

*Summary*

## **Quality and the future**

**Sustainability outlook**



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# Quality and the future

Sustainability outlook

Netherlands Environmental Assessment Agency  
RIVM

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This is the summary of the publication *Kwaliteit en Toekomst* (Quality and the Future), made in the year 2004 by the Netherlands Environmental Assessment Agency, a part of the National Institute for Public Health and the Environment (RIVM). From an ecological perspective, this agency supports the political and societal debate on economical, ecological, spatial and social qualities of society.

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## MAIN CONCLUSIONS

### *Sustainability: societal values and scientific insights*

In essence, sustainability is about the quality of life and the possibilities for maintaining this quality in future. What sustainability is, therefore, depends on public opinions about the quality of life, the distribution of this quality across the globe, and the scientific understanding of the functioning of humans and natural systems.

### *Little support for the high-performance society*

A public opinion survey revealed that less than 10% of the Dutch population is comfortable with a society moving in the direction of progressive globalisation and individualisation. Many Dutch people, from all political parties, would rather belong to a society in which regional development and solidarity continue to play a role. However, denial of the high-performance society carries a price tag, considering that the average European in-come may only rise by a modest 40% from the present up to 2040, whereas most official projections aim at and expect up to 140% rise in income by 2040.

However, people are only prepared to change their behaviour if others do so as well. Seventy per cent of the population view the question of sustainability as a 'social dilemma' and think that the government should find a way to resolve such dilemmas. This outcome is diametrically opposed to the idea that people want further government deregulation.

### *Sustainability of the Netherlands declined up to 1990, remaining stable thereafter*

This Outlook contains four answers to the question of sustainability, presented in the form of four 'world views'. Each world addresses the quality of life and the way this quality should be realised from its own specific perspective. These worlds differ primarily in the extent to which they have an international dimension (globalisation versus regionalisation) and in the balance between efficiency and solidarity.

Sustainability is measured in this Outlook using indicators based on societal values and scientific insights. The trends in these indicators over the last 30 years reveal a picture of decreasing sustainability in the Netherlands up to 1990, followed by a period in which the situation has remained more or less stable. These trends reflect the considerable weight society (and science) attach to regional and global ecological issues, the relative decline in the number of people suffering hunger and poverty and in the number of armed conflicts. The indicators can also be used to evaluate the contribution that proposed policies can make to promoting sustainability.

### *Risks inherent in single-perspective and partial solutions*

Each world view has a particular perspective on sustainable development. This one-sidedness of how sustainability is perceived and should be realised is also a drawback,

as revealed in an exploration of future trends in mobility, energy and food supply. More particularly, these risks are rooted in a, sometimes, optimistic focus on technology, in a (great) belief in behavioural change or in (great) confidence in political and administrative capabilities. So far, the solutions that have been found for emerging problems have been partial, which, in turn, have given rise to new problems on a larger scale and over a longer period. These have manifested themselves in the further disruption of global biogeochemical cycles (carbon and nitrogen) and ecosystems. The greatest ecological risks are found in the world views with a bias towards efficiency, in which either consumption or global population continues to grow. For instance, if energy consumption increases fourfold, the risk of drastic climate change will be very high, despite some of this energy being generated from renewable sources.

### ***Solutions***

To avoid the risk of taking a single-perspective approach, the quest for sustainability –and thus sustainable development– must be based on the following elements:

- credible governance with respect to both the setting of explicit goals and the means to achieve them;
- simultaneous management of the key factors of technology development and behavioural change;
- contribution to further ‘modernisation’ of the world and thus stabilisation of the world population (preventing the formation of cultural blocks);
- support for global agreements to resolve the ‘social dilemma’ associated with global ecological problems (e.g. the Kyoto Protocol);
- weighing regional (ecological or social and cultural) interests in making global trade agreements.

If the public’s low opinion of the high-performance society and people’s preference for more solidarity and regional coherence were to determine the choice of solutions, the European scale would provide the elements listed above to a reasonable degree. Technologies for reducing pressures on the environment, such as renewable energy, can be deployed to an optimal effect on this scale. However, Europe would still have to participate in global agreements and help prevent the formation of overly powerful blocks. In addition to the available means, the choice of goals (the chosen quality of life) also determines the degree of sustainability. These societal goals could be based on a conscious decision to uphold certain specifically European values. Given the observed public preference, these goals could incorporate solidarity, good public services, and attention to ecology and the regional scale.

*This Sustainability Outlook was prepared at the request of the state secretary for the Netherlands Ministry of Housing, Spatial Planning and the Environment. It is meant as a contribution to the public debate on sustainable development –and is surely not the last word.*

## SUMMARY

### *Quality of life: here and now, elsewhere and later*

In essence, sustainability is about the quality of life and the possibilities for maintaining this quality in future. What sustainability is, therefore, depends on:

- the public opinion about the quality of life,
- the distribution of this quality of life across the globe, and
- the scientific understanding of the functioning of humans and natural systems.

Is inequality in the world seen as a problem? Are the available collective resources sufficient? Should they be allocated fairly via the public sector, or on the basis of efficiency via the market? Scientific knowledge on the availability of resources can be used to estimate the future risks associated with maintaining this quality. Sustainability, therefore, is as much about social values as scientific insights.

### *World views on structuring the sustainability issue*

To obtain a picture of societal values for this Outlook, TNS-NIPO, a polling agency, conducted a survey of the Dutch population. The survey indicated that both the choice for a certain quality of life and people's opinions on how this quality should be allocated were derived from the same value orientations. Those who rate performance highly are more likely to prefer free trade. Those who consider equity and world peace to be the highest goals are more likely to support strong international governance. The chosen quality of life, the way it should be realised and on what scale can, therefore, be combined. These combinations can be seen as world views.

In this Sustainability Outlook we distinguish between four world views (Figure 1). The world views differ primarily in the degree to which activities have international interlinkages, i.e. globalisation versus more regional development (vertical axis) and in the balance between efficiency and solidarity (horizontal axis). The horizontal axis is strongly associated with the choice between market forces and government coordination. Each world view represents a different specific quality of life; in other words, a specific idea about goals and means.

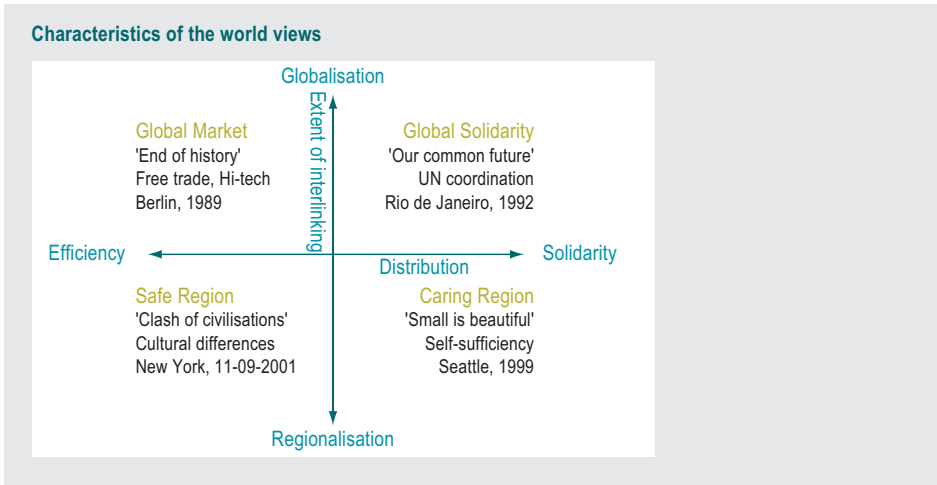


Figure 1 Characteristics of the four world views

**GLOBAL MARKET (A1)**

Increasing globalisation and individualisation lead to the A1 world view, GLOBAL MARKET: the high-performance society. Fukuyama (1992) saw this trend towards a market-oriented, globalising society as the best solution for maximum economic growth and social progress, and therefore ‘the end of history’. In this liberal, individualising and efficiency-seeking world economic growth is indeed high: per capita income in the EU-15 in 2040 is more than 2.4 times the 2000 level (CPB, 2003). However, the ecological risks (particularly climate change) are high. In this world view, the world’s population will stabilize at 9 billion people by the middle of the century. The Dutch population will continue to grow to about 20 million in 2050, of which 6 to 7 million will be of non-Dutch origin.

From the perspective of the A1 world view, positive trends during recent decades were seen in the drop in the level of the national debt, the rise in life expectancy and reduction of the tax burden. Negative trends from the A1 position are the drop in Dutch competitiveness, increasing unemployment and crime, traffic congestion, the declining security of energy supply and the comparative drop in investment in education.



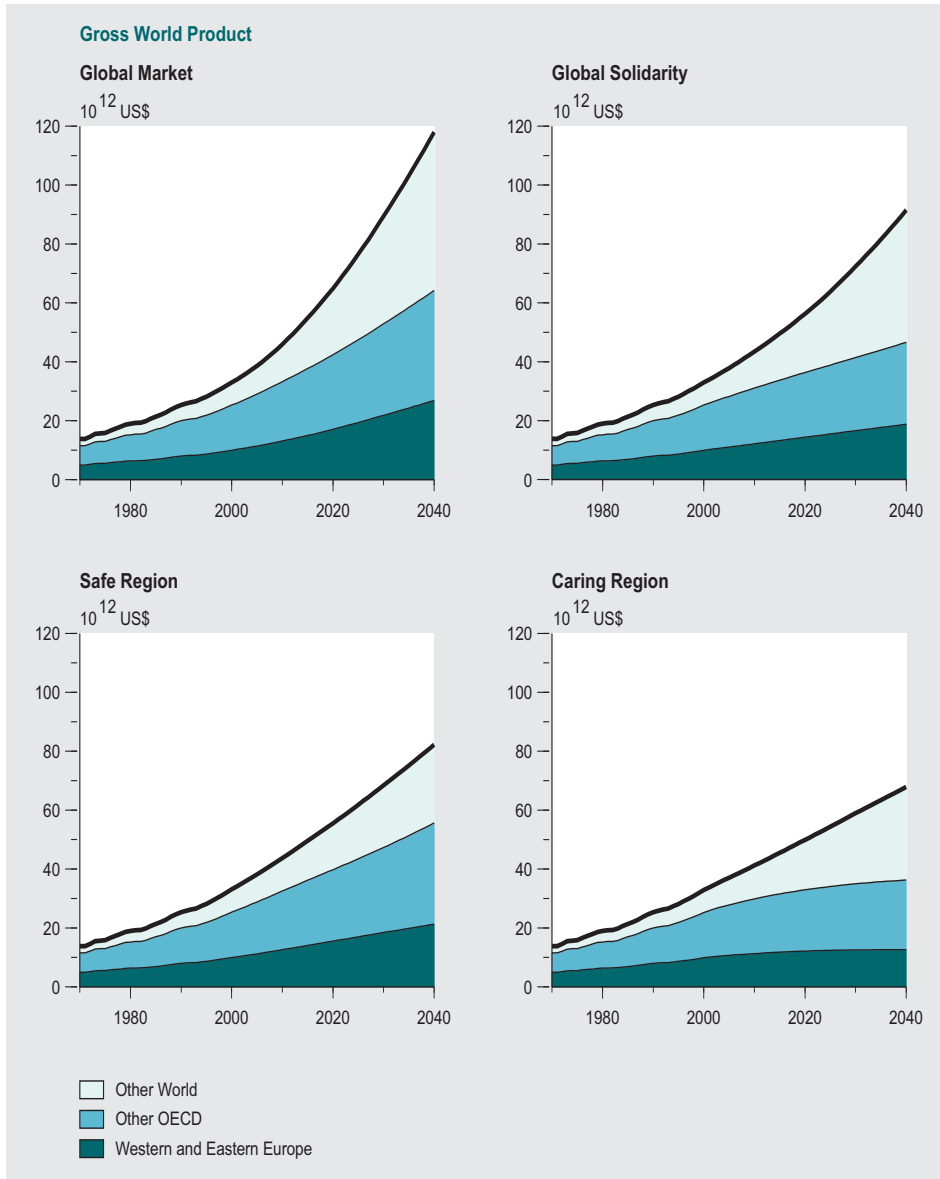


Figure 2 Economic growth in Europe and the world, 1970–2040 (CPB, 2003)

The main risk of failure in the A1 world view, GLOBAL MARKET, is the optimistic reliance on technological advance. In addition, the rapid growth of global trade and communication entails a number of societal and cultural risks, causing:

- *loss of social cohesion*, evoking the opposite world view, namely, the CARING REGION (B2),
- *breakdown of cultural identity*, which can lead to sections of the population retreating into their OWN SAFE REGION (A2), which, in turn, can lead to the formation of cultural blocks,

- *loss of solidarity and collective goods* goods (e.g. a stable climate), shifting opinions towards the GLOBAL SOLIDARITY world view (B1).

### *CARING REGION (B2)*

From their world view based on solidarity and 'small is beautiful', anti-globalists have constantly warned about the risks inherent in the A1 world view. Community spirit, civic duty, and social and cultural diversity, are valued highly in the CARING REGION world view, and immaterial goods like free time and community identity are important: money does not bring happiness. And this is a good thing, too, because in this world view per capita income in Europe in 2040 is 'only' 40% higher than in 2000. By comparison, in the A1 world it is 140% higher. Regional and local products are preferred, and people have considerable faith in local government (self-sufficiency).

### *SAFE REGION (A2)*

The global market (A1) does indeed evoke opposing reactions. There is considerable opposition to major new free trade agreements and a growing desire to protect cultural and economic interests. This leads to the A2 world view, with sharply opposed cultural blocks (Huntington's *The Clash of Civilizations*, 1997). In the SAFE REGION world view the trend towards hedonism and individualism continues. Adherents to this world view are highly concerned with national safety, and law and order. Free trade is seen as a threat to employment.

In the A2 world view, the exclusion of vulnerable areas will prevent 'modernisation'; as a result, the total global population will rise to 11 billion in 2050. The highly unequal division of wealth in this world view will increase the likelihood of global tension and conflicts. The A2 answer to this is fewer immigrants and more security. The size of the Dutch population will rise slightly to 17 million, of which 5 million are immigrants.

From the perspective of the A2 world view, positive trends during recent decades have been the reduction in the tax burden and longer life expectancy. Negative trends in this world view are the increase in cultural diversity (number of residents of non-Dutch origin), rise in crime, smaller pensions and lower security of energy supply.

### *GLOBAL SOLIDARITY (B1)*

Sustainable development has been a goal since the late 1980s, because in many respects globalisation is already in an advanced stage and because ecological limits are being reached on a global scale (climate change and biodiversity loss). In 1987 the Brundtland Commission laid the basis for sustainable development at the United Nations level in its report 'Our Common Future'. This world view geared to GLOBAL SOLIDARITY attempts to steer progressive globalisation in the right direction, ecologically and socially, by means of rules and conventions. An example is the Kyoto Protocol on climate change. Institutions affiliated to the UN are given greater legitimacy and an effective, worldwide government coordination is achieved. Social justice is considered indispensable for resolving the tensions between ecology and economy: no intergene-

rational solidarity without international solidarity. The associated lower economic growth in Europe is accepted in this world view, and brings income levels in 2040 up to 1.8 times the level in 2000.

The B1 world view attaches great importance to reducing hunger and poverty. The developments considered most negative in this world view are violations of human rights, the loss of global biodiversity, climate change, shortage of drinking water and the disruption of global biogeochemical cycles (e.g. the nitrogen cycle).

**Sustainability indicators**

The indicators for measuring progress towards sustainable development used in this Outlook have been derived from the value orientations of the Dutch population and from scientific understanding of the availability of collective resources. These indicators are considered to be measures of the sustainability of societal development for the different world views (Table 1).

*Table 1 Sustainability indicators*

Social and cultural	Economy	Ecology
<b>Indicators based on values</b>		
Poverty	International cooperation	Ozone layer
Child labour	Pensions	Availability of drinking water
Hunger	Security of energy supply	
Armed conflict and terrorism	Energy consumption (resource depletion)	
Human rights	Competitiveness – labour costs	
Crime	Competitiveness – traffic congestion	
Cultural differences (multicultural society)		
<b>Indicators based on values and science</b>		
Education	National debt	Greenhouse effect
Healthcare	Public expenditure	Water quality
Unemployment	Energy price	Biodiversity
<b>Indicators based on science</b>		
Global population growth	Income per capita	Local environment – health impacts
National population growth	Trade flows	Use of space outside the Netherlands
Pressure of work		Landscape quality

*The question ‘How are we doing?’ has more than one answer*

The indicators are the lenses through which we examine the actual trends in sustainability from the perspective of the different world views. In the A1 world view, for example, great significance is attached to the size of the national debt, while in B2 this is unimportant. In B1 great importance is attached to hunger in the world and to human rights. The table below lists the topics the public consider most important in each of the four world views.

**Most important sustainability issues per world view, also showing the significant differences between world views (indicated by an asterisk).**

<p><b>GLOBAL MARKET (A1)</b>                  Water quality                  Greenhouse effect                  National debt                  Healthcare                  Ozone layer                  Crime                  Education                  Security of energy supply                  *Reliable government                  *Competitiveness                  *Public expenditure                  *Unemployment</p>	<p><b>GLOBAL SOLIDARITY (B1)</b>                  Water quality                  Greenhouse effect                  Hunger                  Human rights                  International cooperation                  Ozone layer                  Poverty                  Biodiversity                  *Availability of drinking water                  *Illiteracy                  *Corporate social responsibility                  *Child labour                  *Energy consumption (resource depletion)</p>
<p><b>SAFE REGION (A2)</b>                  Water quality                  Greenhouse effect                  Ozone layer                  Healthcare                  Pensions                  Biodiversity                  Crime                  Security of energy supply                  *Cultural differences (multicultural society)                  *Public expenditure                  *Observance of regulations                  *Unemployment</p>	<p><b>CARING REGION (B2)</b>                  Water quality                  Greenhouse effect                  Ozone layer                  Biodiversity                  Hunger                  International cooperation                  Human rights                  Armed conflict and terrorism</p>

Looking at the changes over the last 30 years through the lenses of the different world views allows us to indicate how sustainable these decades have been. In other words, what sustainability is depends to great extent on which world view is adopted. In most world views, the trends shown by the indicators over the last 30 years reveals a picture in which sustainability in the Netherlands declined until 1990 and has subsequently remained more or less stable (Figure 3). These trends follow from the considerable weight society (and science) attach to global ecological issues and from the gradual improvement in the situation regarding hunger, poverty and armed conflict. The high scores for ecological and global issues in all four world views do not match the expectations of many policy-makers that citizens are mainly worried about economic problems and problems close to home. Pollution of seas and rivers, deforestation, climate

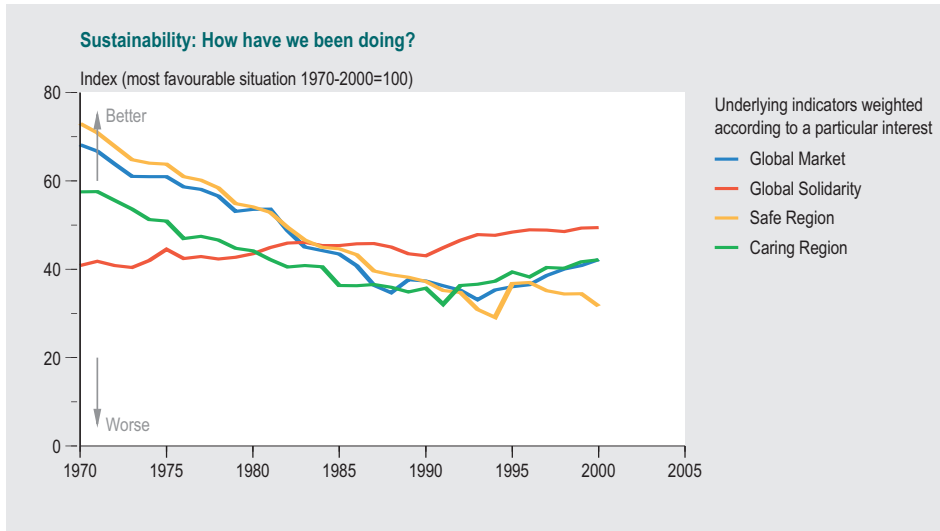


Figure 3 Sustainability indices for the four world views; in most world views sustainability declined until 1990 and has subsequently remained more or less stable.

change and hunger in the world appear to score on average higher than problems in the neighbourhood, traffic congestion or economic issues (such as pensions and taxes).

**Little support for the high-performance society**

To obtain a picture of societal values for use in this Outlook, the Netherlands Environmental Assessment Agency commissioned TNS-NIPO, a polling agency, to conduct a survey of the Dutch population. This revealed that less than 10% of the Dutch population prefer the A1 world view, the achieving society. In other words, more than 90% prefer a world view in which solidarity and regional issues have a place. The most popular world view is the CARING REGION B2 (45%), followed by the SAFE REGION A2 (27%) and GLOBAL SOLIDARITY B1 (22%).

**Government must devise a way to resolve the social dilemma**

A small section of the population claims to be making its own contribution to sustainable development, or say they are able to do so; 70% look to government to take action. Apparently, many aspects of sustainability are seen as a social dilemma: i.e. people are only prepared to change their behaviour if others do so as well. They think that government should find a means to resolve this dilemma. This outcome is diametrically opposed to the idea that people want further government withdrawal.

**The public chooses the CARING REGION (B2) irrespective of political preferences**

Elections are the time to address questions of goals and policy strategies. Voters reveal their value orientations and world views through their voting behaviour. The different political preferences can be associated with the four world views (see Table 2).

Table 2 Support for the four world views among the Dutch political parties

	GLOBAL MARKET A1	SAFE REGION A2	GLOBAL SOLIDARITY B1	CARING REGION B2	Nether- lands	Nether- lands total
	%					
CDA: Christian Democrats	4	26	19	51	100	24
PvdA: Labour Party	3	25	25	47	100	25
VVD: Liberals	16	32	15	37	100	15
SP: Socialist Party	2	22	28	47	100	8
GL: Green Left	3	19	34	44	100	6
LPF: List Pim Fortuyn	6	47	7	39	100	6
D66: Democrats '66	10	15	38	37	100	4
CU: Christian Union	3	13	38	46	100	4
SGP: Political Reformed Party (Protestant)	0	38	13	50	100	1
Other political party; did not vote; no comment	8	33	15	44		8
Netherlands total	6	27	22	45		100

The surprising conclusion from this table is that adherents to the B2 world view form the largest group among the supporters of every party except LPF and D66. The A1 world view based on the GLOBAL MARKET is supported by a relatively large proportion of the VVD and D66 voters. Supporters of the opposition parties (PvdA, GL, SP, CU), and also the D66 voters, tend to prefer the GLOBAL SOLIDARITY world view (B1). The SAFE REGION (A2) world view seems to be attractive to LPF, VVD and SGP voters.

### Future trends: mobility, energy and food supply

To assess sustainability, the risks associated with mobility, energy and food supply have been identified and described. These risks occur when one of the four world views is dominant.

#### *Mobility*

In the GLOBAL MARKET (A1) world view, transport will grow enormously: in 2030 freight traffic between the Netherlands and other West European countries will have doubled, five times the amount of goods will be shipped between the Netherlands and Eastern Europe, and transport between the Netherlands and the rest of the world will have tripled. This will not lead to more congestion on the motorways because extra lanes will be built and a congestion charge introduced. But in this world view, congestion off the motorways will worsen as traffic volumes rapidly rise. The heavy empha-

sis on efficiency leads to a decline in the quality of public transport. If the government were to completely deregulate public transport, fares can be expected to rise by 60% and performance levels fall to about half the present levels. This combination of a congestion charge and poorer public transport services will mean reduced mobility for lower income groups. In this world view, freedom of choice for the consumer is an important principle. One of the consequences of this is that while technological improvements have made car engines much more efficient during the last few decades, any environmental gains have been negated by a shift towards heavier cars (such as four-wheel drive vehicles). Technological development is geared primarily to cutting costs and reducing congestion, and not to resolving environmental and sustainable development issues.

<b>Mobility</b>	
<b>GLOBAL MARKET (A1)</b> <ul style="list-style-type: none"> <li>• road-expansion</li> <li>• congestion charge</li> <li>• congestion on motorways at the current level</li> <li>• more unequal access to mobility</li> <li>• technological gains for comfort rather than for the environment</li> <li>• global CO<sub>2</sub> emissions continue to rise</li> </ul>	<b>GLOBAL SOLIDARITY (B1)</b> <ul style="list-style-type: none"> <li>• successful EU emissions policy</li> <li>• improvements in environmental technology</li> <li>• savings: more efficient vehicles</li> <li>• decrease in Dutch CO<sub>2</sub> emissions</li> </ul>
<b>SAFE REGION (A2)</b> <ul style="list-style-type: none"> <li>• congestion increases by 30%</li> </ul>	<b>CARING REGION (B2)</b> <ul style="list-style-type: none"> <li>• voluntary change in behaviour</li> </ul>

In GLOBAL SOLIDARITY (B1), solving environmental and sustainability problems is indeed the aim. As a result of the large-scale adoption of biofuels, hydrogen and fuel cells, CO<sub>2</sub> emissions from transport will fall sharply (by percentages of 20-30% more in 2030 compared to 2000 levels). However, technical solutions geared towards increasing sustainability are expensive and risky, and any solutions they may provide will only become apparent in the long term. So far, the use of hydrogen and biofuels simply shifts a large proportion of the CO<sub>2</sub> reductions from the transport sector to the energy sector. Policy instruments like pricing and standards for new vehicles can be used to make the cars on the roads more fuel efficient in a relatively short period, but this requires effective governing at the right level. The mobility and environmental policies pursued at the European level have proven to be successful. Air pollution from traffic has already been considerably reduced by tightening up EU emission standards and will decline so sharply over the next few decades that permitted levels will hardly ever be exceeded.

In administrative terms, the European scale has proved to be effective in pursuing a mobility policy, and so the more regionally oriented world views, A2 and B2, are less successful in achieving mobility targets and avoiding negative environmental and other impacts. In the SAFE REGION world view (A2) no congestion charges are introduced: queues on motorways, expressed as vehicle hours lost, increase to about 30% above 2000 levels in 2030. Here, too, public transport never really takes off. At the same time

most of the loss of landscape quality, as in the A1 world view, is caused by road building.

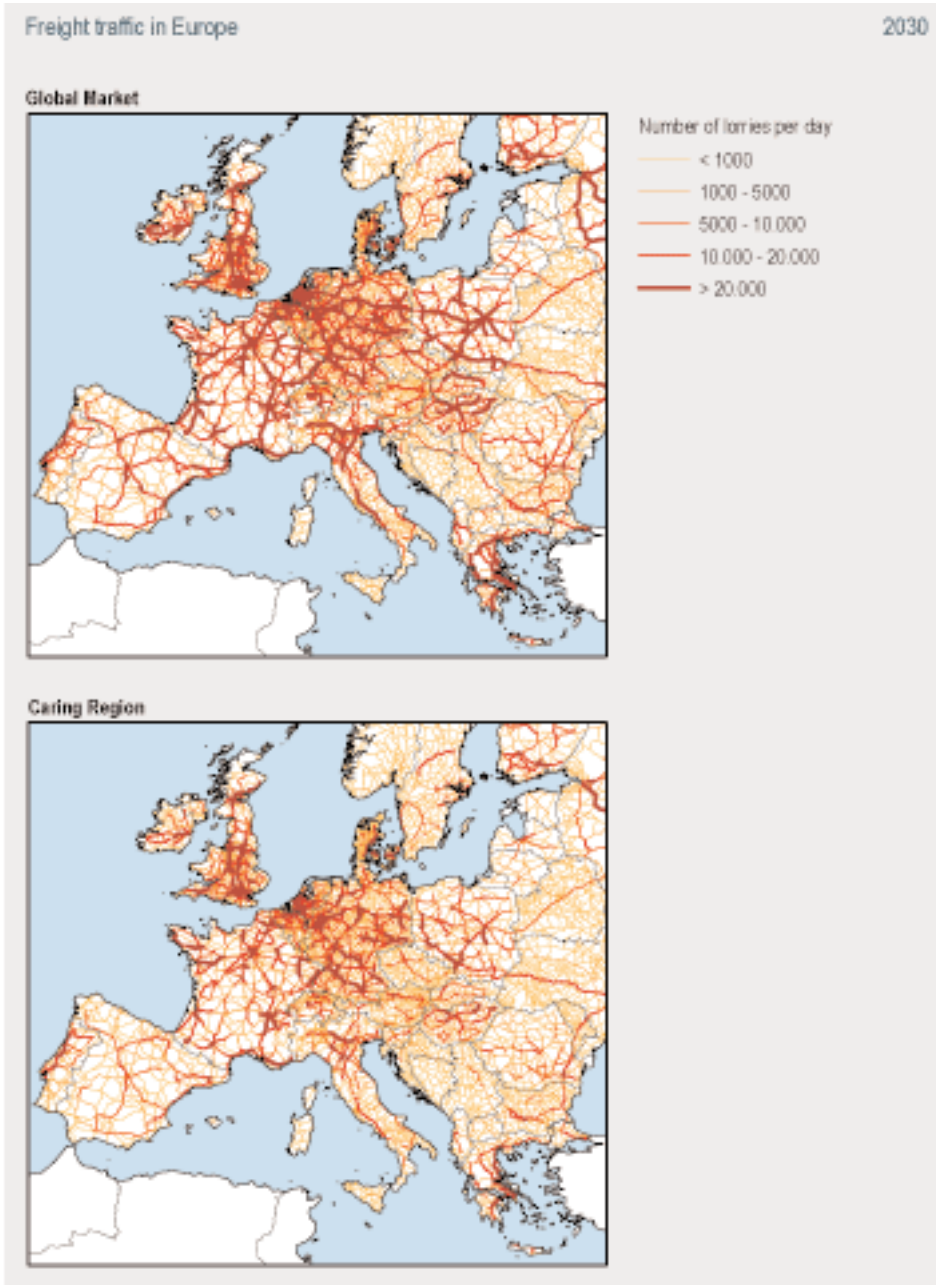


Figure 4 Interregional road transport in Europe in the GLOBAL MARKET and CARING REGION world views, 2030. Interlinkages are more extensive in GLOBAL MARKET than in CARING REGION.



In the CARING REGION world view (B2) mobility, and consequently congestion, increase to a much lesser extent. The contrast with A1 is illustrated in Figure 4. Air pollution, noise nuisance and landscape degradation remain limited. To keep the goal of sustainability within reach, people are encouraged to change their behaviour. In recent years, though, this policy line – which includes a public information campaign under the current traffic and transport policy – has not been successful. Attitudes have changed, but people’s behaviour has not. It has not proven possible to resolve the social dilemma of mobility on a voluntary basis.

We can conclude that the European scale is effective in finding a compromise between the demand for mobility and the sustainability aspects of mobility.

**Energy**

The market-oriented world views (A1, A2) entail the greatest risks of climate change. In these world views, global energy consumption will rise by 75 to 100% between now and 2030. By the end of the century energy consumption and CO<sub>2</sub> emissions will be 3 to 4 times higher than at present, with considerable risks to climate stability (Figure 5). Both of these market-oriented world views offer few incentives to reduce emissions. Technology development is strongest in the globally oriented world view, GLOBAL MARKET, but is geared primarily to cost reduction (cheaper energy), with less emphasis on reducing emissions. This could trigger a ‘lock-in’ situation, in which more and more is invested in the current energy system based on fossil energy. The currently foreseeable technologies in an environment dominated by the market are insufficient to reduce emissions and bring the climate problem under control.

<b>Energy</b>	
<p><b>GLOBAL MARKET (A1)</b></p> <ul style="list-style-type: none"> <li>• technology; cost saving</li> <li>• energy consumption + 100% in 2030</li> <li>• use of fossil energy and CO<sub>2</sub> emissions remain high</li> <li>• substantial development of renewable energy only in the long term</li> <li>• EU self-sufficiency declines from 60% to 40%</li> </ul>	<p><b>GLOBAL SOLIDARITY (B1)</b></p> <ul style="list-style-type: none"> <li>• climate policy, CO<sub>2</sub> emissions trading</li> <li>• energy consumption + 50% in 2030</li> <li>• renewable energy and energy-saving technology: use of fossil energy and CO<sub>2</sub> emissions decline in the long term</li> <li>• EU self-sufficiency declines from 60% to 45%</li> </ul>
<p><b>SAFE REGION (A2)</b></p> <ul style="list-style-type: none"> <li>• self-sufficiency; low costs</li> <li>• energy consumption + 75% in 2030</li> <li>• energy price 100% higher in 2030</li> <li>• energy consumption, use of fossil energy and CO<sub>2</sub> emissions continue to rise</li> <li>• limited development of renewable energy</li> <li>• EU self-sufficiency declines from 60% to 55%</li> </ul>	<p><b>CARING REGION (B2)</b></p> <ul style="list-style-type: none"> <li>• change in behaviour; clean energy</li> <li>• energy consumption +50% in 2030</li> <li>• energy price approx. 80% higher in 2030</li> <li>• renewable energy and energy saving: use of fossil energy and CO<sub>2</sub> stabilise in the long term</li> <li>• EU self-sufficiency declines from 60% to 50%</li> </ul>

In a market-oriented environment the scale of the climate problem can be reduced by introducing a form of emissions trading. Just such a CO<sub>2</sub> emissions trading system is currently being set up within the EU for the industry and energy sectors. This approach can be seen as a compromise between the A1 ideas and the line of reasoning in GLOBAL SOLIDARITY (B1).

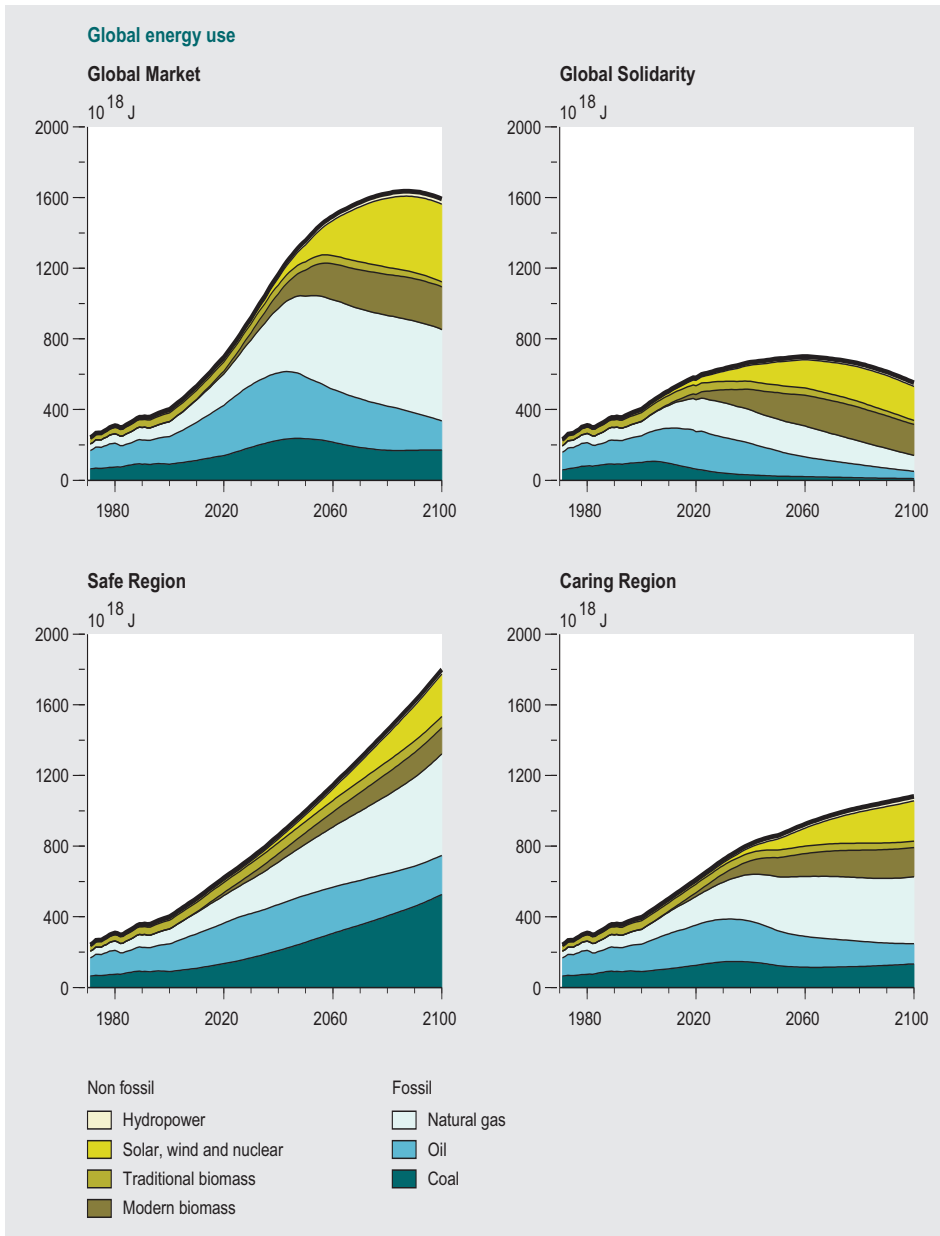


Figure 5 Global energy use, 1970–2100.

Although a further shift in the direction of the GLOBAL SOLIDARITY world view (B1) will slow the growth in global energy consumption to 2030, it will still be 50% higher. Only in the long term, after 2050, will the upward trend be reversed, and by around 2100 global energy consumption could return to current levels. To achieve this, the combined use of technology (efficiency improvement) and the development of renewable energy resources (wind energy, biomass) will be needed at the global level, with the

potential contribution from energy saving the same as from renewable energy. A route that relies entirely on global participation and acceptance of global institutions is risky. Limiting this risk by creating a stronger basis in the EU and using this to forge links with the national and international business communities, and with developing countries, could be part of a robust approach.

An effective energy policy can be pursued at the European level, but Europe has little scope for reducing its dependence on other regions for its energy supply. At the moment Europe produces about 60% of its energy needs. Between 2020 and 2040 the main Euro-pean (and Dutch) reserves will be exhausted, and the level of self-sufficiency will fall to 40–45%. In a more regional orientation on the European scale, self-sufficiency could be maintained at a level of 50–55%. The opportunities for renewable energy in the Netherlands are limited, but at the European and global levels the potential is great, particularly for wind energy, biomass and, in the longer term, solar energy. Given the close integration of the European economies, a European approach to energy saving, technology and renew-able energy sources is an obvious course to take.

The emissions reduction achieved in B1 seems hardly feasible in the regionally oriented worlds. The B2 world lacks the necessary international coordination; furthermore, it is uncertain whether the change in behaviour required to reduce energy consumption can be achieved. The A2 world also lacks the international support required for a global climate policy.

Too much emphasis on European governance combined with the market mechanism, as is the case in the A2 world view, can lead to the formation of regional and global blocks. In this case, the price of energy will rise more quickly than in other world views and by 2030 will be about 100% higher than now. The security of European energy supply in 2030 will be 20% less than at present, taking account of the diversity of energy resources (risk dispersion), proven reserves, import share and political stability of the exporting region. Under continuing globalisation (in A1 and B1) the security of energy supply would decline further (by 30%) due in the main to greater dependence on other regions. As a result of the continuing growth of the world population, energy consumption and CO<sub>2</sub> emissions rise more steeply in the second half of this century in the A2 world view than in the other world views.

The SAFE REGION world view (A2) illustrates most clearly that the regional orientation has its limitations (limited technology transfer, no support for climate policy) and that so-lutions for regional self-sufficiency (more fossil fuels, including coal and nuclear power) involve important trade-offs between environmental impacts, costs and security of energy supply. There are no options or action strategies that bring all goals within reach. The growing dependence can be solved only temporarily and partially by deploying more own reserves or renewable sources. Greater use of national fossil energy reserves increases CO<sub>2</sub> emissions; more nuclear energy raises insecurity. In recognition of European dependence on imports from other regions (Figure 6), con-

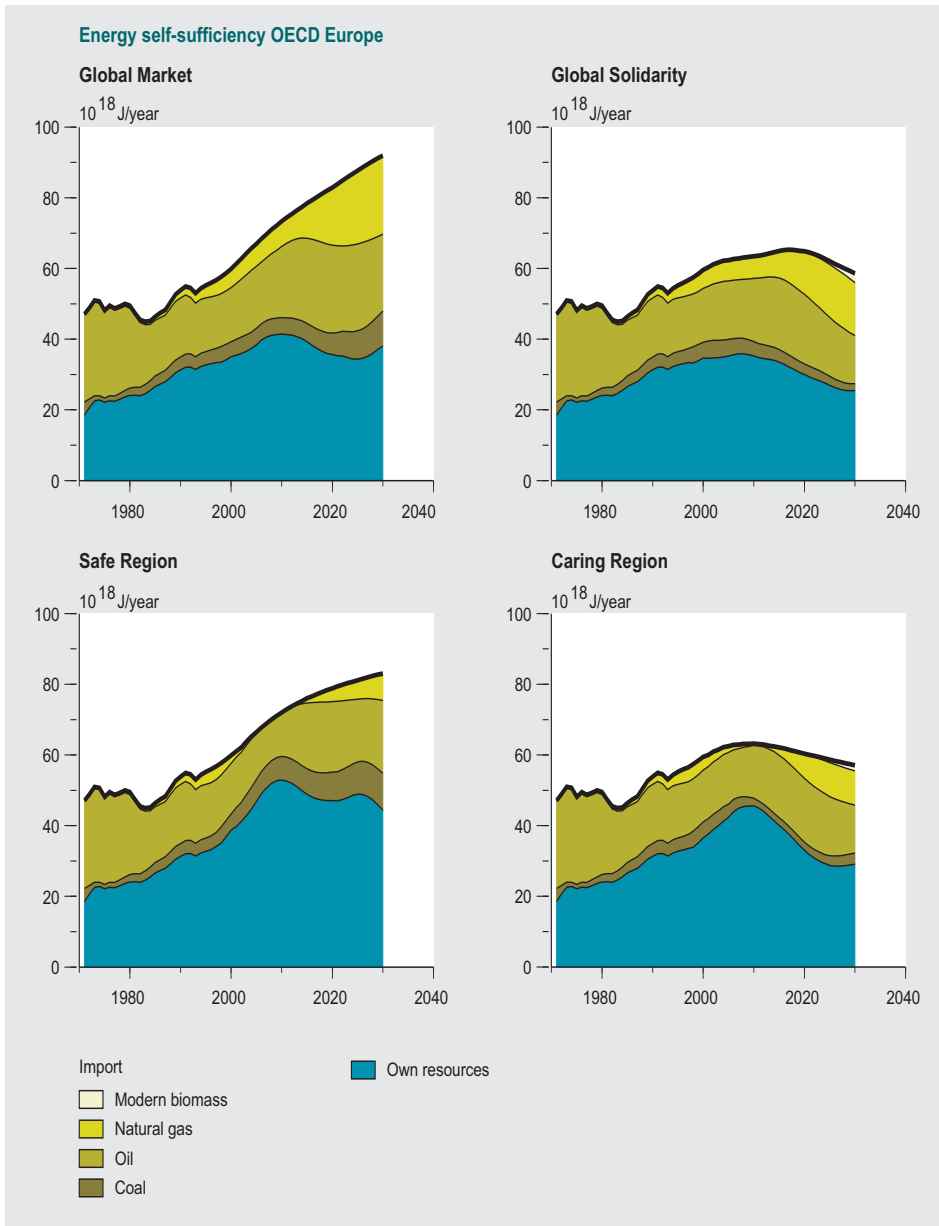


Figure 6 Total energy consumption and energy imports in Europe, 1970–2030.

tinuing European attention to global relations and stability is an important condition for ensuring a continuing energy supply, now and in future.

**Food supply**

In the A1 world view, global food production increases significantly: until 2030 crop production grows by over 50% and animal production by more than 90%, the latter related to the large increase in consumption of luxury foods. The self-sufficiency level of the EU-15 and the Netherlands declines by about 20% (grains and rice), with a risk to food security and a greater threat from animal diseases. The demand for water rises sharply and throughout the world greater use is made of marginal and vulnerable land, and the rate at which natural areas are brought into cultivation rises. An important remedy to prevent this happening in A1 is technology development geared to efficiency and product quality. Use of technology (including the use of genetically modified organisms) leads to a slight increase in land use globally and a slight decrease in Europe. Intensive use is made of artificial fertilizers and nitrogen emissions are high. The technological breakthrough of artificial fertilizer had already led to a doubling of the nitrogen cycle and has contributed to further global population growth. This population growth (to 9 billion in 2050) is in turn responsible for disruption to the carbon cycle, which (very probably) plays a role in climate change.

This world view is best at reducing hunger as a result of improved income levels in developing countries. Risks of failure are the high hopes pinned on technological solutions and the increasing pressures on the environment, which could eventually endanger food supply (water shortage, suitable land, climate change).

**Food supply**

**GLOBAL MARKET (A1)**

- liberalisation and free market operation
- strong increase in luxury foods
- reduction in agricultural land area in Europe; global increase
- self-sufficiency in food; food security at risk
- decline in animal welfare; high pressures on the environment
- sharp rise in water use
- reduction in biodiversity
- decline in landscape quality

**GLOBAL SOLIDARITY (B1)**

- liberalisation, but geared to solidarity
- increase in consumption of luxury foods
- reduction in agricultural land area in Europe; increase elsewhere
- self-sufficiency in food declines; food security at risk
- pressure on the environment rises slightly, but remains too high
- limited increase in water consumption
- competition for land: increase in agricultural land area, extensification of production, energy crops and nature

**SAFE REGION (A2)**

- regional protection but efficient (work)
- increase in consumption of luxury food
- sharp increase in agricultural land area; still slight decline in EU-15
- food supply in EU-15 declines; high vulnerability; the same in other regions
- high pressures on the environment
- sharp growth in water consumption
- reduction in biodiversity

**CARING REGION (B2)**

- regional protection, but with solidarity (nature)
- smallest increase in consumption of luxury foods
- fight against hunger has little effect
- second largest increase in agricultural land area; increase in EU-15 as well
- food self-sufficiency about the same
- pressures on the environment increase
- rise in water consumption
- reduction in biodiversity

In B1 food production tends to grow less sharply and the consumption of luxury foods increases at a lower rate. The level of self-sufficiency in Europe remains somewhat larger than in A1. As a result of the intensification of agriculture and international agreements on the environment and food security, water consumption and nitrogen emissions increase only slightly. The goal of preventing hunger is brought closer in the B1 world view, but raising food production also requires political stability. One problem is that various goals in this world view compete for land: agricultural production, agricultural intensification (to benefit the environment), nature and landscape con-

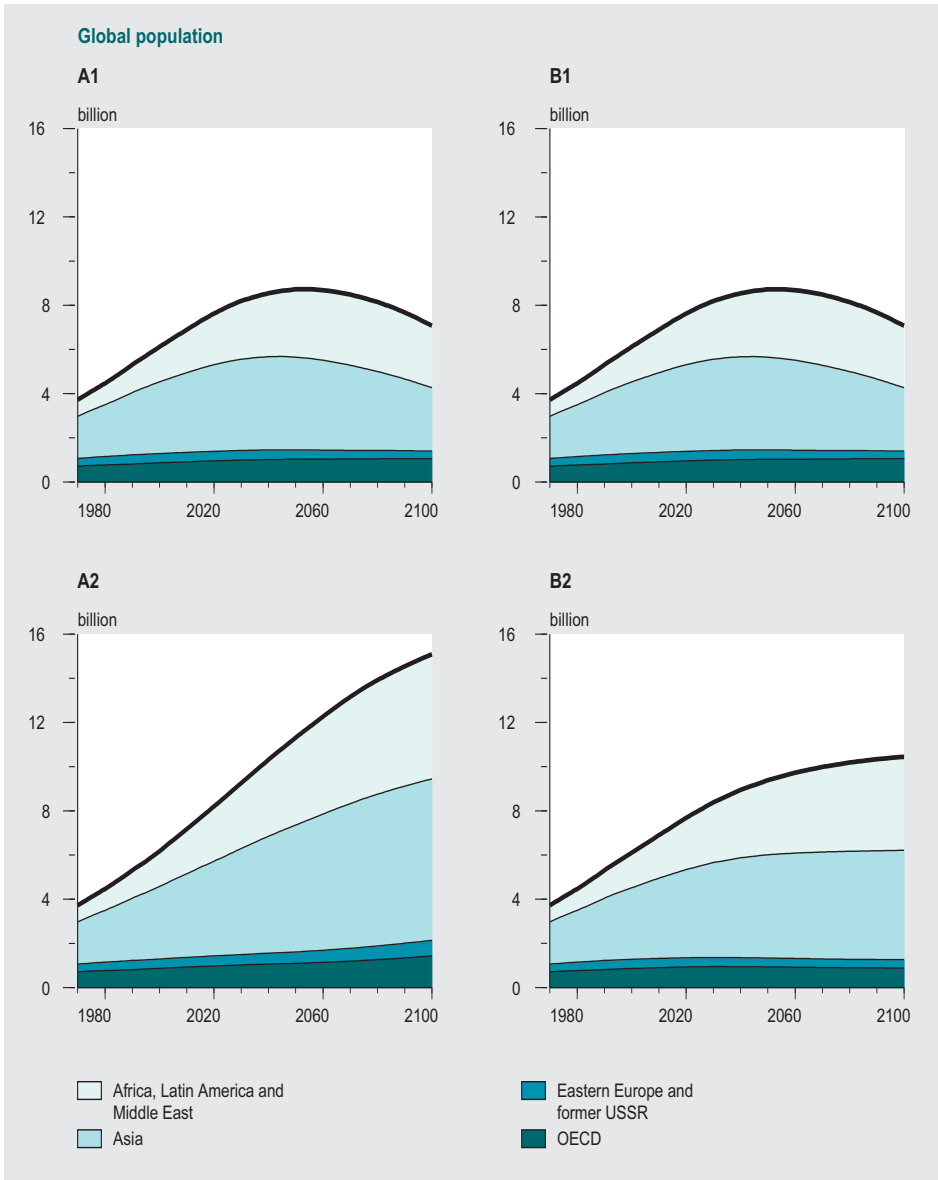


Figure 7 Trends in the global population, 1970–2100.

servation and the extra demand for land for the production of biomass for energy. There are risks of failure in this world view in non-compliance with international agreements and failure to allocate land uses soon enough.

In the B2 world, trade blocks are formed, partly in the interests of nature and the environment, but problems elsewhere also receive attention. This results in the lowest growth of food production (although still 50%). The increase in meat consumption foods in this world view is very small (3%). Self-sufficiency in food (grains and rice) increases slightly and is in line with the objectives. The fight against hunger is as ineffective as in the A2 world view and for the same reasons. The agricultural land area in the world rises slightly, also in Europe. Water consumption and nitrogen emissions rise more than in B1, but less than in the A world views. This world view (B2) is vulnerable with respect to human behaviour. It is expected that voluntary changes in behaviour (eating less meat) will resolve a number of difficulties, but should this not be the case, the goals will remain out of reach.

In A2 food production rises considerably, but less than in the world views related to globalisation. The level of self-sufficiency in Europe falls, but less than in A1. As a result of low levels of investment and the limited availability of capital, efficiency does not improve as fast as in A1. This produces the strongest global expansion of agricultural land area, but with little reduction in the agricultural land area in the EU-15 countries. The vulnerability of the global life-support system increases sharply as marginal land, mainly in Africa, Asia and the Middle East is brought into cultivation. Furthermore, scarce water resources are also extracted. A world population that continues to grow after 2030 (to 11 billion in 2050 and 15 billion in 2100) will only increase the problems in this world view. The vulnerability of food supply in terms of food production compared to population pressure is greatest in the Middle East (see Figures 7 and 8 for population and vulnerability of food supply). The solution to the problem of hunger does not come much closer in this world view because the increases in productivity and disposable income remain low. The formation of trade blocks raises tensions and increases the chance of instability, an important factor for the hunger problem.

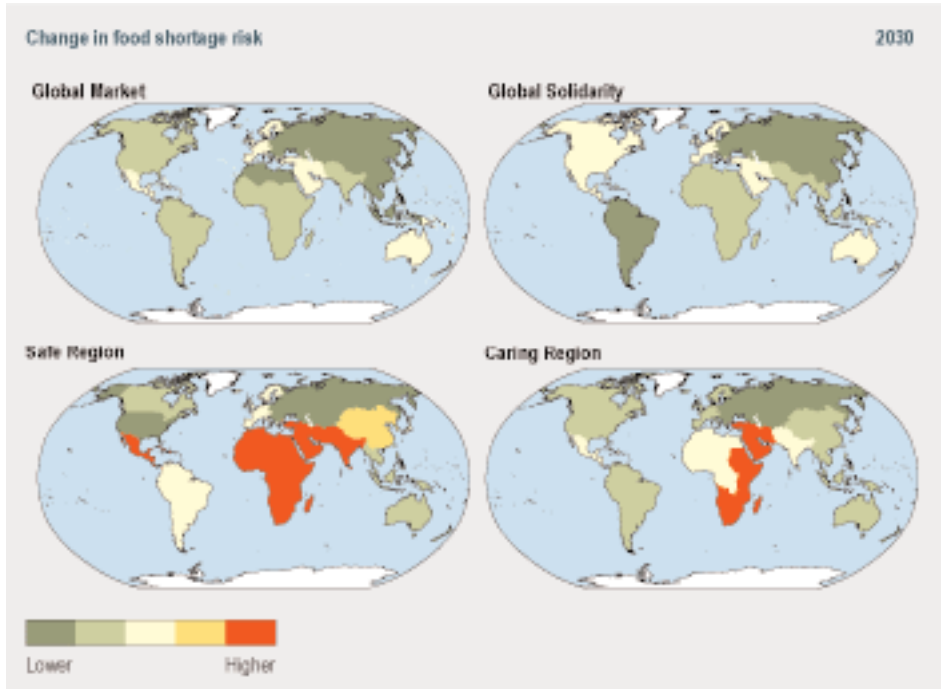


Figure 8 Change in vulnerability of the global food supply 2000-2030.

### ***How does the Dutch population influence global sustainability?***

The Netherlands uses an area of land elsewhere that is 2.5 times the size of the Netherlands itself for the consumption of forest and agricultural products. The Netherlands contains 0.3% of the world's population and contributes to 0.3% of the loss of global biodiversity. The Dutch population uses 0.2% of all the cultivated land in the world (and 0.1% of the total land area). The use of highly productive land makes the global landuse of the Dutch people smaller than average.

Almost 4% of the European population lives in the Netherlands. The Dutch people contribute to 2% of the loss of biodiversity in Europe. Within the Netherlands, 60% of the loss of biodiversity is caused by consumers in the Netherlands; the remainder is caused by production for export. Apparently, the Netherlands allows foreign consumers' footprints on its own land area, despite the already high population density.

### ***How does the world influence the Netherlands?***

In the B1 world view the sustainability issues, by now apparent on a global scale, will be translated back to the European scale and then to the scale of the Netherlands. In this world view there is political and administrative feedback as a consequence of the previous trade-offs to higher scale levels (elsewhere and later, Figure 9). Examples of this are climate policy (Kyoto) and biodiversity policy (Birds and Habitats Directive). EU restrictions related to water management and environmental policy (air pollution



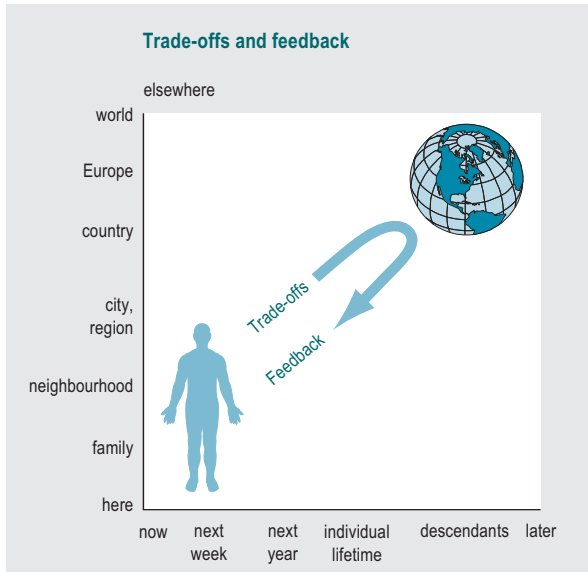


Figure 9 Trade-offs and feedback.

& noise near roads and airports) are also conceivable. In the other world views there is no ‘political and administrative’ feedback, only physical feedbacks. On the lower scales, the consequences of the global problems are experienced, for example, in the form of climate change and migration (to Europe and the Netherlands).

### Key factors for sustainable development

#### *Technology, behaviour, population growth and governance*

Sustainability as an issue is addressed differently in each world view, where each pursues an approach that fits best into its view of the world.

The GLOBAL MARKET world view (A1) assumes that under economic globalisation and individualisation, Dutch (or European) competitiveness will be equal to developments elsewhere. The market is assumed to develop the right technology (the core quality of this world view) at the right time, for example, to meet any negative consequences of climate change: ‘we’ll come up with something’. Studied from the perspective of the other world views, A1 leads to increasing vulnerability. As soon as the limits of natural systems are reached, partial technological solutions are found that push back these limits. This moves the system into an increasingly vulnerable situation, requiring repeated interventions to stave off such growing problems as climate change.

The CARING REGION world view (B2) makes a major demand on people’s consumption patterns and behaviour in the light of the social dilemma: ‘only join in if others do the same’. In this world view the institutional aspect needs to be strengthened.

The SAFE REGION world view (A2) shields itself from the threatening environment (‘clash of civilizations’). It seeks security and certainty through reduced dependence on areas outside the Netherlands (fewer imports), employment protection, less immigration and more security measures. The attempt to limit population growth by closing the borders, however, is counterproductive because the formation of blocks prevents ‘modernisation’ in some parts of the world. As a consequence the levels of population growth and poverty elsewhere remain high, which in turn leads to greater pressure on the borders.

The GLOBAL SOLIDARITY world view (B1) relies heavily on the increasing ability of international institutions and international agreements to manage all the factors that collectively influence the pressure on collective goods: population, consumption patterns and technology development. The risk of failure in the B1 world view is the capacity, or lack of it, to manage these political and administrative processes at the global level without lapsing into the creation of an enormous bureaucracy.

If, from the perspective of a single world view, too much is expected of one solution or the assumptions are too optimistic, the possibilities of achieving the goals of that particular world view will eventually be put at considerable risk – certainly from the perspective of the other world views (see diagram).

	KEY FACTOR	RISK OF FAILURE
GLOBAL MARKET (A1)	technology	sustainable technology does not materialize
GLOBAL SOLIDARITY (B1)	governance	bureaucracy
CARING REGION (B2)	change in behaviour	social dilemma
SAFE REGION (A2)	protection	global overpopulation

**Solutions**

To avoid the risk of taking a one-sided approach, the achievement of sustainability, and thus sustainable development, must be based on the following elements:

- credible governance with respect to both the setting of explicit goals and the means to achieve them;
- simultaneous management of the key factors of technology development and behavioural change;
- contribution to further ‘modernisation’ of the world and thus stabilisation of the world population (preventing the formation of cultural blocks);
- support for global agreements to resolve the ‘social dilemma’ associated with global ecological problems (e.g. the Kyoto Protocol);
- consideration for regional (ecological or social & cultural) interests in global trade agreements.

The GLOBAL SOLIDARITY world view (B1) provides starting points for blunting the sharp edges of the A1 strategy. The increasing power of international organisations such as the UN and the WTO makes international rules more effective. There is a risk that expectations of the effectiveness of international decision making are too high. Under the subsidiarity principle, this would mean that decisions are better taken at a lower level, for example, at the EU level, or by individual countries (a shift in the direction of the B2 world). This analysis demonstrates a European scale that seems to be reasonably effective for a mode of governance geared to achieving sustainability through the deployment of technical solutions, such as the distribution of ecological pressures and optimisation of (sustainable) energy production.

A sustainability strategy based entirely on the B2 world is, however, in some respects rather risky. In the 2000–2040 period this world shows a significantly lower income growth. In addition, adherents to other world views find the expectations for voluntary behavioural change unrealistically high.

In addition, there is a risk that the open Dutch economy will be sidelined if the economy ‘goes it alone’. In principle, this risk can be reduced by placing the choice of societal goals within a European framework. As an economic block, the EU is less open and in a better position to make a conscious choice for specifically European values, to which solidarity, good public services, and attention to ecology and the non-material aspects of life might belong.

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