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# The economy and its physical surroundings

Policy challenges and possible solutions 1995-2020

– Extensive summary –

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## Preface

Last summer CPB published ‘The economy and its physical surroundings: policy challenges and instruments 1995-2020’. This new long-term scenario study focusses on four themes that are likely to occupy Dutch policymakers during the coming years: energy, land requirements, transport and the natural environment. The study identifies potential bottlenecks and assesses several policy instruments addressing these bottlenecks. This paper discusses the methodology and summarizes the main conclusions.

## Introduction

The physical environment can be regarded as a large amount of capital, which is of vital importance for the wellbeing of our society. One important characteristic of this 'environmental capital' is that it is not or only barely 'makable'. In that sense, biodiversity, physical space, a clean atmosphere and our natural gas supply differ from a car factory, a machine and a school building.

Few countries face the restrictions and the finiteness of the physical environment more acutely than the Netherlands. Compared to other affluent countries, the Netherlands features a very high population density. Moreover, only very few countries record by area a higher number of car kilometres, cattle, flight movements and emissions of several important pollutants than the Netherlands.

The government, many citizens, and businesses aim to increase material prosperity. At the same time, the population is not expected to contract or stabilize in the foreseeable future. Without supplementary measures, therefore the demand for land and the pressure on the physical environment is likely to intensify rather than ease during the coming decades.

The policy challenges facing the Dutch economy thus become apparent. On the one hand, aspirations in the spheres of employment, private income and public services demand sustained strong economic growth. Restriction on land use and the physical infrastructure should impede this growth as little as possible. On the other hand, the quality of the physical environment must be protected in order to ensure not only that the Netherlands remains not only an attractive location for economic activity but also an attractive country for people to live in. Indeed, desired economic growth should not be achieved at the expense of the well-being of future generations. In the view of many citizens, economic growth should go hand in hand with relieving pressure on the environment, improving the quality of open spaces and maintaining and, if possible, improving the quality of the immediate urban and rural environment.

This study addresses the following questions: Which policies are required to arrive at a more sustainable economic development? Which solutions and policy instruments would ease the tension between the economy, energy consumption and transport on the one hand and the quality of the natural environment and on the other? Which contributions can the various policy instruments make, and what are their advantages and disadvantages?

*Methodology*

Answers to these questions are by definition conditional on a large number of external developments that are subject to substantial uncertainty. To deal with these uncertainties, we elaborated three different background scenarios, which are based on different assumptions for these external developments. We examined for each scenario how, *in the absence of specific government intervention other than under already agreed policies*, the pressure on the physical variables will develop during the period up to 2020. In assessing these developments, we did not account for feedbacks arising from any physical restrictions. The analysis of physical variables is structured around four so-called *core themes*: energy, land requirements, transport and the natural environment.

We then compared developments on the basis of agreed policies with the policy objectives. This produced a set of potential policy tasks for each core theme. Finally, we examined for each core theme how the discrepancies between the policy goals and the developments without policy changes could be reconciled. In several cases, we analyzed a range of policy instruments for effectiveness, efficiency and legitimacy.

*Background scenarios*

The three background scenarios are called: Divided Europe (DE), European Coordination (EC) and Global Competition (GC). These scenarios incorporate different trends in the spheres of international political and economic developments, technology, social and cultural factors, demography, and economy (see Burk and Suijer (1996)).

In *Divided Europe*, the Netherlands will record only modest GDP growth rates (1½% per year) and productivity gains. Neither the market mechanism nor the coordination mechanism will funcion well in Europe, including the Netherlands. As a direct consequence, European economic growth will substantially lag behind that in North America and Asia.

In *European Coordination*, Dutch GDP volume growth will be significantly higher over the coming 25 years (2¾% per year). EU policy coordination will play an important role. At the same time, a degree of isolation will develop between the world's major economic blocs.

*Global Competition*, is characterized by highly dynamic technological developments, extensive internationalization and a major role for the market mechanism. For the Netherlands, this scenario yields the highest economic growth (3¼% per year), the strongest productivity gains and the largest increase in the labour force. Unemployment will come down appreciably.

In all three scenarios, population growth will level off as the population ages steadily. Consequently, the growth of the potential labour force will decline. Labour supply, however, will continue to expand as more women enter the labour market and the number of people collecting disability benefits is reined in. Demographic, economic, social and cultural factors will also curtail the rise of the number of households.

In all three scenarios, the share of the services sector in the total economy will expand. Even so, industrial output will perform well in EC and GC compared to the period between 1974 and 1995. Manufacturing industries perform better than basic industries do. In the agricultural sector, only horticulture records appreciable output growth in EC and GC; but its output will decline in DE. The number of jobs created in the three scenarios will range from around 500,000 in DE to 2 million in GC. Most jobs will be created in the commercial services. In industry and in agriculture, employment will fall.

Unemployment will remain high in DE, owing to low economic growth. In EC and GC, in contrast, unemployment will fall gradually, from 8½% in 1995 to 4½% and 3% respectively in 2020.

*Regional developments*

In order to analyse the demand for land and transport per region in the Netherlands, we conducted a broad survey of demographic trends and labour demand per region. Because the highly buoyant services sector is well represented in the northern wing of the Randstad, the provinces North Holland and Utrecht will benefit particularly from this sector's growth. Employment in Gelderland, North Brabant and Limburg will rise sharply as a result of the deconcentration of activities away from the Randstad towards these provinces in all scenarios, the demand for labour will expand only modestly in the northeastern provinces because of the region's specialization in agriculture and industry.

Commuter traffic and labour market migration will increase. The northeastern provinces will experience more outward commuting and labour market emigration. Numbers of those commuting to the major Randstad cities will rise. Labour market migration to North Holland, Utrecht, Gelderland, North Brabant and Limburg will expand as a result of the favourable labour market situation in these provinces.

In the DE scenario, especially the northeastern provinces will suffer from surpluses on the labour market. In the EC and GC scenarios, labour market tensions will develop in Utrecht and North Holland, and to a lesser extent in the southeastern provinces.

*Energy and raw materials*

The consumption of energy and raw materials will continue to rise in all three scenarios. Dutch energy consumption will rise by 0.3% per year in DE, 0.9% in EC and 1.4% in GC, thus coming out between 7% and 41% higher in 2020 than in 1995. The consumption of raw materials in, for instance, the petrochemicals sector (to produce plastics) will rise by 0.8%, 1.3% and 2.1% per year respectively in the three scenarios. Also the transit trade through the Netherlands of various commodities (oil, coal, steel scrap) will continue to expand.

The rise in energy and raw materials consumption is due to economic growth and low energy prices. The projected penetration of new technologies and the influence of policy decisions imply that, compared to the past decade, more energy savings will be realized in EC and GC. The structure of the economy is gradually moving in an energy-extensive direction. Nevertheless, energy consumption will rise sharply in EC and GC. The savings in DE are broadly at the level of the last ten years; because economic growth is low, energy consumption will rise only slightly.

The low energy prices are related to the surge in oil supplies from non-OPEC countries. This expansion relies in part on the application of new oil-exploitation technologies. Barring temporary disruptions, there seems to be more than enough oil. With regard to natural gas, however, a larger share of supplies will come from potentially unstable countries (the former Sovjet Union, Algeria). This could prove a problem for Europe once Norwegian, British and Dutch natural gas production starts to decline after 2010.

Consumption of electricity is growing much faster than the consumption of fuels. This is due to the rapidly expanding use of electrical equipment in households and of information technology equipment and air conditioners in businesses. As a result of these trends, total electricity consumption will rise by 1% per year in DE, 2% in EC and 2.8% in GC. Total electricity consumption will thus be between 30 and 100% higher in 2020 than in 1995.

The emissions of carbon dioxide, nitrogen oxides and sulphur dioxide are strongly affected by the rise in energy consumption. The $CO_2$ and $NO_x$ targets will not be met under currently agreed and specified policies; the $SO_2$ target will be. In the low-growth scenario (DE), $CO_2$ emissions will stabilize at their 1995 level; in the high-growth scenarios (EC, GC), $CO_2$ emissions will come out 20-30% higher in 2020.

Also the penetration of ‘durable’ or renewable energy effects emission levels. The amount of renewable energy sources will rise appreciably in all three scenarios, but the ambitious target – 10% renewables by 2020 – will not be realized without supplementary measures. In part owing to the continued growth of energy consumption, the share of

renewable energy will come out at 4-5% by 2020 under currently agreed and specified policies. The low prices of fossil fuels play an important role in keeping this share relatively low. The energy-saving target – 33% between 1995 and 2020 – will be met in full in GC, almost in EC, but will not be met in DE. This outcome is determined in part by the rapid penetration of new environmental and other technologies in EC and especially GC.

International energy levies constitute an effective instrument for alleviating energy and environmental problems. This high effectiveness however, depends in part on extensive structural adjustments, especially in the basic industries (chemicals, metal). The formulation of broadly similar $CO_2$ reduction targets for the OECD countries and the countries in transition (CIS, Eastern Europe) will lead to relatively high levies and costs within the OECD. It is far more efficient to impose uniform levies for all countries so that most of the reductions occur in the countries in transition. The necessary adjustments can no doubt be made palatable to these countries if they were linked to financial transfers.

We have analysed various types of national energy policies: charges, levies, subsidies, investments and regulations (see Groot, Hendriks and Koopmans (1997)). These instruments have been framed in such a way that they do not seriously damage the international competitive position of business. Consequently, the adjustment problems in the analysed national polices are far smaller than with international energy levies. Against this, however, national policies are less effective. For example, the impact of the various analysed instruments on $CO_2$ levels varies from 1-10% of total emissions in 2020, while the gap between targets and actual outcomes in the high-growth background scenarios (EC, GC) amounts to around 20-30%.

Of the various analysed forms of national policies, national energy levies and direct regulation meet the criteria of effectiveness, efficiency and legitimacy somewhat better than the other instrument types (i.e. subsidies and investments). In the case of the analysed national energy levies, this is due above all to the virtual absence of any disadvantages; but the social support for this instrument may be relatively small. Regulation features potentially a relatively high effectiveness; but this must be set against implementation problems and high costs.

*Land requirements*

The spatial elaboration of the scenarios reveals that the processes of urbanization will proceed apace over the coming decades, despite moderating population growth. As long as the number of households and the economy continues to expand, this is hardly surprising of course. Depending on the scenario, a minimum of 40,000 ha and a

maximum of 68,000 ha of land will be needed in the period up to 2020 to meet the demand for residential developments. Under the latest Supplement to the Fourth Policy Document on Physical (Spatial) Planning (VINEX), published in 1996, between 28,000 ha (middle variant) and 31,000 ha (high variant) of land have been allocated for this purpose until 2010. In the high-growth scenarios (EC, GC), additional land for residential developments will have to be found before 2010.

Also the spatial demand for industrial use and office accommodation is rising, ranging from 9,000 ha in DE to 26,000 ha in GC. To realize the policy goal of the National Ecological Network, 125,000 ha of land will have to be converted into nature. The plans for forestry outside farms comprise 23,000 ha.

The expanding spatial demands for living, working, nature and forestry can in principle be met by converting agricultural land. The conversion of agricultural land into new urban developments, nature reserves or industrial estates is cheap in GDP terms. Indeed, arable farming, which accounts for nearly 60% of all land use, accounts only for 1½-2% of GDP. Moreover, the agricultural sector can be expected to easily release land if in the course of the liberalization of agricultural policy the prices of produce, and in their wake those of agricultural land, will fall.

Accordingly, spatial bottlenecks have far less to do with absolute shortage of land than with tensions between the demands for land of individuals and businesses, on the one hand, and the public demands for land as formulated in planning policies, on the other. Especially in the GC scenario, a substantial demand for additional residential, industrial and commercial land will arise in the Randstad even before 2010. The public objective of the National Ecological Network will be most difficult to achieve in the EC scenario, because the price of agricultural land is highest in this scenario.

In analysing these tensions in land use, we have taken population and economic growth as given. The social problem of allocating scare land then boils down to the question of how the spatial demands of the individual as a private person can be reconciled with the demands of the same individual as a member of a community. This reconciliation will invariably require a compromise. The emphasis could be on staying within the existing spatial-planning frameworks as much as possible. Another option would be to relax these frameworks. The first policy option would require a more intensive use of the space reserved for living and working. Preliminary calculations indicate that this option would considerably reduce the demand for land. On the negative side, it would take only limited account of the individual citizens 'and businesses' demands for living and working space. The alternative, relaxing the existing spatial-planning frameworks, does not suffer from this drawback. For the Randstad, however, this policy option would imply that the 'green heart' would no longer be kept open and that some of the buffer

zones would have to be sacrificed. Land for industrial use would have to be found primarily along the main transport corridors to Germany and Belgium.

The relevant arguments that have to be weighed in selecting a particular spatial model are of very different natures and cannot be reduced to a single (monetary) denominator through the market. Indeed, the various spatial models yield quite divergent social, economic, environmental, culture-historical, infrastructural and other implications. The choice of a specific spatial model thus belongs in the political domain.

*Transport*

The growth of personal transport in the Netherlands will slow markedly during the coming decades. The increase in the number of passenger kilometres during the period 1996-2020 will amount, under existing policies, to around only a third of the increase recorded during the period 1970-95. Even so, by 2010 the number of passenger car kilometres in the three scenarios will still exceed by 10% the government targets set out in the second Transport Structure Plan. Within total personal transport, car transport continues to gain in importance. In particular, the passenger car fleet will expand by between 40-60% during the period 1995-2020. The increase in the number of car kilometers will lag this increase somewhat, amounting to between 25 and 40%. Freight transport will continue to boom. In the high-growth scenarios, it will expand at a faster rate than over the last 25 years. Road haulage remains by far the most important mode of transport. In terms of vehicle kilometres, it will increase between 50 and 160%, depending on the sceniaro.

These developments will create several bottlenecks. Whereas accessibility by road has already deteriorated during the past decade, the situation will get worse also on the links with the hinterland. While congestion is primarily an urban problem and above all a rush-hour problem, the peak times are becoming more extended. Under the basic assumptions used, which include a relatively tight road network after 2010 and no road pricing, congestion will get worse in the future. The number of vehicle hours lost on main roads will rise by 15% until 2010, and even more in subsequent years. Without new policy measures, the congestion problem will take on extremely serious proportions by 2020, especially in the high-growth scenarios.

Energy consumption and $CO_2$ emissions from traffic sources will increase significantly, although the policy commitments call for reductions. Especially the $CO_2$ emissions generated by road haulage will surge. As far as $NO_x$ emissions are concerned, the targets for passenger cars will be easily met, but those for freight vehicles will be exceeding substantially. For other emissions, such as $SO_2$ and volatile organic compounds (VOCs), the outlook is encouraging. Noise pollution caused by road traffic, in contrast, will

increase in all three scenarios. Accordingly, the targets for reducing the number of people seriously affected by noise pollution by 2010 will not be met in any of the scenarios.

The links between transport and environmental pollution offer many points for policy intervention. Effective and efficient instruments are available also in the sphere of improving accessibility. Hence, the reconstruction of ambitious economic and environmental targets seems possible in principle, at least for large sections of transport policy.

With regard to enhancing accessibility, the importance of investments in road infrastructure should not be underestimated. This is true in particular for relieving bottlenecks on the routes to the hinterland. However, investments in road can not by themselves reduce urban congestion problems, even if they are carefully selected and properly embedded in the network structure. Directly intervening during rush hours seems to be a necessary condition for cutting traffic jams and creating more road space for the economically vital commercial traffic. On specific routes, also the stimulation of public transport could play a role. Generally speaking, however, public transport policy is not an effective instrument for improving accessibility by road.

In the environmental sphere, regulations aimed at producing a cleaner and quieter vehicle fleet have proved quite effective in the past. Further significant environmental gains should be possible along these lines in the future. However, regulation has suffered from the limitation that it usually addresses only one aspect of the link between transport and polluting emissions. Price policy does not suffer from this limitation. Hence, European-wide hikes in excise duties will not only reduce car traffic but also stimulate interest in more energy-efficient cars and in due course the production of a new generation of energy-efficient cars. All these effects could together significantly reduce $CO_2$ emissions from passenger vehicles.

Excise hikes are less effective however, in reducing soaring freight traffic because they will be passed on in higher transport charges. Accordingly, even with tighter regulations and supporting policies, the $CO_2$ targets for freight traffic are unlikely to come within reach. Stimulating intermodal transport, for instance, offers only very modest benefits in terms of reducing total road freight transport.

We examined noise pollution only in the context of road traffic. Investments and regulations offer opportunities to reduce this pollution further. Nevertheless, the highly ambitious target to reduce serious noise pollution to negligible levels can be achieved only at very large cost.

The major infrastructure projects should be organized well and include incentives for promoting cost-effective solutions. At the same time, the scope for risk management should be exploited to the full.

The above observations point to three challenges for transport policy. First, to create sufficient social support for the emplementation of effective and efficient instruments. Second, to resist the temptation to secure such support mainly by allocating financial resources. Third, to take another critical look at those policy objectives for which effective and efficient solutions are available neither at the national nor the international level. Indeed, rethinking goals for subcategories and differentiating goals by national and international policy sphere may be worth considering.

*Air transport*

In the three scenarios, air transport will continue to expand at a faster pace than GDP. Intensifying competition coupled with sustained low kerosene prices will bring down real air transport charges in all scenarios. Moreover, the scenarios do not take into accouont any national or international policies that will depress air transport growth. Under these conditions, passenger volume will surge to 60-95 million in 2020. Freight volume will expand even faster, from 1 million tons in 1995 to 3.5-5 million tons in 2020. The total number of flights will rise from nearly 300,000 at the start of the period under consideration to around 600,000-800,000 in 2020.

The rampant volume growth of air transport translates into higher energy consumption and emissions. In the period between 1995 and 2020, both $CO_2$ and $NO_x$ emissions from aircraft will rise by 60% (DE) to 150% (GC). The number of people affected by aircraft-generated noise pollution will fall until 2003. This trend has to do with the opening of the fifth runway at Schiphol Airport and the phasing out of noisy 2 aircrafts. After 2003, the air transport boom will be accompanied by an increase in the number of people affected by noise pollution. The target of no more than 10,000 noise-affected dwellings will not be realized. These outcomes apply to a passenger volume between 60 and 95 million in 2020. If volume restrictions are imposed on Schiphol Airport or if alternative policies are adopted to reduce noise pollution and emissions, the situation will be different.

Noise pollution and emissions can be cut in alternative ways. Imposing quotas on the national airport, without constructing a new airport infrastructure elsewhere, is very effective in reducing noise pollution and emissions. The drawback of this option is that it entails extensive economic damage.

There are alternative ways of realizing the environmental targets, more so with regard to noise pollution than with regard to emissions. $CO_2$ and $NO_x$ emissions can be reduced

by formulating rules or setting charges at the national level that aim to create a cleaner aircraft fleet at Schiphol. Most effective, however, are international regulations or international levies. Thus a worldwide kerosene levy would yield a considerable reduction in energy consumption and $CO_2$ emissions. The complication here is that a broad international political consensus has to be built. Even if such a policy can be put into practice, it remains an open question whether it can achieve a sufficient decoupling of air traffic and emissions so as to prevent a further increase in aircraft-related $CO_2$ emissions.

Many policy options exist for reducing noise pollution. A new airport infrastructure in a sparsely populated area to replace Schiphol Airport wholly or in part is an effective means for reducing noise pollution. The major disadvantages of a new airport infrastructure are the considerable costs and economic risks. A second option is to focus policy on securing a quieter and cleaner aircraft fleet. This can yield a substantial reduction in the number of people affected by noise pollution in Schiphol's vicinity and beyond. This could take the form of regulations, charges, levies or tradable noise permits. Specifically aimed at the 35 cost-units zone, a reconfiguration of Schiphol Airport (i.e. constructing a parallel Kaag runway to replace the Aalsmeer runway) and vicinity (i.e. purchasing and relocating residential dwellings) will be effective in reducing noise pollution. If the costs of such a policy are borne by the airport authority, the resulting additional charges eventually passed on to the air transport users are likely to be modest. Also regulations or charges aimed at the timing of takeoffs and landings can yield a major reduction in noise pollution around Schiphol Airport. Most effective would be a ban on night flights, but a disincentive policy operated through the charging structure should also have a significant impact. Economic costs will be higher in the case of a ban than of non-prohibitive charges.

From an economic point of view, a continued expansion at Schiphol Airport is most attractive. However, the choice between expansion at Schiphol and expansion at new airports is not a matter of either/or. There is a point where Schiphol's limits are approached also in a technical and spatial sense. The key point is that, under existing policies, the environmental limits will be reached much sooner than the technical and spatial limits. If additional policy measures can ensure that new airport infrastructure is introduced at a time when environmental, technical and spatial limits coincide as much as possible, then the social and private capital goods stock will be used optimally. An additional advantage is that the air transport market is likely to crystalize out to a large extent during the next decade, so that the many uncertainties in this sphere will be brought down to more manageable proportions.

*Natural Environment*

Emissions of polluting substances will, in the absence of new policies, broadly follow the trends set during the last decade. Without policy changes, $CO_2$ emissions will continue to increase: fractionally (virtual stabilization) in the low-growth scenario (DE) and by up to 20-30% in the high-growth scenarios. The other emissions will decline further. Nevertheless, some of the policy targets will not be met. To illustrate, $NO_x$ emissions will fall in all three scenarios, but well short of the target, mainly because of the growth in freight transport. The $SO_2$ target features a range, and the upper limit of this range will be reached in all the scenarios. Given the paucity of current policy measures, some emission levels will increase again after 2010.

Economic and biotechnological developments will result in an autonomous reduction in livestock numbers. This decline, however, will not be sufficient to meet the recently tightened phosphate and nitrate discharge limits.

Population growth and greater economic activity will intensify pressures on the environment. Nevertheless the implementation of the objectives of the National Ecological Network and the present manure- and ammonia-control policies will enhance the situation of natural habitats.

In the determination of various emissions ($CO_2$, $NO_x$ and $SO_2$), energy consumption and transport (i.e. road traffic) play a major role. Against this background, we examined the potential environmental impact of several key policy instruments affecting these spheres.

National energy levies could reduce $CO_2$ emissions by at least 10-12 megatons (or 4-5%) in 2020. The economic effects of these levies are only limited and energy taxes can be part of plans to modernize the tax system. The additional revenues can then be used to cut other taxes that are deemed too high.

The calculated potential $CO_2$ effect of direct regulations affecting energy efficiency is 20 megatons (or 8%) in 2020. The annual costs to the target groups would amount to at least several billion guilders. A drawback of direct regulation is that it involves implementation problems that may hamper the effectiveness, efficiency and legitimacy of this instrument. Several types of direct regulations that feature fewer of these disadvantages can together yield a $CO_2$ reduction of more than 10 megatons (or 4%).

By curtailing energy consumption, levies and regulations reduce emissions not only of $CO_2$, but also of $NO_x$, $SO_2$ and other harmful substances. Indeed, the instruments fit into

already agreed policy directions and produce relatively favourable results compared to other instruments of energy policy.

To realize the policy targets for substantial reductions of $CO_2$ and $NO_x$ emissions by road traffic, a combination of levies and regulations will be required. Regulation in the form of tightening emission targets seems a particularly effective instrument for cutting $NO_x$ emissions. However, even with the application of levies and regulations, the existing $NO_x$ emission targets will not be met. $NO_x$ emissions, like $SO_2$ emissions, contribute to the acidification problem. The targets for $SO_2$ emissions are broadly achieved in the three scenarios. Since this is proving far more difficult for $NO_x$ emissions, one way to relieve the acidification problem would be to tighten the $SO_2$ emission targets. Indeed, in terms of acid equivalents, the same percentage reduction in $SO_2$ emissions is twice as effective as cutting $NO_x$ and $NH_3$ emissions.

Higher levies on phosphate and nitrogen losses as well as the introduction of ammonia emission permits can make a significant contribution to realizing the government targets set out in the so-called Integrated Manure and Ammonia Memorandum. Levies and emission permits will act as incentives for a more efficient use of minerals. They will probably also reduce the least profitable elements of the livestock.

Paying farmers to maintain natural habitats and landscapes can help to protect the environment. For reasons of efficiency and transparency, this remuneration for farmers should not be linked to the prices of agricultural products.

*Main conclusions*

CPB's analyses show that the adverse effects of autonomous economic and demographic developments on land use, congestion, and the natural environment can be prevented to a large extent. The government has a major role to play in this context. Much of the damage to and depletion of resources occurs in the public domain. Although the allocation of ownership rights can contribute to a more efficient management of scarce physical resources, this offers no guarantee of sustainable development. Moreover, because of the scale effects and other characteristics, many of the resources involved do not lend themselves to privatization. Accordingly, one of the core tasks of government is to define frameworks for citizens and businesses with regard to the use of these resources.

Our first conclusion is that to limit the adverse effects of economic growth on the environment, physical resources will have to be dealt with more efficiently. The various analyses reveal that appropriate price incentives, if applied at the right scale level, can play a major role in achieving this.

*Background scenarios for the economy and physical environment, 1974-2020*

| | 1974-1995 | 1996-2020 | | |
|---|---|---|---|---|
| | | DE | EC | GC |
| Economy and demography | | | | |
| | annual change in % | | | |
| GDP growth | 2,2 | 1,5 | 2,7 | 3,3 |
| | end-year levels | | | |
| Employment (millions) | 5,9 | 6,3 | 7,5 | 7,8 |
| Unemployment job seekers (% of labor force) | 8,4 | 8,0 | 4,5 | 2,8 |
| Population (millions) | 15,5 | 16,2 | 17,7 | 16,9 |
| Physical environment, developments under current policies | | | | |
| *Energy* | end-year levels | | | |
| Real oil price, world market (USD/barrel) | 17 | 20 | 15 | 26 |
| | annual % changes | | | |
| Domestic energy consumption | 0,7 | 0,3 | 0,9 | 1,4 |
| *Land requirements* | end-year levels compared 1995, in thousands of hectares | | | |
| Claims for residentialand business purposes | - | 50 | 77 | 94 |
| Claims for natural purposes | - | 148 | 148 | 148 |
| *Air transport* | millions | | | |
| Passengers | 24,6 | 58,2 | 68,9 | 96,5 |
| | million tons | | | |
| Freight | 1,0 | 3,6 | 4,1 | 5,1 |
| *Transport* | end-year levels (1995=100) | | | |
| Passenger vehicle kilometers | 100 | 122 | 130 | 126 |
| Road transport: ton kilometers | 100 | 170 | 260 | 320 |
| *Environment* | | | | |
| $CO_2$-emissions | 100 | 102 | 120 | 130 |
| $NO_x$-emissions | 100 | 67 | 82 | 93 |

Secondly, the technological opportunities for a more efficient management of the environment are far from exhausted. What is more, new technologies are constantly being developed and refined. Price incentives, research and other forms of stimulation can accelerate the introduction of new technologies.

| DIVIDED EUROPE | EUROPEAN COORDINATION | GLOBAL COMPETITION |
|---|---|---|
| *1. International economic and political developments* | | |
| – market mechanism and regulation do not work well | – coordination plays a greater role than in GC | – market mechanism dominant: fierce international and policy competition |
| – EU: slow further integration | – more emphasis on 'equity'<br>– multispeed Europe | – emphasis on 'efficiency'<br>– Europe à la carte |
| *2. Technological developments* | | |
| – sluggish growth in knowledge potential | – strong growth in knowledge potential | – strong growth in knowledge potential |
| – little knowledge diffusion | – inefficient knowledge diffusion | – strong knowledge diffusion |
| – more traditional focus on technological developments | – technological developments focused more on social needs | – information technology allpervasive<br>– technological developments strongly market-oriented |
| *3. Social and cultural developments* | | |
| – nationalist feeling predominate<br>little additional scope for quality consumption | – sense of being 'European' or 'regional' citizen<br>– greater sense of community, solidarity<br>– consumption patterns and lifestyles more oriented on non-material and environmentally friendly aspects | – sense of being 'world' citizen<br>– strong individualism<br>– large degree of product differentiation and strong materialistic/hedonistic culture |
| *4. Demography* | | |
| – immigration balance lowest | – immigration balance higher owing to solidarity | – immigration balance relatively low owing to policy competition |
| – fertility and life expectancy relatively low | – fertility and life expectancy higher | – fertility and life expectancy moderate |
| – population in 2020: 16.2 mln | – population in 2020: 17.7 mln | – population in 2020: 16.9 mln |
| *5. Economy* | | |
| – strong GDP growth in North America and Asia; Europe lagging behind | – relatively strong GDP growth in Europe and Asia; North America lagging behind | – strong GDP growth worldwide |
| – Dutch GDP growth: 1½% per year | – Dutch GDP growth: 2¾% per year | – Dutch GDP growth: 3¼% per year |
| – sluggish private consumption growth | – relatively strong private consumption growth, but more socially and environmentally aware | – strong private consumption growth, very high degree of product differentiation |
| – relatively few changes to production structure | – less intense international competition; more international environmental policy; more public services | – highly dynamic production structure; emphasis on comparative advantages; on high-value activities |
| – labour market: relatively high unemployment | – labour market: falling unemployment, less dynamism | – labour market: low unemployment, great job insecurity |

Our third conclusion is that, for some problems, international cooperation is a necessary condition for a truly effective approach. This applies above all to problems involving internationally tradable goods and cross-border pollution.

Finally, the various analyses stress the benefit of a pragmatic approach. New knowledge and experiences, for instance in the field of international cooperation or attempts in that direction, can prompt a reassessment of the goals in terms of their original merits and interconnections.

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