6 Final remarks

6.1 Introduction

We begin this final chapter with a brief overview which attempts to put the four scenarios in perspective and explain their rationale and plausibility. We will then focus on policy-oriented conclusions. Actually, many conclusions have already been drawn from this study in the chapters on the prosperity circle, comparative-strength analysis and trends. Therefore, in this chapter we will focus on lessons emanating from the scenarios themselves, specifically, how the scenarios may contribute to what we define as their ultimate goal: the development of strategic policies.

6.2 Scenario rationale

Generally speaking, the scenarios presented may be interpreted as the condensation of our knowledge concerning long-term issues. The prosperity circle, comparative-strength analysis and long-term trends are all combined to give four impressions of how the world economy might develop in the future (see Figure 5.1.1).

The Balanced Growth scenario is basically optimistic. It tries to show that balanced economic growth of 3.5–3.75 per cent annually, which is ecologically sustainable and embraces all the major regions of the world, is still a quite realistic possibility. Although no *conclusive* evidence can be offered for this result, we have tried to substantiate it with research on global environmental problems, world food supply and the depletion of non-renewable mineral resources. Despite its 'can do' character, this is not to say that this bright scenario will materialize effortlessly. As indicated in the scenario, formidable changes are required on a regional, as well as global basis. Nor does this optimistic scenario imply that the income gap between the poorest LDC regions, and the DCs will vanish quickly. In our view, however, the odds are that in this scenario, many favourable conditions are created for an extension of this period of sustainable economic growth as well as catching up of the LDCs until well *after* 2015.

The Global Crisis scenario is the counterpoint of Balanced Growth. It explores the risks and dangers of a neglect of, and late response to regional and global challenges, especially on the part of *Triad* regions. As a result, according to this scenario, the world may end up in the throes of widespread distress, an eco-crisis, which can only be corrected at high cost. The policy message conveyed by this scenario is abundantly clear. Dismissing this scenario as unduly gloomy and pessimistic is in our view, absurd; such a statement would be tantamount to a complete denial of large segments of twentieth-century history.

The Global Shift and European Renaissance scenarios have a distinctly regional focus and may be the most recognizable since both scenarios contain positive and negative developments. They explore particularly divergent developments with respect to the two most powerful economic blocs in the world: North America and Western Europe. The scenarios drive home the message of their vulnerability, as well as the profound *radiating* effects their (positive or negative) economic performance may have on other regions, especially those nearby. The view of their vulnerability is based on the comparative-strength analysis in which these regions' major weaknesses are identified.

In Global Shift, Western Europe falls behind by regressing once again onto an economic course where nationalism, rigidities and *dirigisme* take first place. In the European Renaissance scenario the United States faces serious problems because it fails to correct its 'over-shooting' free-market inclinations, causing essential government tasks and cooperation to be neglected and undervalued. Another feature of these, indeed of all the scenarios, is the continuous and relatively undisturbed rise of the Asian economies.

6.3 Plausibility of the scenarios

Box 6.3.1 Quantitative plausibility of the scenarios

The growth rates for the world economy in the scenarios range between 0.6 and 2.4 per cent on a per capita basis. Looking at the lower limit, a per capita growth rate of 0.6 per cent can indeed be considered low, from an historical perspective. Although there are periods with zero per capita growth, for example, 1979–1983 for the world economy as a whole, and 1929–1938 for the OECD regions, these periods are rather brief, when compared with a twenty-five-year time horizon. Considering the post-oil-crisis period (1973–1989) as a whole, per capita growth of the world economy still reached 1.5 per cent a year. In the 1913–1950 period, which encompassed two world wars and the recession of the thirties, per capita economic growth in the (present) OECD countries was, nevertheless, 1.2 per cent a year.

When considering the upper limit for per capita world economic growth (2.4 per cent) from an historical perspective, it can be assessed as high, especially if it is taken into account that in the Balanced Growth scenario, heavy emphasis is put on environmental policies slowing down economic growth by 0.25 to 0.5 per cent a year. In the OECD area a higher per capita growth rate (3.75 per cent) was realized in the 1950–1973 period. It should, however, be kept in mind that during that period, the OECD countries, not including the United States, had unique opportunities for catching up in a very favourable global economic climate. Today, the growth rate in the OECD regions will be more determined by the technological frontier as the possibilities for catching up have eroded. Since the OECD countries account for over 70 per cent of world GDP, their performance will heavily influence the growth rate of the world economy.

Finally – and this is important to both the upper and lower limits of growth rates – it should be noted that there is a downward aggregation bias in calculating per capita world economic growth rates, as population growth is the highest in the poorer regions. If per capita growth rates in the OECD and the rest of the world are equal, the per capita growth rate for the world economy will nevertheless be lower than this (equal) growth rate for the two regions.

Admitting once again that all scenarios are to a large extent, arbitrary stories, we are also convinced that our fantasies are not all that far-fetched. This is first and foremost because our scenarios are firmly rooted in the prosperity circle and our analyses of regions and trends. Secondly, we have carefully tried to identify the possible chains of events and the interwoven mechanisms leading up to the divergent sketches of the world economy, each involving its own opportunities, bottlenecks and policy reactions. Thirdly, the plausibility also holds true with regard to the quantitative underpinning of the scenarios, especially with regard to the global economic growth rates which range on a per capita basis, between 0.6 and 2.4 per cent annually (see Box 6.3.1).

In summary, we consider all four scenarios to be quite plausible on a qualitative, as well as quantitative basis, which implies that no *one* scenario should be discarded beforehand. It is therefore our hope that these conjectures of the future may provide a starting-point for precipitating the debate on long-term issues.

6.4 Thinking the unthinkable

In our view plausibility does not exclude surprising developments. Indeed, surprises are themselves plausible; they are to be expected, as history within the last decade has once again made so clear. *How* is 'thinking the unthinkable' reflected within the scenarios? Of course, strictly speaking, thinking the unthinkable is impossible. More accurately, the issue is whether there are a few developments apparent in the scenarios which might have a significant impact in the long term, but at present appear only in the *embryonic* stages. Besides being subjective, these developments are also highly speculative, and they deliberately have a non-consensus nature. The purpose of this is primarily to confront people in general with the occurrence of unexpected developments, as well as to give them the opportunity to consider the extreme consequences of certain developments. We will return to this point in the next section, when we consider the impact of the scenarios on strategic policy making.

We believe the following developments in the scenarios are among those which can be considered non-consensus developments:

- in Global Crisis
  - the ecoshock
- in Balanced Growth
  - the multipolar growth, comprising almost the entire world
  - the rapid social transformation of Japan
  - the global CO_2 treaty
- in Global Shift
  - the stagnation of European integration
  - the take-off of India
- in European Renaissance
  - the decline of the United States
  - the rapid reconstruction of Central Europe and Eastern Europe

Finally, we note that *even* these surprises ultimately reflect the preoccupation of the age in which this long-term study is being compiled. Even long-term 'planners' cannot escape that[1].

6.5 Impact on strategic policymaking

How can the study, including the four wide-ranging, uncertain, but plausible scenarios, be brought to bear on strategic thinking and decision making? The broad scope of the study, geographically as well as in terms of issues discussed, has the advantage that it can be used as background for many subjects which require a long-term view. It also means, however, that a further elaboration will almost always be needed in order to meet the special demands of the various decision makers who have different, sometimes even conflicting, interests and backgrounds. This implies that an attempt to indicate in which way the scenario analysis can be applied must be restricted to rather general terms. As a more concrete example of how the study can be used, we will elaborate a bit on strategic policy making for the European Community[2].

In general terms, the first and foremost message of the study is that strategic decisions should not be based on a single scenario and most certainly not on one vision of the future based on an extrapolation of today's *conventional wisdom*. Although policymakers often long for a scenario called 'trend scenario', 'reference scenario', 'business-as-usual scenario', 'middle-of-the-road scenario', or any other name suggesting it as the most probable scenario, this longing should be resisted. The future is fundamentally uncertain in many respects and the only contribution such a single scenario could make would be to create a false sense of certainty. This can be extremely dangerous, leading to wrong decisions and too-late corrections, should future developments turn out to be different.

The preferred procedure in preparing strategic decisions implies as a first step, the identification of the pervasive developments which appear in (almost) all of the scenarios. Examples of pervasive trends evident in each of the scenarios include:

- the rise of Asia, especially of the DAEs, as reflected in the decline of output and trade shares of other regions, most notably of Western Europe and North America, within the total world economy;
- the long period of time needed in order to reconstruct the NMEs;
- the development of most Third World countries taking even longer than the reconstruction of the NMEs;
- the need to take seriously the failure of at least one of the LDC regions;
- the relentless continuation of technical change and internationalization;
- the spread of environmental problems, globally, as well as regionally;
- the risk of the emergence of antagonistic trading blocs.

When the pervasive developments are considered in light of the comparative-strength analysis, this often leads to rather straightforward conclusions on policies which should definitely not be pursued, as opposed to policies which will be viable in all scenarios[3]. These are the so-called *no-regrets policies*.

There will also be categories of policy options where the right choice is heavily dependent on the occurrence of one or the other scenario (see the examples of non-consensus developments which were mentioned in section 6.4). In such a case, various scenario-dependent options should be prepared, including an analysis of the consequences, should one of the other scenarios come true instead of the chosen scenario. This process of policy preparation can in itself contribute towards *social innovation* as the participants are forced to relate the various possible decisions with the various futures which may unfold, thereby breaking free from existing habits and perceptions. Keeping all options open until there is less uncertainty about future developments is often not possible. At some point in time, choices will have to be made. In that situation the decision should not be looked upon

as ultimate wisdom, but as an inevitable *entrepreneurial* choice, to be made while facing a fundamentally uncertain future. This implies that care should be taken to incorporate the highest degree of flexibility in the strategy itself, in order to limit the damage caused by a possible failure. It should also lead to an immediate development of correcting strategies in case future developments turn out to be different than assumed.

6.6 An example of strategic policy: the case of the European Community

6.6.1 Introduction

A major difference between strategic policies for an individual firm or an individual (small) country and a large region like the European Community is that strategic policies of a large region not only influence its own future, but also the future development of the world economy. The European Community has this potential, and should try to avoid the Global Crisis and Global Shift scenarios. In that sense it is not only a matter of adjusting to the future, but also of *shaping the future*. According to the previously outlined procedure, we will first look at pervasive developments in combination with the comparative-strength analysis and try to arrive at policies which have a strong *no-regrets* nature. A distinction will be made between policies within the EC (domestic policies) and foreign policies to be pursued by the EC. Secondly, we will turn to non-consensus developments and policy options.

6.6.2 Pervasive developments and no-regrets policies

Domestic policies

Ever-increasing competitiveness of the Far East, lagging behind in emerging technologies, rigidities in the European product and labour markets, ageing of the population, growing emancipation and independence of individuals, and continued migratory pressures all seem to be challenges which internal EC policies will have to deal with, no matter what. In many respects the Europe '92 project counts as Europe's most prominent response, especially by creating more competitive market structures within an integrated European economic space. This is why full implementation of the Single European Act and the EMU are extremely significant. There is, however, serious doubt as to whether this will provide sufficient means to reinvigorate Europe's labour markets and innovative capacity.

The malfunctioning of the West European labour markets is a major weakness of Western Europe and is closely related to the large expansion of the welfare state, as discussed in the comparative-strength analysis (section 3.4). The ageing of the population and continued immigration will increase pressures on the present system, inducing an upward trend in social security outlays and related taxes and premiums[4]. Furthermore, the growing emancipation and independence of individuals will furthermore make it harder to manage the system. Although a reform of present welfare-state arrangements and labour-market institutions seems inevitable and can be judged as a no-regrets policy, this does not completely determine the character of the reform. Reforms can either put the main thrust on obligatory elements and organizational changes, or on the scaling down of financial entitlements and a reduction of regulations. These non-consensus options will be discussed later. A successful reform will result in a (relative) decline of transfer outlays, which opens up opportunities for reducing distortionary taxes, especially on labour, thus reinforcing the effects of the reforms.

On the Community and national levels, new policy initiatives could also be proposed for research, education and infrastructure. Strengthening the quality in these fields has a strong no-regrets character and is necessary in all successful scenarios. Examples along these lines include: a European Education Review which tests on a regular basis the level of education of member states; the fostering of centres of excellence in technical education and research; improving links between small- and medium-sized business and universities and research centres in order to promote a rapid diffusion of new technologies; programmes to fill the

major gaps in Europe's systems of transport and telecommunication, including an extension to Central Europe, etc.[5].

Foreign policies

On the international level, the pervasive challenges for Western Europe concern the world trade system, global environmental problems and the reconstruction and development of neighbouring regions (Eastern Europe and Africa).

The European Community could propose the following policy initiatives for the 1990s:

- break the deadlock in GATT by compromising drastically with the United States, CAIRNS group and LDCs, concerning the liberalization of agriculture; if possible, in return for an American commitment to help set up a global action plan to curb the emission of greenhouse gases;
- promote a new round of GATT talks, aimed at further defining the *rules of the game* for technology and industrial policy, in order to preclude the rise of techno-protectionism[6];
- rapidly expand the European Energy Community, making it into an operational organization in the energy, as well as environmental fields;
- grant a special member-state status to Central European countries in the European Community, starting with Poland, Hungary and Czechoslovakia, within a short period of time[7];
- set up a new, experimental international aid programme for the poorest LDCs.

The reasoning behind these initiatives is that on the one hand, opening up markets and supplying aid demonstrates Europe's long-term commitment to the development of LDCs and NMEs. As part of this, an experimental aid programme should primarily focus on discovering new and more effective ways of providing aid. The lessons which can be gleaned from the successes and mistakes of 40 years of development policy will have to play an important part in this process. We believe important focal points for this are the prevention of rent-seeking behaviour, and the promotion of good governance, human rights and the ecological sustainability of development processes. The European Energy Community will be able to significantly contribute towards the economic development of NMEs. This is also the case for their admission to the European Community, albeit with a special status.

The policy initiatives also contain significant advantages for Western Europe itself, however. By stimulating a more stable economic and political climate in the region, they can help ease the migratory pressure on Western Europe. Furthermore, as outlined in the European Renaissance scenario, the European Energy Community reduces energy dependency on the Middle East, while also providing the opportunity of tackling important environmental problems, for example acid rain, through the exploitation of Siberian gas and a joint policy for energy conservation. Moreover, favourable economic development in Central and Eastern Europe and Africa implies that attractive market opportunities for Western Europe are gradually being created. Lastly, as one of the most open regions in the world economy[8], and with its relatively weak position in high-technology sectors, it is very much in Western Europe's interest to oppose the threat of techno-protectionism.

If successful, this strategy will also imply the rise of even more competitors, in addition to those from Asia which were mentioned previously. These new competitors will be especially active in the medium- and low-tech markets, where a number of West European countries are still relatively well represented. This re-establishes the importance of upgrading and innovation within Western Europe and the improvement of the functioning of product and labour markets.

The policies outlined have a strong no-regrets character and are pursued in both scenarios in which Western Europe shows a rather favourable development: Balanced Growth and European Renaissance. The international policies, however, are only fully realized in the Balanced Growth scenario because in the European Renaissance scenario, there is a lack of international consensus and cooperation, especially inspired by the relative decline and protectionist tendencies in the United States.

6.6.3 Non-consensus developments and options

Apart from the no-regrets policy options just discussed, which fit in any successful scenario for the European Community, several policy options can be distinguished which are scenario-dependent. This is reflected in the differences between the European Renaissance scenario and the Balanced Growth scenario. Although in the European Renaissance scenario, certainly in product and labour markets, more emphasis is put on the driving forces from the Free-Market perspective, compared with the past twenty-five years, the West European traditional emphasis on the Coordination perspective remains rather important and becomes more effective at the national levels and is extended at the Community level. In the Balanced Growth scenario, the shift to the Free-Market perspective is more pronounced. The differences in successful policies in both scenarios can partly be explained by the different character of technological and international economic developments, and partly by divergent socio-cultural and political trends. The difference in policies successfully pursued is most pronounced in the character of the reform of the welfare-state and labour-market institutions, and in technological and industrial policies which also have consequences for the character of European integration. In these fields strategic policies cannot easily be outlined as they contain various dilemmas and a large element of uncertainty regarding their success.

The welfare state

In the European Renaissance scenario, the maximum of effort is made to retain the West European legacy of social equity. It is, however, also understood that present welfare-state arrangements handicap economic progress and call for fundamental changes. The reforms pursued are a mixture of reactivating the Coordination-oriented legacy, organizational reforms and a modest and selective sobering of financial entitlements. The reactivation of the Coordination-oriented legacy is evident in the consensus between governments, employers and labour unions that an effective policy is needed for extending job opportunities for the weaker part of labour supply (less-skilled, minorities, partially handicapped, etc.). Governments supply services for re-education, temporary subsidies and support for job search. Employers accept that they will have to make a verifiable contribution to solving social problems in order to maintain peace on the labour market, while unions, in addition to limiting the rise of average real wages to labour productivity growth, allow larger pay differentials in order to promote more jobs for the less-favoured. The organizational reforms include stricter requirements for entry to social security systems, tighter checks, commitments towards retraining and continued education and acceptance of less-desirable jobs (including workfare). In addition, the implementing organizations are revised to such an extent that those who execute the schemes, will have a strong direct interest in controlling the costs[9]. The third part of the reform is a modest and selective sobering of financial entitlements, including a scaling back of paternalistic subsidies. This is especially applied in countries and for schemes where the differences in income between those who work and those who do not are rather small for the lower-skilled. No fundamental changes are applied in the field of collective wage bargaining.

In Balanced Growth the continuous rise of educational levels, emancipation, growing individualism, quickly changing competitive product markets and the need for a very flexible labour market, lead to the impossibility of implementing effective policies in the Coordination style. Central employers' and employees' organizations lose their grip on their sub-organizations, which become increasingly more affected by individual members primarily looking after their own interests. Privacy arguments are a stumbling block to a more effective control of social security expenditures, while the decline of loyalty at lower levels of the bureaucracy up to the centre also hampers effective coordination and control. The conclusions of this loss of capacity for effective cooperation and coordination are drawn by making a more radical shift to the Free-Market perspective. Social insurance and social security are simplified and reduced to minimal provisions. Insurance for higher benefit levels is left to private decisions and private insurance. Because of growing heterogeneity of the

population, the problems of control, and the disincentives of the old system, the reforms gradually head in the direction of an individual, negative income tax. Labour-market regulations are relaxed, the support for collective wage bargaining is withdrawn, and apart from education, paternalistic subsidies are abolished.

These two different ways of reforming the welfare-state and labour-market institutions pose a clear dilemma. The policies pursued in the Balanced Growth scenario result in a harsher social climate. Although West European arrangements still remain more generous than those in the United States and Japan, they imply quite a break with the West European legacy of social equity. In European Renaissance the change in policies is far less radical, but on the other hand, involves more risks. If the social consensus is not restored and economic subjects are not willing to subordinate to the common good, policies based on cooperation and coordination will fail, having a detrimental effect on the economic performance of Western Europe.

Industrial policies

If a world resembling Global Shift or Balanced Growth does emerge on the horizon, including many newly industrializing countries, a great deal of technological dynamism, fierce competition, the swift appearance of new firms and industries and disappearance of old ones, then industrial policies in the Coordination style will become ineffective, or even counterproductive. In such circumstances a further shift to the Free-Market perspective is needed, aimed at further privatization and deregulation, including cutting down entry restrictions, import barriers and artificial monopolies. The process of European integration can have a rather decentralized character in these circumstances; economic policies at the Community level are only needed to lift remaining barriers between member countries. A more centralized economic policy will not be fruitful since it only implies the risk of bureaucracy and unnecessary loss of national autonomy.

If, however, technological developments have a less dynamic character, and economics of scale play a dominant role, leading to the emergence of world-wide oligopolies and strategic alliances, then strategic industrial, technological and trade policies may have an important role to play. This will especially be the case if, as in the European Renaissance scenario, the economic performance of the United States declines and American protectionist tendencies increase, while Japan and the DAEs continue following successful policies in the Coordination style. West European policies should then be aimed at developing their own technological potential, at creating a reduction of uncertainty for conglomerates which are active in emerging technologies, and which seek support from governments, and at actively favouring cooperation (including mergers) between European high-tech companies. This calls for policies in the style of the Coordination perspective. The question is, however, whether such policies can really be implemented effectively. The seventies were a clear example of European impotence, also in this field, in contrast to Japan and the DAEs. The danger of strategic industrial, technological and trade policies lies not only in the trade wars they may evoke, but also in the danger that instead of actual policies being directed at emerging industries and technologies, they would slow down adjustment processes in threatened industries and firms. To avoid a battle within Europe, such strategic policies, if pursued, need to be coordinated at the level of the European Community, thus giving rise to a more centralized model of European integration in the field of economic policies.

A possible strategy

Important strategic decisions concerning the future course of policies will have to be made. In the field of strategic industrial, technological and trade policies, the right choice (hands off or hands on) heavily depends on external developments concerning the character of technological developments, international trade and market structures, although it should be added that even when external circumstances develop as in European Renaissance, no policies are better than bad policies. The best way to proceed in this field seems to be to start executing only no-regrets policies. An early, and perhaps unnecessary, start of implementing more specific industrial, technological and trade policies may close the door

to more favourable scenarios, because of the trade and subsidy wars it may evoke on a world-wide scale. Western Europe should, however, prepare itself for the need to apply more specific policies when circumstances evolve in this direction. The preparation should be especially careful in developing procedures and methods to counter the risk of implementing 'slowing-down' policies instead of 'accelerating' policies, a risk of which there is so much evidence in past experience.

The choice of how to reform the welfare-state and the labour-market institutions is less dependent on international developments, than on political choice and on the judgement of the West European ability to reactivate the driving forces from the Coordination perspective in this field. As far as the welfare-state arrangements are concerned, the least risky policy, from a (narrow) economic point of view, seems to be a radical reform in the Free-Market style. If the world economy develops more along the lines of the Free-Market perspective – as in Balanced Growth and Global Shift – it fits perfectly. When economic policies in the Coordination style are required – as in European Renaissance – far more restrained welfare-state arrangements are not a handicap either, while they avoid the risk of failure of more subtle reforms. As discussed in section 3.4, the growth of welfare-state arrangements has not strengthened the capacity and willingness for cooperation and collective adaptation, but undermined the need and potential for this. The countries which most effectively apply Coordination-style policies (Japan and the first-tier DAEs) lack comparable welfare-state arrangements. Furthermore, a radical scaling down would free the financial means for policies in the fields of education, technology and infrastructure, and for a reduction of the high rates of taxes and social security premiums.

Reform of labour-market institutions must be assessed in combination with the welfare-state arrangements. The leaner the welfare-state provisions, the greater the self-interest of trade unions and their members to cooperate in the field of employment, and the greater the chance that advantages of stability and consensus compensate the negative aspects of inflexibilities. The more generous the welfare-state system, the more negative the judgement should be of labour-market regulations and support for labour unions' bargaining position with respect to wages, since these reinforce disincentives and inflexibilities.

The choice for the way to reform welfare-state arrangements can, however, not only be judged according to the effects on the functioning of the economy. Although the negative economic side-effects are clear, it is also clear that the average West European citizen and politician approves of the main goals which the system pursues: a reasonable income distribution, social equity and cohesion. From this point of view, the most desirable strategy will probably be to start trying to fully implement the policies envisaged in the European Renaissance scenario. This supposes that the negative political aspects also associated with these reforms (privacy problems, more selection, control and obligations) can be overcome and a consensus between employers, unions and government can be reached. This could be combined with a more selective support for the bargaining position of trade unions (not for wage increases and wage compression, but for programmes in the field of retraining, on-the-job training, programmes fostering the employment of weaker groups in the labour market, etc.). In case these policies fail (which includes the possibility that they cannot be effectively implemented), however, governments should be prepared for an approach tending more towards the simpler, but more radical Free-Market style.

6.7 Social innovation

Just like Western Europe, other countries and regions will have to formulate their own strategic policies. However, in a world which is globalized on the one hand, but where there is no world governance, the independent pursuit of individual objectives by regions will increasingly create international tensions and conflicts. The danger exists though, that as a result, particularly those problems of truly global dimensions will get bogged down, risking a development as envisaged in the Global Crisis scenario.

At this point we believe the rich countries bear a special responsibility to preclude such a development. Moral principles, as well as self-interest, may be advanced as motives in support of this view. Moreover, because of their power and knowledge, they have the highest potential by far, to take initiatives aimed at coping with these challenges. Their resolve may be decisive in averting possible deadlocks. Accepting this responsibility would meet one of the major prerequisites for a more optimistic development of the world economy, as we tried to sketch in the Balanced Growth scenario. Bearing in mind the dimensions of the challenges facing the world at large, as well as sacrifices that have to be made in exchange for uncertain future benefits, it cannot be taken for granted, however, that the rich countries *will* accept this responsibility.

No matter how important the contribution from the DCs may be, it in no way constitutes a guarantee that all world problems will be solved. As repeatedly stressed up to this point, this is more true of the issue of sustained and sustainable economic development in the Third World, than with anything else.

Ultimately, therefore, it is our belief that both regional and global challenges require more than sound economic analysis and policies, no matter how indispensable they may be: something we have called *social innovation*. No simple guidelines can be offered as to how this should be brought about. Indeed, twentieth-century history is full of examples where it failed to appear, or where it only emerged *after* a severe crisis, often resulting in grave human misery. But there are also examples of success. If experience can provide any guidance, two preconditions stand out: an *open democratic society* and *farsighted leadership* uniting fearlessness, humanity and a vision of the future.

Notes

[1] Even if we could miraculously come up with scenarios which after twenty years would be judged to mimic perfectly the challenges of the year 2010, if those challenges had absolutely no reference to the present, such scenarios would be disregarded; compare Steven P. Schnaars, 'Megamistakes', p. 72, The Free Press, New York (1989).

[2] In the middle of 1992 a follow-up study will be published which focuses on The Netherlands.

[3] If the occurrence of one of the pervasive developments is crucial to the success or failure of a strategy, it should be advised to pay special critical attention to that specific development; the present judgement on pervasive trends cannot be taken for granted and if there are doubts, in such a case the construction of a divergent scenario should be considered.

[4] The effects of ageing not only concern the growth of old-age pensions and health-care expenditures because of the increasing share of people aged over 65, but also the consequences of the (much faster) growth of the share of the population aged 50-65 years, as far as sickness and disability benefits are concerned.

[5] For no regrets policies in the field of technology, see for example Henry Ergas, 'Does Technology Policy Matter', in B. Guile and H. Brooks (eds.), 'Companies and Nations in the World Economy', National Academy of Engineering Technology and Global Industry, Washington D.C. 1987.

[6] See also OECD, 'Strategic Industries in Global Economy Policy Issues for the 1990s', OECD International Futures Programme, Paris (1991).

[7] This assumes that expanding the European Community to include the EFTA countries will no longer be a strategic issue.

[8] Even excluding trade between the West European countries, themselves.

[9] For example, by binding them to a budget which is based on objective criteria (instead of the so-called open-ended arrangement).

Appendices

Appendix 1 Demography and Labour supply

A.1.1 Introduction

Section 4.2 briefly summarizes the most significant outcomes of the medium variant in the 1988 United Nations population projections. This section also indicates how labour supply in the different regions might develop based on the above-mentioned medium variant, and assuming that age- and gender-specific levels of participation would remain constant between 1990 and 2015.

In the scenarios of Chapter 5, there is a deviation from the outcomes of Chapter 4. Because fertility, mortality and migration are partially determined by scenario-related economic and social developments, the demographic development differs among scenarios. This is even more true of the development of labour supply. The functioning of the labour market, developments in social security and taxation, levels of education and emancipation are important, scenario-related determinants of this process.

This appendix explains how and to what extent demographic development and growth of labour supply in the scenarios differ from the outcomes in section 4.2. Initially, regional demographic development in the different scenarios is addressed. Subsequently the development in labour supply will be discussed.

A.1.2 Demography

Fertility rates

The medium variant in the United Nations population projections provides the starting-point for the demographic developments in the scenarios. The most important source of uncertainty in these demographic projections is the development of the fertility rate in the LDCs.

Among the factors affecting fertility development are economic development, information and services in the area of family planning, availability of contraceptives, and educational participation by women, in particular. Because these determinants of the fertility rate are, in turn, themselves related to political, social and economic developments which vary according to scenario, the developments of the fertility rates in the LDC regions have also been made dependent on the scenarios. Economic development in the Balanced Growth scenario and the emphasis placed on education mean that here, there is a relatively favourable prospect of a rapid decline in the fertility rate. Consequently, this scenario supposes that the fertility rate in the LDCs develops along the same lines as the *low* variant in the United Nations population projections. The Global Crisis scenario is the counterexample of Balanced Growth. Global Crisis assumes that the fertility rate in the LDCs develops along the same lines as the *high* variant in the United Nations population projections. Global Shift and European Renaissance take a middle position by assuming that fertility in LDC regions develops in

Table A.1.1 Scenario-specific fertility rates according to region in 2015

	Global Shift	European Renaissance	Global Crisis	Balanced Growth
		Fertility rate (UN variant[a])		
DCs	1.9 (medium)	1.9 (medium)	1.9 (medium)	1.9 (medium)
NMEs	2.1 (medium)	2.1 (medium)	2.1 (medium)	2.1 (medium)
DAEs	2.0 (low)	2.3 (medium)	2.8 (high)	2.0 (low)
Other LDCs	3.3 (medium)	3.3 (medium)	3.7 (high)	2.8 (low)

[a] The corresponding variant of the 1988 United Nations population projections is indicated between parentheses.

line with the medium variant. An exception is made for the DAEs in the Global Shift scenario, where fertility is based on the low variant, in conjunction with the DAEs' favourable economic development in this scenario. The DCs and NMEs universally follow the course of the medium variant. Table A.1.1 briefly summarizes the fertility rate projections.

Mortality rates

The United Nations population projections are partially based on assumptions concerning the development of age-specific mortality rates, according to region. These assumptions resemble each other within the different variants. As a result, the variants do not reflect the uncertainty arising from the occurrence of natural disasters and disease epidemics. However, in the Global Crisis scenario, an escalation of the *AIDS epidemic* in Sub-Saharan Africa is explicitly assumed. An estimate of the consequences of an epidemic on the demographic development is based on model outcomes formulated by Bulatao[2]. Compared with the outcomes of other epidemiological models[3], these outcomes assume an intermediate position. When they are extrapolated according to the total population of Sub-Saharan Africa, the result in 2015 is a population with 93 million fewer people than would have been the case without an escalation of the AIDS epidemic. Compared with the high variant, which was applied to Sub-Saharan Africa in Global Crisis, this means a decline in population growth of 3.1 per cent to 2.8 per cent during the 1990–2015 period.

Migration

With respect to the migratory flows assumed by the United Nations projections, migration is assumed in the Global Shift and Global Crisis scenarios. The distribution of this migration, according to origin and destination, is indicated in Table A.1.2. In the Global Shift and Global Crisis scenarios, the regions of origin (Africa, Middle East, CIS and CE) are characterized by economic stagnation. Western Europe is an important destination because of its relative proximity to the regions of origin and due to the strong historical (colonial), and economic bonds with the regions of origin.

Scenario- and region-specific outcomes

Table A.1.3 shows the result of the scenario-specific demographic projections. The demographic development in the European Renaissance scenario corresponds with the medium variant of the United Nations population projections.

Table A.1.2 Cumulative international migration in the Global Shift and Global Crisis scenarios, 1990–2015

from/to	North America	Western Europe	Total
	million persons		
CIS	1.8	4.2	6.0
Central Europe	0.9	2.1	3.0
Africa	1.5	3.5	5.0
Middle East	0.9	2.1	3.0
Total	5.0	12.0	17.0

Table A.1.3 Regional demographic developments in the scenarios, 1990–2015

	Medium variant[a]		2015			
	1990	2015	1990–2015	GS	GC	BG
			annual %			
	million persons		change	million persons[b]		
NAM	330	400	(0.8)	10	0	0
JAP	120	130	(0.2)	0	0	0
WEU	460	490	(0.3)	10	−10	0
CE	100	110	(0.4)	0	0	0
CIS	290	340	(0.6)	−10	0	0
DAE	390	530	(1.2)	−40	0	−40
CHI	1,140	1,430	(0.9)	0	0	−80
rASIA[c]	1,280	2,040	(1.9)	0	180	−160
ME	270	500	(2.5)	−10	40	−60
AFR	470	1,000	(3.1)	0	−60	−80
LAT	450	680	(1.7)	0	40	−50
WLD	5,290	7,640	(1.5)	−40	270	−460

[a] European Renaissance develops according to the medium variant.
[b] In deviation of the medium variant.
[c] Excluding China.

A.1.3 Labour supply

In section 4.2.3 growth of labour supply is presented under the assumption of constant age- and gender-specific participation rates during the scenario period. As already indicated in that section, the level of labour-market participation is not only affected by demographic developments, but also by social and economic developments. This means that participation, and as a result growth of labour supply, differ among scenarios. In the beginning of this section, a number of factors which affect these degrees of participation will be briefly discussed.

Economic growth
The lack of employment prospects discourages a segment of the potential labour force from availing itself to the labour market, ultimately resulting in a decrease of labour supply. Economic growth provides labour-market opportunities and subsequently results in a higher degree of participation.

Table A.1.4 Levels of participation by men and women in the scenarios, 1990 and 2015

		1990	2015			
			Global Shift	European Renaissance	Global Crisis	Balanced Growth
NAM	men	85	84	83	83	84
	women	64	70	66	66	70
JAP	men	82	84	84	83	83
	women	56	71	69	64	64
WEU	men	81	82	83	82	83
	women	53	59	62	59	66
NME	men	81	80	80	80	79
	women	71	72	72	69	72
DAE	men	86	86	86	86	85
	women	50	49	49	49	49
ME	men	84	82	82	82	83
	women	24	28	28	28	29
rASIA	men	89	86	87	85	86
	women	27	27	27	26	27
AFR	men	89	87	87	87	86
	women	52	53	53	50	53
LAT	men	84	83	83	83	83
	women	31	30	30	30	30
WLD	men	86	87	85	85	85
	women	51	48	48	47	49

Social security and system of taxation
The operative system of social security and taxation affects the functioning of the labour market. A higher replacement rate will generally result in a higher natural rate of unemployment. A low replacement rate or a 'Swedish'-like system of social security in which there are benefit rights on the one hand, and extensive obligations concerning continued education and retraining on the other hand, implies a lower natural rate of unemployment. In addition, the structure of the social security and taxation system partially determines the extent to which specific groups will actively participate in the labour market. These include the elderly (early pension schemes, disablement compensation), double-income households (taxation), and single parents (tax exemptions for childcare), etc.

Education
Higher school enrolment results in a lower level of labour-market participation by young people (aged between 15 and 24). Because education adds to labour-market opportunities, however, it does have a positive effect on the participation of people aged between 25 and 64.

Emancipation
Emancipation results in a higher level of participation by women. Education is an important factor promoting emancipation. Prerequisites to this are the availability of provisions for child care and other factors which make labour-market participation actually feasible, and the labour market's ability to absorb the extra labour supply.

Scenario- and region-specific outcomes

For the DCs, the starting-point was the development of labour supply in the case of constant, age- and gender-specific levels of participation. The starting-point for the LDCs are participation rates derived from labour-supply projections by the International Labour Organization (ILO)[4]. These age- and gender-specific levels of participation have been slightly adjusted, based on scenario-specific considerations with respect to government policy and economic and social development. Notwithstanding the fact that levels of participation by women, in particular, vary widely among the different LDC regions, the scenario-specific adjustments of levels of participation in the DCs, are much greater than in the LDCs. This is based on the consideration that labour-market participation in the LDCs, especially by women, is largely determined by culture, while in addition, the relatively low degree of affluence limits personal freedom of choice, with respect to labour-market participation. An additional factor is that because of demographic developments alone, labour supply in the LDCs already grows very rapidly, so that it is not to be expected that economic developments allow a significant rise in participation. The most important scenario-specific adjustments in the LDCs concern the participation in education in especially the Balanced Growth scenario, and a rise in levels of participation in the DAEs and Latin America in the Global Shift scenario, in answer to the extremely prosperous economic development.

In the DCs, labour-market participation by especially women, has increased steadily during the last decades, a result of the continuing process of emancipation, and steady decline in the average family size, as well as the availability of provisions for child care. This rising trend towards higher degrees of participation and long-term convergence with the high Swedish levels is also assumed in the various scenarios. The rate at which this convergence occurs is, however, partially determined by economic development which varies according to scenario. Disappointing economic developments reduce the chance of finding work which is financially, and/or otherwise, interesting. The result is a delayed rise, or in some cases even temporary reversal, of previous increases of labour supply. Because family incomes in DCs are increasingly earned by several people, individuals' freedom of choice with respect to labour-market participation is greater than in the LDCs.

These considerations are also reflected in the assumptions on the level of labour-market participation where women are concerned. Disappointing economic developments result in relatively small increases of participation in the Global Crisis scenario. In Balanced Growth the promising labour-market prospects are responsible for relatively high degrees of participation, despite a higher school enrolment. In this respect, European Renaissance and Global Shift assume intermediate positions.

The trend in the development of labour-market participation in Japan essentially corresponds with the trend in Western Europe and North America. Because of an assumed, rapid socio-cultural catching up in the Balanced Growth scenario, unlike the Global Shift scenario, there is, however, in this scenario no all-out mobilization of labour forces in order to take care of the ageing problem. As a result, participation increases more slowly in the Balanced Growth scenario than in the Global Shift scenario.

Table A.1.4 shows regional participation rates for men and women in 2015 in the different scenarios and the corresponding figures in 1990.
The demographic developments shown in Table A.1.3, together with the developments in participation levels in Table A.1.4, determine the growth of labour supply in the different scenarios. Table A.1.5 summarizes these outcomes. For the purposes of comparison, the growth of labour supply in the case of constant, gender- and age-specific levels of participation is given.

In all of the scenarios, the growth of the labour supply in the DCs and NMEs is much lower than in the LDCs. This is vastly due to the more rapid population growth in the LDCs, and ageing in the DCs.

Within the DCs, it is striking that in all of the scenarios, the growth of labour supply in North America is almost one percentage point higher than in Japan, whereas Western

Table A.1.5 Regional labour supply in 1990; regional growth of labour supply in the four scenarios, 1990–2015

	1990	Constant participation[a]	Global Shift	European Renaissance	Global Crisis	Balanced Growth
	million persons	annual percentage changes 1990–2015				
NAM	161	0.7	1.0	0.8	0.9	0.9
– US	125	0.5	0.9	0.7	0.8	0.8
JAP	60	– 0.2	0.2	0.1	– 0.0	– 0.0
WEU	203	0.2	0.6	0.6	0.6	0.7
– EC	152	– 0.1	0.3	0.4	0.3	0.5
NME	193	0.6	0.5	0.6	0.5	0.6
DAE	163	1.7	1.6	1.7	1.7	1.5
CHI	647	1.0	0.9	0.9	1.0	0.7
rASIA[b]	421	2.4	2.4	2.4	2.5	2.2
ME	78	3.1	3.2	3.2	3.3	3.0
AFR	165	3.4	3.4	3.4	3.0	3.3
LAT	152	2.1	2.0	2.0	2.1	1.8
LDC	1,616	2.0	1.9	1.9	2.0	1.8
WLD	2,244	1.6	1.6	1.6	1.6	1.5

[a] Based on constant, gender- and age-specific participation rates.
[b] Excluding China.

Europe, with a growth of about 0.6 per cent, assumes an intermediate position. In terms of working hours, the growth of labour supply in Japan will diverge even more from the growth in North America and Western Europe, especially in the Balanced Growth scenario. After all, also with respect to working hours[5], there is good reason to expect convergence with American and European standards.

With respect to the growth of labour supply in the LDCs, the highly deviant situation in China is striking. There, growth is 1 to 2 percentage points lower than in the other LDCs. The development in labour supply is dominated by the trailing demographic development in the LDCs, as well. Lastly, it is striking that in the LDCs, within each of the scenarios, the resulting growth of labour supply was almost 2 per cent per year. If China is excluded, then the resulting growth actually reaches about 2.5 per cent per year. These figures underscore yet again the enormous challenge, based on demographic developments, confronting the economies of the LDCs.

Appendix 2 Energy in the scenarios

A.2.1 Introduction

In the main text of the scenario chapter, developments in the energy field are only briefly explained, with the exception of the Balanced Growth scenario. The purpose of this appendix is to fill any main gaps which remain[1]. Before proceeding to this, however, it might be useful to summarize which factors determine energy consumption and compare the breakdown of this consumption according to energy sources.

As is true of every other market, the developments on the world energy market are essentially the results of interactions between demand, supply and the resulting real price development. These, in turn, subsequently cause feedback effects which influence supply via the exploration of new supply, as well as demand via the application of energy-saving technology.

A number of factors, however, distinguish the energy market from many other markets. The most important characteristic is the strong geographical concentration of global reserves of oil, the most important fossil fuel. Consequently, oil suppliers are capable of forming a cartel, and by means of limiting supply, obtaining an additional profit. These possibilities are less likely in the long term than in the short term, though. The higher prices provoke extra energy savings on the one hand, and on the other hand, stimulate production outside the cartel regions. Partially because of this, in actual practice a cartel of many countries appears difficult to control, certainly at times when demand is considerably below production capacity[2].

In addition, it is significant that often there are major external effects attached to energy use. Examples of this are the negative effects of energy consumption on the local, regional and global environments.

Both factors, together with the strategic importance of an adequate energy supply, help explain government's intensive interference in the energy market. In the various scenarios of this study, an attempt is made to take all these factors into account.

A.2.2 A bird's-eye view of the energy scenarios

Balanced Growth: Striving for sustainability

The Balanced Growth scenario is, within the energy and environmental fields, especially dominated by the possibilities of tackling the greenhouse effect within a world economy which is developing very favourably. This scenario explores these possibilities by means of introducing a global CO_2 tax[3], together with a transfer of know-how and technology to the LDCs and NMEs in the energy field, as well as providing aid and, where needed, compensation for deforestation and for stimulating reafforestation. The international treaty in which this is set forth will be effective as of the late-nineties. It will result in a gradual introduction of a global CO_2 tax which will amount to $21 per barrel of oil ($200 per tonne of carbon) by 2005.

In the energy field specifically, three types of effects appear: realization of the (already available) potential for energy conservation[4], a switch from carbon-rich energy sources to energy sources that release less carbon dioxide, initially by gas primarily, and finally, the stimulation of research aimed at the application of renewable energy as well as new methods for energy conservation. Since, in Balanced Growth, for the time being it is undesirable to exchange the risks involved with global warming for those of nuclear energy, the possibilities (and limitations) of saving energy and renewable energy become the focus of attention.

Table A.2.1 Growth of energy consumption in the scenarios, 1990–2015, growth of energy consumption, 1950–1990[a]

	NAM	JAP	WEU	DC	CHI	rLDC	LDC	NME	WLD
	Annual percentage change, 1990–2015								
Global Shift	1.8	2.4	.6	1.5	4.2	4.4	4.3	–.5	2.4
European Renaissance	.5	1.8	.8	.8	3.5	3.6	3.6	–.4	1.8
Global Crisis	.7	1.9	.9	.9	3.9	3.2	3.5	–.5	1.7
Balanced Growth	–.4	.5	.3	.0	2.4	3.0	2.8	–1.0	1.0
1950–1973	3.6	8.8	4.8	4.3	10.0	7.1	7.9	6.8	5.2
1973–1990	.7	1.3	.6	.7	4.7	5.1	5.0	2.2	1.9

[a] Including non-commercial energy.

Table A.2.2 Development of real energy prices in the scenarios, 1990–2015; development of real energy prices, 1950–1990

	Coal[a]	Oil[a]	Gas[a]	Total[b]		
				Not including CO_2 tax[a]	Including CO_2 tax[a]	User prices[c]
	annual percentage change, 1990–2015					
Global Shift	2.5	3.6	3.5	2.9	2.9	1.0
European Renaissance	1.9	3.3	3.1	2.7	2.8	1.1
Global Crisis	1.3	2.2	2.4	1.8	1.8	0.4
Balanced Growth	.5	2.0	3.8	2.2	5.1	2.8
	annual percentage change					
1950–1973		–1.4				0.4
1973–1990		5.8				1.4

[a] Border prices in case of importing regions, otherwise producer prices.
[b] Including hydro, nuclear and remaining energy sources.
[c] Including value-added and other taxes.

The CO_2 tax places the producer prices of CO_2-intensive fossil fuels, of which coal is the most important, under pressure. In order to keep this drop in price from undermining the effectiveness of the CO_2 tax, after 2005 the tax will be further raised to $320 per tonne of carbon. This implies a tax of $34 per barrel for oil, $45 per barrel of oil-equivalent for coal and $25 per barrel of oil-equivalent for gas. As a result, after 2005 the price of crude, including CO_2 tax, in real terms remains nearly constant. On balance, the result between 1990 and 2015 is a real energy price increase of about 5.1 per cent per year, versus 2.8 per cent per year in the Balanced Growth scenario's reference path, in which there is no CO_2 tax[5].

As is evident from Tables A.2.1–A.2.5, it is possible to assess rather optimistically the energy-technological potential for combining considerable and multipolar economic growth *while at the same time* tackling global warming and other energy-related environmental problems, at least until 2015. This would entail world-wide stabilization of energy-related CO_2 emissions at the 1990 level, while the *total* CO_2 emissions actually decline by 25 per cent, compared with the 1990 level. Within this field the greatest progress would be recorded in the NMEs and China. Another result of this scenario is that the share of coal and oil in the total energy consumption would sharply decline, in favour of gas, renewable energy and, to a limited degree, nuclear energy. Lastly, we note that this energy scenario implies a stabilization of energy consumption for the DCs at the current level, while energy consumption in the LDCs doubles.

Global Crisis: Muddling through

In many respects the Global Crisis scenario is the counterpoint to Balanced Growth. This scenario is characterized by moderate growth on a world-wide basis, with the (relative) exceptions of the DAEs and Japan. Global talks concerning environmental and energy-related problems make no progress at all.

The moderate economic growth slows down the growth of energy consumption and in so doing, the real price development, as well. Although the drawback to this is that energy conservation is also limited, the real energy price increase of about 2 per cent is the lowest of all the scenarios. On the other hand, its energy intensity is the highest of all

the scenarios. By 2015 the global energy intensity will only be 10 per cent lower than it was in 1990. In the developing countries the energy intensity hardly changes at al, as is evident from Table A.2.3.

Because the differences in real price increase *among* energy sources is also modest, the structure of energy consumption is also scarcely altered. The increase of the share of coal, at the expense of the share of oil, is still the most striking.

Therefore, also from an energy-technological point of view, Global Crisis is the scenario of missed opportunities. Only around 2010 are new policies set in motion for sustainable development. Between 2010 and 2015 these new policies will have a merely limited impact, only becoming visible in an increasing share of renewable energy within the fuel mix.

Table A.2.3 Regional energy intensity in the scenarios, 2015; development of regional energy intensity, 1950–1990

	NAM	JAP	WEU	DC	CHI	rLDC	LDC	NME	WLD
	index, 1990 = 100 (annual percentage change)								
Global Shift	68	64	72	69	58	80	76	84	78
	(−1.5)	(−1.8)	(−1.3)	(−1.5)	(−2.1)	(−0.9)	(−1.1)	(−0.7)	(−1.0)
European Renaissance	74	63	62	64	67	85	82	52	75
	(−1.2)	(−1.9)	(−1.9)	(−1.8)	(−1.6)	(−0.6)	(−0.8)	(−2.6)	(−1.2)
Global Crisis	79	77	79	77	89	94	97	97	90
	(−0.9)	(−1.0)	(−0.9)	(−1.1)	(−0.5)	(−0.3)	(−0.1)	(−0.1)	(−0.4)
Balanced Growth	43	53	49	46	39	55	51	40	52
	(−3.3)	(−2.5)	(−2.8)	(−3.1)	(−3.7)	(−2.3)	(−2.6)	(−3.6)	(−2.6)
	annual percentage change								
1950–1973	0.0	−0.3	0.0	−0.2	4.2	2.0	2.7	1.5	0.4
1973–1990	−1.9	−2.6	−1.6	−1.8	−2.2	1.2	0.5	−0.1	−1.1

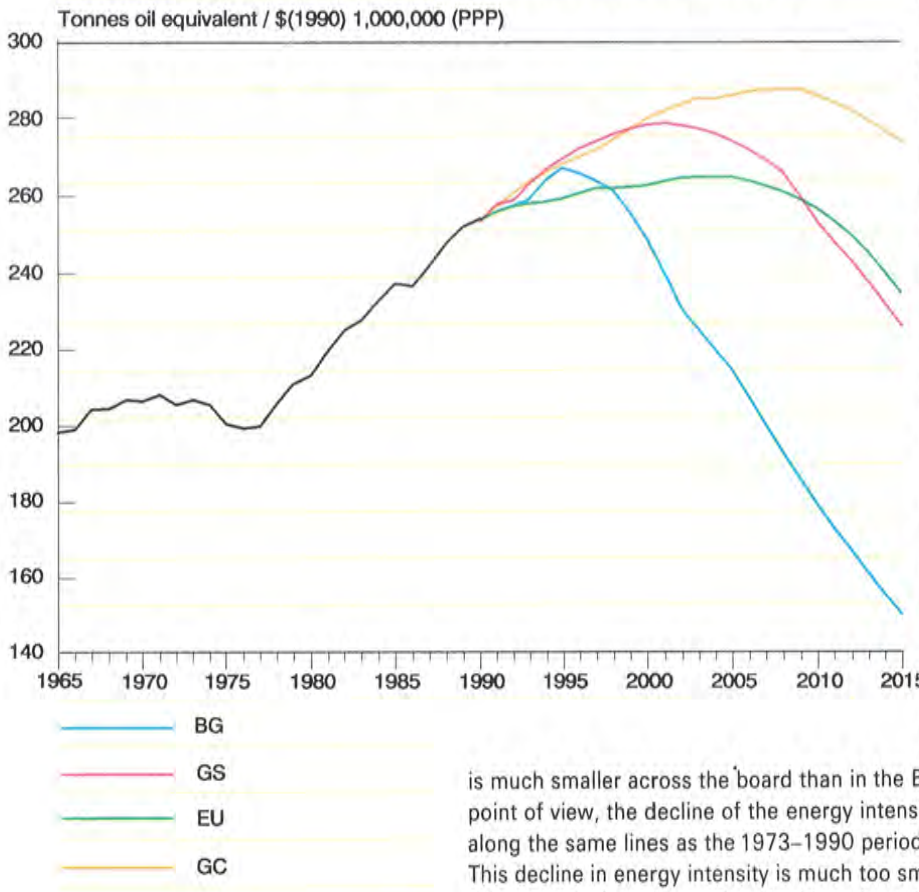
Global Shift: New opportunities for nuclear energy

Global Shift is characterized by the rise of the Pacific Rim region and, from an economic point of view, a further regression on the part of Western Europe and the NMEs. The pursuit of 'traditional' economic growth plays a prominent role. This explains why there is so little need for international coordination in the environmental and energy field. Moreover, there is a great deal of doubt about the enforceability of international agreements, as well as the possibilities for coordination in this field. This is why energy consumption, energy conservation and the structure of energy consumption are left completely to the dynamics of market forces and technological developments.

The powerful economic and industrial development generates a surge of growth in the demand for energy. During the nineties this results in a strong recovery of the real oil price. In the short term this price increase promotes the substitution of oil by coal. It also, however, stimulates research into the application of other sources of energy, especially nuclear energy. In accordance with the technologically dynamic nature of the scenario, Global Shift proposes that after 2000, commercial applications of the so called inherently safe nuclear reactors will be within reach. Especially in the Pacific Rim region, this results in a significant increase in the nuclear contribution to the provision of energy; see Table A.2.4. Consequently, there remains only a small increase in the coal share. Although the real energy price increase promotes significant energy conservation, the impact of market forces alone is not sufficient to approach the savings rate in the Pacific Rim of the Balanced Growth scenario.

The picture is much different for Western Europe which, in this scenario, is confronted with a stagnating process of integration and sluggish economic growth. Resistance against the expansion of nuclear capacity, as well as the use of 'dirty' coal, added to the politically unreliable situation in the Commonwealth of Independent States which makes the European Energy Community into a *dead letter*, explain why the oil share only

Figure A.2.1 Development of energy intensity in LDC's, 1990–2015



declines at a very slow rate despite the strongly increasing real oil price. In addition, the oil share is compensated for in a very diffused manner by the increase of all other energy sources.

The stagnation in the NMEs, as a result of its being cut off from modern technology, is reflected in the very modest decline in energy intensity and the inability to exploit the sizeable gas reserves, bringing on a decrease of the share of gas in the fuel mix. Especially in Central Europe, this leads to an increase of the already large share of coal in energy consumption. This fossil fuel is readily available in this region and thereby, relatively cheap.

In summary, it appears that on a global level, due to substituting coal and nuclear energy for oil, the real energy price increase[6] may remain limited to 3 per cent[7]. In terms of the real oil price, this means that the level of the 1980–1985 period will only be reached again by around 2015. Partially because of this, the decline in energy intensity in this scenario is much smaller across the board than in the Balanced Growth scenario. From a global point of view, the decline of the energy intensity during the scenario period develops along the same lines as the 1973–1990 period.

This decline in energy intensity is much too small to prevent the level of CO_2 emissions in this scenario from increasing significantly until 2015. On a regional basis, the development in energy intensity sharply deviates from the development during the previous decades. In the DCs the energy intensity improves more slowly than during the 1973–1990 period. In the LDCs, excluding China, where the energy intensity increased on average by 1.2 per cent per year during the 1973–1990 period, during the scenario period the intensity improves by 1.1 per cent per year, reflecting strong reductions in Asia, in particular.

Table A.2.4 Structure of energy consumption in four scenarios, 1990 and 2015 (as percentage of total consumption per region)

	NAM	JAP	WEU	DC	LDC	NME	WLD
	1990						
Coal	23	17	22	22	29	26	25
Oil	37	56	44	41	31	29	35
Gas	24	10	16	20	10	38	20
Hydro	6	5	7	6	7	4	6
Nuclear	7	11	11	9	1	3	5
Other	3	0	0	2	22	0	8

European Renaissance: regional cooperation as focal point of energy and environmental policies – the case of Europe

Also in the energy field, Europe is the most dynamic continent in this scenario.

Via the Pan-European Energy Community it is possible to introduce Siberian gas on the European market on a large scale; a large-scale transfer of know-how and technology occurs in order to stimulate energy saving in Central and Eastern Europe[8], and a modest CO_2 tax of $5 per barrel of oil is introduced. The consequences of this are quite far-reaching for European energy consumption. In Western Europe the energy intensity declines by 2 per cent per

year; in Central and Eastern Europe actually by more than 3 per cent. The structure of energy consumption also changes to a significant degree. The share of gas increases significantly, at the expense of the oil and coal shares. In fact, an independent gas market emerges in Europe which has relatively few ties with the oil market.

The favourable development within the CIS enables Japan also to reach agreement on cooperation and to benefit from the Siberian gas. Together with the previously mentioned expansion of nuclear capacity, this means it is possible to sharply reduce the level of oil dependency in Japan. Outside these areas, market forces are the dominating factors. Just as in Global Shift, in this scenario no agreements are reached on a global level.

The decline of the United States in the energy field is reflected in very moderate savings in energy. The pending depletion of gas reserves in the United States is primarily compensated for by an increasing use of coal, a fossil fuel still in very plentiful supply in this region.
In the LDCs the more modest technological dynamics result in a more modest improvement of the energy intensity in the European Renaissance scenario, compared with the Global Shift scenario; see Figure A.2.1. The disappointing economic development leads to a continuing relatively high share of biomass[8] in the energy mix.

Despite the strong regional differences between Global Shift and European Renaissance, the differences on a global level appear to be modest, as far as the real price development of energy, as well as the energy mix are concerned. With regard to the structure of energy consumption, the share of nuclear energy is the only one to stand out in Global Shift. The considerable efforts on the part of the European Energy Community in the European Renaissance scenario are reflected on a global level in a somewhat stronger decline in energy intensity, compared with that of the Global Shift scenario.

Table A.2.4 Continued

	NAM	JAP	WEU	DC	LDC	NME	WLD
Global Shift, 2015							
Coal	23	19	21	22	30	32	27
Oil	29	38	38	33	31	23	31
Gas	23	14	20	21	12	35	18
Hydro	5	5	7	6	8	5	7
Nuclear	14	23	14	15	5	5	9
Other	5	0	0	3	14	0	8
European Renaissance, 2015							
Coal	25	18	13	20	31	18	25
Oil	37	39	33	36	29	24	31
Gas	21	19	28	23	13	44	20
Hydro	6	7	7	6	8	6	7
Nuclear	8	16	16	12	3	5	6
Other	4	1	3	3	16	2	10
Global Crisis, 2015							
Coal	26	17	21	23	30	23	27
Oil	35	43	37	37	29	31	32
Gas	22	13	19	20	12	38	18
Hydro	5	7	7	6	9	4	7
Nuclear	7	18	14	10	2	3	5
Other	5	2	2	4	18	0	11
Balanced Growth, 2015							
Coal	11	10	8	9	21	15	16
Oil	37	46	36	38	31	24	33
Gas	26	18	28	26	16	45	23
Hydro	9	7	10	9	12	7	10
Nuclear	10	16	15	13	3	5	7
Other	7	5	4	5	18	4	11

Table A.2.5 Energy-related carbon dioxide emissions in the scenarios, 1990 and 2015[a]

	NAM	WEU	JAP	DC	CHI	rLDC	LDC	NME	WLD
1990									
CO_2 emission[b]	1590	940	300	2820	700	990	1690	1200	5700
share of world total[c]	28	16	5	49	12	17	30	21	100
Global Shift, 2105									
CO_2 emission[b]	2280	1010	460	3760	1910	3190	5090	1050	9900
share of world total[c]	23	10	5	38	19	32	51	11	100
index 1990 = 100	144	108	156	133	272	323	302	88	174
European Renaissance, 2015									
CO_2 emission[b]	1840	960	410	3210	1610	2620	4220	970	8410
share of world total[c]	22	11	5	38	19	31	50	12	100
index 1990 = 100	116	103	138	114	229	265	250	81	147
Global Crisis, 2015									
CO_2 emission[b]	1940	1100	410	3440	1740	2290	4030	1040	8510
share of world total[c]	23	13	5	40	20	27	47	12	100
index 1990 = 100	122	117	139	122	248	232	239	87	149
Balanced Growth, 2015									
CO^2 emission[b]	1210	780	280	2270	1100	1980	3090	790	6150
share of world total[c]	20	13	4	37	18	32	50	13	100
Index 1990 = 100	77	84	93	81	158	201	183	66	108

[a] See tables 5.2.1, 5.3.1, 5.4.1 and 5.5.1 for information about emissions including de/re-forestation.
[b] In million tonnes of carbon per year.
[c] Percentage.

A.2.3 The energy scenarios in perspective: a brief comparison

On the global level, the most obvious difference between the energy scenarios concerns the decline in energy intensity which varies between 0.4 and 2.6 per cent per year; cumulatively this implies a variation in decrease of between roughly 10 per cent in Global Crisis and 50 per cent in Balanced Growth. The structure of energy consumption also demonstrates a significant deviation on a global level. In Global Crisis the use of coal increases, compared with the 1990 level, while the oil share decreases, whereas in Balanced Growth, the coal share is drastically reduced due to the CO_2 tax, in favour of gas and sustainable energy. Global Shift and European Renaissance assume an intermediate position. Most striking is the declining oil share; in Global Shift this is compensated for by an increased use of nuclear energy, whereas in European Renaissance, the share of non-fossil fuels is increased[10].

Important similarities in each of the energy scenarios is that on a global level, the share

of oil in the provision of energy declines. Another similarity is that, except for Balanced Growth, the real energy price increase consistently varies between 2–3 per cent per year[11]. This price increase reflects the rising marginal recovery costs[12], and is in accordance with long-term projections by the European Community[13, 14].

Some of the similarities between the scenarios are misleading, however. For example, this is true of the deviation of energy consumption in Western Europe that only runs at about 0.6 per cent, versus for example, 2.2 per cent in North America, 1.9 per cent in Japan and 1.8 per cent in China. The reason for this is that in scenarios in which developments in Western Europe are favourable, considerable efforts in the environmental and energy fields are assumed. *Without* these efforts, the deviation of energy consumption growth rates would also be much greater: on the order of about 1 per cent (0.6 per cent in the low-growth Global Shift scenario versus 1.6 per cent in the high-growth Balanced Growth scenario). Without these differences in energy policies, however, the deviation in the American, Japanese and other regions' energy-consumption growth rates would be much smaller. For example, the deviation for America would be reduced to about 1.3 per cent. The resulting energy mix would also show much less differentiation.

Appendix 3 International trade in the scenarios

A.3.1. Introduction

International trade forms one of the major 'mechanisms' through which national economies are linked with each other. This appendix briefly explains how international trade, including bilateral trade flows, is extrapolated in each of the scenarios, and it briefly explains the results of this exercise.

A.3.2. Methodology

The first step is an outline of the individual regions' developments in total imports and exports, as well as their trade balances, within the different scenarios. In this, growth of GDP is considered exogenous data. On the one hand, the extrapolation is now based on historical relationships between income and export growth, while on the other hand, scenario- and region-specific circumstances are also taken into account. The transition to a market economy in Central Europe and the disintegration of the Soviet Union imply, for example, that for these regions, no 'normal elasticities' between GNP and export growth can be applied.

The developments in imports and exports determine the development in column and row totals of the trade matrices in the different scenarios. Based on the 1990 trade matrix and the development in column and row totals, the individual cells of the trade matrices have subsequently been constructed in two rounds. In the first round, the matrix is made with the aid of a so-called RAS procedure. Such a procedure searches for a matrix which is consistent with the column and row totals, and which deviates as little as possible from the structure of the last-known matrix. In the second round, this matrix is adjusted on the basis of the above-mentioned scenario-specific considerations.

Consequently, the result is the product of an accumulation of assumptions and as such, has no sound scientific foundation. This is especially true of the matrix entries, where many degrees of freedom exist. Because it is possible for there to be large differences in size between the bilateral trade flows, especially with respect to the development of cells which are initially relatively small, there is quite an element of uncertainty. This means the result should also be viewed with a certain amount of reservation. The objective is purely to provide a numerical illustration of *potential* developments in the international trade pattern. The creator is confronted by the implications of the region- and scenario-specific assumptions which have been made.

The result can help make it possible to judge the plausibility of the assumptions made.

A.3.2. Results

Table A.3.1 reproduces the world-trade matrix for 1990 as a percentage of total world trade. Because the Soviet Union was still a country at that time, intra-trade within this region is, per definition, nil. According to the OECD, intra-trade among the republics amounted to about 20 per cent of the Soviet Union's GNP in 1988[1]. On the basis of this percentage, an intra-Soviet Union trade of 380 billion dollars was calculated in 1990, 'adding' about 12 per cent to total world trade. This intra-trade is explicitly taken into account in the tables presented here[2].

Some of the most salient characteristics of the world-trade matrix are, first of all, the extent of West European intra-trade, comprising 31 per cent of world trade. Furthermore,

Table A.3.1 Merchanidse trade according to exporting and importing regions, in 1990 (as percentage of total world trade)

	Importing region										
	NAM	JAP	WEU	CE	CIS	DAE	rASIA	ME	ARF	LAT	WLD
Exporting region											
NAM	6.3	2.4	4.1	0.1	0.1	2.2	0.5	0.6	0.1	1.5	18.0
JAP	3.5	0.0	1.9	0.0	0.1	2.2	0.5	0.3	0.0	0.2	8.9
WEU	4.6	1.0	31.3	0.6	1.0	1.7	0.4	2.1	0.5	0.7	43.8
CE	0.0	0.0	0.5	0.5	2.1	0.0	0.0	0.1	0.0	0.1	3.3
CIS	0.1	0.1	1.2	1.8	0.0	0.0	0.0	0.1	0.0	0.2	3.5
DAE	3.3	1.7	1.8	0.0	0.0	2.2	0.6	0.4	0.1	0.1	10.2
rASIA	0.6	0.6	0.5	0.0	0.0	0.9	0.3	0.2	0.0	0.0	3.2
ME	0.6	0.7	1.4	0.1	0.1	0.5	0.1	0.3	0.0	0.2	4.0
AFR	0.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
LAT	2.0	0.2	0.9	0.0	0.3	0.1	0.1	0.1	0.0	0.5	4.4
WLD	21.2	6.8	44.2	3.1	3.7	9.9	2.6	4.2	0.8	3.6	100.0

trade among DCs themselves comprises no less than 60 per cent of world trade; whereas the total DCs' share in world trade amounted to even more than 70 per cent. Trade among LDC regions, excluding DAEs, amounts to no more than 1.8 per cent of total world trade. Due to the rise of Japan and the DAEs, the trade matrix is changing, however. In 1961 the share of these regions was only equal to 4-5 per cent of world trade, compared with 19 per cent in 1990.

Table A.3.2 shows the corresponding matrix for the Global Shift scenario in 2015. The Global Shift nature of the scenario is most clearly prominent in the share of trade originating from Japan, the DAEs and the rest-of-Asia region. In 1990 these regions' share in world exports was more than 20 per cent, in 2015 this share will have more than doubled. The growth will chiefly be at the expense of the West European share. By 2015, total Asian intra-trade will constitute about 25 per cent of total world trade, versus 9 per cent in 1990.

In European Renaissance, North America's share in world trade declines between 1990 and 2015 from 18 to 10 per cent, see Table A.3.3. This scenario also shows the results of the successful re-integration of Central Europe and the Commonwealth of Independent States in the world economy.

In the Global Crisis scenario the structure of the world-trade matrix hardly changes at all, except for the continued rise of the DAEs and Japan.

The Balanced Growth scenario demonstrates an integration of all LDCs within the global economic system, albeit for some regions such as Africa, it is very cautious, whereas the share of the Middle East region suffers from the introduction of the CO_2 tax. Nevertheless, the total share of LDC regions in world trade rises from 20 per cent now, to more than 32 per cent by 2015.

Table A.3.2 Merchandise trade according to exporting and importing region in the Global Shift scenario, in 2015 (as percentage of total world trade)

	Importing region										
	NAM	JAP	WEU	CE	CIS	DAE	rASIA	ME	AFR	LAT	WLD
Exporting region											
NAM	6.0	4.0	2.3	0.1	0.1	4.0	1.2	0.5	0.1	2.0	20.2
JAP	4.0	0.0	1.3	0.1	0.1	4.5	1.6	0.4	0.1	0.5	12.6
WEU	2.0	1.1	15.2	0.6	0.6	1.8	0.5	0.9	0.2	0.5	23.4
CE	0.0	0.1	0.4	0.2	0.4	0.1	0.0	0.1	0.0	0.0	1.4
CIS	0.1	0.1	0.4	0.4	2.9	0.1	0.0	0.1	0.0	0.1	4.2
DAE	4.4	4.8	1.7	0.1	0.1	9.9	2.0	0.5	0.1	0.5	24.0
rASIA	1.0	1.0	0.4	0.0	0.1	2.1	0.9	0.2	0.1	0.1	5.9
ME	0.4	0.7	0.5	0.1	0.0	0.8	0.1	0.2	0.0	0.2	3.0
AFR	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
LAT	1.9	0.5	0.5	0.0	0.1	0.5	0.2	0.1	0.0	1.0	4.8
WLD	19.9	12.2	22.8	1.5	4.5	23.8	6.6	3.2	0.6	5.0	100.0

Table A.3.3 Merchandise trade according to exporting and importing region in the European Renaissance scenario, in 2015 (as percentage of total world trade)

	Importing region										
	NAM	JAP	WEU	CE	CIS	DAE	rASIA	ME	AFR	LAT	WLD
Exporting region											
NAM	2.3	1.6	2.1	0.2	0.3	1.6	0.4	0.4	0.1	0.7	9.7
JAP	1.9	0.0	1.7	0.1	0.5	4.9	1.0	0.4	0.1	0.2	10.7
WEU	1.7	1.4	26.5	1.5	1.8	2.4	0.6	1.2	0.5	0.5	38.0
CE	0.0	0.1	1.4	0.2	0.6	0.0	0.0	0.1	0.0	0.0	2.5
CIS	0.2	0.6	1.7	0.4	6.1	0.7	0.1	0.2	0.0	0.2	10.2
DAE	2.0	4.8	2.5	0.0	0.6	6.6	1.3	0.4	0.1	0.3	18.7
rASIA	0.4	0.8	0.4	0.0	0.1	1.5	0.6	0.1	0.0	0.0	3.9
ME	0.2	0.8	0.6	0.0	0.1	0.6	0.1	0.4	0.1	0.1	3.1
AFR	0.1	0.1	0.5	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.9
LAT	0.7	0.2	0.7	0.0	0.1	0.2	0.1	0.0	0.0	0.3	2.3
WLD	9.5	10.4	37.9	2.5	10.3	18.6	4.1	3.3	1.0	2.4	100.0

Table A.3.4 Merchandise trade according to exporting and importing region in the Global Crisis scenario, in 2015 (as percentage of total world trade)

	Importing region										
	NAM	JAP	WEU	CE	CIS	DAE	rASIA	ME	AFR	LAT	WLD
Exporting region											
NAM	3.5	3.1	2.6	0.2	0.1	2.6	0.5	0.4	0.1	1.1	14.2
JAP	3.4	0.0	2.1	0.1	0.4	4.1	0.8	0.4	0.1	0.6	11.9
WEU	2.2	1.7	26.3	0.9	0.7	2.7	0.5	1.1	0.3	0.9	37.2
CE	0.1	0.1	0.7	0.2	0.3	0.1	0.0	0.0	0.0	0.0	1.5
CIS	0.0	0.2	0.5	0.4	4.0	0.2	0.0	0.0	0.0	0.1	5.4
DAE	3.4	4.2	2.8	0.0	0.1	6.0	1.2	0.2	0.1	0.6	18.6
rASIA	0.3	1.1	0.3	0.0	0.0	1.3	0.4	0.1	0.0	0.1	3.6
ME	0.2	0.6	0.7	0.1	0.1	0.6	0.0	0.2	0.0	0.2	2.8
AFR	0.1	0.1	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.7
LAT	1.2	0.5	0.8	0.0	0.1	0.5	0.1	0.0	0.0	0.8	4.1
WLD	14.5	11.5	37.1	1.8	5.8	18.2	3.5	2.6	0.8	4.1	100.0

Table A.3.5 Merchandise trade according to exporting and importing region in the Balanced Growth scenario, in 2015 (as percentage of total world trade)

	Importing region										
	NAM	JAP	WEU	CE	CIS	DAE	rASIA	ME	AFR	LAT	WLD
Exporting region											
NAM	3.8	2.0	2.8	0.2	0.1	3.1	0.7	0.3	0.1	1.6	14.6
JAP	1.8	0.0	1.1	0.2	0.3	2.4	0.6	0.2	0.1	0.4	7.0
WEU	2.3	1.0	26.9	1.5	0.7	3.1	0.7	0.5	0.4	1.2	38.2
CE	0.1	0.0	1.0	0.4	0.6	0.1	0.0	0.1	0.0	0.0	2.3
CIS	0.0	0.2	0.7	0.5	3.8	0.3	0.1	0.1	0.0	0.1	5.7
DAE	3.7	2.7	2.9	0.0	0.1	7.1	1.8	0.2	0.1	0.9	19.5
rASIA	0.5	0.8	0.4	0.0	0.0	1.8	0.7	0.1	0.1	0.1	4.5
ME	0.1	0.2	0.4	0.1	0.1	0.4	0.0	0.2	0.0	0.1	1.6
AFR	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.8
LAT	1.7	0.4	1.0	0.0	0.1	0.7	0.2	0.1	0.0	1.4	5.7
WLD	14.0	7.4	37.6	2.9	5.7	19.1	4.8	1.8	0.9	5.8	100.0

Appendix 4 Abbreviations

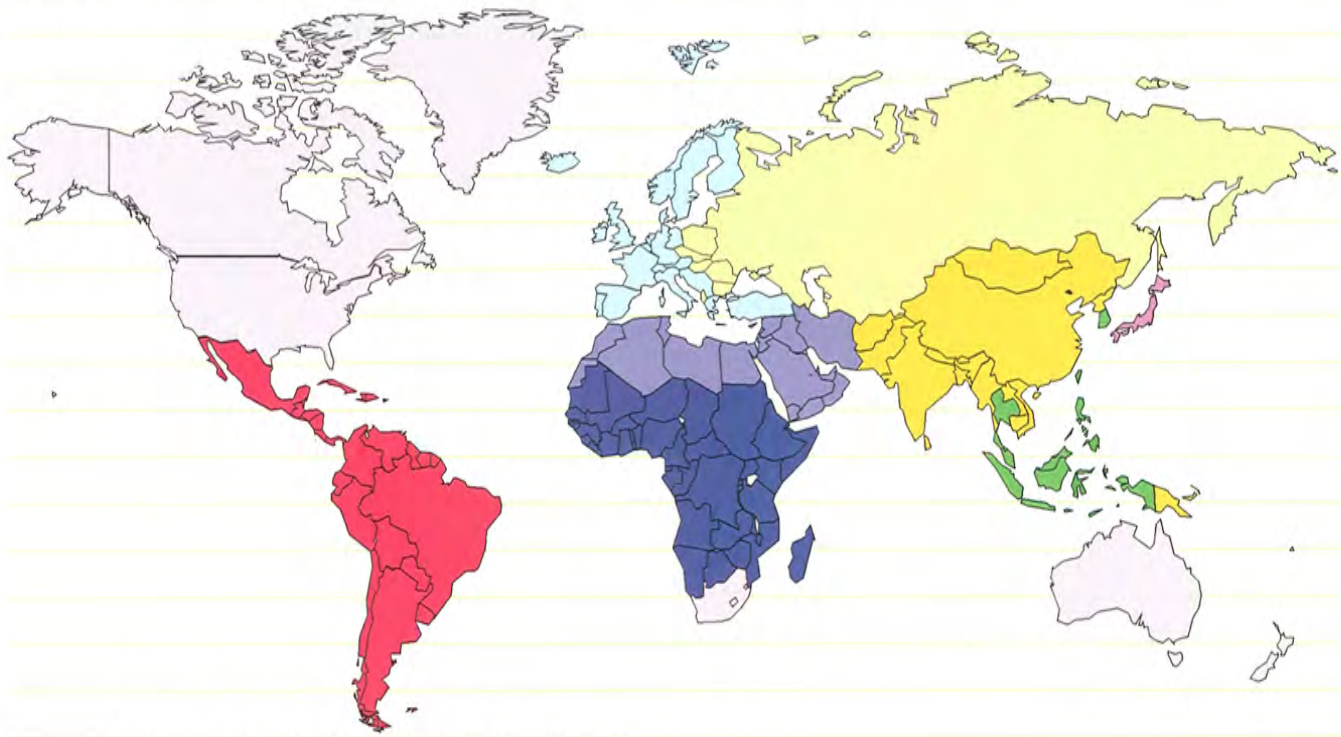
Geographical abbreviations:

AFR	Sub-Saharan Africa: East, Central and Southern Africa, not including South Africa
CHI	China
CE	Central Europe: Poland, Czechoslovakia, Hungary, Bulgaria and Albania
CIS	Commonwealth of Independent States
DAE	Dynamic Asian Economies: Hong Kong, Singapore, Taiwan, South Korea, Malaysia, Philippines, Indonesia and Thailand
JAP	Japan
LAT	Latin America: South America, Central America and the Carribbean
ME	Middle East: North Africa, the Arabian Peninsula, Iran, Iraq, Jordan, Lebanon and Syria, not including Israel
NAM	North America: United States of America and Canada, also including Australia, New Zealand and South Africa
NME	New Market Economies: CE and CIS
rAsia	Rest of Asia. This region also includes Melanesia, Micronesia and Polynesia
WEU	Western Europe: western, northern and southern Europe, including the former Yugoslavia, Israel and Turkey, but not including Albania
WLD	World
DC	Developed Countries: NAM, WEU and JAP
LDC	Less-Developed Countries: DAE, ME, rAsia, AFR and LAT

Additional abbreviations:

NIE	Newly Industrializing Economies
TNC	Transnational Corporations
IT	Information Technology
MNE	Multinational Enterprises

Figure A.4.1 Definition of regions



North America, South Africa, Australia, New Zealand
Western Europe
NMEs
Japan
Latin America
Africa
Middle East
Rest of Asia
DAEs

Appendix 1

[1] For a detailed study of this subject, refer to Adri den Ouden, 'Mondiale Arbeidsaanbodprojecties tot 2015' (Global Labour Supply Projections up to 2015), CPB Research Memorandum (in Dutch with summary in English), The Hague (forthcoming).

[2] Rodolfa A. Bulatao, 'Projecting the demographic impact of the HIV epidemic using standard parameters', Population and Human Resources department, in United Nations/World Health Organization, 'The AIDS epidemic and its demographic consequences', New York (1991).

[3] See also Box 4.1.1.

[4] International Labour Organization, 'Economically active population estimates 1950-1980 and projections 1985-2025', Geneva (1991).

[5] In 1986 the average number of hours worked per person was 2,129 in Japan, versus 1,609 hours in the United States and 1,565 hours in the EC; Angus Maddison, 'The World Economy in the 20th Century', OECD, Paris (1989).

Appendix 2

[1] For a much more detailed explanation of the scenarios, refer to Björn van Hamel, Mark Stoffers and Lenie Wong, 'World Energy Scenarios to the year 2015', CPB Research Memorandum, The Hague (forthcoming).

[2] To a large extent, the problems in OPEC and the disappearance of other cartels of countries producing raw materials can be traced back to this.

[3] Compare also section 5.5.

[4] Compare Box 4.3.1.

[5] In terms of user prices, the real price increases amount to 2.8 and .9 per cent per year, respectively.

[6] Measured in terms of border prices in importing regions and otherwise, in terms of producer prices.

[7] In terms of final energy prices, the real price increase of energy runs at 1.0 per cent in this scenario, versus 2.8 per cent in Balanced Growth and 1.4 per cent during the 1973–1990 period.

[8] Here 'Eastern Europe' refers to Russia, Ukraine, the Baltic Republics and Belorussia.

[9] This biomass, which in the LDCs chiefly consists of fuelwood, falls under the category of remaining energy.

[10] As noted in section A.2.2, the similarities between Global Shift and European Renaissance on the global level conceal important regional differences.

[11] See footnote 6.

[12] See Andrew B. Gordon, 'Potential for Increasing Output', Petroleum Economist, pp. 234–236 (July 1988).

[13] See Commision of the European Communites, 'Energy in Europe', Luxembourg (1990).

[14] For a further explanation of the basis for the price projections in the different scenarios, refer to Björn van Hamel et al., op. cit.

Appendix 3

[1] IMF, The World Bank, OECD, European Bank for Reconstruction and Development, 'A Study of the Soviet Economy', volume 1, p. 224, Paris (1991).

[2] Contrary to the tables presented in Chapter 5, where the export growth, as wel as export shares, are adjusted for intra-trade in the CIS.

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