9

Political development

Previous chapters have shown that emissions of air pollutants are much higher than nature can tolerate, but also that it is possible to reduce them greatly – the technology exists and the price is not unreasonable. But what is happening in society, what decisions are being made, are we heading in the right direction?

This chapter first describes various international agreements, then looks at developments within the EU.

INTERNATIONAL AGREEMENTS

At international level there are a number of agreements, or conventions, that have been reached with the aim of regulating emissions of air pollutants.

The climate convention

The basis of international policy for cutting down emissions of greenhouse gases is the UN Framework Convention on Climate Change, which was signed by some 150 nations in the course of the United Nations conference at Rio de Janeiro in 1992. It came into effect in 1994, and by December 2003 this convention had been ratified by 194 parties.

It has as an "ultimate objective" the stabilizing of greenhouse gas concentrations in the atmosphere "at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system."

What that level should be is not indicated. The text merely says that it "should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

It is a stated principle of the convention that the industrialized nations, being responsible for by far the greatest part of the emissions, both now and in the past, should take the lead in combating climate change and its damaging effects.

The convention calls for no legally binding commitments on the part of the signatories. The so-called Annex I countries do however have a non-binding aim to have returned their emissions of greenhouse gases to 1990 levels by the year 2000. These countries, now numbering 41, include members of the former Eastern Bloc as well as the ordinarily recognized industrialized nations. Far from all succeeded in that aim. It could however be said that it was attained if the group's emissions are reckoned as a whole – largely because emissions dropped by almost 40 per cent in the countries with economies in transition.

Binding commitments came at Kyoto

A first step towards quantified commitments as a means of attaining the aim of the climate convention was taken when the Kyoto Protocol was signed in 1997.

Under this protocol the industrialized nations have made legally binding undertakings with regard to their emissions of greenhouse gases for the period 1990 to 2008–2012 (average for the five years). Some countries will be allowed to increase their emissions, or freeze them at current levels, but most will have to make reductions (see table 9.1). The overall reduction for the Annex I countries was expected to be 5.2 per cent when the protocol was signed.

Emissions from aviation and marine bunker fuels used in international transport do not enter into any national undertakings.

The protocol embraces six greenhouse gases that are combined in a "basket", so that individual gases are translated into CO_2 equivalents, which are then added up to produce a single figure.

The base year against which the reductions of the main greenhouse gases – carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) – will be measured is 1990, except for some countries with economies in transition, while reductions in the emissions of three long-lived industrial gases – hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and

TABLE 9.1. Commitments under the Kyoto Protocol. Required changes from 1990 to 2008–12.

Increases (%)	Freezing (%)	Reductions (%)
Iceland +10	New Zealand, Russia, Ukraine 0	Croatia -5
Australia +8		Canada, Hungary, Japan, Poland -6
Norway +1		USA -7
		EU (collectively), Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Liechtenstein, Monaco, Romania, Switzerland, Slovakia, Slovenia -8

sulphur hexafluoride (SF_6) – will be measured against either 1990 or 1995.

The protocol emphasizes that "demonstrable progress" towards meeting its aim must have been made by 2005, and reports with evidence of this submitted by January 1, 2006. Talks on targets for the second commitment period must start by 2005.

Details fixed at Bonn and Marrakech

The negotiations at Kyoto took such a long time that when the meeting ended and the protocol had been signed, some unresolved matters still remained. There had been particular difficulty in arriving at rules for the use of flexible mechanisms and carbon sinks, and further meetings had to be held to determine how the protocol was to be interpreted and how it was to function in practice. Much of this was decided at Bonn and Marrakech during the summer and autumn of 2001.

Flexible mechanisms. These include emissions trading and the opportunity for any country to pay for the reduction of emissions in another country, then add the result to its own score. As several of the parties, including the EU, wanted to limit the opportunities to use flexible mechanisms, it was finally decided that if used they should be "supplemental to domestic action," and that such action must constitute "a significant element" of the effort to meet commitments. No limit was however set for the extent to which these mechanisms could be employed.

Carbon sinks concern measures such as deforestation and reforestation that aim to increase nature's ability to bind carbon. Many countries wanted to have the opportunity to count any increased uptake of carbon by trees and soil as a reduction in their emissions. It was decided that sinks could be used up to the limit set for each country in a separate table, although concessions that had to be made to Russia, Canada, and Japan have meant that these countries will now be able to use sinks to a greater extent than other countries.

Sanctions. A party failing to meet its commitments will have its emission quota reduced for the following period by the surplus amount, plus an extra 30 per cent.

US opts out

The United States – which answered for a good third of the Annex I countries' emissions of carbon dioxide in 1990 (see figure 9.1) and has the world's largest emissions per capita – abandoned the protocol in March 2001, with the excuse that it excluded 80 per cent of the world's population and would, moreover, be detrimental to the US economy. In February 2002 President Bush presented a national policy on climate change, with voluntary targets that are likely to lead to an increase in emissions of more than 30 per cent over 1990 levels by 2010. This increase in emissions in the US, combined with full exploitation of carbon sinks, is estimated to mean that the Annex I countries will increase their combined emissions by 9 per cent over the period 1990–2012, instead of reducing them by 5.2 per cent.

The US withdrawal means that the protocol will have to be ratified by almost all the other Annex I countries if it is to be legally binding. It will come into effect after it has been ratified by at least 55 parties to the convention, including Annex I countries representing at least 55 per cent of the carbon dioxide emissions in 1990 from this group. It now only needs Russia to ratify – which it has repeatedly promised to do. Without Russia or the US it cannot come into force.

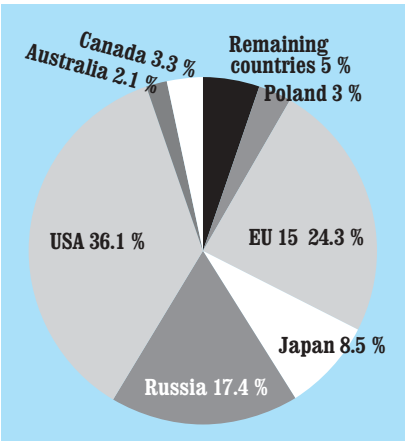

Figure 9.1. The Annex I countries' share of CO_2 emissions in 1990. In order to be enforced, the Kyoto protocol must have been ratified by enough countries to account for 55 per cent of emissions. Since the US (and Australia) do not intend to ratify, Russia must do so to make up the difference.

Continuous negotiation

It is said in the protocol that negotiations concerning the next period for commitments (after 2012) must start at the latest by 2005 (provided that the protocol will come into force).

So far, most of the developing countries have rejected all suggestions that they should cut emissions, maintaining that it is the rich countries that have caused the problem and should therefore be the first to be required to deal with it. But the developing countries' emissions are increasing. The Annex I countries are most likely to demand some form of binding commitment from the developing ones for the period after 2012.

It will be important to decide how reductions are to be distributed. It might be better, instead of using overall percentage figures, to use emissions per inhabitant as the measure. If all individuals were allotted an equal volume of emissions – as might seem reasonable – the industrialized countries would have to reduce their emissions a great deal, while some developing countries could be permitted a slight increase.

The emission levels of individual countries and the reductions that are deemed necessary are presented in chapter 4.

The Convention on Long-range Transboundary Air Pollution

When Sweden and Norway asserted, early in the 1970s, that the acidification of lakes in their countries could be ascribed to the effects of air pollutants transported over long distances, there were many who expressed doubts. But shortly after, in mid-decade, facts came to light that confirmed the theory, and after a period of negotiation, in 1979 some thirty nations signed the Convention on Long-range Transboundary Air Pollution. This is a convention that was worked out within the ECE, the UN Economic Commission for Europe, of which all the countries of Europe are members, as well as the United States and Canada.

In a text that is very generally worded it says that the signatories shall "endeavour to limit and, as far as possible, gradually reduce and prevent air pollution," and in order to fulfil that aim shall "use the best available technology that is eco-

nomically feasible." The Convention came into force in 1983, after ratification by the legislatures of the required two-thirds of the signatory states.

Sulphur, nitrogen oxides, and VOCs

Of more interest than the Convention text itself are the succeeding protocols. First to come was that on **sulphur** in 1985, in which the twenty-one signatories committed themselves to reducing their emissions of sulphur into the air by at least 30 per cent between 1980 and 1993. Some countries, such as the UK, Poland, and Spain, chose however not to sign. In the event, all those that had signed fulfilled their commitments, and several of those that had not – including the three just mentioned – did in fact cut their emissions by more than 30 per cent. Those that succeeded best were Austria, Sweden, and Finland, all of which attained 80-per-cent reductions.

The next was the protocol on **nitrogen oxides** of 1988, ratified by twenty-eight countries agreeing to restrict their emissions to 1987 levels after 1994. As an expression of dissatisfaction at the weakness of this protocol, twelve countries issued an independent declaration promising to reduce emissions of nitrogen oxides by 30 per cent by 1998, from the levels of any year between 1980 and 1986. The figures for 1994 show that several countries did not manage to fulfil even the modest commitment to freeze their emissions. Of the twelve that were aiming at a 30-per-cent reduction, less than half succeeded. It should perhaps be noted that no penalties are to be imposed, either in the Convention or in the protocols, for failure to live up to commitments.

A protocol on the limitation of **volatile organic compounds** was ready in 1991. Ratified by twenty-one nations, this protocol allows several options. Most countries have agreed to reduce their emissions of hydrocarbons by 30 per cent by 1999 (from what they were in 1988 or any other year between 1984 and 1990). Three countries with low emissions need only ensure that their figures do not exceed 1988 levels. Emission statistics indicate that at least eight of the countries that signed for a reduction of 30 per cent have failed to live up to their commitment.

The **second sulphur protocol** was signed in 1994 and has been ratified by twenty-four individual countries as well as the EU. This protocol used a new approach – the so-called critical loads concept – with computer models being used to estimate the likely cost and possible effects of assumed future emission scenarios. This effects-based approach meant that different requirements were set for each country – the aim being to attain the greatest effect for the environment at the least overall cost. Some not very rigorous requirements for large combustion plants are also included in this protocol.

In 1998 two new protocols were added to the Convention. One, which aims to reduce emissions of **heavy metals**, concentrates initially on cadmium, lead, and mercury. The aim of the other is to control, reduce, or eliminate emissions of **persistent organic pollutants** (POPs) into the environment. Sixteen substances are the declared targets of a first step, although – as in the case of heavy metals – new ones can be added later. These two protocols came into force in 2003.

The Gothenburg Protocol

The most recent agreement under the Convention is the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone – also called the multi-effect protocol, which aims to cut emissions of four pollutants: sulphur dioxide, nitrogen oxides, volatile organic compounds, and ammonia, by setting country-by-country emission ceilings to be achieved by the year 2010. It was formally adopted in Gothenburg, Sweden, in December 1999, and has been signed by 31 countries.

In technical terms this was a complicated task that required, among other things, further development of the RAINS computer model in order to handle the large and growing amount of information about emissions, the costs of measures, distribution of deposition and effects, etc., in each European country. On the basis of an analysis of different emission scenarios, the countries reached agreement on the environmental targets that should be achieved in each area by 2010. In the next phase the model was used to divide the emission reductions needed to achieve the agreed environmental targets between the various countries. As in the second sulphur protocol this resulted in different requirements for different countries. The

TABLE 9.2. Signatories of the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone. (Canada and United States excluded.) For each country figures are given for emissions in 1990, their undertakings by 2010 (in both cases in thousands of tonnes) and the percentage change over the period. Countries in bold type have ratified. (Emission data 1990 from EMEP, undertakings 2010 and status of ratification from CLRTAP Secretariat, December 2003.)

	Sulphur dioxide			Nitrogen oxides			VOCs			Ammonia		
	1990	PRO	Change %	1990	PRO	Change %	1990	PRO	Change %	1990	PRO	Change %
Austria	79	39	-51	204	107	-48	345	159	-54	52	66	27
Belgium	362	106	-71	334	181	-46	274	144	-47	99	74	-25
Denmark	180	55	-69	277	127	-54	162	85	-48	133	69	-48
Finland	260	116	-55	300	170	-43	224	130	-42	38	31	-18
France	1323	400	-70	1897	860	-55	2473	1100	-56	779	780	0
Germany	5322	550	-90	2728	1081	-60	3220	995	-69	736	550	-25
Greece	493	546	11	290	344	19	255	261	2	79	73	-8
Ireland	186	42	-77	118	65	-45	111	55	-50	112	116	4
Italy	1651	500	-70	1938	1000	-48	2041	1159	-43	466	419	-10
Luxemb.	15	4	-73	23	11	-52	19	9	-53	7	7	0
Netherl.	202	50	-75	570	266	-53	492	191	-61	232	128	-45
Portugal	273	170	-38	272	260	-4	371	202	-46	106	108	2
Spain	2102	774	-63	1207	847	-30	1555	669	-57	327	353	8
Sweden	106	67	-37	334	148	-56	498	241	-52	554	57	-90
UK	3719	625	-83	2759	1181	-57	2425	1200	-51	341	297	-13
EU 15	16273	4044	-75	13251	6648	-50	14465	6600	-54	3561	3128	-12
Armenia	72	73	1	46	46	0	81	81	0	25	25	0
Bulgaria	2008	856	-57	361	266	-26	217	185	-15	144	108	-25
Croatia	180	70	-61	88	87	-1	105	90	-14	37	30	-19
Czech R.	1881	283	-85	544	286	-47	441	220	-50	156	101	-35
Hungary	1010	550	-46	238	198	-17	205	137	-33	124	90	-27
Latvia	95	107	13	80	84	5	143	136	-5	44	44	0
Liechtens.	0.11	0.11	0	0.52	0.37	-29	0.99	0.86	-13	0.20	0.15	-25
Moldova	265	135	-49	100	90	-10	157	100	-36	49	42	-14
Norway	52	22	-58	224	156	-30	294	195	-34	23	23	0
Poland	3210	1397	-56	1280	879	-31	831	800	-4	508	468	-8
Romania	1311	918	-30	546	437	-20	772	523	-32	300	210	-30
Slovakia	542	110	-80	215	130	-40	262	140	-47	63	39	-38
Slovenia	196	27	-86	63	45	-29	44	40	-9	24	20	-17
Switzerl.	42	26	-38	154	79	-49	279	144	-48	72	63	-13

requirements were assigned according to cost-effectiveness, i.e. to achieve the environmental targets at the lowest overall cost for Europe as a whole.

However, when the time came for the final negotiations it turned out that none of the countries was prepared to reduce emissions as much as needed to achieve the environmental targets. Instead there were more negotiations and compromises – the final results are shown in table 9.2.

Dealing with several environmental effects and several pollutants in a coordinated manner, in a single protocol, should boost overall cost-effectiveness. Provided that the signatories to the protocol actually stick to the ceilings set for them, and that the emissions in the non-signatory countries do not increase, overall European emissions of sulphur dioxide may be expected to fall by at least 63 per cent, nitrogen oxides and volatile organic compounds by 40 per cent, and ammonia by 17 per cent, between 1990 and 2010.

While the agreed emission reductions provide another important step in the right direction, they are far from sufficient for achieving the environmental quality targets for 2010 that were agreed by European countries in January 1999. Compared with what will be needed to meet the internationally agreed long-term aim – no more exceeding of the critical loads for pollutants anywhere – they are of course even more inadequate.

The Gothenburg Protocol is scheduled for review and revision around 2004–2006. But such negotiations must wait until the protocol is brought into force, which requires that sixteen countries must have ratified. So far (December 2003) only six countries have done so.

Improvements and uncertainties

The effects the Gothenburg Protocol is expected to have on people and the environment are shown in table 9.3. As can be seen from the table there will be a tangible reduction in the area over which critical loads for acidification and eutrophication are exceeded, although extensive problems still remain. The changes can be seen in figure 5.5 (page 91) and 6.2 (page 110).

It should be noted that the information in table 9.3 is laden with uncertainty. Alternative estimates for Sweden, with

Table 9.3. Expected effects on the environment of the Gothenburg Protocol ("PRO") by 2010. The figures assume that all signatory countries do as promised under the Gothenburg Protocol (see table 9.2) and that emissions in non-signatory countries develop as officially projected. The column headed "change" gives the percentage reduction compared with 1990. (Integrated Assessment Modelling for the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone in Europe. M. Amann et al., 1999.)

	Acidification[1]			Ozone AOT60[2]			Ocone AOT40[3]			Eutrophication[4]		
	1990	PRO	Change %	1990	PRO	Change %	1990	PRO	Change %	1990	PRO	Change %
EU 15	37.0	5.3	-86	1260	398	-68	12.4	6.8	-45	66.8	47.6	-29
Non-EU countries	56.3	9.8	-83	305	82	-73	9.5	5.4	-43	98.5	60.7	-38
Total for Europe	93.3	15.2	-84	1566	480	-69	21.9	12.2	-44	165.3	108.4	-34

[1] Area of ecosystem where deposition of acidifying substances exceeds the critical load (units: million hectares).

[2] Cumulative exposure index for health effects of ozone (million inhabitants × ppm × hours).

[3] Cumulative exposure index for effects of ozone on vegetation (km^2 × excess × ppm × hours).

[4] Area of ecosystem where deposition of nitrogen exceeds the critical load for eutrophication (million hectares).

higher-resolution data for deposition and critical loads, show that the area that is overloaded with acid deposition is around three times larger than indicated. Note also that the figures refer to the area where the critical load is exceeded, not the real environmental situation. In many ecosystems it is probable that it will take decades, perhaps centuries, for viable living conditions to be restored for many organisms.

Shipping and aviation

One large but almost wholly unregulated source of emissions of sulphur dioxide and nitrogen oxides is shipping (see factfile on next page). The air pollution annex to the MARPOL convention, which was adopted by member countries of the UN's International Maritime Organization (IMO) in autumn 1997, leaves a lot to be desired. It has proved very difficult to get the IMO to incorporate environmental policy in its activities, partly because the voting rights are based on vessel ton-

EMISSIONS FROM SHIPPING

The emissions of air pollutants from ships engaged in international trade in the seas surrounding Europe – the Baltic, the North Sea, the north-eastern part of the Atlantic, the Mediterranean and the Black Sea – were estimated to have been 2.6 million tonnes of sulphur dioxide (SO_2) and 3.6 million tonnes of nitrogen oxides (NO_x) a year in 2000.

While emissions from land-based sources are gradually coming down, those from shipping show a continuous increase. As a result, when the fifteen EU member countries have fulfilled their commitments in accordance with the directive on national emission ceilings, and assuming that the growth in emissions from shipping will be 3 per cent per year, by 2010 the latter will be equivalent to four-fifths of the EU total for sulphur and nearly three-quarters of that for nitrogen oxides (see table below).

	Sulphur dioxide (SO_2)		Nitrogen oxides (NO_x)	
	land-based	shipping	land-based	shipping
1990	16.4	2.0	13.4	2.8
2000	5.8	2.6	9.5	3.6
2010	3.9[1]	3.3[2]	6.6[1]	4.6[2]

[1] Projection according to the EU directive on national emission ceilings.

[2] Assuming an annual growth of 3 per cent.

nage, which gives a strong influence to a small number of flag countries that have large shipping fleets.

The situation is almost as bad when it comes to aviation and air pollution. The UN's International Civil Aviation Organization (ICAO), has only just begun to take environmental issues into account, and the requirements that are imposed on emissions and noise are very generous. Emissions from the aviation sector are currently relatively low, but are growing rapidly. There are also fears that emissions at high altitudes have powerful effects on climate.

THE EU AND THE AIR

Up to the early nineties, EU policy in regard to air pollution had tended to be fragmented. Such directives as existed were either those setting air quality standards for a few selected air pollutants or others to control emissions from certain defined sources such as large power plants and road vehicles.

Strategic approach

Some first steps towards a more clearly aimed and strategic policy could be seen in the fifth environmental action programme, which was presented in 1992 and contained proposals for long-term environmental objectives both for air quality and acidification.

The former stated that "all people should be effectively protected against recognized health risks from air pollution," and that "permitted concentration levels of air pollutants should take into account the protection of the environment." For the acidifying, ozone-forming, and eutrophying pollutants – sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia – the aim was that there should be "no exceeding ever of critical loads and levels".

Also dating from 1992 was the auto-oil programme, aimed at setting new environmental requirements for road vehicles and motor fuels. The requirements were to match certain defined aims for air quality and accord with the World Health Organization guidelines. They were to be cost-effectively attained by 2010. That programme, which was concluded in 1996, resulted in several new directives being adopted in 1998 and 1999.

The mid-nineties also saw the emergence of a framework directive on air quality as well as a completely new directive for the integrated prevention and control of the pollution of air, water, and land (IPPC). The framework directive on air quality provided the springboard for various daughter directives setting limits on the concentrations of several individual air pollutants.

Strategy for combating acidification

In the wake of the fifth environmental action programme and under the influence of the Convention on Long-range Transboundary Air Pollution, the Commission presented in March 1997 a strategy for combating acidification within the EU which included an all-sector-embracing analysis to enable some clearly defined environmental targets to be attained as cost-effectively as possible by 2010. Presented as interim targets, these were to be regarded as first steps towards achieve-

ment of the long-term objectives of the fifth environmental action programme.

The acidification strategy was later supplemented by a similar one to cut down the concentrations of ground-level ozone. The two of them laid the foundation for a Commission proposal to limit emissions – a directive setting binding national ceilings for the emissions of four acidifying and ozone-forming air pollutants, which was formally adopted in 2001. Moreover, the acidification strategy came to involve a revision and tightening up of two important directives: one for controlling the sulphur content of liquid fuels, and the other on emissions of SO_2, NOx and particles from large combustion plants.

CAFE – Clean Air for Europe

The more strategically oriented work on air quality that was initiated in the nineties will now be followed up by a programme called CAFE, Clean Air For Europe, which was presented by the Commission in 2001. The need for this programme derives from the fact that several directives of importance for emission levels and air quality are due for revision around 2004, and to achieve proper results it will, in the view of the Commission, be necessary to gather them into a single programme. The idea is that CAFE should evolve into an on-going, cyclical programme, in which 2004 will only mark the first milestone. It will also be the first of the so-called thematic strategies announced in the sixth environmental action programme.

The CAFE programme will deal mainly with particles and ground-level ozone, both because of their serious effects on health, and the fact that much will have to be done if concentrations are to be brought down to acceptable levels. Outstanding problems in respect of acidification and eutrophication will however also be given attention, and a watch will be kept on developments with regard to pollutants that are as yet unregulated, as well as on what is happening in "hot spot" areas with exceptionally extensive pollution.

One advantage of this more strategic and resolute action at EU level, as envisaged in the CAFE programme, is that it should be able to bring about a more rapid and pronounced

reduction in member states' emissions of pollutants. A further consideration is that such action by the EU will make it possible to put greater pressure on other European countries, outside the EU, to reduce their emissions by taking a more active stance in the context of the Convention on Long-range Transboundary Air Pollution.

Directives and decision making

EU legislative measures that directly affect emissions and concentrations of air pollutants are listed in the factfile pages 162–163. Over and above these there are however a number of directives and other moves at EU level that can have an indirect effect – such as those aimed at reducing the emissions of greenhouse gases, and others capable of influencing developments in the energy, transportation and agricultural sectors.

Most EU decisions on environmental issues are reached by means of a codecision procedure, which means that the European Parliament has an equal say in the matter as the Council of Ministers. As a result the decision-making process can be fairly long-winded – it often takes two years between a proposal from the Commission and the final decision being taken by the Council of Ministers.

Climate-changing gases

In the run up to the 1997 climate convention in Kyoto the negotiating position of the EU countries was that emissions of greenhouse gases should be reduced by 15 per cent between 1990 and 2010, but the reduction that was agreed after the negotiations was 8 per cent (despite the Commission showing that a reduction of 15 per cent would be profitable for the EU).

In the negotiations that followed the Kyoto Protocol the EU countries played a driving role, and the Commission put forward a series of strategies, programmes and proposals to enable the union to meet its undertaking to reduce emissions by 8 per cent. The way in which this collective undertaking is shared between the member countries is shown in table 4.2 (page 71). Over the period 1990–2000 emissions have fallen by 3.5 per cent.

The environmental target set by the Council of Ministers is that the mean global temperature should not rise by more

than 2°C above the pre-industrial level, and that a carbon dioxide concentration of less than 550 ppm should be the guiding figure for global restriction and reduction measures.

Sustainable development

In 1998 the Cardiff process was established in the EU in an effort to integrate environmental issues in all EU policy, for example in trade, structural funds, agriculture, energy and transport. So far there have been few visible results, but this work could be important in the longer term. At a meeting of heads of state and government (European Summit) in Gothenburg in June 2001 a rather generally formulated sustainability strategy was adopted for the EU, which highlights the climate issue as a priority area.

Good or bad?

In order to balance the relatively positive picture of EU environmental work that is given above it is fair to mention some negative aspects too.

- The main goal of the EU is to develop a free internal market, which could result in extensive goods freight.
- Countries that have low environmental ambitions can successfully veto important decisions. It has, for example, been impossible to introduce a substantial tax on carbon dioxide emissions so far. The reason is that decisions on harmonized taxes require unanimous agreement between all member countries.
- EU structural funds (which give support to the poorest member countries) and the Trans European Networks project are subsidizing large investments in new transport infrastructure, in many cases in the form of new roads. Substantial subsidies to agriculture also counteract environmental targets to a large extent.
- The EU decision-making process is largely closed, which reduces the opportunities for transparency and effective influencing of public opinion. The organization also favours those parties that are economically strong and have the ability to supply the Commission with their own analyses and information.

Whether the EU as a whole is good or bad for the environment is a question that can hardly be answered. Even if the analysis is limited solely to air pollution there are no simple answers. It is however clear that, in recent years, the cooperation has spurred on those countries that were previously "worst in class" and which are still dragging their heels. On the other hand, the countries that are pushing for improvement could possibly have made even more headway if they had not been forced to make compromises.

Expansion into the east

A number of eastern and central European countries are to become members of the union over the next few years, which could lead to some improvement in the environmental situation in Europe. However, the effect is not expected to be dramatic. There is also a risk that existing member countries will slacken the pace to allow the new members to catch up with their legislation. In any event it is clear that the decisions that are taken within the union already have a large influence on environmental work in the candidate countries, since harmonization with EU regulations is a condition for membership. On the other hand many of these changes would probably be implemented anyway, regardless of EU membership.

EU DIRECTIVES AFFECTING EMISSIONS AND CONCENTRATIONS OF AIR POLLUTANTS

In the case of products that can travel across national borders, such as vehicles and fuels, the EU requirements are usually harmonization requirements, i.e. the same requirements must apply in all member countries. Stationary installations (e.g. combustion plants) and air quality standards are instead covered by minimum requirements, i.e. each member country is free to set stricter national requirements if it wishes.

Directive on national emission ceilings for acidifying and ozone-forming air pollutants (2001/81/EC): Sets binding ceilings to be attained by each member state by 2010. Covers four air pollutants: sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia. The directive covers the same pollutants as the Gothenburg Protocol (see page 152) and both have developed in parallel. Table 9.4 shows each country's undertaking. The member countries' aggregate emissions of these four pollutants are to be reduced by 77, 51, 54, and 14 per cent respectively between 1990 and 2010. In comparison with the Gothenburg Protocol the differences in emission undertakings are not that large. More importantly, the EU legislation means that the countries that do not fulfil their undertakings can be brought before the European Court of Justice and fined.

The directive is scheduled for review and revision in 2004, when it is expected that proposals will be made to extend it to small particles and to set new ceilings. The aim of the directive is to limit emissions in order to move towards the long-term objectives of not exceeding critical loads and of effective protection of all people against recognized health risks from air pollution.

Control of emissions from large combustion plants (2001/80/EC): Covers plants with a rated thermal capacity of at least 50 MW. Contains emission limits for sulphur dioxide, nitrogen oxides and dust, varying according to the age and capacity of the plants, as well as the type of fuel burned. Not only tightens up the requirements for new plants, but also introduces for the first time emission limits for existing ones. Review and possible revision expected in 2004.

Sulphur content of certain liquid fuels (99/32/EC): Sets the maximum permitted concentration for sulphur in heavy fuel oil used in the EU at 1 per cent as from 2003, and for gas oils at 0.2 per cent, to be reduced to 0.1 per cent from 2008. Discussions are proceeding on a Commission proposal for revision in order to include marine bunker fuel (heavy fuel oil used in ships).

Quality of petrol and diesel fuels (2003/17/EC): Prescribes 350 and 150 ppm as maximum sulphur content for diesel and petrol respectively. As of 2005 the figure will be lowered in both cases to 50 ppm (0.005 per cent) and by 2009 it will be lowered even further, to 10 ppm.

Emissions of air pollutants from road vehicles: Three directives addressing mainly the emissions of nitrogen oxides, non-methane volatile organic com-

pounds, and small particles. The directive for passenger cars and light commercial vehicles (98/69/EC) specifies emission standards to be introduced in two steps – the first put in place in 2000 and the second coming into force in 2005. Directive 99/96/EC takes a similar stepwise approach for heavy vehicles, but with the inclusion of a third step (for 2008). Directive 97/24/EC, as amended by 2002/51/EC, sets emission standards for two and three-wheeled vehicles, mopeds and motorcycles.

Framework directive on ambient air quality assessment and management (96/62/EC): Provides the means for setting limit values on the concentrations of pollutants in the air through daughter directives. See factfile on page 42 for details. Review and revision of the first daughter directive is expected to take place in 2004.

IPPC, Integrated pollution prevention and control (96/61/EC): Aims at preventing or reducing pollution of air, water and land through a comprehensive system of permits. It applies to a significant number of activities, mainly industrial. Since the end of 1999 new installations are required to have a permit issued in compliance with the directive, which means they are expected to employ best available techniques (BAT). The same applies to existing plants, which however have until 2007 to comply. Guidance as to what is regarded as BAT for various sectors of industry is given in reference documents, so-called brefs. The bref for large combustion plants is expected to be adopted in 2004. (Altogether 30 to 35 brefs will be published and regularly updated).

Use of solvents in industry (99/13/EC): Intended to cut down the emissions of volatile organic compounds arising from the use of organic solvents in some twenty industrial processes. Concerning the VOC content of paints and varnishes, the Commission proposed in December 2002 to set EU limits in two stages, starting in 2007.

Emissions from engines for non-road machinery (97/68/EC): Applies only to compression (diesel) engines with power outputs of 18 to 560 kilowatts. The new directive 2002/88/EC extends the scope of directive 97/68/EC so that it also covers small spark-ignition (petrol) engines such as are used in lawn mowers, chainsaws, etc. In December 2002 the Commission proposed to set stricter limits on the emissions of NOx and particles from diesel engines in two steps, in 2006 and 2011. Emissions from tractors used for instance in agriculture and forestry are regulated by directive 00/25/EC.

Emissions from pleasure boats (2003/44/EC): An amendment to directive 94/25/EC, this regulates emissions of air pollutants as well as noise. Its main effect as regards air pollutants will be to reduce emissions of VOCs from new two-stroke marine engines sold after 2005.

A Community Strategy on Air Pollution from Sea-going Ships was presented in November 2002. It includes among others a proposal for modifying directive 99/32/EC on the sulphur content of liquid fuels so as to extend its scope to include heavy bunker fuel oils (see above). It also announces the Commission's intention to investigate and put forward proposals for economic instruments.

TABLE 9.4. Emissions by EU countries in 1990 and undertakings for 2010 in the national emission ceilings (NEC) directive (1000 tonnes).

	SO_2		NO_x		VOC		NH_3	
	1990	2010	1990	2010	1990	2010	1990	2010
Austria	79	39	204	103	345	159	52	66
Belgium	362	99	334	176	274	139	99	74
Denmark	180	55	277	127	162	85	133	69
Finland	260	110	300	170	224	130	38	31
France	1323	375	1897	810	2473	1050	779	780
Germany	5322	520	2728	1051	3220	995	736	550
Greece	493	523	290	344	255	261	79	73
Ireland	186	42	118	65	111	55	112	116
Italy	1651	475	1938	990	2041	1159	466	419
Luxemb.	15	4	23	11	19	9	7	7
Netherl.	202	50	574	260	492	185	232	128
Portugal	273	160	272	250	371	180	106	90
Spain	2102	746	1207	847	1555	662	327	353
Sweden	106	67	334	148	498	241	54	57
UK	3719	585	2759	1167	2425	1200	341	297
Sum EU	16273	3850	13255	6519	14465	6510	3561	3110