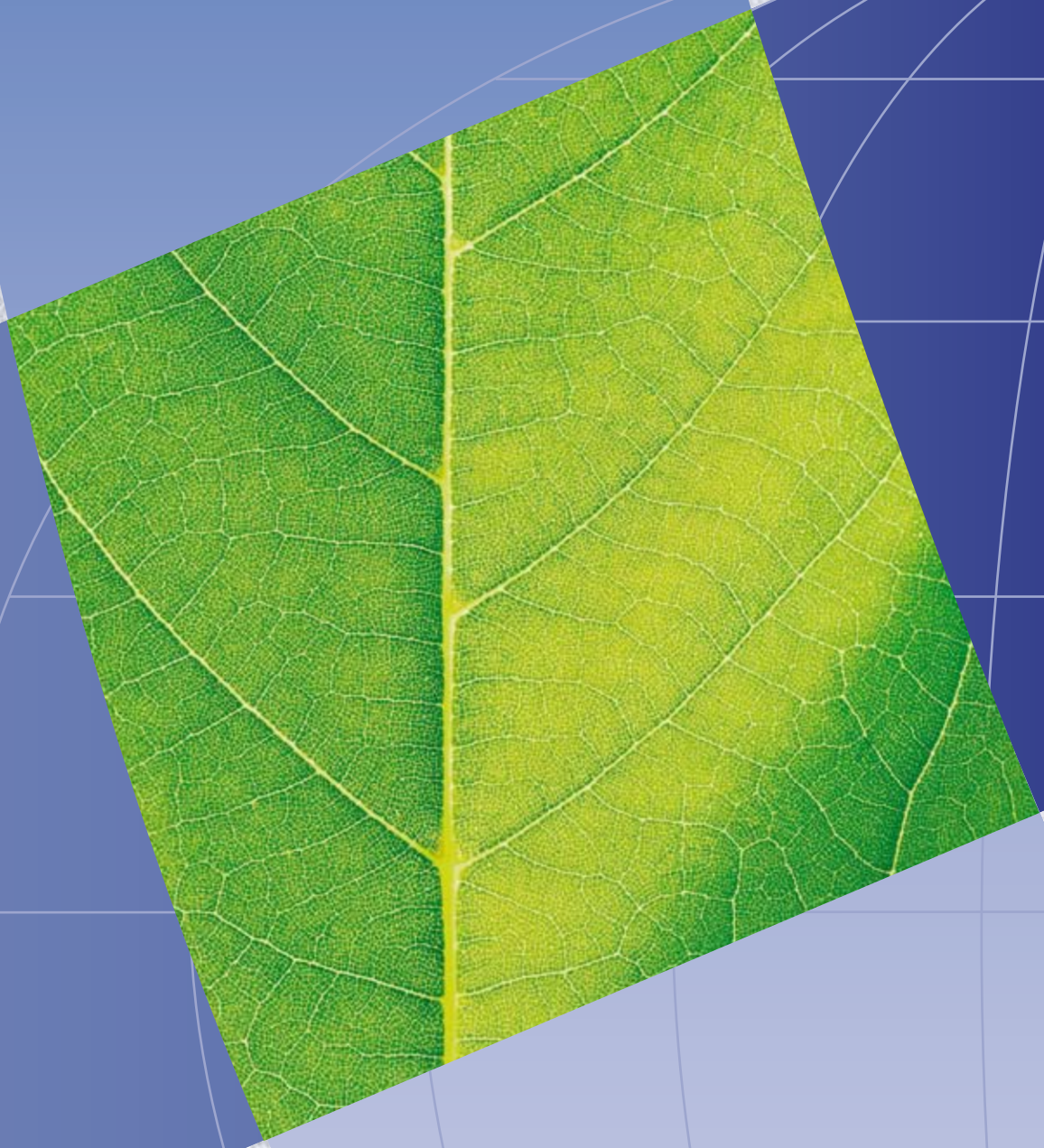

The Netherlands in a Sustainable World

Poverty, Climate and Biodiversity

Second Sustainability Outlook

Netherlands Environmental Assessment Agency

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Colophon

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FOREWORD

In its coalition agreement the Dutch Government declared its desire to work together to create a society of growth, sustainability, respect and solidarity. The aim is to achieve sustainable human, environmental and economic development. Governments will have to ensure policy coherence between all the areas where sustainability can and must take shape. This policy coherence concerns three linkages:

- In the first place, the link between socio-cultural (people), ecological (planet) and economic (profit, prosperity) quality. To achieve a high quality of life these separate qualities must be bound together in a mutual balance, both in the individual sphere and within society as a whole. This was explored in the First Sustainability Outlook (*Quality and the Future*). But from a socio-cultural and economic perspective it still remains difficult to operationalise the concept of sustainability. This is why both the First Sustainability Outlook and this second Outlook have been framed mainly from an ecological (planet) perspective.

- In the second place, the link between the present quality of life and that of future generations. This relation between 'now' and 'later' has been elaborated specifically for the physical living environment in the Netherlands. It was published in June 2007 as the first part of the Second Sustainability Outlook under the title *Nederland later* (*The Netherlands Later*).

- In the third place, the link between the Netherlands and the rest of the world. This second part of the Second Sustainability Outlook, titled *The Netherlands in a Sustainable World*, examines what the impacts of choices made by the Netherlands are elsewhere in the world and, conversely, the influence of global developments on the quality of life in the Netherlands. The focus is on the three interconnected sustainability problems, with regard to both causes and possible solutions:
  1. the poverty and development issue;
  2. the energy and climate issue;
  3. the land use and biodiversity issue.

This Second Sustainability Outlook was prepared at request of the previous Dutch Government. It takes account of comments made by several leading academics and other experts in the field, including members of the Advisory Board of the Netherlands Environmental Assessment Agency.

We are currently working with the other policy assessment agencies and Statistics Netherlands on a compact set of sustainability indicators for relevant themes to allow us to identify problems early on. These indicators will enable us to keep track of sustainable development in the Netherlands.

Interim Director, Netherlands Environmental Assessment Agency

Drs. E.J. Mulock Houwer

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Main conclusions

A finite world

The world is too small to simultaneously produce enough food for everyone, including meat, and to deliver biofuels on a large enough scale to slow down climate change and maintain biodiversity. Further economic development, particularly of the richer countries, and the emerging economies of China, India and Brazil, will be at the expense of biodiversity and will lead to further climate change. This part of the Second Sustainability Outlook of the Netherlands Environmental Assessment Agency (PBL) revolves around three core sustainability issues: development, climate change and biodiversity loss. These are all closely interconnected, both in terms of causes and potential solutions. For example, socio-economic development of the poorest developing countries will lead to less poverty and famine, and in time, to lower rates of population growth, but also to higher levels of consumption and, consequently, to rising energy use and expanding land use, which in turn drive further climate change and loss of biodiversity.

Achievement of the current international objectives for development, climate change and biodiversity loss is becoming more and more unlikely. Important reasons for this are the one-sided emphasis in the short term, working with partial solutions and especially inadequate international cooperation. Reducing poverty, tackling climate change and reducing biodiversity loss to a minimum will only be possible with coordinated international policies. How this can be achieved is set out in the options below.

Promoting development

Although average incomes, and level of education and health have improved considerably during the last fifty years in most regions of the world, Sub-Saharan Africa and South Asia, in particular, are still lagging behind. Efforts to stimulate development in the poorest countries will have to concentrate primarily on the following:

- investing in infrastructure in the broadest sense of the word: education, health care, roads, factories, administration, energy, drinking water and sanitation;
- abolishing agricultural subsidies in combination with the phased opening up of markets in developing countries to allow these countries to adjust to the global market;
- combining existing development cooperation efforts to prevent fragmentation of the aid effort. A good example would be an EU plan for African development, in which the loss of biodiversity and natural habitat is kept to a minimum and energy is used efficiently.

Tackling climate change

Continuous availability of affordable and clean energy is an important element of sustainable development. Growing energy consumption during the last century was accompanied by a sharp rise in greenhouse gas emissions, resulting in more rapid climate change. The negative impacts of climate change will mainly affect developing countries. Tackling the climate problem effectively will necessitate:

- rich countries, the emerging economies (China, India, Russia) and the OPEC countries, joining an international climate regime;
- broadening the European emissions trading system to include other countries in tackling the global climate problem efficiently;
- encouraging the capture and storage of CO_2 at new coal-fired power stations and stimulating the use of alternative sources of energy through a system of subsidies and taxes, or enforcing their use through legislation until the emissions trading system provides an effective price incentive;
- lowering expectations about the contribution biofuels can make to the EU targets for 2020 and taking into account the negative impacts on food and biodiversity. Accelerating the development from first to second generation biofuels can reduce competition between food and energy cropping.

Conserving biodiversity

Population growth and rising consumption are increasing the pressures to convert natural areas into agricultural land, with a resulting loss of biodiversity. Development in Europe has been achieved at the expense of half the original biodiversity of the continent. In other regions too, socio-economic development has led to large-scale losses of biodiversity. It is certain that further economic development in the world will be accompanied by substantial biodiversity loss, especially in the tropical regions. The mission must be to limit the damage as much as possible, achievable by taking simultaneous actions to:

- raise agricultural productivity, particularly in developing countries;
- influence people's diet – although there seems to be little support for this at the moment – especially by encouraging them to eat either less meat (or at least less 'red' meat. i.e. beef) or high quality meat substitutes produced by alternative methods;
- reveal the impacts on biodiversity of production chains that involve processing natural resources, and remind the international business community of their responsibility in conserving biodiversity;
- provide targeted protection of ecosystems, particularly in tropical regions, supported by economic instruments and the establishment of sufficiently sized nature reserves;
- deepen and disseminate the understanding of biodiversity as a condition for development, following the example of the Intergovernmental Panel on Climate Change (IPCC).

Cost of achieving the objectives

A broad international agenda for tackling development issues is contained in the Millennium Development Goals (MDGS). One is to halve the figures for hunger and poverty in 2015 in relation to the 1990 levels. According to calculations, an annual contribution of about 0.5% of GDP from all donor countries will be required up to 2015, in addition to the efforts made by developing countries themselves and direct investments by companies. If we are to achieve the MDGS, other efforts besides financial contributions will be needed, such as good administration and effective arrangements for development cooperation. The costs of limiting average global warming to two degrees, amount to a few per cent of the global GDP in 2040. This is assuming that all the large countries participate and that economic instruments, such as emissions trading, are employed. If the total available emission rights for greenhouse gases were to be distributed equally across the world's population, the policy challenge facing Europe would be relatively high and the costs would also be higher. According to the OECD *Baseline scenario*, by 2040 global GDP will have tripled in comparison with the 2005 level. It is not yet known what it will cost to substantially reduce biodiversity loss.

Resolving the social dilemma

Although the Dutch population considers it important to tackle global sustainability issues and is prepared to make a financial contribution, as individual consumers people often do not act accordingly. They think the government should resolve this social dilemma and prefer this to 'happen behind the scenes' in the creation of more sustainable products or production chains. Companies indicate that they are able and willing to produce more sustainably if government ensures a level international playing field. Countries face a similar problem and are often only willing to take action if other countries do so as well. Adapting and strengthening institutions and the ground rules for action are important conditions for sustainable development.

Coordinated international action

Sustainability issues need to be tackled not only through a robust international policy, but through an integrated approach as well. Development policies have consequences for biodiversity and climate change, and vice versa. Policies for energy, agriculture, trade, biodiversity and development cooperation should therefore be integrated. In pursuing this aim, the Netherlands should, via the European Union, promote a coalition of large countries, including rapidly growing economies. Finally, governments, such as in the Netherlands, could appraise the sustainability of its own policies and plans by consistently identifying and explaining their consequences, at least those concerning climate, biodiversity and poverty. This will alert politicians to the opportunities for countering or avoiding the negative consequences of policies and plans.

Summary

The Netherlands in a Sustainable World, describes the trends and policy options pursued in achieving internationally agreed objectives for development, climate change and biodiversity. The *Baseline scenario* up to 2040 published by the OECD was used here. A baseline scenario assumes no additional policies, such as the recently agreed EU climate policy. This outlook therefore also includes an inventory of additional policy options for working towards the objectives. The policy options identified are then analysed from the perspective of the different world views.

TRENDS

Much progress on development, but unequally distributed
The average income, level of education and health in most parts of the world have improved considerably during the last 50 years. However, a large proportion of the world's population still lives in extreme poverty, particularly in Sub-Saharan Africa and South Asia. Currently more than a billion of the 6 billion people on earth live on less than a dollar a day, 850 million people do not have enough food, more than a billion do not have access to clean drinking water and 2.4 billion people have no access to modern and clean forms of energy.

Development at the expense of nature and the environment
During the last hundred years in particular, human development has taken place at the expense of nature and the environment. Ecosystems and the climate have been the most affected. Humanity has already brought two-thirds of the world's productive land into use, mainly for agriculture, which has resulted in loss of biodiversity. In Europe, half the original biodiversity has already been lost. Rising energy consumption has led to higher greenhouse gas emissions, which, in turn, has caused a higher rate of climate change. Biodiversity loss and climate change constitute the ecological price of socio-economic development.

Population and consumption growth not compensated by technology: pressures on land and energy consumption continue to grow
The two main factors driving the increasing pressures on the environment are population growth and consumption. Consumption has risen in the rich countries of North America and Europe, but also in countries like China and Brazil. In the least developed countries, especially in Sub-Saharan Africa and South Asia, population numbers have grown considerably, but consumption has not. Rising incomes in these countries will in time lead to increasing consumption. Population growth is strongly influenced by socio-economic development, which leads to higher life expectancy, better education and improvements in the position of women in society. One consequence of this is a drop in the number of children per woman. While development does indeed lead to lower population growth, the rise in consumption has a greater effect, resulting in a net increase in the pressure on the environment. Population growth and increasing consumption lead to rising CO_2 emissions and an increase in land use for development. Smart use of technology has made global production and consumption considerably more efficient, but the effect of this has not been sufficient to compensate for the global increase in energy and land use.

Trends: more people, more consumption and more competition for resources
If current trends continue there will be almost 9 billion people on earth in 2040; this is half as many again as today's world population. From 2050 to 2075 this world population is expected to rise gradually to a little more than 9 billion and decline thereafter. In the *Baseline scenario* income per capita of the global population more than doubles by 2040. As a consequence, consumption increases: people eat more meat, drive and fly more, and use more energy in the home. The living conditions of about a billion people in the developed world are what the remaining 5 billion aspire to, and this can already be seen in rapidly developing countries such as China and India. By 2040 energy consumption and land use per capita will have increased further in practically all countries.

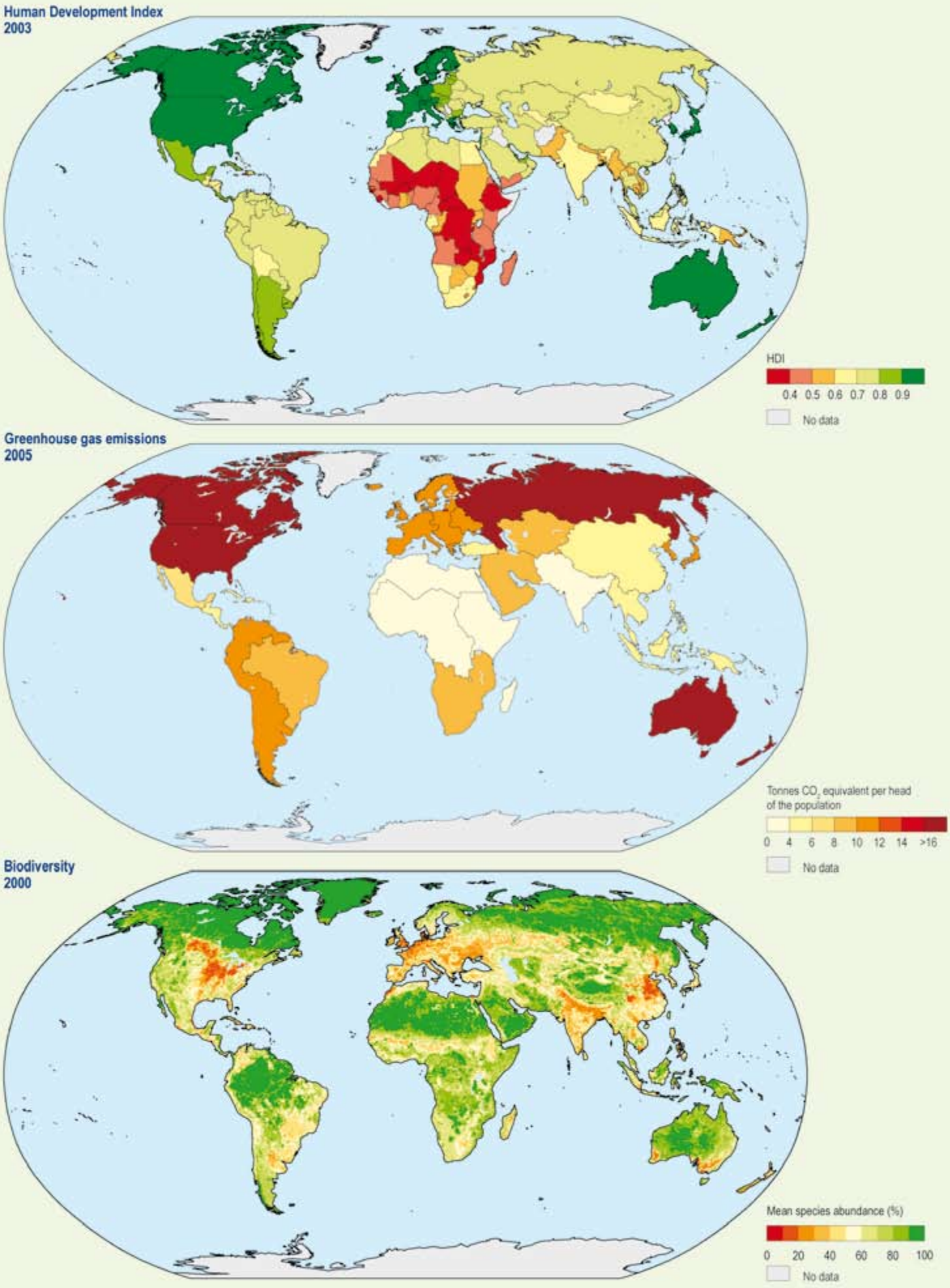


Figure 1 Development has been at the expense of climate and biodiversity.

Continued economic development in countries like China and India will intensify competition for raw materials and push prices up, which could heighten geopolitical tensions. As European gas reserves become exhausted in a few decades time, the continent's dependence on imports will increase from 30% in 2005 to more than 60% in 2050. The Middle East will assume an increasingly dominant role in oil production and Russia in gas production. This growing dependence will make the energy system more vulnerable, and there is a fear that energy suppliers will use their power for economic or political gain. To the extent that the declining security of supply is reflected in higher prices, the effects on the industrialised countries will remain limited. The security of supply problem is therefore less urgent than the climate problem.

Further biodiversity loss and climate change as consequence

The trends sketched above are accompanied by further loss of biodiversity and damage to useful ecosystem functions. Under the *Baseline scenario*, the total area of agricultural land in the world will expand by 10%, with all the additional land use occurring in the tropical and subtropical regions. This increase is envisaged without any additional policy interventions, including policies promoting biofuels. People in developing countries tend to be directly dependent on local ecosystems for their basic needs (food, water & fuel). If, with an eye to climate change and security of supply, biofuels were to be produced on a large scale in the short term, the demand for land, and therefore the pressure on biodiversity, would increase further.

As fossil fuels remain the dominant energy carriers in the *Baseline scenario*, CO_2 emissions rise from 28 Gigatonnes in 2005 to 47 Gigatonnes in 2040. The resulting higher concentration of greenhouse gases in the atmosphere will cause the average global temperature to rise. Developing countries are particularly sensitive to the expected resulting extreme weather conditions (long periods of drought and periods of heavy rainfall) because their economies are based on climate-sensitive sectors such as agriculture. These countries are also less able to take adaptation measures than the industrialised countries. In addition, damage to ecosystems will become more likely and the sea level will rise.

Climate, biodiversity and development objectives unattainable under current policies

The Millennium Development Goals (MDGs) for halving poverty and hunger will, on average, just be achieved by 2015. However, they will not be met in Sub-Saharan Africa and South Asia. Neither will the MDGs for health (child and maternal mortality and infectious diseases) be achieved, at least as a global average, under current policies. There is no concrete global target for climate change, but the EU has set a goal of limiting long-term temperature rise to no more than 2 °C above the pre-industrial level. This will not be achieved without additional policy measures. The intended reduction in the rate of biodiversity loss before 2010 will in any case not be achieved, and the rate of loss will even accelerate without additional policy measures. Further global economic development will inevitably be accompanied by a substantial loss of biodiversity. The mission must be to limit the damage as much as possible. Humankind will not realise the current international objectives all at the same time, simply because planet earth is too small: food production, large-scale biofuel production and conservation of biodiversity are not compatible, certainly not in the short term. To achieve these objectives, or at least to make progress towards them, there will have to be a global turnaround in thinking and acting by both citizens and the business community alike, and a similar shift in policy.

CO_2 emissions and land use for Dutch consumption rising

The Netherlands is a small country and, in absolute terms, contributes only on a small scale to the global climate and biodiversity problem. But the relatively high incomes and accompanying levels of consumption in the Netherlands leads to CO_2 emissions per head of the population that are far above the global average. The area of land used for Dutch consumption per capita of the population is the same as the global average because most of this area is highly productive land in both the Netherlands and abroad. Without additional efforts, the CO_2 emissions and land use associated with Dutch consumption will increase further in the future. The greenhouse gas emissions arising from Dutch consumption per head of the population in 2040 will be five times higher than required to achieve the 2 °C target. If all people in the world were to use as much land through consumption as the average Dutch citizen, all the original 'green nature' would have disappeared by 2040. Dutch policies still pay

little attention to the effects of consumption in the Netherlands on the pressures on the environment elsewhere in the world.

Citizens and companies look to government to enforce changes in behaviour
The average citizen considers it important that global sustainability issues are tackled, but as a consumer often does not act accordingly. The environmental pressure of consumption depends mainly on income and has no relationship with environmental awareness, values or preferred world view. People expect the government to take measures to resolve this social dilemma and bring about a change in behaviour. They can be stimulated to adapt their behaviour either indirectly, via financial incentives, or directly, by laying down normative standards.

Companies also look to government, primarily to secure a level playing field. Government can promote sustainable business practice by creating the right conditions, such as introducing supply chain liability and making sustainability reports compulsory. In addition, government can itself set a good example through its procurement policies and by rewarding vanguard companies, for example, by giving them a tax advantage. Requirements can be placed on production processes via the supply chain in public–private agreements with businesses and non-governmental organisations (NGOs). Given the relatively strong position of the Netherlands in global business networks, this can have a considerable impact. Besides this, various Dutch multinationals are already responding to the issues of development, working conditions, energy and biodiversity.

Sustainable development not yet key principle in guiding policies
Sustainable development is an important policy principle at the national, European and global levels, although at no level has a sustainability strategy been adopted that actually determines the direction of policy. The current best-case situation is one in which sustainability policy is shaped by a consideration of the impacts in other policy areas. In practice, however, this is seldom found, not even at European or national level. For example, the impact assessments carried out in the EU have to date been hardly concerned with impacts outside Europe. Given the interconnections between the main problems discussed in this outlook, sustainability policy should focus on the socio-economic development of developing countries, while at the same time limit climate change and biodiversity loss.

OPTIONS AND PROSPECTS FOR ACTION

Global sustainability problems require firm international agreements
The current trends can be changed by pursuing targeted policies. An important component of these policies is a robust international policy. However, to date there has not been a broad and powerful enough coalition of countries to achieve the objectives for climate, biodiversity and development. Neither have there been effective sanctions for enforcing agreements between countries. This makes it increasingly unlikely that poverty will be halved everywhere before 2015, that biodiversity loss will be significantly reduced by 2010 and that the temperature rise will be kept under 2 degrees.

Lowering the ambitions for biodiversity and climate, for example, by accepting further loss of biodiversity and a higher average temperature, can create opportunities for broad coalitions to effectively tackle these problems. The global community will then have to accept that in future additional adaptations will be necessary to cope with the consequences of biodiversity loss and climate change, with the additional costs of adaptation.

Firm international agreements imply compensation for developing countries
Currently, there appears to be a lack of international political will to make firm international agreements on the sustainability issues raised here and to provide the current institutions with binding and concrete policies. Possibilities for remedying this situation can be sought in various forms of compensation for countries who lose in a deal or are already lagging behind in their development, and in better coordination of policies for climate, biodiversity and development. Options for doing this are the transfer of agricultural and energy technologies, and linking targeted funding to the protection of specific wildlife habitats and protected areas, particularly in tropical regions.

EU as powerful middle tier and the Netherlands can take the international lead

Global solutions are by far the most preferable options for global problems, but are difficult to realise in practice. *By negotiating at the global level the EU can harmonise issues to promote integrated solutions.* In doing so, the EU can aim for global agreement but can also work to form coalitions of smaller groups of countries. The EU would seem to be the most appropriate scale for the Netherlands, in terms of effectiveness and enforceability, for giving concrete shape to sustainable development.

The EU already takes exclusive responsibility for European trade policies crucial for international cooperation. Climate policy is also a European task, although not an exclusive one. As yet, the EU has much less control in the fields of development cooperation, energy policy and 'external policy', making it difficult to take an integrated approach to development, climate and biodiversity on the EU scale as a whole.

Via the EU, the Netherlands could promote the creation of an international coalition of the major countries, which could then make concrete and enforceable agreements for tackling climate change and biodiversity loss. Of course, adjustment of EU decision-making procedures would probably be required if progress is to be made, even with 27 member states. *Here is where the Netherlands could take a leading role – both within the EU and internationally – in forming coalitions by facilitating dialogue between the major global players.*

The search for robust solutions

This Second Sustainability Outlook (The Netherlands in a Sustainable World) contains various policy options that can contribute to sustainable development. They will probably all be needed if we are to achieve the desired goals. The preferred objectives, options and policy instruments depend on the preferred underlying world view and political philosophy. Political movements have different preferences when it comes to the role of government and the market. These preferences also influence the question of whether international coordination or national independence and responsibility should be the dominant modus operandi. Moreover, opinions are divided on the question of how government can best direct change: primarily via pricing policy or by regulation? This question is clarified in the use of the world views developed for the first sustainability outlook. Measures that are consistent with a world view, but entail risks when viewed from a different perspective, can be made more robust by pursuing flanking policies and compensatory measures to counter the identified risks. More robust solutions may be obtained by taking different normative views into account.

A broad, structural commitment to developing countries

Achieving the MDGs requires a structural approach to infrastructure development in the broadest sense of the word: investments in infrastructure, energy and telecommunications as well as drinking water, sanitation, education and health. Besides good governance, money is also a key ingredient for achieving this. As well as drawing on sources from the developing countries themselves and private funds via trade and investment by the business community, this funding will come from Official Development Assistance (ODA) and debt relief. To achieve the MDGs, an annual sum amounting to about 0.5% of the GDP of the donor countries has been calculated as being required up to 2015.

In addition to more money, transfer of expertise is needed in the fields of infrastructure, health care, education, agricultural productivity and low-energy technologies or alternatives to fossil fuels. More coordinated allocation of ODA among donors and from donors to recipient countries would improve the current fragmented global effort. However, it would also involve combining funding streams, which would make results less visible for individual donors. In turn, this would make it difficult to pursue an evidence-based development policy, which is what the Netherlands is attempting to do. Public support for development assistance depends heavily on the visibility of the results.

Development policy out of solidarity and self-interest

The Netherlands can make a case for countries to raise their national ODA budgets not only out of solidarity, but also out of enlightened self-interest. This approach could, for example, prevent a flood

of refugees from Africa by improving the prospects for the population. ODA budgets can also be used to improve investment conditions for the business communities in donor countries. Good governance in the recipient countries becomes more important in cases where ODA funds provide mutual benefits. In countries without good governance the poorest people remain dependent on hand-outs from NGOs or charitable organisations.

The Dutch government sees the MDGs as an important part of a wider sustainable development agenda. This agenda goes further than traditional development cooperation. One reason is that it envisages an extra commitment to sustainable growth and a fair distribution of resources, and another is that sustainable development is taken as the guiding principle, with special attention to sustainable energy. *This should be given concrete shape and substance in Dutch policy. In addition, the Netherlands can argue for further coordination of ODA and further integration with international climate and nature conservation policies.*

Towards an effective plan for the sustainable development of Africa
Economic development combined with the most efficient possible use of energy and a minimum loss of biodiversity and natural habitat could constitute the cornerstone of a Marshall Plan for Africa. This would also take its potential as producer of biofuels into account.

Abolish agricultural subsidies and phase in trade liberalisation for developing countries
Further market liberalisation combined with targeted development assistance and investments can work out in favour of the population of developing countries. However, because producers in developing countries need time to learn and respond to international competition, and markets need time to develop, markets in developing countries should be opened up in stages. At the same time, fair competition on world markets requires the removal of the agricultural subsidies in the rich countries. These agricultural subsidies harm developing countries most because agricultural exports are the only way most of them can access world markets.

Agricultural trade liberalisation demands flanking policies here and elsewhere
The Netherlands could press for a reduction in agricultural support within the EU. Agricultural subsidies take up the lion's share of the EU budget, while trade barriers keep consumer prices high. In negotiations with the relevant major agricultural countries the abolition of agricultural support could be combined with agreements on tackling climate change and biodiversity loss, including the use of biofuels. Resistance by European farmers to scaling down agricultural subsidies can largely be dispelled by providing financial compensation for taking on landscape and habitat management tasks. Risks affecting the security of food supply can be dealt with by making agreements in advance on the action to be taken in case any hitches occur in the introduction of this regime. Conflicts can be dealt with via the WTO or the UN Security Council.

Climate policy needs a strong coalition and efficient mechanisms
A key requirement for pursuing a serious climate policy is cooperation between Europe and major countries such as the United States, China and India. Almost all the major countries of the world will have to participate this decade if we are to meet the European climate policy target of no more than 2 degrees average warming. Cooperation is needed because of the large amount of the required emission reductions, but also because the cheaper options tend to lie outside Europe. The costs of limiting average global warming to 2 degrees amount to a few per cent of global GDP in 2040, assuming, however, that all the major countries participate and that flexible mechanisms, such as emissions trading, are employed.

The allocation of emission rights is crucial for the success of such a system. Calls are being increasingly heard from the emerging industrial countries and developing countries for an equal allocation of carbon credits per capita throughout the world. *Given the importance of these countries as part of a future climate regime, the Netherlands could make a case for accommodating them when allocating emission rights.*

If the allocation of carbon credits is based on equal rights per capita, the financial burden of climate policy will fall largely on the industrialised countries because they will have to cut back most on their emissions. Current emissions by the poorest developing countries are not that different from what their allocation would be if emission rights per person were distributed equally across the world. These countries could even profit from climate policy by making use of cheaper reduction options and selling emission rights to the industrialised countries.

There are other ways to convince countries to participate besides via an acceptable allocation of emission rights. These include sharing the costs of transferring energy technologies and linking climate policy to other policy areas, such as development cooperation and trade liberalisation. However, even if other major countries join with Europe in pursuing climate policy, we must accept that not all the original goals (such as the EU's 2 degree target) may be achieved.

Extending and supplementing the European emissions trading system
In the absence of a global climate coalition, Europe has chosen to take unilateral action via the European Emission Trading System (ETS). This system is a good example of a market-driven climate policy. However, as long as the ETS remains limited to Europe, and a number of sectors within Europe (including transport) do not take part, the ETS alone will not be enough to achieve the climate target. The current price for a tonne of CO_2 is too low because the emission ceiling for Europe is not restrictive enough, and it is still not certain what will happen after 2012 when the current Kyoto agreements expire.

Because the ETS has not yet been fully taken up, extra instruments such as subsidies, taxes and additional EU legislation could be useful. Appropriate additional measures could be taken in the transport sector, for example, or aimed at domestic consumers. If, in addition to an emission ceiling, the government set additional standards for renewable energy and energy saving, the costs of climate policy would rise sharply. These costs can be justified if other goals than the climate target are involved, or if there is no confidence in the ability of the ETS to achieve the desired energy transition. Clearly, this would require more concrete targets for those other elements of sustainable energy provision, such as security of supply.

Climate policy options good for security of supply, but not vice versa
With current technologies it is possible to reduce greenhouse gas emissions sufficiently over the next 50 years to achieve the climate target. A sustainable energy economy requires a broad pallet of clean energy options. Energy saving, renewable energy, nuclear energy (with acceptable solutions for accident and proliferation risks and storage of radioactive waste), and coal with carbon capture and storage (CCS), are robust options for climate policy that also improve security of supply. Options geared to reducing dependence on imports, however, do not always have a positive effect on greenhouse gas emissions.

Conditions for the use of coal
The future role of coal is crucial. If, in the interests of security of supply, society wants to continue to use coal as a source of energy, climate policy will require CCS as a minimum. Although the market will choose clean technology in an effective emissions trading system, the ETS so far provides no credible long-term incentive. The ramifications of decisions on the energy infrastructure last for decades: a coal-fired power station, for example, has a working life of at least 40 years. In the liberalised European energy market, however, it is not certain that CCS will be consistently applied. *The Netherlands can promote the use of CCS.* While taxes (on carbon) or subsidies (for technological development) can be used to stimulate CCS, an amendment to the Electricity Act will be needed to make the use of CCS compulsory.

Additional measures for an alternative energy supply
In the future we will need alternative forms of energy in addition to energy saving. At the end of this century fossil fuels, with the exception of coal, will have run their course. Existing options will then no longer meet our requirements and new technologies will have to play a major role in energy

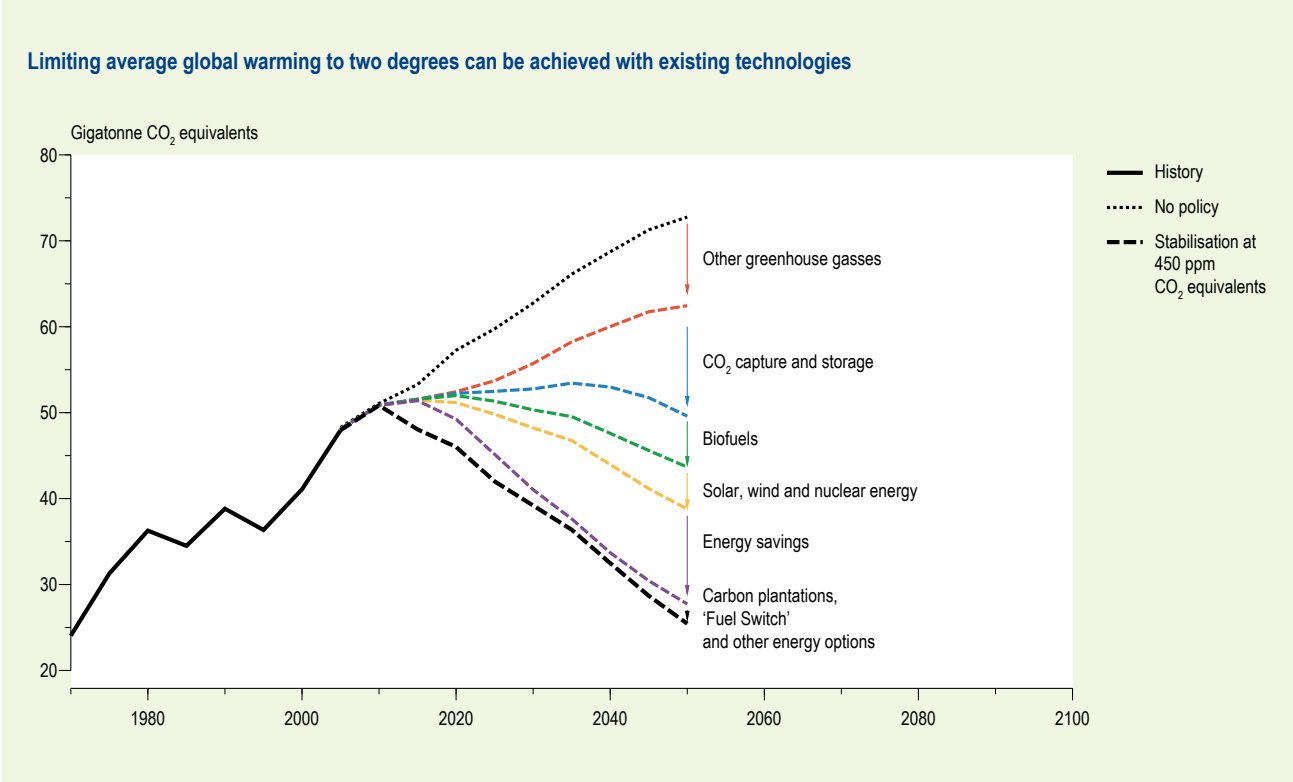


Figure 2 Limiting average global warming to two degrees can be achieved with existing technologies.

supply. Alternatives to the present energy system are both conceivable and available: e.g. solar, nuclear, coal with CCS, and wind and water. For example, under the current state-of-the-art solar power station technology, 0.3% of the area of the Sahara (about the size of the Netherlands) would be enough to meet the total EU demand for electricity. However, these options will require considerable investment and institutional change, while other options, such as nuclear fusion, remain highly uncertain. The vast sums of money involved and the high degree of uncertainty surrounding such options justify a coordinating role for government. These technologies can be brought a step closer and their costs reduced by setting standards for renewable energy and investing in research. The targets in the Dutch government's coalition agreement for energy-saving and the deployment of renewable energy sources can, in the long run, provide an impetus to the desired energy transition. However, in the period up to 2020, these goals look inconsistent with the aim of achieving the climate target in the most cost-effective way.

Considerable public support for climate policy in the Netherlands and the EU

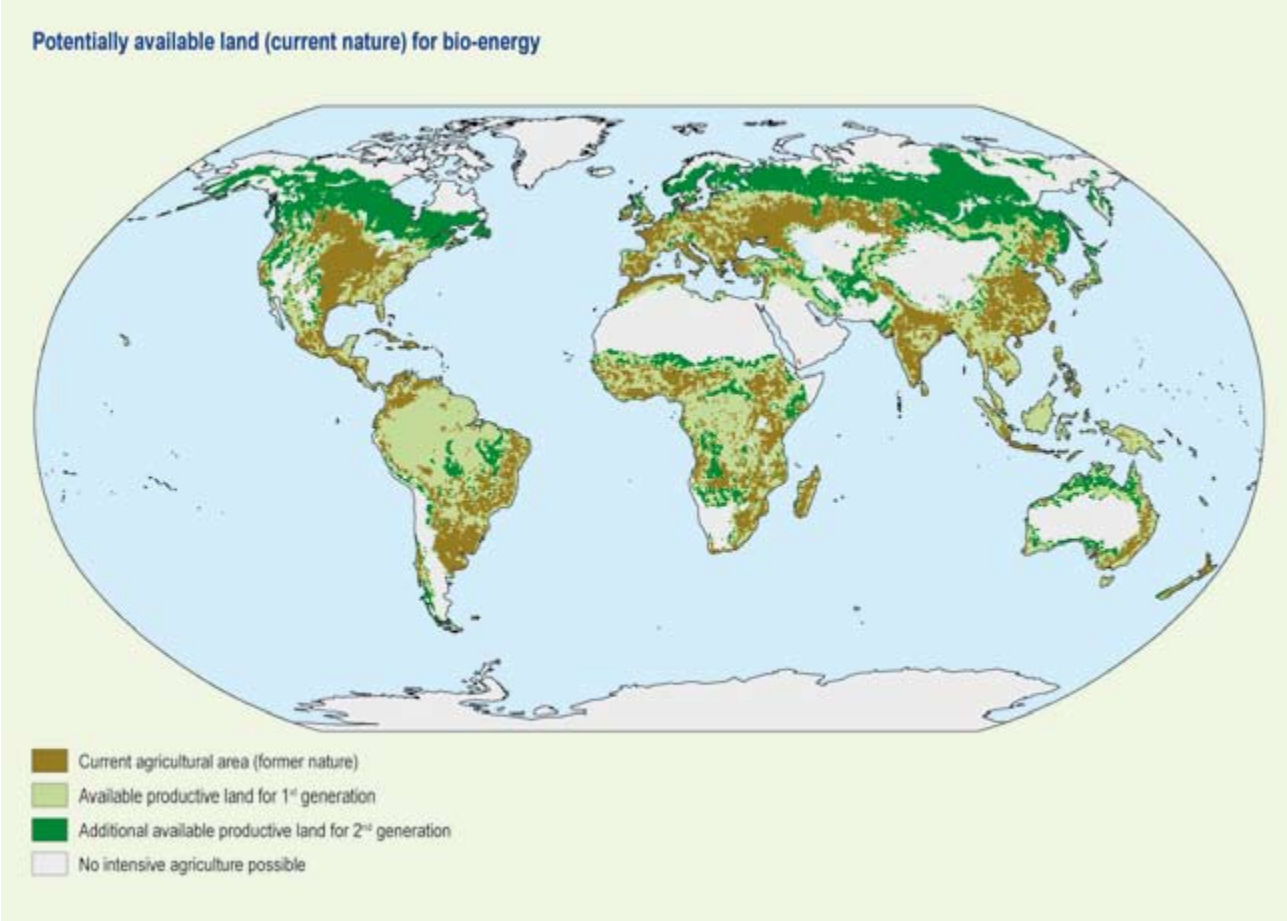
There is considerable support for tackling climate change: doing nothing is simply not an option for the average citizen, even if other countries do nothing. The majority of the population in the Netherlands and other European countries support a policy to reduce CO_2 emissions by about 10%. They are also prepared to pay for this in the form of price increases. Citizens have a preference for measures outside their own private sphere, particularly for measures taken by the electricity generation industry and for energy saving measures by producers.

There is also support for energy saving by consumers, especially measures which pay for themselves. More than half the Dutch population think that a 10% increase in the price of new fuel-efficient cars is acceptable. This can be realised by setting CO_2 emission standards for vehicles. There is also wide public support for European standards and regulations for electrical appliances. Such European measures would have a worldwide effect via producers and products.

Revise expectations of the contribution biofuels can make to achieving the targets

Large-scale introduction of biofuels in the transport sector will be needed in order to achieve the EU target of 20% renewable energy by 2020 in a cost-effective way. This will require at least 15 million hectares of agricultural land within the EU (about 8% of the current crop area). This land will only become available if the European agricultural policy is revised and further liberalisation takes place. Up to 2020 only the first generation biofuels, which have a relatively low CO_2 efficiency, are likely to be available on a large scale. In a fully liberalised market many crops will be cultivated outside Europe, for example, in Brazil or Africa, because production in the tropics is cheaper, is more energy efficient and requires less land. The first generation of biofuels can be produced cheaply in Brazil; in the EU, production is only possible with permanent subsidies. It is highly likely that the European target of 20% renewable energy can only be achieved with large-scale imports of biofuels. It therefore seems inevitable that in the short term first generation biofuels will have negative consequences for biodiversity, especially in tropical regions, and will drive up food prices. A second generation of biofuels will have to meet a number of strict criteria: they should not be cultivated on highly productive agricultural land or in wildlife habitats and protected areas, and their cultivation should not involve additional irrigation water. It is questionable whether this is technically possible and economically feasible. In any case, the expected contribution by biofuels to the targets for 2020 will have to be toned down. A better alternative for the transport sector would be to develop more efficient engines. The transition from first to second generation biofuels will be crucial in the longer term.

Figure 3 Tropical nature under pressure due to agricultural expansion.



Biodiversity conservation requires higher agricultural productivity, changes in diet and more nature reserves

An important option for combating biodiversity loss is to increase agricultural productivity. If agriculture does not become more productive, in 2040 all the available highly productive land will be under cultivation, including the current tropical (and rain) forest areas, as well as tropical grassland. Heavy investment in technological development is expected to lead to a substantial increase in agricultural productivity, but not enough to compensate for the rising demand for agricultural products. Increasing demand for agricultural products will inevitably lead to loss of biodiversity in Brazil and Africa, even if all currently available techniques are employed to the full. Technology alone will not be enough to achieve the biodiversity target.

Besides technology, efforts can be made to change people's diet. The worldwide growth in meat consumption is an important driver behind the increased demand for land. This growth can be curbed by reducing the amount of beef in the global diet and replacing it with a greater consumption of chicken and cereals. However, price incentives to bring about such a change in Western countries appear to have little effect in practice, and even if beef were twice as expensive, the land taken up for Dutch consumption would only be reduced by 4%. There is little support among citizens in the Netherlands and other countries for changing their diet (eating less meat) to scale down the continuing global loss of biodiversity and natural habitat. There is more support for investments in technology than for changes in behaviour, even if these technologies are controversial, such as genetic modification.

In view of this, creating more nature reserves seems to be a necessary option. Provided they are well managed and funded, nature reserves are an effective instrument for protecting specific ecosystems, especially in tropical regions.

Biodiversity conservation also requires transfer of expertise and funds, along with greater public support

In addition to the transfer of knowledge and technology for increasing local agricultural productivity, the protection of specific nature conservation areas has to be financed. Nature protection outside the EU stands or falls on the possibilities for compensating those who depend on protection of nature areas for their livelihood. One condition is that ownership rights in countries with large nature areas are clearly defined and legally protected. *The Dutch government, companies and NGOS can weigh up the possibilities of bearing the costs of managing valuable nature areas in anticipation of a global biodiversity conservation plan.*

The Netherlands can also call for increasing knowledge and understanding of biodiversity, particularly the exploitation of biodiversity as a source of prosperity, development and future applications (such as new medicines). The job of pulling together the necessary knowledge and making it accessible to the public and politicians might be given to a network organisation like the Intergovernmental Panel on Climate Change (IPCC). Such an agency will also be necessary to broaden support for biodiversity policy. At the moment most citizens see no direct relationship between their consumption of meat and dairy products, and its impact in terms of land use and biodiversity loss.

Change consumer behaviour, preferably by making production chains more sustainable

At the moment changes in consumer behaviour are not occurring on a large enough scale to have a substantial impact on climate change, biodiversity loss, fair pricing and acceptable working conditions. Opinions are divided on the desirability and possibilities for behavioural change. Provision of information, labelling and raising awareness of the ecological footprint is fine, but there is a fear that government will be seen to be patronising. Direct standard-setting for consumer behaviour by citizens, for example, in the form of quotas for vehicle kilometres or amount of meat consumed, is not feasible in the short term. Meat or fuel pricing at realistic levels has little effect on consumer behaviour in rich countries like the Netherlands because these items account for just a small proportion of total income, but it can serve as a source of funding for nature conservation. People's behaviour can

also be influenced indirectly. Subsidies and taxes make sustainable behaviour more attractive and can therefore help consumers to make their behaviour more sustainable.

Citizens generally prefer the government to ensure that products are manufactured in the most sustainable way possible and that it pursues policies for making production chains more sustainable without consumers having to change their consumer behaviour. They prefer to see technical measures made obligatory. Companies indicate that they can and are willing to produce more sustainably if government ensures a level international playing field. In addition, government can require companies or sectors to report on environmental pressures and working conditions throughout the whole production chain, including activities in countries which have less stringent environmental regulations. A promising option that is already being applied in a number of production and supply chains is to make international agreements between the business sector, NGOS and governments, starting with the most damaging product groups. Care should be taken to prevent verification costs falling on developing countries to avoid impeding their access to the market.

Sustainability appraisal of policy plans with a view to ensuring policy coherence
In its coalition agreement the Dutch government emphasises the importance of policy coherence. Through active international engagement the Netherlands wants to contribute to a competitive domestic economy and to development elsewhere in the world, as well as to a more sustainable living environment both in the Netherlands and abroad. Sustainability policy implies that decisions taken here and now do not unnecessarily contribute to increasing problems elsewhere and later. It is all about striking a balance between economic interests here and now, improving global income distribution in the medium term and reducing ecological risks on a global scale for the remainder of this century. *The Netherlands and other countries could therefore introduce a simple sustainability appraisal for policy plans designed to identify – in a consistent manner – the impacts of policy proposals on climate change, biodiversity, poverty throughout the world, and the loss of income and employment at home.* The aim here is to prevent unnecessary loss and provide an evidence base for proposing flanking measures to compensate for the negative impacts. This would allow policy options to be weighed up and appraised in a consistent manner within a broad and integrated context.

Core table and maps of the world

The core table and maps of the world below shows relevant trends for various countries during the last 35 years and how these trends will develop over the next 35 years (up to 2040) according to the OECD's *Baseline scenario*. The figures for 2040 are given to bring the policy challenge into focus.

Baseline scenarios are based on the assumptions of no major policy shifts in future and no additional policies, such as the recently agreed EU climate policy, which is not included.

Trends in population, GDP, greenhouse gases and remaining biodiversity in 1970, 2005 and 2040 (2040 according to the OECD *Baseline scenario*).

1970

	Population		GDP		Greenhouse gases		Remaining biodiversity
	Residents (x billion)	%	Dollars (x billion)	%	CO_2-equiv. (Gigatonne)	%	%
EU	0.35	9	4,250	28	4.4	18	50
US	0.21	6	3,500	23	5.5	23	66
China	0.87	23	500	3	1.6	7	75
India	0.57	15	580	4	1.2	5	61
Brazil	0.10	3	340	2	0.5	2	80
World	3.79	100	15,020	100	24.0	100	78

2005

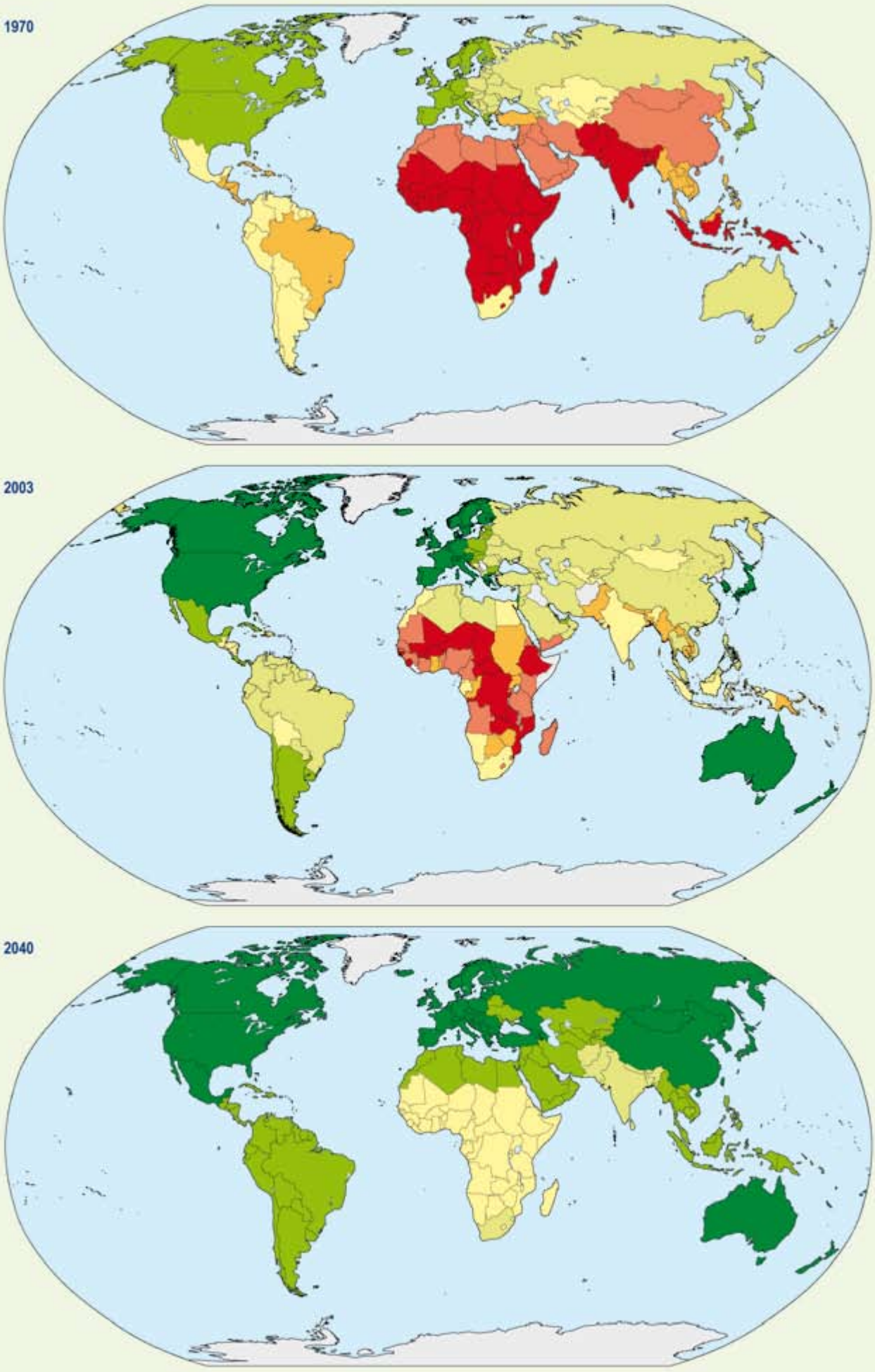
	Population		GDP		Greenhouse gases		Remaining biodiversity
	Residents (x billion)	%	Dollars (x billion)	%	CO_2-equiv. (Gigatonne)	%	%
EU	0.40	6	9,590	20	4.4	9	46
US	0.29	4	10,040	20	7.9	16	62
China	1.33	20	7,140	15	7.8	16	63
India	1.09	17	3,040	6	3.9	8	46
Brazil	0.18	3	1,280	3	1.5	3	74
World	6.49	100	49,130	100	48.6	100	72

2040

	Population		GDP		Greenhouse gases		Remaining biodiversity
	Residents (x billion)	%	Dollars (x billion)	%	CO_2-equiv. (Gigatonne)	%	%
EU	0.40	5	18,460	12	5.2	7	39
US	0.37	4	24,020	16	10.1	15	55
China	1.44	17	34,060	22	13.2	19	57
India	1.52	17	15,740	10	7.1	10	27
Brazil	0.24	3	3,190	2	1.8	3	68
World	8.74	100	151,660	100	69.6	100	64

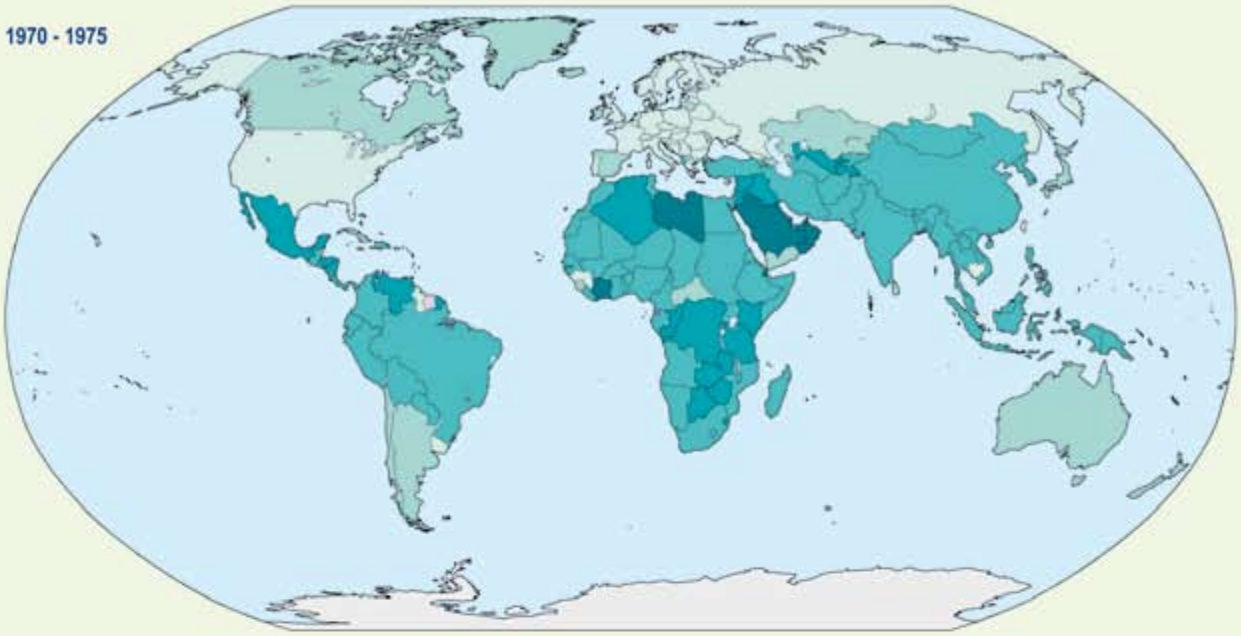
- GDP in billions of dollars and 1995 prices
- Greenhouse gas emissions for all sources, including energy-related emissions and emissions from land use
- Human Development Index (HDI): income, education and life expectancy

Human Development Index

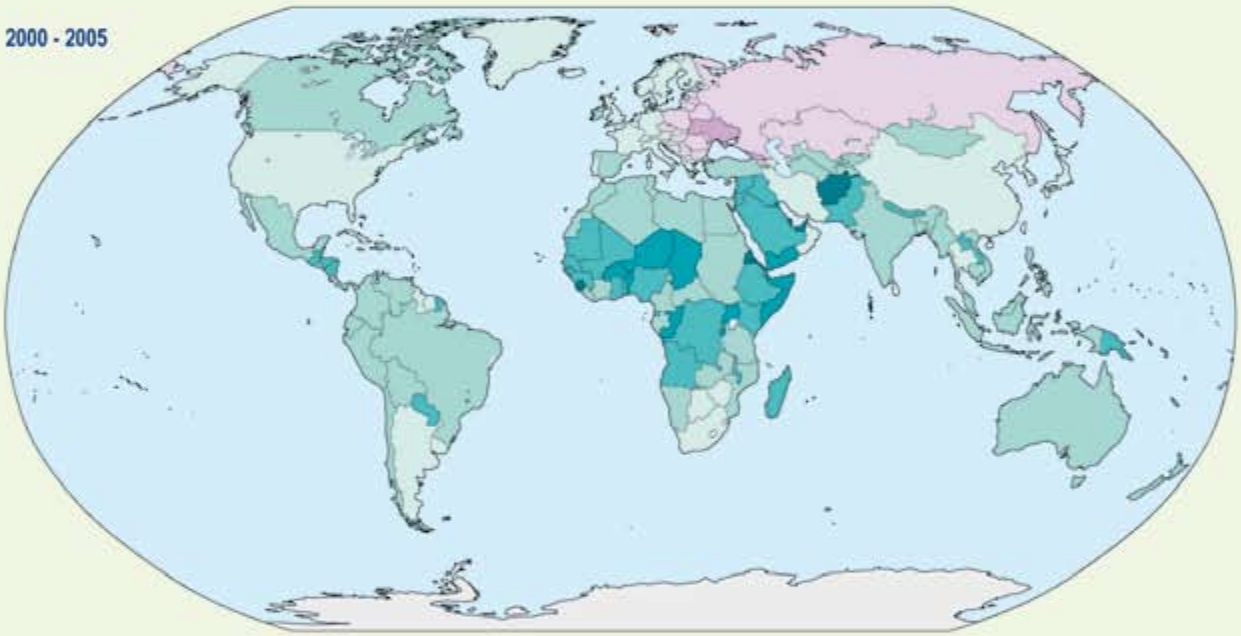


Population growth

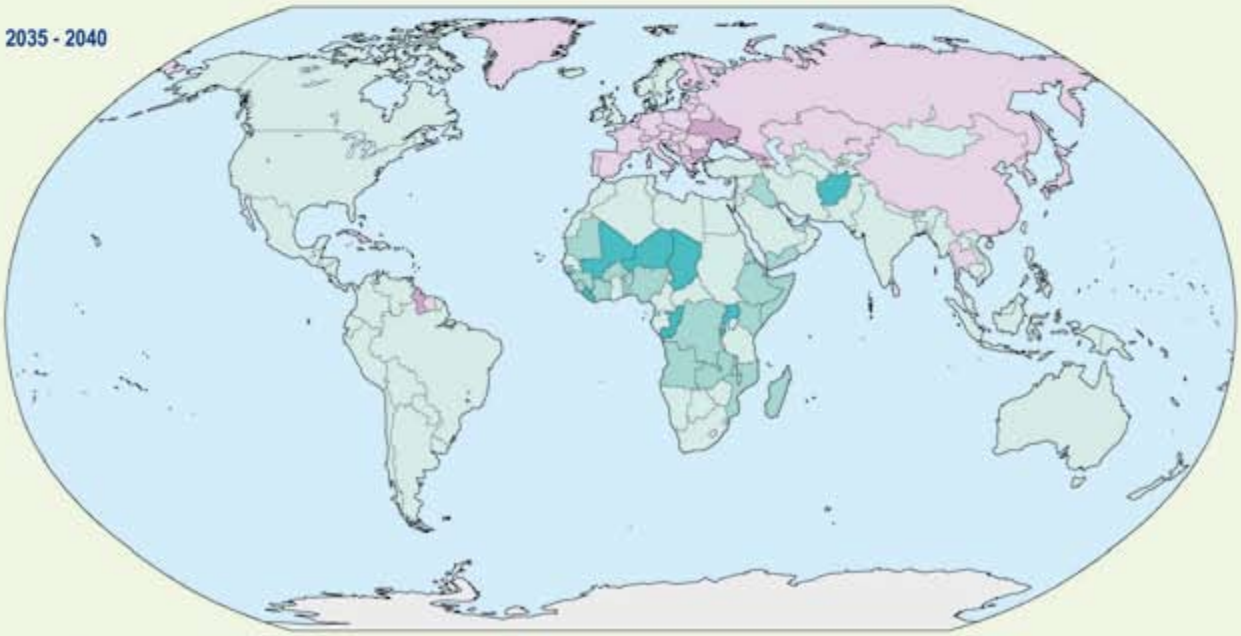
1970 - 1975



2000 - 2005



2035 - 2040



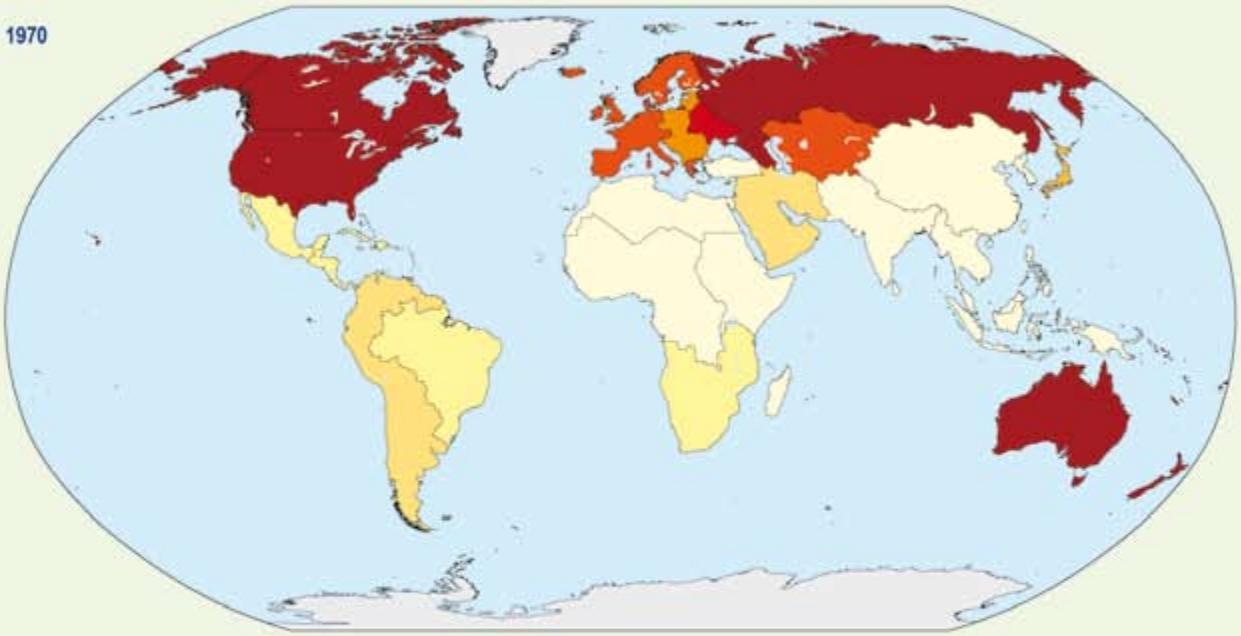
Growth (%)

-2 0 2 4

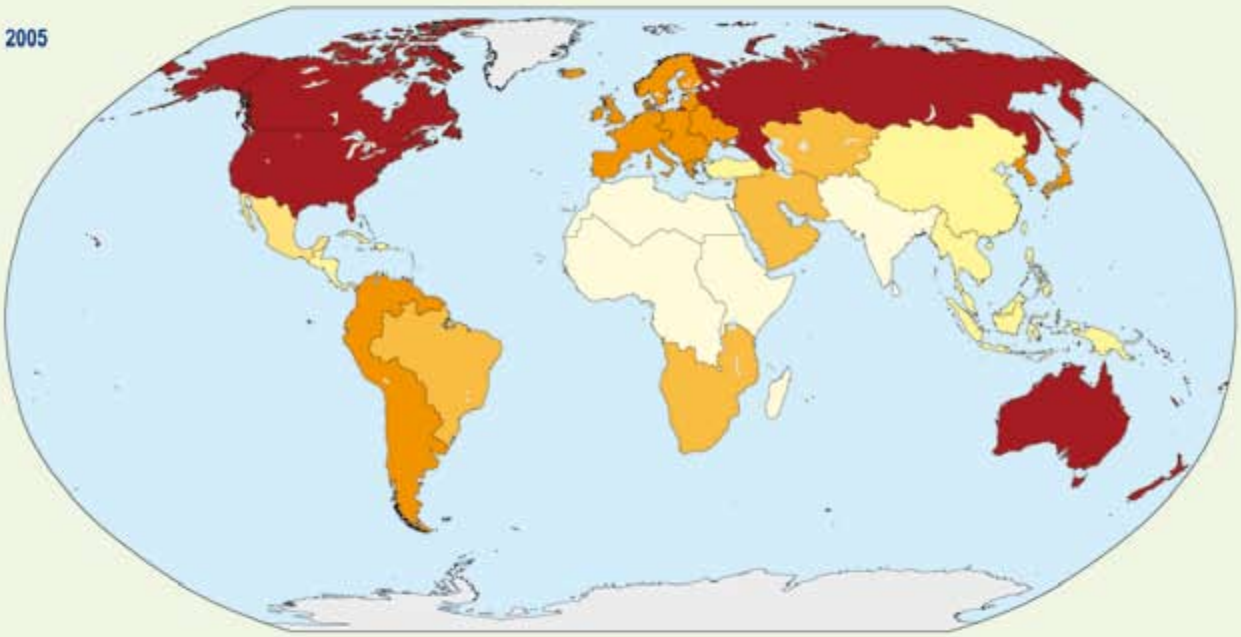
No data

Total greenhouse gas emissions per head of the population

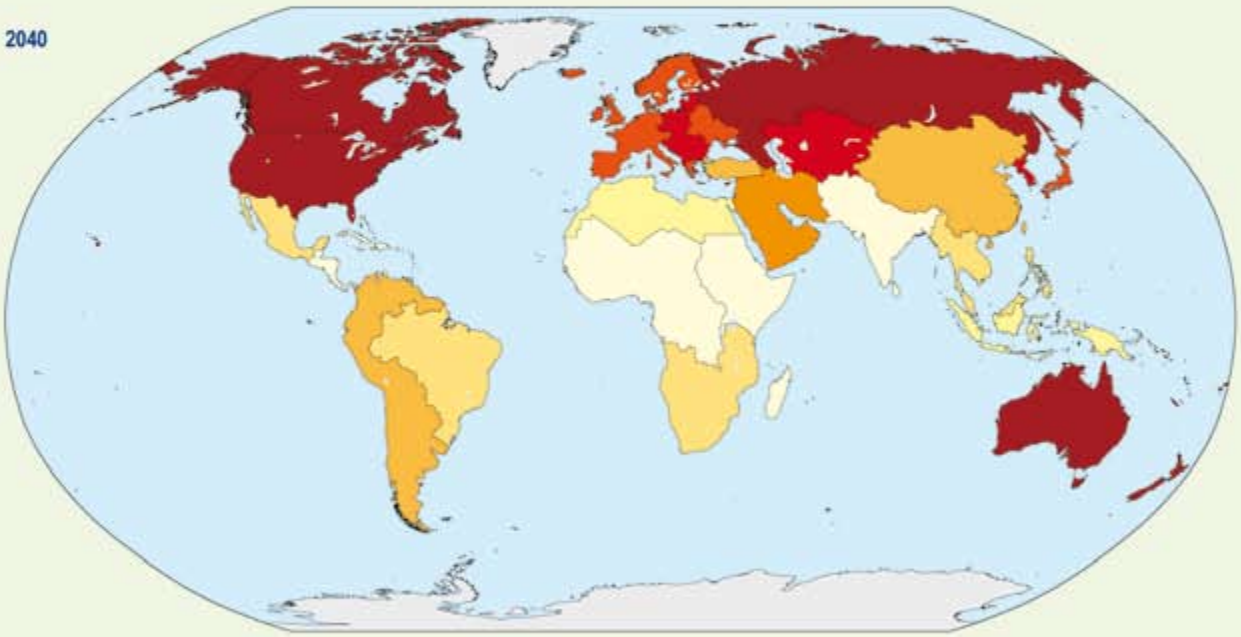
1970



2005



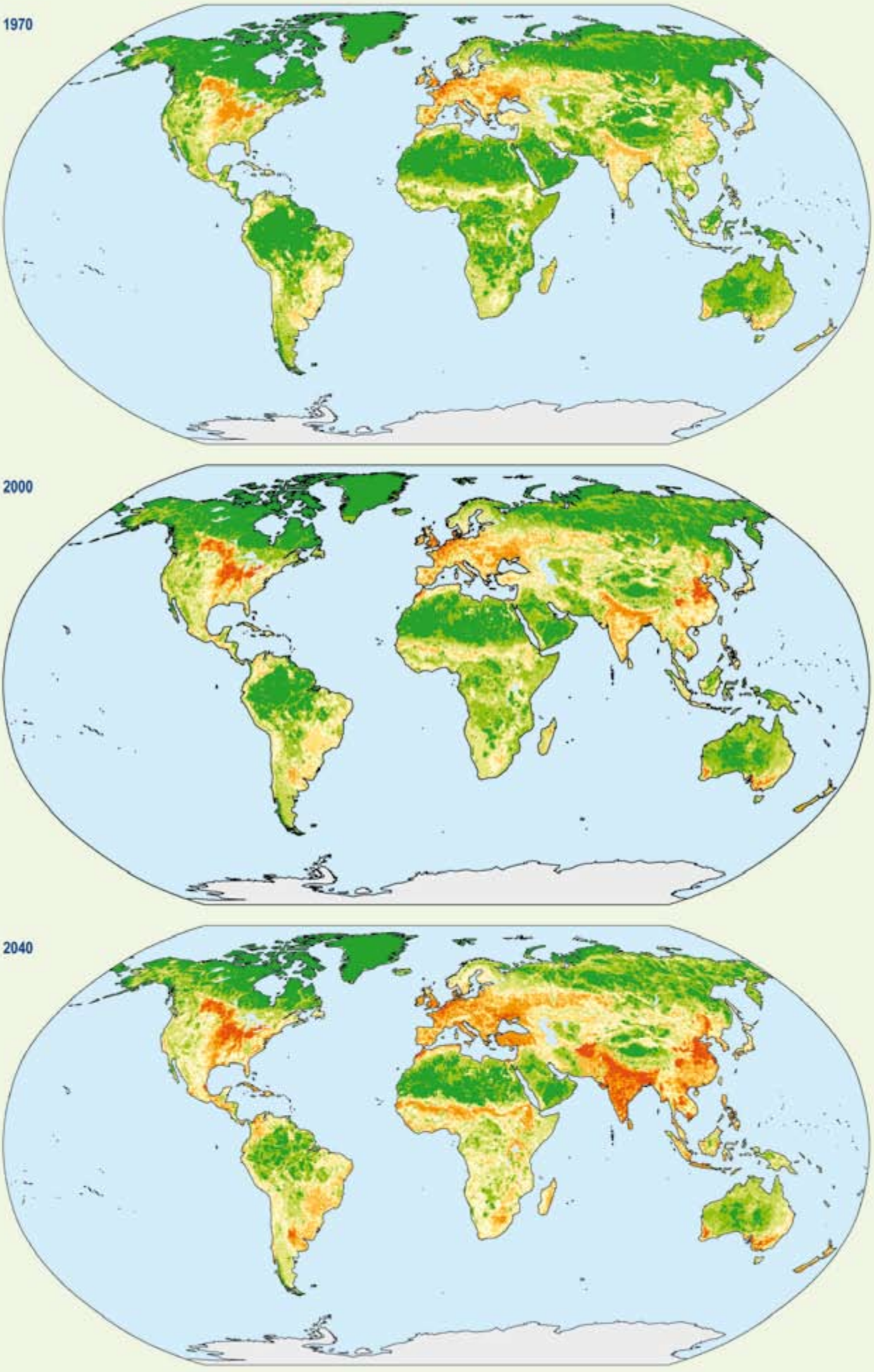
2040



Tonnes CO_2 equivalent per head of the population

0 4 6 8 10 12 14 >16

No data


1970
2000
2040
Mean species abundance (%)
0
20
40
60
80
100
No data

Introduction

Background
In 2004 the Netherlands Environmental Assessment Agency (*Milieu- en Natuurplanbureau*, MNP, until May 2008; the current Dutch name is: *Planbureau voor de Leefomgeving*, PBL) issued the First Sustainability Outlook, *Quality and the Future* (MNP, 2004 (in Dutch); English summary available: MNP, 2005). In its response to this study the Dutch Government called for a follow-up sustainability outlook. This book is the English translation of the Second Sustainability Outlook, *The Netherlands in a Sustainable World*, which was published end 2007 (MNP, 2007; in Dutch). This Second Sustainability Outlook sets out to provide an integrated analysis of several major sustainability issues that reveals how all the different elements hang together. Sustainability problems have many causes, including inadequate understanding of the effects and side-effects of our actions, insufficient will among the public and the business community to change their behaviour, scant efforts by some actors, a short-term focus and compartmentalised policy-making.

Goal of this report
The goal of the Second Sustainability Outlook is to show how policy decisions made now affect each other and to reveal the consequences for the future and for other regions of the world. Armed with a better understanding of the correlation between the various policy challenges, we can provide a more concrete picture of the synergy and trade-offs involved and the prospects for turning policy into action through an analytical approach that supports the political decision-making process. In this way, the Netherlands Environmental Assessment Agency provides the Government with evidence and with pointers for concrete measures that contribute to sustainable development.

What is sustainable development?
In this Sustainability Outlook, 'sustainable development' is defined as the presence and maintainability of a certain quality of life. 'Quality of life' is determined by the opportunities people have to shape their own lives. Sustainable development is about the relationship between 'now and later' (maintainability) and between 'here and elsewhere' (distribution and interdependence). This notion assumes that the quality of life achieved here and now must be maintainable and not gained at the cost of an acceptable quality of life elsewhere and in the future. Insight into the resources required and their availability to countries and individuals can be obtained by examining the human (social), ecological and economic capitals, or people, planet and profit (see also Appendix 1). In this context, 'profit' can be understood to mean 'prosperity'. We can talk of sustainable development, therefore, if the quality of life can be maintained and this quality of life is at least at a certain minimum level throughout all parts of the world.

It is uncertain to which degree a desired minimum quality of life can be maintained, including an acceptable distribution of resources. The issues involved in maintaining quality of life are difficult to tackle; solutions to one problem have consequences for another. What is required is an analysis of the connections between all sustainability issues and an ability to identify possible synergistic solutions that go beyond conventional lines of thinking. Examples of sustainability issues include for instance the problem of the integration of minorities in a society, accessibility problems (e.g. related to traffic congestion) and the issue of biodiversity loss.

Elaboration of themes in terms of policy targets
This study focuses on the relation between development and environment and explores three interrelated sustainability problems, not only in terms of their causes but also with a view to identifying possible solutions:

1. the poverty and development issue;
2. the energy and climate change issue;
3. the land use and biodiversity issue.

The development issue raises the challenge of ensuring an acceptable quality of life for all of the world's people. The availability of energy and land and the consequences for the climate and for biodiversity define the limits set by the ecological system for development in general, and have to be taken into account in any attempt to tackle the issue of human development.

Given the fact that it is not possible to provide a neutral assessment of what is sustainable (because it requires normative, and thus political, choices), the study takes as its starting point the international targets that have been adopted in Dutch and European policies. These are the global Millennium Development Goals (MDGs), the EU climate target of limiting the rise in the global temperature to a maximum of two degrees, and the global target of substantially reducing the rate of biodiversity loss. Achieving these targets will contribute to a more sustainable development of the world.

Choice of the Baseline scenario
When examining many sustainability issues we have to make projections for several decades into the future. This is essential when effects are involved that only become manifest after several decades and the underlying systems

are inert. Insight into how action taken now impacts on the future can be gained by working with scenarios. For this outlook a decision was made to work with a *Baseline scenario* to 2040 developed by the OECD (together with the Netherlands Environmental Assessment Agency); where relevant the text also looks beyond that date. Baseline scenarios are based on the assumption that no major policy shifts will occur in future (see text box 'The Baseline scenario' in Chapter 1). By also assuming that no additional policies (such as the recent EU climate policy proposals) will be adopted, they can be used to clarify which problems will arise if no attempt is made to counter negative developments. The advantage of such an approach is that additional policy measures designed to bring us closer to the goals can be identified and defined in a transparent manner. It is difficult to identify the effects of individual policy measures using 'policy-rich' scenarios because these already incorporate full packages of measures.

Like other scenarios, this *Baseline scenario* does not attempt to predict the future. In reality, certain policies will be pursued to reverse these trends, although the exact nature of those policies remains uncertain. This study, therefore, does not contain any projections of sustainability policy, but reveals the benefits and disadvantages of various possible policy choices. The conclusions drawn in this study about the effects of policy measures are meant to be robust vis-à-vis the uncertainties in the *Baseline scenario*.

Relation to the previous study

The First Sustainability Outlook noted that the differences in underlying objectives within society make sustainability a highly value-laden concept. The possibilities for achieving a maintainable quality of life were therefore explored with reference to world views (visions of the world and how problems can be solved). Sustainability problems often arise from partial approaches, in which development is viewed solely from the perspective of a single world view, objectives are chosen on the basis of a partial viewpoint and the links between goals and means are lost.

In order to relate this study to policy options in the most concrete way possible, an alternative line of reasoning was taken from that adopted in the First Sustainability Outlook. Rather than using policy-rich scenarios, this study is based on the *Baseline scenario* mentioned above. The world views around which the First Sustainability Outlook was based are only used to assess the potential and possibilities for developing policy instruments for the different options. This is done with the goal to use arguments from different world views to help explain or justify the various options.

Structure of the report

Chapter 1 outlines the global sustainability problems, the trends observable in these problems and the part played by the Netherlands. Chapters 2, 3 and 4 examine the poverty and development issue, the energy and climate issue, and the land use and biodiversity issue. The reference framework for these discussions is provided by the objectives of the relevant global, European and Dutch policies. In each case the policy challenges we face in the absence of additional policy measures are illustrated by extrapolating present trends. Various policy options are then identified for reducing the gap between the actual and the desired situation. Possible positive and negative consequences of these options for other objectives are also considered. Chapters 5 and 6 attempt to explain why these promising policy options have not yet been pursued. Chapter 5 explores the role played by citizens and businesses in the Netherlands; Chapter 6 sets out the policy and institutional context of sustainable development at different scales. These two chapters respectively seek to define the potential civil society support for the options and how well they can be accommodated within the administrative system. The Biofuels case study is an example of a sustainability issue that contains not only opportunities but also policy pitfalls. Finally, Chapter 7 explores potential solutions to the sustainability issue in the form of specific prospects for turning policy into action. Four different world views, with corresponding normative views and beliefs associated with them, are then used as tools to formulate robust strategies for implementing the various policy options.

1 Global sustainability and the role of the Netherlands

Human living conditions have improved greatly over the last fifty years. However, not everyone has been able to benefit from this development and more than a billion people still live in extreme poverty. As population growth and rising prosperity push up the demand for energy and land, satisfying these demands erodes biodiversity and has consequences for the climate. Development has by no means become sustainable yet.

If nothing further is done, the internationally agreed targets for human development and for limiting climate change and biodiversity loss will not be achieved. If these targets are to be met, or at least progress is to be made towards them, there will have to be a global turnaround in thinking and in action. The challenge is to meet development needs in a way that gives everyone on the planet an acceptable quality of life, as well as satisfy the additional demand for energy and land. Smart use of technology has made global production and consumption much more efficient already, but it is not enough to compensate for the global increase in energy and land use.

Keeping the climate target of limiting global warming to no more than two degrees above the pre-industrial level will require a substantial cut in greenhouse gas emissions of developed countries. If, in 2040, emissions per head of the global population were equally distributed, Dutch emissions would have to be at least five times lower than they are at present, and emissions by India and China would not be able to rise much above current levels. However, it is unlikely that this can command enough political support in time. To limit the risk of species loss the developed countries will also have to restrict their demand for land. In the tropics in particular, the remaining biodiversity is under grave threat.

This chapter first describes how the development and environment challenges are related and what may be expected if past trends continue into the future (2040). The international policy targets for sustainable development are then looked at in the light of expected trends (Section 1.2). The part the Netherlands plays in sustainable development is examined in Section 1.3, followed by an explanation of how policy options are assessed for sustainability and which indicators have been chosen for this assessment (Section 1.4).

1.1 Global trends

1.1.1 Global development and distribution of quality of life

Quality of life rising globally

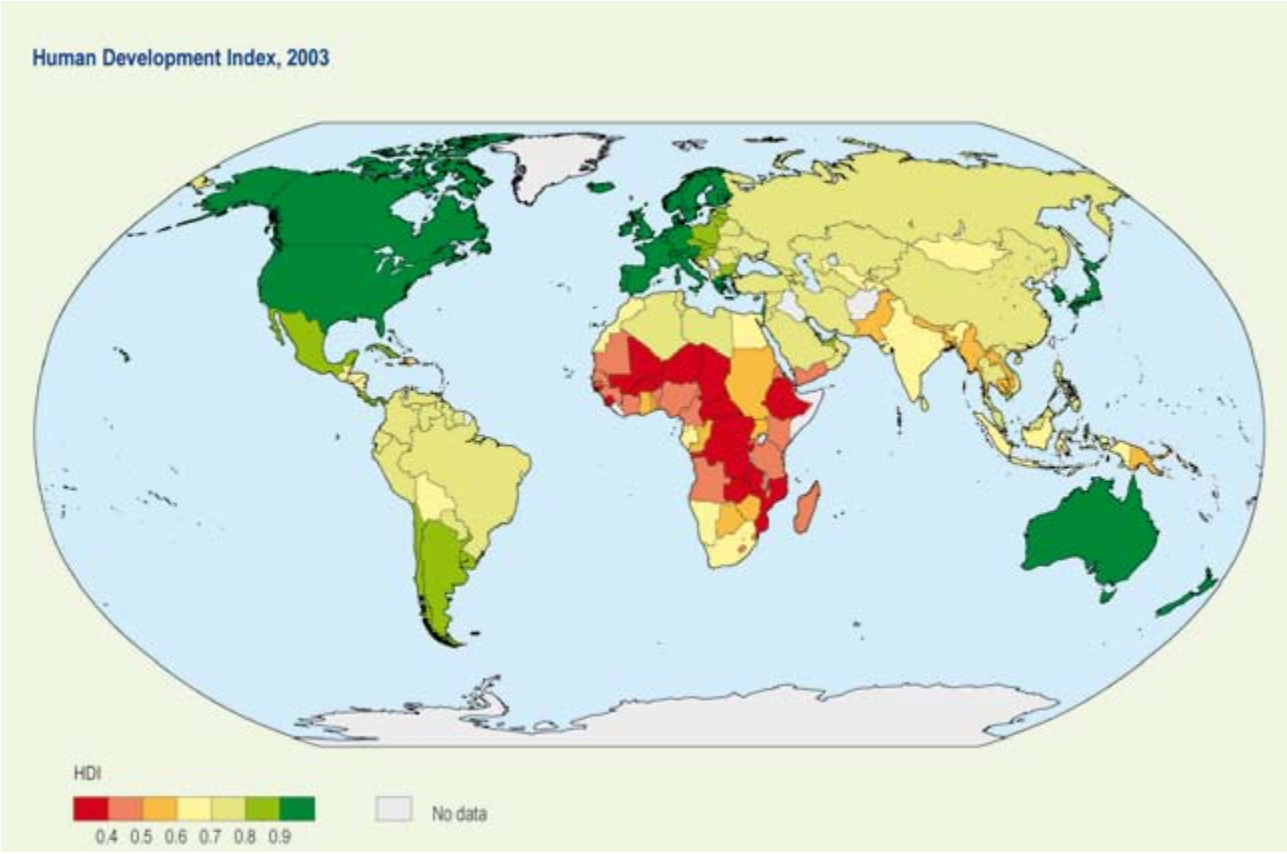
During the last century the quality of people's lives has improved considerably on a number of fronts. Average life expectancy worldwide has risen from 31 years in 1900 to 66 years in 2005, average income has risen from 1250 dollars in 1900 to almost 7000 dollars in 2005, and illiteracy has fallen from 44% in 1950 to 18% in 2005 (Cipolla, 1962; OECD, 2001; UNESCO, 2006).

During the Nineties, the United Nations Development Programme (UNDP) developed the Human Development Index (HDI), which provides an indication of the development status of every country in the world. It is a combined measure of the life expectancy, level of education and Gross Domestic Product (GDP) per inhabitant of a country. The HDI can be considered as an indicative measure of quality of life, although it does not reflect many aspects of quality of life, such as the enjoyment of nature, free time, human rights and political engagement. Neither does the HDI give an indication of the differences within countries. During the course of the last three decades the HDI has risen in all regions, with the exception of Sub-Saharan Africa (see Chapter 2), and the situation is good (HDI > 0.5) in many countries (Figure 1.1). In East Asia in particular, the proportion of the population that has to live on less than 1 dollar per day is falling rapidly. According to the *Baseline scenario* (see text box 'The Baseline scenario'), the HDI will rise in all regions.

Quality of life not distributed equally

Across the globe there are large differences in the quality of life between regions (Figure 1.1). Currently, more than a billion people live on less than a dollar a day, 850 million people do not have enough food and more than a billion people have no access to clean drinking water. Extreme poverty, hunger and inadequate health care and education are still prevalent in Africa and South Asia, making these

Figure 1.1 Human Development Index for individual countries in 2003.



The Baseline scenario

The *Baseline scenario* used in this outlook is based on the 'baseline' in the second *Environmental Outlook to 2030* by the Organisation for Economic Co-operation and Development and developed together with the Netherlands Environmental Assessment Agency (OECD, 2008). The economic growth scenario is based on data from 1980-2001. The most important drivers of economic growth are growth in labour supply, labour productivity and trade. The labour supply is determined by the population size and the labour participation rate. The population size numbers are drawn from the 'medium variant' of the UN projections (9 billion people in 2050), with most of the growth taking place in non-OECD countries. The labour participation rate in OECD countries remains fairly constant at 60% and the *Baseline scenario* assumes that the non-OECD countries will all converge towards the same labour participation rate. Annual growth in labour productivity across the world will gradually converge at a long-term rate of 1.75% (the differences in productivity growth will be halved in 35 years). In the *Baseline scenario* international trade does not become more liberalised and continues to grow, but no faster than the economy. To allow policy effects to be studied separately, the OECD trend extrapolation has deliberately been constructed as a scenario which assumes that no additional policy measures are taken.

In many areas the OECD trend extrapolation remains within the margins of various published policy-deficient scenarios. As can be seen in Figure 1.3, the OECD population growth projection for 2040, lies in the range between approximately 7 and 10 billion people. Uncertainties in population projections over the short term are relatively small because of inertia in the underlying trends. The income projections are more uncertain than the others; this is illustrated in Figure 1.3 by the assumed rate of growth in the IPCC SRES scenarios and the margins of recently published scenarios developed for the Energy Modeling Forum (de la Chesnaye and Weyant, 2006). Compared with this range in projected values, the OECD projection can be seen as a relatively fast economic growth scenario, in which rapid economic growth leads to high demand for agricultural products and energy. The OECD projections show a rise in energy consumption and emissions consistent with other scenarios in the literature, such as the US Department of Energy and the EIA (2006). In the OECD Baseline the assumptions about agricultural efficiency are about average, compared with other scenarios, leading to a relatively high land use (given the high demand for agricultural products). The assumptions about improvements in energy efficiency are relatively high; thus, economic growth leads to medium-high CO_2 emissions (OECD, 2008).

regions particularly vulnerable to the effects of natural disasters. Driven largely by the emergence of the middle classes in China and India, the relative income imbalances between these countries and the Western countries became smaller between 1975 and 2003, and will have fallen further in 2040 (Figure 1.2). Currently, the richest 20% of the world's population still enjoys 85% of the global GDP. Economies like Brazil, India and China are currently expanding at a tremendous rate (since 1975, China has made the most spectacular growth of all the big countries) and will shift the future balance of economic power. By 2040, India and China are expected to account for 10% and 22%, respectively, of the world economy (against 6% and 15% today, corrected for purchasing power parity).

Disparities in income and development opportunities are also found within countries. For example, in 2001 distribution of income in China was more uneven than in all the OECD countries, and the gap between rich and poor is only widening (IDS, 2006). In 1992, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, the world community declared that there can be no *sustainable* development until the quality of life substantially improves for people who live in extreme poverty.

Development curbs population growth

Population growth is strongly influenced by socio-economic development. If the latter improves, life expectancy rises, better schooling becomes available and the position of women improves. As women obtain a better position in society, fertility (the number of children per woman) declines. In virtually all countries this process, called the demographic transition, has been completed or is still taking place. The developing countries are following the developed countries and the emerging economies of China, India, Brazil and Russia along this path, which is the underlying cause of the long-term decline in fertility since 1980 (see Chapter 2). In the *Baseline scenario* the world's population reaches 9 billion people in 2050.

World population in cities is growing

Half the global population already lives in urban areas (UN, 2005). Over the next few decades, much of the world's population growth will be in the cities in developing countries (Figure 1.4), a trend which is pulling food production and consumption further apart and placing increasing reliance on good infrastructure for supplying energy and drinking water to the cities. Generally speaking, incomes in the city are higher; however, half of all the world's poor nowadays live in the cities, too (UN-HABITAT, 2006).

Growth in world prosperity due partly to globalisation

Globalisation is described as the process of worldwide economic, political and cultural interaction and integration. In recent decades globalisation has become most apparent in the trade in goods and services, migration, technology

Figure 1.2 Global distribution of purchasing power in 1975, 2003 and 2040.

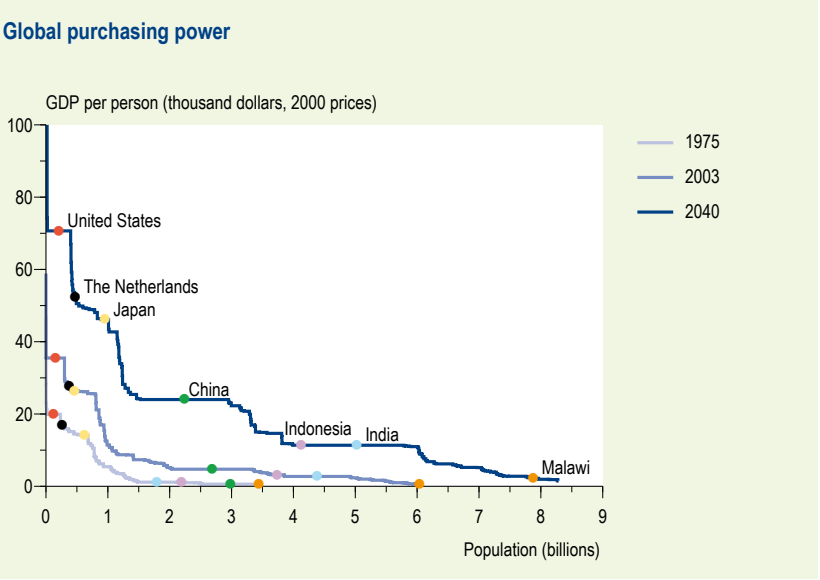


Figure 1.3 OECD trend extrapolations for population, income, land use and greenhouse gas emissions compared with various other scenarios.

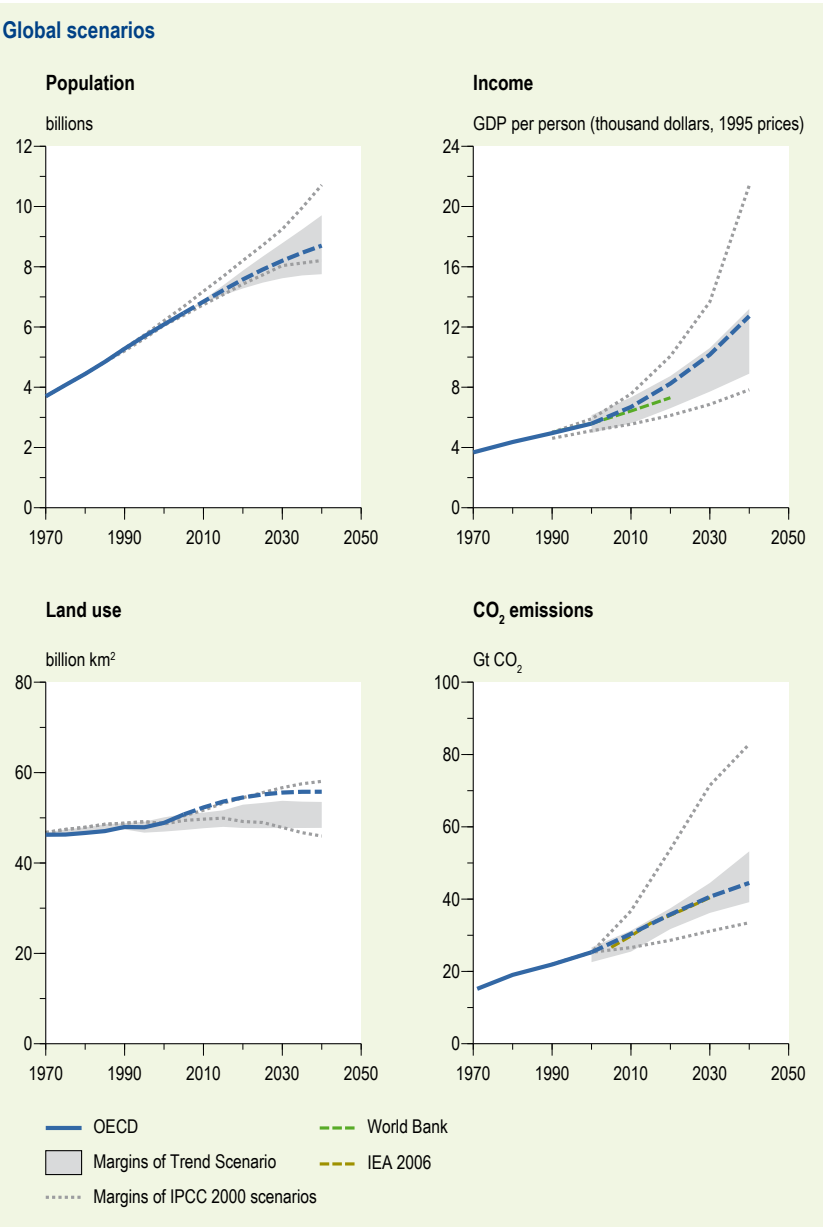
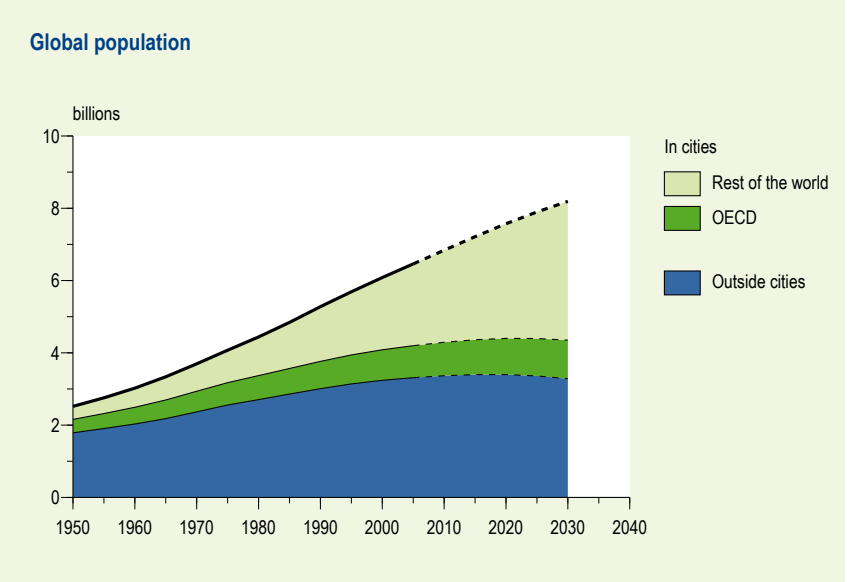


Figure 1.4 Rural and urban population growth, 1950 – 2030 (Source: UN, 2005).



and information (World Bank, 2007). Free trade makes it possible for countries to profit from technological development, specialisation and economies of scale. World trade has grown enormously over the past thirty years and within Europe, too, trade has grown rapidly as a result of the single European market and the removal of barriers, from which the Netherlands has also profited. This growth in world trade has been made possible not only by free trade agreements, but also because the Iron Curtain came down, the Indian and Chinese markets opened up and transport and communication costs have fallen. Capital markets have been increasingly liberalised and foreign investments in developing countries have risen from 22 billion dollars in 1990 to 200 billion dollars per year today. About a third of all foreign investment now goes to developing countries. Meanwhile, foreign investments from developing countries have also increased, especially from China and India (World Bank, 2007). By 2040, the Chinese and Indian economies are expected to be larger than those of the United States and the EU.

Do the poorest people also benefit from further globalisation?

Despite the projected major growth in prosperity in developing countries, 30% of the population of Sub-Saharan Africa will still be living on less than 1 dollar a day in 2030 (World Bank, 2006). Not everyone benefits to the same degree from the advantages of globalisation. Other scenarios are conceivable, in which further efforts can be made to reduce poverty in Sub-Saharan Africa. For example, the *Baseline scenario* does not assume that trade is further liberalised, that development aid will increase or that debts are restructured. Moreover, in the scenario no extra investments are made in technology and knowledge transfer, it will not be any easier for migrants to transfer money to family members, efforts are not made to increase access to energy in developing countries, and no payments are made to developing countries for ecosystem management (see Chapters 2, 3 and 4). Depending on how such policy options might be implemented, further globalisation along these lines could also benefit the poorest people in the world. The various aspects of the policy options mentioned above are examined in more detail in this outlook, particularly their effects, the institutional barriers and the support for such measures among the Dutch and European populations.

1.1.2 Environmental consequences of development

Good environmental quality is important for development

People depend on a good quality environment for their development (MA, 2005). Natural resources provide humanity with food, water, energy and timber. Ecosystems form the key to this, and are indispensable for controlling disease, regulating the climate and stimulating aesthetic enjoyment. A good quality environment also means access to clean drinking water and sanitation, clean air and healthy soils, as well as a stable climate. Many of the environmental problems that are linked to rising prosperity seem to be coming under control as prosperity continues to increase. Air quality, for example, has improved considerably in many rich countries. However, two environmental problems appear to be particularly persistent: climate change and biodiversity loss. Together with the development challenge (see Chapter 2), these two environmental problems (see Chapters 3 and 4, respectively) form the core issues in this outlook.

Development at the expense of environment

During the last hundred years in particular, human development in its broadest sense has taken place at the expense of the environment, with ecosystems and climate affected most (see Figure 1.5 for some indicators of global development). Humans have already brought two-thirds of the world's productive land into use (FAO, 2006; MNP, 2006), which, in turn, causes loss of biodiversity. Rising energy use is leading to higher greenhouse gas emissions, which are considered to be responsible for climate change. Biodiversity loss and climate change are part of the ecological price the world is paying as an unintended side-effect of socio-economic development. In other words, the ecological capital is being exploited unsustainably: the planet quality has been sacrificed in favour of the people and profit qualities. The question is: at what point will this loss go at the expense of the two other capitals.

Environmental pressure from population growth and consumption

The two main factors driving the increasing pressure on the environment are population growth and rising consumption (see text box 'The IPAT equation'). The causes of the increased pressures on the environment since 1970 vary considerably between countries. In OECD countries such as the USA, Canada, Japan, Australia, New Zealand, and those in Europe, the population has grown little over the past few decades (Figure 1.6). Also their consumption of fossil fuels in particular has risen, an increase driven by a desire for greater comfort (transport, convenience, heating and cooling). In India and Brazil both the population and consumption have grown faster. China is an exception because the one child per family policy has tempered population growth. The group of 'other countries', which includes many developing countries, has tended to experience high population growth, but little rise in consumption. When the economic prosperity in these countries increases, the volume of consumption will also rise. On average, the rise in population and consumption across the world lead to higher CO_2 emissions (Figure 1.6). Although, in future, continued development of the poorer regions of the world will further restrict population growth, on balance the pressure on the environment will still increase.

Technology has partly offset growth in consumption

The pressure on the environment resulting from population growth and consumer spending can be offset by making more efficient use of natural resources (including land and energy). Cost savings and autonomous technological progress have been responsible for considerable efficiency gains in the use of energy and land worldwide (Figure 1.7), but this has not been enough to prevent climate change and loss of biodiversity. Meanwhile, the level of prosperity enjoyed by the billion or so people living in the developed countries, is what the other five billion aspire to, as can be seen already in the rapidly developing countries, such as China and India.

The IPAT equation

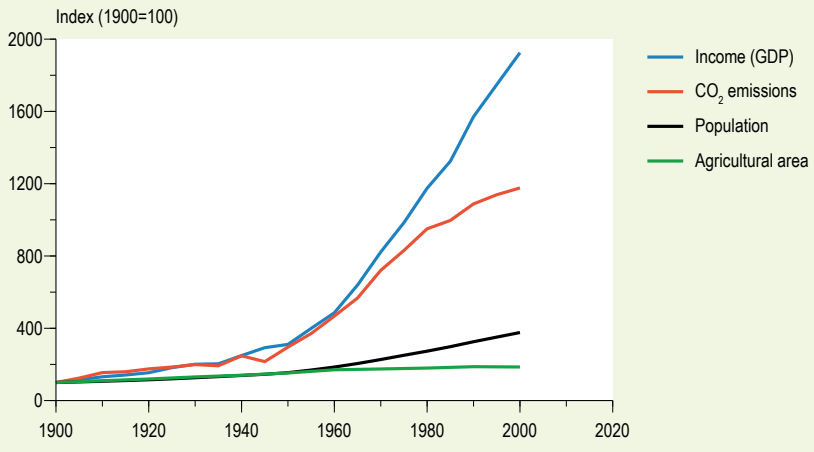
The pressure that development puts on the ecological capital is illustrated by the IPAT equation:

Environmental Impact = Population × Affluence × Technology

The impact on ecology depends on the number of people (P), how much they spend on consumption (A) and the use of technology in production (T) (see for example Ehrlich, 2003). The IPAT equation can also be generalised for land use. It helps to understand the various factors influencing the pressures on the environment.

Figure 1.5 Income, CO_2 emissions, land use and population, 1900 – 2000.

Global development



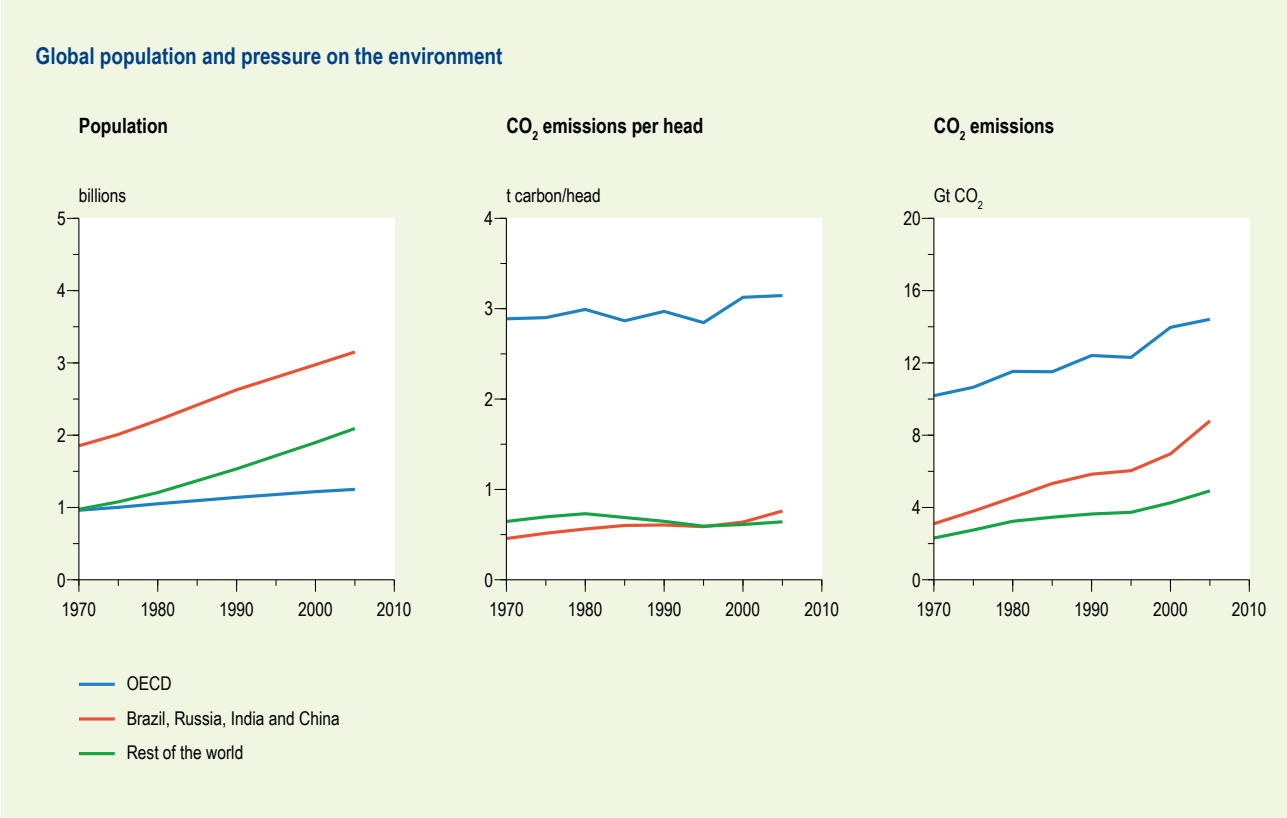


Figure 1.6 Population, CO_2 emissions per head and total CO_2 emissions, 1970 – 2005.

Developed countries mainly responsible for climate change

So far, the biggest contribution to climate change has been made by countries with a high HDI. The United States has been responsible for about 20% of all greenhouse gases emitted from 1970 to the present day; the EU's share has been about 15%. During the same period the poorest countries made a much smaller contribution to climate change.

Greenhouse gas emissions driving climate change

If the current trends in energy use continue, if consumption in the North remains high and if population numbers and prosperity in the South continue to grow, atmospheric greenhouse gas concentrations will rise. In turn, this will increase the risk of a temperature rise greater than two degrees, extreme weather and a faster sea-level rise. People in the poorer tropical regions in particular will experience the disadvantages of climate change, including lack of water, flooding and disease. As temperatures rise, the negative effects on agricultural productivity, water availability and health will become more noticeable. In the *Baseline scenario*, average greenhouse gas emissions per head of the population rise by about 10% (0.3% per year) from 2001 to 2040, and total global greenhouse gas emissions rise by almost 60% (1.2% per year) (Figure 1.8). Most of this is caused by the rising global population and economic growth in developing countries. In 2005, the United States emitted almost 20% of all greenhouse gas emissions; the EU was responsible for 11%. In 2006, China replaced the US as the biggest emitter of CO_2 and is expected to continue to emit the most greenhouse gases during the period to 2040 (OECD, 2008). The *Baseline scenario* contains no additional policy measures that could lead to a reduction in greenhouse gas emissions, such as pricing CO_2 emissions, developing and promoting alternatives to energy generation, and saving energy (see Chapter 3). However, it does assume that, on average, comparable policy measures will be taken across the world to continue the trends of the past few decades, for example in energy saving. If the *Baseline scenario* should become a reality, the global temperature beyond 2040 will almost certainly exceed the 2 °C target.

Figure 1.7 Energy intensity and improvement in agricultural productivity, 1970 – 2000.

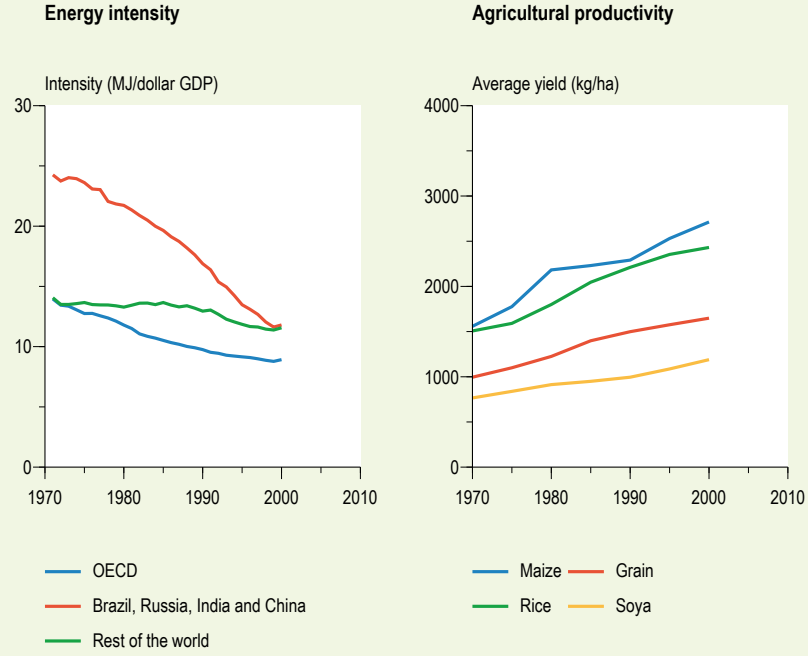
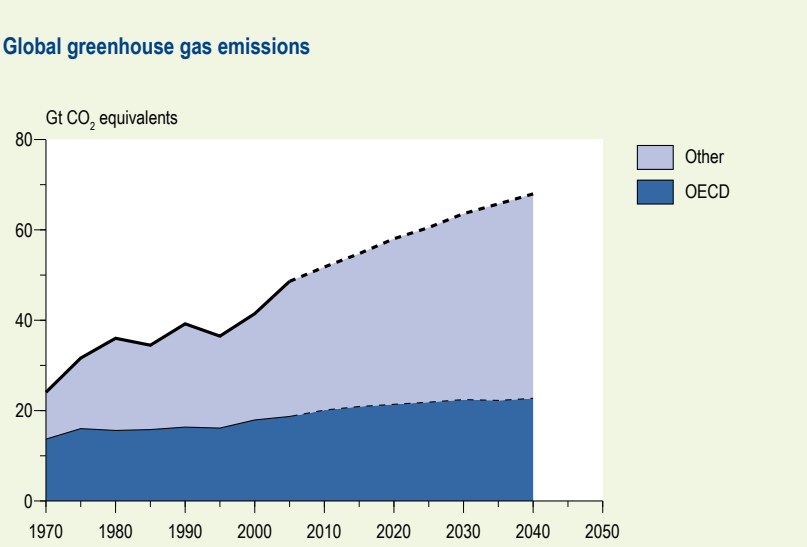


Figure 1.8 Global emissions of greenhouse gases in the Baseline scenario, 1970 – 2040.



Greenhouse gas emissions per person relatively high in rich countries

In rich countries, greenhouse gas emissions from consumption per head of the population is higher than in poor countries (Figures 1.9 and 1.10). The Netherlands has committed itself to the European climate target for global temperature rise of no more than 2 °C. For a global population of 9 billion people in 2040, this means that emissions may not exceed an average of about 3.5 tonnes CO_2 equivalents per head of the population. Average emissions in 2001 were 6.7 tonnes CO_2 equivalents.

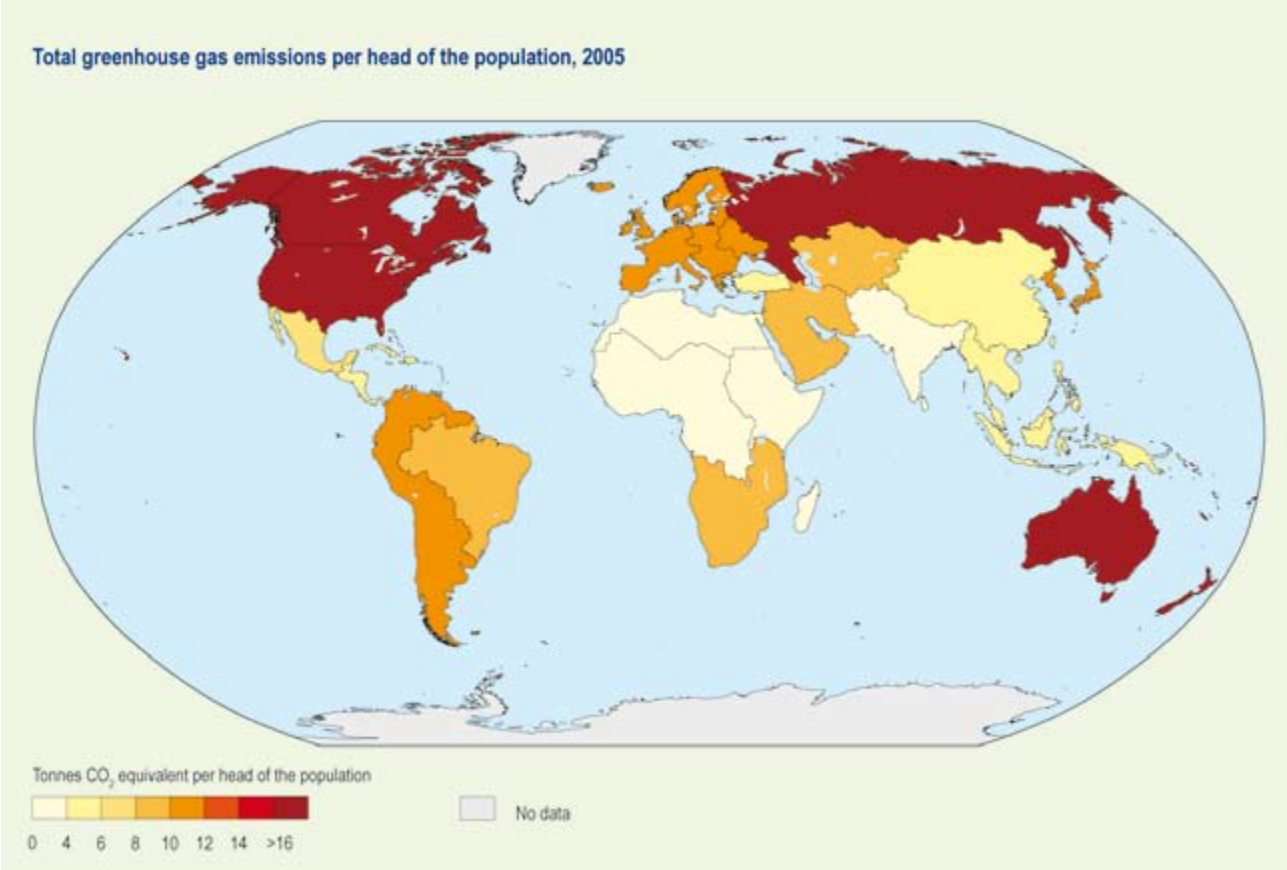
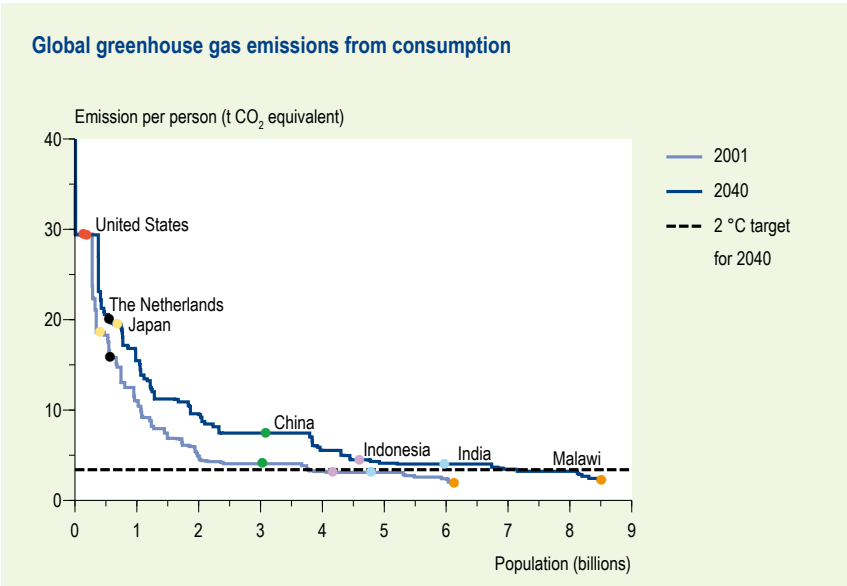


Figure 1.9 Total greenhouse gas emissions per head of the population by country in 2005.

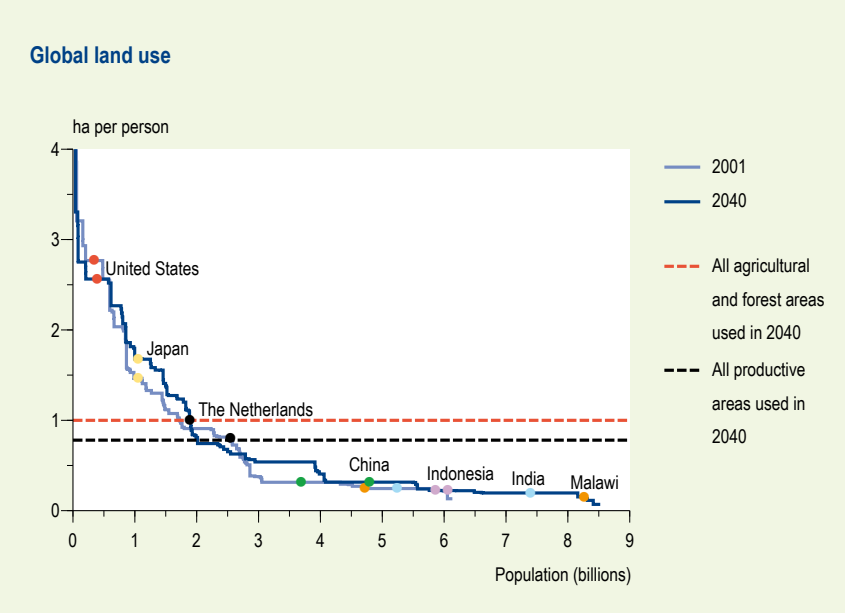
Figure 1.10 Greenhouse gas emissions from consumption per head of the population by country, 2001 and 2040.



Land use per person is also relatively high in rich countries

The global average land use per person is currently 0.8 hectares (Rood *et al.*, 2004). Land use is strongly related to the level of consumption: on average, richer countries lay claim to a much greater share of land in the world than the poorer countries. But these differences are smaller than those for greenhouse gas emissions (Figure 1.11), because land in the richer countries is generally more efficiently and intensively used than land in poorer countries.

Figure 1.11 Land use for consumption per head of the population by country, 2001 and 2040.



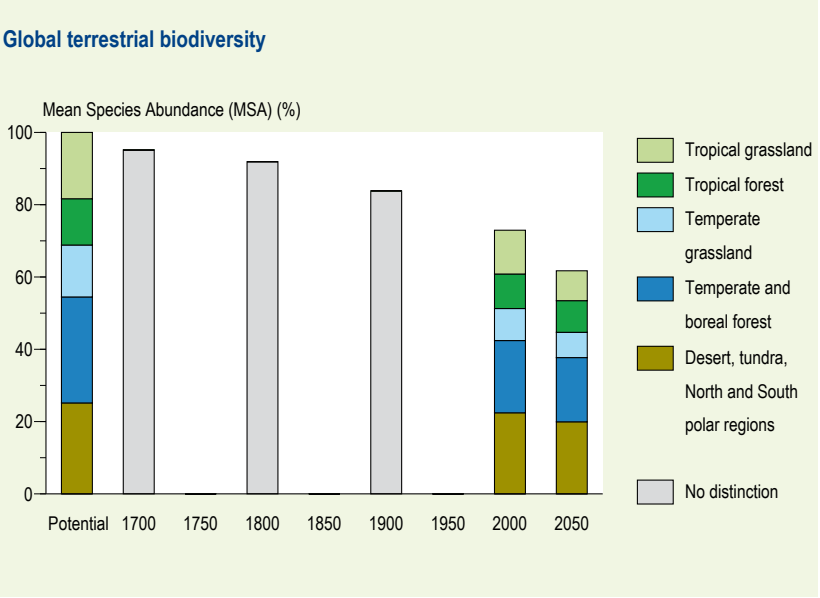
A larger global population means less land will be available to each world citizen in 2040

Despite further improvements in agricultural productivity, the *Baseline scenario* predicts that land use worldwide will expand by about 10%, due to world population growth and rising levels of consumption per person. Most of this additional land use is needed to meet rising food consumption in developing countries. The area used to cultivate biofuels will also increase tenfold, but in absolute terms will remain a modest fraction of land use because the *Baseline scenario* assumes no additional climate or energy policy. At the moment, about 50 million km² of land are in agricultural production to supply 6 billion people throughout the world, which amounts to an average of about 0.8 hectares per person. In 2040, about 55 million km² will be in agricultural use to feed 9 billion people. In the *Baseline scenario*, therefore, with the global population expanding by 50%, only a 10% increase in land is needed. This 'gain' is achieved by a presumed steep rise in agricultural productivity in developing countries. The world can provide no more than 70 million km² for intensive agricultural production. With a population of 9 billion, that also amounts to an average of 0.8 hectares per person (Figure 1.11). Most of the area that could be converted to agricultural use is currently forest and grassland in tropical regions; other areas, including the deserts, ice sheets, coniferous forest and tundras in the northern cold climates (for example in Siberia) and the steppes in tropical and sub-tropical areas, have a very low productivity and cannot be put to agricultural use. It would be possible, however, to use a considerable amount of this land for forestry because this is a much less intensive use. If this additional 20 million km² is included in the equation, as land potentially available for human use, the total area of 'available' land in 2040 will be 90 million km², or about 1 hectare per person. If this were the case, though, all the remaining vegetated natural areas will have been converted to agriculture or forestry. The increasing demand for wood products can theoretically be met by the less productive areas (20 million km²), but steering production to these areas is surrounded by much uncertainty (see Biofuels case study). Given the expected growth in food consumption, the pressure on tropical biodiversity will increase. To prevent the pressures on land from rising too high, considerable additional productivity increases will be needed and land-hungry consumption, such as meat, will have to be restricted (see Chapter 4).

Biodiversity loss from growing pressures on ecosystems

The Millennium Ecosystem Assessment (MA, 2005) has shown that rising levels of human consumption over the last fifty years have altered ecosystems at a rate and to an extent never seen before. Ecosystem changes, such as deforestation, influence the presence of diseases, such as malaria and cholera, and increase the risk of the emergence of new diseases. Human pressures on ecosystems will increase considerably over the next fifty years, as population growth and economic development fuel an expanding demand for ecosystem services. During the last century this pressure on ecosystems has caused biodiversity to decline, especially in forests and grasslands. Natural areas where few people live, such as deserts, extensive coniferous forests (in Canada and Russia), tundras and polar regions have so far been spared (Figure 1.12). In total these areas contain about 35% of global biodiversity. Much biodiversity has been lost in Europe, India and China. Countries with rapid economic growth tend to experience high population growth and a highly active agricultural sector, but they have relatively little productive land to spare. Biodiversity in these countries will decline relatively quickly in future. Much of

Figure 1.12 Global biodiversity, 1700 – 2050.



the agricultural activity and production in developing countries is for export to the richer countries, for example the export of soya from Brazil to the EU. The *Baseline scenario* considers no policies for further technological improvement, for reducing meat consumption or protecting specific areas by establishing nature reserves (see Chapter 4).

Conflicts arising from competition for natural resources and from climate change

Further development in the emerging economies and the developing countries will intensify competition for raw materials and may push prices up, which could heighten geopolitical tensions. The effects of higher prices are partly negated by a greater incentive for further exploration, substitution, reduction in use and recycling. The climate will change as well, with more flooding, drought and food and water shortages. In turn, these will heighten the risk of internal disputes and conflict between countries (DCDC, 2007; UNDP, 2006). The growing scarcity of natural resources, such as oil and metals, will also increase the risk of conflict. Disparities in access to natural resources (water, food, oil and minerals), trade networks and money flows may spark off armed conflict between countries (Clingendael, 2003), but it is difficult to identify in advance where these will break out and what the impacts will be. That is why the *Baseline scenario*, like most other scenarios, does not take account of the effects of the increased likelihood of conflicts triggered by increasingly scarce resources and climate change.

1.2 International policy targets

1.2.1 Global recognition of the relation between development and environment

What is meant by 'development'? Development can be regarded as making more efficient use of the three capitals of sustainable development – *people*, *planet* and *profit* – and how, through their use, these three capitals influence and counterbalance each other. Water, food and energy (*planet*) are basic requirements for personal development (*people* and *profit*). As human societies use more raw materials, the pressures on the environment increase (for example via greenhouse gas emissions and land use), CO_2 concentrations rise and wildlife and natural habitat are lost. Ecological capital is being exchanged for economic growth. This has already happened in the Netherlands and has, on balance, led to a higher quality of life, and the same process is now taking place in developing countries. Although some targets have been set for resolving the problems encountered in the separate capitals for sustainable development, a global effort to maintain a mutual balance between the three is still lacking: poverty has to be tackled, further biodiversity loss and further climate change must be prevented, and energy supply must be safeguarded.

Twenty years ago, the report *Our Common Future* (1987) by the World Commission on Environment and Development (WCED) showed that environment and development are inextricably linked. It was a milestone in broadening the global environmental agenda and moving it towards sustainable development. In 1992, the UN organised the Rio de Janeiro Earth Summit – in full: the United Nations Conference on Environment and Development. All the participating countries, including the Netherlands, agreed on a set of 27 principles for realising the targets and

vision of the Brundtland report and the strategy contained in it (*Agenda 21*) (see text box 'The Rio Principles' (selection). The parties to this international conference also signed several international conventions in three policy areas: preventing biodiversity loss (CBD), climate change (UNFCCC) and desertification (UNCCD). The Netherlands is a party to all these conventions.

1.2.2 Targets for sustainable development

After the Rio conference the global agenda developed along several lines. Given the difficulty of establishing with scientific certainty whether there is a critical imbalance between the three capitals for sustainable development, the reference points for this second sustainability outlook are the international policy targets for sustainable development. These are the targets for climate, biodiversity and development, and they are more concrete expressions of the Rio Principles:

- The climate target is based on scientific understanding of the risks associated with a temperature rise, but the uncertainties are large. If the CO_2 concentration in the atmosphere causes a rise in global temperatures of more than 2 °C above the pre-industrial level, the EU sees this as an imbalance in the ecological capital.

The Rio Principles (selection)

PRINCIPLE 1
Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

PRINCIPLE 2
States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

PRINCIPLE 3
The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

PRINCIPLE 4
In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

PRINCIPLE 5
All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

PRINCIPLE 8
To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

PRINCIPLE 12
States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.

PRINCIPLE 14
States should effectively cooperate to discourage or prevent the relocation and transfer to other States of any activities and substances that cause severe environmental degradation or are found to be harmful to human health.

PRINCIPLE 15
In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

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- The uncertainties surrounding the biodiversity target are even greater. The parties to the Convention on Biological Diversity (CBD) have set themselves the target of reducing the rate of biodiversity loss by 2010.
- Lastly, no critical limits can be set for the development target. In 2000, countries agreed to realise the Millennium Development Goals (MDGs) by 2015. The MDGs set a lower limit for future human and social capital and for the economic capital in developing countries, and set out to reduce poverty and hunger and achieve a broad sustainable development agenda (see Chapter 2).

To achieve the last two goals the global community, in the form of the United Nations, has declared that biodiversity loss must be reduced significantly and that extreme poverty and hunger must be eradicated. The main indicators for policy achievement follow logically from the internationally agreed targets for sustainable development. To realise these targets, however, secondary targets and indicators have to be determined (as was the case for the MDGs). The choice of appropriate indicators also depends on the scale (country, region or world) at which the policy operates. Highly aggregated indicators (indices) are useful when comparing the performance of different countries (see Section 1.4).

1.2.3 Prerequisites for global sustainable development

Achieving global targets will require global social change

Under continuing economic development the stated targets will not be met without taking additional policy measures. It is expected that by 2030, the development targets will not have been met everywhere across the world. The rate of decline in biodiversity, measured as mean species abundance (MSA; MNP, 2006), is even expected to increase. Without additional policy measures, greenhouse gas emissions are expected to have doubled by 2100. To actually achieve the targets, or in the case of biodiversity to get as close as possible to achieving them, a worldwide transition will be needed in energy and food consumption and in the approach to meeting the development challenge.

More cooperation and political will are needed

The technological advances made, so far, have not been enough to reduce the growing pressures on ecosystems and the climate. The additional energy and land use requirements of the growing world population, compounded by the growth in consumption and changes in consumption patterns, have only partly been met by improved technical efficiencies (see text box 'The IPAT equation'). Humanity now faces the challenge of taking adequate, justifiable and affordable policy measures to help solve the identified sustainability problems. Timely action can prevent undesirable and irreversible impacts on subsequent generations. The challenges outlined above are substantial and urgent, but certainly not irresolvable, given better global and international cooperation and sufficient political will to tackle the problems. But the bottleneck lies with cooperation and political will. Various options appear to be technically feasible, but they demand a turnaround in thinking and action by vested interests and require radical changes in the institutional, technological and cultural context. Delivering this will require ambitious national and international leadership, as well as long-term commitment (see Chapter 6). What does this mean for the Netherlands, and what can the Netherlands do in concrete terms on various scales at home and via the EU and global institutions? This report examines these most relevant questions in the following chapters.

Sustainable decisions

If poverty is not tackled, little support for climate and biodiversity policies can be expected from the poor countries. And these are the countries where the remaining biodiversity is at serious risk. Eradicating extreme poverty is an essential step in improving the quality of life for billions of people on earth, but if poor countries develop along the route taken by the richer countries and the emerging economies, natural resources will be further depleted. Therefore, to bring the stated targets within sight, the challenge facing the world is to create models and methods of development – here and elsewhere – that break with the past. For the Netherlands, in concrete terms this could mean ensuring that decisions have a positive effect by:

- reducing emissions of greenhouse gases;
- curbing the rate of biodiversity loss;
- narrowing the gap between rich and poor in the world.

Decisions may be considered to be sustainable if they do not cause any unnecessary negative effects on other outcomes, and if they take these effects into account. The decision-makers can then determine what can and cannot be considered to be sustainable, and how complementary or flanking measures can compensate these negative effects.

1.3 The Dutch contribution

Often, only the activities within the geographical borders of a country are taken into account when determining the pressures they exert on the environment. However, a significant share of Dutch production is not for domestic consumption by households and government, but for export. Moreover, part of the consumption by the Dutch population is met by imported goods, and the manufacture of these goods has an impact on the environment in other countries. It is, therefore, relevant to examine not just the pressure on the environment within the territory of the Netherlands, but also the global environmental impacts associated with Dutch consumption (the whole chain approach). Consumption puts pressure on the environment, partly as a direct result of consumption itself and partly from the production of consumer goods.

The Netherlands is a small country and so its absolute contribution to global climate change and biodiversity loss is small. It also belongs to the wealthiest countries in the world (Figure 1.2). Over the last fifty years, the rise in income has caused private consumption, per head of its population, to nearly quadruple. Additionally, according to the *Baseline scenario*, private consumption per head of the population will have more than doubled by 2040, but this rise in income will hardly contribute any further to the quality of life of the Dutch population. The future development in quality of life in the Netherlands depends mainly on other factors (see text box 'Interpretations of quality of life'). These factors, however, are not considered in this outlook, which is primarily concerned with the relation between the Netherlands and the rest of the world.

Interpretations of quality of life

'Quality of life' is determined by the opportunities people have to shape their own lives. It is unequally distributed across the world. Very many people in Africa and in large parts of China and India cannot meet their basic needs, while the growing middle class in China and India demand more cars, and many Europeans want more free time. As stated before, the Human Development Index (HDI) is considered to be an approximate indicator for quality of life. The HDI reflects the state of development, which is a combination of life expectancy, level of education and GDP per capita.

The HDI is very high in the Netherlands and other rich countries. Although the HDI is generally considered to be an approximate indicator for quality of life, it is less suitable for analysing this quality for the Dutch population, as it does not cover all the relevant aspects for rich countries. According to the British economist Layard, health, relations and paid or voluntary work are useful indicators (and not only for rich countries). In addition, in rich countries, where people's basic needs are satisfied, relative income is more important than absolute income. International research (Inglehardt, 1997) indicates that people with an income of more than about 15,000 dollars a year do not immediately consider themselves much happier with more money. Most people want to have at least as much as 'the neighbours' or neighbouring countries and if people's income and that of their peer group rises at the same rate, their feelings of contentment or happiness are hardly affected at all (Layard, 2005). (See Appendix 1 for more information on the conceptualisation of quality of life.)

1.3.1 Greenhouse gas emissions from production and consumption

Dutch consumption fuels strong growth in greenhouse gas emissions

A significant share of total greenhouse gas emissions related to household consumption is caused by the use of gas and electricity, mobility, and the production of food (in 2000 more than 70%, Nijdam *et al.*, 2005). As consumption has grown, emissions of CO_2 per head of the population have risen by 160% since 1950. *The Baseline scenario* expects this rise to level off, and by 2040 emissions are expected to be 35% higher than they were in 2005. A significant proportion of these greenhouse gases are emitted during the production of consumer goods (more than 55% in 2000). However, CO_2 emissions are rising at a slower rate than consumer spending because goods are being manufactured more efficiently and because direct energy consumption (electricity, gas and motor fuels) is not growing as fast as consumer spending. The share of CO_2 emissions from direct energy consumption is projected to decline from about 45% to about 30% in 2040.

Dutch production relatively energy efficient

Emissions of greenhouse gases have risen much less strongly than production, mainly because of technological progress. Between 1990 and 2005, GDP in the Netherlands grew by almost 45%, while CO_2 emissions from production processes rose by about 18%. In the *Baseline scenario* GDP is projected to double by 2040, whereas CO_2 emissions from production activities rise by about 30%.

The Dutch economy is relatively energy intensive, but this is mainly due to the presence of several energy-intensive production sectors. A comparison of the energy-efficiency of companies in the Netherlands with comparable companies elsewhere, reveals that Dutch companies in several energy-intensive sectors are among the best performers in the world (Phylipsen *et al.*, 2002). The average energy-efficiency of Dutch industry is also among the best in the world, but the lead over companies in other countries has narrowed since 1999 (Verificatiebureau Benchmarking Energie-efficiency, 2006).

The Netherlands becomes a net importer of greenhouse gas emissions
Because Dutch exports are energy intensive, CO_2 emissions in the Netherlands from the production of goods for export are higher than CO_2 emissions in other countries from the production of goods for consumption in the Netherlands. If the non-CO_2 greenhouse gases are included, the greenhouse gas emissions from the production of imports and exports are about the same, in contrast to many other West-European countries, the United States and Japan, which are net exporters of greenhouse gas emissions.

Over the past fifteen years, the pressure on the environment, due to greenhouse gas emissions from production in other countries for the Dutch market, has not shifted as a result of changes in imports and exports (Wilting *et al.*, 2006). However, this is expected to change over the coming decades to 2040. The Netherlands will increasingly specialise in the export of services and will, therefore, import a larger proportion of the products used in the Netherlands. Exports of products from agricultural, industrial and energy sectors will, therefore, rise more slowly than imports of products in these sectors (CPB/MNP/RPB, 2006). Over the next few decades, CO_2 emissions in the Netherlands are expected to rise more slowly than production levels, not only because of efficiency improvements, but also because of increased emissions from the production of goods outside the Netherlands for consumption in the Netherlands.

Dutch greenhouse gas emissions five times too high
To achieve the two degree climate target, the greenhouse gas emissions of the developed countries, including the Netherlands, must be reduced drastically (Figure 1.10). If in 2040 these emissions were allocated in equal shares to every person in the world, the greenhouse gas emissions linked to Dutch consumption would have to be five times lower than they are now.

1.3.2 Land use for production and consumption

The Netherlands contributes to global biodiversity loss via land use in other countries
Agriculture is by far the biggest user of land in the Netherlands, taking up more than 60% of the land area. A large share of national agricultural production is exported and produce from about 45% of the land is meant for export. In the *Baseline scenario*, agricultural land use in the Netherlands falls to 50% of the national land area between 2005 and 2040.

The land elsewhere in the world that is used to produce for consumption in the Netherlands amounts to about four times the land area of the Netherlands itself (Figure 1.13). About 45% of land used for Dutch consumption is for the production of food and 55% for the supply of wood for paper, cardboard and other wood products. The area of land used for food production is strongly related to the demand for meat and dairy products, which require a relatively large area of land. Dutch consumption contributes to biodiversity loss through the use of this land.

Dutch land use for consumption will rise sharply
According to the *Baseline scenario*, the land used around the world to produce goods for Dutch consumption by 2040 will have risen to more than five times the land area of the Netherlands, in large part due to the growing demand for wood and paper products. Although consumer spending on food in the Netherlands will also grow in future, the demand for additional agricultural land will not rise in the period to 2040. This higher expenditure on food has much more to do with food processing than with the actual amount of food consumed (NIPO, 2007). Moreover, agriculture is becoming more productive, worldwide (MNP, 2006).

Will increased land use be at the expense of tropical biodiversity?
Section 1.1.2 states that the maximum potential area of land for agriculture and forestry worldwide amounts to about 1 hectare per person (assuming a global population of 9 billion people in 2040). Land use for Dutch consumption already amounts to 0.8 hectares per person. The area of land used for Dutch consumption is smaller than for other rich countries (Figure 1.11), partly because the land used, both in the Netherlands and abroad, is highly productive. According to the *Baseline scenario*, the land use for Dutch consumption will rise to 1.0 hectare per capita in 2040, because of a growing demand for wood and biomass for biofuels. The Dutch government is pushing for greater use of biomass for fuels in 2040 than is assumed in the *Baseline scenario*. This will lead to a further 0.1 hectares per capita land use by the Dutch population. At the moment, timber for wood products is sourced from low productivity forests in temperate and boreal regions. If the higher demand for wood in 2040 continues to be met primarily from these areas, it will cause further biodiversity loss in these regions, but will not compete with global food production. But if the increased demand for wood and biofuels (first generation) is met by imports from tropical regions, this will be accompanied by a loss of tropical biodiversity and will compete with the production of food.

No targets for pressure on the environment elsewhere from Dutch consumption
Dutch environmental policy, as that of other countries, is geared primarily towards reducing pressures on the environment at home. Where relevant, the Netherlands also work with other countries on developing a common set of more stringent environmental standards for products and

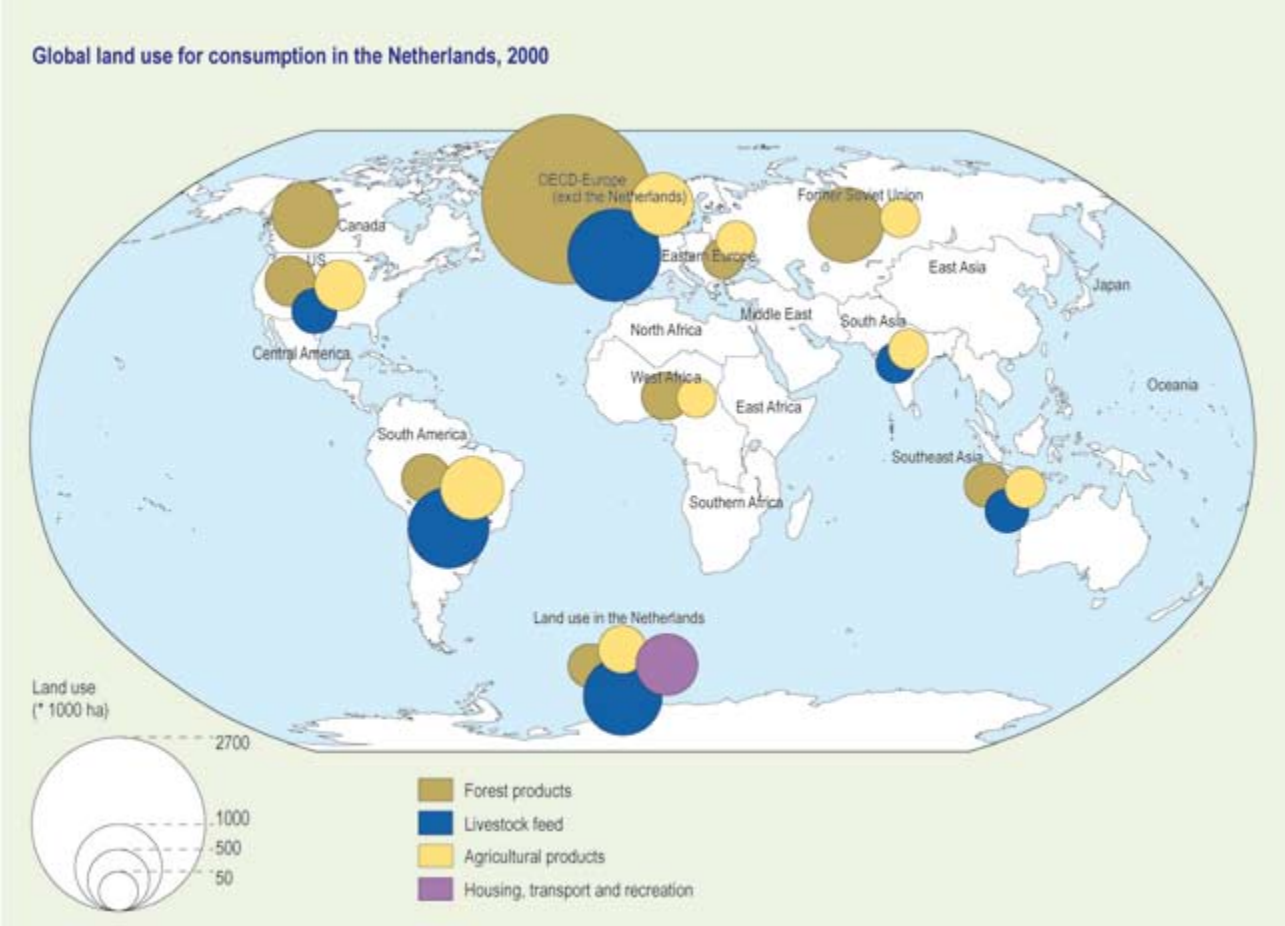


Figure 1.13 Land use for consumption in the Netherlands in 2000. Areas smaller than 50,000 hectares are not shown (Rood *et al.*, 2004).

services, but otherwise generally no limits are put on environmental loads arising elsewhere from the production of goods imported into the Netherlands. To limit increases in greenhouse gas emissions and loss of biodiversity elsewhere in the world from consumption in the Netherlands, it is important to formulate concrete targets for environmental loads from the production of consumer goods. However, defining environmental criteria for specific products can be very difficult. Moreover, the options are limited by various international accords and trade agreements made under the auspices of the World Trade Organisation (WTO) and the EU. One solution may be to make public-private agreements with the corporate sector on imposing standards via the whole chain approach.

1.3.3 The Netherlands in the global economy

Dutch economy increasingly international in orientation

On balance, the Netherlands benefits from international trade and investment (Gorter *et al.*, 2005), and the Dutch economy is becoming increasingly integrated into other economies in the world. One of the outcomes of this has been a rapid increase in trade flows: between 1970 and 2005 the volume of imports increased fivefold and the volume of exports sixfold. The Netherlands is one of the world's major exporting countries, and in 2005 was sixth on the WTO list of major exporting countries, with a share of almost 4% of all exports (WTO, 2006). Most Dutch trade is with the rest of the EU (almost 80% of exports) and the United States. Asia has grown steadily in importance, one reason being the growth in the Chinese share of total imports from 0.2% in 1970 to almost 8% in 2005. Africa and Central and South America still account for just a few percent of total trade flows.

Direct foreign investments have also risen substantially. The sum of direct investments by Dutch companies in other countries has tripled in the last fifteen years (Gorter *et al.*, 2005). Most of these investments are within the EU (about 50%) and the United States (about 25%). Only a limited part of investments are made in South East Asia, Africa and South America. Inward investment by foreign companies in the Netherlands is smaller than outgoing investment; about half comes from the EU and about a quarter from the US (Gorter *et al.*, 2005).

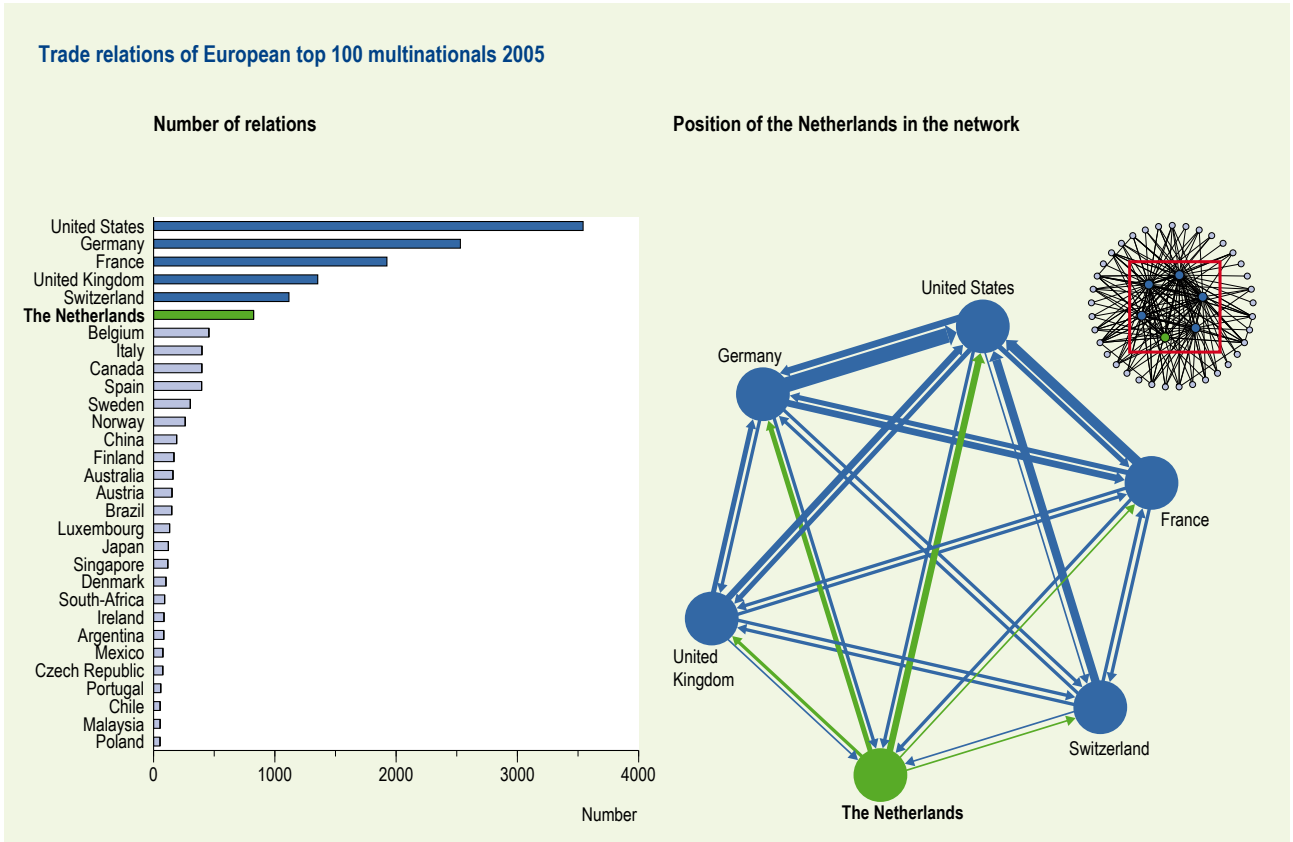
Indirect Dutch government influence via Dutch multinationals

As a small, but prosperous, country, the Netherlands is relatively well integrated into the global business network (Figure 1.14). After New York, Tokyo, London and Paris, the Randstad (the urban conglomeration in the west of the Netherlands) is the fifth major urban complex in the world in terms of the number of relations with businesses elsewhere (Wall *et al.*, 2007). Besides the multinationals such as Shell, ING, Unilever and Philips, this is due to the presence of numerous subsidiaries of foreign multinationals. The globalisation of business activity has made it easy for companies to relocate their headquarters, for example to countries where the legislation is most favourable. Because the Dutch government can only control activities that take place in the Netherlands, it is losing its direct influence over these multinationals. However, it can still exert an indirect influence by imposing reporting requirements on companies established in the Netherlands, for example to enhance transparency, or by collaborating with non-governmental organisations (NGOs) on developing codes of conduct with the corporate sector. Various Dutch multinationals are already responding voluntarily to the issues of human development, working conditions, energy and biodiversity. However, opportunities for more radical measures are limited because there is no level playing field for businesses in various countries, and because the global business network itself is far from transparent (see Chapter 5).

1.4 Sustainability appraisal of policy options

The next three chapters examine what progress will or will not be made, based on the projections in the *Baseline scenario*, towards achieving the policy targets for specific sustainability themes: development, climate and biodiversity. Several policy options are identified, which could help to make progress towards the targets. It will become clear that not all the targets can be achieved at the same time. This second sustainability outlook employs a simple sustainable development assessment framework to reveal the trade-offs between targets. The effects of the policy options are determined for the three themes of climate, biodiversity and development. The concrete indicators used for these themes depend on the specific issue being addressed and the scale on which it is examined. Sustainability indices are considered to be of secondary interest (see text box 'Sustainability indicators and indices').

Figure 1.14 European top 100 multinational network in 2005 (Source: Wall *et al.*, 2007).



Sustainability indicators and indices

Indicators for sustainable development differ considerably in their degree of aggregation. The Human Development Index (HDI), which is used in this study, is an example of a highly aggregated indicator for *people* and *profit* (for more examples of highly aggregated indicators, see Appendix 2). However, in highly aggregated indicators (or 'indices') the trade-off relationships between *planet*, *people* and *profit* are largely hidden. Indices are most relevant for communication and sometimes for making comparisons between countries. Another disadvantage of such indices is that they usually offer little basis for evaluating concrete policy options. The underlying indicators (or a selection of these) are often much better suited for this purpose.

The challenges facing humanity are to limit climate change, halt the loss of biodiversity and narrow the gap between rich and poor. Sustainability policy implies that these problems should not be made worse unnecessarily by decisions taken here and now. A balance between *people*, *planet* and *profit* also means that solutions for acute national issues, such as unemployment, the tax burden and accessibility, must not unnecessarily add to greenhouse gas emissions and biodiversity loss, or widen the gap between rich and poor in the world. In turn, poverty should be tackled in combination with global efforts to reduce the causes of climate change and biodiversity loss. Efforts to limit climate change and maintain biodiversity may, however, be at odds with efforts to reduce poverty and hunger. The clearest example of this, at the moment, is the use of biomass to restrict the increase in CO_2 concentrations in the atmosphere. If biofuels are rapidly introduced, ecosystems will come under increasing pressure and prices will be driven up (see Biofuels case study). In short: appraising the effects of policy measures on climate, biodiversity and poverty in advance, can help to improve assessments of policy for 'sustainable development'.

2 Poverty and development

In almost all parts of the world, income, education levels and life expectancy have increased over the past 30 years. Many enjoy greatly improved living conditions, but there are still more than one billion people who have to live on less than a dollar a day. Development in large sections of Africa has stagnated over the past 20 years, and since 1980 people's life expectancy has fallen, primarily as a result of HIV/AIDS and civil conflicts.

The world as a whole might just manage to achieve the MDGs (Millennium Development Goals) and halve poverty and hunger in 2015, assuming that current trends continue. However, progress in Sub-Saharan Africa and, to a lesser extent also in South Asia, is far behind schedule. The MDGs for education and health (child mortality, maternal mortality, infectious diseases) seem to be out of reach unless additional policies are applied.

To achieve the MDGs, measures need to be taken dealing with acute problems such as HIV/AIDS, and shortages of food and water. In addition, infrastructure (education, healthcare, roads and energy) needs to be improved in order to facilitate long-term development. This will require funding, as well as knowledge transfer, and donors need to harmonise their activities better, both among themselves, and between donors and receiving countries. Foreign direct investments also play an important role in achieving these improvements in infrastructure. At the same time, developing countries need to get access to the global market. Lowering trade barriers can have a positive effect on economic growth, both for developed and developing countries, although vulnerable, lower-educated people often cannot profit directly. Further liberalisation of global markets, in combination with targeted official development assistance and investments, can produce favourable results for both economic growth and human development.

This chapter describes the most important trends in quality of life, and the underlying factors. The emphasis is on the situation in developing countries. Human development means that everybody has the opportunity to expand their options to live their lives as they wish. Essential aspects are to live a long and healthy life, gain knowledge, and have the means to support a basic standard of living (UNDP, 1990). However, there are still many people who largely lack these opportunities. Worldwide, over one billion people have to survive on less than one dollar a day. This situation occurs primarily in regions such as Sub-Saharan Africa (i.e. all countries to the south of the Sahara) and in South Asia, in countries such as India, Pakistan and Bangladesh (see Appendix 3 for an overview of the regions).

2.1 Global trends in development and population growth

Development is not only relevant for quality of life, it also has a direct relation with population growth. Analyses show that high fertility figures go hand-in-hand with a low Human Development Index (HDI), an indicator of the quality of life.

Relationship between population, health and the environment

The population can be seen as a driving force behind the increased pressure on ecosystems. At the same time, the population is dependent on these ecosystems, for example for food, water and energy. Developing countries, in particular, often still depend directly on (local) ecosystems. Population and health are also often strongly intertwined. High population growth often goes hand-in-hand with poverty, and poverty is often accompanied by poor health (WHO, 2002). People with poor health are also more liable to poverty. This results in a high birth rate, as poor people often anticipate the possibility of their children dying, and see their children as cheap labour and as a provision for their old age. If basic living standards improve (i.e. if there is food and clean drinking water available and the hygiene and housing improve) then, in general, the death rate will fall. This particularly applies to child deaths, which can be seen as the start of the demographic transition from high, to low, birth and death rates. During this transition the population grows considerably, but as time progresses, the size of the population stabilises or even drops once the demographic transition is completed.

Development accelerates demographic transition

The birth rate is strongly influenced by the modernisation process (Easterlin, 1983), for which the HDI can be seen as an approximation (Hilderink, 2000). Income and education for women appear to be important conditions for lowering

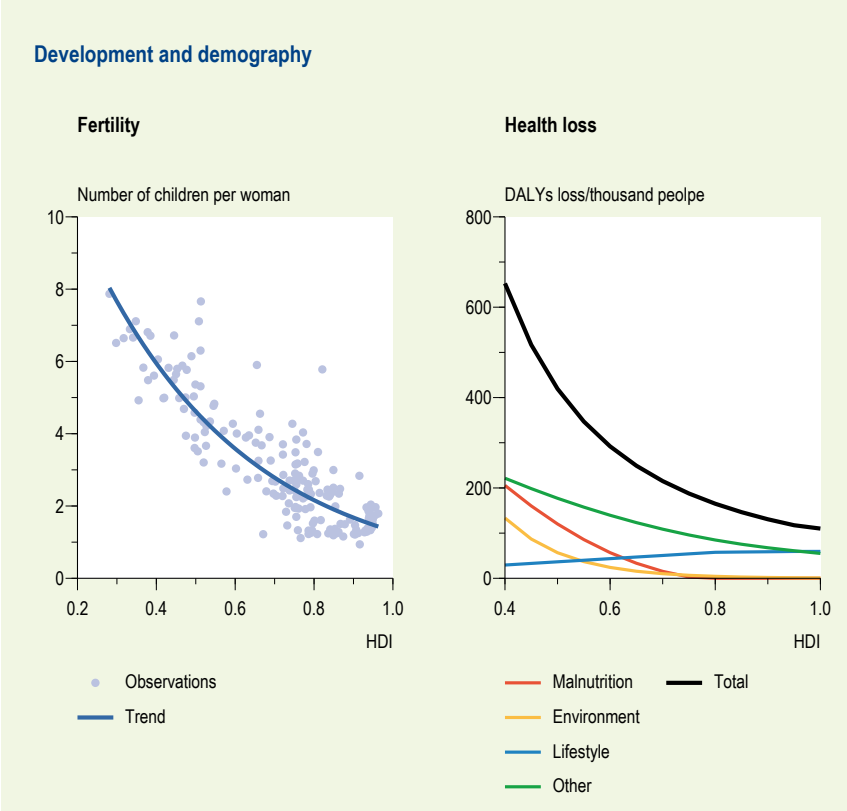
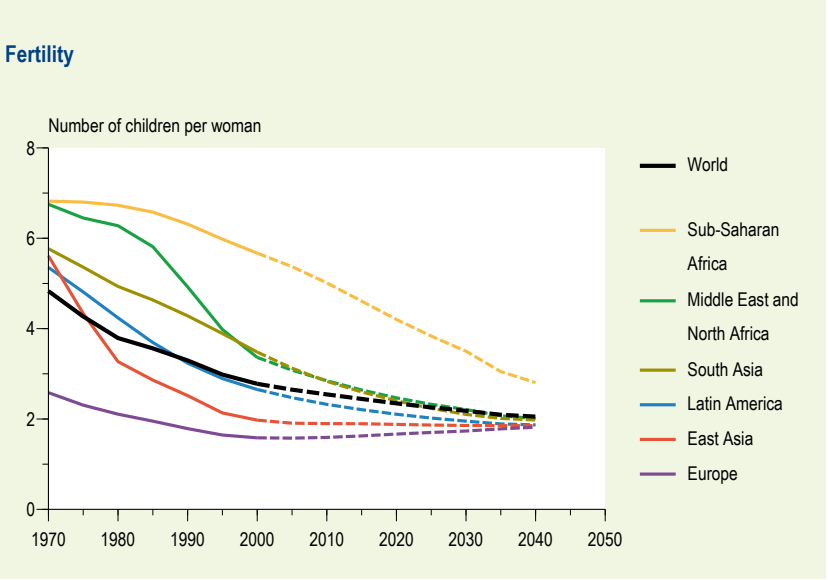


Figure 2.1 Human Development Index (HDI) related to the total fertility rate and health loss in Disability-adjusted Life Years (DALY) per cause (UNDP, 2005; UN, 2004; WHO, 2002).

Figure 2.2 Total fertility rates in various regions of the world (UN, 2004).



the birth rate. The HDI and the average number of children per woman are also strongly correlated: the higher the HDI, the lower the number of children per woman (Figure 2.1).

In developing countries, the pattern of the demographic transition follows that of the emerging economies and the developed countries, and shows convergence to the same average number of children per woman (Wilson, 2001). In India, for example, the birth rate fell from over five children per woman in 1975, to less than three in 2005. However, there is still a wide variation between countries, which can be attributed to the various phases of the demographic transition. There are still many Sub-Saharan countries with an average of over five children per woman. However, here too, this rate has been falling during the Eighties (Figure 2.2).

In almost all countries, this process of demographic transition is ongoing, or has been completed. The *Baseline scenario* shows the world population expanding to 8.7 billion people in the year 2040. Of course, this may turn out to be higher if the modernisation process stagnates, or lower if the process accelerates. In the higher and lower population variants of the United Nations – where the average number of children per woman may be plus or minus half a child – the world population in 2040 could vary by plus or minus one billion.

In addition to this demographic transition, the epidemiological transition is also closely related to the HDI. Alongside lower death rates, developments also show a move from more traditional infectious diseases and hunger-related illnesses, toward modern, lifestyle-related diseases, such as cancer, heart and cardio-vascular diseases (Figure 2.1 and Section 2.2.4).

2.2 Global trends in incomes, education and health

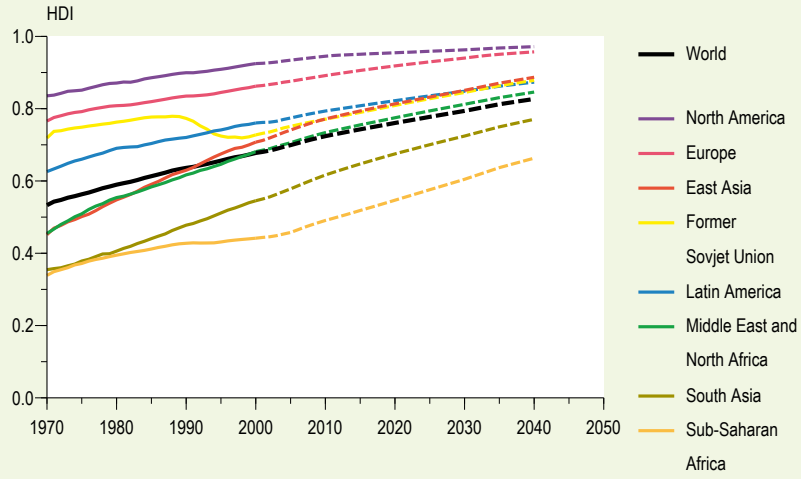
The HDI consists of three aspects that are closely interlinked: incomes, education and health. This section discusses the worldwide development of HDI, the three individual components included and the relationship between them.

Average HDI increases worldwide
Improved incomes, education and life expectancy have resulted in higher HDI rates in almost all regions of the world over the past 30 years (Figure 2.3). East Asia (including China) and South Asia show accelerated growth patterns over the past decades. The former Soviet Union and Central and Eastern Europe also show an upward trend again, after a drop during the 1990s. However, where HDI is concerned, these regions are now being overtaken by East Asia and Latin America.

Africa, in particular, is still lagging behind
The region that shows a striking pattern of development is Sub-Saharan Africa. After a cautious increase during the Seventies, the following decades clearly saw the effects of economic stagnation and the consequences of HIV/AIDS. The growth of HDI in this region has, therefore, almost entirely stagnated. This is why Sub-Saharan Africa now clearly lags much further behind other regions. One positive point to mention is that education has made progress.

HDI will increase further over the next few decades
According to the *Baseline scenario*, the HDI will improve further over the next 30 years, even in Sub-Saharan Africa. This scenario assumes that the HIV/AIDS epidemic in Africa will be largely under control (UN, 2004), thus partly

Figure 2.3 Human Development Index in world regions 1970 - 2040 (Source: Hilderink, 2003, based on UN, 2004; UNDP, 2006; UNESCO, 2002).



causing improved economic growth in this region. However, according to the *Baseline scenario* Sub-Saharan Africa will still lag far behind other regions, even in 2040.

2.2.1 Rising incomes

The 'income per capita' is a common indicator of people's capacity to purchase goods and services. If there is more income available, this contributes to a better literacy level and better healthcare, which in turn contribute to a better income. Alleviating poverty has, therefore, been a focal point in development policy for many years; the aim is to reduce absolute hardship and increase the individual's development opportunities.

Does economic growth lead to less poverty?
To what extent does a higher average income lead to extra poverty reduction, the so-called 'pro-poor growth' (World Bank, 2007)? There are different points of view. Research studies show that economic growth is distribution-neutral, which means that inequality does not significantly change as the average income rises (Dollar and Kraay, 2002). This means that incomes of the poorest people increase approximately equal to the average income. However, this does result in widening of the gap between the rich and the poor in absolute terms. Therefore, the division of power, possessions and access to markets and services become more unequal, which can worsen the position of the lowest income groups. Some, therefore, do not see equal growth as pro-poor growth (Woodward and Simms, 2007). There are signs that international aid and trade have a positive effect on the growth of incomes among the poor (World Bank, 2007).

Incomes increase almost everywhere, except in Sub-Saharan Africa
The GDP per capita of the world population has increased by 50% over the past 30 years, from 4,000 US dollars in 1970 to 6,800 US dollars in 2000 (World Bank, 2006d) (Figure 2.4). In East Asia the GDP per capita has increased almost fivefold, and South Asia has also seen a significant increase (i.e. double, in 30 years). However, the GDP per capita in the least developed countries has barely increased, with Sub-Saharan Africa even seeing a drop of 6% in 2003, compared to 1970 levels.

Absolute poverty, particularly in Sub-Saharan Africa and South Asia
A much-used international measure of absolute poverty is the less than one US dollar a day income for spending on basic daily needs, such as food, drink, clothes and shelter. The average amount of two dollars per day is also used to measure poverty. In 2003 there were over one billion people living below the poverty line of one US dollar per day, and 2.6 billion living under the two-dollar level. The situation is most urgent in Sub-Saharan Africa, where 45% live in poverty, and in South Asia, where 33% live under the one-dollar poverty level.

South Asia and sub-Saharan Africa will continue to lag behind over the coming decades
According to the *Baseline scenario*, over the next 30 years average incomes will continue to rise, most in developing countries. In East Asia, particularly in China, this projected continuing growth means that this country will make the transition from the lower-income group to the medium-income group. South Asia and Sub-Saharan Africa will continue to lag behind, despite having a higher growth pattern than in the past.

Figure 2.4 Trends in average income for the various world regions, 1970 – 2040.

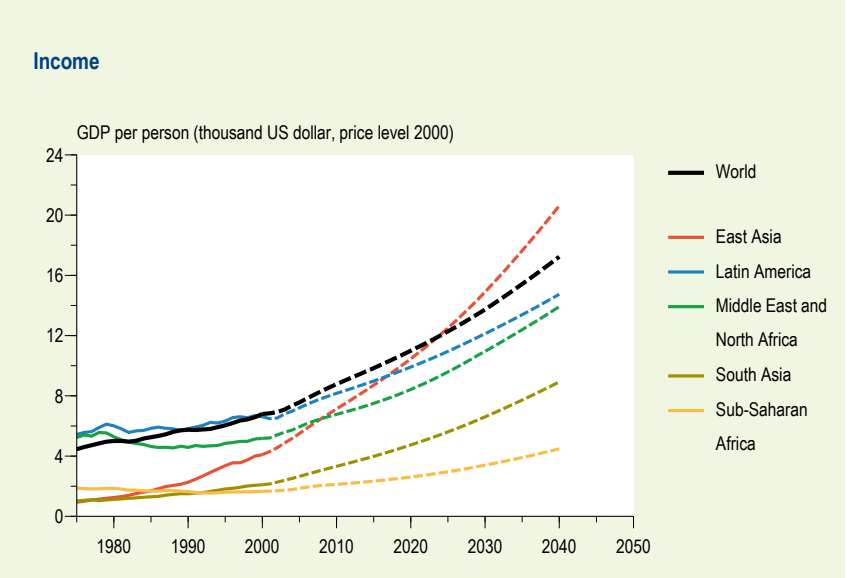
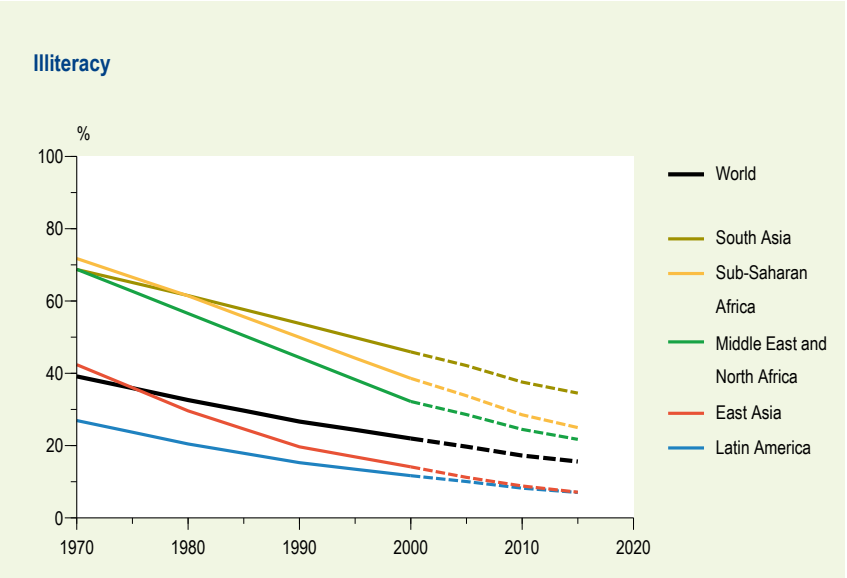


Figure 2.5 Adult illiteracy in the various world regions, 1970 – 2015 (UNESCO, 2002).



2.2.2 Education and literacy

The second dimension of the HDI involves knowledge and the opportunity to gain knowledge, that is, to learn. This is an essential aspect of the quality of life, and the possible choices that people can make in their lives. 'There is no better developmental instrument than education. Literacy forms the bridge between misery and hope, the defence against poverty and the road to development', according to Kofi Annan.

Worldwide progress in education

Worldwide, considerable progress has been made in the field of education. The adult illiteracy rate fell from 39% in 1970 to 22% in 2000 (Figure 2.5). This progress has been particularly significant in Sub-Saharan Africa and North Africa, in South and West Asia, and in the Middle East. During the Seventies these regions had a high percentage of illiterates, which has now dropped overall by almost half.

Education in rural areas and among girls still lags behind

Almost 90% of the 900 million illiterates live in the least developed regions of the world, often in rural areas. However, there is hope for improvement, as the percentage of children attending primary school in these regions rose from 54% in 1990 to 68% in 2002 (World Bank, 2006d). However, there are still wide differences within regions and countries. Many children who do not go to school often come from poor families, live in rural areas and often have mothers who did not have any education (UNESCO, 2007).

It is predominantly the girls who do not go to school. Although the gap between boys and girls is diminishing in all regions of the world, there are still several reasons why

girls do not go to school. Sometimes it is the parents who do not find it necessary to send their daughters to school, because they have to help around the house and are later expected to marry and have children of their own. Sometimes factors such as safety play a role, for example, with respect to transport to and from school. For boys too, there may be obstructional factors why they do not go to school. For example, the continuation of the farm/company may be endangered if boys prefer to work in areas that better match their education and interests once they have finished school. Dutch history also shows us that a universal right to an education is not always automatic, because even after the implementation of the Compulsory Education Act in 1900, exceptions were still made for farmers' families during times of war, and daughters could remain at home to care for the family.

2.2.3 Life expectancy

Life expectancy has increased everywhere, except in Sub-Saharan Africa

Life expectancy has increased everywhere over the past 30 years (Figure 2.6). On average, life expectancy has been extended by around eight years. Remarkably, however, the growth in life expectancy for a 65-year-old, worldwide, is around 16 years. In developed countries this is 1.3 years more, and in developing countries 1.4 years less, although at birth the difference in life expectancy between these regions is still 12 years. When children in developing countries survive the vulnerable first years of life (with infectious diseases, malnutrition and diarrhoea), their mortality patterns resembles those in developed countries. However, HIV/AIDS distorts this image. Sub-Saharan Africa stands out as the region where life expectancy has fallen since the Eighties, mostly due to the effects of HIV/AIDS. Other factors also play a role, such as civil conflicts, economic stagnation and resurgent infectious diseases, such as malaria and tuberculosis. The *Baseline scenario* for Africa shows that, here too, the life expectancy is expected to increase again. This assumes that the spread of HIV will be reduced and that antiviral medications will be more widely available. It also assumes that Africa will become more economically and politically stable, although the gap between Sub-Saharan Africa and the rest of the world will remain considerable.

Large differences in life expectancy

In a number of African countries, such as Zambia and Zimbabwe, the average life expectancy is currently less than 40 years. This level contrasts sharply with 82 years in Japan, which has the highest life expectancy in the world. There is also considerable variety among the infant mortality rates. In the most developed countries this is well under 10 children per 1000 births, while in some countries in Sub-Saharan Africa this level is over 150. Of the average six children born per woman in Sierra Leone, one will die before its first birthday. On average, a second child will die before its fifth birthday, and a third will die before it is 45 years old. The most important reasons for this are the lack of basic healthcare, malnutrition, a lack of clean drinking water and the prevalence of HIV/AIDS.

2.2.4 Health and causes of health loss

Health means more than just life expectancy; it can be defined as a condition of complete physical, mental and social well-being. Diseases are often the result of being exposed to health risks; there is a wide range of health risks and associated diseases. The epidemiological transition describes how causes of death have changed from infectious diseases (such as diarrhoea, malaria, bronchial infections) to chronic illnesses. This transition shows a shift

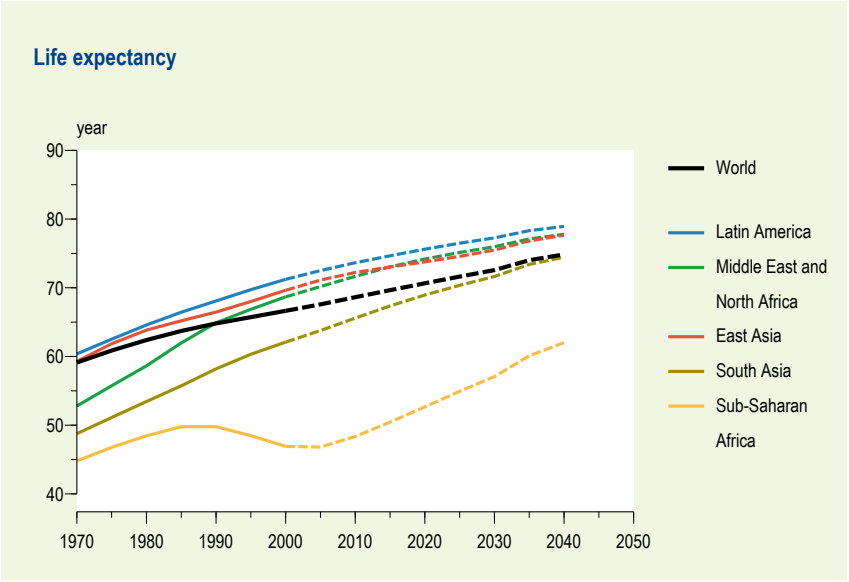
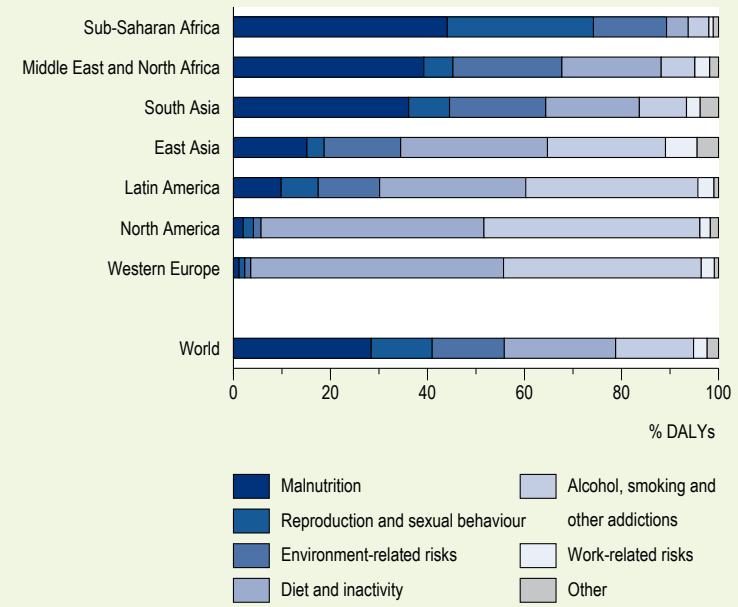


Figure 2.6 Life expectancy at birth, 1970 – 2040 (UN, 2004).

Figure 2.7 Relative health loss (in Disability-adjusted Life Years, DALYs), by risk factors (WHO, 2002).



in health risks due to malnutrition, air pollution caused by the use of traditional fuels, and the lack of clean drinking water and sanitary facilities, to risks that are related to behavioural factors, such as smoking, alcohol consumption and eating too much and too fat.

Risk factors in developing countries: malnutrition, environment and HIV/AIDS

In Sub-Saharan Africa over 40% of the population suffer from malnutrition as a health risk, primarily caused by a unequal distribution (see text box 'Food supply, a matter of distribution'). This is followed by HIV/AIDS (30%) and the environment (15%) (Figure 2.7). The 'environment' refers to aspects such as access to clean drinking water and sanitary facilities, as well as air pollution. Malnutrition and the environment are also important risk factors in areas such as the Middle East and South Asia. HIV/AIDS plays a lesser role here, although HIV-related infections have increased here, too, over the past few years. The burden of disease often falls disproportionately on young children. In Africa, children under five years old carry 45% of the disease burden, while they make up only 16% of the population. Many children die from malnutrition and infectious diseases (WHO, 2005b). Over two-thirds of all children die from preventable causes, such as malaria, diarrhoea, bronchial infections and measles.

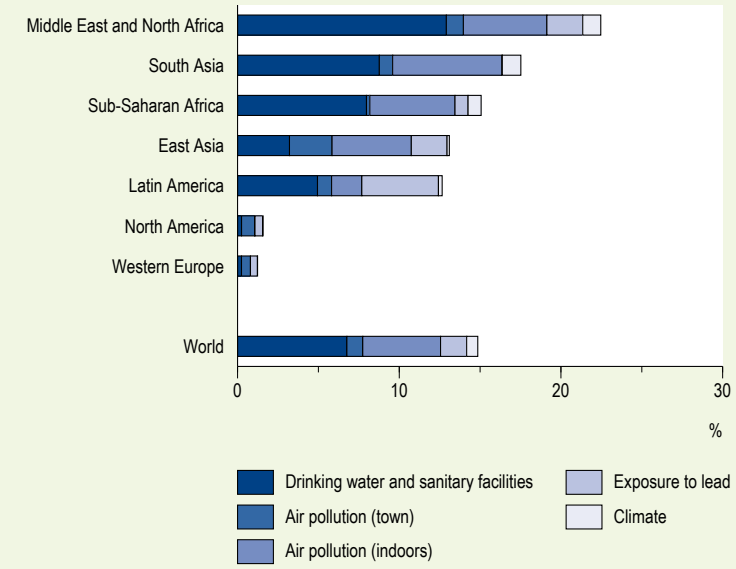
Food supply, a matter of distribution

The worldwide food production could feed everyone, however, there are still 850 million people around the world who do not have enough to eat every day, particularly in Asia and Sub-Saharan Africa (FAO, 2006). Over 6 million people die from hunger every year (WHO, 2002). Malnutrition and insufficient body weight are deadly when combined with other health risks, such as malaria and diarrhoea. Where food supplies used to be a problem of supply and demand, this is currently related to poverty and market access, so the security of food supplies is now more of a distribution problem.

Health risks increase due to conflict situations

Conflict situations do not always lead directly to health loss, but often exacerbate other risk factors. In 2000, 310,000 people died as a direct result of civil unrest, mostly in Africa and Southeast Asia. The indirect effects of civil conflict on the mortality rate is probably around nine times higher, although considerable uncertainty surrounds this estimate as deaths are not registered during conflict situations (Garfield and Neugut, 1997; Murray *et al.*, 2002). During civil unrest the quality of life is not only damaged by the outbreak of infectious diseases, malnutrition and difficulty in obtaining basic healthcare, but also due to the collapse of all kinds of social structures.

Figure 2.8 Contribution of specific environmental factors to health loss (WHO, 2002).



HIV/AIDS disastrous for development

HIV/AIDS has had a disastrous effect on health: in some parts of the world 30 years of progress (in terms of life expectancy) have been nullified by this disease. Social and economic structures have also been undermined. Young men and women have been particularly hard hit. The most productive age group has been largely removed, including many healthcare personnel and teachers, who are important pillars for development (UNAIDS, 2006). Thus, in addition to the direct effect on life expectancy, HIV/AIDS also has had an indirect negative effect on education, health and incomes.

Clean drinking water and sanitary facilities for more and more people

One of the most important environmental factors is the lack of overall access to clean drinking water and sanitary facilities (Figure 2.8). Over the past 20 years, 2.4 billion people have been given access to clean drinking water. Although 83% of the world's population now have access to clean drinking water, there are still 1.1 billion people who do not. This results in more than just health problems. In regions where access to clean water is limited, women have to spend a lot of time fetching water, sometimes up to 15-17 hours per week (UNDP, 2006). The situation concerning sanitation is also pressing, since there are 2.4 billion people worldwide who do not have adequate sanitary facilities. Most of the people without good facilities live in Asia and Africa. Many of the current drinking water and sanitary facilities are under pressure due to high population growth rates and urbanisation.

1.6 million deaths per year from indoor air pollution

One of the most important environmental factors is indoor air pollution. Of the 2.4 million deaths (worldwide) due to air pollution in 2000, 1.6 million were caused by indoor air pollution (WHO, 2002). This is because most people still use traditional fuels, such as brushwood, charcoal and manure for heating and cooking, without providing adequate ventilation. Women and children suffer most from this indoor air pollution. This not only results in many victims, but a lot of time is also lost in collecting these fuels – time that could have been spent on education or other work. Access to modern energy is, therefore, also a relevant factor for development (see text box 'Improved access to

Improved access to energy is important for development

In developing countries many people do not have access to modern forms of energy and electricity. In 2030, there will still be 1.4 billion people without access to power in their homes, primarily in Sub-Saharan Africa and South Asia (OECD/IEA, 2004). The number of people who depend on traditional biomass to cook and to heat their homes is expected to increase from 2.4 billion in 2000 to 2.7 billion in 2030 (OECD/IEA, 2004). Improved access to energy is an important condition for development. The use of modern energy leads to less health loss when cooking and heating, and reliable access to electricity and energy in the form of mechanical power offers new opportunities for local commercialisation and also saves a lot of time.

Energy targets have not been included in the Millennium Development Goals (MDGs). In order to achieve the MDGs in all countries by 2015, 50% of the people currently using traditional biomass for cooking will need to have reliable access to electricity and modern fuels (Modi *et al.*, 2006).

The 2007 Coalition Agreement in the Netherlands has set a target of supplying 10 million people with modern energy in a sustainable fashion, ultimately by 2015. Just as with the Netherlands' choice of electricity generation, here too the question is raised as to which form of energy generation will be implemented (see Chapter 3). The Netherlands' policy could focus on harmonising development policy with energy and climate policy. This could, for example, be achieved by using development funds to encourage the use of renewable energy sources.

energy is important for development'). The remaining 800 thousend deaths due to air pollution are primarily caused by air pollution in the large towns, particularly in the fast-developing Asian economies.

Health effects of climate change can be extensive
The climate affects health in various ways – both direct and indirect (Epstein and Mills, 2006). Extreme weather conditions, such as drought and floods, take their annual toll, but even the gradual warming of the earth forms a threat. Infectious diseases are spread faster as the temperature rises. The current worldwide health loss as a result of the climate is less than 1% (WHO, 2002), but the health effects will continue to increase as the earth becomes warmer and the precipitation patterns change further (IPCC, 2007).

Chronic diseases are on the move, also in developing countries
The picture in industrial regions, such as Europe, is completely different to that in developing countries. In developed countries the disease burden in children is 6% of the total impact, corresponding to their number in the total population. In Europe, the disease burden is more prominent in people over 45 years old. This is largely due to the underlying risk factors, such as addictions (e.g. smoking and alcohol consumption), diet and inactivity (causing overweight). Overweight has always been strongly associated with developed countries, but now this problem is also increasing in developing countries. There are currently over 1.5 billion people who are overweight, which is more than the total suffering from malnutrition. According to the *Baseline scenario*, chronic diseases such as cardiovascular disorders, cancer and diabetes, will, in 2030, cause half of all deaths around the world (Mathers and Loncar, 2006). By then, even in Africa, these diseases will have taken a prominent place (at over 20%), alongside the more traditional infectious diseases. The occurrence of both infection and chronic disease is known as the 'double burden of disease' (Gaziano, 2007).

2.3 Targets and policy tasks

Global targets for development defined in the MDGs
The MDGs are the most well-known policy targets for development. The MDGs comprise quantitative targets for 2015, including halving extreme poverty and hunger (see text box 'Millennium Development Goals'), and focus primarily on the basic development of countries, where development targets are formulated for both the short and the long term. The short-term targets (quick wins) indicate how many early deaths can be prevented (within ten years), for example, through food supplements, installing mosquito nets and condom use. At the same time, it is important to structurally improve the development of a country, safeguarding long-term development. For example, this means transferring knowledge and technology to increase agricultural productivity, improving access to energy and education, and setting up (and maintaining) a basic healthcare system.

Millennium Development Goals (MDGs)

The MDGs form the most important targets of the various UN conferences held during the 1990s. Eight goals were defined to reflect the realisation that development is multidimensional, with people's welfare or quality of life being the most important objective:

MDG1: Halve the percentage of people that have to live on less than one dollar a day and the percentage of people that suffer from hunger.
MDG2: Achieve universal primary education.
MDG3: Eliminate gender disparity and empower women.
MDG4: Reduce child mortality by two-thirds.
MDG5: Improve maternal health.
MDG6: Combat HIV/AIDS, malaria and other diseases.
MDG7: Ensure environmental sustainability.
MDG8: Develop a global partnership for development.

The relationship between the MDGs and the Human Development Index can be seen as follows:

Income →	MDG1 (to halve poverty and hunger)
Education →	MDG2 and 3 (send everyone to primary school, ensure gender equality in schooling and empower women)
Health →	MDG4, 5 and 6 (reduce child mortality, improve maternal health and combat serious diseases)

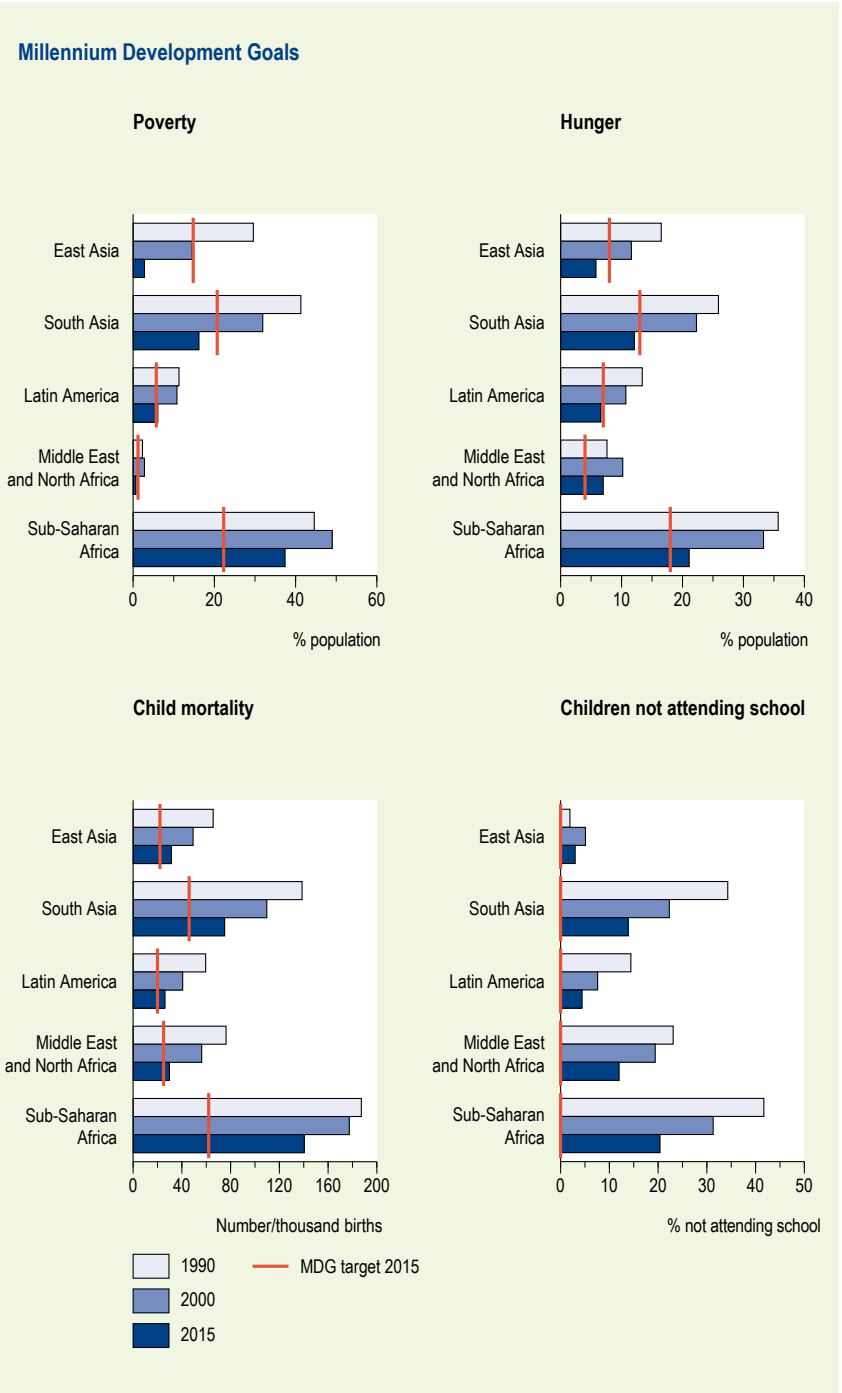
Composition of MDGs is crucial

The MDGs should be seen as a complete package. If one of the MDGs is achieved, this will make a positive contribution to the others. Progress in education also helps to reduce child and maternal mortality. In addition to these strengthening effects, there may also be some competition between the various MDGs, so that they work counterproductively. A good example is an HIV/AIDS programme that may require so many of the available healthcare personnel that it will be detrimental to other healthcare programmes.

Not all MDGs are achieved everywhere

East Asian and Latin American countries seem to have found the road to development, and will probably achieve most of the MDGs before 2015 (Figure 2.9). However, additional efforts will be required in the other regions. Sub-Saharan Africa, in particular, seems nowhere near to achieving the goals for poverty, education and health. South Asia has made better progress but also not sufficient to achieve all goals.

Figure 2.9 Millennium development goals for poverty, hunger, school-age children and child mortality.



Halving global poverty and hunger narrowly achieved
If current trends continue, the world as a whole may just about achieve to halve poverty and hunger (MDG1). This result will largely be determined by China. Sub-Saharan Africa will certainly not achieve this goal without additional policies. The number of people who are forced to live on less than one US dollar a day may even rise slightly, in absolute terms. Additional policies to alleviate hunger will also be required in the Middle East and North Africa if this goal is to be achieved.

All children at school apparently hard to achieve
Significant progress has been made over the past decades. Globally, over 80% of all children attend school, but the goal to give all children a basic education (MDG2) seems difficult for many regions to achieve. Particularly Sub-Saharan Africa and, to a lesser extent, the Middle East and North Africa, still have a long way to go. Even South Asia is behind schedule, but has made considerable progress over the past ten years.

Health goals still have a long way to go
The goals to reduce child mortality rates by two-thirds in the year 2015 (MDG4) and reduce maternal mortality by three-quarters (MDG5), seem nowhere near to being achieved. Again, this is particularly true in Sub-Saharan Africa. In 1990, some 9.5% of children (worldwide) died before their fifth birthday. The goal to reduce this by two-thirds may be achievable around 2040-2050, but certainly not in 2015.

The number of AIDS-related deaths will continue to increase, from 2.9 million in 2006, to 6.5 million in 2030, assuming that HIV/AIDS continues to be spread at the current rate, that no extra prevention policies are implemented, and that antiviral medication is made available for 80% of the people suffering from this disease (WHO, 2006; Mathers and Loncar, 2006). The number of malaria-related deaths is expected to fall everywhere, from almost 900,000 to 600,000 deaths per year (WHO, 2006). Since over 90% of all malaria-related deaths occur in Sub-Saharan Africa, this is one of the few positive projections for this region. Partially as a result of this improvement, the goal to reduce infectious diseases (MDG6) will probably be achieved in part.

The goal to improve drinking water supplies (MDG7) will certainly be achieved globally, primarily due to developments in South Asia and Latin America. Other regions remain behind schedule, although they have also made considerable progress and the goal is now in sight. However, the goal concerning access to sanitation (MDG7) seems unlikely to be achieved, at the global level, while the picture in the various regions is often different. A number of countries and regions (primarily China) seem to be progressing well, although Sub-Saharan Africa has made little progress.

MDGs are also at the centre of the Netherlands development policy
The Netherlands development cooperation policy is defined in the official memorandum entitled *Aan elkaar verplicht* (Committed to each other) (DGIS, 2003). Sustainable poverty alleviation is the major issue, with several adjoining themes such as education, HIV/AIDS, water and the environment, reproductive health and good governance. The Netherlands has selected these themes because they contribute to the achievement of the MDGs in 2015. In the Coalition Agreement, the government has recently underlined the importance of the MDGs, together with harmonising bilateral aid and further debt cancellation (Ministry of General Affairs, 2007). Government policy also focuses on making development policy better and more effective, plus ways to make the input and results of the Netherlands' efforts more transparent. Partly as a result of these goals, the number of so-called partner countries receiving bilateral aid has been reduced from 49 to 36. The most important condition for a country to be eligible for poverty alleviation is good governance. This means 'the political will and institutional climate to protect human rights, democratic principles and the rule of law, where human and natural aid sources, as well as economic and financial resources, are managed in a transparent and responsible manner, for justifiable and sustainable development' (DGIS, 2003).

The Netherlands' development policy in relation to other policy areas
The present Dutch government coalition (known as Balkenende IV) also sees the MDGs as an important part of the broader sustainable development agenda. This extends much further than just the traditional development cooperation (Minister for Development Cooperation, 2007). An essential element here is that the MDGs are viewed not just as an intertwined set of targets, but also in relation to other factors. For example, poverty alleviation can be achieved by encouraging the agriculture and informal sectors, partly because this is where employment for the poor is often concentrated. The Dutch Cabinet also recognises that development cooperation efforts should be implemented in collaboration with the Ministry of Economic Affairs (EZ), and the Ministry of Housing, Spatial Planning and the Environment (VROM), to achieve a sustainable energy supply, even in developing countries.

2.4 Policy options and instruments for the MDGs

Conditions for development
Many MDGs will not be achieved without additional policies. However, there are no simple solutions to this problem because of the complexity of the development agenda. The development of a country cannot generally be attributed to a single crucial factor, but depends on a mix of socio-economic, demographic, infrastructural, geographic and climate factors. These factors can also play a different role in each country (see text box 'Factors for development success/failure'). MDG8 shows the conditions that must be met for a number of aspects, for instance, by building a global partnership for development. This MDG serves as a starting point to describe possible options by which the other seven MDGs can be brought closer to realisation.

Global partnership to achieve MDGs
MDG8 is about 'global partnership for development' and focuses on a number of facets of development aid, which, collectively, should lead to a practical approach to the development agenda. These are:

- Official development assistance (ODA);
- Debt cancellation for the least developed countries;
- Access to (world) markets;
- Availability of affordable medicines and new technologies;
- Reducing youth unemployment levels (this subject is not included in this document).

Partnership of various stakeholders
A global partnership requires that various stakeholders work together at various levels. Firstly, the governments of developing countries play an important role here. The donor countries are also active, via bilateral aid programmes or multilateral institutions; included here are the United Nations, World Bank, World Trade Organisation (WTO) and the European Union. The business community also has an important role to play via public-private cooperation projects and FDI (Foreign Direct Investment). A fourth group includes the non-governmental organisations (NGOs), which do not fall directly under the government, but often play a supporting financial role through Western governments and as advisors to the UN. Finally, we must not forget the money that migrants living abroad send to their families back home. This private money amounts to a considerable quantity (Figure 2.10) and is important for development (see text box 'Private finances are difficult for the government to influence').

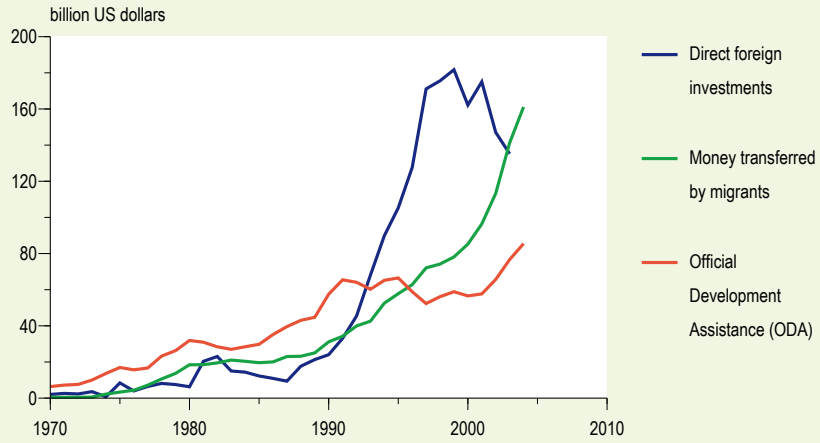
Factors for development success/failure

Many books have been written on the question of why some countries fall behind in economic growth. Reasons include: HIV/AIDS and other infectious diseases (Thomas Friedman), corruption and bad management (Joseph Stiglitz), the role of the informal economy (Hernando De Soto), the warm climate (David Landes) and being landlocked (Jeffrey Sachs). Jared Diamond even claims it is because zebras cannot be tamed, whereas in Europe horses have aided development for centuries. The World Bank sees a parallel with the 'O-ring theory of economic development'. In 1986, a faulty O-ring caused the Space Shuttle to explode. The lesson was: every (tiny) item must work correctly. A country may not be able to develop because the necessary conditions have not been met. Stiglitz indicates that education is important, but so is employment. Markets need to be open, but an infrastructure is also required. Markets form the central point of every successful economy, although the government needs to provide the right climate in which the business community can function. A physical and institutional infrastructure is essential, such as laws to ensure solid banking and reliable stock market sectors, as well as to prevent companies forming monopolies and oligopolies.

Governments must implement a powerful competitive policy for crucial sectors, such as telecommunications. According to Stiglitz, East Asian countries realise that success requires social and political stability, and that this demands both a high employment rate and limited inequality.

There are many reasons why Africa lags behind in development targets. Many African countries did not gain independent status until the beginning of the Sixties. They had no experience with self-government, included few educated people in their ranks and had hardly any institutional and physical infrastructure. Corruption was rife and dictators often came to power; countries borrowed money under unfavourable conditions; markets were opened, although the countries themselves had little to sell. These are just a few of the reasons given. Countries also failed to attract foreign capital, and the fast-growing markets in Asia seemed a better option. In the meantime, countries were faced with high population growth, less-productive agricultural sectors – the green revolution largely missed Africa – and HIV/AIDS manifested itself, primarily in African countries.

Figure 2.10 International financial flows to developing countries (Source: OECD/World Bank).



Private finances are difficult for the government to influence

Over the past few decades, private finances (FDI, money transferred by migrants and through microcredit facilities) have increased significantly. FDI and money transfers by migrants currently amount to more money than the official development aid. However, government policies have little influence over this private money.

During the Nineties, FDI by companies rose considerably, although over the past few years this flow of money has fallen once again (Figure 2.10). FDI can contribute to economic growth and social, infrastructural and technological development in developing countries. FDI is largely credited to the accounts of multinationals. Here too, the Dutch government has little direct influence over FDI, although corporate social responsibility (CSR) and chain liability can encourage FDI to be used in a sustainable manner in developing countries (see Chapter 5). The relationships between the various developing countries have also become more important, recently. The increasingly large investments in Africa (by China and India) are good examples. This relationship – also known as the new 'silk route' – has given a boost to the economic growth in Africa (Broadman, 2007), although there are also concerns that this growth is not sustainable (DGIS, 2006).

The transfer of money by a migrant to his/her family has generally a positive effect on poverty alleviation and boosts investments in education. The economic advantages of migration (for those remaining behind) can be utilised more fully by issuing temporary work permits, making money transfers easier and reducing transfer charges (World Bank, 2006b). The Dutch government cannot exert any direct influence over these financial transactions or the amount of the transaction charges; this is determined by the banks themselves. However, the government can initiate a dialogue with the banks and, if necessary, pay part of the transaction charges itself. The expected reduction in the working population of developed countries can also offer economic advantages for migration. Since migration often concerns only a small fraction of the total number of highly qualified people, the national loss of skilled people (the 'brain drain') would appear to be small. For the poorest, smaller countries (such as Jamaica, Haiti and a number of African countries) the brain drain is certainly a problem, and one that has become worse over the past 15 years (World Bank, 2006b, UNCTAD, 2007). Money transfers also appear to encourage the emigration intentions of family members in the land of origin, and thus contribute to a new migration exodus (Van Dalen *et al.*, 2005).

Microcredits are small loans that are allocated mainly to small entrepreneurs in developing countries who, due to lack of collateral or fixed monthly income, cannot obtain loans via the traditional banks. A microcredit allows these entrepreneurs to invest in basic necessities for their company, such as purchasing a cow or a sewing machine, or to furnish their shop. Such investments can improve their financial position in the long term. Microcredits are usually provided by private organisations. Government policies can play a role by promoting microcredits and urging reduction in international transaction costs. However, just as with money transfers from migrants, it is the banks themselves that determine the actual tariffs.

2.4.1 Official development assistance (ODA)

ODA is the most direct form of development policy. In addition to the amount of money made available, it is important how this development assistance is organised using the funds available (e.g. bilateral or via the UN), and which countries receive this assistance. It is also important to know how the money is actually spent.

Donor countries give too little development cooperation
International donor countries have agreed to allocate at least 0.7% of their total GDP to development cooperation. However, in 2005 the amount of ODA from all donor countries totalled only 0.33% of the GDP (Figure 2.11), and in 2006 this was reduced further, both in relative and absolute terms (OECD, 2007).

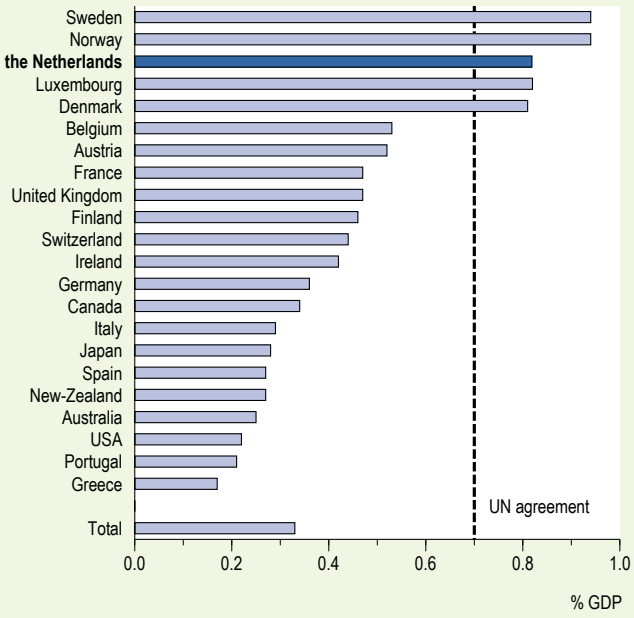
In addition to the Netherlands, only four other European countries spend more on development cooperation than the agreed 0.7% (OECD, 2007). If all EU countries were to keep to this agreement, the MDGs would be achieved (see text box 'Over half a percent GDP is sufficient to achieve MDGs'). In 2003, the Netherlands donated around 40% of the ODA to social infrastructure and services (health, education), 13% to economic infrastructure (transport, energy, agriculture and trade) and 12% to emergency aid, with the remainder being spent on smaller items (Van Dalen and Reuser, 2006).

Over half a percent GDP is sufficient to achieve MDGs

The UN Millennium Project (UN Millennium Project, 2005) has calculated what is required to achieve the MDGs and how much this will cost. This analysis was conducted for five countries. The results showed that annual investments of around 70-80 US dollars per person (in 2006) need to be raised to 120-160 US dollars per person in 2015, in order to achieve the MDG targets. Of this, 13-25 US dollars needed to be spent on health in 2006, increasing to 30-48 US dollars in 2015 (the higher costs being necessary for countries with widespread HIV infection). Around one-third of the total budget needs to be spent on education and health, although energy and road infrastructure also form an important segment of the total. An increasing proportion of these investments will need to be allocated for scaling up local public investments in primary education and healthcare (an increase of around 4% of the GDP), as well as scaling up private investments in agricultural productivity, secondary education, energy supplies, clean drinking water and sanitary facilities. Most developing countries will still have a 10-20% shortfall in GDP, which will be increased further due to a number of extra costs (capacity building, debt cancellation and implementing international cooperation). The total amount required to achieve the MDGs, therefore, amounts to 121 billion US dollars (in 2006) to 189 billion in 2015. The ODA required totals 135 billion US dollars (in 2006) to 195 billion in 2015. Taking everything into account, for donor countries this amounts to 0.44% of their GDP (in 2006) and 0.54% in 2015.

Figure 2.11 ODA as a percentage of GDP, 2005 (OECD, 2007).

Funds for development cooperation, 2005



Urging countries to fulfil ODA agreements
Since 1975, the Netherlands has allocated more funds for development purposes than the UN target (0.7% of the national GDP). There is, therefore, no immediate reason why the Netherlands should make even more money available to ODA. However, the Netherlands can call for other countries, both in European and global contexts, to fulfil their ODA commitments. The Netherlands has already done so within the EU, which in part has led to the 'old' Member States now setting an intermediary goal of 0.56% of GDP in 2010. Unfortunately, there are no enforcement measures available with which to put pressure on these countries. The EU has no authority to force Member States to allocate financial reserves for ODA purposes.

It is currently not clear what exactly falls under the formal definition of ODA. Although military activities should not be included – as stated in the OECD definition –, there seems to be an international trend in financial policies that funds made available for peace-keeping operations and redevelopment are included in the ODA budget (OECD, 2006b). By harmonising the definitions of ODA and excluding military activities, more funds could be made available for direct development cooperation.

Clustering ODA via international organisations
What are the arguments for setting up ODA on a more multilateral basis?

- Clustering offers more scope for scaling up;
- Knowledge and expertise are clustered together;
- Clustering reduces fragmentation of assistance from all types of countries;
- Multilateral assistance can be defined in a more uniform manner (what falls under ODA and what does not), a differentiation that is currently left partly to the donor countries themselves;
- Multilateral assistance counteracts reciprocal aid.

Reciprocal aid refers to financial assistance to developing countries, whereby a percentage of the funds allocated must be spent in the donor country itself. This leads to limited competition, high administrative costs and often to the use of unsuitable technologies. The costs of reciprocal aid appear to be 10-30% higher than for non-reciprocal aid (IBO, 2003). In the Netherlands the amount of formal reciprocal aid is currently around 12%, which is more or less equal to the average for OECD countries, excluding the US (well-known for its high percentage of reciprocal aid (OECD, 2006b)). The 'real' reciprocity as a result of return orders to the Dutch business community is estimated to be over half the amount in Dutch development funds (IBO, 2003). The negative side of multilateral assistance is the fact that the contribution by individual donor countries is less visible, thus reducing the level of support for development assistance.

The funds allocated by the Netherlands to the more coordinated organisations (e.g. World Bank, the UN organisations, such as UNDP and UNFPA) have increased over the past few years (BuZa, 2006). The bilateral channel has become less important, as the percentage has halved over the last five years.

The Netherlands can give EU development policy more control and power
All EU Member States are collectively responsible for around 45 billion euros in Official Development Assistance, which is more than half of all ODA funds worldwide. In contrast to the trade policy, for example, development policy is still far more of a matter for the Member States. The European Commission itself has around 6 billion euros available for development policy, thus, the majority of development funds is being allocated by the Member States themselves. The result is fragmentation, in which an estimated 10-15% of the total budget is lost (*Europa Nu*, 2007). The Netherlands would prefer to see the EU develop a common development policy, provided this complements the development policies of the Member States. Eight percent of the Netherlands ODA currently goes to the EU. A higher budget for development cooperation by the European Commission would probably result in a stronger position compared to other European policy areas. The Netherlands could make more ODA funds available to the European Commission, but, in doing so, they would partly lose their say in the matter of criteria and focal points.

Assisting countries with good governance is more effective, but can exclude poorest countries
The Netherlands and the EU have determined that a country is only eligible for development cooperation if it has a good governance system and respects human rights. Of the Netherlands' 36 bilateral partner countries, 13 currently fall into the category of least-developed countries, with an HDI that is lower than 0.5. In 2002, there were 36 countries worldwide with an HDI of under 0.5. There are, therefore, 23 countries that have a low HDI but do not receive development assistance from the Netherlands. There are a number of reasons for this, including the 'good governance' criterion. If the number of countries eligible for development assistance from the Netherlands were to be reduced further on the basis of the 'good governance' criterion, development assistance would become more effective (see text box 'The Netherlands development policy already assessed as 'good' in several instances'). However, the question rises whether the global poverty problem would be best served by this option. After all, many of the least developed countries do not show 'good governance' (World Bank, 2006c), resulting in these countries being excluded from the assistance programmes.

The Netherlands development policy already assessed as 'good' in several instances

The OECD (2006a) qualifies the Netherlands as leader when it comes to development cooperation policy, at least in terms of accepting new challenges and trying innovative methods. On the Commitment to Development Index (CGD, 2006) the Netherlands tops the list (of 21 countries) for assistance, trade, environment, migration, security and technology. The effectiveness and cohesion of development cooperation has also undergone a national assessment (IBO, 2003; Commissie Dijkstal, 2006). The IBO indicates that the effectiveness and control should form an integrated entity wherever possible, and that considerable improvements in effectivity could be achieved with respect to poverty alleviation (15-38%) if the Netherlands focuses its development assistance more on the countries with good policies and showing good governance.

2.4.2 Debt cancellation

A second important focal point of MDG8, which could also be grouped under ODA, concerns debt cancellation. This means alleviating the amount of debt that developing countries owe to banks, other governments and international financial institutions, such as the World Bank and the IMF (International Monetary Fund). The total debt owed by developing countries amounts to over 2,000 billion US dollars (World Bank, 2006a). Governments pay off their debt (and interest) at over 300 billion US dollars per year.

The Netherlands can cancel debts
The Netherlands has around 4 billion euros in outstanding loans, which yield around 280 million euros per year in interest revenue. The Dutch government could cancel the debts owed by developing countries. The Netherlands' policy is indeed aimed at doing so, but only when there are sufficient guarantees that these released funds will be used to alleviate poverty. This means that countries are only eligible for debt cancellation if they have a reasonable level of 'good governance' and domestic corruption is limited.

The Netherlands could urge the World Bank to cancel debts
The level of debt owed by developing countries could be reduced under strict conditions, which are usually defined by the World Bank and the IMF. These conditions serve to structurally improve the economy of a country, thus ensuring that loans will not be necessary in the future. This often means that markets are opened and all kinds of government processes are liberalised and privatised, and where the costs for basic facilities (water and electricity) often increase. 'The cancelling of debts is only advisable if countries already have improved their policy and governance, and if the cancellation is a one-off procedure, which does not create a pattern of borrowing money and cancelling debt' (IBO, 2003). The Netherlands could urge the World Bank to cancel some of this debt, but it has only a limited influence. Countries have voting rights at the World Bank, based on their financial contribution. The Netherlands only contributes slightly over 2%, while the United States contributes over 16%, and thus has far more voting rights.

Together with other EU Member States, the Netherlands can exert some influence at the World Bank
The EU as a whole is not a member of the World Bank, but all EU Member States are individual members, and together they control almost 30% of the voting rights. Together with Japan and Canada they make up the majority of the votes. If such a coalition would send out a united message, this would exert considerable power. The United Kingdom, France and Germany are permanent members of the 'board of directors', also (together with the USA and Japan).

2.4.3 Trade liberalisation

A third focal point under MDG8 is that developing countries should have better access to (world) markets. If trade barriers are lowered then everyone can profit, including the poorest segment of the population (World Bank, 2007). These trade barriers consist of revenue subsidies, import duties and export subsidies. Revenue subsidies contribute the most to European farmers' incomes, while excise duties and export subsidies interfere the most with normal trading. In particular, the income support paid to EU farmers is seen by developing countries as a constant problem, because they usually cannot provide these levels of income support themselves. If this EU income support is removed, it will encourage honest competition between farmers, both here and elsewhere.

Extra economic growth through free trade
Removing trade barriers can have a positive effect on economic growth in both developing and developed countries (OECD, 2006c). It is difficult to define the actual consequences, but various studies have shown that the global prosperity effect could be 0.3-3.1% of the global GDP, if all countries were to remove all trade barriers (Bouët, 2006). This means not only removing trade barriers between north and south, but also between developing countries themselves (south-south). The south-south trade tariffs are in general higher than other trade tariffs (OECD, 2006c).

Not all countries profit from the same level of growth
As a result of a higher economic growth, complete trade reform would raise an extra 100 million people above the 2-dollar poverty line (World Bank, 2007). However, if an economy is opened for trade and investment, this only has a

positive effect in the longer term. In the short term this effect may even be negative (World Bank, 2007). For example, increased exports in production areas can result in a worse socio-economic development, even if the national average is positive (AidEnviroment, 2007). Since liberalisation and removal of subsidies will cause the food prices on the world market to rise, food-importing countries (such as Bangladesh, China, countries in the Middle East and North Africa) will profit less (or not at all) from this liberalisation. Even countries with a preferential access to the European market (including a number of countries in Sub-Saharan Africa) will initially be disadvantaged by the liberalisation. Food exporting countries, such as Brazil and Argentina, will profit most from trade liberalisation. In Brazil, the fast expansion of soy production has already led to conflicts in several areas (see Chapter 4).

Untrained workers suffer most
Trade liberalisation would increase employment opportunities, but this would not necessarily result in better working conditions (see Chapter 5). It is primarily the skilled workers who will profit the most, with possible wage increases, so that the gap between skilled and unskilled workers will only become wider. Vulnerable groups, such as unskilled workers, will profit far less from liberalisation (FAO, 2005; World Bank, 2007). The FAO proposes a two-track approach for these groups: offering people and communities more ways to profit from the opportunities offered by liberalisation, while, at the same time, offering a safety net for the most vulnerable groups so as to prevent poverty and hunger.

Development is possible, even without trade liberalisation
Although trade liberalisation certainly has a positive effect on prosperity in the longer term, the current trade situation need not be too restrictive to achieve economic growth in developing countries. Examples, both positive (Brazil) and negative (Zimbabwe), show the following factors to be extremely important for achieving stable economic growth:

- good governance;
- focused development assistance;
- attracting foreign investors;
- strengthening human capital;
- encouraging institutions that allow markets to function better and more honestly.

Estimates of the effect of trade liberalisation have also changed over the past few years: the latest studies show the smallest effect (Bouët, 2006). One of the reasons for this concerns the fact that the positive effects of bilateral trade agreements were initially underestimated. The poorest countries usually seem to already have the lowest import tariffs. All together, trade liberalisation can therefore be detrimental to developing countries. Trade liberalisation, combined with focused development assistance and investment, could have a positive effect for both economic growth and human development.

Liberalising the agricultural sector produces winners and losers, including those in Europe
Countries such as Brazil, Argentina, Thailand and Malaysia, as well as Western countries such as Australia and New Zealand, will profit most from the withdrawing of agricultural support by the EU and other rich countries. These countries currently compete with the EU, for example in supplying sugar and beef. European sugar farmers and cattle farmers within the EU will suffer most if the agricultural sector is completely liberalised. The effect of trade liberalisation will, therefore, be greater in countries such as Belgium, France, Spain and Ireland, than in other EU countries. Agriculture in the Netherlands is less influenced by EU policy than in other EU countries, because the percentage of agricultural products that fall under the EU market regulations is much lower (around 50%) than in the EU as a whole (around 80%, EC, 2007). If income support is terminated, the total agricultural income in Europe will fall drastically (Nowicki *et al*., 2006). In large sections of Europe this drop in income is expected to be replaced by larger scale production, specialisation and dropping the price of agricultural land. Farmers will stop working in mountainous areas if the (extra) income support is cancelled (Nowicki *et al*., 2006).

2.4.4 Technology and innovation

A fourth focal point of MDG8, and the last to be discussed here, also concerns allowing developing countries to profit from additional opportunities provided by technological progress. Developing countries do not have the resources to invest much money in research, development and innovation. They are, thus, dependent on foreign investors and on trade, for new technological developments.

Technology and innovation can improve trading position
Technological development and innovation can be favourable for developing countries, in all kinds of ways. Technological improvements in the agricultural sector can increase productivity and boost economic development. Medical technology and affordable, and available, medicines can also have a direct influence on a country's development.

Trade liberalisation is crucial for technology transfer
Low trade tariffs make technology more easily obtainable for developing countries. Trade liberalisation has a particularly positive effect on the price of technologies.

However, current patent restrictions still form a huge obstacle to technology transfer (WHO, 2005a).

A certain level of development is required for technology transfer
In order to transfer technologies efficiently to developing countries, people in the receiving country must be able to work with the new technology. This means, for example, that the receiving region must be stable (so that the business community will invest), there must be sufficient numbers of skilled workers available, and the infrastructure must be sufficiently developed. Therefore, a country needs to have achieved a certain level of structural development, in all kinds of areas. A necessary condition here is that education levels must improve (World Bank, 2007).

2.5 Conclusions

Income, education and health are the three elements of the Human Development Index (HDI), and they are closely interlinked. Countries can only develop if they make simultaneous progress in all three areas. The environment plays a smaller role in health-loss as countries develop further. Further improving food, drinking water and cleaner energy supplies leads to lower mortality rates. In contrast, climate change in the future can have a negative impact on development.

China and India have experienced a period of rapid development, which is expected to continue over the next three decades. China, in particular, can make an important contribution to achieving average global Millennium Development Goals (MDGs). According to the B*aseline scenario*, Sub-Saharan Africa will fail to meet almost all the MDGs. Poverty there will be barely reduced at all, and even the goal concerning child mortality rates cannot be achieved. The goal of sending all children to school is also out of reach. However, the illiteracy rate will continue to drop in Sub-Saharan Africa. Considerable additional policies and efforts by other stakeholders, such as the business community and NGOs, will be required to bring these goals closer to achievement.

Efforts with respect to education and basic healthcare remain crucial to the development of a country, both in the long and short terms. Not just the direct effect on development, but also the ability to profit from trade liberalisation and technology transfer are both important reasons for improving education levels. A basic healthcare system is a necessary precondition for achieving the health-related MDGs.

If the industrialised nations fulfil their commitments and release the funds pledged for development cooperation, the MDGs can be achieved. However, in practice, only five countries, including the Netherlands, have kept their promise to spend at least 0.7% of their GDP on development assistance.

Development cooperation is increasingly occurring via multilateral organisations, although there is also still a considerable flow of bilateral aid from the various individual donor countries. This increases the risk of fragmentation. Around 8% of the development funds allocated by the Netherlands are spent via the EU. Clustering more funds via the EU makes it more difficult for donor countries to see precisely what is achieved with their money. This is in sharp contrast with the fact that the Netherlands aims to make the input and results of Dutch efforts more transparent. Good governance makes development cooperation more effective, but this criterion also excludes a number of developing countries (needing this aid the most) because of their HDI level.

Progress in development in developing countries could be further stimulated by coupling various policy portfolios. The most logical start would be to couple trade policy and development policy. Trade liberalisation could also play an important role in alleviating poverty. Agriculture plays a main role with trade policy; therefore, development cooperation could also become more coherent and effective if agricultural policy were to be coupled to development policy. It is also important to continue helping those countries that cannot profit from improved access to world trade markets by providing parallel development policy support (see Chapter 7).

3 Energy and climate

If current trends continue then greenhouse gas emissions will keep on rising substantially. The EU climate target of keeping the worldwide rise in temperature below 2 °C will not be met, unless new and widely supported policies are introduced. In addition to the EU, large countries such as the United States, but also China and India, must reduce their greenhouse gas emissions within the next ten years. The more countries that participate, the lower the costs. It seems feasible to significantly reduce greenhouse gas emissions using existing technologies.

Since there is no global climate coalition, the EU has decided on a unilateral campaign via the European emissions trading system (ETS). In order to make the best use of this approach, it is necessary to expand the system by adding other countries and sectors. Additional objectives, such as the amount of renewable energy used and the rate at which energy is saved, are not necessary to achieve the climate objective, and only lead to extra costs.

In addition to the climate problem, the availability and stability of fossil-based energy supplies remain a concern. According to the latest estimates, there are still sufficient supplies of fossil energy available, although the dependence on a small number of countries supplying oil and gas is increasing. The social concern regarding security of supply has not yet been translated into specific policy objectives. Although the reduced security of supply results in higher prices, the effects for the industrialised nations remain limited. In comparison to the climate problem, the security of our energy supplies seems to be far less important.

Options that are positive for the climate often also have a positive effect on the security of supply. However, the reverse is not always the case. This applies in particular to coal-fired power plants without CO_2 capture and storage. Bearing in mind the long-term effects on the climate, the government could now certainly demand that CO_2 capture and storage be implemented immediately, although additional policies would be necessary.

Eventually, the fossil sources will become depleted, so new technologies will need to play an important role in the long-term future. However, these options are currently still expensive (solar-powered electricity generation) and uncertain (nuclear fusion). Both the vast amounts of money involved and the considerable uncertainty justify a coordinating role for governments.

Society greatly depends on a clean, reliable and affordable energy supply. Continuous availability of affordable and clean energy is a criterion for sustainable economic growth. However, this availability does not occur by itself. Oil and gas stocks become depleted, and economic growth in a continually larger section of the world is demanding more and more energy, which, in turn, leads to tensions on the energy markets. Greenhouse gas emissions and increased climate change are the negative effects that result from current energy consumption levels. One of the greatest challenges is, therefore, to change current energy consumption levels so that global warming can be kept within safe limits. One should keep in mind that most of the world's population assign another meaning to the terms 'clean, available and affordable'. Hundreds of millions of people worldwide have no access to modern, affordable and clean energy. The dependency on brushwood and waste for cooking and heating is considerable for those who have no electricity. This important aspect of a worldwide sustainable energy supply ('energy for development') is not covered in this chapter, but is discussed in Chapter 2.

Clean, available and affordable are important aspects of a sustainable energy supply and cannot be seen as separate items. This requires careful consideration, both for the short and longer terms.

3.1 Global trends

Worldwide demand for energy continues to expand
The total demand for energy has increased enormously over the past century, and this trend is expected to continue into the future (Figure 3.1). The *Baseline scenario* predicts (and this Outlook assumes) that, in 2040, people (worldwide) will use 75% more energy than in 2005. This is an average increase of 1.3% per year. This increase in energy consumption will primarily occur in developing countries, where the demand for energy will increase by an average of 2% per year, compared with 0.5% in the developed OECD countries (see Appendix 3 for an overview of the OECD countries). The fast-growing industrialised developing countries (such as China, India and Brazil) will consume a continually increasing percentage of the worldwide energy. In just a few years' time, non-OECD countries will consume more energy than the OECD region.

World becomes more energy conscious
Improvements in energy intensity will help to limit the demand for energy. Energy intensity refers to the amount of energy used per unit of GDP. Industrialised nations now require one-third less energy than 30 years ago, to generate one unit of GDP (IEA, 2004). This fall in energy intensity is primarily the result of technological improvements that lead to better energy efficiency. However, structural changes also play a role, such as a declining share of industrial sectors in the economy. Compared to service sectors, these use a relatively large amount of energy. This downward trend will continue in the future. If the energy intensity would be the same in 2040 as it was in 2005 then, according to the *Baseline scenario*, energy consumption will be almost twice as high.

Energy intensity varies considerably between countries. Europe requires only half the energy used by the United States in order to produce a certain amount of goods and services. China uses almost six times as much energy as Europe, per unit of GDP. These differences are primarily due to out-of-date technologies. Energy intensity drops the most in countries where it is currently among the highest levels. Energy intensity worldwide is eventually expected to converge, but even in 2040 there will still be differences.

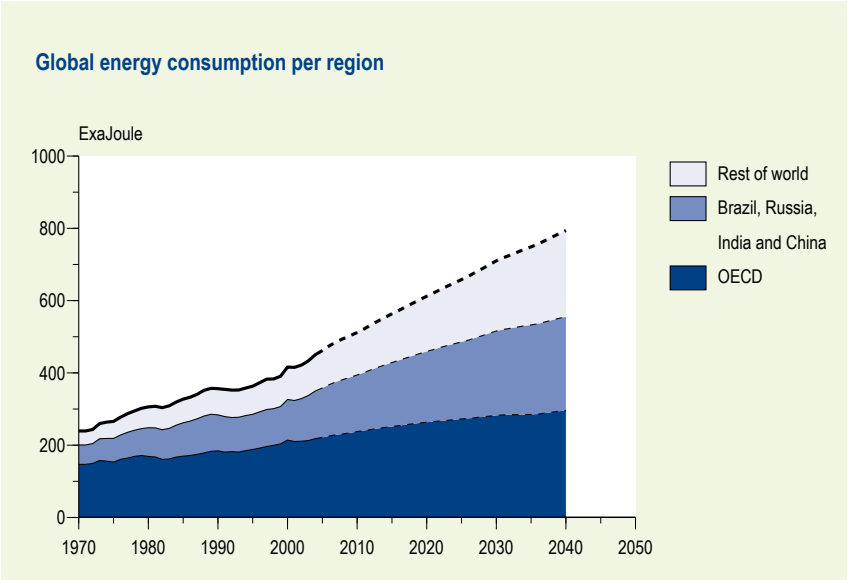


Figure 3.1 Global energy consumption per region, 1970–2040 (*Baseline scenario*), analysis TIMER.

Worldwide, there are still sufficient stocks of fossil energy

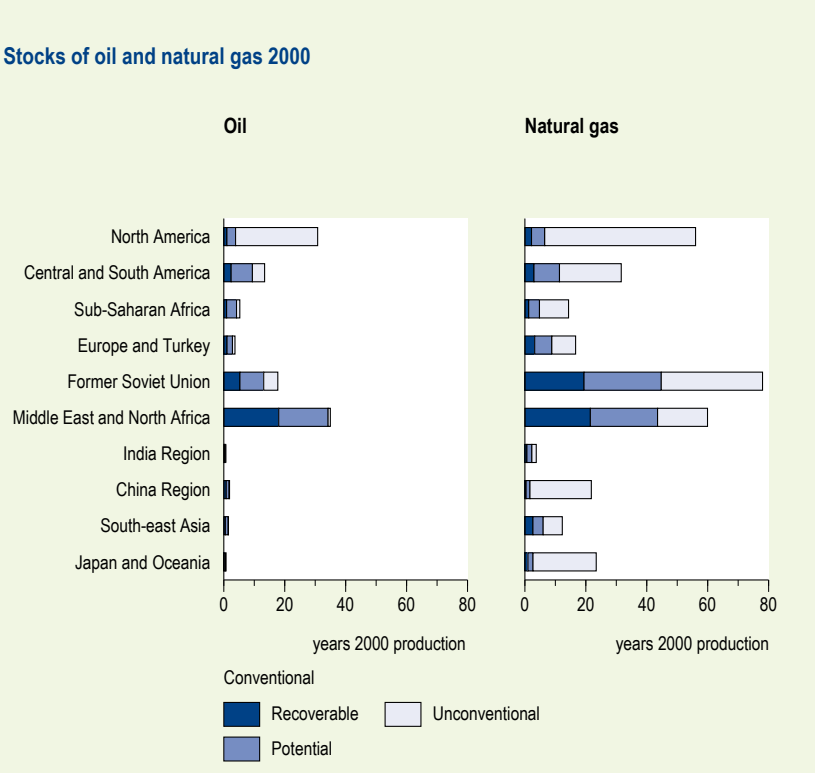
Studies show that the global stocks of fossil fuels are expected to be sufficient to meet our energy needs, even over the next few decades (NPC, 2007). Estimates indicate that, at current worldwide consumption rates, oil stocks will last for another 150 years, with 360 years of gas supplies and 1300 years of coal (see *Milieu & Natuurcompendium*, www.milieuennatuurcompendium.nl). However, inexpensive stocks of natural gas and oil are becoming scarcer. Distribution around the world is also uneven. For example, China and India have very few conventional stocks of oil and natural gas, but plenty of coal. The non-conventional stocks, such as oil from tar sands, shale oil and methane from underground coal layers, are many times larger than the conventional stocks (Figure 3.2). The extent to which these non-conventional oil stocks can be exploited, will depend on the world market price for these energy carriers. In addition, there is also the question of the extent to which climate policy and other environmental measures will limit the use of these energy carriers. These stocks of fossil fuels are also causing considerable controversy. A group of geologists feel that available and easily extractable oil and gas stocks are very limited, that the maximum production levels have already been reached, and that production will certainly fall. According to the so-called 'peak-oil hypothesis', the world must prepare itself for continuing high oil prices (see, for example, www.peakoil.nl).

Europe becomes more dependent on a few oil and gas suppliers

European gas stocks are becoming depleted. Gas stocks in the Netherlands are estimated to be 20 times the current annual production (EZ, 2007). Europe must, therefore, import more and more gas to meet the demand. This import dependency, the percentage of imports meeting European gas demand, is expected to increase from 30% in 2005 to over 60% in 2040. During this period, the amount of gas imported into Europe from Russia will increase from 25% to 40%. Europe will also remain dependent on a small group of countries for its oil supplies. Around 60% of all oil used in Europe is currently imported from outside the EU. This dependency will increase over the next few years, but is expected to fall during the second half of the scenario period, back to current levels, because higher oil prices will make alternative fuels more attractive. The Middle East will play an increasingly dominant role in oil production. Where, in 2005, one-third of all oil came from this region, the *Baseline scenario* predicts that this will rise to 44% in 2040.

Europe also needs to import most of the coal that it requires. Considering the huge stocks available and the broader geographic range of these stocks, there is less concern regarding the security of coal supplies.

Figure 3.2 Stocks of oil and gas, per region (*Baseline scenario*).



Energy security remains on the agenda, due to geopolitical aspects and high prices

Over the last few years the security of energy supplies has largely dominated the energy agenda, just as it did after the first oil crisis during the Seventies. The increasing dependency on a limited number of oil- and gas-producing countries feeds the fear that these suppliers will use their market power for economic or political gain. In the aftermath of the terrorist attacks of 11 September 2001, matters of peace and security have continued to dominate the energy debate. Particularly in the United States, the 'addiction' to oil is seen as an important source of finance for terrorists and malicious Middle East states (Friedman, 2007). A number of these supply regions have become politically less stable, and political leaders in gas- and oil-producing countries (such as Chavez in Venezuela and Poetin in Russia) have recently strengthened the feeling of uncertainty concerning energy supplies. Another factor is the fast rising demand for energy in countries such as China and India. These countries claim an increasingly large proportion of the energy stocks. This leads to tensions of supply and demand, on both energy markets and at political levels. The high and volatile energy prices spur worries about every security further.

Still very little known about the quantitative risks concerning security of supply

Very few analyses have been conducted into the risks relating to the supply of energy and the consequences of any disruptions. Until now, serious disruptions to energy supplies have remained limited, so that the kind of risks involved are not really known. After the price rises immediately following Hurricane Katrina in 2005, oil prices soon fell back to the old level. With respect to interruptions in the gas supply by Russia, this has yet remained simply a threat. High oil prices are not necessarily bad, and can stimulate the search for alternatives. Investors become uncertain about the volatile energy prices as a result of the tight markets, thus inhibiting the development of new energy stocks and economic growth.

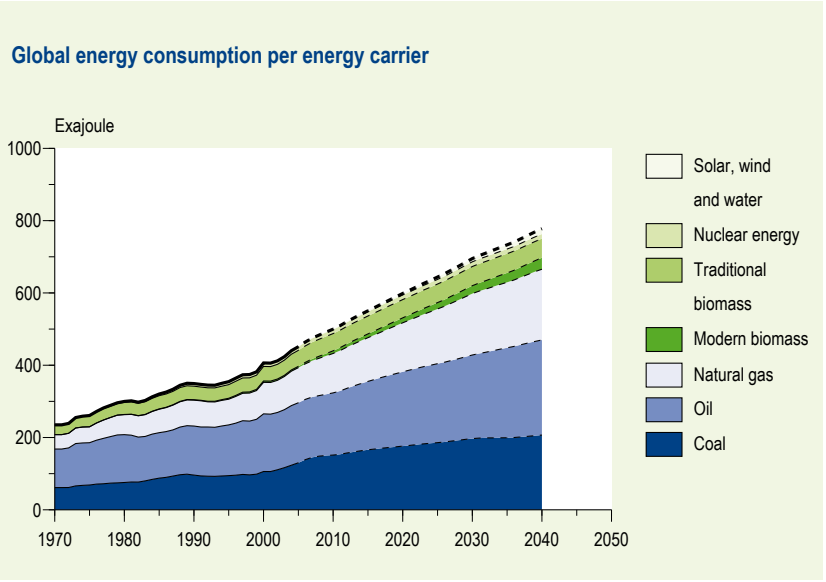
Fossil energy and traditional biomass remain important

Fossil energy is, and remains, the dominant energy carrier, according to the *Baseline scenario* (Figure 3.3). The scenario assumes that there will be no policy changes and only limited price increases. The *Baseline scenario* shows a small drop in the share of coal, oil and gas in the total energy supply, from 85% in 2005 to 82% in 2040. However, traditional biomass (firewood, dung and waste) remains an important source of energy for a large proportion of the world's population, particularly in Africa. Worldwide, 2.4 billion people depend on this fuel for cooking and heating. In Africa this even applies to over 80% of the population (Kok *et al.*, 2004).

Climate change probably due to the use of fossil energy

As more fossil-based energy is used, so greenhouse gas emissions, such as CO_2, increase further (Figure 1.8 in Chapter 1). CO_2 emissions are expected to increase from 28 $GtCO_2$ in 2005 to 47 $GtCO_2$ in 2040. The resulting higher concentration of greenhouse gases in the atmosphere has led to climate change (IPCC, 2007a). The *Baseline scenario* shows a rise in temperature of 1.4 °C in 2040, compared to the level before the industrial revolution. As the earth's temperature responds slowly to greenhouse gas emissions, it will probably continue to increase after 2040. Therefore, using the *Baseline scenario* as a basis, it is extremely unlikely that the average temperature increase will remain below 2 °C. Based on a broad scenario analysis, the Intergovernmental Panel on Climate Change (IPCC) expects the temperature to rise by 1.5-4.5 °C in 2100 (IPCC, 2007a). The higher concentrations of greenhouse gases not only lead to rising temperatures, but also to more

Figure 3.3 Global energy consumption per energy carrier, 1970 – 2040 (*Baseline scenario*), analysis TIMER.



extreme weather and to sea levels rising faster. The impacts of climate change are felt particularly in the poorer, tropical areas, primarily via problems with water supplies, floods, diseases and smaller harvests. The consequences of climate change are described in detail in many other publications (IPCC, 2007b; Stern, 2006; MNP, 2005). This Outlook simply refers readers to the relevant literature.

Least developed countries contribute little to climate change, but are still vulnerable

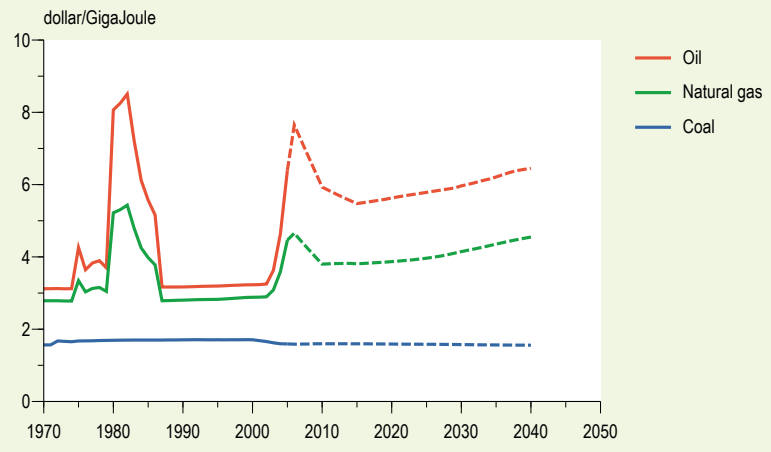
The energy-related greenhouse gas emissions produced by the least developed countries are minor, and contribute little to the climate problem. Around 15% of the world's population live in Africa, but the CO_2 emissions by Africa, in 2005, amounted to less than 3% of the world total. However, developing countries are the most vulnerable to climate change, partially because they are more dependent on sectors that are climate-sensitive (such as agriculture in the tropics), and because they have minimum opportunities to adapt to climate change. For example, food supplies in Africa will be endangered further: in 2020 the harvest in various countries will be reduced by 50%. With economic growth in developing countries, demand for energy and emissions will rise. Achieving the MDGs will only have limited influence on global emission levels (UN, 2005).

Oil and gas prices probably remain high

After the oil crisis during the Seventies, energy prices fell during the Eighties and Nineties. However, from 2002 onwards, prices have continued to rise, substantially. The most important reasons for the current high oil price is the significantly higher demand in developing countries (particularly in China and India), the lack of reserve production capacity (refining), political uncertainties in the most important oil-producing countries, and lack of short-term opportunity to modify the demand for oil. The future development of oil prices is determined by the extent to which the aforementioned factors are structural or temporary. The depletion of cheap extractable oil types also plays a role. All things considered, most analysts expect prices in the medium term (up to 2015) to fall slightly, but feel that the oil price will remain structurally higher than the 1990 level (IEA, 2006). In the longer term, depletion will cause continual price rises. Gas prices will follow those of oil (Figure 3.4). Coal is expected to remain a cheap energy source and will, therefore, become more attractive as an affordable energy source.

The higher prices for oil and gas have not led to higher electricity prices in Europe. Corrected for inflation and taxes, electricity prices have fallen slowly to a level that (in 2005) was 25% below 1995 prices (Eurostat, 2005). Economies of scale and liberalisation of the electricity markets have played a significant role in this development.

Figure 3.4 Energy prices of oil, coal and gas, in real terms, 1970 – 2040 (*Baseline scenario*).



Increased oil prices have little effect on strong economies, but developing countries are vulnerable

The period 2002-2006 was characterised by concern for the effects of exceptionally high oil prices (see, for example, President Bush in his State of the Union speeches 2006 and 2007). In real terms, the current oil price is actually no higher than at the beginning of the Eighties. Industrialised economies have become less vulnerable to these high prices, because over the past 30 years they have become 50% less dependent on oil, as their energy intensity has improved. However, oil prices do have an effect. The International Energy Agency (IEA) estimates that the growth of the world economy has been 0.3% lower because the oil price doubled during the period 2002-2005 (IEA, 2006). In the longer term, the effect will be smaller because economies will adjust, such as also occurred after the first oil crisis, when the energy intensity of the economies fell significantly.

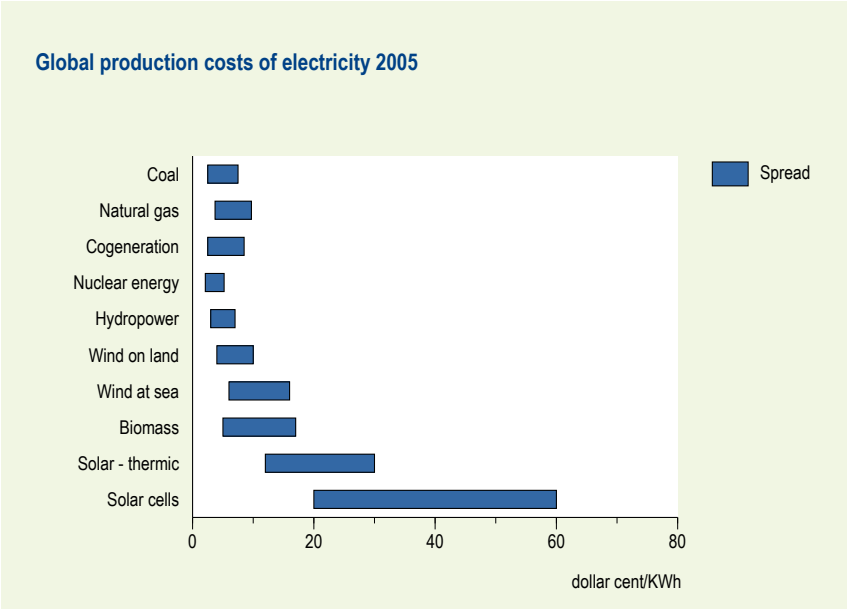
Developing countries are far more sensitive to high oil prices (IEA, 2004). Many developing countries have a high energy intensity *and* are largely dependent on imported oil. The high oil prices in 2005 probably caused the GDP in these countries to fall by 3-10%. The poorest people in developing countries are affected the most: directly, through higher energy prices, and indirectly because government funds are needed to pay for energy. According to the World Bank, the number of people living in poverty rose by 4-6% as a result of the high and volatile oil prices (World Bank, 2006). Africa remains the most vulnerable, and this will only increase in the future.

Alternatives to fossil energy still remain expensive

At current energy prices, renewable energy sources on most markets cannot be considered a real alternative, because they are still too expensive (REN21, Renewable Energy Policy Network, 2005). Figure 3.5 illustrates this, using electricity production costs for various technologies. The ranges in these figures indicate that costs can vary considerably, depending on local circumstances and the technology used. Conventional techniques can also become more expensive if (future) energy prices increase, or if these fuels are heavily taxed by strict environmental policies. In contrast to fossil energy and biomass, solar and wind energy are free of charge, but the investment costs for solar and wind energy are relatively high. Changes in interest rates or discount rates, therefore, exert a relatively large influence on the costs of these alternatives.

The costs of renewable energy sources may fall further if capacity can be expanded. These technologies are still at the beginning of the so-called 'learning curve' (IEA, 2000). Over the past few years the costs of solar and wind energy have fallen considerably. For example, the costs of wind energy have been halved, compared to the Nineties. But costs could fall further by building larger wind turbines, selecting better locations and designing better rotor blades, and by improving the generators and control technology. If the market for offshore wind generation is developed further, costs could fall yet again (Worldwatch Institute, 2005). In 1980, the first thermal solar plants (Concentrating Solar Power / CSP) produced solar energy at twice the costs charged today. As more funds are invested in these sources, so the costs will fall due to scaling up and experience gained (IEA, 2000). In 2020, the cost price of electricity produced from solar power plants can be brought down to

Figure 3.5 Current production costs of electricity for a number of technologies, based on the Projected Costs of Generating Electricity - 2005 Update (IEA, 2005) and Renewables 2005 - a global status report (Worldwatch Institute, 2005).



5-6 cents (US$), if the plant is located in the Sahara (MNP, 2007). The costs of solar cells (photovoltaic (PV)) have fallen by 20% every time the installed capacity is doubled – which is around 5% per year. Future cost reductions are possible by improving materials, designs, the process and efficiency, as well as further scaling up. However, the costs of investments and modifications remain high. These investments will be made sooner if the price of fossil fuels remains high, or if governments selectively intervene in the prices.

The costs of biofuels are also considerably higher than those of conventional petrol or diesel, except in Brazil, where the latest ethanol plants produce this biofuel for around 20 cents (US$) per litre. This is competitive at current oil prices. In Europe, the production costs of ethanol, including subsidies, amount to around 55 cents (US$) per litre. In the US, ethanol costs an average of 30 cents per litre. Without subsidies the costs would be much higher (IEA, 2006). In the future, only limited cost-reduction options appear possible for the current generation of biofuels (based on plants, such as sugar cane and corn). However, the costs of so-called '2nd-generation' biofuels (based on woody crops) are expected to fall from 50 cents (US$), to around 27 cents per litre, after 2010 (Worldwatch Institute, 2005).

3.2 Policy objectives

The current trends in fossil fuel consumption are not sustainable; without additional policies the climate will become warmer and the uncertainty concerning the supply and price of energy will only increase. Therefore, an energy supply that is clean and affordable and reliable will be even less feasible. Clean, reliable and affordable are the main criteria set by the Dutch Government for a sustainable energy supply (EZ, 2004). Similar terms have also been defined at international policy levels. The European Commission speaks of 'Clean, Clever and Competitive'. The G8 world-leaders' summit calls it the three E's: the inter-related themes of Energy security, Economic growth, and Environmental protection. The World Energy Council (WEC) mentions the three A's of sustainable energy supply: Accessibility, Availability and Acceptability (WEC, 2005).

The three objectives 'clean', 'affordable' and 'reliable' sometimes result in a tense relationship. In the short term, a clean energy supply is also an expensive energy supply. The policy challenge is to strike a good balance between these various objectives. The various, and sometimes contradictory criteria are widely recognised. The focal point in the policy differs across countries, and can also be determined from various world views (MNP, 2004). Climate policy is high on the agenda in both the Netherlands and Europe.

The United States emphasises the American dependence on oil from the Persian Gulf. China focuses particularly on protecting oil imports. Energy-exporting countries, such as Russia and the OPEC countries, are primarily concerned with securing their energy revenues. Access to improved forms of energy, and energy for development, is particularly important for the very poorest countries (see Chapter 2).

The following sections (3.2.1 and 3.2.2) discuss in more detail the meaning of the objectives 'clean' and 'reliable' respectively, both within the criterion of keeping energy affordable.

3.2.1 Clean: climate

In this Outlook, a clean energy supply focuses on climate change. The first Climate Convention was signed in 1992 in Rio de Janeiro. The objective (Article 2) was to stabilise greenhouse gas concentrations, to prevent dangerous changes to the climate due to human activities, in order to protect food production, biodiversity and a sustainable development in general. However, there is still no political or scientific consensus as to what constitutes 'dangerous', in terms of reducing greenhouse gas emissions and, as yet, there is no agreement on a worldwide approach to the problem or on each country's contribution to the solution.

Climate change: the Netherlands and the EU focus on the 2°C target

The European Union has chosen to try and limit the average rise in the earth's temperature to a maximum of 2 °C, compared to the period before the Industrial Revolution (the 2 °C target). Since 1996, this target has formed the central theme of European climate policy (in both the EU and its Member States) and, in 2005, it was ratified by the EU government leaders. The Netherlands also follows suit in its national climate policy. The 2 °C target is seen as a political balance between the risks of climate change and the options available to prevent climate change.

Objectives in the EU and the Netherlands

The European Commission presented its ambitious energy plans in January 2007: the climate problem needs to be tackled, the security of supply needs to be improved and the competition on the European energy market needs to be expanded (EU, 2007). The EU wants to limit greenhouse gas emissions to 20% in 2020, compared to 1990 levels. Other industrialised nations need to be persuaded to participate, so that the EU emissions objective can be extended to 30%. Even greater reductions are proposed in the longer term, such as binding commitments for renewable energy (20% in 2020) and biofuels (10% in 2020). Over the next seven years the EU also plans to spend at least 50% more on energy research. Energy efficiency in 2020 must be improved by another 20%. Stricter norms and energy labels will be introduced for equipment and buildings.

It is still unclear whether the primary emphasis of this objective concerns the climate target, or whether it also focuses on sustainable energy. This will become clear over the next few years as the Member States decide on the content, instruments used and task distribution.

The Coalition Agreement objectives focus on reducing greenhouse gas emissions by 30% in 2020 (compared to 1990), saving energy at 2% per year, and 20% use of renewable sources in the energy supply in 2020. The Cabinet's long-term ambition is to achieve a sustainable energy management system via energy transition. In 2006, the Energy Transition Task Force drew up the transition action plan entitled *Meer met Energie (*More with energy) (EZ, 2006). The Netherlands plans to use this action plan to become a pioneer in the transition to a sustainable energy supply. Commissioned by the previous government, the advisory bodies *Adviesraad Internationale Vraagstukken (AIV)* and *Algemene Energieraad (AER)* advised the government on energy and foreign policy. The most important conclusion from the *Energiek buitenlands beleid* (Energetic foreign policy) was that ensuring the security of our energy supplies should be a separate, new main objective in the country's foreign policy.

2 °C target only feasible if large countries implement climate policy

To meet the EU temperature target worldwide greenhouse gas emissions must be drastically reduced. The 2 °C target, with all its uncertainties, requires an enormous trend reversal. In 2040, emission levels must be around 25-60% lower than they were in 1990 (MNP, 2006). In comparison, the Kyoto Protocol commitments are just a modest first step. If worldwide reductions are to be achieved, input by both large industrialised nations and developing counties will be required, as shown in Figure 3.6. The *Baseline scenario* shows that, in 2030, emissions from the developing countries alone will be higher than worldwide emissions were in 1990.

Distributing the global objectives over the various countries is crucial for affordability and support

Policy efforts by individual countries depend on how the worldwide reduction objective is shared between the various countries. How will emission rights be allocated? An often-used burden-sharing rule used in discussions concerning future climate policy is based on equal rights per capita. In general, non energy exporting developing countries will find it easier to achieve their climate objectives under this type of burden-sharing rule. In the case of an equal per capita distribution, the allocated rights will not really deviate from their expected emissions if there is no climate policy (Figure 3.7). The illustration assumes that the world will gradually converge towards equal rights per capita, although this process will not be completed by 2040. In a global emissions trading system, some of the developing countries could also profit by reducing their actual emissions even further, down to those of their allocated rights. They can then sell this extra reduction as emission rights (carbon credits) to countries where the reductions are relatively expensive. Industrialised nations, therefore can reduce their efforts. For climate purposes, it does not matter where the emissions reduction takes place. Figure 3.7 shows how actual emissions per capita could look if emissions trading succeeds in achieving reductions in those areas where this is cheapest (see also Section 3.4.1).

There are many other possible burden-sharing rule, for example based on current greenhouse gas emissions (grandfathering), which would be advantageous for industrialised nations. The allocation could also be such that the policy efforts are equal for all countries (equal burden-sharing). The EU's objective in 2020 (to limit greenhouse gas emissions by 20%, compared to 1990 levels) fits in with a distribution that will eventually lead to an equal emission per capita policy (den Elzen, 2006).

3.2.2 Reliable: security of supply

Prevent disruptions and reduce vulnerability

Security of supply refers to various aspects of the energy supply (see text box 'Security of supply has various dimensions'). Generally speaking, two categories of objectives should provide the desired security of supply:

1) Prevent disruptions to the energy supply;
2) Reduce the vulnerability to such disruptions.

Objectives under the first category focus on maintaining stable relationships with suppliers, spreading the demand for energy over several suppliers, or preventing geopolitical tensions. The second category focuses on objectives that limit the import of oil from the Persian Gulf (see text box 'Objectives in the USA'). Importing gas from Russia is also a reason for the EU to be extra careful about new gas applications. Both the Netherlands and the EU have

Figure 3.6 Energy-related emissions by developing and industrialised countries, according to the *Baseline scenario* and the emission-reduction profile required for the 2 °C target (stabilisation at 450 ppm CO_2-equivalents) (analysis TIMER/FAIR).

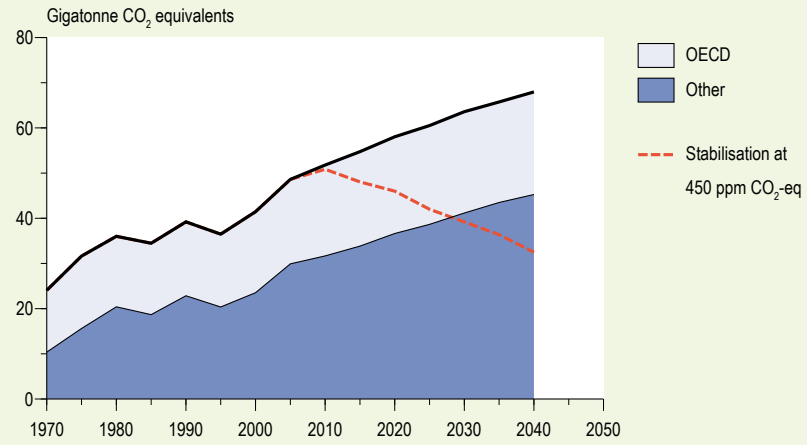
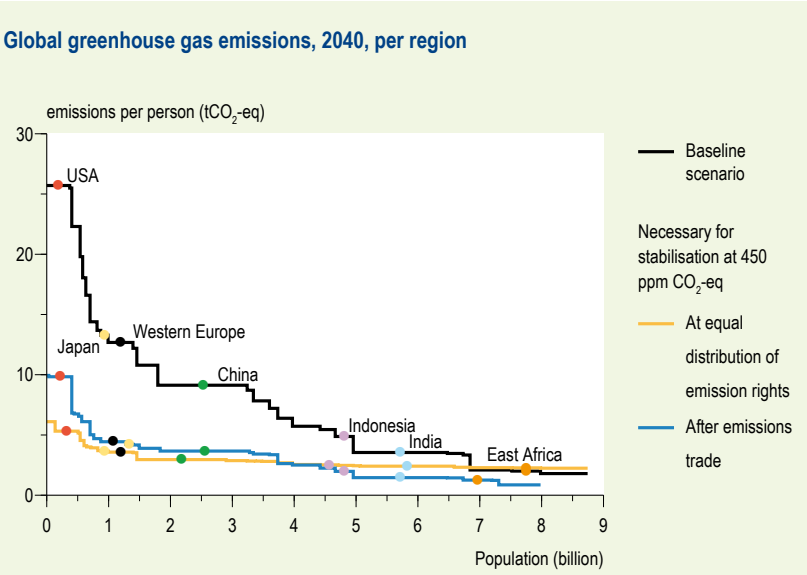


Figure 3.7 Emissions per capita in 2040 and the emission ceilings, based on an equal per capita distribution, with convergence in 2050, in compliance with the 2 °C target (stabilisation at 450 ppm) (analysis Timer/FAIR).



Security of supply has various dimensions

With the security of supply it is important to differentiate between the types of disruption to the supply, both in the long and short terms. In case of the latter, security can be disrupted by aspects, such as terrorist actions, natural disasters or a failing infrastructure. In the medium term, this may be due to a growing dependence by clients and an increased market power of suppliers. Finally, in the long term, stocks can become depleted. A number of geologists (sometimes seen as supporters of the peak-oil hypothesis) have emphasised that, in the short term, the world will be confronted with a shortage of production and processing capacity for oil, because there are too few new oil stocks available that can be mined immediately. The supply and pricing of oil will, therefore, become much more unstable – a situation for which the world is not prepared.

There are essential differences between oil and gas, in respect to the security of supply. Oil is traded on a worldwide market. Gas is more dependent on infrastructure (pipelines). The risks also differ from one country to another, depending on their energy management system. Developing countries with a high energy intensity and considerable dependence on imports, are more sensitive to high prices and fluctuations than industrialised nations. There are differences between European countries, too, with Sweden importing hardly any gas, and Eastern Europe being completely dependent on Russian gas.

indicated (in policy documents) that they are concerned about the growing dependence on an increasingly smaller number of oil and gas suppliers.

No specific objectives for security of supply
There are no quantitative objectives for security of supply, both nationally and internationally. Therefore, the precise policy tasks are not clear, nor the extent to which the Netherlands and the EU hope to improve the security of energy supplies. This lack of specific objectives makes it difficult to estimate the benefits that would result from an improved security of supply. The costs of a reduced energy security also seem limited, compared to the risks that result from climate change. Based on a macro-economic cost-benefit analysis (CPB, 2004), the costs of improving the security of energy supplies do not appear comparable to the benefits and, on this basis, achieving climate objectives should be given the highest priority.

In addition, other considerations also play a role in decision making, such as the social unrest that energy disruptions can cause. It is, thus, primarily a political decision as to which precautionary measures are taken, and how the costs/benefits of these measures to improve security of supply are considered in this context.

Objectives in the USA

The plan entitled 'Twenty in ten', announced by President Bush in his State of the Union 2007, focuses primarily on reducing the dependence on foreign oil. Dependency makes the US sensitive to hostile regimes and terrorists. Significant disruptions lead to price increases, which damage the economy. Bush wants to reduce fuel consumption by 20% over ten years (in 2017). More money will be made available for research and development of alternative fuels, such as ethanol. The strategic oil stocks will be doubled. There will be no emission ceilings. Bush is encouraging the use of ethanol by giving considerable subsidies to American farmers. It will cost American society at least 10 billion dollars per year to reduce oil consumption by 10% in this manner. The climate effect of this measure is limited, because the net energy saving of replacing one litre of petrol with ethanol is equal to a quarter of a litre of petrol (Department of Energy, 2006). Oil consumption could also be reduced by 10% by forcing car manufacturers to supply more efficient vehicles. This would achieve a greater climate effect and would only cost an estimated 3.6 billion dollars per year (Congressional Budget Office, 2006).

3.3 Options for climate and security of supply

There are many measures, options, and policy instruments that could be used to ensure that the energy supply meets the formulated goals: clean, reliable and affordable. However, it is not possible to say which of these should weigh heaviest in times of conflicting effects. This section discusses the options available and the steps required to move towards 'clean and reliable'. Firstly, options are split into those that are primarily meant for climate policy, and those that focus on security of energy supply. Both these types of options are assessed according to their affordability, both in the short and long terms. The discussion then moves to the synergy and relationship between climate and security of supply measures, and a comparison is made between the costs of these options.

3.3.1 Options for climate policy?

Climate policy (emissions trade, carbon tax, regulations, information) can contribute to saving energy and the use of alternative fuels (nuclear energy, biomass, solar and wind). Climate policy can also lead to CO_2 capture and storage. These are the three main outlines whereby emissions can be reduced. The cost-efficiency of these options is influenced by the mix of technological solutions chosen, and by dividing these costs over as many countries, and stakeholders, as possible.

Emissions trade a theoretically efficient option
An emissions trading system is an instrument used to help achieve the climate objective. This approach has been chosen under the Kyoto Protocol and also under the European emissions trading system (ETS). Such a system internalises the negative effects of emissions by allocating a limited number of emission rights (carbon credits) to the various stakeholders, who can trade them among themselves. On the market, the effects of supply and demand lead to a certain price for these emission rights: the emission price. This price leads to the desired limitation of emissions. The market is left to make its own decisions on how this is achieved – via more energy saving, CO_2 capture and storage, or by using alternative energy sources. In theory, an emissions trading system is efficient: emissions are reduced where this can be achieved in the cheapest possible way.

The efficiency of an emissions trading system does not depend on how the emissions rights were initially allocated. However, the division of costs does depend on this initial allocation. In practice, aspects such as transaction costs, information problems, and questions concerning monitoring and maintenance, can undermine this efficiency. It is,

therefore, impractical to allow individual households to participate.

The latest IPCC Assessment Report estimates the global macro-economic costs in 2030, provided that greenhouse gas emissions are stabilised in an efficient manner. For stabilisation at a level of 445-590 ppm CO_2-eq, costs are estimated at between 0.2% and 3% of GDP (IPCC, 2007c). The Stern Review, which defined the costs/benefits of climate policy, indicates that stabilisation at 500-550 ppm CO_2-eq per year will cost around 1% of global GDP in 2050 (Stern, 2006).

An alternative approach to emissions trading is to introduce a direct price for emissions, via a carbon tax. This tax on energy is also related to the extent to which the energy carrier leads to climate change. The use of 'dirty' coal is taxed more heavily than the relatively clean gas. New Zealand has now become the first country to implement a carbon tax in order to meet its Kyoto commitments. There are good reasons for considering a carbon tax, given the many uncertainties surrounding the future emission price in an emissions trading system (Nordhaus, 2006). However, both the Netherlands and the EU have explicitly chosen emissions trading.

Energy subsidies and energy taxes frustrate climate policy

Most countries subsidise and tax the use and/or production of energy (IEA, 2006). However, there are considerable differences between countries. Energy subsidies are much higher in developing countries than in industrialised nations. In Iran and Indonesia alone, the subsidies on oil are greater than all energy subsidies in all industrialised nations together. Developing countries primarily give subsidies to those who use fossil energy and electricity. In the industrialised nations it is primarily the production of renewable energy and nuclear energy that is subsidised, but a number of European countries also subsidise coal production. In industrialised nations the taxes on oil are far higher than the energy subsidies, mostly due to arguments such as environmental criteria, improved security of energy supply and the need to maintain government revenues. From a viewpoint whereby 'the polluter pays', it is not logical to charge the highest tax for oil. From a climate point of view it is more logical to charge a relatively heavy tax for coal. Countries could benefit by terminating subsidies on energy and reformulating the tax system in a more climate-friendly direction (Babiker *et al.*, 2007).

European emissions trading system works, but does not yet result in reductions

After years of debate within the EU, with both Member States and market stakeholders, it was decided to implement an emissions trading system as the main climate policy measure, initially just for the group of large industrial consumers. The EU is a pioneer in this respect. The European emissions trading system (ETS) is *the* largest working example of market-based climate policy in order to achieve emission reductions within the EU at the lowest possible cost. The current emission price is around 0.13 euro per ton CO_2 (see, for example, the website www.climatecorp.com). However, this type of low short-term price will not bring about the desired changes. Therefore, when allocating CO_2 rights during the second phase, the EU will need to be much stricter. This would cause the emissions price to rise, thus producing at least some effect. The future price of emission rights traded at the end of 2008, will be around 20 euros per ton. The EU is also trying to expand the number of greenhouse gases and sectors that fall within the ETS, which will make the system even more effective. The EU is also negotiating with countries outside the EU in order to expand the system further. The evaluation as to whether emissions trading was the right choice, is not expected to be made until the system has been operating for around five years.

The trading system can become more effective by adding more sectors and countries

The 2 °C target cannot be achieved as long as climate policy and the ETS remain limited to the EU, and as long as a number of important sectors within Europe, such as the transport sector, do not participate. Europe, therefore, needs to expand its climate coalition by adding strict targets for the period after 2012, expanding the ETS by including other sectors, and by using another approach for those sectors that do not fall under the ETS. Although the effectiveness of the ETS remains limited, and the costs are high compared to the reductions that have so far been achieved, the European step can be seen as a signal to others; an opening bid in the negotiations over climate policy after Kyoto. Europe is showing the world that it takes climate policy seriously, and that is an important criterion for participation by developing countries. These poorer countries feel that it is the rich industrialised nations that are responsible for the climate problem. If other countries also participate then the costs will be reduced and the effectiveness of worldwide climate policy will be increased (see text box 'Worldwide coalition is more effective and cheaper'). Europe has indicated that, in this case, it will reduce emissions by a further 30%.

Disadvantages of a unilateral climate policy: distorting competition and leakage effects

The EU's pioneering role is not without risks. Climate policy in Europe alone can lead to a price disadvantage, compared to trading partners that do not implement climate policy. After all, climate policy results in energy being more expensive. Energy-intensive imports, such as chemical products and steel, are expected to increase, and European

Worldwide coalition is more effective and cheaper

In 2006, the CPB and MNP conducted an analysis of possible scenarios for a future climate regime (working group IBO Future Climate Policy). The scenario 'Grand coalition' limits emissions by industrialized nations with a collective absolute emissions ceiling in 2020 that, on average, is 20% below the 1990 level. The emissions target for Europe, in this scenario, is 23% below 1990 levels. Even the large fast-growing developing countries are expected to slowly limit their emissions. As all reduction commitments can be traded within the coalition, the cheapest reductions are achieved first. This scenario sees the costs remaining relatively low. Emissions are reduced at an emission price of 24 euros per ton CO_2, while the loss of revenue for the EU remains limited to 0.4% of the national income. The scenario variant 'Unilateral' sketches a situation in which the EU only accepts firm commitments (20%). The costs of this variant are considerably higher and the reductions of global emissions are significantly less.

Table 3.1 Emission targets, reduction efforts and costs of two policy scenarios, percentage differences, 2020.

	Grand coalition	Unilateral
Emission target EU-25, compared to 1990	-23	-20
Worldwide emissions, compared to background scenario	-21	-6
National Income EU-24, compared to background scenario	-0,4	-0,9
EU-emission price, in euros per ton CO_2	24	69

Source: WorldScan

exports will fall. This competitive disadvantage will probably strengthen the call for trade-restricting measures (European Parliament, 2007). Some go one step further and even urge trade sanctions, to force unwilling countries to participate in climate policy (The New Economics Foundation, 2003). Under the WTO regulations, there are limited options for implementing import taxes (Stokke, 2004). Trade restrictions, as sanctions, have little effect because the consequences of the sanction for unwilling trade partners do not compare to the costs of participating in climate policy. Energy-intensive exporters could bridge this gap via exemptions or subsidies, although this would increase the costs of climate policy, because the costs are transferred to others (Babiker and Rutherford, 2005). In addition, this type of measure quickly leads to counter-measures by disadvantaged trading partners. Therefore, the European Commission does not support this (Lamy, 2004).

Leakage effects are another disadvantage to unilateral climate policy. If energy-intensive industries are relocated to countries with a less strict climate regime, then emissions will increase in these countries, certainly if production is less efficient. These leakage effects can amount to 25% of the originally intended effect on emissions reduction (Bollen *et al.*, 2005).

Additional policy is required, but can lead to higher costs

In addition to the current emissions trading system in Europe, extra climate policy is required in order to achieve climate targets. Specific standardisations and regulations can contribute in sectors that currently do not participate in the ETS. Measures that ensure emissions reduction in other social sectors include implementing a sufficiently high kilometre charge (road tax), restricting CO_2 emissions from vehicles, and defining energy consumption standards for buildings and equipment. It is also important to remember that, from a climate point of view, the tax on fuel and energy tax for households are far higher than the (expected) emission price.

If there are no international agreements for the period after 2012, then the ETS provides no credible impulse for the long term. Decisions on energy options that are currently being taken do not take sufficient account of future climate policy. Decisions have a long-term impact, for example coal-fired power plants, which cover 40 years. Working ahead of an effective ETS, the government can try to guide this process via specific standardisations and regulations, although the opportunities for doing so remain limited in a liberalised marketplace.

Extra policy for certain sectors can be motivated if other policy objectives play a role alongside climate policy. However, if energy-saving standardisations are implemented alongside an emissions ceiling for a *specific sector*, then this will not achieve the most cost-effective measures. Saving energy is not equal to restricting greenhouse gas emissions. A lower energy intensity is not per definition equal to a lower carbon intensity. It may also be cheaper to reduce greenhouse gas emissions by using alternative sources. An extra set of objectives can only be justified if other targets also play a role, alongside climate policy.

Contribution by reduction options to stabilise the emissions of greenhouse gases

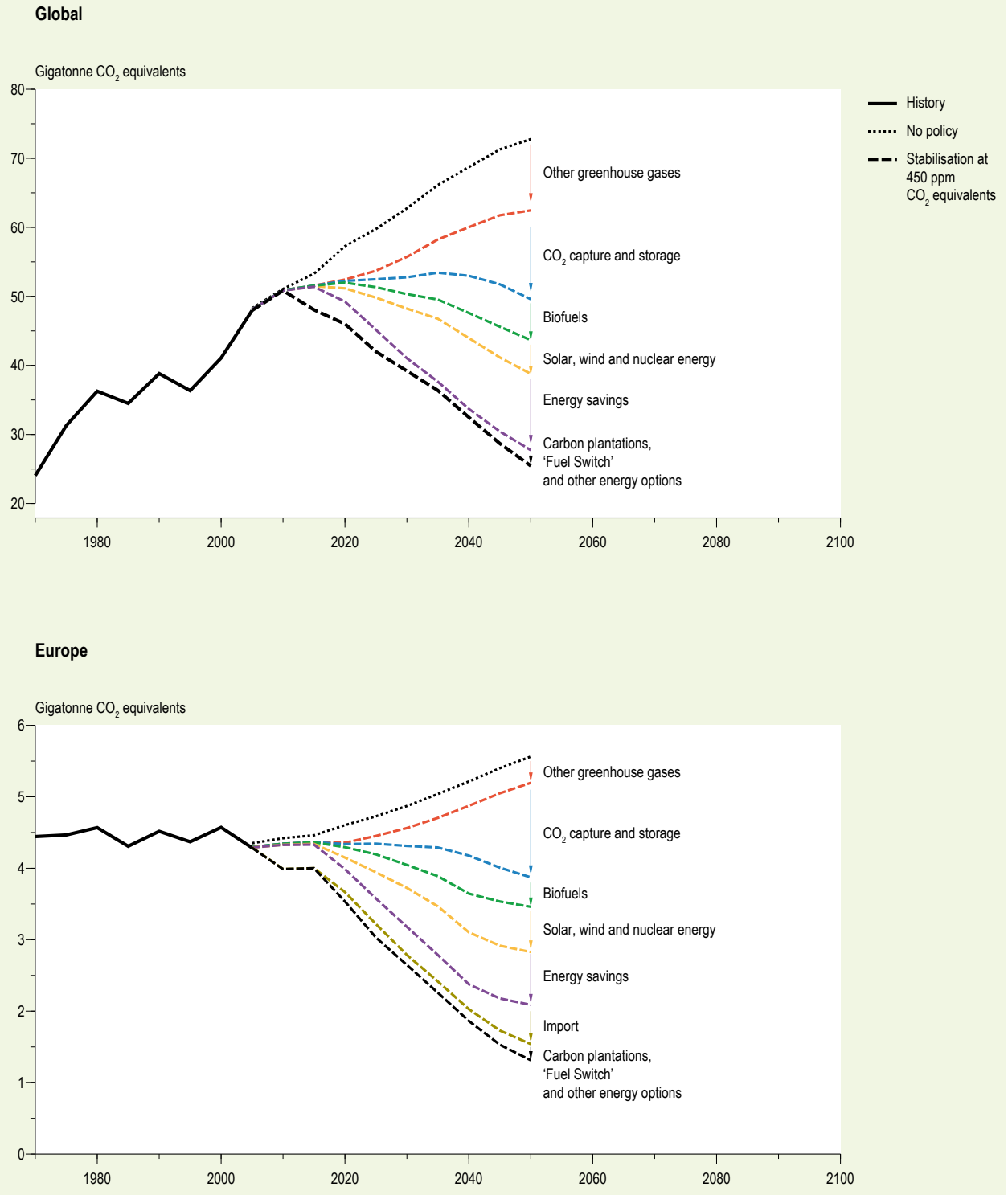


Figure 3.8 Contribution by reduction options in the energy supply, for cost-efficient stabilisation at 450 ppm, both around the world, and in Europe, in accordance with the 2 °C target (Source: Timer/FAIR).

Energy options

Climate policy leads to energy savings, the use of alternatives to fossil fuels (such as nuclear energy, biomass, solar and wind), and CO_2 capture and storage. These are the three most important opportunities for reducing emissions. Figure 3.8 shows the reduction options for the world as a

whole and for Europe in particular, if the 2 °C target is to be achieved in a cost-efficient manner. The main assumption is that a grand coalition will be formed, where countries join at various stages. Emission rights are divided on the basis of convergence towards equal rights for everyone in 2050. Emissions are reduced such that the concentration of greenhouse gases in the atmosphere amounts to around 450 ppm CO_2-eq. At this level the rise in temperature is expected to be limited to 2 °C (MNP, 2006).

A broad range of options are required, existing technologies are sufficient
How can the 2 °C target be achieved in a cost-efficient manner? Greenhouse gas emissions must be reduced, in order to achieve this temperature target. Figure 3.7 shows that saving energy is an important option, both for the world as a whole and for Europe. The rate at which energy is saved in Europe is lower than in other parts of the world, as Europe is already fairly energy efficient. Outside Europe there are relatively inexpensive savings options available. In addition, significant contributions can be made via biofuels, renewable energy sources such as solar, wind and nuclear energy. CO_2 capture and storage also has an important role to play. It must be remembered that not all reductions result from modifications in the energy sector. Reducing other non-CO_2 greenhouse gases (CH_4, N_2O, CFCs) over the next two decades offers an attractive option to keep costs down. From a European perspective, part of the reduction commitments will be realised outside the EU. The allocation of emission rights, based on equal rights per capita, leads to strict objectives in Europe. It is, therefore, attractive to purchase relatively cheap emission rights from foreign countries. The purchase of emission rights plays an important role, particularly at the beginning of the scenario period. In time, emission rights outside Europe will also become more expensive, and emissions trading will become less popular. The above analysis shows that the potential for currently known technologies is sufficient to achieve the necessary reductions for low stabilisation levels.

Cost-efficient specification of climate targets conflict with other European objectives
If all efforts focus on reducing greenhouse gas emissions at the lowest possible cost, then other EU objectives will not be achieved. In 2020, the proportion of renewable energy in Europe would only be 5%, which is nowhere near the EU target of 20% renewable energy. The demand for energy in 2020 would be 6% below that of the *Baseline scenario*, while Europe has an energy-saving target of 20% for 2020. Strictly speaking, the EU targets for saving energy, and the proportion of renewable energy used, appear to be unnecessary in order to implement cost-efficient climate policy. If other aspects also play a role alongside climate policy, such as security of energy supply, it may be useful to set additional targets.

3.3.2 Options for security of energy supplies

The security of our energy supplies can be improved by reducing the vulnerability to disruptions, or by limiting the uncertainty in the oil and gas supplies. Various policy options and measures could be considered.

Less use of oil and gas reduces vulnerability to disruptions
The energy supply becomes less vulnerable to disruptions by reducing oil and gas intensity. The transport sector is currently almost entirely dependent on oil products.

A greater role for biofuels, batteries (plug-in hybrids), vehicle efficiency improvements and changing motorists' purchasing and driving behaviour patterns, could help to reduce this demand. Measures that the government could consider, include more subsidies for biofuels and hybrid vehicles, heavier taxes on car use (road pricing), setting efficiency standards, and promoting the use of public transport.

The demand for gas can be reduced by using other fuels to generate electricity, by efficiency improvements in the electricity sector and by savings measures in the built environment. If diversification in the electricity sector is stimulated by replacing gas-fired power plants with energy from wind, coal or nuclear energy, this will moderate the demand for gas. Cogeneration plants can also help reduce the demand for gas. Increasing the tax on electricity will lead to lower energy consumption and will indirectly influence the security of supply. As long as there are no specific objectives for security of supply, it is difficult to say which measures (from a civil society point of view) are most desirable. If the costs of policy measures are compared with the benefits of an improved energy supply, this investment is generally not profitable (see text box 'Policy specifically focusing on security of supply is generally not cost-effective').

Policy to avoid imports from a specific region is fairly useless
Oil is sold via a global market. An integrated market will show no price differences between the price of imported oil and oil from surrounding regions. Therefore, a country that replaces imported oil with that from its own production, remains equally vulnerable to oil price fluctuations (Darmstadter, 2007). This also increasingly applies to gas, among others as a result of increased amounts of LNG (liquefied natural gas) that is being sold in ever-larger quantities on the global market. Reducing the oil and gas intensity would seem to be a better way to limit vulnerability to supply disruptions, than to reduce the dependency on imports.

Policy specifically focusing on security of supply is generally not cost-effective

The Netherlands Bureau for Economic Policy Analysis (CPB) has developed a framework for cost/benefit analyses, and has used this on a number of possible measures to improve the security of supply (CPB, 2004). These options vary from investing in strategic oil stocks, to financial stimuli to encourage consumers to reduce their energy consumption. The policy options considered include subsidies, forms of regulation and investments. The analysis also considered the risks to the three largest energy markets (oil, gas and electricity). The general picture shows that government policy, specifically aimed at security of supply, is generally not cost-effective: the costs exceed the benefits. This macro-economic cost/benefit analysis allows the conclusion that it is cheaper to accept the costs of disruptions to supply, rather than prevent disruptions at any cost. Governments should, therefore, look carefully at the cost-effectiveness aspects when implementing measures that focus only on security of supply. A precondition for this approach is that markets should function well, and that the long-term aspects are also considered.

Not only energy measures secure supply

It is not only the energy options that offer an alternative for oil and gas to improve security of supply. Investing in a better energy infrastructure (gas pipelines and electricity distribution networks) also make the energy supply less vulnerable to disruption. Policy options may also focus on guaranteeing the availability of oil and gas, for example, by improving relationships with suppliers. Recommendations by the advisory bodies AIV and AER form an example (AER, 2005). Security of energy supplies should, therefore, be given a more important place in foreign policy. Countries should be prepared to contribute to the military protection of international transport routes. The negative consequences of disruptions to energy supplies can also be relieved by increasing strategic stocks. Releasing these stocks during a crisis situation can counteract price increases. By temporarily reducing excise duties on fuel, the government could also dampen the social consequences of peaks in the oil price.

Collaboration at European level is important

Although there are considerable differences between the energy management systems of the European countries, and, thus, between the risks for security of supply, all Member States can benefit significantly through more cooperation at EU level (AER, 2005). The EU would be in a much stronger position if negotiations on energy supplies, for example with Russia, were conducted on behalf of all Member States. Such negotiations also put the EU in a stronger position in WTO (free trade) negotiations, where trade agreements can be coupled to energy supplies. Dependency by both sides seems a good guarantee for stable relationships, and, thus, for energy supplies. Reducing the vulnerability requires decisions about the energy infrastructure. Since the crucial infrastructure (electricity, gas) is in the form of coupled pan-European national networks, decisions can better be taken at European level. When strategic stocks are used at the European level to relieve peaks in the energy price, this achieves more influence than when this occurs on a regional level.

Finally, many savings policies benefit from being at a large enough scale to prevent competitive distortion and to stimulate as much innovation as possible.

3.3.3 Long-term options

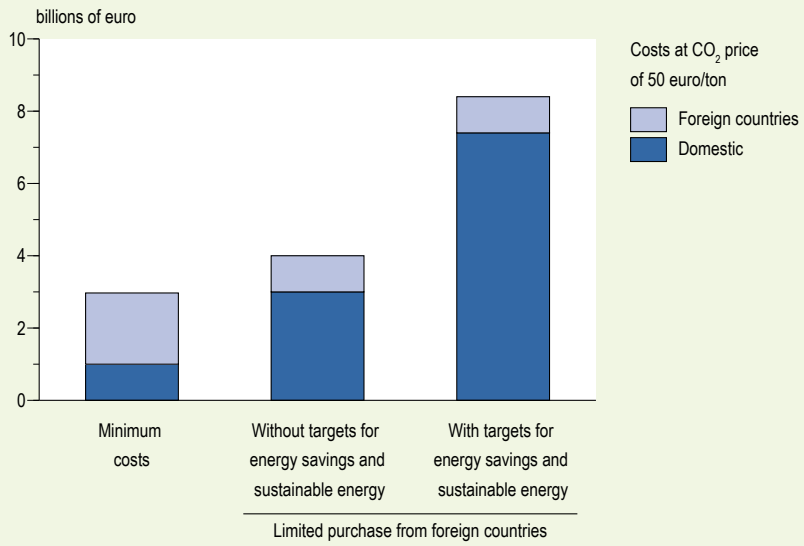
Based on the desire to achieve climate targets and reduce the vulnerability to disruptions in the energy supply, both the Netherlands and the EU have focused their policies on future alternatives to fossil-based energy. In the long term, an energy supply with low greenhouse gas emissions to achieve the 2 °C target seems feasible. This requires a non-fossil energy supply that is completely different to the current situation. There are alternatives that are feasible, available and acceptable, compared to the current energy system, such as solar, nuclear energy, coal with CO_2 capture and storage, and wind and hydropower. Using today's techniques, 0.3% of the Sahara land surface (around 300 by 100 km, which is an area similar to the size of the Netherlands) would be required by solar-powered plants to meet the demand for electricity (around 50% of the total energy consumption) in Europe (Kabariti *et al.*, 2003, cited in Nagelhout and Ros, 2006; Ros *et al.*, 2006). These types of energy systems are still very expensive, require huge investments and large-scale institutional changes. Considering the investment levels required for alternatives, without additional policy or continuing high prices for fossil fuels, investments are primarily expected to focus on gradually changing existing technologies. There is a risk that ETS will face increasingly stricter ceilings, particularly if emission reductions need to be achieved through existing technologies. This route dependency, or so-called 'lock-in effect', means that attractive long-term options remain in the background. Defining standards for renewable energy and investing in research can bring these technologies closer and allow costs to fall. If, in the long term, a different energy system is required, then steps will need to be taken now, since today's investments in energy supply have consequences for the system over the next few decades. Depending on the method used to achieve the medium-term climate ambitions, the 30% reduction target defined in the Coalition Agreement can be given a boost in the right direction (see text box 'The 30% ambition requires difficult choices between short term and long term').

The 30% ambition requires difficult choices between short term and long term

The Dutch Coalition Agreement focuses on a 30% reduction in CO_2 emissions in 2020, compared to 1990 levels. However, achieving a climate policy in a cost-effective manner causes some friction with the 2% energy savings per year and the 20% sustainable energy target in 2020 (Figure 3.9). However, there are more arguments than climate alone for focusing on sustainable energy and energy savings. These options also have a positive long-term effect on the security of energy supplies.

It should also be remembered that, if the Netherlands take additional domestic measures, which would undoubtedly lead to higher costs compared to measures in other countries, this would certainly lead to improved air quality. Although the benefits of investing in alternative energy systems have not yet been completely assessed, the extra costs (8–9 billion euros) should be viewed in this light. However, there are also negative effects to extra use of sustainable energy: achieving the 20% sustainable energy target will require large-scale use of biofuels and the most efficient approach. The risks of using biofuels are discussed in the Biofuels Guide.

Figure 3.9 National annual costs of achieving the climate target -30% in 2020 (MNP, 2007).



3.4 Trade-off between climate and security of supply

Measures to limit climate change often also help to improve the security of supply. If CO_2 emissions are reduced, there is less demand for oil and gas, which in turn reduces the vulnerability to supply disruptions. However, this synergy does not always occur, and there may also be negative trade-off, such as with 'fuel switching'. Replacing coal with gas when generating electricity will certainly reduce CO_2 emissions, but also increases the dependency on gas. Purchasing foreign emission rights via an emissions trading system also restricts the domestic efforts, and thus the positive effect on the security of supply.

Options that specifically focus on reducing the demand for oil and gas can be less advantageous for climate policy. For example, increased use of coal (without CO_2 capture and storage) leads to less gas (and oil) being used, but also leads to extra greenhouse gas emissions. Replacing oil with bio-ethanol and biodiesel as transport fuels, considering the energy required for cultivation, still has a limited effect on the climate.

A number of options that look at energy from a different point of view, can be comprised into a single summary table showing several advantages and disadvantages. Table 3.2 provides an overview of the various effects from a number of options. These are options that Europe could use to reduce CO_2 emissions and/or limit the dependency on oil and gas. Each option shows the effects on the climate and on biodiversity (planet), security of supply (people) and current costs (profit). Only rough scores can be given, and the long-term effects on possible price reductions and the competitive position are not taken into account. Table 3.2 clearly shows that various measures have a positive effect on the climate target and security of supply (nuclear energy, energy savings, biomass, solar and wind energy). The most important trade-off in these options concerns the higher costs compared to the current energy supply. Biomass leads

to a trade-off with biodiversity elsewhere (see Biofuels Guide). The most important trade-off between possible measures for security of supply and climate, concerns the increased use of coal. This can only be resolved by using CO_2 storage.

Trade-offs are not limited to the country or region where the policy is implemented. If one region becomes less dependent on oil, this has a positive effect on the security of supply in other countries. This reduced demand makes the oil market more flexible, which in turn results in lower and more stable prices. However, there are also negative effects. A unilateral European climate policy can lead to considerable leakage effects outside Europe, because polluting industry moves to countries with less strict legislation. Where there is a lack of positive trade-off, but still some level of trade-off, policy will need to make a choice. What are the main objectives? Affordable and clean, affordable and reliable, or less affordable but still clean and reliable?

Two policy variants

When considering the individual measures, it is fairly easy to monitor the consequences for emissions, security of supply, and costs. However this is more difficult for a complete set of policy measures. Two policy variants (a climate scenario and a security of supply scenario) are used here to illustrate the consequences for the other aspects of a sustainable energy supply when policies focus on a single objective.

- The climate or stabilisation scenario assumes a worldwide coalition that aims to reduce emissions in a cost-effective manner in line with the 2°C target. Eventually, emissions are reduced such that the concentration of greenhouse gases stabilises at 450 ppm. For Europe, this scenario means that in 2040 emissions may only be 40% of those indicated in the *Baseline scenario* (a reduction target of 60%).
- The security of supply scenario assumes that in 2040 Europe will have halved its import dependency on oil and gas, compared to the *Baseline scenario*. Europe, thus, imports around 30% of the total demand for oil and gas; the *Baseline scenario* indicates 60%.

Figure 3.10 shows the change in the demand for various primary energy carriers across Europe in 2040, under both variants. Under the climate scenario the proportion of all fossil-based energy carriers (oil, coal and gas) falls drastically. This reduction is only partially compensated by the increased use of biomass. Import restrictions in the security of supply scenario lead to a higher use of coals and biomass, thus reducing the demand for oil and gas. However, this reduction is limited because, in this scenario, the import restrictions are only partially compensated by a greater use of European oil and gas reserves.

In order to make a good comparison between the various aspects of a sustainable energy supply, it is important to know the consequences for emissions and energy imports, as well as the costs to society of implementing this policy. Table 3.3 shows a number of effects resulting from the two policy variants. Costs are measured according to the annual expenditures on energy, including any costs of purchasing emission reductions from foreign countries, and are calculated as a percentage of the GDP. For Europe the costs under the stabilisation scenario amount to 1.4% of the GDP. In comparison: according to the *Baseline scenario*, the direct expenditures for energy in 2005, worldwide, were around 6% of the GDP, and the costs for environmental policy in Western Europe were around 2% of GDP. Reduction measures to improve greenhouse gases will also improve the security of supply. The stabilisation scenario shows the import dependency, for both oil and gas, falling by 8% in 2040 compared to the *Baseline scenario*. The security of supply scenario shows the upward effect on greenhouse gas emissions due to extra coal use, compensated by the greater use of low-emission biomass. In total,

Table 3.2 Trade-off between energy-based and climate-based options in Europe.

	Clean	Reliable	Affordable now	Comments
Energy savings	+	+	0/–	Costs increase at high policy ambitions
CO_2 capture and storage	+	0	0/–	
Nuclear energy	+	0/+	0/–	Security/safety risks, waste and proliferation
Biomass electricity	+	0/–	–	
Biofuels	0/+	+	–	2nd-generation is cleaner and need not have as much impact on nature
Fuel switching, from coal to gas	+	–	–	Only limited possibilities in the long term
Increased use of coal	–	+	+	
Solar, wind	+	+	– –	Cost reductions can be made through investments and R&D

Figure 3.10 Primary energy consumption in Europe, using three scenarios in 2040, calculated on the basis of FAIR/TIMER.

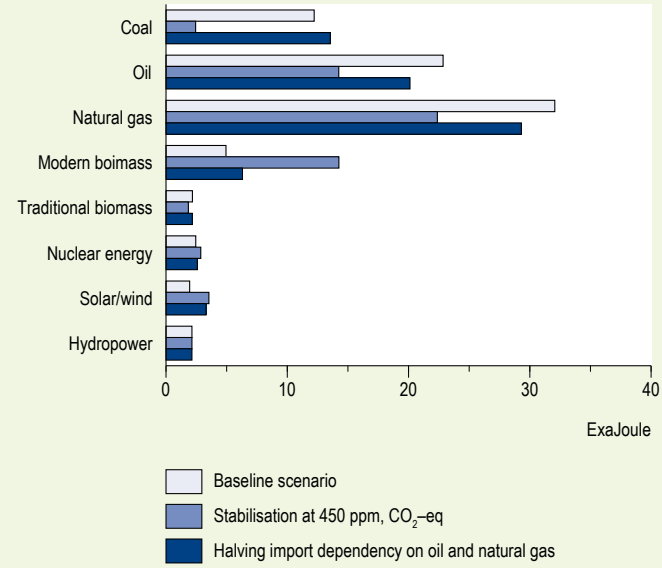


Table 3.3 Consequences of climate policy and security of supply policy on energy consumption, emissions, imports and costs for Europe, 2040.

	Primary energy consumption	CO_2 emissions in Europe	Import dependency on oil and gas	Expenditures on energy
	Changes compared to the Baseline scenario (in %)			
Stabilisation at 450 ppmv	-21	-57	-8	1,4
Halving the import dependency on oil and gas	-2	-4	-50	0,2

Calculations based on TIMER/FAIR

the energy-related emissions barely change at all. The costs of this policy, in terms of extra expenditures for energy, amount to 0.2% of GDP.

3.5 Towards a sustainable energy supply

A sustainable energy supply must meet a number of criteria: clean, reliable and affordable. Concerning clean, this Outlook emphasizes the climate problem and limiting greenhouse gas emissions. 'Reliable' concerns the security of supply, in the long term, and 'affordable' primarily concerns the costs of the energy supply. Although these aspects of sustainability are widely recognized, these objectives remain vague. The European Union has only defined a specific long-term target for the climate problem. Improving the security of supply is often translated into reducing the dependency on foreign suppliers, which only partially covers the vulnerability of the security of supply. With respect to affordability, further integration and liberalisation of the European energy market is seen by European Commission as the way in which energy costs can be kept low for both private citizens and the business community.

Without additional policies, the aforementioned objectives will be even less feasible. The use of fossil fuels leads to increased greenhouse gas emissions. In all probability the average worldwide rise in temperature will rise above 2 °C. Over the next 40 years European energy stocks will gradually be depleted and Europe will become increasingly dependent on a small number of foreign suppliers. This increasing dependency feeds the concern that fossil fuel suppliers will use their power for economic or political gain. Worldwide, there seem to be sufficient fossil energy reserves to meet demand, although the cheap and easily extractable stocks will become scarcer. Future energy prices are expected to remain high.

Justifiably, the climate problem receives considerable attention in the sustainability debate. The effects of climate change seem to be more serious than the consequences of a reduced security of supply. Although there is still considerable uncertainty surrounding the risks of increased dependency on foreign fossil fuel suppliers, the vulnerability to disruptions in the energy supply seems to lessen in the future. The role that energy plays in the economy will steadily become smaller, while the risks concerning climate change will only become greater.

A sustainable energy policy should strike a balance between the various 'criteria' with which an energy supply must comply. These criteria sometimes conflict with each other, particularly 'affordable' *and* 'clean'. Both climate policy and security of supply policy cost money. Specific investments in another type of energy supply would cost even more money. As policy becomes stricter and the desired change rate increases, so the costs of that policy increase significantly. However, there may be synergy also. Energy savings and renewable energy both lead to lower emissions and less dependency. However, the balance between them (which target, or which combination of targets are given priority) is, in the end, a political decision. Do we want to ensure that, in the long term, our energy supply produces less greenhouse gas emissions, or does short-term economic growth have more priority? It is also important to realise which risks we are prepared to take, and how we take account of the effects in the distant future. A robust policy requires evaluation against specific objectives. These are lacking, particularly for security of supply, so that an integral comparison is not possible.

It is not just the objectives that require political decisions. The priorities concerning the way in which these objectives should be achieved vary, and are dependent on the political decisions and world view. There are several ways in which the government can stimulate an alternative energy supply. With generic measures, such as an emissions trading system or taxation of energy sources, the government makes no explicit decisions about certain technologies or options, because these measures assume trust in the way the markets work. Specific measures, such as setting standards and regulations, assume a high level of trust in the government, and the willingness to give the government a major role to play. Specific solutions often pay less attention to cost-efficiency aspects. It is also difficult for the government to use specific measures within a liberalised European energy market. If given the considerable risks for the climate, CO_2 capture and storage appears desirable, this will be an obstruction. Energy companies usually make autonomous choices concerning the technology they use.

In the future we must use less energy *and* choose other forms of energy. There is no simple solution for achieving a sustainable energy supply in the future. We need a wide range of clean energy options. Investing in energy savings, renewable energy, 'sustainable' nuclear energy (with acceptable solutions regarding the accident and proliferation risks and the long-term storage of radioactive waste), and coal (with CO_2 capture and storage) are all strong options for improving the climate policy *and* the security of supply issue.

The future role played by coal is crucial, because there are conflicting aspects involved. From a security of supply aspect, society will want to remain confident about coal, though climate policy requires at least the capture and storage of CO_2. Although, under an effective emissions trading system, the market will select clean technology, as yet the current ETS has provided no credible long-term incentive. Coal-fired power plants are currently being converted and will remain part of the long-term supply. In view of the long-term objectives, the government can change course towards a more climate-friendly direction by ensuring that CO_2 capture and storage are implemented immediately.

Based on today's technologies it would seem possible to reduce greenhouse gas emissions over the next 50 years, such that the climate target comes within range. In the longer term (at the end of this century), the role played by fossil sources will cease, with the exception of coal (with CO_2 capture and storage). Current options will then no longer apply and, in the distant future, new technologies will have to play an important role. However, as yet, these options require considerable institutional change and investment (solar-based power plants), or are too uncertain (nuclear fusion). Both the huge investments involved and the high levels of uncertainty justify the government playing a coordinating role.

The objective is not just to use technical options to make energy policy more sustainable. Investing in better international relationships, removing subsidies and fiscal measures also offer considerable scope and opportunities.

The greatest policy challenge today is to find the best approach that results in worldwide participation, and that helps to resolve the climate problem. This is a worldwide problem and can only be solved on a global scale. The proposals by the European Commission for reducing CO_2 emissions are a step in the right direction but, in the end, the EU's long-term target of limiting global warming to 2°C cannot be achieved without a broad global coalition. The scale of the problem concerning climate and security of supply requires more coordination. European coordination is an important intermediate step, with the competitive power of industry and the use of innovative advantages being assisted by the European approach. But new and

far-reaching international agreements are required, with more countries becoming involved in finding a climate solution and encouraging fast technological development. As an economic power, Europe can throw more weight behind the negotiations. The Netherlands will also need to contribute to an EU strategy, according to its capacity. On the other side of the coin, there will be less room for national policy to manoeuvre.

4 Land use and biodiversity

Biodiversity loss continues, partly because the world's population is growing, but primarily because production and consumption continue to rise. Agriculture, in particular, continues to put great pressure on land and, therefore, on biodiversity. Climate change and infrastructure (via landscape and habitat fragmentation) are emerging threats to biodiversity. The world is too small to achieve all the current policy targets at the same time. Food production and large-scale production and use of biofuels are not compatible with the goal of significantly reducing the rate of biodiversity loss.

One of the key options for reducing biodiversity loss is to raise agricultural productivity. If agricultural productivity does not increase at all, then all the available highly productive land will have been brought into cultivation by 2040. Most of this land is now tropical forest (including rain forest) and tropical grassland. However, agricultural productivity is expected to improve considerably, especially in the developing countries. Although, in many tropical regions, such as Africa and Brazil, expansion of the agricultural area – and consequently damage to biodiversity – cannot be prevented, even if full use is made of existing technologies. Technology alone will therefore not be enough to achieve the biodiversity target.

Besides the use of technology, policies can also be aimed at changing people's diets. The expansion of the land area used by the agricultural sector can be slowed down by reducing the amount of beef in the global diet, and replacing this with chicken and cereals. Reducing meat consumption, however, is very hard to achieve: consumers hardly respond to rising meat prices. Even if the price of beef were to double in the Netherlands, land use would be reduced by just 4%. Governments should, therefore, also plan to inform the public about how meat consumption affects global land use and is instrumental in driving biodiversity loss.

A final option is to create more nature reserves. This will not make more land available, but it is a 'no regret' option, which can be implemented relatively quickly to conserve specific natural systems.

Besides these three options for conserving biodiversity, investments are needed to improve the scientific understanding of the relation between biodiversity and development. As governments introduce more stringent biodiversity policies, the public will increasingly demand a justification for these policies. An important condition for making better use of scientific knowledge about biodiversity in policy making would, therefore, seem to be to increase the international pool of knowledge, as the Intergovernmental Panel on Climate Change (IPCC) is doing for climate.

For its development humanity depends heavily on ecosystem services, the most important of these being the provision of energy, water, food and timber. So far, human development has been achieved by occupying and exploiting an ever increasing area of the earth's surface, at the expense of the plant and animal species in these areas. This chapter is primarily concerned with the human use of land as the main cause of biodiversity loss. The major scientific and social question is: how much longer can humanity continue to convert land for its own use, and thus cause biodiversity loss, without generating undesirable impacts? Two-thirds of the potential area of productive agricultural land is already in use, and this is expected to expand further over the next few decades. How much biodiversity will be lost as a result, and especially how serious the consequences will be, is not easy to determine. What can be established with some certainty is how much additional land will have to be converted to agricultural use to meet the growing demand for food.

Regardless of the uncertainty surrounding biodiversity loss and the value judgements about how bad or harmful it is, policymakers around the world have agreed to achieve significant reductions in the rate of biodiversity loss. In effect, the world has taken on the task of protecting nature and curtailing the loss of species. This global challenge is the core subject of this chapter, which focuses largely on the trade-offs involved between meeting this objective and continuing economic and social development.

4.1 Global trends

Human land use expanding

Mankind needs an increasing area of land to grow food and to build infrastructure and cities. As a consequence, the land available for terrestrial ecosystems is being reduced and biodiversity continues to decline. Not only do the increasing numbers of people need food (and use more land in order to obtain it), but people's diets are also changing as levels of affluence rise: people are eating larger amounts of animal products. In turn, more land is needed to produce feed for these animals.

Of the estimated 60 million km² of land in the world that is suitable for intensive agriculture, the present global population of 6 billion people currently use almost 40 million km² for agricultural production (FAO, 2006a; Table 4.1). The area theoretically remaining for intensive agriculture lies mainly in the tropics (Table 4.1). In addition, a further 10 million km² of land is used as extensive grassland and cannot be used for more intensive agricultural production systems because of the low productivity of these areas (see Table 4.1 and Chapter 1). An example of this type of extensively used area are the Mongolian steppes, which the Food and Agriculture Organization (FAO) in its statistics describes as 'pasture' (FAO, 2006a), also known as grassland for grazers.

If land use per person rises in proportion to the growth of the population, all the productive land will have to be brought into cultivation when the global population reaches 9 billion. It is crucial, therefore, that productivity rises to avoid the need for further expansion of agricultural land use. According to the *Baseline scenario* (calculated using the IMAGE model; MNP, 2006) agricultural production will rise so fast over the next forty years that by the middle of this century around 55 million km² of land will be in use for agricultural and extensive grazing. In this scenario, total agricultural land use will expand by 5 million km², or a rise of 10% between 2005 and 2040, which is the same percentage as the increase in area between 1970 and 2005. To make this possible, average global productivity will have to rise by 43% between 2005 and 2040. For comparison, between 1970 and 2005 average global productivity increased by 55%. The role played by technology in improving agricultural productivity is examined further in section 4.3.1.

Besides the agricultural potential of 60 million km² and the 10 million km² in use for extensive grazing mentioned above, a further 20 million km² of forest is available which, theoretically, could be used for timber production (Table 4.1). If this were the case, it would mean that every available square inch of the earth that could, theoretically, be used for production would in fact be taken up, and no account would be taken of biodiversity and its potential uses (see text box 'Land available for forestry and making it sustainable'). In any case, these figures clearly show that there are limits to the physical availability of land to meet global demand for consumption. The allocation of the available land per world citizen has already been discussed in Chapter 1.

Biodiversity loses out

Socio-economic development is at the expense of biodiversity. Natural areas are converted to agriculture or forestry, cities and infrastructure fragment ecosystems even more and the quality of the water and the air deteriorate, for example, due to emissions of nitrate and greenhouse gases. These have all contributed to the decline in biodiversity during the past few centuries (Figure 4.1); 30% of the original biodiversity has been lost during the course of the last three centuries, measured as mean species abundance (MSA, see text box 'Definition of biodiversity'). Over the next fifty years the rate of biodiversity loss is expected to accelerate and a further 10% of the world's biodiversity will be lost.

Table 4.1 Current areas of the most important land use types in the world (to the nearest 5) and the proportions that can be used for intensive agriculture (Source: MNP, 2006; based on FAO, 2001 and FAO, 2006a).

	Area (million km^2)	Proportion suitable for intensive agriculture
Intensive agriculture (arable)	15	100 %
Grassland for grazers	35	70 %
Ice and tundra	10	0 %
Desert	15	0 %
Boreal forest (coniferous)	15	20 %
Tropical forest	15	80 %
Other forest (temperate and subtropical regions)	10	50 %
Other natural areas (particularly savannah and steppe)	15	20 %
Total	130	45 %

Land available for forestry and making it sustainable

About a third of the global land surface is covered by forests. This amounts to a total forest cover of 40 million km^2 (Table 4.1; FAO, 2001). The area of still undamaged forest is estimated to be about 15 million km^2; the rest is already managed for human use.

As humanity needs large quantities of timber and paper, a large part of the total forest area is currently used for the production of timber. A recent estimate indicates that this takes up about 15 million km^2 (FAO, 2006c). This use of the world's forests is hard to quantify in terms of biodiversity loss. Only intensively used forest plantations have a low biodiversity, but so far less than 5% of the total forest area can be described as forest plantations (FAO, 2006c). It is clear, though, that forests contribute to human well-being via their ecosystem functions, such as flow regulation, carbon storage, provision of fuel wood and other, non-timber forest products (bushmeat, fruit, nuts and fibres) and recreational opportunities. The poor, in particular, are directly dependent on the services provided by natural systems (MA, 2005a).

At the moment about 10% of the total forest area lies within nature reserves (FAO, 2006c), which means that only a limited area of the world's forest cover is protected, and many forests run the risk of being felled. Not all the area of forest cover can be used for intensive agriculture (Table 4.1), but it can of course be used for timber production. The debate about how forests can be protected in future – either by expanding the area of nature reserves or by introducing sustainable forestry practices – is therefore highly relevant.

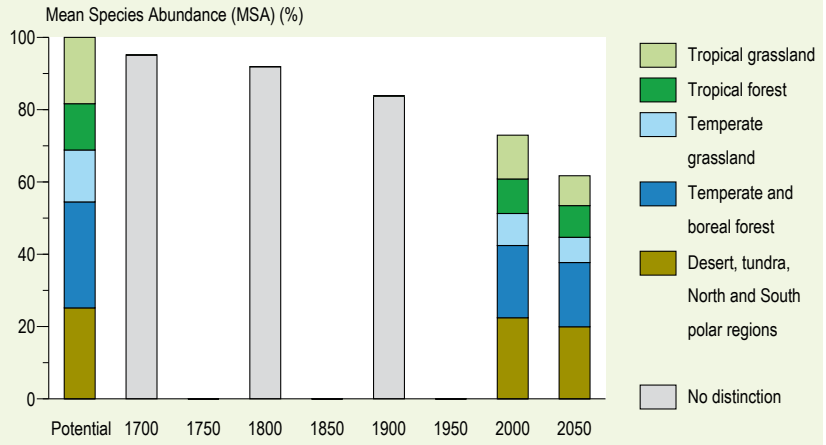
The goal of sustainable forestry is to maintain the contribution forests make to meeting economic, ecological and social needs over the long term. In 1992 the International Tropical Timber Organization (ITTO) established criteria for sustainable forestry which form the basis for the certification system run by the Forest Stewardship Council (FSC) and the Dutch assessment guidelines for green timber labels (*Beoordelingsrichtlijn voor duurzaam bosbeheer en de handelsketen voor hout en duurzaam beheerd bos*; BRL). Important requirements for certification under these labels are:

- restrictions on harvesting intensity (no higher than the annual rate of growth and only after a full rotation cycle);
- maintenance of ecological functions and biodiversity;
- good living and working conditions for forest workers and the local population.

Plantations are permitted under the criteria for the FSC label if they do not replace natural forest. At the end of 2006 more than 0.80 million km^2 worldwide were managed under the FSC system. If other, less stringent and comprehensive internationally recognised systems are also taken into account, the certified area verified by the timber trade amounts to 2.9 million km^2 (VVNH, 2007). It is worth noting that the tropics are clearly overrepresented in these numbers.

How much land is required to meet current global demand for timber under sustainable forestry management, at least without further deforestation? An initial estimate of the area required under sustainable cropping ranges from 18 million km^2 in 2005 to more than 21 million km^2 in 2040, which means that the currently available area for production forest is insufficient and that the area of still undamaged forest will continue to decline. One way to reduce the required area of production forest is to develop intensively managed plantations. However, this will take up productive land (Table 4.1), which is becoming scarcer and is already under pressure from agricultural expansion.

Figure 4.1 Terrestrial biodiversity through the centuries measured as mean species abundance (Source: Alkemade *et al.*, 2006).



Loss of biodiversity shifting from North to South

The areas that are still largely unaffected are the boreal forests, the polar regions, the tundras in the northern cold regions, and the deserts (Figure 4.1). These areas (especially in Canada, Scandinavia, Russia and Africa) take up about a third of the global land surface. Little or no use can be made of these areas to supply the most important ecosystem services, such as the provision of food (Table 4.1) and, therefore, they run less risk of being damaged.

Between 1700 and 2000 a large area of land was converted to agriculture, mainly in the temperate forest regions and heathlands of Europe and the United States (about 50%) because these were the regions where human development was most rapid (Klein Goldewijk, 2005). In the near future the greatest agricultural expansion can be expected in the tropical regions because the economies of South America, Africa and Asia will grow (Eickhout *et al.*, 2006b).

Definition of biodiversity

'Biodiversity' is short for biological diversity and covers the total variability among all living plants and animals on earth. This includes the variation between species and the genetic variation within species, as well as the variety of communities of organisms and of ecosystems. An area has a high biodiversity if it contains:

a) many species of plants and animals;
b) enough individuals of each species (density) to maintain those species.

Biodiversity is, therefore, about species diversity (quality) within a large enough area (quantity). In terms of land area, biodiversity depends on the size of the natural area and the quality of that area for supporting a sufficient number of species.

The Netherlands Environmental Assessment Agency (PBL) is working with a terrestrial biodiversity indicator that reflects both the loss of quality and the loss of quantity (area of land): the mean species abundance (MSA; Alkemade *et al.*, 2006). Loss of quality is factored into the loss of area in order to aggregate the various pressure factors. These pressure factors, such as climate change and nitrogen deposition, were translated into loss of area by using relations derived from the literature ('dose-response' relations; Alkemade *et al.*, 2006). These pressure factors, therefore, reduce the initial value of each ecosystem. The initial value of an ecosystem depends on the agricultural function. An irrigated area, for example, has an initial value of 5%, whereas an agroforestry area has an initial value of 50%. The final indicator, MSA, produces a value between 0% (a non-natural area, or an intensively used area with very high pressure factors) and 100% (completely natural area without any pressure factors).

The MSA is one of the indicators used by scientists to describe biodiversity. The Convention on Biological Diversity (CBD) makes use of many indicators to monitor the loss of biodiversity. These indicators vary from the area of nature reserves to the ecological footprint, and from trends in nitrogen deposition to the list of endangered species (UNEP, 2004). Many of the indicators, however, cannot be simulated in projections for the future. Using MSA, though, it is possible to simulate future trends (Alkemade *et al.*, 2006), which makes the MSA one of the biodiversity indicators that provide insights into projections for the future. Other indicators are the Species-Area Curve (Sala *et al.*, 2000) and the Biodiversity Intactness Index (Scholes and Biggs, 2005). The MSA approach has already been used for the CBD's Global Biodiversity Outlook (CBD/MNP, 2007).

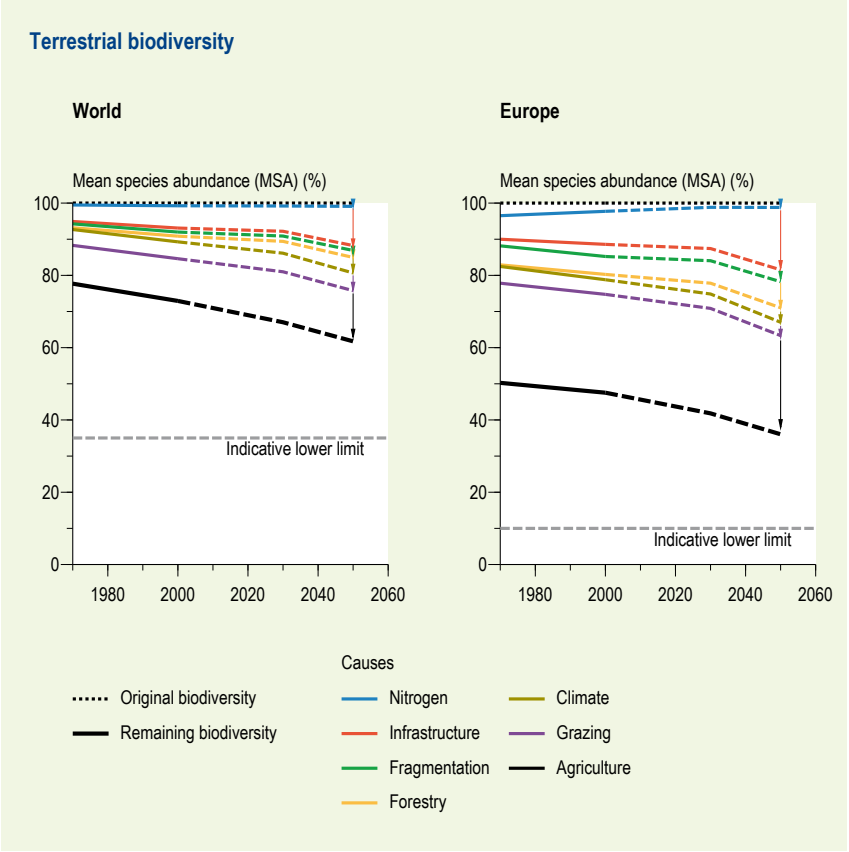


Figure 4.2 Changes in global and European terrestrial biodiversity (mean species abundance, MSA) to 2050 under the *Baseline scenario*.

Agriculture is a major cause of biodiversity loss

Most biodiversity loss is caused by agriculture and its continuing expansion. According to the *Baseline scenario*, agriculture will remain the principal cause of biodiversity loss in future, although infrastructure will become a much more important additional factor (Figure 4.2). Figure 4.2 shows an indicative minimum of 35% of global biodiversity that cannot be used for more intensive agriculture (Table 4.1) or forestry.

Climate change will become more important as a cause of biodiversity loss. The climate appears to be changing at a faster rate than many ecosystems can cope with, which increases the chance that these ecosystems will be weakened (Leemans and Eickhout, 2004). Weakened ecosystems are, in turn, more vulnerable to invasive species, which can cause further loss of biodiversity (IPCC, 2007). The effects of climate change can also be seen in the Netherlands (MNP, 2003, 2005), where the rise in temperature has extended the growing season by at least three weeks compared with the period before 1980. The timing of natural phenomena and the annual activities of many species are shifting: plants flower earlier and trees come into leaf earlier. In addition, the biological rhythms in the lives of birds, insects and amphibians have clearly changed (MNP, 2003), in turn altering the interactions between species. If these changes progress at different rates, prey species, for example, may not be available to predators at the right time (IPCC, 2007). This means that policies to tackle climate change are also needed to prevent further damage to biodiversity. If these policies involve greater use of biofuels as an alternative to fossil fuels, the effects of this on biodiversity will have to be considered: on the one hand, there will be negative effects due to a loss of land converted for the cultivation of biofuel crops, and on the other hand there will be a positive effect from avoiding climate impacts (CBD/MNP, 2007). This is explored further in the Biofuels case study.

Other factors, such as forestry and eutrophication from excessive application of nitrogen, play a relatively small role in the loss of terrestrial biodiversity, although the impacts may vary from region to region. The estimated effects of forestry on biodiversity may be larger if they are calculated using other biodiversity indicators (see text box 'Definition of biodiversity').

Climate change and infrastructure contribute to biodiversity loss in Europe

The level of biodiversity in Europe in 2000 is low compared to the level of global biodiversity: 50% versus 70% (Figure 4.2.). The level in Europe is low mainly because the natural environment was domesticated centuries ago (Millennium Ecosystem Assessment / MA, 2005a). For Europe, the lower limit for nature areas which cannot be used for human purposes, such as for agriculture, has been set at 10%. This is because Europe has many more productive ecosystems than the rest of the world. The areas in

Europe that cannot be brought into productive use are the boreal regions in Scandinavia and the mountainous areas in the Alps, Pyrenees and Carpathians. Another point is that a relatively high proportion of biodiversity loss is caused by nitrogen (eutrophication) (Alkemade *et al*., 2006). Under the *Baseline scenario* nitrogen deposition will be a declining factor in future, an opposite trend to the rest of the world (Eickhout *et al.*, 2006a). Agriculture has also been a major factor in the strong decline in biodiversity in Europe, but is not expected to increase much in future (Eickhout *et al.*, 2007). However, over the coming decades climate change will have a greater impact on biodiversity in Europe than in the rest of the world, because the Mediterranean area is expected to become drier and the higher latitudes are expected to warm relatively rapidly (IPCC, 2007; Bakkenes *et al.*, 2006). In addition, under the *Baseline scenario* infrastructure and forestry will put European biodiversity under increasing pressure, which means that the loss of biodiversity in Europe will not be halted soon.

Important loss factors: growing demand for food and dietary change

One of the most important trends during recent decades is the rising demand for agricultural products. For many regions this rising demand is due to the additional demand for food. Between 1970 and 2000 the total worldwide demand for food has almost doubled, which is equivalent to an increase of about 20% per person (FAO, 2006a). Besides the demand for food, an additional factor is that in the regions where prosperity has risen people tend to include more animal products (like meat and milk) in their diet. For example, meat consumption in China rose sharply between 1990 and 2000. In 2000 the average Chinese citizen approached Western levels of consumption of meat.The consumption of all animal products in China almost doubled per person between 1990 and 2000. The trend of a rising demand for animal products is hardly detectable in the African countries (Figure 4.3). However, consumption of animal products in the United States and the Netherlands is very high: measured in calories about a third of American consumption consists of animal products. The demand for animal products per head of the world's population rose by about 40% between 1970 and 2000, while the demand for vegetable products increased by 'only' 10% (FAO, 2006a).

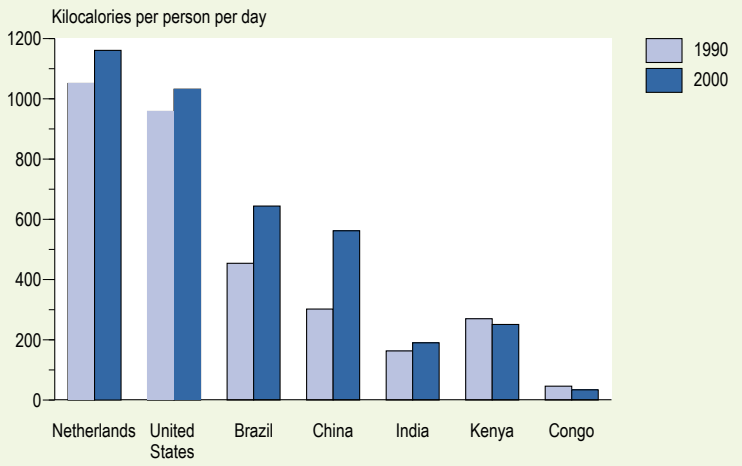
Of the 50 million km² of land in agricultural use, almost 40 million km² is estimated to be used for livestock farming (FAO, 2006b). Of this almost 35 million km² is grassland and about 5 million km² is used to cultivate feed crops. This means that a third of the total arable area is used for global meat consumption (Table 4.1). On average, 80 times as much land is needed globally to produce one kilocalorie of beef than to produce one kilocalorie of cereals (calculation based on FAO, 2006a). Measured on the basis of protein content, the difference is smaller because meat contains more protein per kilogram than cereals. Taking account of the fact that a kilogram of meat contains eight times as much protein, the production of beef protein still requires more than ten times as much land than the production of vegetable proteins, such as cereals. This is mainly because of the area of grassland used by beef cattle, which are generally still grazed quite extensively, making the average area of land per head of cattle very high. Dutch cattle, though, take up much less land because of the intensive livestock farming methods in the Netherlands, which illustrates the trade-off between land use and animal welfare. The ratio is a lot lower for non-grazing livestock, such as chickens: about 2.5 times as much land is needed to produce one kilocalorie of chicken than to produce one kilocalorie of cereals (calculations based on FAO, 2006a).

The demand for meat will in future continue to put pressure on land use (FAO, 2006b). On the one hand, the area of grassland is not expected to expand much because extensive farming practices will be converted to more intensive systems (Bruinsma, 2003; Bouwman *et al.*, 2005). On the other hand, this intensification will lead to a rise in demand for livestock feed, soya being the best-known example. According to the Baseline scenario, the area of land used to cultivate soya will increase over the next 40 years by almost 20%, while the total area of grassland will remain more or less the same (an increase in Africa will be compensated by a decrease elsewhere). This means that the loss of biodiversity will be caused mainly by an expansion of the area of arable land rather than an expansion of the area of grassland (Figure 4.2).

Demand for livestock feed rising dramatically

The production of soya for use as livestock feed has risen dramatically, almost threefold between 1970 and 2000 (FAO, 2006a). Soya beans can be converted into soya cake, which is very rich in calories and in great demand as a feedstuff for chickens, pigs and cows. As the demand for soya is rising so fast, the area under agriculture will have to expand substantially because the relevant agricultural technologies have not got to the point where the rise in soya yields can compensate for the increased demand. For example, between 1995 and 2003 soya production in Brazil more than quadrupled. And while in 1995 more than 80% of Brazilian soya was exported to the EU (3 million Mtonnes of the 3.6 million Mtonnes), in 2003 this had fallen to 'just' 50% (9.4 million of the more than 20 million Mtonnes). In the same eight years, exports of Brazilian soya to China rose steeply (6.5 Mtonnes in 2003). The area of land in Brazil that is needed to produce this soya rose from 2 million hectares in 1970 to 16 million hectares in 2000, and by 2005 had risen to more than 20 million hectares. Such an explosive growth in agricultural production is usually accompanied by social conflicts in the region (see text box 'Land conflicts').

Figure 4.3 Growth in the consumption of animal products from 1990 to 2000 in various countries (Source: FAO, 2006a).



Globalisation is driving a shift in land use to other countries

The world is becoming smaller, and for various reasons this applies to food production, too. Not only is the remaining unused area of land literally becoming smaller as human land use expands (Table 4.1), but improved technologies and transportation make it easier for countries to have the products they need produced elsewhere. As a result, more

Land conflicts

If the demand for land for the production of soya beans rises fast it can lead to social tensions, especially if the land use within specific areas changes rapidly. Figure 4.4 shows that the number of land conflicts in the Brazilian regions where soya cultivation was introduced recently (the new soya regions) is high. The number of land conflicts per hectare in the regions where soya has been cultivated for decades is much smaller, although soya production is rising in these regions, too. This shows that regions need time for society to adapt to new conditions, such as the emergence of a more professional agriculture (AIDEnvironment, 2007a).

Moreover, regions where soya is not only cultivated but is also converted into livestock feed for immediate use in the poultry sector, appear to profit economically more than regions where soya is cultivated and then exported (AIDEnvironment, 2007b). Again, this shows that developing countries can obtain greater economic benefits if they not only cultivate primary products but also process them into end products. In such cases, developing countries obtain greater economic profit from soya production, and loss of natural areas (ecological pillar) is compensated by economic growth (economic pillar). This also involves consideration of the sustainability trade-offs between here and elsewhere, because the more links in the soya production and supply chain developing countries keep in their own hands, the less the developed countries can profit from it economically.

Figure 4.4 Number of land conflicts in Brazilian soya producing regions. Three types of regions are identified: regions where soya has been cultivated for a long time, regions where soya production has recently expanded and regions where soya production has recently been introduced (Source: AIDEnvironment, 2007a).

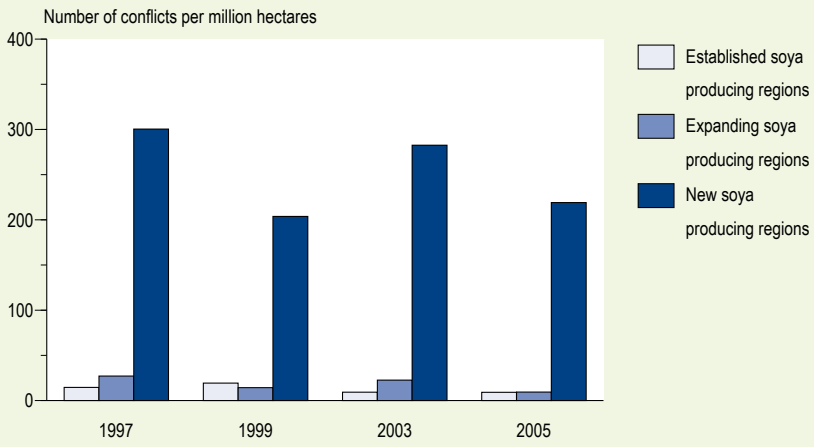
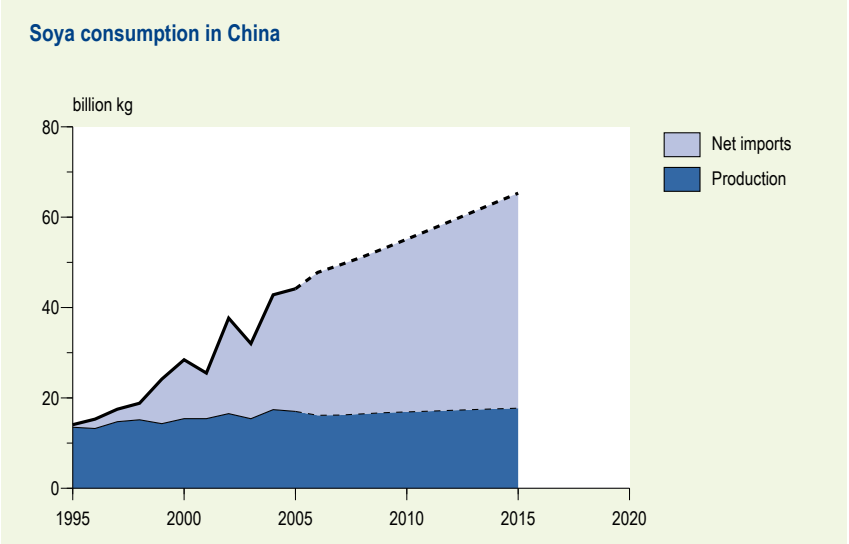


Figure 4.5 Soya production and consumption in China (Source: FAO, 2006a).



countries with a shortage of land are transferring production to countries that still have enough productive land available. In the European region clearly most of the productive land is already in use or protected (Eickhout *et al.*, 2007). In China almost all the available productive land has now been brought into agricultural or urban uses to satisfy the growth in consumption and production (Bruinsma, 2003). Any additional growth in consumption in China, therefore, will have to be met elsewhere (Figure 4.5), which means that trade in agricultural products will increase in future, regardless of any possible changes in agricultural policy (Eickhout *et al.*, 2004). Increasing trade generally leads to higher economic growth (World Bank, 2007). In addition, exchange of knowledge generally results in higher agricultural productivity (OECD, 2003a, 2003b), but whether everyone can benefit from increased trade remains a highly controversial issue.

Aquatic biodiversity

So far the focus has been on terrestrial biodiversity: biodiversity on land. But loss of aquatic biodiversity is also occurring. The aquatic system of seas, oceans, rivers and lakes contains diverse forms of life, such as fish, shellfish and crustaceans, plankton, marine mammals, turtles, water birds, corals and plants, and these have also shown a declining trend in recent decades (MA, 2005a). This decline can be attributed mainly to fisheries, followed by pollution from shipping, the construction of pipelines and drilling rigs, coastal development and tourism, polluted rivers (e.g. eutrophication) and climate change.

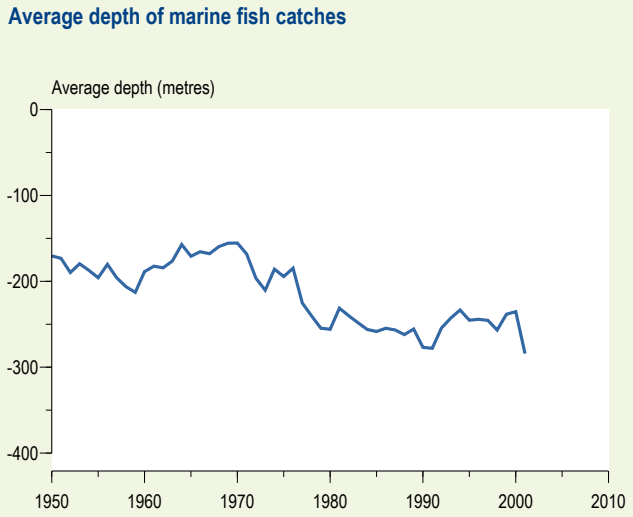
About 90% of the world's fish are found above the continental shelves and are caught by fishing vessels from the coastal states. Nine out of ten fishing boats catch a few tonnes of fish per year and most come from developing countries. Fishing boats from developed countries catch considerably more fish. Although fishing activity at sea is increasing, catches have remained about the same or have even fallen slightly since the end of the 1980s. Fishing boats already have to go further out to sea to find enough fish and have to fish increasingly deeper waters (Figure 4.6), which has been made possible by new technologies.

The Millennium Ecosystem Assessment (MA, 2005a, 2005b) discusses the main causes of the decline in aquatic biodiversity. The main cause is that it has proved difficult to establish international arrangements for managing fish stocks around the world. There are laws, treaties and codes, but enforcing them is problematic. Another important cause is the increased demand for fish, which is rising faster than the global population. In the rich countries and the countries that are becoming wealthier, such as China, fish is seen as an interesting luxury food. Moreover, countries encourage fish consumption for health reasons. The fishing industry is highly subsidised in various ways, which leads to fishing boats becoming larger and more powerful.

As demand is increasing faster than supply, fish prices will rise but will not lead to lower demand. The response so far has been to make greater efforts (both legal and illegal) to catch more fish. But higher prices only have the effect of lowering fish consumption in some developing countries. African countries in particular have sold fishing rights to richer countries, especially to the EU, while technological advances such as deep freezing fish now enable large fishing vessels to remain at sea far from home for long periods and catch huge quantities. GPS systems and sonar can be used to track down shoals of fish and map the ocean bottom. All these techniques have made it possible to catch

fish quicker, leaving them less time to reproduce, and lie behind the sombre predictions that the oceans could be emptied of fish by 2050 (Worm *et al.*, 2006). Although such predictions have been criticised (Hilborn, 2007), no-one disputes that in a *Baseline scenario* without additional policy measures the fishing industry will come under increasing pressure.

Figure 4.6 Average ocean depth fished by year (Source: MA, 2005b).



4.2 Policy challenges

Global biodiversity target will not be met

The loss of biodiversity has been an issue for decades, both at the global level and within the EU and the Netherlands. In 1992, world leaders drew up the Convention on Biological Diversity (CBD) at the Earth Summit in Rio de Janeiro. It came into force on 29 December 1993 and now it has been ratified by more than 180 countries, including the Netherlands and the European Union.

The Convention has three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of that use. Under the CBD, biodiversity is valued not just in terms of its ability to meet human needs and desires, but also as an intrinsic quality of nature. The Parties have agreed to achieve a significant reduction of the current rate of biodiversity loss by 2010, although what is 'significant' has been left open to interpretation. However, the CBD commits the Parties to take measures at the national level to conserve biodiversity and to make sustainable use of its components. It is unclear what the consequences will be if these policy goals are not met. The short timescale in particular (2010) makes it is impossible to achieve the targets at the global level (CBD/MNP, 2007). The *Baseline scenario* also foresees no significant slowdown in the rate of biodiversity loss (Figure 4.1), not even in the longer term (2040). Therefore, additional measures will be needed to achieve the target in the longer term.

European policy target: halt biodiversity loss by 2010

Several initiatives have been launched at the European level to conserve biodiversity in Europe. The EU's target for these initiatives is more ambitious than the CBD target: the loss of biodiversity at the European level must be halted by 2010. The EU has adopted a number of directives as instruments for achieving this goal, the best known being the Birds Directive (adopted in 1979) and the Habitats Directive (1992). Both oblige the national governments of the EU Member States to designate areas where species enjoy sustainable protection. This is known as area-based policy. Under the Birds and Habitats Directives the Netherlands is also committed to protecting some species outside these areas through a protected species policy. The areas designated under the Birds and Habitats Directives (Natura 2000 areas) must be well managed and protected in order to maintain the natural habitats and species.

Protection of the Natura 2000 areas has been incorporated into Dutch legislation through a revision of the Nature Conservancy Act 1998 (*Natuurbeschermingswet*). The species protection requirements under the Birds and Habitats Directives have been transposed into Dutch law in the Flora and Fauna Act (*Flora- en faunawet*), which incorporates the Dutch targets for species protection.

Preventing fragmentation: also a Dutch policy objective
Besides its European obligations, the Netherlands has developed its own biodiversity policy which focuses largely on preventing the fragmentation of habitats. This fragmentation is a typically Dutch threat to biodiversity because the population density in the country is so high. With this in mind, the Dutch government adopted a policy for a National Ecological Network (*Ecologische Hoofdstructuur*) in 1990 in its Nature Policy Plan (*Natuurbeleidsplan*) (LNV, 1990) and took it further in the policy document 'Nature for People, People for Nature' (*Natuur voor mensen, mensen voor natuur*) (LNV, 2000). When it has been fully established, the National Ecological Network (NEN) will cover an area of 750 thousand hectares on land and encompass 6.3 million hectares of the large water bodies (the rivers, the Zeeland delta, the IJssel lake (*IJsselmeer*) and its border lakes (*randmeren*), the Wadden Sea and the North Sea). About 450 thousand hectares of the terrestrial part of the NEN consists of nature conservation areas that already existed in 1990. New conservation areas and wildlife corridors are being created to link these existing areas together to form an interconnected whole. The 'Nature for People, People for Nature' policy document (LNV, 2000) adds 'robust nature links' to the original NEN concept.

Biodiversity policy as a global challenge
Government authorities are pursuing all these policies at various different scales in an attempt to prevent any further loss of biodiversity, without entering into trade-offs with other land uses. In the short term (2010) it would not appear to be possible to simultaneously

- develop those regions where the Millennium Development Goals have to be achieved (see Chapter 2);
- increase food production;
- significantly reduce the rate of biodiversity loss (as countries have agreed in the global CBD targets).

Because the biodiversity target in the *Baseline scenario* clearly will not be achieved (Figure 4.1), it seems that here too additional measures will be needed to reduce the rate of biodiversity loss without pushing our ability to achieve the Millennium Development Goals further into the future.

4.3 Options, measures and instruments

Three main approaches can be taken to reduce the pressures on nature:

1. Reduce the main pressure factor, the expansion of agriculture (Figure 4.2), by increasing agricultural productivity.
2. Reduce agricultural pressures by changing human behaviour: let consumption rise at a lower rate than in the *Baseline scenario*, especially consumption of animal products.
3. Achieve direct benefits for nature by protecting specific areas (nature reserves).

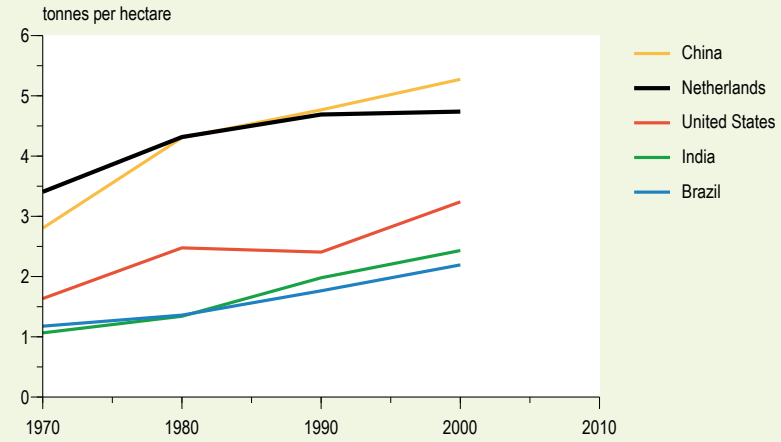
Climate change is another factor that puts pressure on biodiversity. Possible actions to reduce this pressure are discussed in Chapter 3.

4.3.1 Technology: agricultural productivity

Technology can bring about an increase in agricultural productivity, allowing food production to rise without increasing the area of agricultural land. Expansion of the agricultural area must be slowed down if the rate of biodiversity loss is to be significantly reduced. This means that agricultural productivity must be considerably increased, especially in the tropical regions. The likelihood that this can be achieved is examined in this section.

Shortage of land is an important stimulus for improving agricultural productivity
Agricultural technologies are not yet being applied equally in all countries. This is one of the reasons for the large differences in current crop yields, for example in cereals (Figure 4.7). Biophysical conditions obviously play a role: the climate and the soil are not equally suitable for food production everywhere. But the degree to which technologies are applied has a comparable influence. Countries with a shortage of land, such as the Netherlands and China, have already invested much in improving their agricultural technologies. Because these countries experience high external pressures on their agricultural systems (shortage of land), they make greater technological investments to raise yields per hectare (Figure 4.7). In contrast, the United States, which in principle has enough capital to generate higher yields, sees no need to make sweeping investments to raise yields across the whole country, which was done for maize in the southern states. In fact, land in the United States is still too cheap to justify major investments in agricultural technology. In emerging regions, such as Brazil, crop yields are expected to rise steeply. For example, the average yield of soya per hectare in Brazil is now already higher than in the United States: Brazilian soya yields doubled between 1970 and 2000, whereas during the same period yields in the United States rose by 40% (FAO, 2006b). The explosive growth in demand for soya in Brazil itself has certainly been an influential factor.

Figure 4.7 Cereal yields per year for selected countries (in tonnes per hectare) (Source: FAO, 2006a).



Much to be gained from increased productivity

An increase in productivity can compensate for much loss of land and, therefore, reduce biodiversity loss. It is very difficult to make projections of how much crop yields will have to rise to prevent any further loss of biodiversity, because the demand for products, the price of those products and crop yields are interdependent. A simple calculation can be made by assuming that the cropping area is 'not allowed' to expand. The results of such a calculation are given in Figure 4.8, in which the expected yields between 2005 and 2040 in the *Baseline scenario* (based on assumptions by Bruinsma (2003) and model calculations in van Meijl *et al.* (2006)) are compared with the crop yields required to ensure that the agricultural area does not expand.

Between 2005 and 2040 the Baseline scenario projects that global crop yields will rise less than in the last 35 years. For rice the expectations are that yields per hectare will not increase much (Figure 4.8). If the agricultural area remains constant, a considerable effort will be needed to raise yields further. To ensure that the area of land required for soya production does not have to be increased, yields will have to rise even more over the next 35 years than was achieved during the previous 35 years. It is difficult to say how realistic this is, but a good way to find out is to look at the yield gap.

The yield gap is the difference between the actual yield and the maximum potential yield. This difference is caused by disease, nutrient deficiencies, negative price effects and poor agricultural management. The yield gaps for rice in several countries are listed in Table 4.2.

Figure 4.8 Percentage increase in the global yields of various crops between 1970 and 2005 and between 2005 and 2040.

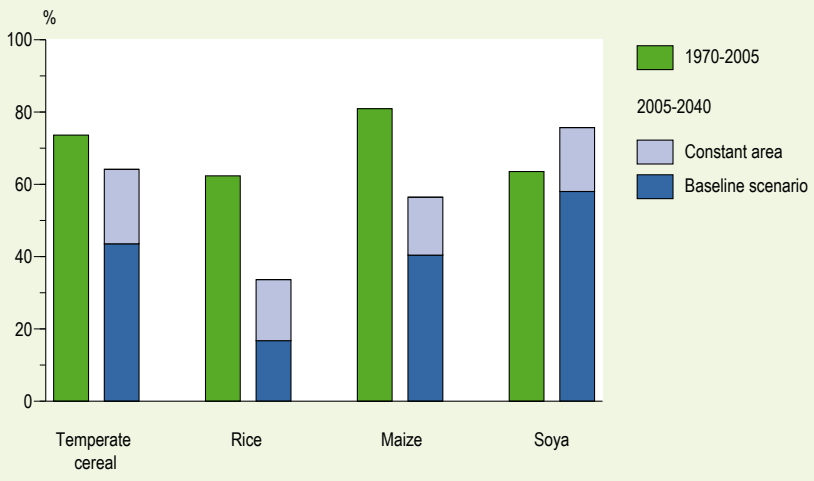


Table 4.2 Yield gaps for irrigated rice cultivation in various countries (Source: FAO, 2004).

	Rice yield at harvest (t/ha)	Potential rice yield (t/ha)	Yield gap (t/ha)
India	4.0	6.8	2.8
South Korea	7.0	7.6	0.6
Philippines	5.5	7.5	2.0
Vietnam	6.5	8.5	2.0
Egypt	8.5	10.4	1.9
Madagascar	4.1	6.0	2.1
Italy	6.0	9.0	3.0
Brazil	5.5	8.5	3.0

There are also yield gaps for wheat in many countries. Even in France, the current wheat yield of 8.7 tonnes per hectare could theoretically be raised to 11.6 tonnes per hectare (Fischer *et al.*, 2000). This calculation takes account of the different climatological conditions in each country. Theoretical maximum yields are based on the optimum use of available technologies for sowing, crop growth and harvesting.

For some countries it is theoretically possible to keep the area under agriculture constant. An example: in the United States wheat yields are currently about 2.8 tonnes per hectare. Theoretically, yields of almost 6 tonnes per hectare are possible (Fischer *et al.*, 2000). In the *Baseline scenario* wheat productivity in the United States rises by about 30%, but this is not sufficient to keep the area constant; to do this yields would have to rise by about 60%. This is theoretically possible, but it does require that the United States makes a much greater effort to raise productivity than is assumed in the *Baseline scenario* (based on Bruinsma, 2003). However, it is not possible for a country like Brazil to keep the agricultural area constant. An increase in the wheat yield of 70% is still theoretically possible (Fischer *et al.*, 2000), and the *Baseline scenario* already assumes that the wheat yield will increase by more than 50% by 2040. To keep the area in Brazil constant, though, yields will have to rise by more than 180%. This would appear to be impossible unless new technological breakthroughs are made. In 40 years time, therefore, it is inevitable that the agricultural area in Brazil will have been expanded at the expense of the remaining natural areas. The same conclusion applies to Sub-Saharan Africa: the *Baseline scenario* assumes that the yields of tropical cereals (such as *sorghum*) will double, whereas at least a tripling of the yield will be needed to keep the cultivated area constant. These calculations do not assume that further changes in trade occur, which could also provide relief for countries where sufficient technological advances will be insufficient to keep the cropping area constant. However, it is inevitable that the global agricultural area will have to expand.

Are GMOs necessary to raise productivity?

According to the Food and Agriculture Organization (FAO) there are various ways to reduce yield gaps:

- promoting integrated crop management;
- using new techniques, including genetically modified organisms (GMOs);
- reducing harvest losses;
- turning the outcome of agricultural research into practical methods farmers can use;
- providing efficient government support (FAO, 2004).

To create GMOs, specific non-natural proteins are introduced into plants. GMOs are usually created to make plants resistant to certain diseases and, therefore, raise yields. The biggest risk involved in doing this is that these non-natural proteins may be introduced into nature. The possible effects of this on humans are not known with certainty. So far the greatest risk appears to be that at some later stage people may be found to be allergic to these proteins (FDA, 1996). The potential impacts of GMOs on nature are still highly uncertain. It is also possible that companies that produce GMOs may obtain a monopolistic position.

When can there be a 100% certainty that something introduced into nature does not pose a health hazard? Organisations such as Greenpeace take a precautionary approach and are against the use of GMOs in principle. In contrast, the FAO says that GMOs are essential for raising agricultural yields even further (Bruinsma, 2003). It is still uncertain what possible direct effects GMOs may have on biodiversity. Nevertheless, about 55 million hectares of genetically modified crops are already cultivated in the United States, and in Argentina and Brazil they are cultivated on 18 and 11.5 million hectares respectively. In this sense, GMOs are already a part of our society.

Technology cannot completely compensate for biodiversity loss

The conclusion is that more land will be turned over to agriculture, despite the improved crop yields projected in the *Baseline scenario*. Such an expansion will have to be resisted to achieve any significant reductions in the rate of biodiversity loss to agriculture. In turn, this means that the yield gap will have to be fully closed in many regions. Although much biodiversity can be saved through the application of new technologies, it will be impossible to prevent agricultural expansion through the use of technology alone. In short, technology will be an essential element of any package of agricultural measures for reducing the rate of biodiversity loss, but it will not be enough on its own to make a significant reduction in the rate of this loss (CBD target), let alone for halting biodiversity loss altogether (EU target) in the longer term (2040).

4.3.2 Behaviour: dietary change

Extreme measures needed to reduce meat consumption

Consumption of meat and dairy products are important factors behind the present and future land requirements for food production. Producing one kilocalorie of beef takes eighty times more land than producing one kilocalorie of cereals (mainly due to the area of grassland needed to feed the cattle). About 2.5 times as much land is needed to produce one kilocalorie of chicken than to produce one kilocalorie of cereals. This means that as consumption of meat rises an increasing area of land will be needed to produce each kilocalorie of food. A shift to a more vegetarian diet would, therefore, be another way of curbing agricultural expansion.

If people were encouraged just to eat more chicken instead of more beef, the pressures on grassland would at least not increase any further. In the *Baseline scenario* the area of grassland is projected to increase by 3 million km². This increase can be prevented if people eat chicken instead of beef, although an additional 0.5 million km², compared with 2000, will be needed for feed production. If all additional calories are obtained from the consumption of cereal products instead of meat, the area of arable land will only have to be expanded by a small amount by 2040. In short, agricultural expansion can be prevented if the increase in consumption is met by producing more crops instead of more meat.

How realistic is such a scenario? People will voluntarily reduce their meat intake by only a limited amount. Meat consumption will have to be discouraged mainly in the Western world and in the emerging economies, such as China and Brazil, because meat consumption in developing countries is still at a very low level (Figure 4.3). If prices double people will reduce their meat consumption by an estimated 50%. The reduction in consumption of dairy products will be less: a 100% price rise will result in an estimated 10% reduction in consumption (LEI, 2004).

Measures to reduce meat consumption, therefore, will deliver only a limited result. A doubling of the price of meat in the Netherlands will reduce the area of land used for food production per person by only 4%. Analyses to test the effect of introducing a global meat tax that raises world prices by 10% indicate a resulting biodiversity dividend of less than 1% (CBD/MNP, 2007). In short, theoretically much can be gained by giving up eating meat, but this behaviour is very hard to stimulate via the price mechanism. In addition, there seems to be little support for such measures, partly because biodiversity loss and the role played by meat consumption in causing this loss are not considered to be a problem (see Chapter 5).

Measures very hard to implement

Given the potentially high biodiversity dividend of eating less meat and dairy products, it would be worth investigating *how* meat and dairy products could be made more expensive. One way, for example, could be to raise VAT or impose a tax based on the amount of land used, similar to the present approach to petrol and diesel based on energy content. The Netherlands could introduce such measures independently. A prerequisite is that when imposing any such tax no distinction should be made between domestic products and imported products. Besides, the rules of the European internal market and the WTO state that VAT tariff differentiation or tax levies may not in effect amount to a trade barrier or a hidden form of discrimination or protectionism.

The Netherlands could also make a case for making meat or dairy products more expensive at the EU level. To introduce such measures in the EU will require a unanimous decision by the European Council. Instead of a price policy, a system of tradeable credits could be introduced in which the Dutch or European authorities would issue a certain number of credits onto the market that could be traded, rather like the system for CO_2. However, it is extremely unlikely that such a system of meat and dairy credits will be introduced in the near future. It would have to be preceded by an extensive information campaign explaining why it is a good idea to eat less meat. Finally, besides pricing or restricting meat consumption, another possibility for combating the effects of meat and dairy consumption on biodiversity is to look for alternatives in the form of high quality meat substitutes and artificial culturing of meat.

4.3.3 Nature conservation

Besides general measures for reducing the area of land under agriculture, pressures on nature can be eased by direct protection of specific ecosystems. The CBD target is that 10% of all ecosystems in the world are protected. In the *Baseline scenario* this target is almost achieved, but doubts have been expressed in the scientific literature that this 10% level of protection is sufficient. For example, studies show that the existing nature reserves can protect just 57% of all species (Ferrier *et al*., 2004). To protect more species, therefore, we need more nature reserves. Although this will not lead to less agricultural expansion, the nature reserve status can be used to steer the future development of those areas that are converted to agricultural uses.

Nature reserves do not protect land, but specific animal species
To protect more than 10% of all ecosystems, the various groups in society will have to invest in nature reserves. The costs are limited: the current costs of maintaining the existing area of nature reserves is estimated at 6.5 billion euros per year, but the costs of protecting 15% of the terrestrial area and 30% of the marine area in the world would not have to cost more than 30 billion euros per year (Balmford *et al.*, 2003), which is considerably less than the costs of climate policy (see Chapter 3). The effect on land use would be limited: no additional land would be gained for nature because nature reserves only shift agricultural production from one area to another. In this sense, protecting nature has little effect in terms of improving MSA: if 20% of all ecosystems in the world were protected, the result would be a 1% reduction in biodiversity loss (CBD/MNP, 2007). However, additional nature reserves would have a considerable effect on the protection of specific animal species. Moreover, nature reserves can become a new source of income for the regional population, for example via tourism. The protection of areas would have to focus on *hotspots* (Figure 4.9), or nature conservation areas that are rich in plant and animal species and also currently under the greatest pressures from agricultural expansion. As stated earlier, these areas are found mainly in the tropics. The Cerrado, an area of savannah in the central area of western Brazil is a good example of an area presently under great pressure from expanding soya production. Indonesia also has many hotspots that are currently coming under increasing pressure from agriculture and timber extraction.

Ecologists have very different opinions about which areas should have priority in obtaining protected area status because no consensus has yet been reached on the areas that need to be protected first. Maps of hotspots, such as Figure 4.9, should therefore be treated as indicative of possible priority areas. The wilderness areas are not yet under pressure from agricultural activities and, therefore, have a greater chance of remaining undamaged. If the pressures on land become very high, however, these areas are also very likely to be exploited for timber extraction, and in some cases for agriculture.

Protecting nature by giving financial support to countries with valuable natural areas
Many valuable natural areas are found outside the Netherlands and the EU. The Netherlands can protect such areas by giving aid to the relevant regions to allow them to protect these areas themselves. This support should be directed at developing the required knowledge, expertise and enforcement capacity to ensure that nature is properly protected. It must not be limited to one-time donations, but consist of structural and stable financing for the long term. Such support will have to be arranged in close cooperation with the local population and development and conservation organisations active in these regions. In this sense, current EU biodiversity policy should be given an external dimension: each euro spent outside the EU can conserve more nature than if it were spent inside the EU.

4.4 Conclusions

The global target set by the Convention on Biological Diversity (CBD) of significantly reducing the rate of biodiversity loss by 2010 cannot be achieved in this short period, even if all the possible options are pursued. More options are available for the longer term, although no single option in itself will be enough to avoid the projected loss of biodiversity in the *Baseline scenario*. Technology cannot entirely prevent an expansion of the area under agriculture in a number of crucial tropical regions, reducing the consumption of meat is difficult to achieve, and nature reserves can only influence or redirect the loss of nature, but not prevent it. All these options should, therefore, definitely be considered for use in curbing biodiversity loss, but for the time being it is inevitable that more biodiversity will be lost. Against this background, it can be stated that the earth is simply too small to meet all the policy objectives (Table 4.3).

In this chapter several options have been examined for reducing the rate of biodiversity loss. These options, which can all be deployed at the same time, are: more robust application of technology, measures to reduce meat consumption, and targeted conservation in specific wildlife habitats and protected areas. However, these options have their negative aspects (Table 4.3). Much can be gained from further use of technologies in developing countries, but not enough to compensate for the growing demand for agricultural products (Figure 4.8). For example, even if all the available techniques are used in Brazil, rising demand for

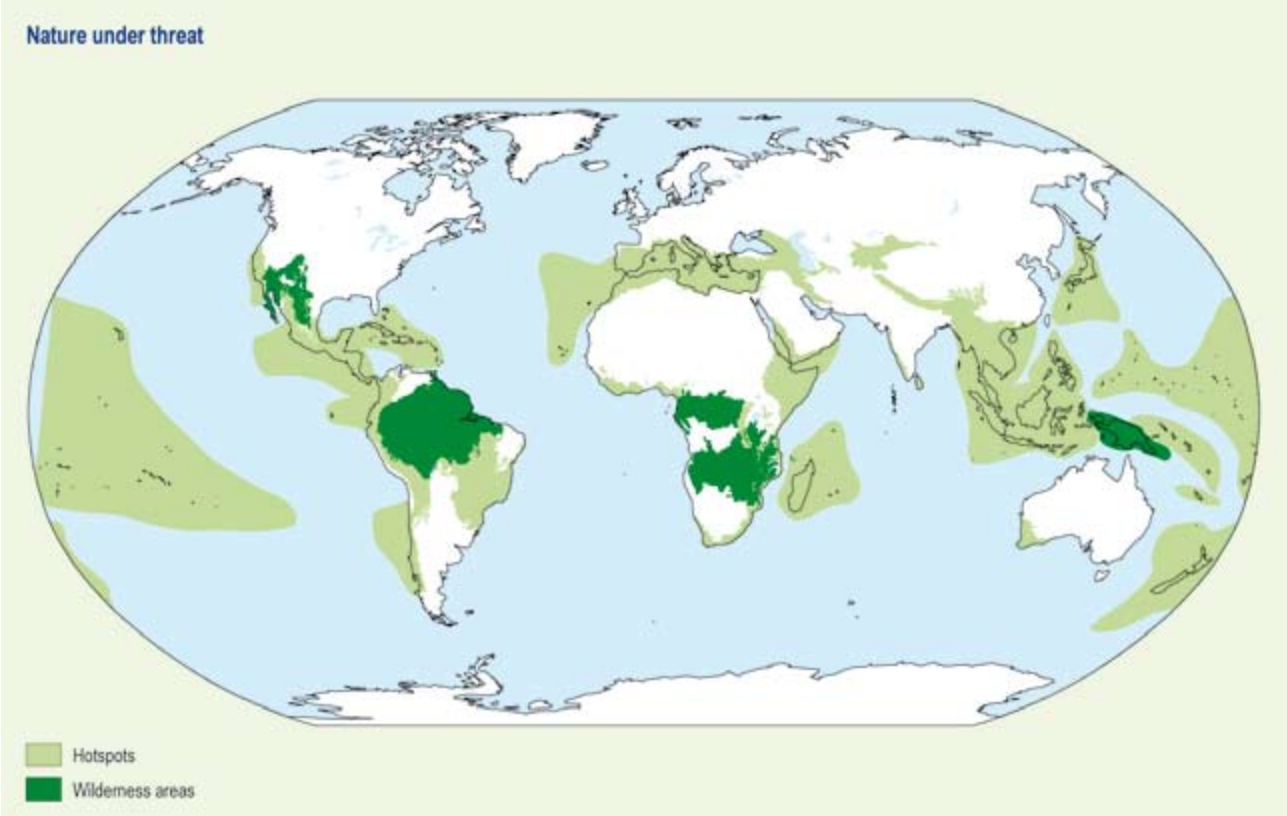


Figure 4.9 Areas rich in animal and plant species (Myers *et al.*, 2000; Mittermeier *et al.*, 2003).

agricultural products will still inevitably lead to biodiversity loss. Additional negative side-effects in the form of land conflicts will also arise, especially in new agricultural production areas, which in turn will require additional policy measures. In principle, dietary change scores well as a theoretical concept, but is very hard to bring about: although it is possible to raise prices, for example, the effect of this is expected to be limited. Nature reserves are a 'no regret' option because the designation of such areas can be used to conserve the rich diversity of plant and animal species in specific protected areas. This option can be deployed at relatively low cost. However, it will not bring about any fundamental change in the relation between rising consumption and its effects on biodiversity, and so continued expansion of the cultivated area will be needed in order to meet the rising demand for food.

All these three routes will have to be pursued to make as much progress as possible towards the biodiversity target. The major question, though, is whether there is sufficient support for measures to conserve biodiversity (see Chapter 5). Of course, everyone acknowledges that biodiversity is being lost, and the Dutch also place great value on nature (as evidenced, for example, by the large memberships of nature conservation organisations), but so far people have not changed their behaviour accordingly (which, in the case of biodiversity, should start with eating less meat).

Apparently, people do not readily acknowledge the relation between their own behaviour and biodiversity loss. But even if people did acknowledge this relation, it is doubtful whether they would really change their behaviour to help stop the loss of biodiversity. In this respect, it appears that the public are much more prepared to accept less popular measures aimed at halting climate change (see Chapter 5).

An important step has to be taken by the scientific community as well, because as more exacting biodiversity policies are introduced, the question of *why* biodiversity loss is a bad thing will be scrutinised more critically. The Millennium Ecosystem Assessment (MA, 2005a) was a first step towards clarifying this, but did not adequately succeed in explaining just how important biodiversity is for human development. An important next step after the MA, therefore, would be to improve our scientific understanding of biodiversity. To what extent is biodiversity loss harmful to humanity and when will critical limits be exceeded? To answer these questions it would seem sensible to establish a biodiversity equivalent to the IPCC: an Intergovernmental Panel on Biodiversity Loss (IPBL). This IPBL should concentrate on biodiversity knowledge as a prerequisite for development. The panel should go further than the recent initiative by UNEP and the Global Environment Facility (GEF) and develop additional indicators for showing whether the CBD target for 2010 can be achieved. The

Table 4.3 Options for reducing the rate of biodiversity loss, scored for *people*, *profit* and *planet*.

	Here				Elsewhere			
	People	*Profit*: costs	*Planet*		*People*: land conflicts	*Profit*: economic growth	*Planet*	
Options			*Bio-diversity*	*Climate*			*Bio-diversity*	*Climate*
Technology transfer	No effect	Profit	Less land use	More fertiliser	Risk to agricultural expansion	Income growth	Less land use	More fertiliser
Change in diet	No effect	Expensive meat	Less land use	Lower emissions	Less explosive growth	No effect	Less land use	Lower emissions
New nature reserves	No effect	Limited	Benefits to specific areas	No effect	Can lead to local resistance	Potential alternative income	Benefits to specific areas	No effect

results obtained from a scientific panel such as an IPBL could then be used to establish how many countries are prepared to act to conserve biodiversity, given the risks, costs and benefits.

5 Perceptions and actions by citizens and companies

Most citizens are well aware of the currently most important issues of global sustainability; however, these 'perceptions' are not always supported by 'actions'. The degree in which consumption patterns affect the environment largely depends on the consumers' income and has no relationship with their environmental notions or value patterns. Citizens expect governments to take measures to break through this so-called social dilemma in order to actualise behavioural changes, for example, by enforcing standards or taxes.

Companies also look to governments for issues concerning sustainable development policies, which they expect to help them realise a level playing field. Dutch multinationals listed on the stock exchange have relatively high sustainability scores. Further elaboration of the chain of responsibility can assist in making the whole production chain more sustainable, because it will aid companies in making specific choices, leading to more sustainable products. The lack of a level playing field and differences in the level of enforcement of legislation between countries limits internationally operating companies from progressing towards more sustainable ways of production.

Citizens want their governments to do more about climate change. There is a level of support from a majority of the population in the Netherlands and other European countries for policy with which an approximate 10% reduction in CO_2 emissions is achieved. People are also prepared to pay the additional costs required to achieve this reduction via price increases. It seems as if citizens prefer measures that are beyond their field of view, such as manufacturers' measures, found chiefly in reduced electricity generation and energy-saving. These and similar measures affect the citizen via a limited general increase in (electricity) prices. Although citizens, in principle, have a preference for electricity generation from renewable energy sources to meet the targeted reduction in CO_2, when they are confronted with the costs, they find CO_2 reduction through nuclear energy and through coal with CO_2 storage to be equally acceptable.

The level of support for maintaining biodiversity is lower. Changing eating patterns, stimulated by a tax on meat or dairy products to reduce loss of biodiversity, is a sensitive issue and does not enjoy the support of the majority. A majority of the citizens in the Netherlands, as well as in other countries, are prepared to pay more taxes for development aid if the benefits are clearly visible, for instance lives saved and more children gaining access to basic education.

In previous chapters poverty and development, and biodiversity and climate were indicated as global sustainability challenges. This chapter discusses the questions: do citizens and companies recognise these problems and take action on them, and is there support in the Netherlands and other European countries for the options presented in previous chapters that will bring the targets for climate, biodiversity and development closer?

5.1 Perceptions and actions by citizens

In order to design a sustainable society, it is important that citizens and companies take the responsibility for the negative consequences of their actions (SER, 2005). If behaviour that supports sustainable development is to be realised, both citizens and companies have to be aware of sustainability problems.

Global sustainability issues are important to citizens

When Dutch citizens were asked to rank social issues in the order of importance for solving them, they indicated that besides old-age provisions and health care, priority should chiefly be given to global sustainability issues such as war, hunger and violation of human rights (Table 5.1). When citizens were also asked to consider Dutch policy, the global and environmental issues disappeared from the priority list. Citizens apparently do not associate global problems with national policy.

Environmental issues descended on the social agenda in 2006 (Visser *et al.*, 2007), except for the pollution of oceans. Ecological issues did not appear in the top ten of a list of 64 proposed social issues. This picture coincided with the very limited attention given to the environment until the last quarter of 2006. Thereafter, partially due to the film of Al Gore, the climate issue came up again in 2007, rising quickly to the tenth place in April of that year. Social issues related to development cooperation scored high as well, but preventing loss of biodiversity through less

Table 5.1 Ranking of social issues in 2007, 2006, 2005 and 2003 (Visser *et al.*, 2007a; Visser *et al.*, 2007b).

Top 10 social issues	Theme [a]	Scale [b]	Ranking			
			2007	2006	2005	2003
War and terrorism		G	1	1	1	3
Hunger	D	G	2	3	4	5
Human rights	D	G	3	4	5	6
Old-age provisions		N	4	2	2	2
Tension between religions		G	5	6	*	*
Netherlands – more tolerant and more social		N	6	11	9	14
Pollution of oceans, rivers and lakes		G	7	7	6	4
Health care		N	8	5	3	1
Child labour	D	G	9	8	15	11
Greenhouse effect/Climate change	C	G	10	17	19	9
Other issues, relevant to climate change, biodiversity and development						
Drinking water in developing countries	D	G	11	10	14	17
Prosperity in developing countries	D	G	13	12	11	8
Being more efficient with oil and gas supplies	C	G	17	26	20	24
Replacing oil and gas with other energy sources	C	G	18	19	*	*
Contagious diseases	D	G	19	14	17	19
More democracies	D	G	22	23	*	*
Illiteracy	D	G	23	16	23	13
Deforestation	B	G	26	31	24	20
Secure supply of energy	C	N	28	35	*	*
Genetically modified organisms (GMOs)	B	G	45	41	34	28

[a] Biodiversity (B), Climate (C), Development cooperation (D)
[b] From the survey used for the issues, Global (G) and the Netherlands (N).
* Not measured.

deforestation did not get beyond the 26th place in 2007 (Table 5.1).

Citizens' actions are independent of attitudes about sustainability issues

In principle, citizens are well aware of which behavioural changes are related to tackling environmental problems. One might expect that citizens who give high priority to environmental problems and a society-oriented world perspective (see Chapter 7), or value pattern (MNP, 2004), would demonstrate a higher degree of environmentally friendly behaviour. However, the relationship between 'perceptions' and 'actions' cannot be demonstrated. Household energy use does not show a correlation with prioritisation of the climate problem or with the motivation to save energy. The amount of energy used for an entire household in the Netherlands is for approximately two thirds determined by socio-economic factors of which income is by far the most important (Vringer *et al*., 2007).

Environmentally friendly behaviour frequently requires more sacrifices than environmentally unfriendly behaviour, not only in a financial sense but also, for example, through loss of comfort, convenience and breaking routines. More specifically, consider commuter traffic where a transition from driving to taking public transport can mean a great deal in terms of departure time, comfort and habits. Additionally, the loss of status associated with a certain consumption pattern can also be seen as a sacrifice. This means that citizens, except for a small group of trendsetters, do not easily change their behaviour, even if many see the societal benefit of the behaviour change. This phenomenon is often called a 'social dilemma'. Social dilemmas are situations in which individual members of a group make choices that are good for them personally, but that are bad for the group as a whole in the long term, and thus, ultimately, also bad for the individual (Dawes and Messick, 2000).

According to citizens, government should break through the social dilemma

It is of importance that a coordinating party takes the initiative in breaking through the social dilemma. Approximately 70% of Dutch citizens think that the government should take the initiative for solving important social issues (MNP, 2004; Aalbers *et al.*, 2006). A government is often needed to establish and maintain rules for a large group of people so as to compel desired behaviour at an individual level for the interest of the collective. This is possible by bringing about a behavioural change through setting standards or taxing goods and services.

5.2 Perceptions and actions by companies

Dutch companies listed on the stock exchange score relatively well on sustainability

In a comparison between Dutch AEX companies and 1000 significant international competitors, using more than 100 indicators for various sustainability aspects, over 80% of the Dutch AEX companies scored better than the average for the global industry sector (Dutch Sustainability Research, 2006a). This score put Dutch companies in first place in 2006, and in 2004 and 2005, in third place. European enterprises score on average better than the Asian and North American companies (Dutch Sustainability Research, 2006a). This can be accounted for by the fact that the corporate social responsibility (CSR) in Dutch and European companies often makes up part of the operational management itself (Cooymans, 2007). In American companies, CSR often consists of donations to charities and other 'good causes'.

Dutch multinationals respond to global sustainability problems

In contrast to the nationally operating companies, the internationally operating companies have more to do with global sustainability issues, such as child labour, lower salaries, poor working conditions and severe environmental pollution. This does not only involve the international operational management, but these companies are also subjected to greater societal pressure from non-governmental organisations (NGOs). There are times when behavioural change is enforced through public opinion.

A number of large Dutch multinationals have actively responded to issues concerning energy, climate change, fighting poverty and working conditions in developing countries (CDP, 2006). Large energy companies are working on alternative energy sources, dealing more efficiently with energy and improvements in efficiency. Other companies have the policy of taking into account the consequences that livestock breeding, fishery and logging have on global biodiversity, by posing requirements for sustainability on supply chains. A number of companies contribute to the Millennium Development Goals (MDGs), which are often coupled with company activities or operational management elsewhere in the world, for example, by supplying logistical means, medical help and education in developing countries (Dutch Sustainability Research, 2006b).

Financial sector relevant to sustainable development, but still insufficiently transparent

The Dutch banking sector manages almost 1.9 trillion euros in total. The investment capacity of large institutional investors (pension funds and insurance companies) is almost 1 trillion euro. Financial institutions can influence the sustainability achievements of their clients (companies and organisations) by way of extending credit, financing projects and making investments. The sustainability investment capacity of large institutional investors amounts to approximately 5% of their total invested capital.

The large pension funds (ABP, PGGM and PME) signed the Principles for Responsible Investment (PRI) in 2006. The PRI, which is voluntary, provides guidelines for normal investment decisions for integrating environmental and social aspects with corporate governance. Through their large investment capacity, pension funds can be important for corporate social responsibility (CSR) when potential investments are screened for sustainability criteria.

Currently, most banks offer companies and individuals the possibility to save and invest in sustainability. The opportunity for individuals to make sustainable investments and enrol in sustainable savings accounts increased by 20% in 2006 to 11 billion euros, through which the market share of sustainability saving and investment further increased to about 3.5% (VBDO, 2007). Moreover, large banks have established guidelines to manage social and environmental issues (Equator Principles) for socially responsible project financing in developing countries. The banks that have become associated with this initiative cover approximately 75% of the worldwide project-financing above 10 million dollars (NovioConsult and Van Spaendonck/CREM, 2007).

Additionally, large Dutch banks have their own guidelines for financial transactions, such as for palm oil plantations or genetically modified organisms (GMOs). More recently, sector-specific criteria have been developed for extending credit for trade flows (e.g. for coffee, cacao and soya).

Pension funds and banks, both in the Netherlands and in other countries, are often insufficiently transparent about their investments in sustainability (VBDO, 2006; Van Gelder and Scheire, 2007). There is even less insight into the impact their investments have on sustainable development. The importance of the financial sector's transparency is that citizens and companies can make socially responsible choices. The fact that there is an increasing need for transparency here in the Netherlands emerged from recent discussions about investments by Dutch banks and pension funds in cluster bombs and also, for example, from a discussion between the Dutch Cancer Society and an investment institution, when it turned out that there were tobacco manufacturers in their share funds.

Global sustainability issues do not play a significant role in small and medium enterprises (SMEs)

Managers of the larger SMEs (with 5 to 100 employees) were also asked on behalf of MNP to rank a number of social issues (Hoevenagel *et al.*, 2007). The study demonstrated that more than half of these managers singled out the following social issues as requiring a solution:

- improvement in education,
- provision of reliable utility services and
- retention of competitiveness in science and technology (Table 5.2).

Table 5.2 Prioritisation of social issues by the larger SMEs (Hoevenagel *et al.*, 2007) compared to that of citizen prioritisation in 2006 (Visser *et al.*, 2007).

Top 10 social issues	scale *	Ranking companies	Ranking citizens
Improving the quality of education	N	1	29
Reliable utility services	N	2	28
Remaining competitive in science and technology	N	3	39
Reduced traffic congestion	N	4	49
Lowering tax obligation	N	5	25
Improving competitive position compared to abroad	N	6	46
Better organisation of government finances	N	7	34
Being more efficient with oil and gas supplies	G	8	26
Reliability of government	N	9	30
Reducing ambiguity of standards/more tolerant and more social	N	10	11

* From the survey used for the issues, Global (G) and the Netherlands (N)

In order to prevent managers from ranking the issues from a citizen's point of view, they were asked to draw a relationship between the issue and their own company. From the ranking of social issues, SMEs seem to have different priorities than citizens. The top ten of social issues consists almost exclusively of Dutch problems, for which the solutions would contribute to a stronger competitive position for Dutch companies (Profit). Corporate social responsibility is the 14th priority. In contrast, citizens give priority to social issues that have to do with the People and Planet (Table 5.1). Citizens also differ from companies concerning the desired direction in which the world should develop and the government's role in this (see Chapter 7).

Corporate social responsibility is important for SMEs
Corporate social responsibility (CSR) is taking responsibility for the impacts of an enterprise's activities on society (SER, 2000). CSR can contribute to the efficiency of operational management, of saving natural resources and of the opening of new markets (Cooymans, 2007). As such, CSR is an instrument that allows companies to operate more sustainably. Per definition, CSR goes further than current legislation and regulation and occurs on a voluntary basis. In the smaller SMEs (<5 employees), 60% to 70% of the companies are reasonably or very familiar with CSR (Hoevenagel, 2007). This group consists of approximately 85% of the SMEs. Of the larger SMEs, 80% of the managers are positive about CSR. These companies associate CSR with an integrated consideration for People-Planet-Profit (65%), a fair personnel policy (60%), or environmentally friendly operational management (50%).

SMEs implement CSR mostly through proper care of personnel
On average, the larger small and medium enterprises (SMEs) put over half of the more frequently occurring CSR measures into practice (Hoevenagel *et al.*, 2007). Depending on the type of measure, 60% to 90% of the companies put the measures into practice. These measures cost the companies approximately 1% of their sales. This mainly involves activities that belong to contemporary entrepreneurship and are often geared towards internal personnel policy (equal pay for men and women, part-time work and hiring employees from within the region). These CSR measures are regarded as 'easy solutions'. Environmental and people-oriented measures that require a bit more time and investment are employed by 20% to 40% of the companies. Approximately 30% of the smaller SME businesses relate their practice to CSR (Hoevenagel, 2007). Internationally operating SME businesses and larger companies carry out relatively more CSR activities than smaller SMEs (Hoevenagel *et al.*, 2007). The same applies to family companies and companies with a longer history. A positive attitude by management, involvement by employees and activities by NGOs lead to more CSR activities (Quaak *et al.*, 2007).

As mentioned earlier, citizens who think that combating climate change is important use just as much energy as citizens who do not think this. It is unknown if companies with a CSR policy perform better on these issues than other companies.

Much to achieve with chain responsibility
Factors that play a role in chain responsibility are:
- the request by consumer and buyer;
- the pressure from NGOs and the government;
- the power and experience of the company.

The absence of a chain of responsibility is chiefly attributed to the absence of a strong consumer demand (Quaak *et al.*, 2007). Internationally operating companies, in contrast, increasingly try to pose demands on production via the production chain. This happens more and more in collaboration with other participants, such as NGOs. Companies work on making production more sustainable in various international joint ventures among governments, NGOs, participants in the chain and manufacturers (so-called public–private partnerships). An example of this behaviour is seen in the criteria for sustainable production and import of biomass for non-food purposes, as presented by the Cramer commission (project group on Sustainable Production of Biomass, 2007). Joint ventures are increasingly set up to create a level playing field. Minimum standards for sustainability are developed and implemented via international multi-stakeholder initiatives, such as the 'Roundtable on sustainable palm oil'. Criteria have also recently been developed for fishery, soya and cotton production, while a set of principles and criteria for sustainable fishery has been formulated by the Marine Steward Council (MSC).

Merely 5% of SME entrepreneurs associate the practice of CSR with posing demands on suppliers (Hoevenagel *et al.*, 2007; NovioConsult and Van Spaendonck/CREM, 2007). For years, companies in the do-it-yourself branch, clothing manufacturers and coffee roasters have been publicly addressed by social organisations about sustainability problems occurring further up the chain. Supermarkets are increasingly addressing direct suppliers when their products delivered are not meeting the requirements. This concerns not only the physical characteristics of the product, such as the presence of pesticides on fruit, but also the circumstances under which the products are produced, such as use of child labour, honest pay, no discrimination and proper health care regulations. The requirements in the chain can turn out to be negative for suppliers (often in developing countries) when they are insufficiently supported, or if the procurement values offer insufficient room

for companies to meet the requirements (price, delivery time, etc.). Therefore, the support of suppliers is a specific component in the chain of responsibility (Hoevenagel *et al.*, 2007; NovioConsult and Van Spaendonck/CREM, 2007).

Managing sustainable development via the chain is complex

Chain responsibility presents a number of dilemmas that have to do with the fact that Dutch companies are part of international production chains. But the differences in the interpretation of CSR among countries do play a role. The trade-offs among people, planet and profit are greater in developing countries and the possibility for verification of how the environmental and social circumstances are safeguarded further up in the chain is sometimes problematic. The absence of a level playing field can lead to suppliers switching to other clients in opposition to the strict requirements imposed on suppliers. Legislation and regulation are needed to be able to address manufacturers and suppliers about responsible chain management. A great deal of this is often absent in developing countries.

Companies ask government for a level playing field

Companies often have an ambivalent attitude towards environmental and sustainability policy because it can lead to additional limitations for operational management. Companies find one-sided and voluntary behavioural change to be too expensive in their appraisal of costs and benefits, feeling this can affect their competitive position. This is comparable with the social dilemma for citizens. Taking a competitive position into consideration, companies also think that the same measures should be established for all competitors, resulting in the creation and maintenance of a level playing field. However, the enforcement of rules undermines the voluntary character of CSR.

A few Dutch companies have recently made an appeal to implement a progressive environmental policy and to set sustainability and innovation high on the political agenda. According to them, the government should show some initiative and come up with a consistent policy and long-term goals. Progressive companies can profit from this. Companies should also be more involved in the implementation of the policy. The 'green procurement' by government (see text box 'Sustainable procurement by government') is also seen by companies as a component of the government's ambition in the area of sustainable development.

Sustainable procurement by government

Governmental organisations procure approximately 30 billion euros worth of products and services annually. This enables the government to set the tone in those markets in which they are have a position of prominence. The national government's objective for 2010 is to see that 100% of its procurements and tenders are sustainable (VROM, 2007). A minimum ambition of 50% applies to provincial and municipal governments. According to the Monitor of Sustainable Management of Governments 2006, 50% of the core departments' procurements for company clothes, bus transport, catering, service cars, printed matter, buildings, green provisions, IT hardware and cleaning supplies are sustainable procurements. This product group accounts for 10% to 15% of the entire procurement volume.

5.3 Public support for policy

Citizens as well as companies expect the government to take action in tackling the sustainability problems. Citizens expect government policy to break through the social dilemma and companies expect policy to create a level playing field. There will almost always be resistance to new policies because they usually lead to additional costs for citizens and companies. In preparing the Second Sustainability Outlook, the current level of support by citizens was researched by MNP for a limited set of measures (Verhue *et al.*, 2007).

The options presented in Chapters 2, 3 and 4 of this Outlook, which can help to address the development and climate change issues, and stop the loss of biodiversity, can be implemented through various policy measures. The options (Table 5.3) have been translated into specific policy measures, with different levels of applicable costs and benefits for potentially making a significant contribution to achieving the goals. The options, measures and levels of cost and benefits are represented in (Verhue *et al.*, 2007). This survey was not only done in the Netherlands, but also in Germany, France, Italy, Poland, Sweden and England (UK). The purpose of this was to get an impression of the degree of consensus in various EU Member States (Verhue *et al.*, 2007).

Majority of citizens prefer solutions for sustainability issues

It is not surprising that a majority of citizens from the Netherlands and the European countries studied support tackling the greenhouse effect, stopping loss of biodiversity and supporting development cooperation, at least if it is cost-free (Table 5.4). Reducing the loss of biodiversity and infrastructure improvement in developing countries score the lowest. Of all the countries studied, the level of support

Table 5.3 Options for which measures are included in the study of citizens' level of support.

Biodiversity
- Less land use for agriculture (worldwide) to counteract loss of biodiversity
Climate change
- Reduction of CO_2 emissions by increasing energy efficiency
- Reduction of CO_2 emissions by electricity generation
Foreign aid
- Less mortality caused by disease and hunger in developing countries through direct assistance
- Aid focused on better access to education in developing countries
- Better infrastructure provided through investments in developing countries

Table 5.4 Civil support (%) for a number of options, with no associated costs (Source: Verhue *et al.*, 2007).

	Biodiversity	Greenhouse effect		Development aid		
	Less land use	Saving energy	Electricity generation	Death from disease	Better education	Better infrastructure
The Netherlands	61	76	76	73	73	56
Germany	68	87	86	83	82	46
France	69	89	89	84	87	48
Italy	60	83	80	80	79	61
Poland	53	69	73	74	72	58
England (UK)	66	86	85	84	84	60
Sweden	71	82	82	84	85	45

for the complete package of measures is the lowest in Poland.

The relatively low score on biodiversity corresponds with the low priority that citizens give to this issue (Table 5.1). The level of support diminishes when citizens have to make sacrifices for the solutions to the issues. The intensity of this decline is dependent on the type of instrument or measure that is implemented, the level of the costs and the expected effect.

Change in the food consumption pattern is a sensitive issue

The consumption of meat and dairy products involves the use of a relatively large amount of land, because agricultural land is required for growing livestock fodder. A tax on meat and dairy products to reduce this land use raises resistance in the Netherlands as well as in other European countries. A tax, increasing the price of meat by approximately 50%, has the greatest level of support in Italy (49%), England (53%) and Sweden (62%). There is no majority level of support for a reduction in the use of land by implementing genetically modified crops (GMO), even if GMO does not affect the price of food. Just under half of the Dutch population (47%) accepts permitting genetically modified crops for fodder. The resistance to this measure is greater in other countries, where the average level of support is just under 40%. The level of support for genetic modification of crops in the Netherlands is greater than the price increase for meat and dairy products. Implementation of GMO for crops destined for human consumption does not have much of a level of support in any of the countries studied.

Low level of support for paying for nature in areas outside Europe

Loss of biodiversity can also be prevented by purchasing vulnerable nature reserves outside of Europe. A majority of support for an additional tax of approximately 5 euros per person per month was only found in Sweden (52%) for the purchase of nature reserves outside of Europe. The level of support for this measure is 40% in the Netherlands. However, an earlier study showed an ample level of support among Dutch citizens (76%) for increasing the share of sustainable hardwood to fight deforestation to 100% (Mulder *et al.*, 2005).

Besides this, the level of support does not increase substantially when these measures are implemented on a European or global level. The measures surveyed also have a limited effect on the land use (see Chapter 4).

Broad level of support for measures against climate change

In contrast to measures aimed at maintaining biodiversity, there is a relatively high level of support for policy aimed at fighting climate change. In all the countries studied, an ample majority of citizens chose additional measures leading to a reduction of CO_2 emissions in addition to maintaining the current policy. The level of support is particularly high for reduction of CO_2 emissions in the production of electricity through the use of other fuel combinations. The level of support is not as great for energy-saving measures, such as obligatory insulation of existing homes and stricter emission requirements for manufacturers. However, a majority for the reduction of CO_2 emissions along these lines can also be found in most of the countries. The reduction potentials of these measures are based on Dutch data (Daniëls and Farla, 2006; Daniëls *et al.*, 2006).

Citizens prefer CO_2 reduction measures by companies

In the countries studied, over two-thirds of the citizens support sets of measures that yield a reduction in CO_2 emissions of at least 10% (Netherlands), 12% (England), 13% (France, Italy and Sweden), or 14% (Germany), even when the costs of these measures are taken into consideration. In Poland, just under two-thirds of the citizens support an emission reduction of 5%. For sets of measures that provide higher reductions than those mentioned above, the level of support is reduced to a smaller majority or a minority, because the costs increase. Furthermore, less popular measures would therefore have to be implemented, such as a tax on car fuels. An earlier study to ascertain the level of support among the Dutch population for CO_2 reduction measures also revealed a large majority to be in favour of a substantial reduction of CO_2 emission (Mulder *et al.*, 2005).

The set with a CO_2 reduction of 10%, for which the level of support is the highest in the Netherlands, includes five measures. Of these, two measures taken collectively cause the bulk of the total reduction in CO_2 emissions. In the first measure the government imposes limitations on companies with respect to CO_2 emissions during production. On average, this makes consumer goods more expensive by about 1%. The other measure implies a substantial tax on non-sustainable electricity, which may cause the electricity bill to increase by up to 25%. In addition, the set includes three measures that have a relatively small effect, but are supported because the costs of these measures are limited; in addition, the costs are partly recovered by lower energy costs. These measures imply obligatory insulation of existing houses, energy-efficiency standards for electrical home appliances and subsidising of economical cars combined with a tax on less economical cars. Taking into account the decrease in energy cost, the cost of this set of measures for an average household will be about 10 euros per month.

In all countries there seems to be a preference for energy-saving by companies beyond measures that involve the citizen more directly, such as obligatory insulation of existing houses and energy-efficiency standards for electrical home appliances and cars, even if the costs of these measures are returned or partially returned. This might have to do with the greater visibility of the last category of measures. It can also possibly be explained by the fact that a few consumption goods show a substantial increase in price in the last category of measures, while energy-saving by manufacturers will raise the prices of the entire consumption set to a limited extent.

Table 5.5 presents the level of support in the various countries for sets of measures that yield a reduction in CO_2 emissions of 10%, 12% and 13%. The sets presented are those for which the level of support was, on average, highest in the countries studied.

Attractiveness of renewable energy sources partly negated by higher costs

In all the countries studied citizens, prefer electricity generated from renewable sources (biomass, wind and sun). Natural gas came in second, followed by nuclear energy, coal with CO_2 storage and coal without CO_2 storage. Other European studies, such as the Eurobarometer, have revealed that renewable energy is considered to be the most attractive, and nuclear energy and coal the least attractive (The Gallup Organization, 2007). Citizens in France and Sweden think nuclear energy is about as attractive as natural gas, whereas nuclear energy is viewed in Germany, Italy and Poland as relatively unattractive. Polish citizens prefer coal (with or without CO_2 storage) to nuclear energy.

However, when the differences between the costs of generating electricity with the different sources of energy to achieve a specific CO_2 reduction are taken into account, the differences in preference largely disappear. In every country, the attractiveness of renewable sources of energy is largely offset by their relatively high costs. Costs have the least influence on the level of support in the Netherlands and Sweden. Costs have the most influence in Poland and England, where the current costs for electricity are relatively low. Were costs to be taken into account, Poland and Italy would have a clear preference for renewable sources of energy to nuclear energy. Currently, there is no electricity generated by nuclear energy in either country. In most of the countries, the support for coal with CO_2 storage is comparable with that for nuclear energy. Only in Poland is the support for coal with CO_2 storage comparable with that for renewable sources of energy (Table 5.6).

Table 5.5 Level of support for sets with energy-saving measures leading to different levels of reduction of CO_2 emissions (Verhue *et al.*, 2007).

	CO_2 reduction 10%	CO_2 reduction 12%	CO_2 reduction 13%
Measures			
Obligatory insulation of existing houses	limited requirements	limited requirements	more stringent requirements
Energy-efficiency standards	electrical home appliances	electrical home appliances and cars	electrical home appliances and cars
Measures by companies	standards for CO_2 emissions	standards for CO_2 emissions	standards for CO_2 emissions
Tax on unsustainable electricity; electricity bill increases by up to	25%	35%	40%
Level of support			
The Netherlands	69%	65%	62%
Germany	84%	79%	74%
France	76%	69%	68%
Italy	79%	77%	74%
Poland	40%	34%	30%
England (UK)	72%	69%	63%
Sweden	68%	71%	70%

Over 75% of Dutch citizens prefer to reduce the share of coal (without CO_2 storage) used to generate electricity from 25% to 5%, which would amount to a CO_2 reduction of approximately 10% of the total Dutch emissions. Citizens are prepared to accept the higher costs. It doesn't really matter to them whether coal is replaced by nuclear energy, renewable sources of energy or coal with CO_2 storage.

In Germany, Italy and England over 75% of the citizens are also prepared to pay more for electricity in order to achieve a 10% reduction of CO_2 emissions from coal, by partially replacing coal with renewable sources of energy, nuclear energy or CO_2 storage. In Poland, the support for this measure is lower, but still clearly above 50% (Table 5.6).

Table 5.6 The level of support among citizens for changes in electricity generation leading to a 10% reduction in CO_2 emissions and the associated cost (Verhue *et al.*, 2007).

	Replacing coal with renewable sources		Replacing coal with nuclear energy		Coal in combination with CO_2 storage	
	Cost increase[b]	Level of support	Cost increase[b]	Level of support	Cost increase[b]	Level of support
The Netherlands	7-12%	80%	2-10%	77%	2-8%	76%
Germany	5-8%	90%	2-8%	85%	2-7%	86%
France[a]	4-5%	84%	not measured		1-4%	81%
Italy	5-10%	84%	2-8%	76%	2-5%	79%
Poland	10-20%	71%	5-20%	61%	5-15%	72%
Sweden[a]	1-2%	86%	0-1%	85%	0-1%	86%
England (UK)	9-18%	84%	3-15%	82%	3-12%	82%

[a] Because of the high share of nuclear energy and/or renewables, in France and Sweden the share of coal used to generate electricity is not sufficient to achieve a 10% reduction. The level of support and cost figures displayed for France and Sweden apply to a CO_2 reduction of 6% and 3%, respectively.

[b] Increase in the electricity bill as a percentage compared with 2004 (Eurostat, 2007). The specified range reflects the ambiguity of the cost estimate (see Verhue *et al.*, 2007, see also Chapter 3). For each measure, it is assumed that the costs per tonne of CO_2 reduction are assumed comparable in each country. Because the current cost of electricity differs between countries (low in Poland and England, high in Sweden), the relative cost increase also differs considerably.

Possibly a majority support for a CO_2 reduction of more than 10%

There was no study undertaken to find out the level of support for a combination comprising a set of measures geared to energy-saving and a set geared to CO_2 emission reduction during the generation of electricity. Achieving majority support for such a combination that would lead to a 20% reduction is unlikely. It is possible to combine both sets of measures that – taken separately – have the highest level of support (CO_2 reduction by using renewable energy to generate electricity and emission limitation at companies). In this case it might be possible to have a majority level of support for a reduction in CO_2 emissions of a few percentage points more than the 10% that would be achieved by the individual sets of measures.

Citizens are prepared to pay additional taxes for development aid as long as the results are visible

A majority of citizens in the Netherlands, and in the other countries, are prepared to pay more taxes to increase the level of the government's annual development aid spending by 20%, as long as the results are clear. Much importance is attached to saving lives by combating hunger and disease and increasing access to basic education. There is less support for development aid that only delivers results over the long term, such as infrastructural improvements (Table 5.7). Noteworthy is that the extent of the achieved effect, meaning the number of people reached, hardly has any impact on the level of support. The level of support would, however, decrease if the costs increased.

The results show that citizens are indifferent as to whether development aid is provided by their own country or within an international context (EU or UN). However, to achieve the effects of development aid such as those included in the study (Table 5.7), several countries will have to increase their development aid budgets (see Chapter 2). Moreover, in the study the level of support was calculated, assuming that developing countries would not have to meet any specific requirements (such as good governance and respect of human rights). In this way, even the least developed countries could receive development aid. However, because the majority of the countries believe applying these criteria to development aid is important, the level of support in many countries would be 15-20% higher if the requirements were upheld.

Chances for policy

Citizens in the Netherlands and Europe want government to take the initiative to prevent climate change. Citizens are prepared to pay for climate measures. From the measurement of the level of public support, it appeared that for equivalent CO_2 reduction, measures implemented out of public view have a higher level of support than those measures demanding citizens to undertake action themselves. Thus, measures with which (electricity) producers would have to take action to reduce CO_2 emissions, are preferred in all countries above measures that result in the same reduction, but involve energy-saving from households, for example, through energy-saving appliances, homes or cars. People are more likely prepared to provide support for measures for which the costs are spread out over all goods and services. A higher price for specific consumption goods is less attractive, yet a majority level of support for this is also found in most countries. Taxes on goods that are more or less seen as necessary (meat, dairy, petrol and diesel) and for which no equivalent environmentally friendly alternatives are yet available, are less acceptable. The level of support increases when undesirable behaviour is sanctioned with taxes, provided that desired behaviour is simultaneously rewarded as well. The relatively high level of support for measures to limit CO_2 emissions now also probably has to do with the ample attention that climate change is currently receiving in

Table 5.7 Level of support among citizens for an increase in the budget for development aid with 20-40% for various effects[a] (Verhue *et al.*, 2007).

	Current level of expenses for development aid (% GDP)	10-20 million fewer deaths from hunger and diseases	25-100 million children with better access to education	Improvement of the entire infrastructure within 20-30 years
The Netherlands	0.8%	46 - 51%	46 - 55%	30 - 35%
Germany	0.4%	55 - 62%	53 - 61%	23 - 30%
France	0.5%	51 - 58%	50 - 63%	22 - 27%
Italy	0.3%	61 - 67%	59 - 67%	41 - 50%
Poland	0.1%	65 - 72%	63 - 69%	49 - 56%
England (UK)	0.5%	44 - 53%	47 - 58%	25 - 32%
Sweden	0.9%	56 - 63%	57 - 67%	28 - 32%

[a] For calculating the level of support, conditions such as good management and respect for human rights were assumed as playing no role.

society. If this attention continues in the future, people will become accustomed to the consequences of the measures implemented and additional measures will possibly evoke less resistance in the long term.

A majority of the population is in favour of tackling the loss of biodiversity, as long as the measures to diminish the use of space do not cost anything. The level of support decreases considerably when products seen as essential for basic needs (e.g. fuels, meat and other animal products) become more expensive, or if there is a perception of risks where food safety is involved. No combination of measures was found that had a European-wide level of support for limiting use of space elsewhere in the world. The Dutch would rather pay a higher contribution to development aid than pay more for their meat. A majority of the Dutch population is for an extra contribution of 100 euros per year per person for development aid, as long as it results in fewer deaths from hunger and disease and gives better access to education. In contrast, there is no majority in the Netherlands for a tax on meat of, say, 1.25 euro per kg. This would come to some 60 euros per year for an average annual consumption of meat of about 50 kg per person. Measures aimed at changes in the food consumption pattern are apparently sensitive issues for citizens. Therefore, information aimed at the relationship between the increasing use of space through consumption of animal products and loss of biodiversity would increase the societal attention for this issue and, consequently, also the level of support for appropriate measures.

Citizens and companies expect the government to make explicit choices and to facilitate and condition behavioural changes. Under these prerequisites, there is a level of support for change and a willingness to make sacrifices. Through leading by example, the government presents a more powerful role model for citizens and companies to follow. A good example of this, is the sustainable procurement by all government departments.

Section 5.1 established that the degree to which consumption patterns influence the environment largely depends on consumer income and bears no relationship to environmental notions, problem perception or value patterns. Moreover, there appears to be an equal level of support for the measures presented in this chapter among groups of people in similar socio-economic circumstances (e.g. income, household situation, education), even if they differ in their preference for future developments (worldview, see Chapter 7) or their value patterns. Age, education and income are, in themselves, hardly of influence on the level of support. This makes specific policy aimed at different target groups less obvious.

6 Levels of scale in policy

Solving global problems requires international cooperation. However international agreements are the hardest to make. Agreements on free trade are an exception: they are an example of relatively solid agreements which countries generally comply with. Trade sanctions will follow, if they fail to do so. However, agreements made about climate, biodiversity and poverty alleviation are a lot less formal. There are no sanctions coupled to failure to meet the Millennium Development Goals (MDGs), and a number of crucial countries have still not ratified agreements on specific climate change targets (e.g. United States has not ratified the Kyoto Protocol). At the moment there appears to be a lack of broad international political will to formulate specific policy commitments on climate change, biodiversity and poverty. Possible explanations for this include differences in power and an unequal division of costs and benefits between countries. A possible way out of this situation is to provide compensation in various forms, such as technology and monetary transfers. Trade embargos are examples of sanctions that have proved effective in the past.

Sustainable development is an important policy principle at global, European and national levels. However, at none of these levels is the direction of policy determined by a sustainability strategy. At best, sustainability policy is shaped by taking account of effects in other policy areas. In practice, though, this rarely happens, not even at European or national levels. Coordination is therefore a significant challenge, because it is not possible to make equally firm agreements in all policy areas and at all levels.

In short: global solutions are indeed preferable for resolving global problems, but in practice this is difficult to achieve. International cooperation *within* the EU goes further than voluntary action. In various policy areas the Member States have given up some measure of their sovereignty to the EU. In doing so, they must comply with the legally binding legislation from Brussels. In terms of scale, effectiveness and enforceability, the EU is the most appropriate scale for policies involving European countries that focus on the three sustainability areas described in this Outlook. To act decisively and with one voice on sustainability, changes appear to be needed in the constitutional setting of the EU, in particular the current unanimity procedure.

Far-reaching measures will be needed to achieve the targets set for tackling the sustainability problems identified in this Outlook (poverty, climate change and biodiversity loss; see Chapters 2, 3 and 4). The public looks to politicians and governments to introduce measures that can resolve this 'social dilemma'. Companies also expect governments to help create a level playing field that allows companies to take their own measures (see Chapter 5). In the three identified sustainability problems governments must strike a good balance between the three dimensions of sustainability (social, economic and environmental; see also the Introduction and Appendix 1). Therefore, sustainability policy is defined as policy that focuses on specific themes and strikes an optimum balance between the social, economic and ecological dimensions here and now. But it should also take account of 'elsewhere' and 'later'. The most sustainable policy is one that favours all three dimensions, although this is not always possible. Policy can be considered sustainable if it has no unnecessary negative effects on the other dimensions, and is accountable for these effects (see Chapter 7).

Considering the global scale of the three sustainability problems, it seems logical to pursue a global policy, either via international cooperation or via supranational forms of government. International policy is currently being implemented on all three topics, although there are differences in how concrete and enforceable the measures are.

6.1 Shaping sustainability policy

It is difficult to pursue global policies on three sustainability problems because all three involve global commons. Individual countries around the world do not experience the problem directly enough or are unable to make a real difference on their own. In practice it has proved difficult to implement globally enforceable policies. Many policies have a voluntary basis and there are no firm sanctions for failure to comply. To remedy this, three steps will need to be taken in all three problem areas. First, governments need to recognise the full extent of the problem. Second, they need to agree on specific targets around which they can harmonise policies. Finally, they must ensure that these agreements are met during implementation, resorting to sanctions, if necessary. Policies can only be successful when governments have taken all three steps. In this analysis it is also important that policies are evaluated for the three capitals of sustainability.

The following sections investigate the three sustainability problems against the criteria mentioned above at each scale (global, European, national). Table 6.1 shows the steps that have already been taken for the three topics.

6.1.1 Global

Around the world considerable attention is paid to the sustainability problems identified here (poverty, climate change and loss of biodiversity). Various international governmental organisations are working on the three problems and claim that they aim for sustainable development: the United Nations (UN), the World Bank and the World Trade Organisation (WTO). The UN pursues global environmental policy; the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD) focus on climate change and biodiversity, respectively. The World Bank and the WTO are primarily concerned with the economic development of developing countries, with the WTO concentrating specifically on trade. There is no general sustainability policy at the global level. The UN tries to coordinate sustainability policy via the Commission for Sustainable Development, but this is an institutionally weak mechanism.

Global development policy is widely supported, but largely voluntary

The global development agenda is currently targeted on the Millennium Development Goals (MDGs, see Chapter 2). These goals show a clear balance between the three dimensions of sustainable development: six objectives are concerned with social and economic aspects (such as poverty, education and the empowerment of women), one explicitly focuses on the environment (MDG7) and one concerns global cooperation (MDG8). The aim is to

Table 6.1 Progress made to date with implementing policies on the three sustainability problems.

	Common, global problem perception	Specific objectives	Implementation: enforcement and sanctions
Development policy **Trade agreements (WTO)*	Yes	Yes *Yes*	No *Yes*
Climate change ** Kyoto Protocol*	Yes	No *Yes*	No *Yes*
Biodiversity	Yes	No (EU yes)	No

achieve all eight MDGs as a complete package, which is a clear nod to sustainable development:

'It shows the vital importance of a comprehensive approach and a coordinated strategy, tackling many problems simultaneously across a broad front.' (UN, 2001)

However, little attention has so far been given to the environmental goal (MNP, 2005). The Millennium Project by Jeffrey Sachs, set up at the request of the UN to elaborate the MDGs in more detail and to monitor progress, focuses primarily on the development of developing countries (UN, 2007). By focusing on developing countries, the MDG agenda seems to have become primarily a 'development agenda'.

The MDGs are well supported internationally (Table 6.1). A total of 189 countries have adopted the Millennium Declaration and 147 heads of state have signed it (UN, 2007). However, the agreements made are entirely voluntary, as are the agreements on the percentage of GDP that rich countries should spend on development assistance (the so-called Monterrey agreements). Rich countries are called upon to spend 0.7% of their GDP on 'official development assistance' (ODA) but have not yet committed themselves to this. Most countries do not meet this target, with the exception of a few nations, such as the Netherlands and the Scandinavian countries (see Chapter 2). There is certainly awareness of the problem and there are specific targets, but their enforcement remains vague and there are no clear agreements at all about sanctions for not meeting them (Table 6.1).

World trade is based on a system of binding agreements and sanctions

Other organisations that focus on development at a global scale include the WTO and the World Bank. The former acts as secretariat for the trade agreements made, as well as promoting free trade (the removal of trade barriers) and mediating during trade conflicts. The WTO's mission is also to ensure that the trade in services must serve economic growth and well-being:

'The system's overriding purpose is to help trade flow as freely as possible – so long as there are no undesirable side-effects – because this is important for economic development and well-being.' (WTO, 2007)

Because the WTO also aims to prevent 'undesirable side-effects', theoretically the organisation has a broad mandate, but critics regularly question whether this aspect receives just as much attention as the promotion of free trade (see Chapter 2). The WTO now has 150 member countries. Each has one vote and decisions are only taken if there is a consensus. The EU decides internally beforehand on its collective viewpoint, and has only one vote within the WTO.

The free trade agreements that countries make with each other can be enforced by trade sanctions. Free trade is therefore one of the most advanced forms of international cooperation. It delivers a positive welfare effect in terms of extra economic growth in participating countries (see Chapter 2), and this is an important reason why parties can make firm international agreements, including agreements on sanctions. However, the WTO is coming under increasing pressure from the growing number of countries joining and the need for the ongoing trade round (known as the Doha Round, which focuses on the development of developing countries) to succeed. Little progress has been made over the past few years.

The World Bank, founded in 1945, focuses primarily on alleviating poverty:

'Our mission is to help developing countries and their people reach the MDGs by working with our partners to alleviate poverty.' (World Bank, 2007)

The World Bank finances many development projects in the poorest regions and countries. Its main mission is to alleviate poverty throughout the world by creating a good investment climate in all developing countries and by creating jobs for all citizens, so that everyone can participate in development. The World Bank has 185 member nations. They have voting rights according to the amount of money they make available, which means that the United States has around 16% of all voting rights and the Netherlands has just over 2%. The 27 EU countries together control around 29% of the votes, but the EU as an entity is not a member of the World Bank. Internationally, there is considerable respect for the World Bank, but its policies are difficult to implement in a coherent fashion. There is a huge gap between the global targets and actual implementation of policies by supporting countries via loans, project financing and other means.

Climate target in a sustainable framework

In addition to global institutions that promote economic growth, there are also international agreements on climate change and biodiversity. Here too, policy targets are often placed in a broader context so that, in theory, there is a balance between the three main dimensions of sustainability (social, economic and environmental). The objective of the United Nations Framework Convention on Climate Change (UNFCCC) is very explicit regarding this balance:

'The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant

provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.' (UNFCCC, 1994)

Article 4.7 makes the connection to poverty alleviation:

'The extent to which developing country parties will effectively implement their commitments under the convention (…) will take fully into account that economic and social development and poverty alleviation are the first and overriding priorities of the developing country parties.'

The last parts of the UNFCCC mission (Articles 2 and 4.7), in particular, emphasise that climate policy must always be in balance with policies for economic growth and poverty alleviation. Apart from this, the climate target is very unclear: exactly what is meant by 'dangerous anthropogenic interference'?

The UNFCCC objective has been ratified by 191 countries, including the United States. Since 1992, only the EU has gone further in clarifying this objective by stating that it considers global warming beyond a maximum rise of 2 °C to be a dangerous anthropogenic influence on the climate system. Climate policy is thus slowly moving towards more specific targets. However, as yet, no other country in the world has followed the EU initiative by setting a comparable objective.

Kyoto targets binding, but ratified by fewer countries
As a follow-up to the UNFCCC objective, the countries that ratified the Convention also agreed to the Kyoto Protocol in 1997. The Protocol makes sustainable development the key goal, which requires the reduction of greenhouse gas emissions. Initially, specific emissions targets were agreed only for the Western countries. Since then, 175 countries have ratified the Kyoto Protocol. Although this is a large number, most of them are not subject to any legally binding emission reduction targets. The most glaring shortcoming is the refusal of the United States to ratify the Kyoto Protocol, which drastically diminishes its effect. Moreover, many important countries are not prepared to accept binding targets, despite earlier ratification.

There are clear sanctions for those countries that have ratified the Kyoto Protocol (Table 6.1): emission reductions that are not achieved during the 2008-2012 period must be added to the target for the following period. An official enforcement branch has been set up to monitor progress (UNFCCC, 2006).

Biodiversity target is the least specific
In 2002, the Convention on Biological Diversity (CBD) decided, in addition to previous statements, that the rate of biodiversity loss must be reduced:

'To achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth.' (CBD, 2002)

This target was added to the CBD, in 2002, to put biodiversity protection on the agenda at the Sustainability Summit in Johannesburg. This CBD target has now been added as an extra MDG to demonstrate the link between biodiversity and poverty. The CBD has 190 member nations.

The CBD biodiversity target, though, is not very specific (Table 6.1) and one of the most important countries (the United States) has not yet signed up to it. Not only does this make the target unrealistic (see Chapter 4), but it reduces commitment. This shows that for biodiversity much still needs to be done, both by the scientific community (see Chapter 4) and policy makers, to arrive at a common perception of the problem.

6.1.2 Europe

As previously described, global sustainability policy is based on voluntary agreements between sovereign countries. This does not apply within the EU. The EU Member States have agreed to transfer a certain amount of their sovereignty to EU institutions. Individual nations are free to decide whether or not they wish to join the EU, but once they become members they are obliged to comply with the agreements that are made. A sanctions system is in place to force Member States to comply with agreements and to mediate in conflicts between Member States or between the European Commission and one or more Member States, on which the European Court of Justice decides. Apparently the advantages of EU membership far outweigh the possible disadvantages of giving up some sovereignty.

EU sustainable development strategy and Lisbon Agenda outline the priorities of European sustainability policy
The EU's Sustainable Development Strategy (EU SDS) outlines the main priorities for sustainable development both inside and outside the EU: environmental protection, social cohesion, economic prosperity and international responsibility. Environment here includes climate change and clean energy, sustainable transport, sustainable production and consumption, and the conservation and management of natural resources (European Council, 2006). In effect, the European sustainability policy covers the three sustainability problems described in this Outlook,

but it is not binding. This is understandable, since the EU has no or only partial competence in many of the areas covered by the EU SDS and so cannot set binding policies (see text box 'Policymaking by the EU and the Member States').

Besides the EU SDS, there is a second overarching strategy of great significance for determining the emphasis within the European sustainability policy: the Lisbon Agenda. This focuses on strengthening Europe's competitive position, primarily via employment, economic reform and social cohesion policies. The Lisbon Agenda, too, contains no binding commitments for Member States and the European Commission. Both the EU SDS and the Lisbon Agenda call on Member States to initiate more specific and binding plans that underline both strategies.

The EU SDS was revised in 2006, to ensure that the Lisbon Agenda is the driving force behind economic development within the EU SDS. The new EU SDS also states that economic, social and environmental targets should complement each other and should, therefore, be developed simultaneously. Exactly how this complementarity between the Lisbon Agenda and the EU SDS can be exploited is not described in detail. The question is whether the objective of strengthening economic competitiveness via the revised EU SDS has been brought into balance with the other sustainability objectives.

European development policy still in its infancy

There is no adequately targeted sustainability policy yet at the European level. However, there is an explicit European policy for the three defined areas. DG Development has set the following development policy objective:

'Our mission is to help to reduce and ultimately to eradicate poverty in the developing countries through the promotion of sustainable development, democracy, peace and security.' (DG Development, 2007)

European development policy was designed to supplement national development policy. It was signed in December 2005 under the heading of the European Consensus on Development. This showed that a clear European policy needed to be developed. The Consensus indicates the possibilities available within the EU to increase harmonisation between policies, such as trade, agriculture, fisheries, migration, the environment and development policies. Integration, of, for example, trade and development policies, proves difficult to accomplish in practice: how does trade help development policy (see Chapter 2)? The discussion concerning the rate at which the 77 African, Caribbean and Pacific (ACP) countries should open their markets, is a good illustration of this (see text box 'EU negotiations with ACP countries').

Policymaking by the EU and the Member States

In the European treaties policy is divided into three areas or 'pillars', roughly based on whether policy is determined mainly by the EU (community) or the Member States themselves (intergovernmental). In the latter case, the Member States make agreements among themselves, but keep their individual sovereignty. In other words, the pillars indicate the extent to which Member States are prepared to allow collective interests to prevail over their own national interests.

The EU has various decision-making procedures. Within the first pillar of European policy, the 'codecision procedure' is most commonly used. This pillar includes policy areas such as the customs union, the internal market and the environment. The codecision procedure essentially means that the European Council can approve a proposal based on a qualified majority vote. The European Parliament has decision rights, as well, and may submit amendments.

For several decisions within community policy the EU 'consultation procedure' is preferred. This applies to decisions such as international trade agreements, agricultural policy and environmental measures that are mainly of a fiscal nature, as well as measures that have a considerable influence on the choices made by Member States regarding energy sources and the general structure of energy supply. The consultation procedure means that the European Council decides by unanimous vote and is not bound by the judgement of the European Parliament. If all EU Member States ratify the new European treaty, various topics, such as agriculture and energy, will belong to the category requiring a codecision procedure.

EU negotiations with ACP countries

The EU has been conducting negotiations on Economic Partnership Agreements (EPAs) with the African, Caribbean and Pacific States (ACP). These are 77 developing countries, mostly former colonies. The EPAs replace the Cotonou Treaty, which was designed to help bring ACP countries into the world economy. This treaty terminated in 2007. The EU hopes that the EPAs will help to bring the previous trade agreements with ACP countries into line with the WTO's free trade regulations, although development in ACP countries remains the core aim (European Commission, 2003). According to WTO regulations, free trade includes the elimination of excise duties and other restrictive trade practices for almost all products within a period of ten years. In the EPA negotiations, the EU therefore demands that ACP countries completely open their markets to all EU products with the next ten years.

Various groups think that the development objectives receive too little attention in the EPAs. They are afraid that the transition period is too short and that ACP countries will reap no benefit from the new treaties. In their view, the negotiations are primarily aimed at improving access to markets in ACP countries, rather than improving the position of ACP countries (see, for example, www.stopepa.org).

Environmental policy increasingly an EU affair
A growing proportion of environmental policy comes from the EU (RIVM, 2003). This trend is partially driven by the transnational scale of many environmental problems. At the same time, it is becoming increasingly important to create a 'level playing field' for the European business community and to guarantee an equal level of protection for all European citizens. The level playing field and equal protection level can sometimes be in conflict with each other: countries with a high population density and economic activity usually need more stringent source control policies to meet agreed air, water or soil quality standards.

EU usually speaks with one voice on the environment
Even in areas where it has no exclusive competence, the EU often represents the Member States in the international arena to ensure that EU objectives are achieved. This occurs in cooperation with countries via the EU presidency. This type of parallel approach results in 'mixed treaties', where both the Member States and the EU are party to the agreement, examples being the UNFCCC and the CBD (see Section 6.1.1). This situation requires careful coordination, which costs a lot of time and puts added pressure on diplomacy. The EU can arrange this coordination through the European Council, which issues a mandate to the European Commission to conduct negotiations (based on a qualified majority). An alternative is that the Member States themselves conduct the negotiations via the EU presidency, but as the presidency rotates every six months this raises the problem of continuity. In practice the European Commission often acts as the European representative in multilateral environmental forums, even though it has no authority to do so, thus allowing the EU (as a whole) to speak with a single voice.

EU increasingly determines direction of energy policy
The EU Member States are currently still free to make their own decisions about energy, although energy policy is increasingly influenced by EU legislation. Prime concerns are the importance of a well-functioning internal market and climate policy. The European Commission has recently drawn up targets for renewable energy and energy security. However, on the area of energy, the European Commission does not have all the decision power, yet. The new European Treaty should change this slightly, at least when all the Member States have completed the ratification process.

6.1.3 The Netherlands

At the level of the Netherlands some policies already exist on the three areas of sustainability identified in this Outlook. These policies have been discussed in the previous chapters (see Chapters 2, 3 and 4). This section examines the question of how the Netherlands can pursue an explicit sustainability policy, emphasising the balance between the three capitals and the relation to the rest of the world.

The Netherlands' NSDS is not a real sustainability strategy
In preparation for the UN Conference on Sustainable Development in Johannesburg, the Dutch Government drew up a Review of National Policy, which was part of the National Sustainable Development Strategy (NSDO, 2002). It defined the term 'sustainable' in very broad terms, which met with criticism from institutions such as the Scientific Council for Government Policy (WRR). They felt it would make the concept of sustainable development meaningless in practice (WRR, 2002). Therefore, the WRR urged that the policy focus be changed to environmental quality and natural resources. However, others emphasised that, particularly in the international context, the link with socio-economic problems was crucial in developing countries. The ongoing debate about the NSDS has meant that the government has still not taken any concrete steps to implement the strategy.

This was also noted recently by the international Peer Review of the NSDS (RMNO, 2007). This review states that the current NSDS suggests too few potential solutions. It seems to go no further than slight shifts in course within existing structures. There is also too little focus on complementarity, which makes the NSDS feel as if it has been 'tacked on' to existing policy. The issue of complementarity

and cohesion is barely touched on in the many forecasts and scenario studies drawn up by the government. Finally, the Peer Review indicates that too little attention is paid to the cross-cutting issues (RMNO, 2007). All in all, the Peer Review appears to have found a number of weak points in the Netherlands' NSDS, which are considered to be crucial in this Sustainability Outlook.

Sustainability is at the core of the Coalition Agreement
Sustainable development is the central theme of the 2007 Coalition Agreement of the Balkenende IV Government. The Coalition Agreement, therefore, resembles the current EU SDS (see text box 'Corresponding elements: EU SDS and Coalition Agreement'). The coalition agreement of the earlier Balkenende II Government clearly shows similarities with the Lisbon Agenda (2002), which was the dominant policy strategy in the EU at that time (MNP, 2006). The current Coalition Agreement, therefore, seems to have broken with the centralised economic thinking of previous coalitions led by Balkenende and adopted an approach based around sustainability.

Transition policy an important part of environmental policy
Dutch environmental policy is largely determined by the European Union. In its Fourth National Environmental Policy Plan (NMP4) the government mentions seven persistent environmental problems, including the loss of biodiversity, climate change and the overexploitation of natural resources. These points correspond to the environmental areas identified in this Outlook that are important for sustainable development. A fundamental and strategic element from NMP4 is the realisation that system changes and transitions are required to solve these persistent environmental problems, and that a focused long-term transition policy is needed to accomplish these transitions. In practice, there was already talk of transition processes, in the form of ongoing research projects, experiments and think-tanks. But these transitions were in need of a fresh stimulus and government needed to become more involved and more focused. With respect to energy, the Government has set an ambitious long-term goal of obtaining a sustainable energy supply by means of an energy transition. To this end, the Energy Transition Task Force has published a transition plan *Meer met Energie* (More with Energy) (EZ, 2006), which the Netherlands hopes will put it at the forefront of the transition to a sustainable energy supply.

Corresponding elements: EU SDS and Coalition Agreement

The similarities between the Coalition Agreement and the EU SDS are found mainly in the first four of the six pillars of the agreement. The EU SDS has four main goals: environmental protection, social cohesion, economic prosperity and international responsibility. These correspond with the following pillars in the Coalition Agreement: a sustainable living environment (III), social cohesion (IV), an innovative, competitive and enterprising economy (II), and an active international and European role (I). The order in which these subjects are discussed vary: the Coalition Agreement starts with the international dimension, while the EU SDS leaves this to last. This could be a reflection of the fact that until its revision in 2006, the EU SDS focused primarily on the EU, and only took note of the 'external dimension' after this date. Important differences between the two include the attention the Coalition Agreement pays to safety, stability and respect (pillar V) and to government and public services (VI). These are not included in the EU SDS, with the exception of 'better regulations'. Moreover, the EU SDS says nothing about streamlining European public services and governance structures, whereas the size and function of national public services is an important subject in the Coalition Agreement.

6.2 Success and failure factors of international policy

In serving the common interest, a government can pursue national policies that benefit some, but impose costs on others. It is the duty of national government to ensure that the collective interest prevails over the individual interests of citizens. Within the EU, the Member States have made agreements on a wide range of subjects in which the common European interest prevails over those of the individual Member States. The Member States make agreements between themselves or give up some of their sovereignty to the EU to safeguard collective EU interests.

As yet there has been no such relinquishing of sovereignty at the global scale. This makes it difficult to pursue decisive policies at a global level, but this is just what is needed to solve global sustainability problems. However, it is still possible to pursue global policy, and there are a number of positive examples. This section briefly discusses the factors governing the success or failure of international policies.

International environmental policy is successful in some areas

Over 500 international environmental agreements have been made between (groups of) countries (Multilateral Environmental Agreements, or MEAs). Examples include the successful Montreal Protocol (to protect the ozone layer), the CITES Convention which regulates trade in endangered plants and animals, the Convention on Biological Diversity and the Climate Convention.

Of all the environmental agreements, the Montreal Protocol (1987) is one of the most successful treaties. Over a period of 20 years, international agreements have virtually halted emissions of ozone-depleting substances (primarily CFCs) in developed countries entirely, without the use of firm sanctions. An important reason for the success of the Montreal Protocol is the fact that there were sufficient (affordable) substitutes for CFCs. The developed countries, which produced by far the most CFCs, were able to implement the Protocol at reasonable costs. The number of countries manufacturing CFCs was also limited, so it was easier to make agreements between these countries. Developing countries that manufacture CFCs were allowed to phase out production at a later date, and are able to draw on an 'ozone fund' for financial support to assist the transition to substitutes.

The 169 countries that have signed the CITES Convention are committed to taking necessary measures to regulate the trade in and possession of protected animal species. This international agreement is nationally enforceable and thus binding in character. The CITES Convention requires traders to obtain import and export permits when trading in species of plants and animals that appear on the CITES list. The weak point of CITES is that it depends on the effective execution of this licensing system, which cannot be enforced.

Economic benefits determine policy success?

The effectiveness of international organisations such as the World Bank and WTO (see Section 6.1.1) and the International Monetary Fund (IMF) is hard to determine. Of course, the main objective of these organisations is to promote economic growth, which makes them more welcome on the world stage. The World Bank and IMF are also funded mostly by the rich nations, so that economic power is directly translated into political power. Although this seems to explain why these international institutes are so powerful, their legitimacy is strongly questioned, particularly by developing countries. Why are these institutes currently under so much pressure to reform (Stiglitz, 2006)? And how can they regain their strength?

The dwindling success factors can best be illustrated by developments within the WTO. Established in 1995 as a follow-up to the GATT, the WTO set out with optimism to expand free trade, but progress has stagnated since the start of the Doha Agenda in 2001. In Doha it was agreed that the following WTO rounds would benefit developing countries, with an emphasis on environment and development (WTO, 2007). However, since the agreement in 2001, all negotiations within the WTO have failed and there is little prospect of progress. The European Union claims to have tried several times to make headway in the process (DG Trade, 2007).

One possible conclusion is that organisations are less successful as soon as economic growth in the most powerful countries in the organisations comes into doubt, or when these countries have to make concessions. This at least explains some of the criticisms of the World Bank by the United States.

Rate of change in the world outpacing institutions

Experts suggest there are three problems underlying the fading influence of the WTO, World Bank and IMF (Coffey and Riley, 2006):

- Developing countries are underrepresented in all three institutes.
- The institutes are cumbersome and bureaucratic.
- The objectives of the institutes are too broad.

A number of possible reforms present themselves in response to these problems (Coffey and Riley, 2006):

- Decision-making by global organisations must become more transparent.
- Developing countries need a louder voice.
- Objectives could be narrowed down.

There is also some debate as to whether institutes operating at the global level can cope with the heterogeneity of the various countries and regions. This partly underlies current proposals to establish regional versions of the World Bank, such as the existing Asian and African Development Banks. These regional banks are considered to be more able to make the right loans than the World Bank (Coffey and Riley, 2006).

In this respect, the recommendations tend to move in the opposite direction to sustainability policy: they propose a narrower range of tasks (only for development policy) than needed for sustainability policy. Calls for a global sustainability policy should, therefore, focus more on strengthening the social and environmental pillars, in particular. Only then can the three sustainability dimensions in the identified problem areas be properly weighed and considered.

Fragmentation of policy responsibilities frustrates harmonisation

Within the UN a discussion is currently taking place on how the organisation can be more successful in pursuing its goals of peace and security, sustainable development and human rights. They can be achieved through better harmonisation of policies at the international level, as well as better implementation in individual countries (UN, 2006). Improving the system of international environmental policy has long been on the agenda of the United Nations Environment Programme (UNEP).

The shortcomings in the functioning of UN organisations with an interest in the themes discussed in this Outlook can be traced back to a number of interrelated problems (Najam *et al.*, 2006):

- policy inconsistencies by the Member States themselves, resulting in indecisive and incoherent governance;
- an out-of-date mandate for operational activities by the UN;
- spreading scarce resources over too many countries and too many activities, resulting in fragmented and ineffective aid programmes;
- poor implementation and enforcement of agreements, and thus inefficient use of the resources available;
- bad management by the organisations and too little cooperation with other international organisations.

To increase the effectiveness of multilateral efforts, improvements must be made in the various UN institutions themselves, as well as between the UN and other multilateral organisations, such as the World Bank and WTO (Najam *et al.*, 2006). The increasingly greater involvement of non-public stakeholders in global policy forms an additional challenge to reforming the UN system, which is traditionally geared to dealing with governments.

Policy integration also on EU agenda

Integrating environmental considerations into other policy areas has been on the European agenda for years, but without much success. Article 6 of the Treaty of Amsterdam (in operation since 1999) gave an important boost to attempts at policy integration within the EU. The 'Cardiff process' played an important role in the implementation of this proposal. During a European Council meeting in Cardiff (1998) all relevant Council configurations were called upon to set up a strategy for integrating environmental targets into sectoral policies. Although nine Council configurations complied with this request, little specific progress was made (IEEP/Ecologic, 2001; IEEP, 2002; EEA, 2005). Most 'integration strategies' went no further than describing existing sectoral policy and attempting to view it from a sustainable development perspective. Nothing more has been heard from the Cardiff process since 2004.

The EU SDS has diverted political attention away from the Cardiff process. It makes policy integration one of the guiding principles for sustainable development, broadening its scope from integrating environmental policy into sectoral policies to integrating all three pillars of sustainable development. The painstaking progress of the integration strategies at Cardiff casts doubt on whether the EU SDS has sufficient momentum to bring about any real policy integration. The system of impact assessments could be part of the answer, but has not yet contributed much (see text box 'Strengthening the external dimension in the EU sustainability toolkit').

Strengthening the external dimension in the EU sustainability toolkit

One of the main concrete results of the EU SDS is the implementation of what the first version of the EU SDS calls 'Sustainability Impact Assessment', but is now known simply as 'Impact Assessment'. Use of this instrument should lead to various sustainability aspects being considered at the early stages of policymaking and, therefore, also to better legislation. Impact Assessment was introduced in 2003 under this double motto of better legislation and policy integration for sustainable development. Its execution has tended to lean more towards the first objective, as reflected in the new name. Moreover, most of the Impact Assessments that have been carried out are of inadequate quality (European Commission, 2004; Wilkinson *et al.*, 2004). In practice, economic impacts are highlighted and little or no attention is paid to impacts outside the EU (Adelle *et al.*, 2006). Therefore, a question mark hangs over the contribution this new instrument can really make to policy integration for sustainability. It has not yet performed well enough to provide insight into the external effects of EU policy.

Integration at European level currently offers the best opportunities

For the sustainability issues identified in this Outlook, focusing on the EU currently offers the best opportunity at an intermediate level for European countries. At the global level there must first be several institutional reforms in the UN, as well as the World Bank, WTO and IMF. In addition, global sustainability policy is paralysed by the call for further policy integration on the one hand, and for a simplified interpretation of the tasks of these institutions, on the other.

The EU offers wider possibilities. The EU has a powerful voice when it comes to biodiversity and climate change (see Section 6.1.2) though, as yet, much less for development policy. If the EU voice is heard in all three areas there is a

better chance, from a European perspective, of getting sustainability policy off the ground. The EU could use this voice to make the three dimensions of sustainable development more transparent and introduce them in the relevant institutions at the global level. The EU is also better able to create a level playing field for industry. However, this requires the Member States to take a proactive stance in the European debate.

6.3 What could be done at each level?

The recent trends in policy and the possibility of formulating policy at various scales raise the question of the scale at which the options discussed in Chapters 2, 3 and 4 can be implemented best? There is no simple answer: it depends on factors like confidence in the ability to make firm agreements at the European or global level. It also depends on confidence in countries complying with these agreements. A number of ground rules can be derived from Table 6.2, which shows the policy options discussed in Chapters 2, 3 and 4:

- (phased) trade liberalisation and development cooperation;
- technology transfer (for agriculture and energy);
- improving efficiency and changing behaviour with respect to energy and land use;
- changing to alternative sources of energy;
- international climate policy (extending the EU emissions trading system, as well as post-Kyoto policy);
- targeted nature protection outside the EU.

Table 6.2 shows the scale of political competence for each policy option.

Policy of voluntary behavioural change is primarily a national affair

Member States are free to encourage behavioural change by informing consumers of the consequences of using certain products. Policy on public information campaigns is typically a national matter, as long as specific information is not (yet) required to be displayed on those products.

Product standards and exclusions are primarily an EU affair

Individual nations can pursue specific policies for certain reasons, including public health or environmental protection. They can set additional standards for certain products, exclude certain products or pursue a pricing policy, although their room for manoeuvre is limited by the EU regulations governing the internal market. Every country may implement such policies, as long as they do not frustrate the workings of the internal market. This makes it difficult to implement such policies, not least because a well-functioning internal market makes it difficult to enforce product exclusions. For example, the ban on the sale and use of more powerful fireworks in the Netherlands has been withdrawn, simply because these products can easily be purchased in Belgium and transported across the border. To be effective, policies for safer and cleaner production need a European approach.

The EU can function as a coordinating intermediate level

At the moment the EU Member States still act as independent bodies in the field of development cooperation and in international negotiations on climate, energy and biodiversity. However, cooperation and coordination between countries in the EU could be useful, since the EU as a unified bloc has more power than each of the Member States individually. The EU already acts as a unified bloc in

Table 6.2 Level of political competence for the policy options.

	Member States (The Netherlands)	EU	Rest of the World
Development policy	D		
Debt reduction	D		
Trade liberalisation	D	D	D
Technology transfer and innovation (agriculture)	D		
Efficiency improvements	D	D*	
Introduction of cost-effective alternative energy	D	New treaty	
Improving the security of energy supply	D	New treaty	
Targeted nature protection outside the EU	D		
Reducing the footprint of consumption	D		

D = decisions are taken at this scale

* Under the European Emissions Trading Scheme

several multilateral agreements. The question is whether the Member States should transfer even more sovereignty to increase EU power, or less. If they choose the latter, the EU will play a mainly coordinating role. Opinions on this are divided, as illustrated by the debate on the new EU constitutional treaty. The new Constitutional Treaty permits an expansion of EU competence in policy making on energy and the environment.

6.4 Conclusions

National interest determines willingness to make binding commitments
Analysis of international and European progress with policies on trade, development cooperation and environment reveal an important truth: individual national interests take priority. Countries are more inclined to enter into binding agreements if they deliver a net benefit. Many countries, though, have gained so much stability and prosperity from the EU's internal market that losing some of their sovereignty is an acceptable trade-off. The parallel with global free trade agreements is evident: free trade brings so many benefits that countries accept an institution that can apply sanctions. So far, there has been little willingness to make such binding and specific agreements on environmental and other aspects of sustainability; the Kyoto Protocol being the only example. This also applies to more far-reaching free trade agreements, particularly if they lead to the shrinking or complete disappearance of certain sectors, such as agriculture in the US and the EU. When it came to reducing ozone-depleting substances, for most participating countries the advantages (protecting the ozone layer) outweighed the disadvantages (costs of changing to alternatives). Luckily there were affordable alternatives available.

Difficult to formulate cohesive and binding sustainability policy
At all levels, drawing up and implementing an integrated sustainability policy is problematic. The main reason is that competence in the relevant portfolios is spread across different levels, institutions and government departments. For example, trade agreements and agricultural subsidies are handled at EU level, which makes the Netherlands dependent on European decision-making for implementing changes. However, this does not mean it would not be possible, or useful, to construct an integrated and (partially) binding sustainability strategy – it could contribute to the formulation of policy visions and indicate, within defined limits, how other policy decisions should be made to realise the stated objectives.

Little progress with external dimension of EU policy
Even within the EU it has not been possible to clearly define the external dimension of policies, although an instrument is available to do this, in the form of the mandatory (Sustainability) Impact Assessment (SIA). However, in practice virtually no attention has yet been paid to impacts outside the EU. Over the next few years, the methods used in SIA will be one of the indicators of whether the EU is being successful in making policies that take more account of impacts outside Europe.

Current sustainability problems must be tackled at the European level
When considering the success/failure factors of international policy, it is clear that policies are successful if they meet three criteria. First, countries that are important for that policy field must support the policy. Second, economic losers must be compensated for the costs incurred. Finally, the policy must be differentiated. Global solutions are by far the most preferable for solving global problems but, in practice, are difficult to implement. Many experts in the international field are also calling for a clearer mandate for global institutions, with limited objectives and more democratic and transparent governance (see Section 6.2).

Besides the above factors, the policy options mentioned in Chapters 2, 3 and 4 apparently require a behavioural change, additional product standards and a level playing field, at least at the European level (see Section 6.3). This quickly leads to the conclusion that in terms of necessary size, effectiveness and enforceability, the EU is by far the best administrative scale for initiating policies on the three sustainability problems discussed in this Outlook. To operate decisively and with one voice on sustainability, a change must be made in the constitutional setting of the EU, particularly the current unanimity procedure. A role model function for each European country should remain possible, when certain policy areas are shifted onto the European level.

More detailed policies require political choices that can easily become highly charged. Should the EU argue for further globalisation, or for protecting the African market? Should the climate problem be tackled via pricing, or by setting standards? Should the Netherlands push to make Rotterdam a sustainable biomass mainport, or would worldwide sustainability benefit more by creating added value in the country of origin? What can be achieved via sustainability policy at lower levels than that of national government? The policy options identified here are discussed in more detail in Chapter 7.

The sustainability challenges identified in this Sustainability Outlook are to:

- limit climate change;
- conserve biodiversity;
- eradicate poverty and hunger.

These three objectives are closely interrelated, although in some respects they conflict with each other. Some developments make a positive contribution to one objective, but have a negative effect on another, even to the extent that a policy measure taken to support one objective makes another goal more difficult to achieve. For example, development in developing countries leads to increased food consumption and thus to increased pressure on land and biodiversity (see Chapter 4). The complementarity between the objectives should, therefore, be apparent when assessing proposed policy measures and such an appraisal offers the best chance of ensuring a positive contribution to sustainable development. If a political decision needs to be made, the various targets and priorities should be taken into consideration.

The clearest example of a policy measure that impinges on all three areas of sustainable development is the use of biofuels, which is why it is the subject of this case study. The main purpose of using biofuels is to limit the increase in CO_2 concentrations in the atmosphere, but they should improve the security of energy supply in Europe as well (see Chapter 3). However, the production of biofuels requires large amounts of land to cultivate the crops. Biofuels, therefore, lay claim to land, while at the same time increasing amounts of land are also needed to produce food, timber and animal feed (see also Chapter 4). Finally, there is the question of whether biofuels form a new market for the developing countries, and whether they actually contribute to further poverty by causing food prices to rise (see also Chapter 2).

This case study discusses the possible consequences of using biofuels on a large scale and the objectives and interests involved in their use. Politicians have several ways, or 'action strategies' available to them for tackling this complex and topical sustainability question. This case study describes the various options that politicians can choose from and the pros and cons of these choices. This information will help them to take a considered and responsible decision.

Biofuels as an alternative to fossil fuels

People have used bio-energy for centuries to meet their energy needs, primarily by burning brushwood for heating and cooking. In industrialised countries this traditional form of energy consumption has now been almost entirely replaced by the use of fossil fuels.

This case study does not include these 'traditional' forms of biofuels, but concentrates on their modern counterparts, which are an alternative to fossil fuels. Modern bio-energy generally supplies energy in three ways:

1. burning wood residues (for heat and electricity);
2. burning waste in general (also for heat and electricity);
3. converting agricultural produce into bio-ethanol and biodiesel (for the transport sector).

To convert agricultural products into energy (the third category), manufacturers currently use sugars, oils (palm oil and rapeseed oil) and starchy plants (such as maize and grain). These biofuels are known as first generation biofuels. Eventually, they are expected to be followed by second generation biofuels, biodiesel and bio-ethanol produced from woody and non-woody plants (including straw, sawdust, etc.). These biofuels are not yet available on a large scale.

Biofuels currently make up only a small part of the total energy mix. Brazil is the only country that converts sugar cane into bio-ethanol for use as a transport fuel. Within the EU around 4% of total energy consumption comes from biomass (European Environment Agency / EEA, 2006), which itself accounts for about two-thirds of the EU's total sustainable energy. Until now this biomass has mainly been wood residues and green waste for co-combustion in the generation of heat and electricity, although agricultural crops are also increasingly being used to produce bio-ethanol and biodiesel. For the transport sector, these fuels form the only alternative to fossil fuels.

The use of biomass is currently an important theme in the energy debate. It is not only seen as a way of reducing greenhouse gas emissions, but can also improve the security of European energy supplies and provide an alternative for European agriculture. The popularity of biomass clearly shows that measures involving biofuels have a far greater chance of succeeding if they also contribute to a number of objectives (see also Chapter 7).

Biofuels are controversial

The biofuels debate is about far more than just the advantages. Much of the discussion concerns the use of agricultural products. This case study describes the debate, but does not go into the bio-energy generated from the co-firing of wood residues and waste because this form of bio-energy can only meet part of the policy

objectives (Table 1BF). Optimistic estimates show that Europe could produce up to 140 Mtoe (million tonnes of oil equivalents) of energy from waste and wood residues (EEA, 2006). This is too little for the required 210-230 Mtoe in 2020 (Table 1BF).

Bio-energy from agricultural products is controversial for several reasons. Firstly, it takes up land that could otherwise remain protected as nature areas. About 3 million km² of agricultural land is required to replace 10% of current global oil consumption, which is equivalent to around 20% of the area currently used to cultivate food crops (FAO, 2005; see also Chapter 4). Biofuels can, thus, exert considerable influence on global biodiversity.

Secondly, critics ask themselves whether the current biofuels are efficient enough in fixing greenhouse gases and whether it would be better for the greenhouse gas balance if trees are allowed to grow again (Righelato and Spracklen, 2007). For palm oil in Indonesia the net greenhouse gas balance is sometimes even negative. This is because peat soils are drained for oil palm plantations. Moreover, a lot of palm oil is needed to generate sufficient energy. It seems, therefore, that producing palm oil emits more CO_2 than using fossil fuels (Hooijer *et al.*, 2006). Biofuel production also requires water and fertiliser, which increases competition for natural resources (Lysen *et al.*, 2007).

Finally, the debate looks at the question of whether biofuel crops will not out-compete food crops for land (de Vries, 2007a). The higher price of tortilla in Mexico seems to be due, at least in part, to the demand for maize in the United States. However, this extra upward pressure on food prices should be seen in the light of the increasing demand across the board for food, animal feed and biofuels (Wise, 2007; see Chapter 4).

In short: there is a complex relationship between developments in biofuels and trends in related activities. Policy objectives also need to be considered carefully within this context.

EU climate policy needs biofuels

In the low-policy *Baseline scenario* (without additional climate policy) biofuels are only expected to make a small contribution to the energy supply in the short term (up to 2030) (van Vuuren *et al.*, 2007). Under this type of policy-neutral scenario, biofuels can only compete with conventional energy sources such as oil, gas and coal in a very limited way.

However, the European Commission has recently decided to initiate a stringent climate policy which will push up demand for alternatives to fossil fuels. Ongoing agreements at EU level (Commission for Environmental Cooperation / CEC 2005a, b: Biomass Action Plan) anticipate at least a doubling of biofuel consumption by the year 2010. Further increases are also likely beyond this date, according to recent proposals by the European Commission (CEC, 2006a-d, 2007 and 2008).

The European Commission's proposals aim to bring the contribution renewable energy makes to meeting total energy demand up to 20% in 2020 (EC, 2008). Two-thirds are expected to come from biomass, which means an increase in the use of biomass to 210-230 Mtoe, equal to 8,800-9,600 PJ (Table 1BF). The European Council has adopted most of these proposals, on two conditions. First, the required biomass must be produced in a sustainable manner. Second, the second generation biofuels (in the form of woody crops) must come onto the market (European Council, 2007). Table 1BF clearly shows that biofuels for the transport sector will only form a substantial percentage after 2010. Specifically for the transport sector, the European Commission proposes to meet 10% of the final energy demand of the transport sector by renewables. This means that 34.6 Mtoe of energy must be met by biofuels in the transport sector, which is in line with the Commissions projections.

The policy initiatives by the European Commission and the European Council will push up the demand for biofuels in a relatively short time. To what extent will biofuel production displace food production? This question is not easy to answer as biofuels are still in their

Table 1BF Current and proposed use of renewable energy in the EU-25 (Source: de Vries, 2007a).

Mtoe (% primary energy consumption)	2002*	2010*	2020**
renewable energy sources	97 (5,8)	210 (12)	325-340 (20)
- of which biofuels	69 (4,1)	149 (8,3)	210-230 (13)
markets for biofuels			
- electricity	20	55	90
- heat	48	75	90-95
- transport	1	19	31-43

*) from CEC (2004a, b): The Share of Renewables and CEC (2005a, b): Biomass Action Plan.
**) from CEC (2006a, b): Renewable Energy Roadmap and CEC (2007): An Energy Policy for Europe.

infancy. Brazil is the only country where biofuel crops are grown on a large scale and currently produces around 40% of the world's bioethanol (Walter *et al.*, 2006), but this is primarily sold on the domestic market.

So far, the cultivation of sugar cane for bio-ethanol in Brazil has expanded very slowly (Figure 1BF). In contrast, soya production for animal feed has grown dramatically and is presenting huge challenges to natural areas (see also Chapter 4). If the demand for alternative fuels continues to rise, similar problems (land conflicts and rising food prices) may arise (see Chapter 4).

The extent to which biofuel production will replace food production appears to depend mainly on the pace at which change occurs. The short-term effects will be different from the long-term structural effects. For example, adjustment costs could lead to higher prices in the short term, probably accompanied by short-term fluctuations if demand for biofuels rises rapidly, as expected. The process of adjustment will occur in fits and starts, particularly with respect to prices.

Policy initiatives for biofuels should, therefore, encourage a gradual change so that food remains affordable for the local population. The current initiatives in the EU and the United States do not support such gradual growth. Neither is it certain that the biofuel targets for 2020 of 10% will guarantee the desired gradual change (Eickhout *et al.*, 2008).

First generation biofuels take up productive land and nature

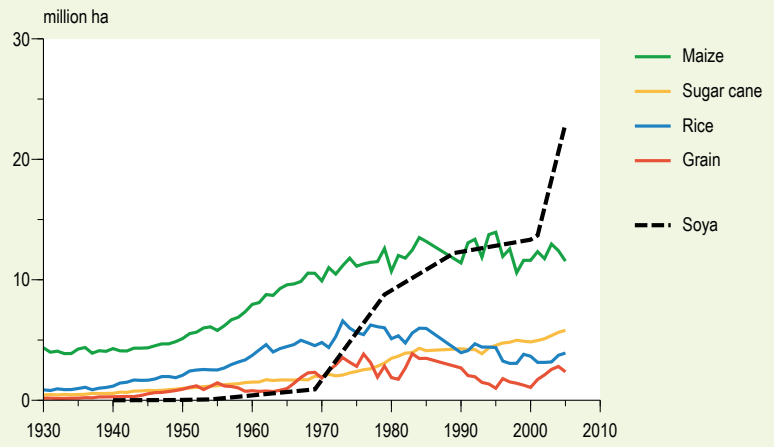
There is reason for concern about the rate of introduction of biofuels. Besides, only first generation biofuels are currently available for the transport sector. As previously mentioned, this type of biofuel requires artificial fertiliser and energy inputs for cultivating and processing the crops, severely limiting its net contribution to solving the climate problem. In addition, large-scale cultivation of first generation biofuels requires very productive land and so these crops compete with food production. Biofuel crops grow well enough in productive soil to make production economically feasible (Hoogwijk *et al.*, 2005).

In an attempt to limit the negative consequences, it is proposed to make a controlled start with producing raw materials for biofuels within the EU. The European Environment Agency (EEA) has studied whether biofuels can be produced in sufficient quantities within the EU itself and concluded that Europe has sufficient land available for the sustainable production of enough biofuels to meet policy targets in 2010 and 2020 (EEA, 2006). However, it would require around 70-90 Mtoe from agricultural produce to achieve the total of 210-230 Mtoe (Table 1BF). This conclusion by the EEA does depend on two conditions, though: a complete revision of the EU's Common Agricultural Policy and the availability of second generation biofuels.

Availability of agricultural land within the EU depends on agricultural policy

The EEA has concluded that 95 Mtoe of energy from biofuels can be produced from agricultural products in the EU in a sustainable way, based on criteria such as 'expanding organic agriculture' and '3% of the area for biodiversity within the EU' (EEA, 2006). This yield would, therefore, be sufficient to achieve the EU target for 2020 (Table 1BF). In its analysis, the EEA assumes that agricultural land will become available in various European countries. It also assumes that the EU Common Agricultural Policy (CAP) will be completely liberalised (see also Chapter 6). However, the study does not describe the consequences elsewhere if some agricultural produc-

Figure 1BF Most important crop areas in Brazil, 1930–2005 (in million hectares). Sugar cane is used to produce bio-ethanol, soya for animal feed (Macedo, 2005).



tion leaves the EU while worldwide food production remains the same. If production in the EU declines, this will be compensated by additional agricultural production outside the EU. Given that the average yields outside the EU are lower, more agricultural land will be required to maintain the same level of crop production (Eickhout *et al.*, 2007).

If the release of agricultural land in Europe is compared with various agricultural studies, such as Eururalis (Rienks, 2008; Eickhout and Prins, 2008), it becomes clear how crucial it is that the Common Agricultural Policy is completely revised. The project includes several scenarios in which the CAP in particular is varied. In a liberalised scenario (i.e. ending all subsidies and import barriers) such as the Global Economy scenario (GE), areas of agricultural land are released for other uses (Table 2BF), similar to the EEA study. Most of this land is in West European countries, in contrast to the EEA study which contains a more balanced distribution between East and West. However, if a scenario is chosen where the CAP remains intact, a much smaller area of land will be released (Continental Markets scenario (CM); see Table 2BF). In this case only around 30 Mtoe could be achieved from agricultural products, which is not enough to meet the EU target (Table 1BF).

Strict EU targets will, therefore, put considerable pressure on cultivating biomass outside the EU. Productive land outside the EU which is not yet being used can be found mainly in Brazil, Central Africa and Indonesia, in areas that are currently covered by tropical rain forests (Figure 2BF). A large proportion of these areas contains many species, otherwise known as biodiversity hotspots (see Chapter 4). The use of first generation biofuels, therefore, leads to extra demand for productive agricultural land, thus competing with food production and nature conservation. This brings the risk of land conflicts (as in Brazil, where soya production has increased dramatically; see Chapter 4), higher food prices and loss of nature. Analyses conducted for Eururalis show that a compulsory blending of 10% biofuels in the total energy consumption of the transport sector would have considerable effects on food prices (Banse *et al.*, 2008).

The use of biofuels also offers opportunities for farmers in developing countries and emerging economies (particularly Brazil), which largely depend on agriculture. It is unclear whether biofuels will also result in higher incomes for the poor segment of the population. This partly depends on the distribution of land and power in these countries.

Second generation biofuels only after 2020

Eventually, second generation (ligno-cellulose) biofuels will become part of the sustainable production of energy. These second generation biofuels supply more energy per hectare and are, therefore, cheaper in the long term. They also result in a more positive greenhouse gas balance (Righelato and Spracklen, 2007). Moreover, they can be grown in less productive areas because woody crops, such as poplars and eucalyptus, can also be used in the production process (Figure 2BF).

It is not easy to say when second generation biofuels will become available, but it will probably take another 10 to 15 years before these biofuels can compete with other energy sources purely on cost (UN-Energy, 2007). The EEA actually assumes that second generation biofuels will be widely available by 2020 (EEA, 2006). Therefore, according to the EEA, 95 Mtoe of energy could be produced from just over 15 million hectares of agricultural land (Table 2BF). Assuming that there are no second generation biofuels available in 2020, then the same area of land will 'only' produce 70 Mtoe of energy. The assumptions by the EEA can be seen as optimistic. Therefore, it can be concluded that the 10% target of the European Commission will require 20 to 30 million hectares of land (Eickhout *et al.*, 2008)

For second generation biofuels to become suitable for large-scale energy production, technological optimisation techniques will be required in the conversion of raw materials, like cellulose, to biodiesel and/or bio-ethanol. The infrastructure for transporting woody crops to power plants and other facilities needs to be modified. In those cases where the availability of biomass is a limiting factor, it should be used where the best outcome can be obtained. For example, burning wood to generate electricity delivers

Table 2BF Agricultural land available for biofuels per EU Member State in 2020 under various scenarios (in 1,000 hectares) (Sources: EEA: EEA, 2006; Global Economy (GE) and Continental Markets (CM): WUR/MNP, 2007).

Scenario	Czech Rep	Finland	France	Germany	Greece	Hungary	Italy	Poland	Spain	Sweden	UK	EU-25
EEA	314	299	1000	2000	298	512	1786	4321	2582	168	1118	16170
GE	0	608	3045	2975	425	315	2438	0	1928	792	744	15813
CM	15	243	238	862	0	80	1177	168	0	458	156	4752

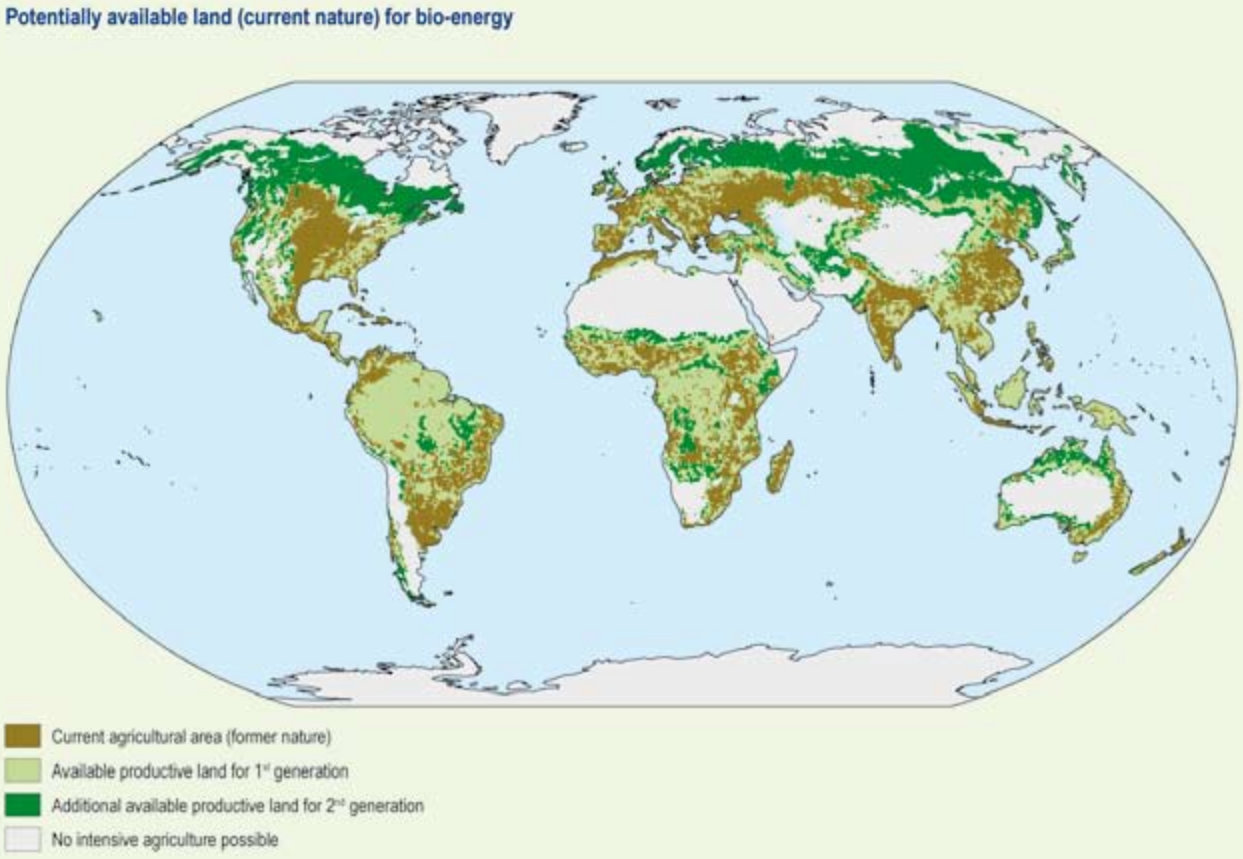


Figure 2BF **Tropical nature potentially under additional pressure due to first generation biofuels.**

greater reductions in greenhouse gas emissions than conversion for use as a liquid transport fuel. As an alternative to the electricity sector, in the short term biofuels will have no effect on Europe's dependency on oil (see also Chapter 3).

Many studies into potential solutions assume that second generation biofuels will come on stream. They sidestep the question of competition for agricultural land (Hoogwijk *et al.*, 2005; Smeets *et al.*, 2007). In these studies the cultivation of crops for biofuels is only 'allowed' in areas containing less productive land (e.g. natural grasslands, savannah and tundras; see Figure 2BF) or where agricultural land is abandoned. In the longer term (2050) around 75% of the total crops required for biomass are expected to be produced on abandoned agricultural land (Hoogwijk *et al.*, 2005).

If the introduction of second generation biofuels is assumed, then to supply around 20% of the global energy demand, in 2040, will require an area equal to 40% of the current agricultural area for crops (CBD/MNP, 2007). The area required is so large because plantations for second generation biofuels are on less productive land.

Opportunities for biofuels particularly outside Europe

If there are no trade barriers, then crops for biofuels (such as sugar cane and palm oil) could also be produced in developing countries such as Brazil or in Central Africa. However, in such a 'liberalised world', it is highly questionable whether the EU would be able to exert enough influence on exactly where biofuel crops are cultivated. Producers would first abandon the less accessible areas in Europe. Moreover, large-scale production on abandoned agricultural land within the EU seems unlikely without subsidies or additional (sustainable) production criteria. This is because, in liberalised scenarios, agricultural production moves to developing countries (WUR/MNP, 2007). If the EU introduces criteria it could lead to extra WTO barriers and current EU policy instruments do not offer many opportunities (see text box).

Limited control over geographical distribution of biofuel cultivation makes the effects uncertain

The above analysis shows that a few difficult choices remain. In any event, it is clear that resolving the problems of climate change and security of supply will have go to further than just biofuels alone. Moreover, biofuels also do not have a positive effect on biodiversity, either

EU policy instruments offer little potential for sustainability criteria

Sustainability criteria are not easily translated into policy instruments. Currently, the EU uses two incentives to increase the use of renewable alternatives, including biofuels: feed-in tariffs and compulsory quotas (de Vries, 2007b). Feed-in tariffs bridge the cost price difference between renewable energy and conventional energy. Quotas oblige energy customers or their suppliers to include a certain percentage of renewable energy in their total product package.

An obvious option is to redefine both instruments so that only sustainably produced forms of biofuels are eligible for the incentive scheme. This option has been studied in detail, both in the Netherlands and the UK. The UK Government concluded that, without international harmonisation, biofuel importers could only be subject to a reporting commitment, without material consequences or sanctions. Companies would then have to report on the greenhouse gas balance and the broader sustainability aspects of the biofuels in which they trade. Uniform guidelines have been set up, although companies have the option of giving the answer 'not known'.

In the Netherlands, the Cramer Commission recently published its latest recommendations on sustainability criteria and on biofuels (*Projectgroep Duurzame productie van biomassa*, 2006 and 2007). Both reports recommend tightening the criteria and/or expanding their scope, over time. The short-term objective should be the exclusion of undesirable biofuels from government incentive schemes. In the longer term (from 2011 onwards) the aim should be the 'active protection of nature and the environment, and of the economic and social climate'.

The proposals have not yet been tested against the WTO regulations. This will be a critical test that could threaten their application, particularly in the short term (de Vries, 2007b). Under the WTO, governments can set extra product standards, but these must be 'justified' (well founded), not discriminate between products and be proportional (restricting trade as little as possible). These 'Technical Barriers to Trade' (TBT) are allowed under WTO for products and related processes and production methods. However, the extent to which bio-ethanol processes are product related is very unclear, and there are no legal precedents. This latter point is particularly relevant because Brazil is currently preparing to export large quantities of biomass as a commodity, as well as ethanol as a product.

(CBD/MNP, 2007). A drastic rise in demand for first generation biofuels will certainly be detrimental to biodiversity and food production.

The extent of the side effects also depends on whether biofuels are indeed only cultivated on abandoned and less productive, but still idle land. This type of mechanism could probably be operated quite well from within the EU, but it is highly uncertain whether sufficient agricultural land will become available. Moreover, this land is also generally not easily accessible. Outside the EU it is doubtful whether any control can be exerted on where the crops are grown. Part of the biofuel production is expected to come from countries where the state currently lacks sufficient ability or motivation to prevent loss of biodiversity or food production.

Possible action strategies for biofuels

The above analysis reveals various strategies for action. Each strategy has its advantages and disadvantages. The relevant questions at this stage include: Should biofuels be used primarily within the EU, or primarily elsewhere? How great are the risks of biodiversity loss, and can competition with food production for the poor be limited? These choices are value laden: benefits cannot be obtained on all points. Four possible action strategies for biofuels are described below. They can be linked to the four world views from the first Sustainability Outlook (see also Chapter 7).

1. Energy security and support to EU farmers are leading

The first strategy is for the EU to give priority to 'secure self-sufficiency in the interests of safety'. The EU would produce as much energy and food as possible from its own land, encouraged by a system of taxes and subsidies. The EU would, therefore, pursue a safe region philosophy. Agricultural subsidies and other forms of market protection for biofuels will remain. Biofuels would primarily be used for energy supply and as a means to support farmers within the EU.

Under this strategy, the use of biofuels within the EU will have a positive effect on the climate. However, the flanking protective trade policies will frustrate international cooperation, probably ensuring that global climate and biodiversity policies will not get off the ground. On balance, the trend will be away from the climate and biodiversity targets rather than towards them and so the EU will have to devote its efforts to preparing for the possible consequences (adaptation). Eventually, the EU could form coalitions with other countries that want to participate in tackling climate change and conserving nature, giving them trade privileges in return.

2. Market liberalisation and world trade are leading
A second strategy is for the EU to put world trade and the global market first. It means ending agricultural and other subsidies that stand in the way of world trade, and the EU would promote this in the WTO. Dutch and European farmers affected by these measures can be suitably compensated to reduce objections. The measures also offer long-term opportunities for developing the poorest regions, but initially countries like Brazil, Argentina and New Zealand will be the main beneficiaries. The consequences for biodiversity and the distribution of wealth are less likely to be positive (see Chapter 2).

By removing existing trade barriers and not setting new ones for biofuels, further opportunities will be created for working with developing countries and the BRIC countries (Brazil, Russia, India and China) towards a global climate and biodiversity coalition. The climate target (see Chapter 3) could probably be achieved, although the rate of biodiversity loss will not be significantly reduced before 2010 (see Chapter 4). It is also unclear whether the poorest countries in Africa and South Asia would benefit sufficiently from the large-scale developments taking place around them (see chapter 2).

3. Climate and development cooperation are leading
A third strategy emphasises global solidarity and aims to benefit from the strong institutional foundations of world trade. This strategy links international development and climate and biodiversity policies to the free trade agreements in the WTO. This also includes the phased introduction of free trade to give the poorest countries the chance to develop their own markets first. The EU would then be prepared to end its agricultural subsidies and refrain from setting new barriers to biofuel imports. A condition is that the developing countries must participate in global climate and biodiversity policy.

This strategy carries the risk of unrest and resistance among the European farmers. It is also unclear how quickly these measures could be introduced. Would consensus be reached soon enough to stabilise conditions, as stated in the 2 °C target, as the EU wants? Here too, the rate of biodiversity loss will not be significantly reduced before 2010.

4. Reducing the impacts of our own activities is leading
This last strategy focuses on reducing the amount of energy and land used for consumption in the Netherlands or the EU. Within this overall goal, biofuels could be used on a small scale: co-combustion of biomass, but no large-scale use of biofuels from other parts of the world, nor from the EU if this is accompanied by loss of biodiversity. Self-sufficiency is the main theme in this caring region, more to prevent environmental pressure from transport than in the interests of security. Under this strategy, measures to halt climate change and protect nature primarily occur within the EU. Since there is no global approach to solving the climate problem, both the EU and the Netherlands will need to adapt to the effects of climate change. The loss of biodiversity is thus limited within the EU, but continues unabated in other parts of the world. Eventually, coalitions could be formed with other countries wishing to participate in climate and nature protection strategies.

Conclusions
Early large-scale application of biofuels in the transport sector would lead to greater risks for food production and loss of biodiversity. This is because in the short term (up to 2020) only first generation biofuels are likely to be available and these can only be grown on productive agricultural land. These areas largely overlap with existing nature hotspots. The faster rate of transition to biofuels also increases the risk that food will be less affordable for the poorest segment of the local population.

In time, Europe will be able to meet 10-20% of its own energy needs by cultivating biofuels within the EU on abandoned agricultural land (EEA, 2006). However, it is doubtful whether the EU can keep the production of biofuels within its borders if there is a global market for biofuels. It would also seem very difficult for the EU to combine trade liberalisation and the release of agricultural land with complete biofuel production within the EU. Without trade liberalisation, insufficient land would be released within Europe to achieve the 20% target of renewables. If strict biofuel targets are implemented in the short term, as proposed by the Commission in its 10% target for the transport sector, there will be considerable pressure to import biomass for the transport sector, which will be detrimental to biodiversity outside the EU.

In its target for biofuels in 2020, the European Council has left room for a cautious start by setting conditions on sustainability criteria. However, current sustainability criteria are only to be set at a consignment level. Global displacement effects are not addressed. If second generation biofuels are not available before 2020 (which seems unlikely), there is a considerable risk that biofuels will compete with food production elsewhere and will have a negative effect on biodiversity (WUR/MNP, 2007). In the short term, there would then be no alternatives for the transport sector. This makes it even more important for the EU to concentrate on more efficient engines, and to reconsider the current binding 10% target for the transport sector (Eickhout *et al*., 2008).

7 Searching for solutions

The previous chapters describe how the sustainable development of society is threatened by climate change, loss of biodiversity and the sluggish socio-economic development in the third world. Of course there are more problems to be considered, such as the depletion of raw materials, increasing water shortages, the risk of armed conflicts and income inequalities in prosperous countries. Although these problems all fall outside the scope of this outlook, when defining a sustainability strategy, the relationship with these unexplored challenges will eventually have to be recognised. This outlook contains policy options aimed at reversing unfavourable trends: the climate problem makes it imperative that greenhouse gas emissions are reduced, the loss of biodiversity through deforestation and other changes makes it imperative to use land and nutrients more efficiently, while an energetic and coordinated development policy is needed to tackle poverty in developing countries.

This outlook takes the international targets for climate, biodiversity, poverty and development as its starting points. Climate policy, biodiversity policy and development policy are all closely interrelated and can be at odds with the drive for more prosperity in individual countries. In order to evaluate the contribution that policy options can make to sustainable development, the effects of these options on climate and biodiversity must also be analysed. The development issue is about ensuring that most people have an acceptable quality of life. One of the requirements for this is minimum depletion of natural resources, with the minimum possible ecological damage. In principle, the interests of development and the environment conflict (see Chapter 1). Similar difficulties exist between nature conservation and climate policy, for example the use of biofuels, or carbon capture in forests.

The policy options examined in this Outlook should be evaluated for institutional feasibility and public support. Global problems require a global approach and leadership, but governance at this level is far more difficult than within countries or groups of countries (see Chapter 6). Private citizens and the business community expect the government to resolve this 'social dilemma' and guarantee that everyone plays their part. Support from the public and the business community for doing something about the sustainability problems grew in 2006, following several years in which support from the Dutch population had waned (see Chapter 5). The renewed worldwide interest is due primarily to progressive scientific understanding of the risks involved and publicity campaigns on climate change and poverty.

This chapter analyses the relations between poverty, climate and biodiversity. Specific alternative approaches to tackling these issues are examined and the preferred options and associated risks are discussed from the perspectives of the four world views. Finally, this chapter explores the possibilities for assembling a package of policy options and measures which deliver the most beneficial outcome for all dimensions of sustainability and which can count on broad support in each of the world views.

7.1 The global policy challenge for this century

The analysis of the global trends in Chapters 2, 3 and 4 indicate that without a shift in current trends there will be no sustainable development. This raises several difficult challenges.

Ecological challenges

In the *Baseline scenario*, under current policies, the continuing growth of the world's population and rising standards of living will increase demand for fossil energy (see Chapter 3). The global availability of fossil energy (including fuels from unconventional stocks) is sufficient to meet most of the energy demand for the next few centuries and so, in the *Baseline scenario*, the price of fossil energy rises only slightly (it is assumed that sufficient production capacity will be added). Under these assumptions, it will, therefore, be several decades before the price of solar and other energy technologies becomes competitive. Given the current trends in greenhouse gas emissions, it is highly unlikely that the rise in temperature can be limited to 2 °C, the safe limit determined by the EU. The 2 °C target can only be achieved if large countries outside the EU also implement climate policies.

The survival of a large number of plant and animal species on earth is threatened by the loss of natural habitat as an expanding area of agricultural land is needed to feed the rising population. The world population is also becoming richer and is eating more meat. Global biodiversity is under pressure from climate change, overexploitation (particularly fish catches and deforestation) and, in intensive agricultural areas, surplus nutrients. Without additional efforts, the global biodiversity target will not be achieved.

Social challenges across the world

Over the past 30 years almost all regions of the world have experienced rising incomes, better education and improved life expectancy. According to the *Baseline scenario*, the next 30 years will bring a further rise in prosperity. If the HIV/AIDS epidemic in Africa can be brought under control, then Sub-Saharan Africa will also see a positive social and economic change. However, not all the Millennium Development Goals (MDGs) for 2015 will be achieved. It may be possible to halve poverty and hunger measured as a global average, but certainly not in Africa. The goal of universal primary education also seems difficult to achieve, at least at the moment, as do the goals concerning health. Moreover, governance problems in developing countries weaken the effects of development policy. All these problems also create uncertainty among foreign investors and work against the development of an energetic climate and biodiversity policy in these countries.

The efforts to achieve the development goals still contribute towards solving the ecological problems and there are important mutual relationships between the social and ecological dimensions. Population growth is one of the forces driving the increased pressure on ecosystems. At the same time, living standards also depend on the natural resources these ecosystems provide. An important condition for reducing the birth rate seems to be a growth in incomes, but also in education and information for women. Without working towards the development goals, it seems difficult to see how developing countries can contribute to a vigorous programme of action on climate change and deforestation.

Economic challenges in individual countries

Growth in prosperity is a key consideration in national decisions on social issues, and this is also true in the Netherlands and Europe. As long as all countries strive above all else to increase their own national prosperity in the short term, it will be difficult to achieve long-term global sustainability targets. Sustainability requires a broader rationality, in which the consequences for 'elsewhere and later' are taken into consideration when making decisions 'here and now'. Negative side effects should also be compensated as much as possible by taking flanking measures. Ideally, a sustainable approach will eventually not only be good for prosperity here, but also help reduce poverty around the world and slow climate change and biodiversity loss.

7.2 What next?

7.2.1 Different strategic visions

Nobody is against sustainable development, but there are differences of opinion on the best strategy to adopt and who should do what.

Opposite trends
There appear to be a number of seemingly inconsistent social trends (certainly in Europe and the Netherlands): social studies report increasing individualism and materialism, but at the same time a greater desire for social cohesion and spiritualism. Countries appear to place increasing value on their own culture and sovereignty, but at the same time work on new agreements within the EU and the UN. While efforts are being made for more free trade and market development, steps are being taken to tighten up conditions on the operation of the market and expand public sector involvement in managing the public realm. How things will develop depends largely on which trends dominate in future. Policy choices will need to be made. For example: what are the core objectives of energy policy? Affordable and clean energy, affordable and secure energy – or less affordable but both clean and secure energy?

Knowledge gaps
Opinions differ about the vulnerability of ecosystems, societies and markets, as well as about the ability of governments to anticipate potential risks. If there are strong conflicts of interests and the scientific uncertainties are considerable, the debate quickly loses structure and facts become jumbled with value judgements. A good example is the public and political debates on climate policy.

Different visions on the role of government
Opinions also differ on the best governmental steering strategy. Government is generally considered to play a role when it comes to the management of collective goods. Citizens and companies do not pay individually for the use of these collective goods. In these cases, should the government affect prices and use the price mechanism or would it be better to take a regulatory approach? Or is the UN best placed to do something for 'our common future' because controlling climate change, managing nature and reducing poverty are, by definition, global collective responsibilities? There is something to be said for this last point, because the aforementioned 'social dilemma' occurs between countries: countries are generally unwilling to participate voluntarily in finding a solution to poverty, climate change or biodiversity loss (see Chapter 6). A global institution could be effective because it could compel all countries to make their contribution. Or would such international governmental steering only result in more bureaucracy? Can national policies be implemented faster? Besides, resistance to the increasing power of international institutions became clear during the Dutch EU referendum in 2005. Top-down management sounds effective, but there is some doubt as to whether it would be democratic on such a large scale. Will citizens and countries be prepared to give up some of their freedoms and sovereignty? Perhaps those who want to improve the world should start with themselves, rather than wait for 'the government' to act. Should people really all feel partly responsible for the poverty in the world? Or should the EU simply leave the African continent alone? Furthermore, will future generations not be able to solve ecological problems themselves?

Government is expected to lead and decide
Problems such as poverty, climate change and biodiversity loss are first and foremost collective problems, and thus require collective decision-making. Can governments direct social change in a particular direction in a democratic and effective way? If action is only left to voluntary individual decisions by citizens and companies, this will be less effective. People are inclined to take a 'wait and see' attitude, leaving it to others to make the effort. If we assume that most people would make a contribution if everyone else does too, then government has an important part to play. It should break this 'social dilemma' by introducing regulations or economic incentives to get the unwilling minority to act.

The analysis in Chapter 5 shows that both the public and the business community in the Netherlands look to government to break this social dilemma, create a level playing field and protect collective goods and services. In essence, sustainable development requires cooperation between government, the business community and civil society groups. Both private individuals and businesses are motivated and capable of doing something; companies already have many solutions available that could have a positive effect on the consumption and production chains. The larger the scale, the greater the role that the business community can play. However, private citizens much prefer the necessary measures to be taken for them (see Chapter 5). An important question, therefore, is what policy instruments should be used and by which governmental body: national government, the European Union, or a global institution?

Options for sustainable development

This Sustainability Outlook identifies various options that could contribute to sustainable development. This chapter discusses these options in more detail. The options – sometimes clustered together in one – are summarised below and are derived from the development, energy and climate, and land use and biodiversity themes.

1. *Development policy*. This includes increasing and scaling up Official Development Assistance (ODA), with better international coordination, as well as debt reduction and optimising money flows, taking account of foreign investments by companies (Foreign Direct Investment, FDI) and money transfers by migrants to their families back home. Private investments and the transfer of knowledge and technology could stimulate sustainable development, as can improving access to energy for the very poorest in developing countries and separate policies focusing on people living in poorly-governed developing countries. The underlying principle here is that stable societies foster economic development.
2. *Trade liberalisation that benefits development in poor countries*. This includes phasing out agricultural subsidies and tariff barriers, but also taking protective measures for the least-developed countries to give them time to strengthen their economies.
3. *Improving efficiency and low-CO_2 energy generation*. This can be achieved, for example, through technological innovation in power supply and agriculture, and stimulating low-CO_2 energy generation through emissions trading and a renewable energy obligation.
4. *Protecting nature in developing countries*. This includes taking measures to protect conservation areas outside the EU and making agreements with those countries that still have high levels of biodiversity (e.g. tropical rain forests). However, this would first require biodiversity to be recognised as a collective problem.
5. *Changing behaviour within the Netherlands*. The aim is to limit consumption, or make it more efficient in terms of land and energy use. Measures include taxes, for example on meat, electricity and transport, or by setting standards for certain products.

People's preference for a certain option and the instruments used to achieve it, depends largely on their concepts of government. Such choices are ideologically tinged. To structure the debate the four simplified world views can be used from the First Sustainability Outlook (MNP, 2004).

Figure 7.1 Four world views and their associated book titles.

7.2.2 Clustering visions into world views

World views help to structure the debate
All sustainability issues require a political response. The different political movements have different preferences regarding the role of the market and of government. Views even differ on the question of whether international coordination should outweigh regional independence and responsibility. The First Sustainability Outlook (*Quality and the Future*, MNP, 2004; MNP 2005) provides a structure in which these various lines of thought are clustered into four world views (Figure 7.1). The concept of world views can help to analyse and structure the social sustainability debate.

A1: Global Market

It is inevitable that the world moves towards a single global market. Francis Fukuyama saw this in 1989, after the fall of the Berlin wall, as the approach of the 'end of history'. He saw a world with no place for different ideologies. Capitalism and democracy would triumph worldwide as more free trade, the phasing out of subsidies and trade barriers, deregulation and privatisation encourage efficiency and innovation. Eventually everyone will benefit from globalisation. Technologically, much can be done to resolve ecological problems, but the government plays a limited role in this process. History has shown that the invention of the steam engine and artificial fertiliser mean that the earth can accommodate more people with a higher standard of living than Malthus ever dreamt. Thomas Friedman repeated this message in 2005 in *The World is Flat*. Performance is an important value in this world view. If everyone does their best then all will be well with sustainable development.

A2: Safe Region

In addition to the choice between government (B1) and market (A1) there is another dimension to the social debate: the choice between an international or a national approach. World view A2 emphasises national sovereignty and countries do not transfer any more competences to international institutions. The EU already wants to regulate too much and should not be expanded further. Member countries should not have to comply fully with all international agreements, whether about the environment or free trade. Other countries will also not want to lose employment and will continue giving hidden subsidies. Sustainable development should be primarily a question of becoming as self-sufficient as possible in food and energy, with protection from negative outside influences. People are responsible for themselves and must listen to their individual conscience. With respect to the future, we must be prepared for the worst: protect ourselves from rising sea levels, stop the flow of migrants and arm ourselves against terrorists. NATO and a good relationship with the United States are important for national security. We can enjoy life here in a fairly green environment; developing countries should show some resilience and get their economies in order. The book *The Clash of Civilizations* by Samuel Huntington gives a good impression of this world view.

B1: Global Solidarity

This world view is best represented by the Brundtland Commission, which in 1987 published its vision of the future under the title *Our Common Future*. On its own, the market is not able to supply global public services in the fields of poverty alleviation, climate or nature conservation. International government coordination is necessary. International treaties on development and the environment are now being agreed faster, and the scientific evidence base continues to improve. More free trade only benefits poverty alleviation and the environment if accompanied by more regulations on social conditions (e.g. child labour), the environment and nature conservation. Without this, free trade will only lead to a further accumulation of wealth by those already best off, and to more environmental pollution and loss of biodiversity and nature. The earth's limits are in sight, and that also imposes limitations on individual freedom of choice. Ensuring more equal access to natural sources and solidarity with future generations are key concepts in this world view. Clean technologies are needed to solve global challenges, but this technical expertise must be shared. Therefore, governments are also partially responsible for developing sustainable technologies.

B2: Caring Region

As in A2, this world view takes a regional approach. The sluggishness of an international approach and the limited possibilities for reaching democratic decisions in international forums lead to the conclusion that people should do what they can and push for more subsidiarity: not everything has to be decided in Brussels or New York. Globalisation and the market lead to alienation and loss of social norms and values. Schumacher wrote *Small Is Beautiful* at the beginning of the Seventies. People like Etzioni and Putnam are putting this case today. Citizens and countries must each take on the responsibilities they can bear, providing aid or setting a green example to the rest of the world, from a sense of duty, out of conviction or for ethical reasons. Money does not buy happiness, but helping others will lead to a good relationship with like-minded people and greater cooperation, sometimes even across national borders. Above all, it commands respect. Support for campaigns and activities shows that young people are increasingly willing to voluntarily contribute to reducing poverty. One should not rely too much on technology to solve everything, because every new invention generates new problems. People should take a critical look at the consequences of their own behaviour.

World views represent value-laden visions of the world. No single world view is true, or untrue. Supporters and opponents of each of these world views can be found within society. World views exist alongside each other, sometimes even inside the head of a single person. Participants in public and political debates exchange arguments from the perspective of different world views, while they may search for a robust decision, a win-win compromise or flanking measures to offset the risks of a certain choice. The real world, therefore, will always include elements of the different world views.

People want a caring society; companies want a global market
Opinion surveys show that directors of small and medium-sized enterprises (SME) in the Netherlands generally prefer a world view with a free market economy (A1: Global Market). This preference is translated into reducing government regulations and a more flexible labour market, accompanied by investments in improving structural conditions, such as education, research and infrastructure (EIM, 2006). However, private citizens prefer a world view with a government that is on their side, but also contributes to the solution of global problems. People want healthcare, disability and pension schemes to be the responsibility of government and not the private sector.

Research has also been conducted in several European countries to find out which world view is preferred by private citizens. In the countries studied, with the exception of Poland, a majority of the population prefers a more sympathetic world in which the government has a relatively large coordinating role (B1 or B2). Poland is the most market oriented (see also Appendix 4).

7.3 Four strategies according to four world views

This Outlook analyses various options for sustainable development. They are given different priorities in the four world views and are also put into practice in different ways. The world views can also give different priorities to the objectives. This Outlook, however, takes the internationally agreed targets for climate, biodiversity, poverty and development as its starting points. This section examines the essential elements in the preferences for the options (Figure 7.2) from the perspective of the four world views and the risks associated with them.

7.3.1 Global Market (A1)

Global Market (A1) assumes that a global free market economy is a condition for efficient solutions to poverty, climate change and loss of biodiversity.

Remove trade barriers as quickly as possible
According to world view A1, free trade is the key means to stimulate economic growth and eradicate poverty. All countries should, therefore, abolish subsidies and trade barriers as quickly as possible because they disrupt the market. This applies to both developing countries and developed nations (World Bank, 2007). In addition, growth in China and India will create more sales opportunities for competitive western companies.

For the least-developed countries, the short-term effects of free trade may be negative, for example higher food prices. Countries that are net importers of food, including most countries in Sub-Saharan Africa, will be particularly affected. However, higher incomes will compensate the effects of high food prices. The prosperity generated by free trade will, in time, also lead to more environmental and labour legislation in countries where such legislation lags behind. Multinationals that invest in developing countries will consider the environmental and social circumstances, partly to avoid obtaining a negative image. Free trade agreements should preferably be multilateral, with the WTO being the most appropriate organisation to supervise the process of reaching agreements.

Globalisation and pricing policies deliver eco-innovation and technology transfer
Global free trade also simplifies the development and spread of technology. According to world view A1, actions on climate change and biodiversity follow when living standards and prosperity rise. Environmental innovation will be high on the worldwide corporate agenda. Companies want to avoid the risk of damaging their image and have to comply with international agreements on carbon pricing and land use in nature conservation areas. According to world view A1, government's role in the

Table 7.1: Preferred futures for the Netherlands by private citizens and SME entrepreneurs.

Future scenarios for the Netherlands	Citizens		SMEs
	2003	2006	2005
Global Market (A1)	6%	8%	37%
Safe Region (A2)	27%	25%	21%
Global Solidarity (B1)	22%	23%	23%
Caring Region (B2)	45%	44%	19%

Source: (Visser *et al.*, 2007; EIM, 2007)

Figure 7.2 Indication of the priorities afforded to measures under the four world views.

	A1	A2	B1	B2
Development cooperation				
Fewer agricultural subsidies				
Innovation policy				
Saving energy				
Climate agreements				
More biofuels				
Nature protection elsewhere				
Less meat and mobility				

Green = top priority, yellow = important, orange = less important, red = unimportant

The priorities are relative scores per world view. All the measures are considered important in world view B1.

development of clean technologies is limited to a facilitating one. For example, it can cover the risks in situations of considerable uncertainty, create protected markets during the start-up phase, as well as providing good education, bringing parties together and ensuring proper protection of intellectual property rights. This creates a good basis for a healthy climate for innovation.

Development cooperation as investment

The A1 world view sees development support as an investment in structural improvements in infrastructure, telecommunications, energy and other networks. Such investments lead to better education and health care and improved access to modern forms of energy, including renewables, allowing more people to be trained and find employment. In turn, a healthy and well-educated professional population is a criterion for participating in world trade. Once linked into the world trade system, economic growth, stimulated by foreign private investment, will make further development cooperation unnecessary.
Development support is, therefore, a financial injection that can mobilise private funding streams. Good governance is a criterion for receiving official development cooperation and people living in countries without good governance are still dependent on charitable organisations. The coordination of official development cooperation is in the hands of the large supranational organisations such as the World Bank and the United Nations Development Programme (UNDP). Governments of richer nations can contribute by covering the risks to multinationals that wish to invest in developing countries.

Global carbon tax as efficient climate measure

According to world view A1, governments can best tackle climate change by pricing the external costs of greenhouse gas emissions. The preferred method is a worldwide carbon tax, which is more efficient, more effective and does not interfere with competition. This type of tax encourages the business community to develop and apply clean and efficient technologies. The revenues generated by a carbon tax are reimbursed to market players via a reduction in corporation tax, income tax or both. In addition, existing subsidies on fossil energy, mostly in developing countries, are abolished. Besides the carbon tax, world view A1 sees emissions trading as another good option for achieving the climate targets because it allows market processes to be used to achieve climate targets.

Maintaining biodiversity by pricing ecosystem services

Under this world view, attention to nature and biodiversity rises as countries prosper: when living standards reach a certain level, concern for nature and the environment will grow, accompanied by the desire to manage collective natural resources better and price them by granting intellectual property rights. If companies need to pay more for wood, fish and other 'nature services' they will be encouraged to become more efficient. Valuable natural areas, in particular, deserve protection that makes exploitation financially unfeasible or legally impossible. In the long term, the business community will have to contribute to biodiversity conservation as it does now to climate measures, for one reason because of the green and socially responsible image. Another reason for protecting nature is its tourism value. Governments and private stakeholders (NGOs, citizens and companies) can buy natural areas and manage them for conservation and tourism. Therefore, nature can provide an extra boost to economic development.

Additional consumption or production standards are inefficient

To change consumer behaviour in the A1 world view it is necessary to price ecosystem services and greenhouse gas emissions in the right way. External costs then become internalised. As compensation, the government could reduce the tax on labour. Behavioural change is not a goal in itself, but could certainly be a result of 'greening the tax system' ('the polluter pays'). It is rather pointless and inefficient to set product standards in addition to a pricing policy; compelled by the pricing policy, the market will

automatically search for the best and cheapest solutions. However, pricing policy is not equally effective for all product groups. Analyses show that a 20% global tax on meat will deliver a biodiversity benefit of less than 1%. Consumers hardly react to such price increases on products they enjoy or consider necessary. The effect of a tax can also be negated by further increases in incomes. For travel by car and air, the effect of 1% additional income growth is greater than that of a 1% increase in tax.

Risks: legitimacy and timely availability of technology
Of course, the potential solutions described above also involve risks. People with another world view will doubt whether citizens have sufficient democratic influence on the decisions taken about our future. Are these decisions not taken mostly in the boardrooms of large companies? Will consumers be given enough information to 'vote with their feet' and boycott (cheap) unsustainable products? Will governments have sufficient power in this global market to charge taxes on the use of carbon and ecosystem services? Will they be able to overcome the temptation to compete among themselves by reducing 'tariffs'? To avoid a 'race to the bottom' more international coordination may be required than this world view allows. Will the required technology be available at the right time, and will technology move in the right direction? Or will new technologies lead to as yet unforeseen sustainability problems? How will the pricing of public goods affect the buying power of those who currently have to make ends meet on the lowest incomes? Will free trade indeed lead to greater prosperity for all, or will those who already have the best prospects benefit the most? Other world views offer several possibilities for offsetting such risks (see section 7.4).

7.3.2 Safe Region (A2)

A safe region is one geared to security of supply (e.g. food, water and energy), adapting to climate change, protecting employment, and keeping refugees and terrorists out – particularly from countries that do not succeed in making economic progress. An important difference between Global Market (A1) and Safe Region (A2) is how people think economic problems should be tackled: by everybody, or alone (or part of a bloc of like-minded countries).

Trading with friendly nations
Where Global Market (A1) opts for complete and multilateral (preferably worldwide) trade liberalisation, Safe Region (A2) prefers collaboration and trade agreements with 'friendly nations' (favoured trading partners). This is already happening and there are a large number of bilateral trade agreements between various trading blocs. Which countries work together is determined, among other things, by safety and security of supply (presence of raw materials). Trade agreements are political instruments that can be used to secure a supply of raw materials. Not everyone benefits from such trade agreements, but that is not necessary. Every country is responsible for itself and countries that have little to offer on the world market will continue to depend on aid. Self-sufficiency is the core principle and justifies maintaining subsidies for agricultural and other products considered essential for the proper functioning of the regional economy. Successful countries and regions (such as the EU) will protect themselves from undesired migration and conflicts that could arise when competition for raw materials intensifies.

Development cooperation focuses on emergency aid and stabilising unsafe regions
Within the A2 world view, development cooperation has a low priority and concentrates on offering emergency aid or stabilising unsafe regions. Where Global Market sees development cooperation as an investment in potential markets, Safe Region sees it as a way of supporting friendly nations. Moreover, aid goes largely to countries with raw materials to guarantee supplies. Tied aid is a common type of agreement that increases mutual dependence and creates opportunities for bilateral cooperation.

Technology to strengthen national position and self-sufficiency
Technological progress is important in world view A2 to guarantee the economic development and independence of the region. Technology transfer is less important, except when there is profit to be made as an export product. Technology is used primarily to strengthen a country's competitive position rather than to solve sustainability problems as in Global Market. In the A2 world view countries also aim to use energy and other raw materials more efficiently, not so much to combat climate change or conserve nature but to improve security of supply. To compel efficiency improvements, government must set standards for products that are allowed on the market, and can use import duties to stop the import of inefficient products. Governments could also influence consumer behaviour by increasing the taxes and duties on inefficient products and services.

Risks: geopolitical tensions and suboptimal solutions
From the viewpoint of other world views, the risk with A2 is that it could lead to geopolitical tensions, for example if major powers compete for fossil fuels and minerals. A common EU defence policy may well then be necessary. Suboptimal solutions may also result if just a limited group of countries work together. For example, because cooperation on climate change and nature conservation is limited to those countries that have good relations with each other, inexpensive options elsewhere in the world are probably ignored and targets are not met. There is also a risk that population growth remains high in regions that are left out.

In turn, this would mean an increased influx of economic refugees to rich countries. Additional adaptation would then be required to strengthen the dikes against the effects of climate change, patrol the borders to keep out refugees and protect the domestic market.

7.3.3 Global Solidarity (B1)

The Global Solidarity world view looks for solutions to development questions, climate change and biodiversity loss mainly through international agreements that aim for a fair distribution of the available resources. This fair distribution could, for instance, be based on an equal use or emission per person, or on the ability to contribute to reductions. The EU has an important task in setting an example.

Trade regulations to prevent a 'race to the bottom'
Free trade under the B1 world view is primarily a way of achieving a better distribution of wealth. According to this world view, subsidies and tariff barriers in the rich countries should be abolished as soon as possible – if necessary unilaterally. The subsidies that also have a negative impact on climate and biodiversity, such as agricultural subsidies, should be the first to go. The least developed countries are given permission to temporarily protect their markets (phased opening), allowing vulnerable economies to become stronger before allowing international competition.

This world view also recognises the drawbacks to free trade, compensating for this by setting social and ecological conditions. Companies are required to report on environmental and working conditions throughout the entire production chain, including activities in countries with less stringent legislation.

Policy must deliver eco-innovation and technology transfer
If world view B1 dominates, clear international goals will be set for climate and biodiversity. Agreements will also be made on maximum permissible emissions, the use of land and the use of the best accessible and available technologies. This will stimulate eco-innovations and ensure their worldwide dissemination. European public-private knowledge networks will be responsible for realising the European technological dream: the EU wants to be market leader in clean and efficient technologies and aims to become the first carbon-neutral continent in the world. This will also be essential if Europe is to become less dependent on energy imports from countries in unstable regions. The European Commission will be given greater powers to formulate European energy policy.

Development cooperation concentrates on broad development
The Global Solidarity world view gives top priority to a more equal socio-economic development of countries. Investing in poverty alleviation and education contributes to a more equal distribution of global prosperity, to structural development and political stability. Development cooperation priorities, therefore, lie in the poorest countries, not in those that are interesting from an economic perspective. The results of development cooperation include better education and stable governance, making these countries more attractive for investment by companies. Better cooperation between the WTO, IMF, World Bank and UNDP would increase the impact of international development cooperation, perhaps in the form of a 'Marshall Plan' for Africa. The business community can also contribute to international development cooperation, particularly through public-private partnerships. Debts owed by developing countries could be cancelled under certain conditions, such as transferring ownership or management of valuable habitats and ecosystems to nature conservation organisations in 'debt for nature' swaps.

Emissions trading as instrument of climate policy
The European Emissions Trading System (ETS) could form the basis for a global emissions trading scheme. The EU is considered to set a good example with this system by showing that climate policy and rising standards of living can go together. The preparatory scientific work underlying climate agreements, such as the work of the Intergovernmental Panel on Climate Change (IPCC), could be expanded to include other aspects of sustainable development. Currently, the greatest challenge is to agree on emission reduction objectives for all nations that have signed the Climate Convention (UNFCCC). The 'per person' approach (equal emission rights per citizen) forms the starting point, but emission rights may be traded to allow the market to find the most efficient approach.

Towards a carbon-neutral energy supply
The drive towards a carbon-neutral economy is increasingly becoming a collective project that binds the EU countries to a common dream. The goal of becoming less dependent on energy imports from unstable countries is part of this dream. Governments mobilise business leaders and citizens to work together on a common vision, using every means at their disposal: energy saving, solar energy from Spain and Italy, biomass from Eastern Europe, hydrogen from hydropower or geothermal energy from Scandinavia and Iceland and CO_2 storage in the North Sea. European public-private knowledge networks provide the means to realise the European dream, supported by European investment programmes funded by the EU from the revenues from the sale of emission rights. The EU combats emissions from households and small businesses

via product standards and a European carbon tax. Subsidies that directly or indirectly encourage carbon emissions will be terminated.

Maintaining biodiversity through international protection
In world view B1 important global ecosystems, such as tropical forests and oceans, must be given global protection. The first requirement is that countries increase their knowledge of and familiarity with biodiversity loss and agree on the most valuable areas that deserve global protection status. This calls for a scientific approach to biodiversity similar to the IPCC. The most valuable natural areas should be protected as soon as possible. Since these areas are largely in developing countries (Congo, Kenya, Indonesia, Brazil), adequate protection can only be given with international support. UN organisations, the international environment movement (IUCN, WWF), or national organisations under strict UN regulations, can take over management of the chosen 'global commons' ('UNESCO list'). In addition, countries can make international agreements on a distribution key for allocating tradable 'ecological rights', such as fishing and logging quotas (comparable with the per-person approach for CO_2 emissions). World view B1 also seeks to raise agricultural productivity in developing countries, as well as effectively restrict the use of ecological capital. Governments of prosperous countries discourage people from eating meat, for example via health campaigns. The EU also sets stringent sustainability criteria for importing biomass from developing countries, which must not be detrimental to protected natural areas. This will probably mean that the amount of biomass available in the EU will be less than the European Commission currently intends.

Behavioural change via product standards
Behavioural change should primarily be effected by setting standards for appliances and vehicles so that consumers can easily change their behaviour, such as light switches that switch off automatically. Governments can also influence consumer behaviour via taxes and subsidies, first of all in the more pioneering countries. They will then be able to convince other countries to participate in global climate and biodiversity policies.

Risks: bureaucracy and wrong choices
The Global Solidarity world view relies primarily on international agreements and institutions. With almost 200 countries around the world, it is extremely difficult to make international agreements. The risk – seen from the perspective of other world views – is that, despite all good intentions, no binding agreements will be made – and the clock is ticking. Would it not be far more efficient to make voluntary agreements with the 25 largest corporations in a sector, or to make bilateral agreements with the countries most relevant for climate and biodiversity? Instead of aspiring to assemble a grand global coalition, should the aim not be for a coalition of the major countries, as was argued inter alia by the Scientific Council for Government Policy (WRR, 2006)? And can all countries be trusted? What about enforcement and sanctions? Would the government not become too involved with technical matters and make wrong choices for certain technologies? Does world view B1 take sufficient account of the fact that China and India are becoming major economic powers and may not automatically be inclined to sell emission rights or fishing quotas to European countries? The focus on climate, biodiversity and poverty alleviation will have a negative impact on economic growth in industrialised nations, but world view B1 considers this a price worth paying.

7.3.4 Caring Region (B2)

Like Global Solidarity (B1), the Caring Region (B2) world view sees the government playing a significant role in enforcing solutions to sustainability problems. However, where Global Solidarity focuses on worldwide multilateral cooperation, Caring Region looks to solutions that governments can implement themselves, in their own region, and via bilateral cooperation agreements. Self-sufficiency and self-reliance are the main priorities. Pioneers should set an example to convince other countries to take responsibility for finding solutions to sustainability problems.

Trade agreements should strengthen regions
The starting point for international trade policy in the B2 world is that development must come from the home region and that government works to this end. Basic supplies and services, such as food, water, energy and cheap public transport, should initially be produced by countries themselves. The government guarantees security of supply. International trade is fine as long as it helps to strengthen regions, so partners to new trade agreements draw up strict rules concerning the environment and working conditions. Subsidies for agriculture and public transport remain in force.

Bilateral development cooperation
The more bilateral, rather than multilateral, leanings in this world view are also reflected in the development policy. Development cooperation does not go through the international organisations, but is arranged in bilateral cooperation agreements and is designed primarily to build up a strong civil society. Cooperation with private organisations is encouraged, with an emphasis on the role of private citizens and businesses in regions that give and receive support.

Using technology to reduce footprint
In world view B2 technological development is mainly geared to reducing the region's own 'footprint' so that it does not 'outsource' environmental pressures to other regions. For climate and biodiversity this means that countries take measures to reduce mobility and the use of land and energy. They encourage small, more efficient cars and seasonal vegetables from the region. Multilateral cooperation with respect to technology is limited. Climate and biodiversity partnerships are created to help developing countries and emerging economies to obtain the technology they need to expand and to reduce their own footprint somewhat, or to protect valuable natural areas. The trade in and possession of illegally logged timber is punishable by law.

Citizens, companies and government initiate shift in behaviour
In essence, the B2 world view is about changing unsustainable behaviour. Of course, legislation, 'clean' technologies and international agreements could be waited on, but that could take some considerable time. Given this situation, many willing citizens, companies and governments are starting to take action themselves. Everyone is welcome. Town councils are making climate agreements with towns in other countries. Governments are encouraging facilities, such as the green credit card for people who want to live in a climate-neutral way. Donations by individuals and the business community allow development projects to be set up for the poorest. The management of nature parks is also given a boost through voluntary initiatives.

Risks: voluntary change lacks momentum
In the eyes of the other world views, the social dilemma – the question of whether everyone will participate voluntarily – presents the greatest risk of failure to B2. In practice, it appears difficult to change consumer behaviour and voluntary change is particularly hard to get off the ground. The fewer people, companies or countries that participate, the less effective this strategy will be, eventually reducing it to no more than a drop in the ocean.

7.4 Searching for robust solutions

Chapters 2, 3 and 4 proposed various options for tackling the problems of poverty, climate change and biodiversity. The previous section interpreted these options from the perspectives of the four world views. Solutions that are preferable under one view need not be supported by people who view the problems from a different perspective. That is why a robust sustainability policy is needed, that can encompass all options by pursuing measures that can be supported by representatives of various political colours – even in the foreseeable future. For one thing, this means that compensation will be required for measures that do not clearly contribute to sustainable development. These would include measures that negatively affect one of the 'dimensions' (poverty reduction, combating climate change and biodiversity conservation) or have negative consequences for the economy. In addition, measures that contain risks (viewed from another perspective) can be made more robust by offsetting these risks by adopting flanking policies. However, this does not prevent governments from having to make controversial choices, because they cannot satisfy everyone's opinion.

This section discusses the possibilities for defining a package of options and measures that generate the most benefits for all the sustainability targets together and can count on broad support from the various world views (Figures 7.3 to 7.6). This package combines options such as efficiency improvements, alternative energy sources, nature conservation, trade liberalisation, development cooperation and behavioural changes, including measures to minimise the negative consequences and risks of these options. The following strategies are not meant to be the 'last word', but simply aim to show that it is possible, through an interchange of normative views, to find new solutions that command broad support.

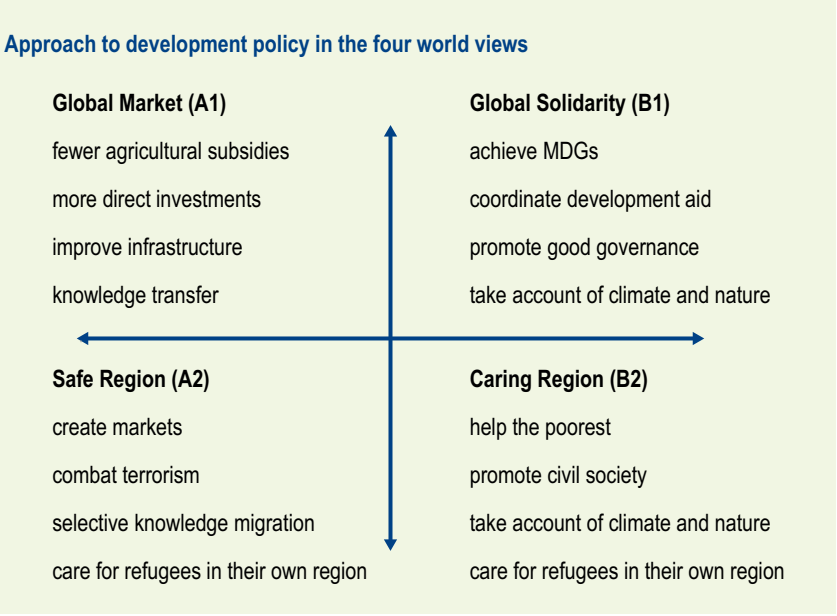
7.4.1 Development policy

Justice and self-interest
Additional funding for global development cooperation is required if the Millennium Development Goals are to be achieved. If all donor nations contributed 0.5% of their GDP up to 2015, estimates show that there would be sufficient funds available to achieve these goals (Sachs, 2005). The Netherlands has already set a good example here. Coordination with other large donor countries could help to improve effectiveness and limit overlap between development activities.

The next step could be to call for stronger European coordination of existing development cooperation and, in the long term, an increase in the EU's development cooperation (ODA) budget. This will be needed to permit the most efficient and productive development policy to be pursued (see Chapter 2), in which the interests of the local population and local governance have top priority. The argument here is not motivated just by a sense of justice, but also enlightened self-interest, such as avoiding an enormous influx of refugees from poor countries.

Development cooperation can also serve to lever in further investment by the business community. However, it is essential to promote good governance. The poorest people in countries without good governance will continue to need support from aid organisations: structural assistance then

Figure 7.3 Each world view places a different emphasis on development policy.



gives way to project funding and microcredits. In advance of official aid programmes, the EU can – via cofinancing with ODA resources – use this informal support to selected groups to stimulate the development of a civil society from the bottom up.

Development cooperation in light of climate and nature policy

If all goes well, development cooperation will lead to increased incomes and set the process of industrialisation in motion. However, this also has negative consequences, including increased traffic, higher meat consumption, greater demand for fuel and rising CO_2 emissions, and nature will come under even greater pressure. To prevent poverty reduction standing in the way of resolving the climate and biodiversity problems, it is important to include the ecological dimension in the strategy right from the start. This might mean attaching conditions to aid, such as the transfer of clean and efficient technologies and the management of valuable natural areas. In the end, the growth in living standards in third world countries can be tied more closely to a sustainable development strategy, when there is clarity about the third world's share of future permissible global greenhouse gas emissions and the boundaries of protected natural areas in the third world (such as tropical rain forests). The latter are very important for global biodiversity and are, therefore, part of the world's heritage.

Energy supply in developing countries

Cheap energy is an important condition for increasing the standard of living in developing countries. Too much emphasis is placed on wood and other biomass, for example in Africa and South Asia, which can be detrimental to nature, while turning to inexpensive coal would lead to a significant increase in CO_2 emissions. Therefore, it is also in the interests of industrialised nations to ensure that developing countries have access to efficient and clean forms of energy. So there is sufficient reason for rich countries to contribute to the development of clean and accessible energy sources in poor countries, for example through development cooperation projects or projects under the Clean Development Mechanism (CDM). In addition, corporate social responsibility (CSR) offers opportunities for the business community to create a large market and set an encouraging example. There are opportunities for CO_2 storage and for innovative products that use solar energy (LEDs), for example, or small-scale electricity generation and efficient cookers. However, the increasing demand for energy for transport and space cooling poses a complex challenge. It is also important to develop a long-term vision for energy supply in Africa and South Asia, striking a balance between the need for land to produce food and the need for land for nature conservation and biomass (energy). If conserving tropical forests is given top priority, it is doubtful whether developing countries will be able to supply sufficient biomass to meet European targets for the use of biofuels by 2020.

7.4.2 Trade liberalisation for development in poor countries

Sustainable free trade

Free trade leads to more economic growth. Liberalisation of the trade in agricultural products in particular could, in the longer term, lead to economic growth in developing countries, enabling more people to benefit from rising living standards. As a rule, economic growth also leads to higher CO_2 emissions and an expansion in land use. Various options for dealing with this are conceivable. In any case, it makes sense to include the additional economic

growth generated by free trade when determining the climate and nature conservation measures that need to be taken. Extra growth also delivers additional income that governments can use to finance climate and nature conservation measures. In principle, the multilateral WTO framework also contains provisions for agreeing trade standards that set minimum required standards in areas like child labour, energy efficiency, forestry and food safety. This would be a good example of coupling the 'three Ps' on a global scale.

Gradual liberalisation and flanking policy
The process of multilateral trade liberalisation can be undertaken through WTO negotiations and regional free trade agreements. It is particularly important to reduce the high barriers between developing countries, although proceeding too quickly entails economic risks for developing countries and so it is advisable to agree on a timetable within which countries are given sufficient time to develop their own industries. Several obstacles to trade liberalisation remain, such as the feared impacts on employment from free trade and increased dependency on imports. Undoubtedly, some jobs will move to countries such as China and India and low productivity farms in rich countries will have to close down. It would be wise, therefore, to adopt temporary flanking measures to offset sectoral employment effects. These could include retraining schemes and offer farmers alternative sources of income, which can draw on financing for activities that support EU goals for local nature and landscape management.

Acknowledge the risks to security of supply
In principle, free trade leads to greater security of supply at the lowest costs. However, there is a real risk that putting too much trust in free trade will endanger the security of supply for food and energy. Monopolists could demand excessive prices for basic commodities or boycott customers for political reasons. Therefore, a case can be made for excluding certain basic commodities from free trade agreements. Risks to the security of supply (of basic commodities) still need to be recognised, but they can be offset by making 'what if' provisions for what to do should supplies be disrupted. This type of agreement already exists, for example for water supplies during periods of extreme drought. In addition to these adaptation strategies, countries could also raise the issue of access to basic commodities at the WTO. The WTO could possibly play a role in preventing the exclusion of certain stakeholders from the market, for example by resisting the formation of cartels and monopolies. In crisis situations this task would presumably be taken over by the UN Security Council.

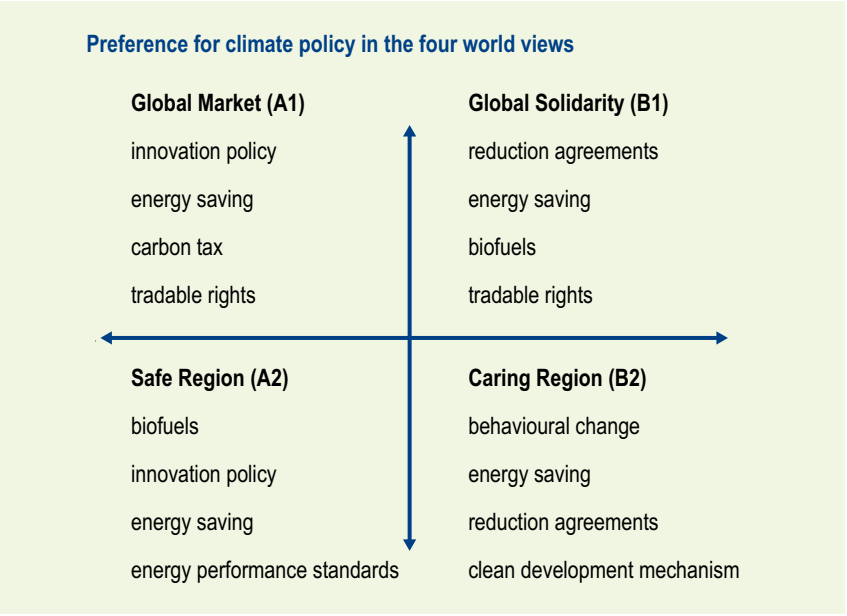
7.4.3 Improved efficiency and low-CO_2 energy

Higher efficiencies and technological solutions desirable, but how and to what extent?
All world views make improving efficiency and encouraging new technologies important components in solving the climate problem and reducing pressures on land. This includes energy saving technologies and technologies that increase agricultural productivity. The differences arise when choosing *how* this stimulus should be given and how strong the incentive should be. On the one hand, there is the fear that the market will not receive sufficient signals to allow it to adopt the most efficient technologies early enough. Poor uptake of house insulation and energy-saving light bulbs are just two examples. On the other hand, there is the fear that government will create inefficiency by exerting too much control via detailed regulations, or that it will make the 'wrong' choices.

The four world views highlight various policy options that command broad support and are indeed reflected in the current policies of both the Netherlands and the EU. For example, there is broad support for emissions trading to encourage further emissions reductions. But this support also extends to the funding of Research and Development (R&D) on new technologies and setting standards for appliances that are not price sensitive. The following section briefly describes these two approaches, then examines where the similarities end and where their broader application would require social and political choices.

Emissions trading
The use of an emissions trading scheme for climate policy enjoys broad support, but for very different reasons. Some support emissions trading because it presents an entry point to setting a firm ceiling on CO_2 emissions. Others feel it is a useful tool because emissions trading encourages efficiency through the operation of the market. It also offers good opportunities for expansion: there is always room for more countries and more sectors. Nevertheless, emissions trading can cause tensions. A major stumbling block is determining the level of the ceilings: are they worth the economic disadvantages, and will they not lead to too wide disparities with countries that do not pursue a climate policy? The initial distribution of emission rights is another issue that leads to discussion: should this be on the basis of efficiency (in which countries such as Poland and China would be allocated fewer rights because reduction is cheaper there) or on the basis of equality (in which populous countries receive more rights, but sell them on; this creates a flow of money that contributes to reducing income differences). These tensions imply that further expansion of emissions trading, despite all the support, will

Figure 7.4 Each world view has a different interpretation of climate policy.



require political decisions. Support for the concept of 'emissions trading' on its own is simply not enough.

Government R&D funding for new technologies

The government may, and must, support long-term investments in R&D because crucial clean and efficient technologies will not be profitable for some considerable time. Examples include fuel cell cars, nuclear fusion and second generation biofuels. This appears to be a 'no regret' approach. Public funds may be invested in sustainable energy, climate and agricultural technology at national, European and global levels. However, there are differences in opinion when it comes to cross-border collaboration, the role of the government and the corporate sector, intellectual property rights and transparency. Opinions also differ widely about the effectiveness of the large-scale R&D investments being made towards achieving the climate targets.

Public-private partnerships offer a possible compromise with respect to technologies, and – preferably – cross-border partnerships. Such an approach could ensure that the public and private sectors work jointly for a low-carbon society and limit the expansion of agricultural land for food production. The government's role can be limited to three main tasks: covering the risks of certain R&D investments, encouraging experimentation and creating markets by quickly setting environmental standards to match proven clean and efficient technologies. It is also important for the Netherlands (and Europe) to focus innovation on those areas where it already has strong technological expertise and where the existing infrastructure is suitable for further development of the technology. The Dutch contribution to global sustainable development could, therefore, be built around water and agricultural technologies, energy technology or carbon capture and storage.

Good education and investment in R&D are also very important for sustainable development. Those who pay for the research become the owners of this knowledge. But governments could also invest in R&D if it is in the interest of the world to make knowledge on, for example, clean technology internationally available. The transfer of knowledge to developing countries needs not take place solely in the form of direct training and knowledge transfer, but could also be achieved by investing in foreign subsidiaries or joint ventures. The Clean Development Mechanism (CDM) can also contribute to the transfer of technological knowledge, provided that not mainly 'old' technologies are being used. International cooperation in research will probably lead to knowledge becoming available much faster than before. The B1 world view, in particular, urges that the knowledge needed for all kinds of basic commodities and services (food, water, energy, medicines) should be released as quickly as possible and the development of these technologies should be financed by (international) governments. However, the A2 world view focuses more on the individual country's 'own knowledge' position and preferred trading partners. Expansion of R&D with wider support is expected to be achieved by making more international agreements with countries that have similar interests (comparable to the Asia-Pacific Pact between the United States, Japan, India, China, Australia and several smaller countries in South-East Asia). Finally, in line with several worldviews, European or international standards can be set for the use of proven clean and efficient technology in appliances.

Increasing the percentage of low-CO_2 energy options in the Netherlands and the EU

A strategy to increase the percentage of low-CO2 energy generation has three main target groups: low-volume users, high-volume users and producers of electricity and heat. Low-volume users in the Netherlands currently pay an energy/CO_2 tax. High-volume users and producers fall under the European emissions trading system which, in future, will permit emission rights to be auctioned. In the long term, a CO_2 tax could be introduced for all users across Europe.

Price incentives are an important driver for improving efficiency. In this respect, the current high fuel prices provide a good stimulus to save energy. Opinions differ as to whether the price is high enough and stable enough. A possible 'no regret' approach could be to sustain the efficiency improvements made during a period of high prices by subsequently setting equivalent energy standards, just in case energy prices fall again. An alternative is to keep the price incentives in place even if fuel prices fall, for example by levying a CO_2 tax on fuel.

The Dutch Government can increase the CO_2 tax on low-volume users, which are not covered by international agreements. However, the effect increases if other countries follow this example and measures are coordinated internationally. Additional measures could include a more strict allocation of emission rights to companies that participate in the European CO_2 emissions trading system. This is also a way to elicit clean and efficient technologies.

The wider the trading system, the more effective it will be. The distribution of the costs depends on how the rights are distributed. Emission rights can be auctioned and the government can use the revenue either to compensate the public by reducing taxes or to invest in low-CO_2 energy generation. By reducing taxes, one should take into account not only the effects on income distribution but also on the environmental effectiveness of the system.

Europe should be a stable engine for efficiency and technology

A short time ago the EU and the individual Member States presented a clear long-term vision for European energy supply in the light of climate change and security of supply. Some countries had already announced ambitious climate goals. For example, the UK plans to reduce CO_2 emissions by 60% before 2050, Germany aims to achieve a 40% reduction in 2030 (without carbon storage, joint implementation and CDM) and Norway plans to become the first climate-neutral country in the world. It would be good if the EU developed similar ambitions. They could provide direction for research and investment, and become a collective project to help bridge the cultural and political differences in Europe. As the Netherlands has considerable experience in achieving a consensus between government and civil society organisations, it could play a leading role in realising this European dream and establishing the necessary knowledge networks and investment programmes. Important questions that remain include the distribution of rights between the various parties, the role of nuclear energy and carbon storage, the use of biomass and the right to reduce emissions outside Europe. This last point would be required to compensate for less ambitious efforts within the EU.

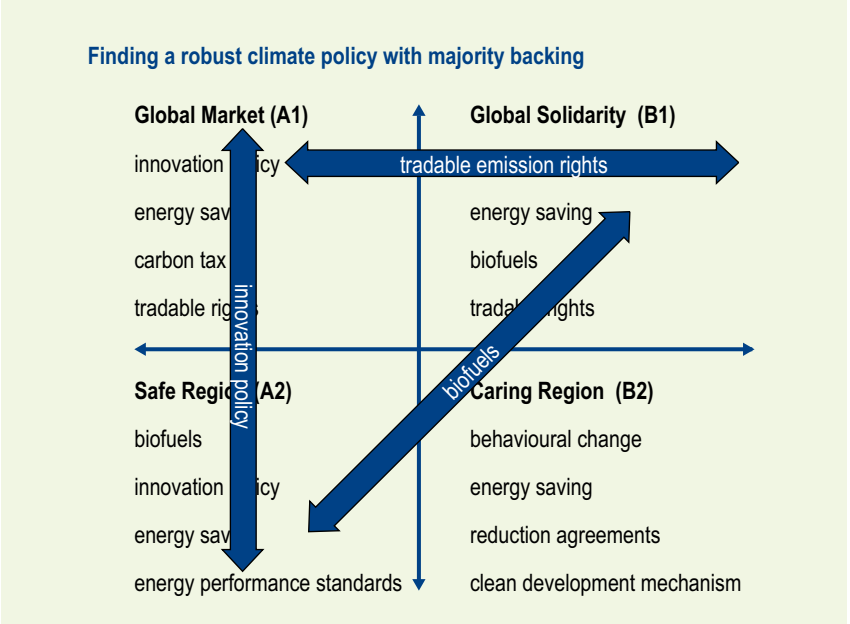


Figure 7.5 Support for a robust climate policy.

7.4.4 Nature conservation in developing countries

Another method of implementing robust sustainability policy is to protect nature elsewhere. When protecting nature in developing countries the first thing that needs to be established is who owns the land, because the owner can decide to prohibit economic activities in the area or limit them via price mechanisms. To prevent undesirable exploitation of nature the negative external effects of such uses must be adequately expressed in the price. However, there is not always an owner to set a price or close off an area entirely. Determining legal ownership is, therefore, the first essential step towards sustainability, but is probably not sufficient because owners may always be tempted to sell the land for conversion into a sugar or palm oil plantation, which will bring in more revenue. Anyone wishing to protect valuable nature areas will, therefore, have to pay for this privilege. This principle is supported by all four world views. The protectors will generally come from rich industrialised nations, because developing countries have other priorities. The financing could be from voluntary donations to NGOs (e.g. World Wildlife Fund) by individuals and companies, or from tourism in nature parks (e.g. South Africa's Kruger National Park). However, more is needed for a comprehensive strategy of serious measures to prevent the loss of valuable natural areas. For example, ownership and management of such global heritage could be brought under the responsibility of UNESCO, which would compensate countries for conserving biodiversity, either in the form of debt cancellation (debt for nature swaps), or from ODA resources or via CDM-like schemes. In all cases it is important that ecosystem management also generates employment and income for the local population.

7.4.5 Changing people's behaviour

Opinions vary widely on the desirability and opportunities for changing people's behaviour. Publicity campaigns, labelling products and making people more aware of their ecological 'footprint' is acceptable, but when the government decides how many kilometres you can drive, how high you can turn up your heating, how heavy your car may be, or how much meat you should eat and how many children you should have, it soon smacks of the 'nanny state'. It would appear to be very difficult to set standards for consumer behaviour, for example via road pricing or meat quotas. If the aim is voluntary behavioural change, the ties with health may provide some leverage: environmentally friendly behaviour, for example, often has a positive effect on health (more exercise, less meat). People could be made much more aware of their own behaviour, for example by making the cost of using energy in the home and the car more visible (e.g. install meters in the living room, rather than in the cellar cupboard).

People's behaviour can also be influenced indirectly. In fact, local authorities already influence motorists' behaviour through parking policy, public transport or restricting road capacity. Price incentives, such as carbon tax or road pricing, are acceptable, but obtaining a reasonable effect in prosperous countries like the Netherlands requires high price incentives. The political debate focuses primarily on the effects of these measures on the less well off and how the revenues should be recycled into the system. Depending on the technical implementation options, (compulsory) offsetting of carbon emissions, for example via credit cards, could be an option.

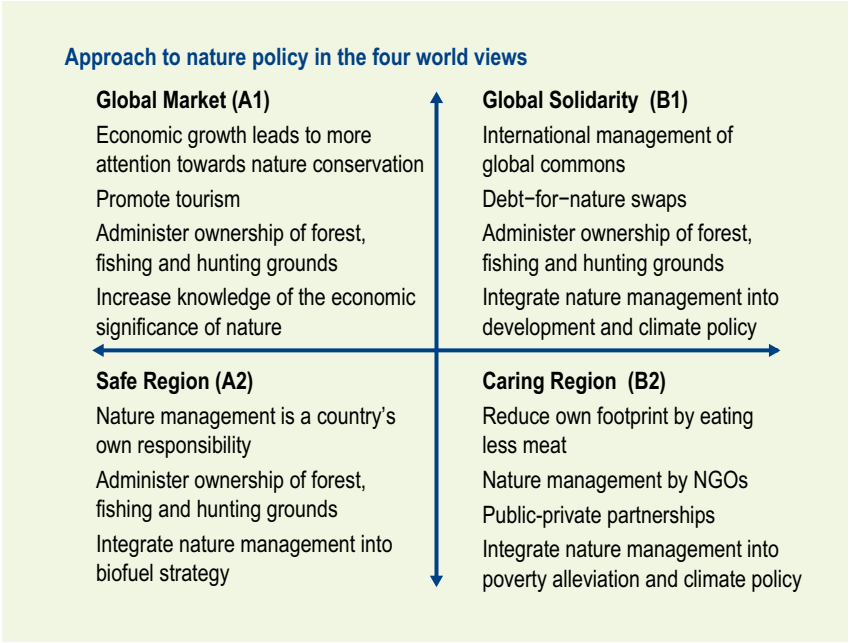


Figure 7.6 Each world view places a different emphasis on nature policy.

Another form of indirect steering is to make products more sustainable during the production chain. The advantage is that the public do not have to change their behaviour much, which has proven to be difficult in practice. More sustainable products could be achieved either through technical measures or standards, which hardly affect consumer choice. Only those products with the least acceptable socio-economic and ecological impacts would be removed from the product range. Or, for example, emission criteria could be defined for all cars in the EU.

However, there is one important precondition for voluntary behavioural change and acceptance of government measures (regulations and higher taxes): people must be fully aware of the urgency of the sustainability problem. Government must be convincing and supported by professional communication experts. It must not just cajole and threaten disaster, but know how to persuade.

7.4.6 Possible basic principles for sustainable policy

In addition to the policy strategies described above, a few fundamental choices have to be made that concern the distribution of responsibilities between countries.

The existing targets for poverty, climate and biodiversity will not be achieved without additional policy measures. There are several conceivable solutions, but all require considerable long-term global policy efforts. Sustainable development cannot be encompassed by a single term of government, but is a global 'project' for decades to come in which all countries, companies and citizens actively participate. For the Netherlands and Europe there is also the important question of the contribution that industrialised nations will have to make. Starting with the ecological targets (limit temperature rise to 2 °C; reduce the rate of biodiversity loss) and the targets for poverty reduction, it is possible to calculate, for several prognoses for technology and distribution, how much (Western) countries are expected to contribute in terms of CO_2 emissions reductions, reducing land take and development cooperation. No clear benchmark for this can be given, because opinions differ on the extent to which industrialised nations should share responsibility, which instruments offer the best possibilities for resolving these global problems, and what can still be offered by technology. For example, emission rights could be allocated according to any one of four different criteria:

1. global cost-effectiveness of emission reduction;
2. historically acquired rights;
3. equal distribution per person;
4. contribution according to abilities.

These normative assumptions each lead to a different allocation of future emission rights between the rich and poor countries, and emissions trading will, therefore, lead to different flows of money. For example, options 1 and 2 will result in the Netherlands being allocated more rights per person than the Baltic States. Under options 3 and 4 the Netherlands would need to purchase more rights, creating a flow of funds towards eastern EU countries, which assists coherence within the EU.

The starting points and world views of different countries and other stakeholders may conflict with each other. So what makes a strategy robust? Below, a number of 'rules of thumb' are given that can help to bridge the gap between world views. In all world views vigorous steps will need to be taken to achieve the targets for climate, biodiversity and poverty; even with a maximum level of preventive action, adaptation to climate change will already be required. As argued in the part of this Second Sustainability Outlook, which examines the physical living and working environment in the Netherlands (MNP, 2007), the country must take the prospect of increasing water management problems very seriously.

Trade-off between equity and efficiency

Governments can make social decisions based on various allocation mechanisms. Two extremes are a mechanism that is based purely on equal rights (solidarity) and one that is based entirely on economic efficiency. Okun (1975) argues that both solidarity and efficiency are important, and that neither allocation mechanism should be given absolute priority: in practice it comes down to striking a sensible and acceptable balance.

However, there is no adequate international income-distribution policy which weighs up these considerations. It appears to be difficult enough to persuade all industrialised nations to commit to the principle of spending 0.7% of GDP on development cooperation. Moreover, the social or ecological risks associated with some measures, designed to encourage market forces, are extremely difficult to estimate beforehand. For example, the liberalisation of the energy market paid little or no consideration to the possible expansion in the combustion of coal which has now arisen. This shows that it is better to discuss social or ecological conditions at the beginning of the privatisation or liberalisation process.

Vigorous international action needed, possible guiding role for the EU

Global problems, such as poverty, climate and biodiversity can always be more effectively tackled if all countries, companies and citizens work together, than if only some take action on a more or less voluntary basis. However, a global approach takes considerable time with the negotia-

tion and implementation of international treaties. More rapid progress can be made if willing countries or regions start straight away. Even if such a coalition of willing nations is small, it can still set an example (demonstration role). The European Union could fulfil such a role as the European economy is strong enough and large enough to permit independent choices. Such a pioneering role is both necessary and useful, but is not sufficient for sustainability. The coalition would quickly need to be expanded into a group that is capable of making substantial progress towards resolving the problems. However, it is important to realise that not all the objectives of the original coalition (such as the EU's 2 °C temperature target) may remain tenable within a broader coalition. International treaties will eventually be needed to ensure that the other countries ('free riders') are committed to act.

Long-term view promotes cohesion

Crucial to sustainability policy is an unwavering focus on long-term objectives, such as managing the climate, conserving biodiversity and reducing poverty. These objectives must always be viewed in relation to individual short-term economic interests. The challenge is to strike an optimum balance between economic interests here and now, improving global income distribution in the medium term, and reducing worldwide ecological risks in the coming century.

Policy that benefits economic, social and ecological objectives is most sustainable, but this is not always possible. Policy can be viewed as 'sustainable' when it causes no unnecessary negative effects on other objectives, and takes account of these effects. It is then possible to determine what can and cannot be considered sustainable, and a case can be made why flanking measures that can compensate for negative effects are taken or not taken.

The above implies a national economic policy that includes the consequences of achieving the 2 °C temperature target and the targets for nature conservation and poverty reduction. In turn, this supposes a development policy that also contributes to climate and biodiversity policies. Lastly, it requires a climate policy that has minimal detrimental effects on nature, developing countries, and on the individual economy or health. Sustainable solutions can only be found if the climate, nature, poverty and national economic issues are looked at as a whole. Governments must sometimes decide on a trade-off between these problems, or find ways of avoiding the undesirable risks of passing on costs attached to partial solutions.

7.5 The Netherlands and the world

Sustainable development is a project for the next 100 years and for the world as a whole, and Dutch sustainability policy for the next term of government should be viewed in this light. In the short term, the government can make concrete decisions, for example, to increase the ecotax for low-volume energy consumers, intensify public information campaigns, incorporate climate and nature policies into development cooperation and harmonise efforts with that of other donor countries. The climate, nature and poverty reduction goals can also be integrated into the innovation policy. But most sustainability issues require a broader approach at the European or global scale. The Netherlands can play an initiating role by pursuing an international policy strategy that is based on a long-term vision (Figure 7.7). This is extremely important because for the Netherlands, a densely populated low-lying country with an open economy, the stakes are high.

Over the next few decades additional global or European agreements will be required on climate change, biodiversity loss and poverty reduction. Which institutions can make the future a collective responsibility? The basis can be laid within the EU, but how can the involvement be ensured of the major players like the United States, China, India, Russia and the OPEC countries (for climate policy), and Brazil, Indonesia and Congo (for biodiversity policy)? Should the WTO or the UN Security Council play a role here (that is, incorporate sustainability concerns) or are new, separate institutions needed? What can the Netherlands or the EU do as long as there are no international agreements, but with ongoing geopolitical tensions and trends in poverty, climate and nature continuing to move in the wrong direction?

Europe is now facing the new and considerable challenge of formulating climate policy, coupled with a European innovation and investment agenda, while the security of energy supply is becoming increasingly vulnerable. The Netherlands can play a role in harmonising the EU objectives for energy security, prosperity and peace. The EU has made great advances in finding and defining collective economic interests that transcend the individual interests of Member States. Building on this experience, the EU can seek to establish global common interests to provide a basis for a climate strategy and policy, development cooperation and biodiversity conservation.

Decision-making on the European emissions trading system is an important test case. How much will income distribution aspects influence the allocation of emission rights? Or will cost-effectiveness be the only criterion, with the social pillar missing out altogether? The Netherlands can play a pioneering role in this process of balancing

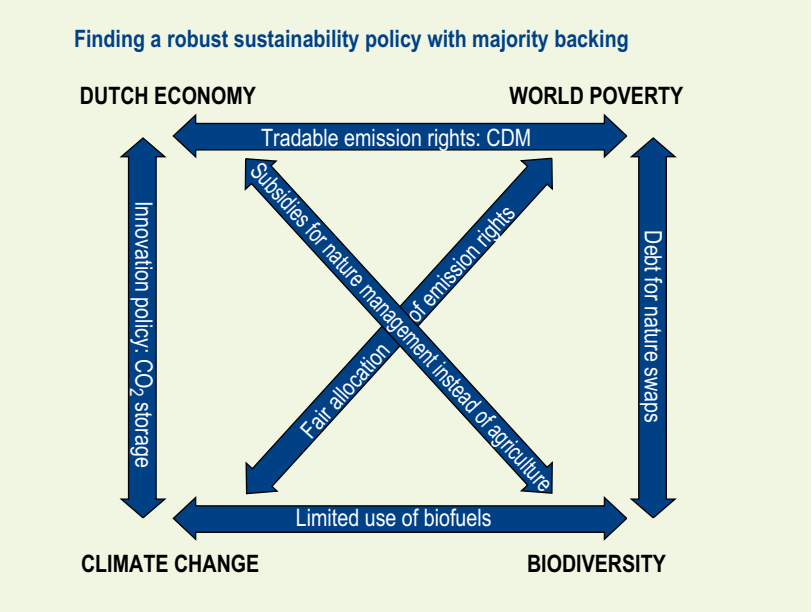


Figure 7.7 Finding sustainable development that is good for the economy, poverty reduction, risk avoidance, climate change and biodiversity conservation.

efficiency and equity, both in the EU and the UN, in line with the Dutch Government's stated aim in the Coalition Agreement to make an active contribution on the European and world stage.

Can the Netherlands succeed in getting the EU to create a market for efficient and clean products by setting more stringent product and emissions standards? There are also opportunities for the Netherlands to exploit Dutch expertise in water and agricultural technologies, energy saving and CO_2 capture and storage. On the other hand, investments in carbon storage in the Netherlands require a stable (higher) CO_2 price and are thus dependent on EU policy.

Sustainable development at the global level presents a collective challenge: improved standards of living and poverty reduction must go together, while climate change must be tackled and the rate of biodiversity loss reduced. Defined this way, global sustainable development requires a package of the interrelated measures:

- targeted development cooperation;
- trade agreements;
- technological developments in agricultural and energy policy;
- targeted nature conservation (in developing countries);
- behavioural change.

Within the EU, the Netherlands can argue for better coordination of development cooperation between the Member States and harmonisation of development cooperation with climate and nature policy. Africa, in particular, presents huge challenges in stimulating economic development using inexpensive, low-carbon energy while conserving nature. Together with the African nations, Europe could take the initiative and develop a comprehensive 'Marshall Plan for Africa'.

Removing trade barriers for agricultural products

WTO agreements that benefit developing countries require a revision of the European agricultural subsidy scheme. The current subsidies damage the interests of developing countries and do not contribute to environmental and nature conservation. Income support could best be coupled to nature management work or carbon storage. The Netherlands could push for changes to the subsidy system in the short term. Agricultural subsidies are currently the largest item in the EU budget. If this support were scaled down, national contributions to the EU could be reduced. Abolishing these subsidies altogether could have a beneficial long-term effect for both rich and poor countries. The short-term consequences would not be beneficial for large food importers and for developing countries with preferential access to the EU market. It would be necessary to prevent the formation of cartels and ensure that increased competition does not lead to damage to valuable habitats and ecosystems on highly productive land or to local food supplies in the poorest areas. Therefore, as free trade expands, better protection will be needed for valuable nature conservation areas and for those areas where the purchasing power is too low to compete with the demand from richer areas of the world.

Post Kyoto: acceptable allocation of emissions, coordination of policies and compensation of losers

Pursuing a serious climate policy will depend heavily on cooperating with other, large countries such as the United States, China and India. Such cooperation will be crucial because of the scale of the emissions reductions required and because the cheaper reduction options lie primarily in

these countries. Emissions can be reduced anywhere and still produce the same end result for the climate. However, the necessary cooperation is difficult to mobilise because unwilling parties still benefit from the policies of others, a classic example of the 'prisoner's dilemma'. It is not easy to press independent states into action and cooperation will only really get off the ground if everyone is convinced that collective international action will achieve far more than individual national campaigns, or sitting back and doing nothing. As the risks of climate change become clearer and more serious, countries will be more willing to cooperate. It is also important that the costs of climate policy are allocated in a way that is acceptable to everyone, on the basis of equal rights per person, historical emission levels or ability to pay. Another possibility is to tempt countries with compensatory measures, as was the case when Russia joined the WTO in exchange for ratification of the Kyoto Protocol. In addition, the development agenda needs to be made more climate friendly. The position of energy exporters requires special attention, because in the end an effective climate policy will depress the demand for oil and gas, reducing the revenues of oil and gas producing countries. Climate policy can only be successful if the economies in these countries are restructured. Europe should start on this now, for example by issuing (limited, but long-term) sales guarantees and supplying technologies for large solar energy projects.

Discourage coal-fired power plants without CO_2 storage
Coal will be a crucial component of future energy supply. Sufficient global stocks remain that are relatively inexpensive to mine and are distributed over a wide geographical area. Security of supply and cost considerations indicate that the demand for coal will increase, certainly in countries such as China. However, climate policy requires that coal accounts for a smaller proportion of the worlds energy needs in future. Coal is the dirtiest fossil fuel, but CO_2 emissions can be reduced by capturing and storing CO_2. Under an effective emissions trading system the market should choose clean technologies, but the European emissions trading system does not yet provide a credible long-term incentive. New coal-fired power plants are currently being built and will be operational for a long time to come. It is, therefore, sensible for the government to steer energy supply plans in a more climate-friendly direction. The knowledge gained could later be applied in countries such as China. A problem with this, though, is that government intervention is difficult in a liberalised European energy market. Limited shifts in the energy supply mix can be effected via taxes (on carbon) or subsidies (on technology development), but compulsory CO_2 capture and storage for new coal-fired power plants would require amendments to the Electricity Act.

Cautious use of first generation biofuels
Another topical debate concerns the possible use of biofuels to improve the security of energy supply and to contribute to the climate target. Under a stringent climate policy, biofuels would appear to be an important part of the energy mix in the long term. However, in the short term, an over-ambitious biofuel target could result in unnecessary biodiversity loss, rising subsidy payments and increasing pressure on agricultural markets (in turn resulting in higher food prices). Achieving the EU target of generating 20% of its energy needs in 2020 from renewables in a cost-effective manner, requires the large-scale use of biofuels. However, in the longer term (after 2020) it will probably be possible to use second generation biofuels. In the interests of sustainable development, these second generation biofuels will need to meet stringent criteria: they must not be cultivated on productive agricultural land or in nature areas and without the use of additional irrigation water or fertiliser. However, it is doubtful whether this is technically and financially feasible, and whether such conditions could be enforced. Further research is required. Policy expectations regarding the contribution that biofuels can make to the climate objectives should be tempered, certainly with respect to the short-term targets for 2020.

Prevent biodiversity from losing out
A sustainable solution to the growing demand for food, wood and biomass requires a global vision of nature that needs to be protected. For example, how much more loss of tropical rain forest can the world permit? The Netherlands can actively help to strengthen international scientific networks, such as in a follow-up to the *Millennium Ecosystem Assessment*, or via an intergovernmental organisation along the lines of the IPCC. The objective here is to expand the awareness of the role that forests, plants and animal species play in the global water and carbon cycles, and to make proposals for the *hotspots* of biodiversity that deserve to be granted global protection status. In preparation of a possible 'disaster prevention plan' for biodiversity, the Dutch Government, the business community and NGOs could now start looking at the opportunities to pay for the acquisition and management of valuable nature areas.

Sustainable production and consumption
The EU states that more sustainable production and consumption patterns will lead to more efficient use of resources, reducing costs and impacts on the environment and society (EU, 2006). This policy area is currently being developed in both the Netherlands and the European Union. People first need to understand that there is a sustainability problem before they will be prepared to voluntarily change their behaviour or pay for the necessary measures. There is already some awareness of climate change and poverty in the world, but little awareness of the connection between

biodiversity loss (e.g. via deforestation and over-fishing) and their own behaviour.

In the short term, it is not feasible to impose standards directly on consumer behaviour, for example in the form of kilometre quotas for motor vehicles or meat rationing. In a free market, pricing meat or fuel will have little effect at realistic levels because these commodities take up a small share of total household incomes. Subsidies and taxes are more logical options for bringing about sustainable behaviour and can help people to adjust their consumption patterns to more sustainable levels. However, people prefer the government to ensure that companies make their products as sustainable as possible and to adopts policies to make production chains more sustainable because they would not then have to change their consumption patterns much. Technical measures that encourage more sustainable behaviour (e.g. electricity switches with timers) are much preferred. Environmental and product standards remain a good alternative for those situations where the citizens' freedom of choice is not affected or only slightly restricted, or where considerable benefits can be obtained for society.

Essentially, sustainable development requires cooperation between government, the business community and civil society. The desire and the opportunity to do something positive are present among both private citizens and the corporate sector. Businesses say they are prepared to conduct innovative research into sustainable products and production processes, provided that the government ensures a level playing field. The government must also encourage innovation and cooperation throughout the production chain. Manufacturers want the government to provide clarification on sustainability targets, how these targets should be translated into specific products in the long term, and the way in which the government intends to achieve these targets. This means that products will need to be tested for sustainability (People, Planet, Profit), also when allocating subsidies. The government can show leadership by using regulations or financial incentives to create markets and by operating a sustainable procurement policy for government departments. Companies could also be required to report on the environmental and labour conditions throughout the entire production chain, including activities in countries with less stringent legislation.

Assess the sustainability aspects of new policies

Finally, the Netherlands can subject all new policies and plans to a simple sustainability appraisal. Sustainability policy implies that such plans should not have any unnecessary or unnoticed negative impacts on climate change, biodiversity, and the gap between rich and poor or domestic prosperity. Traditional social cost-benefit analyses only look at this last element, but this only concerns the relatively short-term self-interest. In his book *Collapse* (2004) Jared Diamond blames the collapse of several cultures in the past on a series of separate decisions based on considerations that did not look far enough into the future. Sustainability policy requires national interests to be placed in the broader context of the common interests of the whole world in the longer term. How can negative effects be compensated by flanking measures? These are the issues that must be raised when governments take decisions, but individuals and businesses can also ask themselves these questions when making their own decisions.

Appendix 1. Conceptual framework for quality of life and sustainable development

A conceptual framework is required in order to analyse the problems of sustainable development. Sustainability aspects concern the question of how to shape the quality of (human) life in a continual and equitable manner. Quality of life can be viewed at three levels (Robeyns and van der Veen, 2007). The middle level concentrates on the *c*apability concept. The quality of life is determined by the capabilities of people to organise their lives in various domains. These domains are, for example, health, food, shelter, mobility, security, freedom of speech, determining what constitutes a good of life, connecting to people and animal species, relaxation, political participation, development/education, (intellectual) property rights, and the right to work. If people have the opportunities to arrange and achieve the 'good life', this can lead to experiences of contentment or happiness. Subjectively, this is known as well-being: the highest level in the analysis of the quality of life. At its lowest level, the quality of life is seen as the availability of natural, human-social and economic resources. Figure A1.1 shows the relationship between resources, capabilities and subjective well-being.

In the choice for focusinf on quality of life, humans take a central position in the analysis, thus understanding 'sustainable development' in an anthropocentrical way. The sustainable development of the quality of life can be seen as a criterion for the use of resources (Robeyns and van der Veen, 2007). The quality of life that is formulated *here* and *now*, must be continual, given the available natural, human-social and economic resources, and may not be detrimental to the acceptable quality of life *elsewhere* and *later*.

Resources are the necessary input for functionings (realising capabilities). Insight into these resources and the availability for countries/individuals can be obtained by focusing on ecological, human-social and economic capital, i.e. planet, people and profit respectively. There are all kinds of proxies imaginable to show the condition and expiration of the three capitals. Proxies for ecological capital are, for example, the Mean Species Abundance (MSA) and the concentration of CO_2 in the atmosphere. The so-called 'IPAT formula' (Impact = Population x Affluence x Technology) is used to determine the effect on ecology. The pressure on the environment is thus the result of the population size, consumption levels and the use of technology.

The main question for sustainable development is: based on the output of the three capitals, to what extent can the quality of life be maintained and distributed in an equitable manner? There is some trade-off between the capitals, as seen in this Sustainability Outlook. The starting point is that there are bottom limits for the capitals and, therefore, limits to the trade-off between capitals. It is not clear exactly where these limits lie, and it is difficult to say when economic, social and ecological systems will collapse. However, policies have already formulated targets for some capitals.

If there is too much imbalance in one of the capitals, other capitals can be directly focused on that capital to redress the imbalance. For example, an excessive imbalance in ecological capital in downgraded agricultural areas forms a threat to the other capitals. Direct human-social and economic capital, therefore, needs to be used to ensure the recovery of ecological capital. A side issue here is the extent to which capitals can be depleted, so that recovery is only possible at ever-increasing costs, or is even no longer possible (irreversible changes). The latter results in big sustainability problems.

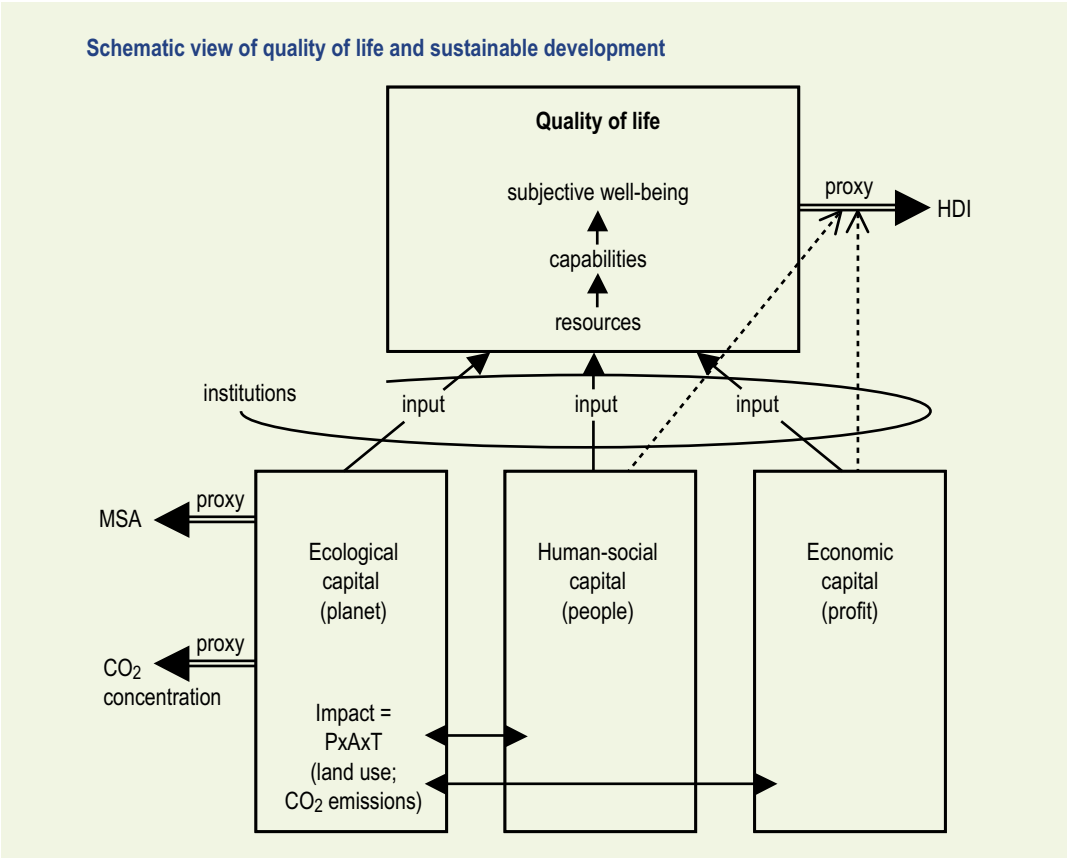


Figure A1.1 Quality of life and sustainable development, in relation to the three capitals.

Appendix 2. Indices for sustainability and the position of the Netherlands

There are a number of indices available that can be associated with sustainable development. One group of indices indicates a ranking list per year. Another group shows the progress of 'sustainability' for several countries, over the course of time. Indices that only offer data for a limited group of countries, such as the Index of Sustainable Economic Welfare (ISEW) or the SNI (Sustainable National Income), are not included here. This also applies to indices that primarily focus on one of the pillars of sustainability, such as the Good Governance Index, the Globalisation Index (where the Netherlands takes seventh place), the Footprint (from the WNF) and the Living Planet Index.

Human Development Index
The UN has been using the Human Development Index for over 15 years. It is built up of three categories: public health, knowledge and living standard, and includes four indicators: life expectancy, literacy, education and GDP. The environment and nature are not included in the index. Of the 177 countries for which data is available, the Netherlands stands in tenth place. This is not surprising, as the Netherlands is a rich country and the indicators are fairly correlated.

2005 Environmental Sustainability Index
The 2005 Environmental Sustainability Index used by Yale and CIESIN is built up of a broad set of indicators. The three Ps (people, planet and profit) are fairly well integrated into five categories: environment and nature quality, indicators meant to improve this quality, human vulnerability, institutions and global stewardship. The subjects are diverse, from air quality to science and technology, SO_2 export, development and environmental aid, and good governance. Of the 146 countries included, the Netherlands stands at number 40, with low scores for the environment and nature quality, but achieving good scores in the other categories. In the list of 21 countries with a high population density, the Netherlands stands in third place.

2006 Environmental Performance Index
The 2006 Environmental Performance Index, also from Yale and CIESIN, has a narrower focus than the aforementioned indices. This one is based on the following categories: environment-related health, air quality, water, natural resources, biodiversity and sustainable energy. The Netherlands stands in 27th place (listed as 34th in 2004, and 41st in 2005). The Netherlands scores well on some points, but scores badly on others (such as air quality, measured in ozone at living level). According to this index, the Netherlands has relatively little protected nature. On the list of densely populated countries, the Netherlands stands in fourth place, after Japan, Italy and Germany.

Happy Planet Index
The Happy Planet Index used by the New Economics foundation and supported by Friends of the Earth, is a fairly simple indicator for 178 countries, which combines happiness, life expectancy and footprint. This last aspect, as used here, depends on the population density and economic activity. A rich and densely populated country generally has a large footprint. Rich countries also have a high life expectancy and high scores for happiness, according to Veenhoven. The Netherlands stands here in 70th place. This is due to the high population density, which results in a high footprint.

Index for a Sustainable Society (IDS)
The Index voor een Duurzame Samenleving (Sustainable Society Index) focuses on illustrating how sustainably a society has developed. This index is a private initiative by Geurt van de Kerk, and was set up in 2006 for 150 countries. The index is built up of five categories: personal development (enough to eat and drink, sufficient education, equal opportunities etc.), clean living conditions, a stable society, sustainable use of raw materials and a sustainable world. The last two categories are weighted twice as heavily as the others. There are 22 indicators used, including few really economic indicators. The Netherlands stands at 12th place, and scores 6.2 (on a scale of 0–10), which is higher than the world average of 5.5. The Netherlands has a very high score for personal development, although it has low scores for air quality and water, as well as maintaining biodiversity, and very low scores for sustainable energy use, greenhouse gas emissions and the global footprint.

The Netherlands will not come top of the list in indices that include the environment and nature. This is primarily due to our high population density and economic activities, which lead to relatively high environmental pressure per km^2. However, on a 'per person' basis the Netherlands often scores much better. In addition, the Netherlands no longer has much primeval nature, which weighs heavily in many indexes.

Appendix 3. Region classification used in the Sustainability Outlook

This Sustainability Outlook splits countries, regions and groups of countries according to various contexts. This Appendix provides an overview of these clusters.

Overview of country clusters used.

Cluster	Countries
OECD	Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Germany, Finland, France, Greece, Hungary, Ireland, Italy, Iceland, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States
Sub-Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Central African Republic, Cameroon, Cape Verde, Chad, Comoros, Congo (Democratic Republic), Congo (the Republic), Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe
North Africa and the Middle East	Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi-Arabia, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, Yemen
South Asia	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
East Asia	Brunei, Cambodia, China, East Timor, Fiji, Hong Kong, Indonesia, Japan, Laos PDR, Macao, Malaysia, Mongolia, Myanmar, North Korea, Papua New Guinea, Philippines, Singapore, South Korea, Thailand, Vietnam
Latin America	Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Porto Rico, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela, Virgin Islands (USA)
North America	Canada, United States

Appendix 4. European citizen preferences for world views

European citizens prefer more solidarity in the world
Table A4.1 shows the average preferences for the four world views as indicated by citizens from various European countries. With the exception of Poland, most citizens in the countries studied prefer more solidarity in the world (view B1 or B2). Among European countries the preference for the global market (A1) is greater than in the Netherlands (Table A4.1), with the highest preference in Poland. The southern countries and Sweden showed a greater preference for a safe region (A2) than in the Netherlands, Germany and the United Kingdom; the reverse applies to global solidarity (B1).

Table A4.1 European citizen preferences for world views.

		Global market (A1)	Safe region (A2)	Global solidarity (B1)	Caring region (B2)
The Netherlands	2003	6%	27%	22%	45%
	2005	8%	20%	30%	41%
	2007	8%	25%	23%	44%
Germany	2005	19%	15%	36%	29%
	2007	19%	18%	26%	36%
United Kingdom	2005	18%	23%	30%	29%
	2007	12%	25%	19%	44%
France	2005	15%	13%	41%	31%
	2007	16%	14%	44%	27%
Italy	2005	15%	15%	44%	27%
	2007	11%	12%	42%	35%
Spain	2005	13%	9%	46%	32%
	2007	-	-	-	-
Sweden	2005	-	-	-	-
	2007	20%	12%	35%	32%
Poland	2005	-	-	-	-
	2007	29%	33%	16%	22%

Abbreviations

AER	The Dutch Energy Council (Algemene Energieraad)
AIDS	Acquired Immune Deficiency Syndrome
AIV	Netherlands Advisory Council on International Affairs (Adviesraad Internationale Vraagstukken)
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSP	Concentrating Solar Power
CSR	Corporate Social Responsibility
DALYs	Disability Adjusted Life Years
DGIS	Directorate-General for International Cooperation (Directoraat-Generaal Internationale Samenwerking)
EEA	European Environment Agency
EPAs	Economic Partnership Agreements
ETS	Emissions Trading System
EUSDS	European Union Sustainable Development Strategy
FAO	Food and Agriculture Organisation
FDI	Foreign Direct Investment
FSC	Forest Stewardship Council
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GEF	Global Environment Facility
GNP	Gross National Product
CAP	Common Agricultural Policy
GMOs	Genetically Modified Organisms
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
IEA	International Energy Agency
IMAGE	Integrated Model to Assess the Global Environment
IPAT	Impact = Population x Affluence x Technology
IPCC	Intergovernmental Panel on Climate Change
ITTO	International Tropical Timber Organisation
IUCN	The International Union for Conservation of Nature
LNG	Liquefied Natural Gas
MA	Millennium Ecosystem Assessment
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
MNC	Environmental Data Compendium (Milieu- & Natuurcompendium)
MSA	Mean Species Abundance
MSC	Marine Stewardship Council
NEN	National Ecological Network
NGOs	Non-governmental Organisations
NSDS	National Sustainable Development Strategy
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OPEC	Organisation of the Petroleum Exporting Countries
PRI	Principles for Responsible Investment
SIA	Sustainability Impact Assessment
SMEs	Small and Medium Enterprises
SRES	Special Report on Emissions Scenarios (IPCC, 2000)
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification

UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
VROM	Netherlands Ministry of Housing, Spatial Planning and the Environment (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer)
WCED	World Commission on Environment and Development
WEC	World Energy Council
WHO	World Health Organisation
WRR	Netherlands Scientific Council for Government Policy (Wetenschappelijke Raad voor het Regeringsbeleid)
WTO	World Trade Organisation

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The Netherlands in a Sustainable World

How has the world changed during the last 20 years after the publication of Our Common Future by the Brundtland Commission, and after the United Nations issued the Rio Declaration on Environment and Development in 1992? Many people have seen considerable improvements in their income, health and level of education. But poverty has not been eradicated, global warming caused by greenhouse gas emissions is still unavoidable, and the rate of biodiversity loss is increasing.

The Netherlands in a Sustainable World (Second Sustainability Outlook) is about what needs to be done to tackle these problems of sustainability, and what specific contribution can be made by the Netherlands. In its coalition agreement, the Dutch government stated its ambition to make the world a better place. Although this is not a simple task, this book presents sufficient options for fighting poverty, tackling climate change and limiting the loss of biodiversity. Within the context of a coherent international approach, forming an important condition for meeting the challenges posed, the Netherlands can make a significant contribution to global sustainable development.

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