ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

OECD

For a stronger, cleaner, fairer world economy

COSTS AND EFFECTIVENESS OF THE COPENHAGEN PLEDGES:
Assessing global greenhouse gas emissions targets and actions for 2020

Introduction

Tackling the problem of global climate change requires a high level of international cooperation. Broad based participation is needed, involving not only developed, but also developing countries.

At the Copenhagen Conference of Parties (COP-15) of the UN Framework Convention on Climate Change (UNFCCC) in December 2009, the international community took note of the Copenhagen Accord, a political agreement on climate change. To date, more than 120 countries plus the European Union have associated themselves with the Accord – ranging from major emitters such as the United States and China, to smaller countries that are vulnerable to climate change impacts, such as the Maldives. The Accord recognises the scientific view that the increase in average global temperature should be below 2°C. The Accord also invited all Parties to the UNFCCC to submit pledges for targets or actions to reduce their greenhouse gas (GHG) emissions.

OECD analysis shows that while the emission targets currently pledged by a wide range of countries under the Accord are an important and welcome start to a global solution, the pledges are not ambitious enough to put us on a pathway to limit average global temperature rise to 2°C. The pledges do reverse the trend of growing emissions by 2020, however there remains a sizable gap from the trajectory outlined by the IPCC for a 2°C pathway (see Figure 1).

OECD analysis also provides insights into the costs of the pledges, and explores the potential for increased fiscal revenue or proceeds if mitigation actions are achieved through market instruments such as carbon taxes or cap-and-trade emission schemes with auctioned emission allowances.

What targets and actions have been declared by countries?

As of May 2010, 42 Annex I countries have pledged quantified economy-wide emissions targets for 2020 and 36 non-Annex I countries have pledged mitigation actions under the Copenhagen Accord.

Table 1 shows how these pledges are translated into simulation scenarios for the purposes of th OECD model-based analysis. In order to estimate costs and effectiveness in a consistent manner, all Annex I emission reduction targets are translated into reductions from the same base year 1990 and all non-Annex I mitigation actions, including the emission intensity targets of China and India, are expressed in emission reductions from Business-as-Usual (BAU) in 2020. For countries that have not submitted a pledge, the assumption is made that emissions remain at the BAU baseline level. Several countries have submitted a range of targets or actions, with various conditions attached (see the UNFCCC website for details); for instance, some developing countries have announced that these actions are dependent on international financing. These conditions have not been taken into consideration in this analysis. The “Low & Fragmented” scenario corresponds to all countries meeting the lower end of their pledged ranges and assumes no linking of Annex I carbon markets. The “High & Linked” scenario corresponds to all countries meeting the higher end of their pledged ranges, and assumes that Annex I countries harmonize their carbon markets to allow trading of emission permits.

Due to the limited information available on what offset policies might be in the future, this analysis requires ad-hoc assumptions regarding the level of offsets. Many countries have not yet declared to what extent they want to allow offsets as part of their pledge. A default value of 20% of the required emission reductions is used for Annex I countries, with the exception of Canada and Russia (see Table 1). The impact of this default assumption is investigated below.

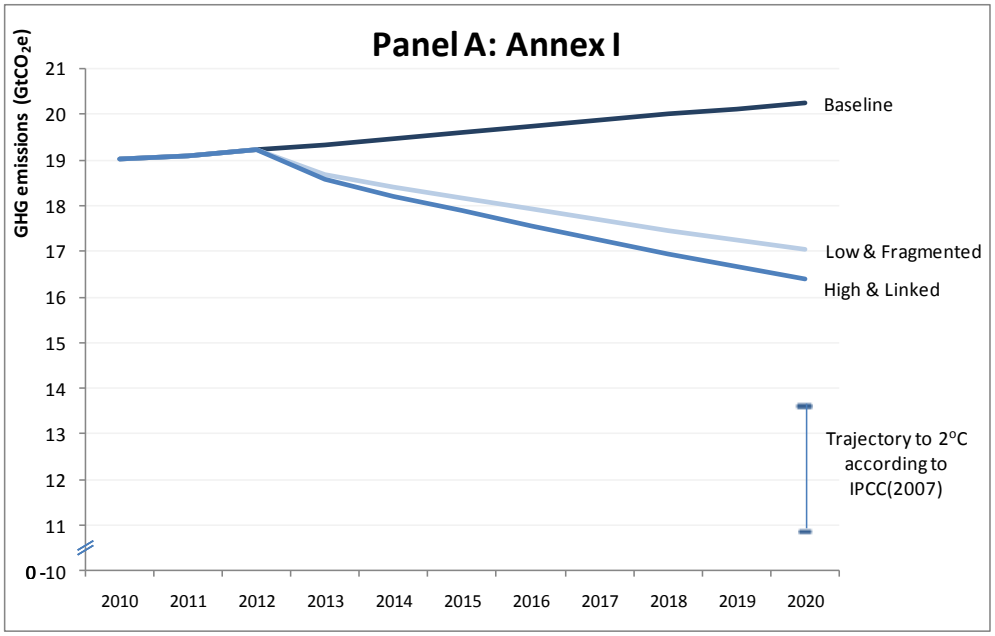
Table 1. Translation of pledged targets and actions into simulation scenarios

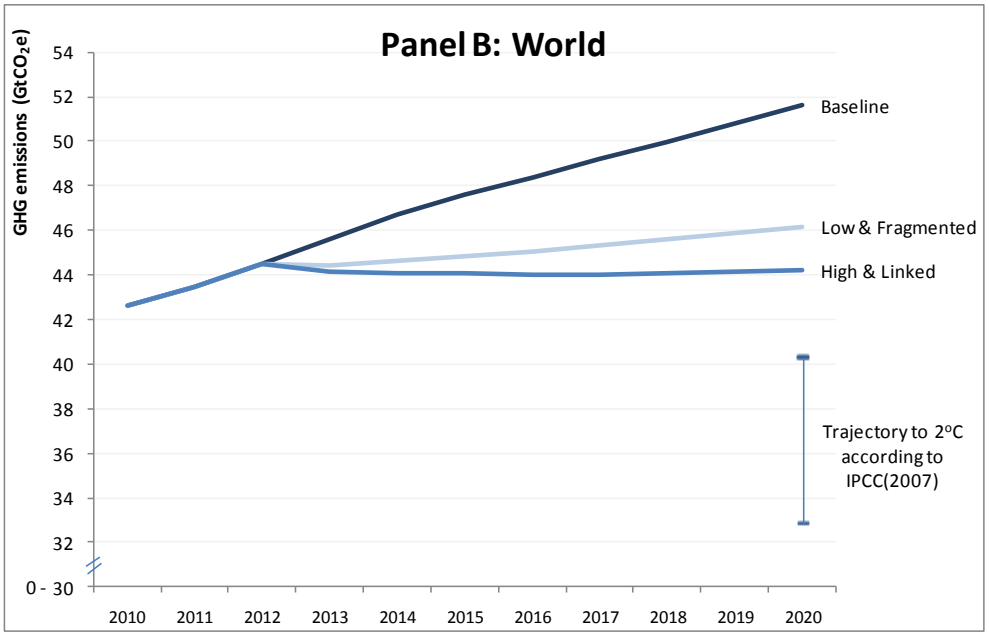
Region	Declared country targets and actions	Simulated scenarios	
		Low & Fragmented[1]	High & Linked[1]
Australia & New Zealand	Australia -5% to -25% from 2000; New Zealand -10% to -20% from 1990	+10.5% from 1990 (20% offsets)	-11.5% from 1990 (20% offsets)
Canada	-17% from 2005 domestic reductions; max. 10% credits from CDM	+3% from 1990 (10% offsets)	+3% from 1990 (10% offsets)
EU27 & EFTA	EU27, Liechtenstein and Switzerland -20% to -30% from 1990; Norway -30% to -40% from 1990; Iceland -30% from 1990; Monaco -30% from 1990	-20% from 1990 (20% offsets)	-30% from 1990 (20% offsets)
Japan	-25% from 1990	-25% from 1990 (20% offsets)	-25% from 1990 (20% offsets)
Russia	-15% to -25% from 1990	-15% from 1990 (no offsets)	-25% from 1990 (20% offsets)
United States	-17% from 2005	-3.5% from 1990 (20% offsets)	-3.5% from 1990 (20% offsets)
Non-EU Eastern Europe	Ukraine -20% from 1990; Belarus -5% to -10% from 1990; Croatia -5% from 1990	-16% from 1990 (20% offsets)	-16.5% from 1990 (20% offsets)
Brazil	-36% to -39% from BAU	-36% from BAU	-39% from BAU
China	Carbon intensity -40% to -45% from 2005	-0.2% from BAU	-8.5% from BAU
India	Carbon intensity -20% to -25% from 2005	+45% from BAU	+36% from BAU
Oil Exporting countries & Middle East[2]	Indonesia -26% from BAU; Israel -20% from BAU	-8.5% from BAU	-8.5% from BAU
Rest of the World	Korea -30% from BAU; Mexico -30% from BAU; South Africa -34% from BAU; many other pledges (incl. Costa Rica, Maldives, Marshall Islands)	-6% from BAU	-6% from BAU

1. All emission reductions are excluding LULUCF. The 20% limit on offsets in most Annex I regions is in line with the assumption in OECD (2009). All emissions are based on IEA and US-EPA data.

2. The region includes Middle East, Algeria, Libya, Egypt, Indonesia and Venezuela.

Figure 1. The gap between pledged targets and the trajectory towards the long term goal of limiting global temperature increases to 2°C





Source: OECD ENV-Linkages model, as described in OECD (2009).

Are collective actions for 2020 ambitious enough?

According to the IPCC's Fourth Assessment Report (IPCC, 2007), a trajectory of 25% to 40% reduction from 1990 emission levels by 2020 for Annex I countries, combined with substantial deviation from baseline by major developing and emerging economies, would be consistent with a pathway to stabilisation of atmospheric concentration of greenhouse gases at around 450 parts per million (ppm) CO2-equivalent. This GHG concentration level is associated with a medium likelihood (*i.e.* a chance of at least 50%) of

limiting global average temperature increase to below 2°C, which is the long-term target for climate policies stated in the Copenhagen Accord.

Figure 1 shows that the pledges by Annex I regions do reverse the trend of growing emissions, but a sizable gap between pledged Annex I targets and the trajectory suggested by the IPCC remains. For non-Annex I countries, the transition towards low-carbon development also needs to be stronger to meet the IPCC trajectory. The expected emission growth in the baseline with no additional climate action is so large, that even a sizable reduction from BAU does not lead to a stabilisation of emissions in non-Annex I. The higher end of the pledges by Annex I countries amount to -17% in emissions from 1990; for non-Annex I to -7% in emissions from BAU in 2020. As the combined pledges for both groups of countries fall short of the pathway identified by the IPCC, the chance of exceeding temperature increases of 2°C is high. Even though ambitious stabilisation targets would still be achievable in the longer run, far more significant efforts may be needed after 2020, likely at a higher cost than if a more gradual pathway to 2°C was chosen today.

Although the combined pledges do not put emissions on the desired long-term pathway, these efforts do represent a significant break from current trends. If current trends would continue unabated, global emissions would by 2020 reach levels that are more than 30% above 2005 levels. If, however, all countries take on their most ambitious pledges as in the High & Linked scenario, global emission reductions in 2020 amount to 7.4 $GtCO_2e$. This implies emission levels that are projected to be 14.5% below BAU levels in 2020, or equivalently around 13% above 2005 levels. This implies that in this scenario global emissions are stabilising after 2013. In contrast, the Low and Fragmented scenario would result in global reductions in 2020 of 10.5% (5.5 $GtCO_2e$) from BAU, leading to global emission levels in 2020 that are 18% above 2005 levels, and that keep increasing every year.

What are the expected economic impacts of these pledges?

This analysis sheds light on the economic impacts of implementing these pledges. For both scenarios, Table 2 shows how these mitigation policies affect key regional and global economic and environmental indicators. As the damages from climate change, and hence the benefits from mitigation action, are not included in the analysis, these numbers represent the cost of action. expected Gross Domestic Product (GDP) impacts and real income losses are larger in the High & Linked scenario, even though this scenario assumes Annex I countries link their carbon markets.1 At the global level, the additional costs are relatively minor, but for a few regions the higher end of the pledges implies substantially higher costs. Fossil fuel suppliers, such as Russia, suffer from the falling fuel prices on the world market, as international mitigation policies induce lower demand for fossil fuels and hence lower prices. The GDP impact in Russia is further affected by the stricter domestic policies in the High & Linked scenario (-25% emission reduction versus -15% in the Low & Fragmented scenario).

In contrast, there are a number of regions that have lower costs in the High & Linked scenario, including Canada, Japan and the United States. The main reason is that the High & Linked scenario allows permit trading between Annex I countries. The domestic mitigation costs in Japan are relatively high, and therefore Japan in particular can limit its costs by linking their carbon market to those of the other Annex I countries. Moreover, Japan as well as Canada and the US do not have increased mitigation efforts above and beyond their Low & Fragmented scenario.

The Low & Fragmented scenario leads to a reduction in output of the energy-intensive industries by about 1% for Annex I, versus a 0.3% increase in non-Annex I. In the High & Linked scenario, two opposite effects in the Annex I region cancel each other out: on the one hand the higher pledges negatively impact domestic energy-intensive industries, but on the other hand linking will reduce the worst negative impacts.

[1] The impact of the assumption on linking Annex I carbon markets is investigated in detail in the Annex.

Table 2. Costs and potential revenues in 2020

Panel A. Low & Fragmented scenario

Region	Carbon price (USD/tCO_2)	Fiscal revenues (% of GDP)	% deviation from BAU 2020			GHG emissions deviation	
			GDP	Household equivalent real income[1]	Output EIIs	$MtCO_2$ eq.	Target[2] % relative to base year
Australia & New Zealand	13.4	1.1	-0.4	-0.9	-0.4	-163	10.5
Brazil	97.0	8.6	-1.5	-4.4	-2.2	-468	-19.2
Canada	27.7	1.4	-0.4	-2.3	0.0	-197	3.0
China	0.9	0.0	-0.2	-0.3	0.0	-978	88.0
EU27 & EFTA	20.5	0.7	-0.2	-0.3	-0.4	-970	-20.0
India	0.9	0.0	0.1	0.3	0.4	-135	56.6
Japan	59.7	1.2	-0.4	-0.4	-2.1	-355	-25.0
Oil exporting countries	8.6	1.8	-0.9	-2.8	0.6	-343	25.4
Non-EU Eastern Europe	2.2	0.6	-0.3	-1.4	0.4	-104	-16.0
Rest of the World	0.9	0.3	0.0	-0.2	0.9	-296	19.9
Russia	0.0	0.0	-0.2	-1.8	5.1	12	-19.3
United States	27.9	1.1	-0.2	-0.4	-1.5	-1,435	-3.5
Annex I		1.0	-0.3	-0.5	-0.9	-3,213	-12.7
Non-Annex I		0.8	-0.2	-0.7	0.3	-2,220	47.7
World		**0.9**	**-0.3**	**-0.5**	**-0.4**	**-5,433**	**17.9**

Panel B. High & Linked scenario

Region	Carbon price (USD/tCO_2)	Fiscal revenues (% of GDP)	% deviation from BAU 2020			GHG emissions deviation	
			GDP	Household equivalent real income[1]	Output EIIs	$MtCO_2$ eq.	Target[2] % relative to base year
Australia & New Zealand	25.3	1.9	-0.6	-1.2	-2.4	-211	-11.5
Brazil	115.9	9.9	-1.9	-5.5	-2.7	-508	-23.0
Canada	25.3	1.3	-0.3	-2.2	0.1	-185	3.0
China	3.0	0.3	-0.3	-0.5	-0.4	-1,895	73.1
EU27 & EFTA	25.3	0.9	-0.3	-0.5	-0.3	-1,054	-30.0
India	3.0	0.0	0.0	0.2	0.1	-259	57.0
Japan	25.3	0.6	-0.1	-0.2	-0.3	-208	-25.0
Oil exporting countries	8.6	1.8	-0.9	-2.8	0.7	-343	25.4
Non-EU Eastern Europe	25.3	6.0	-1.5	-1.7	-2.5	-307	-16.5
Rest of the World	3.0	0.3	-0.1	-0.2	0.9	-547	19.9
Russia	25.3	7.4	-1.9	-2.7	-10.6	-525	-25.0
United States	25.3	1.0	-0.2	-0.4	-1.2	-1,364	-3.5
Annex I		1.1	-0.3	-0.5	-0.9	-3,855	-17.3
Non-Annex I		0.9	-0.3	-0.8	0.0	-3,551	42.1
World		**1.0**	**-0.3**	**-0.6**	**-0.5**	**-7,406**	**12.8**

1. Hicksian "equivalent real income variation" defined as the change in real income (in percentage) necessary to ensure the same level of utility to consumers as in the baseline projection.
2. Potential revenues or proceeds, based on implementation through carbon tax or full auctioning of permits.
3. Energy-intensive industries include chemicals, metallurgic, other metal, iron and steel, paper and mineral products.
4. Due to data availability constraints, the base year is 1990 for Annex I regions and 2005 for non-Annex I regions (Brazil, China, India, Oil Exporters & Middle East, Rest of the world). Global deviation is based on 2005 data for all regions.

Source: OECD ENV-Linkages model.

The intensity target declared by India is evaluated in the model analysis as being less strict than the autonomous development projected in the baseline. The country can therefore benefit from providing offset credits and increase its GDP levels, albeit not much. In the High & Linked scenario, this increase fades, because the Annex I countries can limit costs by linking their carbon markets. For China, the lower end of their pledge translates into an allowed emission level that is very close to the baseline projection, but the cap does imply a small economic cost.

Finally, although these costs are certainly not negligible, they should be viewed in context: the costs of inaction are likely to be substantially higher (cf. Stern, 2007). Moreover, these losses are small compared to the substantial growth in projected GDP in the baseline. For the global economy, these costs represent a reduction in the average annual GDP growth rate from 2.76% in the baseline to 2.74% in the High & Linked scenario. Even in Brazil, where the economic costs are estimated to be highest, the average annual GDP growth rate remains above 3% in all scenarios.

Table 2 also shows the other side of the same coin: introducing carbon pricing can involve the creation of a major source of income for governments, if they either auction permits, or implement a carbon tax. For the Annex I group of countries, these could amount to over 1% of GDP. Domestic fiscal revenues could be especially high in countries that either have a very stringent policy without linking to other carbon markets (the case of Brazil in our assessment), or that can exploit relatively cheap reduction options and sell these on the international carbon market. By assumption, this latter effect is only present in the High & Linked scenario. Revenues from carbon taxes or proceeds generated from auctioned permits in developed countries can be used to offset more distortive forms of taxation, or, given the urgent need to reduce government deficits following the crisis, revenues could be used for fiscal consolidation. They could also be used to help meet the international financial commitments to support of climate adaptation and mitigation efforts in developing countries. In emerging economies, such revenues could be sources of finance for other pressing priorities, such as education, health care and poverty alleviation.

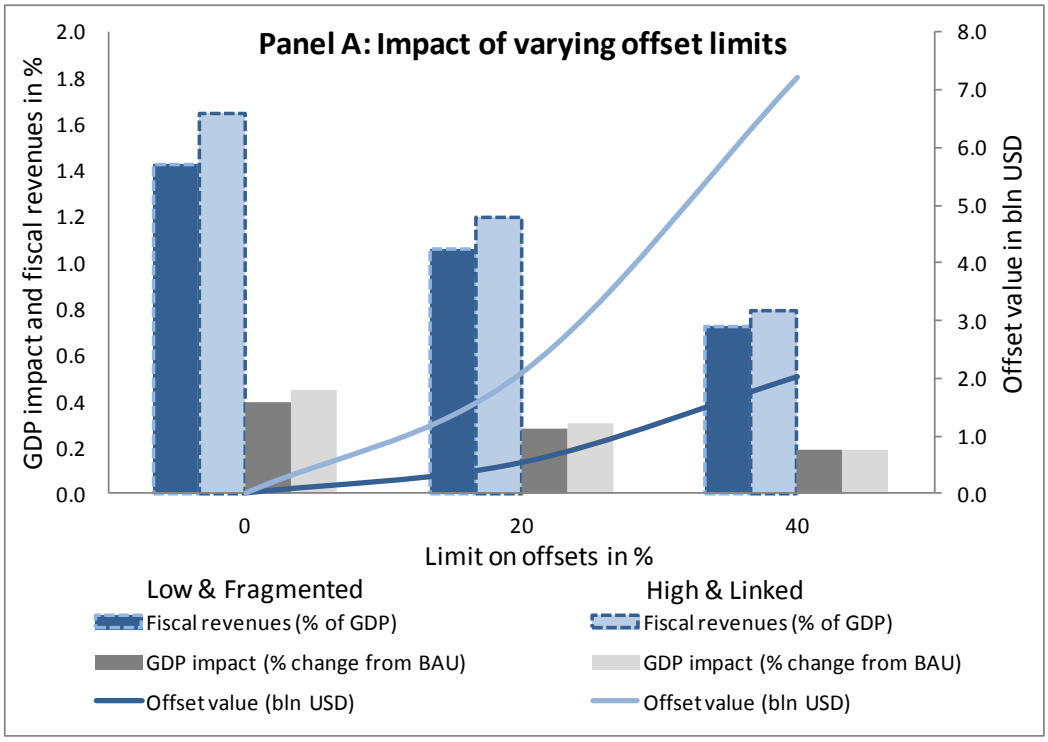
How important are offsets?

The availability of offsets plays a crucial role in keeping the costs of climate policies low, as cheaper mitigation options in developing countries can lower the price of reducing a tonne of GHG emissions in the offset market. In the Low & Fragmented scenario, the offset market reaches a value of around USD 0.8 billion annually, whereas in the High & Linked scenario this increases to USD 3 billion. In comparison, the total carbon market value is around USD 500 billion in the Low & Fragmented scenario, and around USD 580 billion in the High & Linked scenario. Despite domestic action in China, it still dominates the offset market in these scenarios: in the High & Linked scenario it accounts for two-thirds of all offset supply, representing almost 700 $MtCO_2e$, with India also providing substantial amounts (300 $MtCO_2e$).

Changing the default limit on offsets (20% for Annex I) significantly affects the results; more offsets imply lower mitigation costs in Annex I countries and globally. At the same time, fiscal revenues are affected by the lower share of domestic reductions and lower carbon prices. The higher the level of offsets, the further carbon prices in Annex I and non-Annex I converge. Figure 2 presents the impacts of the limit on offsets.[2]

[2] When varying the offset limit, the ad-hoc assumption is made that offsets in Canada increase proportionally with the default value and thus are always half of the default value.

Figure 2. The impact of different offset limits in Annex I in 2020



Source: OECD ENV-Linkages model.

Concluding remarks

While it is promising that many countries are willing to commit to ambitious mitigation action, the pledged targets and actions as submitted to the Copenhagen Accord are insufficient when compared to the emission reductions suggested by the IPCC to keep global temperature change limited to 2°C. This OECD assessment is in line with other model assessments (UNEP, 2010). While not cheap, the costs of these pledges are limited compared to expected economic growth, and substantially less than most estimates of the costs of inaction. Ambitious global action to mitigate greenhouse gas emissions is thus not only necessary, but also economically rational.

Climate policies also provide important environmental benefits and have the potential to generate fiscal revenues that are sizable, when market instruments are used. This is especially attractive in current times of financial hardship. Ambitious climate policies are an essential part of a broader green growth strategy that aims at a strong, fair and clean global economy.

References

IPCC (2007), *Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, New-York.

OECD (2009), *The economics of climate change mitigation: Policies and options for global action beyond 2012*, isbn 978-92-64-05606-0,OECD, Paris.

Stern, N. (2007), *The Economics of Climate Change: The Stern Review*, CUP, Cambridge.

UNEP (2010), *How close are we to the two degree limit*, Information Note.

For further information

For more information on this topic and on OECD work on the economics of climate change, please contact: Rob Dellink, Tel.: +(33 1) 45 24 19 53, e-mail: rob.dellink@oecd.org or Jan Corfee-Morlot, Tel.: +33 1 45 24 79 24, e-mail: jan.corfee-morlot@oecd.org.

Visit the OECD's website on the economics of climate change at www.oecd.org/env/cc/econ

More information on the OECD's work on climate change can be found at www.oecd.org/env/cc

For further reading

Clapp, C., K. Karousakis, B. Buchner, J. Chateau (2009), "National and Sectoral GHG Mitigation Potential: A Comparison across Models." OECD/IEA, Paris. http://www.oecd.org/dataoecd/42/33/44050733.pdf

Dellink, R.B., S. Jamet, J. Chateau and R. Duval (2010), "Towards global carbon pricing: direct and indirect linking of carbon markets", OECD, Paris.

Ellis, J., D. Tirpak (2006), "Linking Greenhouse Gas Emission Trading Systems and Markets", OECD/IEA, Paris. http://www.oecd.org/dataoecd/45/35/37672298.pdf

Karousakis, K., B. Guay, C. Philibert (2008), "Differentiating Countries in Terms of Mitigation Commitments, Actions and Support", OECD/IEA, Paris. http://www.oecd.org/dataoecd/53/55/41762372.pdf

OECD (2008), *Climate Change Mitigation: What Do We Do?* ISBN 978-92-64-05961-0.

OECD (2008), *Environmental Outlook to 2030*, ISBN 978-92-64-04048-9, 520 pages.

OECD (2009), *The Economics of Climate Change Mitigation: Policies and options for global action beyond 2012*, isbn 978-92-64-05606-0,OECD, Paris

Stephenson, John (2009), "Comparing Climate Change Commitments: Technical Versus Political Judgement." Round Table on Sustainable Development Background Paper, OECD, Paris. SG/SD/RT(2009)6/REV2. http://www.oecd.org/dataoecd/4/20/43799803.pdf