Future Climate Change Policy in the Czech Republic, Poland and Slovakia

Workshop in Prague,
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Background Information

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1 Introduction

There is near total agreement internationally that global climate change is a serious problem that urgently requires co-ordinated action beyond the measures already agreed upon. At the Eleventh Conference of the Parties to the **UN Framework Convention on Climate Change** (UNFCCC), held in Montreal in 2005, Parties agreed on a multi-track process to shape future action after the end of the first commitment period of the Kyoto Protocol in 2012. Discussions were continued at the 12th meeting of the Parties in Nairobi (November 2006, COP 12, COP/MOP 2) and are expected to enter a decisive stage by 2009.

In the context of these negotiations, it is clear that not all countries have the same **capacity to participate effectively in the discussions and negotiations**, given the extreme complexity of international climate change policies, and the diversity of national circumstances. Many countries may lack the human resources and the technical and administrative capacity to follow and address every detail of this process, even though the ultimate nature of the post-2012 regime may have far reaching economic consequences for them. Despite great differences among the new Member States of the EU (NMS) and Candidate Countries (CC), there is wide agreement that these countries must strengthen their capacities to make their voices heard in the international negotiations.

Against this backdrop, Ecologic – Institute for International and European Environmental Policy – is organising **the workshop** "Future Climate Change Policy in the Czech Republic, Poland and Slovakia", which is the sixth of a **series of events.** The workshop has been commissioned by the European Commission and is organised in co-operation with

- the Institute for Sustainable Development (ISD), Warsaw,
- the Institute for Environmental Studies (IVM) at the Free University of Amsterdam,
- the Foundation for International Environmental Law and Development (FIELD), London,
- the German Institute for Economic Research (DIW), Berlin, as well as a network of experts.

After presenting some key issues and starting points for discussion, this paper highlights the challenges posed by climate change and the most significant aspects of current and future EU climate change policies. The paper then analyses the economic opportunities and challenges of future climate change policies for the Czech Republic, Poland and Slovakia. Finally, the paper puts forward key elements for consideration in the negotiations on the post-2012 climate regime.

2 Starting points for discussion

Participants are invited to consider the following elements as starting points for discussions. There are many aspects to the negotiation of the post-2012 climate regime, and the political context is likely to evolve over the next few years. Hence this **list is non-exhaustive**, and intended merely to assist in framing discussions:

- Recent research gathered by the Intergovernmental Panel on Climate Change (IPCC) indicates that, depending on how emissions evolve, the Earth's **average surface temperature will warm by 1.8–4.0°C in the 21st century**[1], with potentially very severe consequences for the environment, economies and societies alike. All simulations suggest that temperature rise in the late 20th century can only be explained by man-made increases in greenhouse gas concentration. To avoid or mitigate these consequences, average temperature should not increase by more than 2°C above pre-industrial temperature, a target more likely to be achieved if GHG concentrations **do not exceed 440 ppm CO_2-equivalent**.

- To stabilise greenhouse gas (GHG) concentrations at 440 ppm CO_2-equivalent, scientists agree that **large cuts in GHG emissions are required**. Consequently, the European Council has agreed that developed countries should reduce greenhouse gas emissions by the order of 30% by 2020 (compared to 1990 emission levels). Independent of the outcome of international negotiations, the European Council has agreed that the EU will cut emissions unilaterally by 20 % by 2020. For the long term, the European Council has called for a reduction target of 60-80% by 2050.

- The aggregate emissions of the new EU Member States were 23 % below 1990 levels in 2004. **The Czech Republic (minus 19.9 %), Poland (minus 27.4 %) and Slovakia (minus 24.7 %)** are currently on track to meet their reduction targets under the Kyoto-Protocol. By 2010, however, greenhouse gas emissions are projected to increase to 11 % to 12 % below 1990 levels, even if all additional domestic measures are implemented. Projections indicate that - with additional measures – Czech emissions will be 18.7 %, Poland's 6.1 % and Slovakia's 16.8 % below 1990 levels, i.e. projection indicate that these countries will face a challenging task to meet the reduction targets agreed by the European Council in March 2007.[2]

- Concerning Poland's and the Czech Republic's **second national allocation plans**, the Commission demanded that Poland limits its annual allocation to 208.5m tonnes – almost

1 IPCC 4th Assessment Report: Climate Change 2007: The Physical Science Basis, Summary for Policymakers, http://www.ipcc.ch/SPM2feb07.pdf

2 EEA Report No.9/2006:
http://reports.eea.europa.eu/eea_report_2006_9/en/eea_report_9_2006.pdf

27 % lower than Poland's initial requested - and the Czech Republic to 86.8m tonnes – nearly 15 % less than it had requested.[3]

- In light of recent sharp increases and fluctuations in energy prices, improved energy efficiency and increasing the share of renewable energies in the domestic energy mix can provide a **boost to the competitiveness**. It is now well-established that measures that reduce GHG emissions do not necessarily entail an impediment to economic growth. Instead, these measures can lead to less fossil-fuel dependent economies, with greater energy security, decreased exposure to volatile energy prices, and multiple sustainable development and health co-benefits.
- The Czech Republic, Poland and Slovakia have great capacity to reduce CO_2 emissions in a cost-effective manner. **Energy efficiency** in these countries - despite recent progress - is still considerably lower than in the EU-15. Economic restructuring, then, provides a variety of investment cycle opportunities. In this context, the involvement of business actors will be essential.
- **Negotiations on post-2012 commitments** will be difficult and complex. Emerging issues within these negotiations, such as the inclusion of additional countries and sectors (international transport, deforestation), may present numerous challenges for the Czech Republic, Poland and Slovakia, given the financial, technical, and human resources needed to participate fully and effectively in these discussions.
- The complexity of the post-2012 negotiations will require dedicated human and technical resources from NMS and CC. The **involvement of a range of stakeholders** from government, key industrial sectors, and civil society will be essential over the next few years, in order to achieve the most effective and equitable outcomes at both international and national levels.

3 Impacts of Climate Change on Czech Republic, Poland and Slovakia: the challenge of adaptation

3.1 Effects of Climate Change in Czech Republic, Poland and Slovakia and beyond

3.1.1 Human-induced aspects of global climate change

Global average temperature has increased in the last hundred years by about 0.7°C, the European average temperature by 0.95°C.[4] Globally, the 10 warmest years on record all occurred after 1995. The Intergovernmental Panel on Climate Change (IPCC) has concluded in its Fourth Assessment Report that the Earth on average is most likely to get warmer

[3] See press release "Emissions trading: Commission decides on Czech and Polish national allocation plans for 2008-2012", IP/07/412, and the official decisions at http://ec.europa.eu/environment/climat/2nd_phase_ep.htm

[4] Cf. European Environmental Agency, Impacts of Europe's changing climate. 2004, Copenhagen.

between 1.8 and 4.0°C in the 21st century?, with temperatures in Europe expected to rise above the global average. All simulations suggest that temperature rise in the late 20th century can only be explained by man-made increases in greenhouse gas concentration.[5] The concentration of CO_2 in the lower atmosphere has increased from its pre-industrial concentration of 280 ppm (parts per million) to about 380 ppm in 2005, the highest level in the last 650,000 years.

Article 2 of UNFCCC provides that "the ultimate objective of this Convention […] is to achieve […] stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The EU has chosen an official policy target of limiting global warming to 2ºC above pre-industrial temperatures. Any global warming above 2°C is likely to be increasingly dangerous, due to increases in tropical storms, floods and monsoon variability, increases in drought frequency and heat waves, shifts in vegetation zones and loss of biodiversity, causing irreversible damages.[6] If, hypothetically, all human-induced emissions were stopped immediately today, temperatures would still rise by about 0.7°C by the year 2100. If future GHG concentrations can be kept at about 440 ppm CO_2-equivalent (i.e. CO_2 only below 400 ppm), the probability of keeping temperature increases below 2°C by 2100 is more than 66%. If no climate policy measures are implemented, a further increase to 650–1215 ppm CO_2-equivalent is projected, diminishing the chance of meeting the 2°C target drastically.[7]

3.1.2 Temperature, precipitation and extreme events in Central and Eastern Europe

Annual precipitation trends in Europe for the period 1900–2000 show a contrasting picture between northern Europe (10–40% wetter) and southern Europe (up to 20% drier). Changes have been greatest in winter in most parts of Europe. These changes are projected to continue in the future. Cold winters are projected to disappear almost entirely by 2080 and hot summers are projected to become much more frequent.[8] By 2080, parts of the Central and Eastern Europe will become warmer (2-4°C higher average temperatures), 20% wetter in winter and spring, and 30% drier in summer, as compared to the late 20th century.[9] River flows will increase in autumn and winter, and decrease in summer. Evaporation losses will increase and groundwater levels will decrease.[10] Sea level rise is expected between 20 and 60 cm by the end of the 21st century.

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5 Cf. Jones, P.D. and M.E. Mann, Climate Over Past Millennia. Reviews of Geophysics, 2004. 42(RG2002, doi: 10.1029/2003RG000143); Mann, M.E., et al., On Past Temperatures and Anomalous Late 20th Century Warmth. Eos, 2003. 84: p. 256-258.

6 EEA Draft Technical Report no. 7/2005: Vulnerability and Adaptation to Climate Change in Europe.

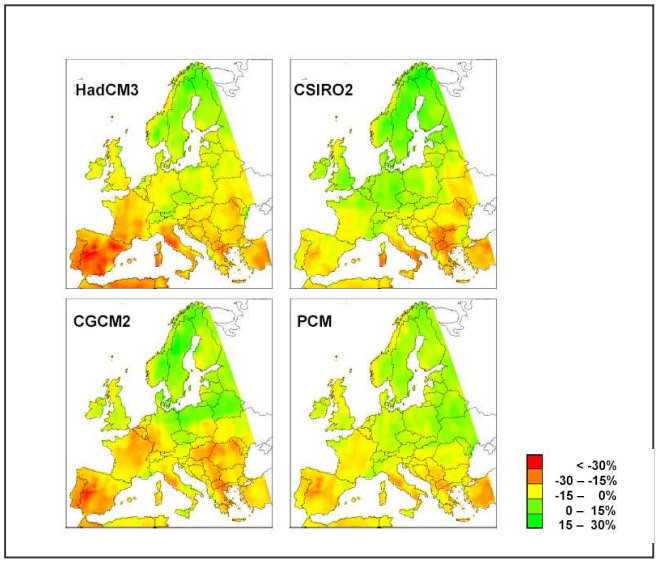
7 Hare, B. and M. Meinshausen, How much warming are we committed to and how much can be avoided? – PIK Report No. 93. 2004, Potsdam Institute for Climate Impact Research: Potsdam.

8 European Environmental Agency, Impacts of Europe's changing climate. 2004, Copenhagen.

9 Schroeter, D., et al., Ecosystem service supply and vulnerability to global change in Europe. Science 2005. 310, pp. 1333-1337. Supporting online material, Figure S2.

10 Czech Republic, Fourth National Communication on UNFCCC, 2005; Poland, Fourth National Communication on UNFCCC, 2006.

Figure 1: Changes in precipitation by 2080, different climate models (Schroeter et al. 2005)



In addition, extreme weather events, such as droughts, heat waves and floods have increased in the past, while cold extremes (frost days) have decreased. The European summer of 2003 was extremely hot and dry.[11] In Europe, 64% of all catastrophic events since 1980 have been directly attributable to climate extremes, 79% of economic losses caused by catastrophic events result from these climate-related events. In the past decade, 1,940 people have died during floods and 417,000 have been made homeless. In 2002, 15 major floods occurred in Austria, the Czech Republic, Germany, Hungary and the Russian Federation. These floods affected one million people and killed approximately 250 persons. Heavy precipitation and snowmelt in spring 2006 have contributed to flooding in Poland, Czech Republic, Slovakia, Germany, Hungary and Romania. Some areas in the Czech Republic were under water for up to fourteen days, hundreds of homes were damaged, and an emergency situation was declared in seven of the country's fourteen regions. Insured losses from flooding in Germany, Poland, and the Czech Republic were expected at more than EUR 15 million.[12] With rising temperatures in the future, the frequency and severity of floods, droughts and fires are expected to increase.

3.1.3 Impacts on agriculture and forestry in Central and Eastern Europe

The average annual growing season in Europe lengthened by about 10 days between 1962 and 1995, and is projected to increase further in the future. The slight positive effects of temperature increase on vegetation growth are likely to be more than outweighed by an increased risk of water shortage and droughts. While agriculture in Northern Europe is expected to potentially benefit from increasing CO_2 concentrations and rising temperatures, most parts of Central and Southeast Europe agriculture will be threatened by increased water stress. During the heat wave in 2003 cereal production in the EU-15 member states dropped by about 10%, while in the Eastern European Accession Countries it decreased on average by about 20%. In Slovakia, cereal production even dropped by more than 25%.

In the future, higher air temperatures will prolong the vegetation period and lead to earlier harvest dates by at least 10 to 14 days. Growing conditions for maize, soybeans, millet and sunflower, which are currently limited especially in Poland, will improve. However, acceleration of vegetation in the spring can increase the danger of damage to plants by late frosts. More favourable conditions for the development and spread of agricultural pests and

[11] Schar, C. and G. Jendritzky, Climate change: Hot news from summer 2003. Nature, 2004. 432(7017): p. 559-560.

[12] See http://iri.columbia.edu/climate/cid/Apr2006/impacts.html

diseases will prevail, and incidences of species from warmer areas will increase. Greater occurrence of viral diseases, e.g. for potatoes, and greater damage from fungal diseases is to be expected. Together with negative impacts on animal health, most of these changes will entail higher production costs.

Forest ecosystems, already frequently under stress from regional air pollution in Eastern Europe, will experience additional pressure from higher temperatures and drought. Capacity for retaining groundwater and mitigating extreme surface water flows will be limited. Soil degradation, erosion and steppification may occur. Climate change may also affect the frequency and spatial range of fires, pests and pathogens. Certain social and recreational functions of forests may become limited.[13]

3.1.4 Impacts on biodiversity

A large number of species might become extinct under future climate change. This is exacerbated by non-climate-related factors, such as the fragmentation of habitats. These factors will limit the migration and adaptation capabilities of species to respond to climate change. Northward movement of plant species (induced by a warmer climate) has probably increased species diversity in north-western Europe, but climate change has caused a decline in biodiversity in Southern and South-eastern parts of Europe.[14] Changes in vegetation caused by climate change and economic use of land will most likely lead to fragmentation of plant species and a decline in the diversity of landscape and biodiversity.

3.2 Adaptation needs for Climate Change in Central and Eastern Europe

Necessary adaptation needs in Central and Eastern European countries include:

- Development of new agricultural crop varieties, which are tolerant to higher temperatures, higher CO_2 levels, and droughts ;
- Change the structure of agricultural crops in a targeted manner to create a compromise between habitat and economic conditions and fulfil the requirements for a certain degree of variety in agro-ecosystems;
- Concentration of subsidy titles in agriculture on support for protective measures in the landscape and expansion of environmentally sound farming;
- Slow-down of land degradation, especially wind erosion, through afforestation and improved agricultural practices;
- Adaptation of land use planning under conditions of demographic, economic and climatic change, e.g. keeping a sufficient area share under nature conservation, in order to provide favourable conditions and flexibility for maintaining biodiversity;

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13 Czech Republic, Fourth National Communication on UNFCCC, 2005; Poland, Fourth National Communication on UNFCCC, 2006.

14 European Environmental Agency, Impacts of Europe's changing climate. 2004, Copenhagen.

- Change in selection of species for afforestation, faster than at current rates, towards a greater proportion of broad-leaved species (especially stabilization and improvement species);
- Preventive measures against river floods due to increased precipitation in winter (especially dikes and managed lowland areas to be flooded in emergency cases);
- Build, reconstruct and maintain a protection system against flooding of the coastal areas, including removal of damages in the coastal flood control system, to ensure stabilisation of the coastline and to prevent beach declining, as well as to monitor the sea coast. This is particularly relevant for Poland, where sea level rise may affect 244,000 people and adaptation costs have been estimated at US$ 30 billion.[15];
- Assessment of future water use requirements, priority-setting for different water uses, and promotion of further reductions in water consumption in industry, energy production, agriculture and households;
- Reduction of water losses through repair and reconstruction of pipeline systems, as well as controlled management of surface and underground waters;
- Strengthening the cooperation and capacity in relevant agencies and research institutions regarding assessment of local impacts and vulnerability of climate change;
- Improving the assessment and prioritisation of adaptation policies and measures, especially in agriculture, water management, forestry, and human settlements.

4 Climate Change Policies in the EU and Czech Republic, Poland and Slovakia

4.1 Status of commitments in the EU and Candidate Countries

Under the Kyoto Protocol, the EU committed itself to reducing greenhouse gas (GHG) emissions by an overall target of 8% below 1990 levels by 2008-2012, the first commitment period. This target only covers the 15 Member States that comprised the EU at the time when the Protocol was agreed. The EU made use of Article 4 of the Kyoto Protocol, which allows groups of countries to accept a common emission target and to redistribute that target internally (‘bubbling’). The Czech Republic and Slovakia agreed to a reduction of 8 %; Poland committed to reduce greenhouse gas emissions by 6 %. Table 1 below summarises the different GHG emissions reduction targets of the old EU Member States and their implementation status.[16] Table 2 provides similar information for the new Member States and Candidate Countries.

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15 Poland, 4th National Communication to the UNFCCC (2006).

16 Data source: Annual European Community greenhouse gas inventory 1990-2004 and inventory report 2006, available at: http://reports.eea.europa.eu/technical_report_2006_6/en. The base year for the ‘old’ Member States is 1990, except for the base year 1995 chosen by some States for fluorinated gases.

Table 1: Emission Reduction Commitments of EU-15 under the Kyoto Protocol

	EU-15	*Austria*	*Belgium*	*Denmark*	*Finland*	*France*	*Germany*	*Greece*
Target	–8%	–13%	–7,5%	–21%	0%	0%	–21%	+25%
2004	–0.9%	+15.7%	+0.7%	–1.8%	+14.5%	–0.8%	–17.5%	+23.9 %

	Ireland	*Italy*	*Luxem-bourg*	*Nether-lands*	*Portugal*	*Spain*	*Sweden*	*UK*
Target	+13%	–6.5%	–28%	–6%	+27%	+15%	+4%	–12.5%
2004	+22.7%	+12.3%	+0.3%	+1.6%	+41.0%	+47.9%	–3.6%	–14.1%

Table 2: Emission Reduction Commitments of NMS and CC under the Kyoto Protocol[17]

Country	**Base year Emissions***	**KP target (%)**	**2004** emissions***	**change base year – 2004** (%)**
Bulgaria	132.3	– 8%	67.5	– 49.0%
Croatia	31.1	– 5%	29.4	– 5.4%
Cyprus	6.0	None	8.9	+ 48.2%
Czech Republic	196.3	– 8%	147.1	– 25.1%
Estonia	42.6	– 8%	21.3	– 50.0%
Hungary	122.2	– 6%	137.6	– 6.0%
Latvia	25.9	– 8%	10.7	– 58.5%
Lithuania	50.9	– 8%	20.3	– 60.1%
Macedonia	15.4	None	15.1	– 2.4%
Malta	2.2	None	3.2	+ 45.9%
Poland	565.3	– 6%	386.4	– 31.6%
Romania	262.3	– 8%	139.0	– 41.0%
Slovakia	73.2	– 8%	51.0	– 30.3%
Slovenia	20.2	– 8%	20.1	– 0.8%
Turkey	170.1	None	296.6	+ 74.4%

* Million tons of carbon equivalent, excluding net emissions from Land Use, Land Use Change and Forestry (LULUCF).

** For Cyprus and Malta: estimation based on gap filling; for Macedonia: 1998 figure (latest figure available).

[17] Sources: Bulgaria, Croatia and Romania: National Inventory Reports submitted in 2006; Macedonia: First National Communication under the UNFCCC (2003); Turkey: First National Communication under the UNFCCC (2007); Other countries: Annual European Community greenhouse gas inventory 1990-2004 and inventory report 2006.

4.2 EU climate policy: history, instruments and the way forward

4.2.1 Historical and current policies and measures

The European Commission first took initiatives to tackle climate change in 1991, when it issued a strategy to limit CO_2 emissions in different sectors. Since then, a wide set of policies and measures have been adopted, aimed at reducing greenhouse gas emissions. These include, for example:

- the **Greenhouse Gas Emission Allowance Trading Scheme** (EU ETS), which limits the total carbon dioxide emissions from almost 12.000 installations across the 25 EU Member States [18],
- the **Linking Directive**[19]**,** which connects the EU ETS with the Kyoto Protocol's project-based Joint Implementation (JI) and Clean Development Mechanism (CDM),
- the **"Renewables Directive"**[20]**,** which sets the indicative target to reach a 22% share of electricity from renewable sources by 2010 (with specific indicative targets for each Member State),
- the **Directive on the promotion of cogeneration**[21], which requires Member States to use their potential for high efficiency cogeneration,
- the **Directive on energy end-use efficiency**[22]**,** which determines mandatory targets for annual energy savings for the period of 2006-2012,
- the **Framework Directive on the eco-design of energy-using products**,[23] which sets conditions and criteria for requirements related to environmentally relevant product characteristics, such as energy consumption.

4.2.2 EU climate change policies following the European Council of March 2007

On the basis of the climate and energy package of the European Commission[24] and the conclusions of the Council of Ministers (Environment) of 20 February 2007, the European

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18 Directive on Establishing a Scheme for Greenhouse Gas Emissions Allowance Trading within the Community and Amending Council Directive 96/61/EC; OJ L275.

19 Directive amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms 2004/101/EC; OJ L338/18.

20 Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market; OJ L 283/33.

21 Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC; JO L 052, 21/02/2004.

22 Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC.

23 Directive 2005/32/EC on the eco-design of Energy-using Products

24 http://ec.europa.eu/energy/energy_policy/documents_en.htm

Council adopted on 8/9 March 2007 far reaching conclusions on future EU climate and energy polices.[25] The conclusions on climate and energy policies received unprecedented public attention and will shape European climate and energy policies for the years to come. The European Council adopted a wide range of climate and energy targets, the latter as part of a comprehensive Energy Action Plan for the period 2007-2009.

In more detail and subject to implementing legislation, the European Council adopted the following **climate and energy targets**:

- A **conditional EU target** of a 30% reduction in greenhouse gas emissions by 2020 compared to 1990. This target depends on the condition „that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities".
- A **unilateral EU target** to cut greenhouse gases by at least 20 % by 2020 compared with 1990 levels. This target is binding and independent of the outcomes of international negotiations. The target will be achieved through Community policies and on an agreed burden-sharing arrangement, which will take into account „national circumstances and the relevant base years for the first commitment period of the Kyoto Protocol". For further in-depth discussions on this burden sharing arrangement, the European Council invited the European Commission to immediately start – in close co-operation with Member States – a technical analysis of relevant criteria, such as socio-economic and other relevant parameters.
- Beyond 2020, developed countries should be aiming at collective cuts in emissions **of 60-80 % by 2050** compared to 1990 levels.
- A **binding target of a 20 % share of renewable energies** in overall EU energy consumption by 2020. From the overall renewables target, differentiated national overall targets will be derived with Member States' full involvement and "due regard to a fair and adequate allocation taking account of different national starting points and potentials, including the existing level of renewable energies and energy mix". The European Commission will set out these national targets in proposals for a comprehensive Directive. These proposals are expected for late 2007 and will allow Member States to decide national targets for each sector of renewable energies (electricity, heating and cooling, biofuels).
- By 2020, all member states must achieve a **10 % minimum binding target for the share of biofuels** in overall EU transport fuel consumption. The binding character of this target is subject to production being sustainable, second-generation biofuels being available, and successful amendments to the fuel quality Directive.
- A non-binding commitment to **reduce the EU's energy consumption by 20 %** compared to projections for 2020 through improvements in energy efficiency. To this end,

[25] http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf

the European Council invites the European Commission to submit proposals, among others, on increased energy efficiency on office and street lighting (to be adopted by 2008) and on incandescent lamps and other forms of lighting in private households (by 2009).

Concerning **international negotiations on further action**, the European Councils stressed that these negotiations should "build upon and broaden the Kyoto Protocol architecture and should provide a fair and flexible framework for widest possible participation". These negotiations should start at the end of 2007 and be completed by 2009. The European Council concluded that essential parts of an effective and appropriate framework beyond 2012 should include, inter alia,

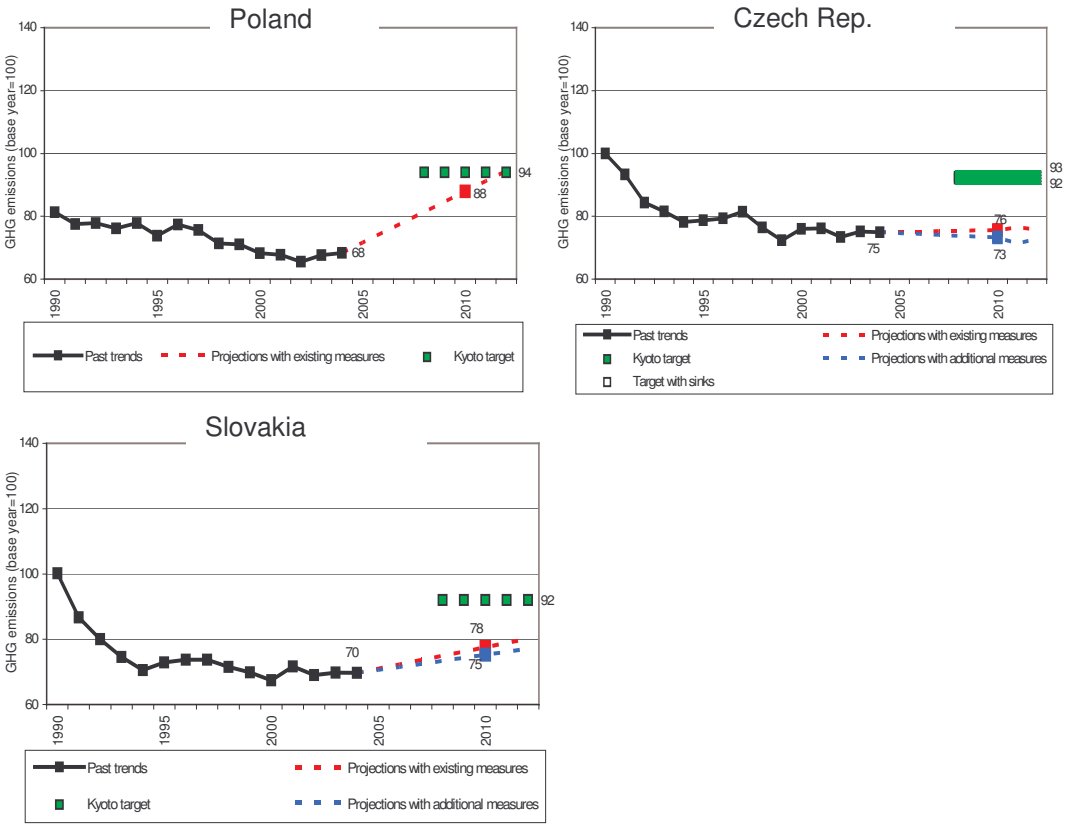
- the development of a shared vision to reach the ultimate objective of the UN Framework Convention on Climate Change,
- the strengthening and extension of global carbon markets,
- the development, deployment and transfer of the necessary technology to reduce emissions,
- appropriate adaptation measures to deal with the effects of climate change,
- action on deforestation and
- addressing emissions from international aviation and maritime transportation.

5 Analysis of the economic opportunities and challenges for the Czech Republic, Poland, and Slovakia

5.1 Greenhouse gas emissions and trends in the Czech Republic, Poland and Slovakia

Following the beginning of the economic transformation, GHG emissions in the **Czech Republic**, **Poland** and **Slovakia** decreased (by 2003) by 24%, 16%, and 28%, respectively. Accordingly and stated above, the Czech Republic, Poland and Slovakia will meet their individual targets under the Kyoto Protocol. However, projections indicate that this trend in greenhouse gas emissions will not continue. For the Czech Republic, projections predict that GHG emissions remain stable or slightly decrease until 2012, but emissions are rising in Slovakia and, especially, Poland. Even with additional measures, projections indicate that these countries will also face a challenging task to meet the agreed reduction targets. Figure 2 and Table 3 illustrate predicted trends:

Figure 2: GHG emissions and trends in Czech Republic, Poland, and Slovakia (index; base year=100)



Source: EEA Report No 9/2006

Table 3: UE-8 targets and projected emission reductions for four different secnarios

Country	Target	Gap for scenario (percentage points relative to base-year emissions)		
		With existing policies and measures (PAMs)	With additional PAMs	With existing and additional PAMs, KMs and carbon sinks
Czech Republic	- 8.0 %	- 16.4 %	- 18.7 %	- 19.5 %
Estonia	- 8.0 %	- 48.5 %	- 52.0 %	Not available
Hungary	- 6.0 %	- 22.5 %	- 22.8 %	Not available
Latvia	- 8.0 %	- 38.1 %	- 40.6 %	Not available
Lithuania	- 8.0 %	- 42.5 %	Not available	Not available
Poland	- 6.0 %	- 6.1 %	- 6.1 %	Not available
Slovakia	- 8.0 %	- 14.4 %	- 16.8 %	Not available
Slovenia	- 8.0 %	+ 12.7 %	+ 6.3 %	- 2.0 %

Note: Projections for Poland consist only of projections for CO_2 and N_2O.

Source: EEA, based on new Member States greenhouse gas projections.

5.2 Climate Relevant Aspects of the Economies of Czech Republic, Poland, and Slovakia

5.2.1 Climate Relevant Aspects in the Energy Sector

In the **Czech Republic**, domestic sources of energy cover about half of total primary energy consumption. Prior to 1989, Czechoslovakia favoured the development of heavy industry based on domestic solid fossil fuels. This situation has changed, and a moderate shift in the direction of cleaner fuels (petroleum and natural gas) has been made. The Czech Republic operates two nuclear power plants: the older Dukovany plant (built 1985-87) and the newer Temelín plant (2000-02). The projected lifetime of the plants extends at least till 2020 when production may be concentrated at Temelín.[26] Nuclear power provides about one-third of the country's electricity (25.9 TWh in 2003, 31% of the country's total consumption). Renewable energy provides for 2.6% of the total energy consumption in 2002 and is expected to slightly increase to 3-6% in 2010.[27]

Poland is self-sufficient in hard coal and lignite, but depends on imports of hydrocarbon fuels (oil: 96%; natural gas: 60%). Since the transition, the share of hard coal and lignite in total primary energy demand has decreased, but it is still over 60% (in 2004). Poland's energy production and distribution systems are riddled by significantly lower energy transformation efficiency than in EU15, high energy losses in electricity (approximately 10%) and heat transmission (approximately 11%) systems.[28] Renewable energy covers about 5% of the total energy consumption and is expected to grow in the medium term at a decreasing rate.[29]

Energy production in **Slovakia** is limited to brown coal and renewable energies. Almost 90% of its primary energy demand is imported. Slovakia operates two nuclear plants: the Bohunice plant (1980-85) and the Mochovce plant (1998-99). During accession negotiations with the EU, the Slovak government agreed - after intensive discussions - to the closure of two units of the Bohunice plant by 2006-08.[30] The two other units of Bohunice are being upgraded with a view to extending its operational life until 2025. Nuclear energy plays an important role as it meets over half the country's electricity consumption. Large-scale hydro energy is the only renewable energy source with a notable share in total electricity production. In total, renewable energy has a share of 3.5% in total primary energy consumption. The Slovak government supports the development of biofuels. The country produces biodiesel.[31]

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26 World Nuclear Association (2004). "Nuclear Power in Czech Republic".

27 Czech Republic, 4th National Communication to the UNFCCC (2005).

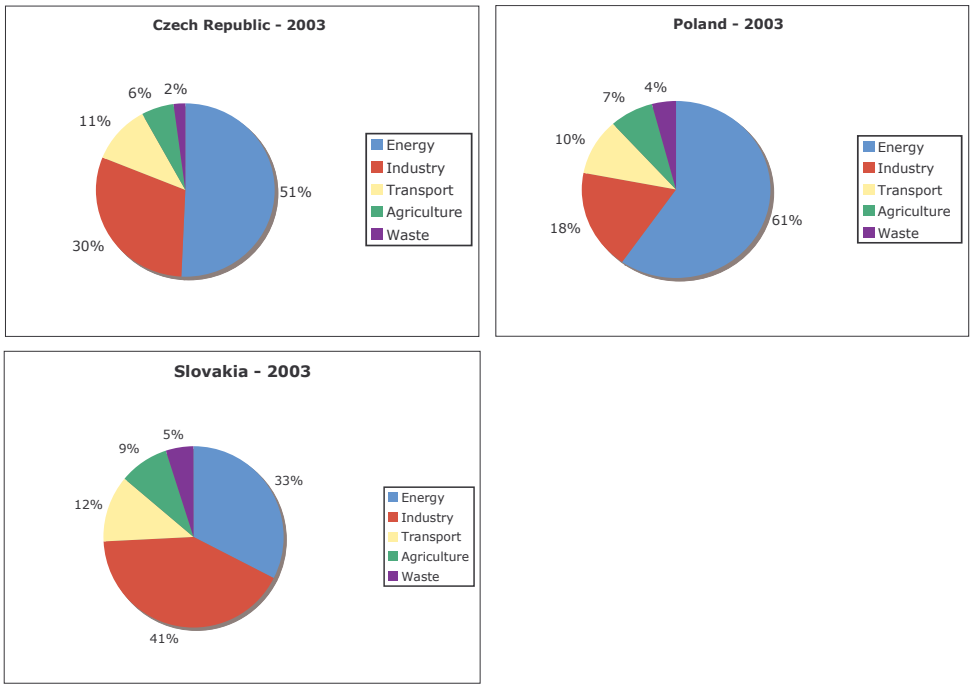
28 Poland, 4th National Communication to the UNFCCC (2006).

29 Ibid.

30 World Nuclear Association (2007). "Nuclear Power in Slovakia".

31 European Commission (2007) "Slovak Republic – Renewable Energy Fact Sheet".

Figure 3: Sector shares in GHG emissions in Czech Republic, Poland, and Slovakia



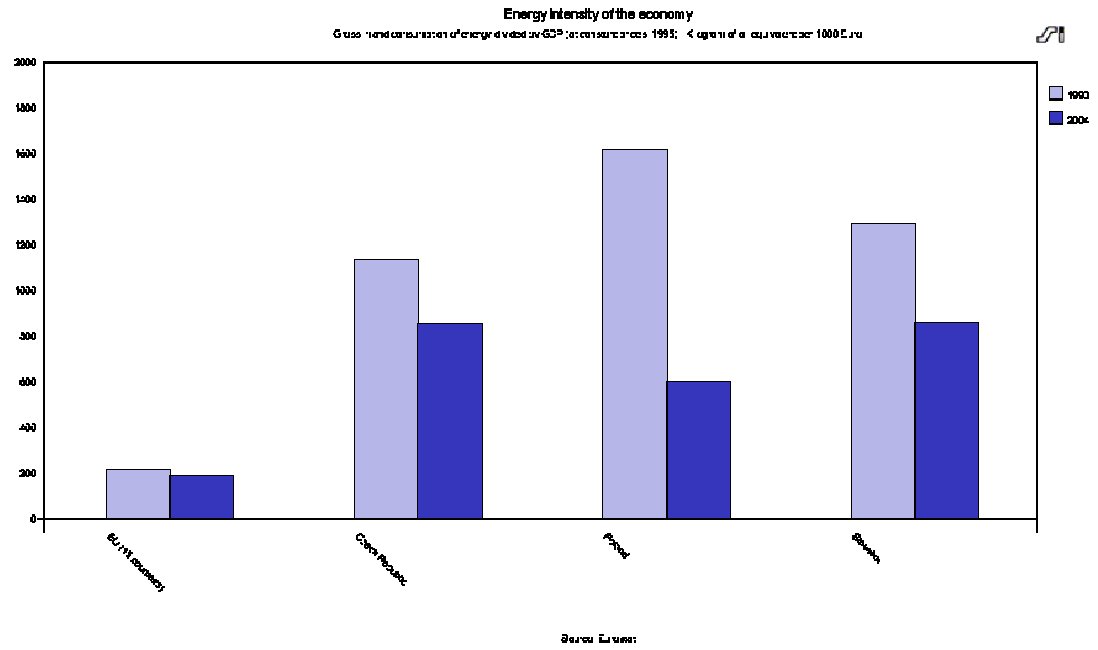
Sources: Eurostat Air Emissions Dataset (March 2006)

All three countries have higher **energy intensities** than the EU-15 average. This is especially true for the Czech Republic and Slovakia, whose energy intensities are more than four times the average EU-15 level (see Figure 4). However, energy intensities of the countries have decreased substantially since the beginning of transition, especially in Poland.

Despite these common trends, there are significant differences between the Czech Republic, Poland, and Slovakia, both in terms of income convergence and energy-intensity convergence. Slovakia is a country that combines a high rate of per capita income growth (3.53% per annum) and a high elasticity of energy-intensity (1.47).[32] The Czech Republic also had an energy-intensity elasticity greater than one (1.04), but a lower economic growth rate over the period 1992-2002 (2.60% per annum). The estimated energy-intensity elasticity of Poland (0.23) was not statistically significant. These data suggest that if economic convergence between the old and new member states continues, a closing of the energy-intensity gap is only a question of time – and could be achieved well before 2020. From a policy perspective, it is interesting to note that a statistically significant (positive) correlation was found between the speed of energy-intensity adjustment and the extent to which a country has carried out reforms in the areas of governance and enterprise restructuring, price liberalization, competition and electric power.

32 Elasticity of energy intensity is the percentage change in energy intensity growth rate per 1% decrease in the per capita income gap between a New Member state and the *average* EU15.

Figure 4: Energy Intensity per GDP in 1995-Euro

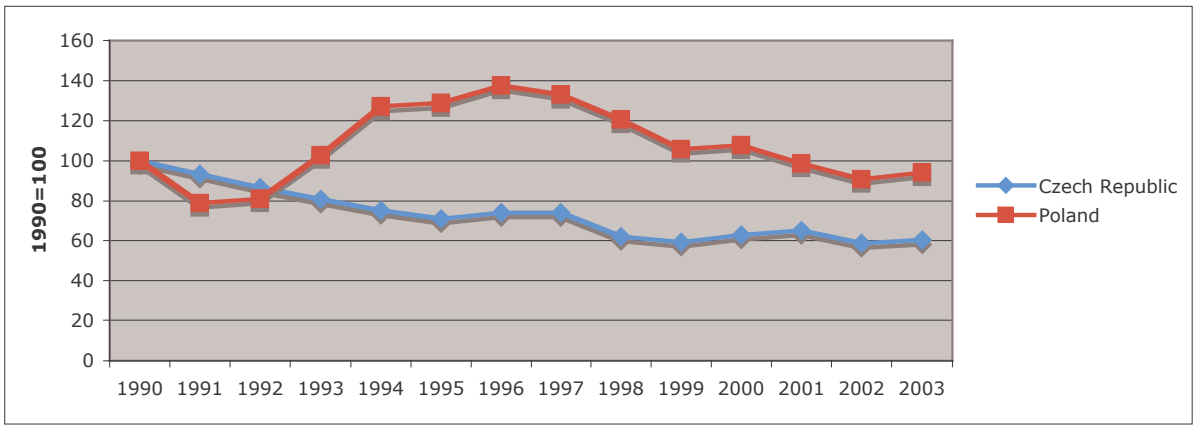


Source: Eurostat Energy Intensity of the Economy Dataset (Aug. 2006)

5.2.2 Climate Relevant Aspects in the Industrial Sector (non-energy)

In the **Czech Republic**, the industrial sector is traditionally very important. The composition of industry has gradually changed, from heavy industry to processing and construction. The mining industry also changed, with significant decreases in the mining of black and brown coal, uranium and metal ores. Since 1990 GHG emissions in the industrial sector in the Czech Republic decreased by about 40%. The composition of industry also changed in **Poland**, from heavy industries, mining and quarrying, to manufacturing and metals production. Industrial GHG emissions dropped initially, but increased quite strongly after 1992. Since the mid-1990s, emissions are falling again and have now reached 1990 levels. In **Slovakia**, the share of mining and quarrying in industrial output also fell, with an increase in manufacturing, especially in the export sector, such as automobiles, rubber and plastics, electric and optic equipment. The emission decreases between 1990 and 2004 — as for other new Member States — were the result of a decline of energy-inefficient heavy industry and the overall restructuring of the economy in late 1980s and early 1990s.

Figure 5: Change of GHG emissions in the Industrial Sector



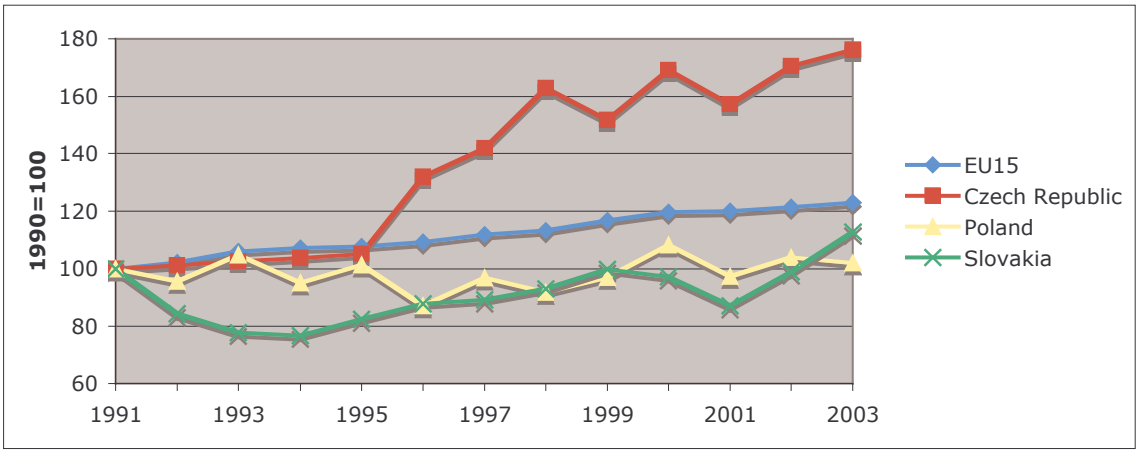
N.B. This statistic was not available for Slovakia for the period 1990-2000.

Source: Eurostat Air Emissions Dataset (March 2006)

5.2.3 Climate Relevant Aspects in the Transport Sector

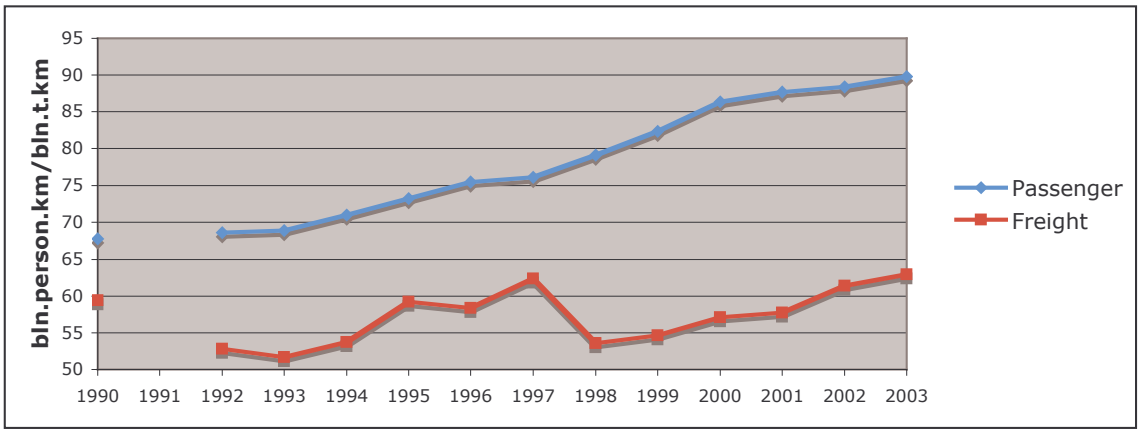
The transport sector is currently the sector with the largest increase in energy usage worldwide. This also holds for the Czech Republic, and, to a lesser extent, for Poland and Slovakia. Transport activities increase along with GDP growth and the share of road freight traffic rises, whereas freight traffic by rail remains constant. Public transport has decreased while private transport has increased. In many Central and Eastern European countries, road transportation is facilitated by EU financing of major European corridors.

Figure 6: Growth of GHG emissions in the Transport Sector (1991 – 2003)



In the **Czech Republic**, emissions from the transport sector have risen by 76% since 1991, the sector's share in GHG emissions has reached almost 10%. This is due to an expansion of road passenger and freight transport (Figure 7). Although the density of the railway network is very high, its infrastructure requires modernization. As in other Central and Eastern European countries there is a shift from railway to road and air transport.

Figure 7: Growth of Road Passenger and Freight Transport in the Czech Republic (1990 – 2003)



Source: 4th National Communication of the Czech Republic

GHG emissions from the transport sector initially decreased in **Poland**, but have been rising again since the mid-1990s. The number of registered passenger cars and trucks increased in the period 1995-2004 by 59% and 77%, respectively. Recently, since 2002, a rising trend in railway transport has been observed with a decreasing trend in road transport. Although energy-efficiency improvements have been observed in cars and trucks, this improvement is counteracted by the high imports of relatively old used cars from Germany and other Western European countries.

GHG emissions from the transport sector fell after transition in **Slovakia**, but have been on the rise again since the mid-1990s (with a temporary decrease around the year 2001). The growth of transport is somewhat restricted because of the poor quality of road and rail infrastructure and the decrease in economic activity in domestic industries, especially construction. Over the past ten years, the number of automobiles (mainly private ones) increased by 17%, and since 1990 the intensity of motorway use has increased by 160%.

5.3 Benefits and costs of climate change policies for the Czech Republic, Poland and Slovakia

Overall, it is increasingly recoginised that climate change presents an economic opportunity. Recently, the Stern Review in the UK[33] assessed the economics of moving to a low carbon economy, focusing on a medium to long term, plus the potential of different approaches to adaptation and lessons for the UK, in the context of climate change commitment. The report concluded that the benefits of strong and early action outweigh the costs of inaction by far. Using the results from an integrated assessment model, the review estimated that the total damage costs of climate change could be at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast to these costs of inaction, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can,

[33] Stern, N., (2006). The Economics of Climate Change. Cabinet Office – HM Treasury. Cambridge University Press.

according to Stern, be limited to around 1% of global GDP each year. Recent analysis by the EU also suggested that the impact of autonomous action by the EU on its GDP would be limited (< 1%), particularly if full access to project-based mechanisms (CDM) becomes possible.[34]

In addition to the direct positive effects of avoiding the worst impacts of climate change, GHG reduction measures are expected to entail several benefits in terms of increased energy intensity, reduced dependency on foreign energy sources, job creation, increased research and development and reduced air pollution. The energy intensity of the economies of the three countries is still well above the EU-15 average. This implies a huge potential to increase energy efficiency at low costs and to improve industrial competitiveness.[35] Since all three countries are net energy importers, they are very vulnerable to supply shocks and price increases. Reduced energy intensity and use of domestic renewable energy sources can lower vulnerability.[36] Cooperation within the EU and within mechanisms of the Kyoto Protocol may generate knowledge spillovers, from which the economies will benefit.

Besides the long-term climate change mitigation, the reduction of GHG emissions has direct environmental and economic effects. Reducing air pollution will create welfare benefits through a higher quality of life and also through a reduction of the costs of health services.[37] Furthermore, improving the environment can benefit tourism, an important sector in all three countries. As the energy intensity of the Czech, Polish and Slovak economies is still considerably higher than the EU-15 average, it is very likely that there are still opportunities to reduce this intensity at no or very little cost. Economic opportunities may also be found in the production of renewable energies, especially biofuels.

6 International Negotiations on post-2012 commitments

6.1 Status of the international debate before COP 13

Since the Kyoto Protocol entered into force, the Parties to the UN Framework Convention on Climate Change have met twice, at COP 11 in Montreal in 2005 and at COP 12 in Nairobi in 2006. These sessions have also served as the first and second Meetings of the Parties to the Kyoto Protocol (COP/MOP 1 and COP/MOP 2).

The Montreal sessions established two parallel processes to assist negotiations on future commitments under both the Convention and the Protocol:

34 European Commission, 2007: Limiting Global Climate Change to 2 degrees Celsius The way ahead for 2020 and beyond COM(2007) 2

35 IEA (2004). “Energy Efficiency in Economies in Transition”, International Energy Agency.

36 ibid.

37 Hunt, A.; Mason, P.; Markandya, A. (1999). “Measuring the Indirect Costs and Benefits of Greenhouse Gas Mitigation Options: Methodology and a Case Study from Hungary”.

- an *Ad Hoc Working Group* to discuss commitments of Kyoto Protocol Parties beyond 2012[38]; and
- a *Dialogue on Long term cooperative action to address climate change by enhancing implementation of the Convention*.

Two other key outcomes from Montreal will impact future negotiations:

- Adoption of a series of decisions that bring the Kyoto Protocol's *'flexible mechanisms'* into full operation.
- Endorsement of *procedures and mechanisms relating to compliance* with the Kyoto Protocol.

At COP 12 and COP/MOP 2 in Nairobi, discussions advanced further on future commitments through meetings of the *Ad Hoc Working Group* and the *Dialogue*. The first review of the Kyoto Protocol, mandated by Protocol Article 9, also took place at COP/MOP 2. COP 13 and COP/MOP 3 will take place in Nusa Dua, Bali, in December 2007.

6.1.1 Ad Hoc Working Group (AWG) on Article 3.9 of the Kyoto Protocol

The Kyoto Protocol defines a five-year period from 2008-2012 as its "first commitment period". Parties' individual emission limitation or reduction commitments for the first commitment period are set out in Protocol Annex B. Under Article 3.9 of the Protocol, Parties are required to "initiate the consideration" of commitments for subsequent periods at least seven years before the end of the first commitment period (i.e. in 2005). These commitments will be established in amendments to Annex B. In Montreal, Parties to the Kyoto Protocol established an *Ad Hoc Working Group (AWG)* to consider future commitments of Annex I Kyoto Parties of Annex I Kyoto Parties for the period beyond 2012. The AWG will aim to complete its work in time to ensure that there is no gap between the first and second commitment periods, and will report back to each annual COP/MOP on its progress.

The AWG is open to all Kyoto Parties. At its first meeting in May 2006, the AWG Chair proposed a non-exhaustive and indicative list of topics for the further work of the Working Group. This list includes the scientific basis for determining the level of ambition of further commitments by Annex I Parties, emission trends, mitigation potential and the architecture of further commitments for Annex I Parties. At the second meeting of the AWG in November 2006, presentations were made on the scientific basis for determining further commitments, scenarios for stabilising concentrations of GHGs and the implications of these scenarios. The AWG noted that this provided useful information with regard to the overall level of ambition of further emission reductions by Annex I Parties.39

The AWG decided that its work programme for the completion of its mandate will include the following tasks: (1) analysis of mitigation potentials and ranges of emission reduction

[38] Decision 1/CMP.1 (FCCC/KP/CMP/2005/8/Add.1)

[39] FCCC/KP/AWG/2006/4

objectives of Annex I Parties; (2) analysis of possible means to achieve mitigation objectives; and (3) consideration of further commitments by Annex I Parties.

The third and next session of the AWG will take place in May 2007, and focus on these topics. It will draw upon analysis and information from the IPCC's Fourth Assessment Report and from IGOs, NGOs, and national research institutional and programmes. The fourth session of the AWG will be held in September or October 2007 in conjunction with the Dialogue, and then resumed and concluded during the sessional period in December 2007.

6.1.2 Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention[40]

In Montreal, by decision 1/CP.11, Parties to the Convention agreed to begin a "*dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention*". This process is meant to engage non-Kyoto Parties in discussions on future actions. The Dialogue is scheduled to be held in four workshops, intended to allow Parties to exchange experiences and analyse strategic approaches for long-term cooperative action in four thematic areas:

- advancing development goals in a sustainable way;
- addressing action on adaptation;
- realising the full potential of technology; and
- realising the full potential of market-based opportunities.

The Dialogue is open to all Parties. It is to be informed by the best available scientific information and assessment on climate change from the IPCC, as well as other relevant scientific, social, and economic information. It is intended to serve as a forum to identify:

- actions to promote research, development and deployment of cleaner technologies;
- ways to support voluntary actions by developing countries; and
- ways to promote access by developing countries to climate-friendly technologies and to technologies for adaptation.

The Dialogue met for the first time 15-16 May 2006 in Bonn. Parties and observer organisations had an initial discussion on all four thematic areas. The second workshop in the sequence was held 15-16 November 2006 in Nairobi. It focused on concrete actions under the first and fourth thematic areas (sustainable development and market-based opportunities), using as inputs presentations from Parties, the results of the Stern Review on the Economics of Climate Change, and business perspectives.[41]

The third workshop will be held in May 2007. It will focus on concrete actions on the remaining two dialogue themes: (1) addressing action on adaptation; and (2) realising the full

[40] FCCC/CP/2005/L.4/Rev.1

[41] Oral Report at COP 12 by the co-facilitators (Ms. Sandea de Wet and Mr. Howard Bamsey).

potential of technology. There will also be a formal briefing on the IPCC working groups' the Working Group contributions to the IPCC's Fourth Assessment Report.

The fourth and final workshop will likely be held from 3-7 in September or October 2007in Vienna, Austria. Before that event, the Secretariat has been asked to provide an analysis of existing and planned investment flows and finance schemes relevant to the development of effective and appropriate international responses to climate change. The Dialogue will report back to COP 13 in December 2007.

6.1.3 Article 9 Review of the Kyoto Protocol

Article 9 of the Kyoto Protocol provides that the COP/MOP shall periodically review the Protocol "in light of the best available scientific information and assessments on climate change and its impacts, as well as relevant technical, social and economic information." Article 9 review under the Protocol is to be coordinated with reviews under the Convention, including those on the adequacy of commitments for all developed country Parties under Articles 4.2(a) and (b). The Protocol provides for a first review at COP/MOP 2.

The first Article 9 Review was completed in Nairobi, in November 2006. In undertaking the review, the Parties noted that the Protocol has fostered cooperative action, including through the CDM, but also acknowledged that a number of elements of the Protocol, including adaptation, could be further elaborated upon and that the implementation of the Protocol could be further enhanced.[42] The Parties decided that the second review of the Kyoto Protocol under Article 9 will take place at COP/MOP 4 in 2008. The scope and content of the second review will be considered at COP/MOP 3. Parties have been invited to submit their views on these issues, and on the preparations required for conducting the review, by 17 August 2007.

Article 9 review is linked politically and substantively to discussions under Kyoto Protocol Article 3.9 on future commitments and discussions within the Convention's Dialogue on long-term cooperative action.

6.1.4 Kyoto Protocol Flexible Mechanisms

The flexible mechanisms allow developed country Parties to lower the cost of meeting their Kyoto Protocol targets, by undertaking emission reduction projects in other Annex I Parties (Joint Implementation) or in developing countries (Clean Development Mechanism), and applying the credits from these projects toward their own targets.

COP/MOP 1 agreed on the importance of the flexible mechanisms for the second commitment period. As a result, it is now clear that the Clean Development Mechanism (CDM) and Joint Implementation (JI) will continue into any Kyoto Protocol second commitment period. This offers opportunities for both developed and developing countries, depending on how rules for the CDM and JI are negotiated for the post-2012 period.

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42 FCCC/KP/CMP/2006/10/Add.1, decision 7/CMP.2

6.1.5 Procedures and Mechanisms on Compliance

Under the compliance procedures of the Kyoto Protocol, if at the end of the first commitment period the emissions of an Annex I Party have exceeded that Party's assigned amount, certain consequences will be applied. These consequences include a deduction of tonnes from the Party's assigned amount for the second commitment period, equal to 1.3 times the number of tonnes of excess emissions in the first commitment period. The multiplier is intended to deter delayed compliance. Parties that have exceeded their assigned amounts will also be required to develop a compliance action plan, and will have their eligibility to participate in International Emissions Trading under the Protocol suspended until certain requirements are met.

These anticipated consequences may become significant for negotiations on commitments for the second commitment, as some Annex I Parties are on track to miss their Kyoto targets for the first commitment period by a substantial margin, in the absence of the use of the flexible mechanisms.

6.2 Most significant challenges faced by the UNFCCC and Kyoto Protocol

A number of key issues will need to be addressed in future international negotiations under the UNFCCC and the Kyoto Protocol:

- **How to stabilize atmospheric GHGs at an appropriate level?** Targets and actions under the climate regime must be designed to allow for early and significant emission reductions, to increase the likelihood of stabilizing GHG concentrations at a level that will avoid dangerous climate change.[43] Different 'reduction pathways', representing different scenarios for aggregated emission reduction effort, will offer different timeframes for GHG stabilisation, and consequently will have different impacts on the climate system.
- **How to secure *deeper* emission reductions by *more* countries?** In order to stabilise GHG levels as soon as possible, deeper emission reductions by more countries are needed. This requires the creation of greater incentives for all countries to participate in emission reduction efforts. What incentives can be put in place to encourage greater emission reductions by Kyoto Parties that have existing emission reduction or limitation commitments, for the next commitment period? What measures can encourage meaningful emission reduction efforts by countries that have not yet ratified the Kyoto Protocol? What incentives can lead to increased efforts by developing countries?
- **How to address adaptation?** GHG emissions that have already occurred will affect the climate system far into the future. Most countries will have to adapt to some impacts of climate change, even if emissions are reduced rapidly in the future. Developing and developed countries alike will have to develop a systematic approach to meet domestic adaptation challenges. At the same time, at the international level, the UNFCCC requires

[43] See above, den Elzen, M.G.J., and Meinshausen, M., Meeting the EU 2° climate target: global and regional emission implications (2005).

certain developed countries (including the EU) to assist particularly vulnerable developing countries in meeting the costs of adaptation. Further arrangements for adaptation will need to be elaborated to address the needs of vulnerable countries, and consideration will have to be given to how the burden of adaptation can be shared equitably – taking into account the differentiation in responsibilities and capabilities among countries.

6.3 Which mitigation options are under discussion?

A variety of mitigation approaches have been suggested by researchers outside the formal negotiating process, to meet the challenge of securing deeper emission reductions by more countries in the Post-2012 period. Many have been proposed to build upon or complement existing Kyoto commitments and are designed to offer ways to engage developing countries in mitigation efforts. Many approaches also stress that technologies will play a significant role in Post-2012 negotiations (energy efficient technologies, renewables, hydrogen, fuel cells, and carbon capture and storage). Examples include:44

- **absolute targets** – Kyoto-like numerical targets that reflect emission limitations or emission reductions compared to emissions in a country's base-year (for example, a limitation of X% over 1990 levels, or a reduction of X% below 1990 levels). Absolute targets build directly on the Kyoto framework and lead to measurable overall reductions. The existence of emissions caps also supports emissions trading.
- **carbon intensity targets** – an agreed limitation or reduction of emissions per unit of output, relative to GDP or another indicator, with these targets applied to sectors or to economies as a whole.
- **sectoral targets** – measures to be undertaken in specific sectors in an economy (e.g., energy, cement, steel, transport), with the type of target differing with the characteristics of the sector.
- **renewable energy targets** – a targeted level of generation or use of renewable energy, or a targeted increase in the generation or use of renewable energy (for example, the EC Renewables Directive aims to achieve a 22% share of electricity from renewable energies by 2010; China has a target of 10% of total power capacity from renewables, excluding large hydro, by 2010)[45].

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44 See generally, Pallemaerts, M., Parker, C.N., Shukla, P.R., and van Schaik, L.G., The Greenland Dialogue on Climate Change: A Policy Discussion Paper (July 2005); Commission Staff Working Paper, Winning the Battle Against Climate Change, Background Paper (February 2, 2005) at 44-45; Baumert, K., Pershing, J., Climate Data: Insights and Observations, World Resources Institute (December 2004); Bodansky, D., International Climate Efforts Beyond 2012: A Survey of Approaches, Pew Center on Climate Change (December 2004).

45 Expert Group on Renewable Energy Convened by the United Nations Department of Economic and Social Affairs, Increasing Global Renewable Energy Market Share: Recent Trends and Perspectives (December 12, 2005) at 36 (noting that by mid-2005, at least 43 countries had set a national target for renewable energy supply, including all 25 EU countries).

- **energy efficiency targets** – a target for energy-saving, requiring improved energy efficiency (for example, in industry, housing construction, or the design of energy-using products).
- **sustainable development policies and measures (SD-PAMs)** – measures that make the development path of a country more sustainable, with the co-benefit of lowering GHG emissions.

There are also a number of **approaches to agreeing upon Post-2012 commitments** that could be used:

- **a top-down approach** – an overarching target could be agreed (e.g., an overall percentage reduction for the global community to achieve) and then responsibility could be distributed among countries through multilateral negotiations;
- **a menu approach** – countries in differentiated groups (e.g., at different stages of development or with different capabilities) could be permitted to choose from among a prescribed menu of possible commitments (e.g., targets or voluntary measures);
- **a bottom-up approach** – countries could decide what types of commitments they are prepared to take (e.g., sector targets, a specified level of investment in technology, a specified level of installed capacity, implementation of specific policies and measures) and then pledge to achieve those commitments.

The Post-2012 climate regime could also allow for a **'multi-staged' approach** to mitigation commitments. This could allow for differentiation among groups of developing countries, based on a set of ***objective criteria*** (e.g., historic GHG emissions, capacity to reduce emissions, GDP per capita, emissions per capita, emissions per unit of GDP, human development index, emission growth rates, or some combination of these indicators). Each group of countries could undertake different levels or kinds of participation in GHG reduction efforts at different points in time. Countries could then ***graduate between stages of mitigation effort*** and take on greater commitments when they reach or cross one or more thresholds. ***Criteria for graduation*** could be developed to allow countries to move automatically or voluntarily through levels of participation. ***Incentives*** for participation could be offered at different levels, to encourage countries to move through stages and increase their reduction efforts.

6.4 International transport: aviation and shipping

Emissions from international aviation and maritime transport are becoming increasingly significant.

- **International aviation emissions** from developed countries increased by 52% from 1990 to 2004.[46] The EU's emissions from international flights grew at an even higher rate,

[46] FCCC/SBI/2006/26, National greenhouse gas inventory data for the period 1990-2004 and status of reporting, at 10.

increasing by 87% from 1990 to 2004, and increasing 7.5% from 2003 to 2004 alone.[47] If present growth continues, emissions from international flights from EU airports could offset more than a quarter of the environmental benefits of the reductions required by the EU's target under the Kyoto Protocol.

- **International maritime transport emissions** from developed countries as a whole increased by 3.4 % between 1990 and 2004.[48] From 1990 to 2002, emissions from the EU-15 increased by about 35%.[49] These emissions are expected to increase still further as international trade expands, driving the demand for more, larger, and faster ships that consume more fuel.

The international aviation and maritime transport sectors are not regulated under the targets agreed in Kyoto. Only GHG emissions from domestic aviation and maritime transport activities are included in Parties' national GHG inventories for purposes of Kyoto commitments. In contrast, emissions that are associated with international transport are reported, but excluded from national emissions totals and hence from Kyoto targets.

Article 2.2 of the Kyoto Protocol provides that "*Annex I Parties are to pursue limitation or reduction of emissions of greenhouse gases from aviation and marine bunker fuels, working through the International Civil Aviation Organization [ICAO] and the International Maritime Organization [IMO] respectively*." Most of the work done through the ICAO and IMO to date has involved methodologies for determining and allocating emissions, and consideration of technical, operational and market-based approaches to reduce emissions and increase GHG efficiency for aviation and maritime transport.

Future options for addressing emissions from international aviation and maritime transport are both operational and technological. These include:

- **For international aviation**: new aircraft; improved passenger management; improved load factors; improved air traffic management; fuel taxation; and emissions trading.[50] The EU has formally proposed that aviation emissions be included in the EU Emissions Trading System for the post-2012 period, with aircraft operators subject to an emissions cap from 2011, and required to surrender allowances to cover emissions.[51]

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47 Commission of the European Communities, Proposal for a Directive of the European Parliament and of the Council amending directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, Brussels 20.12.2006, COM (2006) 818 final, 2006/0304 (COD) at 2.

48 FCCC/SBI/2006/26, at 10.

49 FCCC/SBSTA/2005/INF.2, Information on greenhouse gas emissions from international aviation and maritime transport, at 7.

50 EU Press Release 29.07.2005, Climate change: public consultation underlines support for tackling aviation's contribution; Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Reducing the Climate Change Impact of Aviation, COM(2005) 459 Final, 27.9.2005 (hereinafter 'COM(2005) 459 Final, 27.9.2005').

51 Commission of the European Communities, Proposal for a Directive of the European Parliament and of the Council amending directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community,

- **For international maritime transport:** reducing speed; using higher quality fuels; improved voyage planning procedures that take weather factors into account; advances in hull shape, propulsion systems and injection systems, and use of alternative energy sources.

6.5 Issues to be resolved in the international process

A number of **issues** will have to be considered in negotiating the Post-2012 climate regime:

- **At what concentration level should GHGs be stabilised in the atmosphere?** Different stabilisation concentrations (e.g., 400 ppmv[52], 450 ppmv) will have different impacts on the climate system and on vulnerable populations and ecosystems. The opportunity to stabilise concentrations at certain levels will be lost if sufficient emission reductions cannot be secured in the second commitment period. Stabilising concentrations at 450 ppmv offers only a 50% chance of limiting temperature increase to below 2ºC.[53]
- **What degree of effort is needed over what time frame to achieve stabilisation?** The Kyoto Protocol aimed for developed countries to reduce their emissions as a group to 5.2% below 1990 levels by 2008-2012. Much larger reductions are needed to stabilise GHG emissions. Neither the Convention nor the Protocol sets out a long-term reduction target, or a timeframe for meeting that target through a sequence of shorter-term milestones.
- **How should the principle of 'common but differentiated responsibilities and respective capabilities' be applied to developed and developing countries?** All countries will have to consider how to distribute or share the mitigation burden. Kyoto targets apply to developed countries only. Should developing countries be asked to take on commitments, in view of the rapidly increasing emissions from this group? If so, when, and what kind of commitments? Should different groups of developing countries be asked to take on different kinds of commitments? What kinds of economic incentives and opportunities might be needed to engage developing countries and non-Kyoto Parties in a global agreement? How might such incentives and opportunities be designed and provided?

Brussels 20.12.2006, COM (2006) 818 final, 2006/0304 (COD). ICAO's Committee on Aviation Environmental Protection decided in 2004 not to pursue an aviation-specific emissions trading system based on a new legal instrument under ICAO. However, the ICAO Assembly endorsed open emissions trading and requested the development of non-binding guidance for use by states, to incorporate emissions from international aviation into their emissions trading schemes.

52 Parts per million by volume.

53 Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Limiting Global Climate Change to 2 degrees Celsius – the way ahead for 2020 and beyond, Brussels, 10.1.2007, COM(2007) 2 final at 3.

- **How long should the Kyoto Protocol's second commitment period be?** Should a second commitment period be 5 years, like the first commitment period, or longer, to provide regulatory certainty to industry and guide long-term investment decisions?
- **What types of commitments could be taken in a second commitment period?** If commitments other than fixed Kyoto-like targets are to be permitted or encouraged for some countries (e.g., carbon intensity targets, sectoral targets, energy efficiency targets, renewable energy targets, policies and measures), how can countries' different efforts from these different kinds of commitments be compared? How can overall progress measured?
- **How should technology development and transfer be achieved?** Can sufficient technology transfer occur through the flexible mechanisms or other market-based mechanisms? Or, should a supplemental technology agreement be negotiated that builds upon the Convention and the Kyoto Protocol?
- **How can equitable burden sharing for adaptation be achieved?** The Convention requires developed countries to assist particularly vulnerable countries in meeting the costs of adaptation, but provides no detail on how this is to be done. How can a secure and predictable revenue stream for adaptation be generated that draws upon the resources of all Annex I parties equitably? How can the adaptation needs of vulnerable countries be satisfactorily addressed?
- **What should be the role of the flexible mechanisms in a second commitment period?** The Kyoto Protocol does not resolve the scope of activities that can be included in the CDM in the second commitment period. Can the flexible mechanisms be used to create additional opportunities for cost-effective emission reductions and support sustainable development, without jeopardizing the environmental integrity of the Kyoto Protocol?