Calculating the Costs of the Kyoto Protocol – How Will It Affect Europe's Competitiveness?

an Open Forum sponsored by International Council for Capital Formation

Brussels, 11 September 2002

Background Paper

Outlook for industrialized countries GHG emissions to 2010

by

Robert A. Reinstein
Reinstein & Associates International, Inc.
reinsteinb@aol.com

OUTLOOK FOR INDUSTRIALIZED COUNTRIES
GHG EMISSIONS TO 2010

The following paper presents a brief assessment of where the European Union and other key industrialized countries listed in Annex B of the Kyoto Protocol stand with regard to recent emission trends and projected GHG emissions in relation to the targets set out for each in Annex B. The papers draws on original analysis presented in the *Outlook for Industrialized Countries Greenhouse Gas Emissions, 1999 Edition* (Reinstein & Associates International, January 2000), a two-volume study which examined all of the sectors and countries in detail.

As in the *Outlook*, historical emissions are presented for 1990 (or earlier years for eastern European countries using different base periods) and 1999. For some countries which had not reported emission data for non-energy CO_2, CH_4, N_2O and other gases as of November 2001, data for the most recent year for which emission had been reported were used as a surrogate for 1999 data.

Data Sources

Emissions data for almost all countries are available only through 1999, and even these data are not complete or consistent. However, while they show that some countries are actually on a path that implies they may meet their Kyoto targets, they also strongly suggest that others are still far from these targets, with the gap growing each year.

The data for CO_2 emissions from fuel use are from the International Energy Agency, which provides a more consistent and detailed treatment of these emissions than the UNFCCC emissions inventory data base. Other non-energy CO_2 and other GHG emissions are from the UNFCCC.

Sources of emissions are examined by sector for each of the three principal anthropogenic GHGs: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). In addition, CO_2 emissions from fuel combustion are analyzed by fuel source (coal, oil and natural gas). Emissions are given only in the aggregate for the three additional categories of GHGs ("f-gases") covered by the Kyoto Protocol: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).

For most countries 1990 is the base year, but it is earlier years for Bulgaria (1988), Hungary (average of 1985-87), Poland (1988) and Romania (1989), in accordance with UNFCCC Article 4.6. The base year for the f-gases is 1995.

Emissions Projections

For each country, an assessment is given of the potential to limit emissions in the 2010 time frame. This year is the midpoint of the first commitment period (2008-2012) for Annex B countries under the Protocol, and is probably representative of the outlook for the five-year period

Based in the most recent GHG emission data for all Annex B countries, updated emission projections to 2010 have been prepared. The projections indicate that some countries will be a little closer to their Kyoto

targets in 2010 than suggested earlier, but most will still miss their targets. Annex B as a whole could meet its collective target in the most optimistic scenario, but only because of the significant amount of "hot air" emission reductions projected for the economies in transition under that scenario.

Emissions and projections for CO_2 from energy use (fuel consumption) for all Annex B countries are shown in Table 1 in millions of tonnes of CO_2 equivalent. Emissions and projections for all GHGs included in the Kyoto targets are shown in Table 2. (The corresponding values in terms of carbon equivalent are presented in Tables 1A and 2A, respectively.) It can be seen that energy-related CO_2 represents the largest share of emissions for all Annex B countries, and therefore that each country's energy situation is the largest factor driving future emission trends.

Problems With Uncertain Data

The projections remain difficult to make because of continuing serious gaps and inconsistencies in the historical emissions data for 1990 through 1999. IEA data for the countries of the former Soviet Union are available only from 1992, and details for 1990 have been estimated based on trends since 1992 and aggregate emission data provided to the UNFCCC secretariat. Thus, there are considerable uncertainties regarding the reliability of these estimates (and the amount of "hot air" reductions actually occurring in these countries).

The UNFCCC data continue to show a number of gaps and inconsistencies. A number of countries have not submitted emission data to the FCCC secretariat for 1999 or even earlier years, and so earlier years were used as a surrogate for 1999 for this analysis. One country has submitted emissions inventory data only through 1994. Slovenia has submitted data only for 1990. Croatia has not submitted any data at all (only the IEA CO_2 estimates are available). In addition, several countries, even within western Europe, have not submitted complete data on emissions of the "new" gases (or "f-gases"), i.e., HFCs, PFCs and SF_6.

Even for those countries where data exist for most years from 1990 through 1999, there are some significant discontinuities in some data, with figures for some sectors changing by orders of magnitude from one year to the next. In addition, there are some major inconsistencies between the aggregate totals for broad sectoral categories published in UNFCCC documents prior to COP-7 and the more detailed breakdowns by subsector, available only through 1998 on the UNFCCC secretariat website.

While the other GHGs are less important in influencing the overall emissions level, these problems have made it necessary to make a number of judgments about ignoring certain data that seem out of line with the longer trends or supplying data estimates for 1999 where these were missing for some countries. The projections should be viewed with a little caution in light of these uncertainties, but in general are considered indicative of the situations of each Annex B country regarding its Kyoto target.

The estimates presented here do not include sinks, as the historic data trends and the provisional rules agreed in Bonn and Marrakesh are not sufficiently clear to provide a firm basis for projecting the net emission situation of each country in 2010. It may be that credits from sinks will help some of these countries, particularly Australia, in reducing the substantial deficits they have relative to their Kyoto targets, but at this stage it is simply too early to tell.

The data and estimates also do not include CO_2 emissions from combustion of fuels for international aviation and marine bunkers, as these are excluded from the current Kyoto Protocol commitments. It is likely they will be included in future negotiations, but not clear how they may be treated.

Scenarios Used for Projections

In order to provide a broader perspective on the outlook for industrialized-country GHG emissions, two different scenarios for 2010 were examined:

> Trend Scenario (continued good efforts): current trends continue, including additional reasonable measures that can be justified as well for other reasons, according to national political factors
>
> Pain Threshold Scenario (true best efforts): all reasonable economically and politically feasible measures are taken to limit emissions

As with any scenarios for possible future conditions, these scenarios are not predictions but rather are projections of what might occur given certain policy approaches by different countries. They frame what is considered to be the likely range of results for each country.

Actual emissions would, of course, be lower than the Trend Scenario projections if the Kyoto Protocol were to enter into force. But there is a basic limit on what each country can do to limit its emissions through domestic measures. The Pain Threshold Scenario assumes a country does all that it reasonably can to limit emissions, up to the point where further actions would have unacceptable economic and social consequences (job losses, disproportional regional impacts, individual hardship, etc.). It is assumed that this threshold depends in part on the current state of understanding of the science of climate change, or at least on public perceptions regarding the risks of climate change and related impacts.

This point will necessarily differ from country to country. For example, for some countries a very high value is placed on environmental goals and people are willing to make some sacrifices to achieve these goals, while in other countries this may be less the case. Regional differences in economic activity, which may constrain a country more than national average conditions might suggest, are also different from one country to another. Lifestyles and expectations regarding the levels of certain conveniences and services differ as well. Finally, certain industrial activities that are related to military and security concerns are more important to some countries than to others.

It is most unlikely that countries would go beyond this threshold on the basis of computer model projections, even though emphasized by claims by some politicians and scientists (but not supported by others) that recent weather events are due to human GHG emissions. Most people were unwilling to make the kind of sacrifices that would be beyond the Pain Threshold even in the 1970s when there were actual local shortages of energy and a doubling of oil prices.

The scenarios used for Annex B countries with economies in transition (formerly centrally planned economies) are somewhat different from the two scenarios described above for most OECD countries. The lower number corresponds to a scenario where hardly any improvement is made in the country's economic situation by 2010, while the high estimate assumes the country has progressed reasonably well along the transition path from a centrally planned to a market economy by 2010.

EU Outlook

The EU, as a result of efforts made in several (but not all) Member States, appears to be a little closer to meeting its 8% Kyoto reduction target by 2010 than earlier projections had indicated. But the overall situation is still mostly attributable to the large reductions made during the early 1990s in Germany and the UK for reasons other than climate change. This advantage for the EU seems to be declining, based on more recent data trends, and the EU will still probably miss its Kyoto target.

As shown in Table 1, large reductions in CO_2 emissions occurred between 1990 and 1999 in Germany (due to reunification), the UK (due to restructuring of the coal and electricity sectors) and Luxembourg (due to closing an old steel mill). All other EU countries were above 1990 emission levels in 1999, and thus in most cases are likely to miss the EU commitment to stabilize CO_2 emissions at 1990 levels by 2000. Only Finland and Sweden appear to be close to meeting this earlier non-binding commitment.

The EU as a whole was very close to the stabilization target in 1999, but current trends will take it about 7% above this level by 2010, unless significant new measures in the energy sector are undertaken. Trends in the transport sector and the electricity sector will make it difficult to find such measures in the time frame of the Kyoto targets, and the push to close nuclear plants in Europe only adds to these difficulties.

When all GHGs included in the Kyoto targets are considered, the EU is much closer to its target, as shown in Table 2. This is largely because of significant reductions in methane and nitrous oxide emissions. Methane emissions declined by 17% between 1990 and 1999, with the largest reductions coming from coal-seam leaks (53%) and landfills (20%). Livestock emissions also fell, due to a number of factors (including mad-cow disease and the start of reform of the EU Common Agricultural Policy on subsidies). Nitrous oxide emissions declined by almost 14% over this same period, with a 56% decline in chemical industry emissions more than offsetting a doubling of transport emissions from increasing use of catalytic converters.

Nevertheless, EU emissions are likely to increase by 2010 to slightly above 1990 levels, i.e., far short of the 8% reduction target. The limit of feasible measures is estimated to leave EU total GHG emissions a little more than 5% below 1990, or still short of the target.

Table 3 shows the potential demand for emissions "credits" by EU countries and other OECD Annex B countries in terms of tonnes of CO_2-equivalent emissions. These are calculated by converting the Kyoto targets to annual average tonnes allowed to be emitted between 2008 and 2012 and comparing these to the emission projections under the two scenarios. The difference is shown as a "deficit," although a few countries have a slight surplus in the best (Pain Threshold) case.

Economies in Transition

The supply of potential credits to meet the needs of OECD countries is clearly available in theory in the "hot air" reductions that have taken place in the countries with economies in transition, as shown in Table 4. Russia alone has between 500 million and 1 billion tonnes per year of CO_2 equivalent emission allowances that it could in principle sell to other countries.

Others appear to have significant amounts as well, even under the Trend Scenario where their economies grow and begin to emerge as full market economies. For example, Ukraine would have 300 million tonnes or more of potential surplus credits, Poland between 70 and 120 million tonnes, Romania between 70 and 100 million tonnes, and so forth. These estimates are calculated by comparing the projections in Table 2 with each country's Kyoto target.

It is interesting to note that the aggregate effective target for the economies in transition as a group is only a 2% reduction below 1990 levels, thanks to both Russia and Ukraine having targets of 0%. In contrast, the OECD countries, which have a more difficult time in achieving reductions, have an aggregate target of about 6.3% below 1990 levels. With the US included, the OECD target would have been 6.6% (in other words, the US target was stricter than the OECD average).

The main issue now is whether these countries will in fact make the potential supply of credits available in the market, and at what price. For a number of reasons, it is unlikely that Russia (and others) will simply make the total supply available. How much might be available and under what prices and conditions is still quite up in the air.
An indication of the kind of "hard ball" Russia might be willing to play was provided by a recent statement, published on 21 March, by the chairman of the Duma (parliament) committee for ecology Vladimir Grachev. He clearly linked the Kyoto Protocol to international trade and, noting that Russian ratification of the Protocol is essential because without US participation the Protocol cannot enter into force without Russia, commented:

> "One might get the impression that countries of the European Union believe that Russia is simply obliged to ratify the Protocol, but this position is deeply erroneous. Russia had already cut its greenhouse emission by 41%. I believe that the ratification of the Kyoto Protocol is possible only after negotiations are held with the European Union to which certain terms should be set. In particular, Russia objects to the fact that the European Union might easily adapt the clauses of the Protocol in order to exercise pressure in the field of international trade. If the European Union does not change its politics, Russia will not agree to the ratification of the Kyoto Protocol."

There have been other recent indications that Russia increasingly sees the Kyoto Protocol in economic terms. This suggests that some difficult times may be ahead for those OECD countries that will need to rely heavily on an international emissions credit market that is dominated by Russia.

TABLE 1: ANNEX B EMISSIONS: CO2 FROM FUEL CONSUMPTION
(MILLION TONNES)

COUNTRY	1990	1999	% VS. 1990	2010 TREND	% VS. 1990	2010 PAIN	% VS. 1990
Austria	56.8	61.7	8.6	65.3	14.9	58.1	2.2
Belgium	106.5	116.4	9.3	122.7	15.2	110.7	3.9
Denmark	50.9	53.6	5.3	59.4	16.5	49.0	-3.8
Finland	55.0	55.8	1.4	62.2	13.2	54.8	-0.3
France	352.7	380.6	7.9	393.8	11.7	368.9	4.6
Germany	961.9	825.1	-14.2	862.0	-10.4	816.9	-15.1
Greece	70.6	84.2	19.2	95.5	35.3	92.5	31.0
Ireland	30.3	39.9	31.9	47.8	57.8	44.4	46.9
Italy	399.4	422.4	5.8	456.2	14.2	420.4	5.3
Luxembourg	10.5	7.5	-28.6	7.9	-25.0	6.9	-34.0
Netherlands	159.8	170.6	6.8	183.7	14.9	173.2	8.4
Portugal	39.6	60.4	52.4	73.7	86.1	67.7	70.8
Spain	206.4	266.8	29.2	286.7	38.9	265.8	28.8
Sweden	51.2	51.8	1.3	55.6	8.7	53.1	3.8
United Kingdom	560.3	519.2	-7.3	556.7	-0.6	522.4	-6.8
EU-15	3,111.8	3,115.9	0.1	3,329.1	7.0	3,104.7	-0.2
Australia	258.9	326.6	26.2	354.0	36.7	338.1	30.6
Bulgaria	75.2	43.1	-42.7	59.8	-27.3	48.1	-41.6
Canada	430.2	503.6	17.0	550.6	28.0	532.8	23.8
Croatia	17.3	18.9	9.1	21.8	26.3	19.3	11.6
Czech Republic	153.8	110.0	-28.5	131.2	-14.7	118.4	-23.0
Estonia	33.0	14.2	-57.1	19.9	-39.6	15.9	-51.9
Hungary	70.5	60.5	-14.3	72.9	-10.9	65.0	-20.5
Iceland	1.9	2.1	8.4	3.0	55.3	2.9	51.6
Japan	1,018.7	1,127.4	10.7	1,169.0	14.8	1,094.2	7.4
Latvia	21.4	7.2	-66.2	12.7	-40.5	8.2	-61.7
Lithuania	31.0	12.9	-58.4	21.7	-30.0	15.1	-51.4
New Zealand	21.9	29.8	36.2	32.7	49.6	31.1	42.1
Norway	28.5	38.2	34.0	43.1	51.0	41.8	46.6
Poland	340.7	304.4	-10.6	345.5	-19.1	301.6	-29.4
Romania	166.9	81.8	-51.0	131.4	-30.2	100.2	-46.8
Russia	2,297.0	1,461.8	-36.4	1,897.6	-17.4	1,569.2	-31.7
Slovakia	55.4	40.1	-27.6	47.5	-14.2	39.9	-28.1
Slovenia	12.5	15.0	20.3	19.3	54.5	16.6	32.5
Switzerland	39.9	41.1	3.1	43.0	7.8	40.9	2.5
Ukraine	660.3	337.3	-48.9	451.2	-31.7	368.1	-44.3
United States	4,829.4	5,522.4	14.4	6,019.0	24.6	5,659.0	17.2
Annex B Total	13,676.1	13,214.2	-3.4	14,775.9	8.0	13,530.9	-1.1

TABLE 1A: ANNEX B EMISSIONS: CO2 FROM FUEL CONSUMPTION
(MILLION TONNES CARBON)

COUNTRY	1990	1999	% VS. 1990	2010 TREND	% VS. 1990	2010 PAIN	% VS. 1990
Austria	15.5	16.8	8.6	17.8	14.9	15.8	2.2
Belgium	29.1	31.7	9.3	33.5	15.2	30.2	3.9
Denmark	13.9	14.6	5.3	16.2	16.5	13.4	-3.8
Finland	15.0	15.2	1.4	17.0	13.2	14.9	-0.3
France	96.2	103.8	7.9	107.4	11.7	100.6	4.6
Germany	262.3	225.0	-14.2	235.1	-10.4	222.8	-15.1
Greece	19.2	23.0	19.2	26.0	35.3	25.2	31.0
Ireland	8.3	10.9	31.9	13.0	57.8	12.1	46.9
Italy	108.9	115.2	5.8	124.4	14.2	114.7	5.3
Luxembourg	2.9	2.0	-28.6	2.1	-25.0	1.9	-34.0
Netherlands	43.6	46.5	6.8	50.1	14.9	47.2	8.4
Portugal	10.8	16.5	52.4	20.1	86.1	18.5	70.8
Spain	56.3	72.8	29.2	78.2	38.9	72.5	28.8
Sweden	14.0	14.1	1.3	15.2	8.7	14.5	3.8
United Kingdom	152.8	141.6	-7.3	151.8	-0.6	142.5	-6.8
EU-15	848.7	849.8	0.1	907.9	7.0	846.7	-0.2
Australia	70.6	89.1	26.2	96.5	36.7	92.2	30.6
Bulgaria	20.5	11.8	-42.7	16.3	-27.3	13.1	-41.6
Canada	117.3	137.3	17.0	150.2	28.0	145.3	23.8
Croatia	4.7	5.1	9.1	6.0	26.3	5.3	11.6
Czech Republic	41.9	30.0	-28.5	35.8	-14.7	32.3	-23.0
Estonia	9.0	3.9	-57.1	5.4	-39.6	4.3	-51.9
Hungary	19.2	16.5	-14.3	19.9	-10.9	17.7	-20.5
Iceland	0.5	0.6	8.4	0.8	55.3	0.8	51.6
Japan	277.8	307.5	10.7	318.8	14.8	298.4	7.4
Latvia	5.8	2.0	-66.2	3.5	-40.5	2.2	-61.7
Lithuania	8.4	3.5	-58.4	5.9	-30.0	4.1	-51.4
New Zealand	6.0	8.1	36.2	8.9	49.6	8.5	42.1
Norway	7.8	10.4	34.0	11.7	51.0	11.4	46.6
Poland	92.9	83.0	-10.6	94.2	-19.1	82.3	-29.4
Romania	45.5	22.3	-51.0	35.8	-30.2	27.3	-46.8
Russia	626.5	398.7	-36.4	517.5	-17.4	428.0	-31.7
Slovakia	15.1	10.9	-27.6	13.0	-14.2	10.9	-28.1
Slovenia	3.4	4.1	20.3	5.3	54.5	4.5	32.5
Switzerland	10.9	11.2	3.1	11.7	7.8	11.1	2.5
Ukraine	180.1	92.0	-48.9	123.1	-31.7	100.4	-44.3
United States	1,317.1	1,506.1	14.4	1,641.5	24.6	1,543.4	17.2
Annex B Total	3,729.8	3,603.9	-3.4	4,029.8	8.0	3,690.2	-1.1

TABLE 2: ANNEX B EMISSIONS: SIX KYOTO PROTOCOL GASES
(MILLION TONNES CO2 EQUIV.)

COUNTRY	BASE	1999	% VS. BASE	2010 TREND	% VS. BASE	2010 PAIN	% VS. BASE	TARGET
Austria	87.3	90.3	3.4	92.9	6.4	80.8	-7.4	-13.0
Belgium	139.4	156.3	12.1	160.0	14.8	143.2	2.7	-7.5
Denmark	69.7	72.3	3.7	76.9	10.3	64.0	-8.1	-21.0
Finland	78.1	75.2	-3.7	81.2	3.9	71.8	-8.2	0.0
France	547.3	553.2	1.1	563.4	2.9	523.2	-4.4	0.0
Germany	1,183.9	975.4	-17.6	1,005.2	-15.1	951.6	-19.6	-21.0
Greece	101.6	116.9	15.1	130.5	28.4	125.4	23.4	25.0
Ireland	54.2	65.7	21.2	74.0	36.6	68.9	27.1	13.0
Italy	510.5	533.8	4.6	566.4	10.9	521.8	2.2	-6.5
Luxembourg	11.8	8.9	-24.5	9.2	-22.1	8.1	-31.3	-28.0
Netherlands	218.1	230.1	5.5	244.6	12.1	228.5	4.8	-6.0
Portugal	64.8	87.2	34.5	100.8	55.5	92.4	42.5	27.0
Spain	309.3	390.2	26.2	413.7	33.8	381.5	23.3	15.0
Sweden	69.5	70.8	1.8	76.1	9.4	71.5	2.9	4.0
United Kingdom	748.7	647.1	-13.6	680.3	-9.1	638.3	-14.7	-12.5
EU-15	4,194.3	4,073.3	-2.9	4,275.0	1.9	3,971.0	-5.3	-8.0
Australia	414.1	489.3	18.2	515.8	24.5	489.6	18.2	8.0
Bulgaria	145.3	76.7	-47.2	91.4	-37.1	76.3	-47.5	-8.0
Canada	615.8	710.8	15.4	761.3	23.7	733.2	19.1	-6.0
Croatia	17.3	18.9	9.1	21.8	26.3	19.3	11.6	-5.0
Czech Republic	183.6	133.1	-27.5	156.5	-14.7	141.2	-23.1	-8.0
Estonia	36.5	17.6	-49.9	23.5	-35.6	18.8	-48.6	-8.0
Hungary	104.1	90.5	-13.0	93.3	-10.4	83.8	-19.5	-6.0
Iceland	3.0	3.6	20.0	4.3	44.1	4.2	40.0	10.0
Japan	1,189.7	1,286.9	8.2	1,376.6	15.7	1,288.3	8.3	-6.0
Latvia	29.5	11.2	-59.7	17.3	-41.2	12.0	-59.3	-8.0
Lithuania	45.2	22.4	-44.6	31.6	-30.0	23.9	-47.2	-8.0
New Zealand	72.3	79.6	10.2	82.3	13.9	78.7	8.9	0.0
Norway	51.1	62.7	22.6	67.2	31.5	64.6	26.3	1.0
Poland	528.5	385.7	-27.0	424.3	-19.7	376.0	-28.9	-6.0
Romania	267.4	124.0	-53.6	175.2	-34.5	141.3	-47.2	-8.0
Russia	3,028.7	1,963.0	-35.2	2,466.4	-18.6	2,059.9	-32.0	0.0
Slovakia	72.1	51.1	-29.0	61.2	-15.1	51.9	-28.0	-8.0
Slovenia	18.4	20.4	12.9	25.0	35.6	21.1	14.9	-8.0
Switzerland	53.6	53.5	-0.2	55.6	3.8	53.0	-1.0	-8.0
Ukraine	907.4	493.8	-47.6	622.1	-31.4	523.5	-42.3	0.0
United States	6,047.0	6,815.4	12.7	7,330.7	21.3	6,873.4	13.7	-7.0
Annex B Total	18,024.8	16,983.4	-5.8	18,678.6	3.6	17,104.9	-5.1	-5.2

TABLE 2A: ANNEX B EMISSIONS: SIX KYOTO PROTOCOL GASES
(MILLION TONNES CARBON EQUIV.)

COUNTRY	BASE	1999	% VS. BASE	2010 TREND	% VS. BASE	2010 PAIN	% VS. BASE
Austria	23.82	24.61	3.35	25.33	6.35	22.05	-7.42
Belgium	38.02	42.62	12.10	43.63	14.76	39.04	2.69
Denmark	19.00	19.70	3.70	20.96	10.31	17.46	-8.12
Finland	21.31	20.51	-3.74	22.13	3.88	19.57	-8.16
France	149.27	150.88	1.08	153.66	2.95	142.70	-4.40
Germany	322.88	266.03	-17.61	274.16	-15.09	259.53	-19.62
Greece	27.71	31.89	15.09	35.59	28.43	34.19	23.38
Ireland	14.77	17.91	21.20	20.18	36.56	18.78	27.13
Italy	139.24	145.58	4.56	154.46	10.94	142.32	2.22
Luxembourg	3.21	2.43	-24.50	2.50	-22.14	2.21	-31.34
Netherlands	59.48	62.76	5.51	66.70	12.14	62.32	4.78
Portugal	17.68	23.79	34.55	27.50	55.48	25.21	42.55
Spain	84.35	106.40	26.15	112.83	33.77	104.04	23.34
Sweden	18.96	19.30	1.79	20.74	9.42	19.51	2.90
United Kingdom	204.19	176.49	-13.57	185.53	-9.14	174.07	-14.75
EU-15	1,143.89	1,110.91	-2.88	1,165.91	1.90	1,083.00	-5.35
Australia	112.94	133.46	18.17	140.66	24.55	133.52	18.23
Bulgaria	39.63	20.92	-47.20	24.92	-37.11	20.82	-47.47
Canada	167.96	193.85	15.41	207.63	23.72	199.95	19.15
Croatia	4.71	5.14	9.11	5.95	26.29	5.26	11.60
Czech Republic	50.08	36.29	-27.54	42.69	-14.75	38.52	-23.08
Estonia	9.96	4.80	-49.92	6.42	-35.57	5.12	-48.61
Hungary	28.38	24.68	-13.03	25.43	-10.40	22.84	-19.52
Iceland	0.81	0.98	19.99	1.17	44.14	1.13	39.95
Japan	324.46	350.97	8.17	375.44	15.71	351.35	8.29
Latvia	8.03	3.04	-59.71	4.72	-41.20	3.27	-59.27
Lithuania	12.32	6.12	-44.58	8.63	-29.96	6.51	-47.19
New Zealand	19.70	21.72	10.24	22.45	13.93	21.46	8.91
Norway	13.95	17.09	22.55	18.34	31.48	17.61	26.28
Poland	144.13	105.19	-27.02	115.73	-19.70	102.54	-28.86
Romania	72.93	33.82	-53.63	47.79	-34.47	38.53	-47.17
Russia	826.02	535.35	-35.19	672.66	-18.57	561.79	-31.99
Slovakia	19.66	13.95	-29.04	16.69	-15.08	14.15	-28.00
Slovenia	5.02	5.56	12.85	6.81	35.56	5.77	14.86
Switzerland	14.61	14.59	-0.15	15.16	3.80	14.46	-1.05
Ukraine	247.48	134.66	-47.59	169.67	-31.44	142.78	-42.31
United States	1,649.19	1,858.75	12.71	1,999.28	21.31	1,874.58	13.67
Annex B Total	4,915.86	4,631.84	-5.78	5,094.16	3.63	4,664.96	-5.10

TABLE 3: POSSIBLE DEMAND FOR CREDITS FROM MECHANISMS
(MILLION TONNES CO2 EQUIV.)

COUNTRY	BASE	KYOTO*	TARGET	2010 TREND	DEFICIT	2010 PAIN	DEFICIT
Austria	87.3	0.870	76.0	92.9	-16.9	80.8	-4.9
Belgium	139.4	0.925	129.0	160.0	-31.0	143.2	-14.2
Denmark	69.7	0.790	55.0	76.9	-21.8	64.0	-9.0
Finland	78.1	1.000	78.1	81.2	-3.0	71.8	6.4
France	547.3	1.000	547.3	563.4	-16.1	523.2	24.1
Germany	1,183.9	0.790	935.3	1,005.2	-70.0	951.6	-16.3
Greece	101.6	1.250	127.0	130.5	-3.5	125.4	1.6
Ireland	54.2	1.130	61.2	74.0	-12.8	68.9	-7.7
Italy	510.5	0.935	477.3	566.4	-89.0	521.8	-44.5
Luxembourg	11.8	0.720	8.5	9.2	-0.7	8.1	0.4
Netherlands	218.1	0.940	205.0	244.6	-39.6	228.5	-23.5
Portugal	64.8	1.270	82.4	100.8	-18.5	92.4	-10.1
Spain	309.3	1.150	355.7	413.7	-58.0	381.5	-25.8
Sweden	69.5	1.040	72.3	76.1	-3.8	71.5	0.8
United Kingdom	748.7	0.875	655.1	680.3	-25.2	638.3	16.8
EU-15	4,194.3	0.920	3,858.7	4,275.0	-416.3	3,971.0	-112.3
Australia	414.1	1.080	447.2	515.8	-68.5	489.6	-42.3
Canada	615.8	0.940	578.9	761.3	-182.4	733.2	-154.3
Iceland	3.0	1.100	3.3	4.3	-1.0	4.2	-0.9
Japan	1,189.7	0.940	1,118.3	1,376.6	-258.3	1,288.3	-170.0
New Zealand	72.3	1.000	72.3	82.3	-10.1	78.7	-6.4
Norway	51.1	1.010	51.6	67.2	-15.6	64.6	-12.9
Switzerland	53.6	0.920	49.3	55.6	-6.3	53.0	-3.7
United States	6,047.0	0.930	5,623.7	7,330.7	-1707.0	6,873.4	-1249.7
OECD Total	12,640.9	0.934	11,803.4	14,468.8	-2665.5	13,555.9	-1752.5
OECD ex US	6,593.8	0.937	6,179.6	7,138.1	-958.5	6,682.4	-502.8

TABLE 3A: POSSIBLE DEMAND FOR CREDITS FROM MECHANISMS
(MILLION TONNES CARBON EQUIV.)

COUNTRY	BASE	KYOTO*	TARGET	2010 TREND	DEFICIT	2010 PAIN	DEFICIT
Austria	23.82	0.870	20.72	25.33	-4.61	22.05	-1.33
Belgium	38.02	0.925	35.17	43.63	-8.46	39.04	-3.87
Denmark	19.00	0.790	15.01	20.96	-5.95	17.46	-2.45
Finland	21.31	1.000	21.31	22.13	-0.83	19.57	1.74
France	149.27	1.000	149.27	153.66	-4.40	142.70	6.56
Germany	322.88	0.790	255.08	274.16	-19.08	259.53	-4.45
Greece	27.71	1.250	34.64	35.59	-0.95	34.19	0.45
Ireland	14.77	1.130	16.69	20.18	-3.48	18.78	-2.09
Italy	139.24	0.935	130.19	154.46	-24.28	142.32	-12.13
Luxembourg	3.21	0.720	2.31	2.50	-0.19	2.21	0.11
Netherlands	59.48	0.940	55.91	66.70	-10.79	62.32	-6.41
Portugal	17.68	1.270	22.46	27.50	-5.04	25.21	-2.75
Spain	84.35	1.150	97.00	112.83	-15.83	104.04	-7.04
Sweden	18.96	1.040	19.72	20.74	-1.03	19.51	0.21
United Kingdom	204.19	0.875	178.66	185.53	-6.87	174.07	4.59
EU-15	1,143.89	0.920	1,052.38	1,165.91	-113.53	1,083.00	-30.62
Australia	112.94	1.080	121.97	140.66	-18.69	133.52	-11.55
Canada	167.96	0.940	157.88	207.63	-49.75	199.95	-42.08
Iceland	0.81	1.100	0.89	1.17	-0.27	1.13	-0.24
Japan	324.46	0.940	305.00	375.44	-70.44	351.35	-46.35
New Zealand	19.70	1.000	19.70	22.45	-2.75	21.46	-1.76
Norway	13.95	1.010	14.09	18.34	-4.25	17.61	-3.52
Switzerland	14.61	0.920	13.44	15.16	-1.72	14.46	-1.02
United States	1,649.19	0.930	1,533.75	1,999.28	-465.54	1,874.58	-340.83
OECD Total	3,447.51	0.934	3,219.10	3,946.04	-726.94	3,697.06	-477.96

TABLE 4: POSSIBLE CREDITS FROM ECONOMIES IN TRANSITION
(MILLION TONNES CO2 EQUIV.)

COUNTRY	BASE	KYOTO	TARGET	2010 HIGH	SURPLUS	2010 LOW	SURPLUS
Bulgaria	145.3	0.92	133.7	91.4	42.3	76.3	57.4
Croatia	17.3	0.95	16.4	21.8	-5.4	19.3	-2.9
Czech Republic	183.6	0.92	168.9	156.5	12.4	141.2	27.7
Estonia	36.5	0.92	33.6	23.5	10.1	18.8	14.8
Hungary	104.1	0.94	97.8	93.3	4.6	83.8	14.1
Latvia	29.5	0.92	27.1	17.3	9.8	12.0	15.1
Lithuania	45.2	0.92	41.6	31.6	9.9	23.9	17.7
Poland	528.5	0.94	496.8	424.3	72.4	376.0	120.8
Romania	267.4	0.92	246.0	175.2	70.8	141.3	104.7
Russia	3,028.7	1.00	3,028.7	2,466.4	562.3	2,059.9	968.8
Slovakia	72.1	0.92	66.3	61.2	5.1	51.9	14.4
Slovenia	18.4	0.92	16.9	25.0	-8.0	21.1	-4.2
Ukraine	907.4	1.00	907.4	622.1	285.3	523.5	383.9
TOTAL	5,384.0	0.98	5,281.3	4,209.8	1,071.5	3,549.0	1,732.3

TABLE 4A: POSSIBLE CREDITS FROM ECONOMIES IN TRANSITION
(MILLION TONNES CARBON EQUIV.)

COUNTRY	BASE	KYOTO	TARGET	2010 HIGH	SURPLUS	2010 LOW	SURPLUS
Bulgaria	39.63	0.92	36.46	24.92	11.53	20.82	15.64
Croatia	4.71	0.95	4.48	5.95	-1.48	5.26	-0.78
Czech Republic	50.08	0.95	46.07	42.69	3.38	38.52	7.55
Estonia	9.96	0.92	9.17	6.42	2.75	5.12	4.05
Hungary	28.38	0.95	26.68	25.43	1.25	22.84	3.84
Latvia	8.03	0.92	7.39	4.72	2.67	3.27	4.12
Lithuania	12.32	0.92	11.33	8.63	2.71	6.51	4.83
Poland	144.13	0.95	135.48	115.73	19.75	102.54	32.94
Romania	72.93	0.92	67.10	47.79	19.31	38.53	28.57
Russia	826.02	1.00	826.02	672.66	153.35	561.79	264.22
Slovakia	19.66	0.92	18.08	16.69	1.39	14.15	3.93
Slovenia	5.02	0.92	4.62	6.81	-2.19	5.77	-1.15
Ukraine	247.48	1.00	247.48	169.67	77.82	142.78	104.70
TOTAL	1,468.35		1,440.36	1,148.12	292.24	967.90	472.45