraal Bureau voor de Statistiek)
CDM	Clean Development Mechanism
CIA	Central Intelligence Agency
CIAM	Centre for Integrated Assessment Modelling
CPB	Netherlands Bureau for Economic Policy Analysis (Centraal Planbureau)
CRU	Climatic Research Unit
ECN	Energy Research Centre of the Netherlands (Energieonderzoek Centrum Nederland)
EEA	European Environmental Agency
EF	Ecological Footprint
EHS	National Ecological Network of the Netherlands (Ecologische Hoofdstructuur)
EMEP	European Monitoring and Evaluation Programme
ESS	European Social Survey
ETS	Emission Trading Scheme
EU	European Union
EU-15	European Union, 15 countries
EU-27	European Union, 27 countries
FAO	Food and Agriculture Organisation
GDP	Gross domestic product
GG	Greenhouse gases
GNP	Gross national product
GTAP	Global Trade Analysis Project
HLY	Healthy Life Years
I/A	Inactive/Active population
ICT	Information and communication technology
IEA	International Energy Agency
IPPC	Intergovernmental Panel for Climate Change
ISS	Index for a sustainable society
KADO	Dutch Cabinet's approach to sustainable development (Kabinetsbrede Aanpak Duurzame Ontwikkeling)
KNMI	Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut)
LNV	Dutch Ministry of Agriculture, Nature and Food Quality
MA	Millennium Ecosystem Assessment

MNC	Environment and nature compendium (Milieu- en Natuurcompendium)
MNP	Environment and Nature Assessment Agency (Milieu- en Natuurplanbureau)
MSA	Mean Species Abundance
NPC	National Petroleum Council
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries
OS	Dutch Ministry of Development Cooperation
PBL	Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving)
PISA	Programme for International Student Assessment
R&D	Research and Development
RIVM	National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu)
RPB	Spatial Planning Agency (Ruimtelijk Planbureau)
SCP	Netherlands Institute for Social research (Sociaal en Cultureel Planbureau)
SNI	Sustainable national income
TFIAM	Taskforce in Integrated Assessment Modelling
TFP	Total factor productivity
TIMMS	Trends in International Mathematics and Science Study
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UN	United Nations
VROM	Dutch Ministry of Housing, Spatial Planning and the Environment
VUT	Early retirement
WBSO	Promotion of Research and Development Act (Wet Bevordering Speur- en Ontwikkelingswerk)
WCED	World Commission on Environment and Development
WLO	Welfare and environment
WTO	World Trade Organisation

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Abbreviations used in tables 1–4

µg	microgram
acid eq.	acid equivalents
CO_2	carbon dioxide
CO_2 eq.	carbon dioxide equivalents
EU-27	European Union of 27 countries
euro(2005)	euro, prices of 2005
g	gram
GDP	gross domestic product
GG	greenhouse gas
GJ	Gigajoule
GWP	Global Warming Potential
ha	hectare
kg	kilogram
l	litre
m^3	cubic metre
mln	million
OECD	Organisation for Economic Cooperation and Development
oil eq.	oil equivalents
PISA	Program for International Student Assessment
pmp	per million persons
pp	per person
pw	per week
pwkr	per worker
py	per year
R&D	Research and Development
sse	senior secondary education

Table 1
Headline indicators

	Change [1]		International comparison
	1950–now	1995–now	
	%		*position in EU-27 ranking (number of countries)*
Natural capital			
Climate and energy			
A1 Greenhouse gas emissions (tonnes CO_2-eq. (GWP) pp) [2]	46	–12	19 (27)
A2 Energy reserves (GJ pp)	–80	–38	6 (27)
Biodiversity			
B1 Mean species abundance (%)	–14	0	19 (25) [3]
Soil, water and air			
D1 Urban exposure to particulate matter (μg/m^3) [2]	↑ [5]	↓ [6]	12 (23)
Social capital			
Social participation			
E1 Social participation (hours pw)	.	–17	above average
Trust			
F1 Generalised trust (score out of 10)	.	.	4 (22)
F2 Discrimination (%) [2]	.	.	18 (23)
Human capital			
Labour utilisation			
G1 Hours worked (hours pp py)	–20	4	21 (25)
Education			
H1 Education level (% with sse)	78 [4]	10	17 (27)
Health			
J1 Female life expectancy (years)	12	2	12 (27)
Economic capital			
Physical capital			
K1 Capital stock (1,000 euro (2005) pp)	298	18	.
Knowledge			
L1 Knowledge capital (R&D) (1,000 euro (2005) pp)	1,217	12	.

Source: Various (See annexe).

1) If the indicator is a percentage (incl. % GDP), then the difference is taken (x^{2007}–x^{1995}). For other units, the change is the change in terms of percentage compared with the base year: 100 * (x^{2007}–x^{1995})/x^{1995}.

2) For this indicator a low figure is a favourable score. (See explanation in section 2.1). The ranking runs from low (good) to high (bad).

3) No figures are available for mean species abundance per country of the European Union. Therefore the ranking for 'preservation of species' is taken (indicator B3).

4) For the long-term change, the number of years of formal education is used (source H1a).

5) Increase.

6) Decrease.

Table 2
Sub-indicators

	Change [1]		International comparison			
	Netherlands 1995–now	EU-27 1995–now	Netherlands	EU-27		
				Average	Highest score	
	%		*position in EU-27 ranking (number of countries)*	*value*		*country*
Natural capital						
Climate and energy						
A1 Greenhouse gas emissions (tonnes CO_2-eq. (GWP) pp) [2]	–12.4	–4.7	19 (27)	12.7	10.4	5.1 Latvia
A2 Energy reserves (GJ pp)	–37.7	–23.9	6 (27)	2,615	1,790	10,424 Czech Republic
A3 Energy intensity (oil eq. per 1000 euro GDP) [2]	–18.5	–14.3	9 (27)	188	202	118 Denmark
A4 Renewable energy (%)	1.9	1.6	21 (26)	3.5	6.7	36.3 Latvia
Biodiversity						
B1 Mean species abundance (%)	–0.5	.	.	12.8	.	. .
B2 Red list (number of species)	9.5	.	.	150	.	. .
B3 Preservation of species (%)	.	.	19 (25)	25.5	.	62.0 Latvia
B4 Area of nature and forest (%)	0.2	.	21 (22)	14.1	.	62.3 Slovenia
Soil, water and air						
D1 Urban exposure to particulate matter ($\mu g/m^3$) [2]	.	.	12 (23)	31.4	30.0	15.4 Ireland
D2 Acidifying emissions (kg acid eq. pp) [2]	–37.0	–36.0	5 (27)	1.0	1.5	0.7 Luxembourg
D3 Nitrogen deposits (mol per ha. py) [2]	–13.4	.	26 (26)	1,353	.	175 Cyprus
D4 Phosphorus in soil (kg per ha) [2]	–48.9	.	18 (19)	19.4	.	-0.3 Hungary
D5 Phosphorus in water (g per l) [2]	–28.5	.	.	0.2	.	. .
Social capital						
Social participation						
E1 Social participation (hours pw)	–16.8	.	.	10.9	.	. .
E2 Voluntary work (%)	.	.	2 (18)	20.0	12.0	22.0 Sweden
E3 Contacts with family and friends (%)	.	.	3 (23)	77.0	64.0	87.0 Portugal
Trust						
F1 Generalised trust (score out of 10)	.	.	4 (22)	5.8	4.9	7.0 Denmark
F2 Feelings of discrimination (%) [2]	.	.	18 (23)	7.5	7.3	2.4 Italy
F3 Trust in institutions (%)	.	.	3 (24)	60.0	51.0	65.0 Denmark
Human capital						
Labour utilisation						
G1 Hours worked (hours pp py)	4.2	2.7	21 (25)	702	725	1,077 Luxembourg
G2 Labour participation (%)	11.3	5.3	2 (27)	76.0	65.4	77.1 Denmark
G3 Hours worked by workers (hours pw pwkr)	–5.8	–3.1	27 (27)	31.0	37.2	42.5 Greece
G4 Retirement age (age)	.	.	11 (27)	62.1	.	64.3 Romania
G5 Over-65s (%) [2]	1.3	2.2	8 (27)	14.5	16.9	11.1 Ireland
Education						
H1 Education level (% with sse)	10.1	12.0	17 (27)	73.2	67.5	90.5 Czech Republic
H2 Education level of young people (% sse)	8.6	7.1	21 (27)	76.2	75.2	91.8 Czech Republic
H3 School leavers (%) [2]	.	–4.7	11 (27)	12.0	16.9	4.3 Slovenia
H4 Maths skills (PISA score)	.	.	2 (20)	531	.	548 Finland
H5 Education expenditure (% GDP)	0.4	0.3	14 (27)	5.2	5.1	8.3 Denmark
H6 Lifelong learning (%)	.	.	5 (27)	16.6	9.5	32.4 Sweden
Health						
J1 Female life expectancy (years)	1.9	.	12 (27)	82.0	.	84.4 Spain/France
J2 Healthy female life expectancy (years)	.	.	10 (25)	63.2	.	69.2 Malta
J3 Health expenditure (% GDP)	0.9	.	7 (17)	9.2	.	11.2 France
Economic capital						
Physical capital						
K1 Capital stock (1,000 euro (2005) pp)	18.0	.	.	104	.	. .
K2 Capital stock per unit of GDP (proportion)	–9.4	.	.	3.1	.	. .
K3 Investment (% GDP)	–0.8	1.6	22 (27)	20.0	21.3	32.5 Estonia
Knowledge						
L1 Knowledge capital (R&D) (1,000 euro (2005) pp)	12.0	.	.	1.7	.	. .
L2 Private sector expenditure on R&D (% GDP)	0.0	0.0	10 (27)	1.0	1.2	2.6 Sweden
L3 Public sector expenditure on R&D (% GDP)	–0.3	0.0	8 (27)	0.7	0.7	1.0 Sweden
L4 Patents (number pmp)	52.8	61.6	7 (27)	173	106	275 Germany

Source: Various (See annexe).

[1] If the indicator is a percentage (incl. % GDP), then the difference is taken (x^{2007} - x^{1995}). For other units, the change is the change in terms of percentage compared with the base year: 100 * (x^{2007} - x^{1995})/ x^{1995}.

[2] For this indicator a low figure is a favourable score. (See explanation in section 2.1). The ranking runs from low (good) to high (bad).

Table 3
Distribution and inequality [1)]

	Sex	Ethnic origin		Education level	
	Women	Western foreign background	Non-western foreign background	Middle	High
	% (compared with men)	*% (compared with native Dutch)*		*% (compared with low education level)*	
Social capital					
Social participation					
E1 Social participation (hours pw)	16	.	.	7	4
Trust					
F1 Generalised trust (score out of 10)	–2	–2	–14	12	25
Human capital					
Labour utilisation					
G1 Hours worked (hours pp py)	–50	.	.	98	160
G2 Labour participation (%)	–20	–1	–10	23	34
G3 Hours worked by workers (hours pw pwkr)	–29	–1	0	1	4
Education					
H1 Education level (% with sse)	–2	2	–9	.	.
H6 Lifelong learning (%)	0	3	7	4	13
Health					
J1 Female life expectancy (years)	6	.	.	3	3

Source: Various (See annexe).

[1)] If the indicator is a percentage, then the difference with the reference group is taken (x^{women}–x^{men}). For other units, the difference in terms of percentage is taken compared with the reference group: 100 * ($x^{non\text{-}western\ foreign\ background}$–$x^{native\ Dutch}$)/ $x^{native\ Dutch}$.

Table 4
International dimension [1)]

	Total			Africa			Least Developed Countries		
	1970–2005	1995–2005	2005	1970–2005	1995–2005	2005	1970–2005	1995–2005	2005
	%		*value*	*%*		*value*	*%*		*value*
Natural capital									
N1 Depletion of natural capital (% GDP)	0.8	1.5	3.3	6.3	4.0	11.6	2.8	5.4	10.5
of which:									
energy sources (% GDP)	1.3	1.5	2.8	8.9	4.9	9.8	8.7	6.6	8.7
minerals (% GDP)	–0.3	0.0	0.1	–2.7	–0.5	0.4	–6.5	–0.3	0.2
forest (% GDP)	0.0	0.0	0.0	0.0	–0.3	0.6	0.4	–0.8	1.2
CO2 emissions (% GDP)	–0.2	0.0	0.4	0.1	–0.1	0.7	0.2	0.0	0.3
Climate and energy									
A5 CO2 trade balance (mln kg CO_2)	.	20.0	14,128	.	.	–5,120	.	.	.
A6 GG emissions in aid of consumption [2)]	.	.	1.10	.	.	0.92	.	.	.
Biodiversity									
B5 Land use in aid of consumption [2)]	.	.	0.96	.	.	1.19	.	.	.
Natural resources									
C1 Imports (% total imports)	1.8	7.5	17.1	–1.9	0.4	1.2	–0.3	0.1	0.1
C2 Imports from region (% imports of natural resources)				–13.5	–1.5	7.2	–1.8	0.5	0.7

Source: Various (See annexe).

[1)] If the indicator is a percentage (incl. % GDP), then the difference is taken (x2007 - x1995). For other units, the change is the change in terms of percentage compared with the base year: 100 * (x2007 - x1995)/ x1995.

[2)] This indicator shows the emissions/land use in aid of consumption by an average Dutch person compared with an average inhabitant of one of the European OECD countries. A factor of 1.10 means that an average Dutch person emits 10% more greenhouse gas.