

Workshop: Analysis of mitigation potentials and comparability of efforts

**DG Environment
European Commission**

ec.europa.eu/climateaction

Communication of the Commission on the road to Copenhagen

- COM(2009) 39 final: **Communication**
- SEC(2009) 102 (9 pages): Additional information on specific elements presented in Communication.

Background information and analysis

- SEC(2009) 101 part 1 (101 pages): Staff Working Document that includes a **quantitative analysis**.
- SEC(2009) 101 part 2 (127 pages): Annexes to Staff Working including additional information and **qualitative analysis** of issues.

Council Conclusions to prepare EU position

- 1-2 March: Environment Council
- 10 March: ECOFIN Council
- 19-20 March: Spring European Council

- **Comparability of efforts**
 - **Economic analysis and the role of the global carbon market**
 - **A sectoral perspective: energy and industrial sectors**
 - **Impact of the financial crisis**
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- **What should be the qualities of a successful method to set emission reduction levels for developed countries?**
- **This method will need to ensure that leads to ambitious but ‘credible’ targets in order to be acceptable.**
- **The method therefore should be:**
 - **Balanced and result in no extremes for particular parties**
 - **Easy to understand**
 - **Take into account the country specific situation**
 - **Based on readily available information and not depend on uncertain future projections**
- **This rules out target setting methods that use only an optimisation process via a modelling approach.**

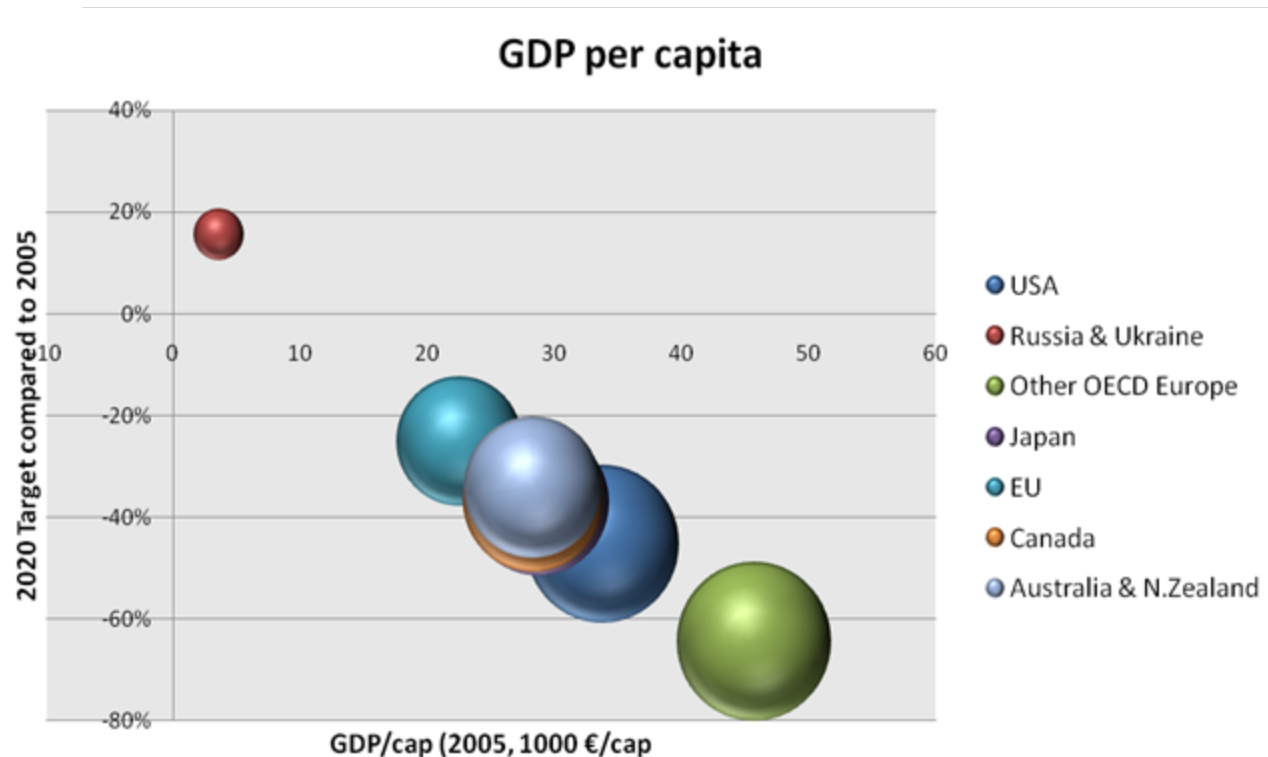
Indicators to set ambition level for developed countries?

Examples of other indicators to compare efforts of developed countries?

- 1. GDP per capita**
 - 2. GHG per GDP**
 - 3. Population trend**
 - 4. Change of GHG emissions between 1990 and 2005**
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- ⇒ **Readily available**
 - ⇒ **Take into account specific national circumstances**
 - ⇒ **Easy to understand, also the link with (political) capability to take on reduction commitments**
 - ⇒ **Not based on model optimisation**
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- ⇒ **But are they balanced?**

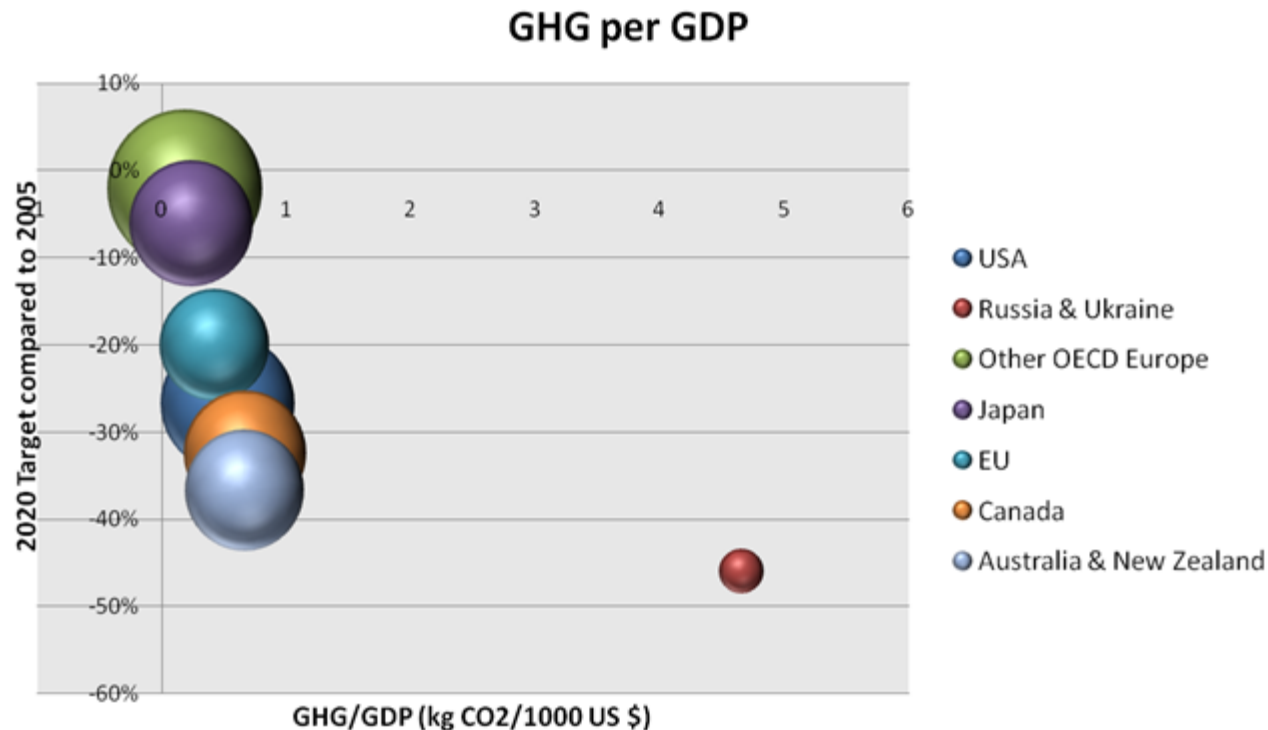
- GDP per capita is an indicator that gives an indication if a country has the ability to pay for reductions:
 - Through internal reductions
 - Through the international carbon market

- Total ambition is -30% compared to 1990 by 2020
- But country targets expressed to a recent base year, i.e. 2005



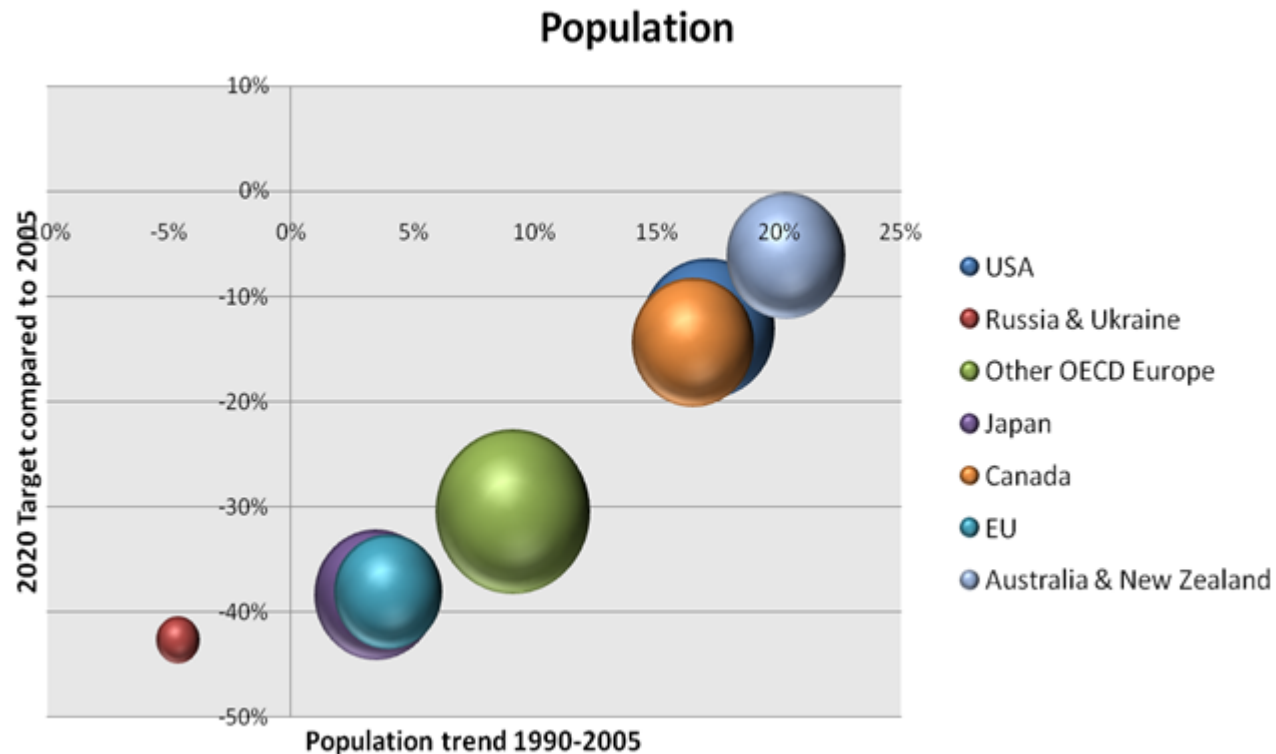
- GHG per GDP is an indicator that gives an indication if a country has the ability to reduce emissions internally:
 - Through increasing its energy efficiency
 - Through decreasing its carbon intensity of its energy mix

- Total ambition is -30% compared to 1990 by 2020
- But country targets expressed to a recent base year, i.e. 2005



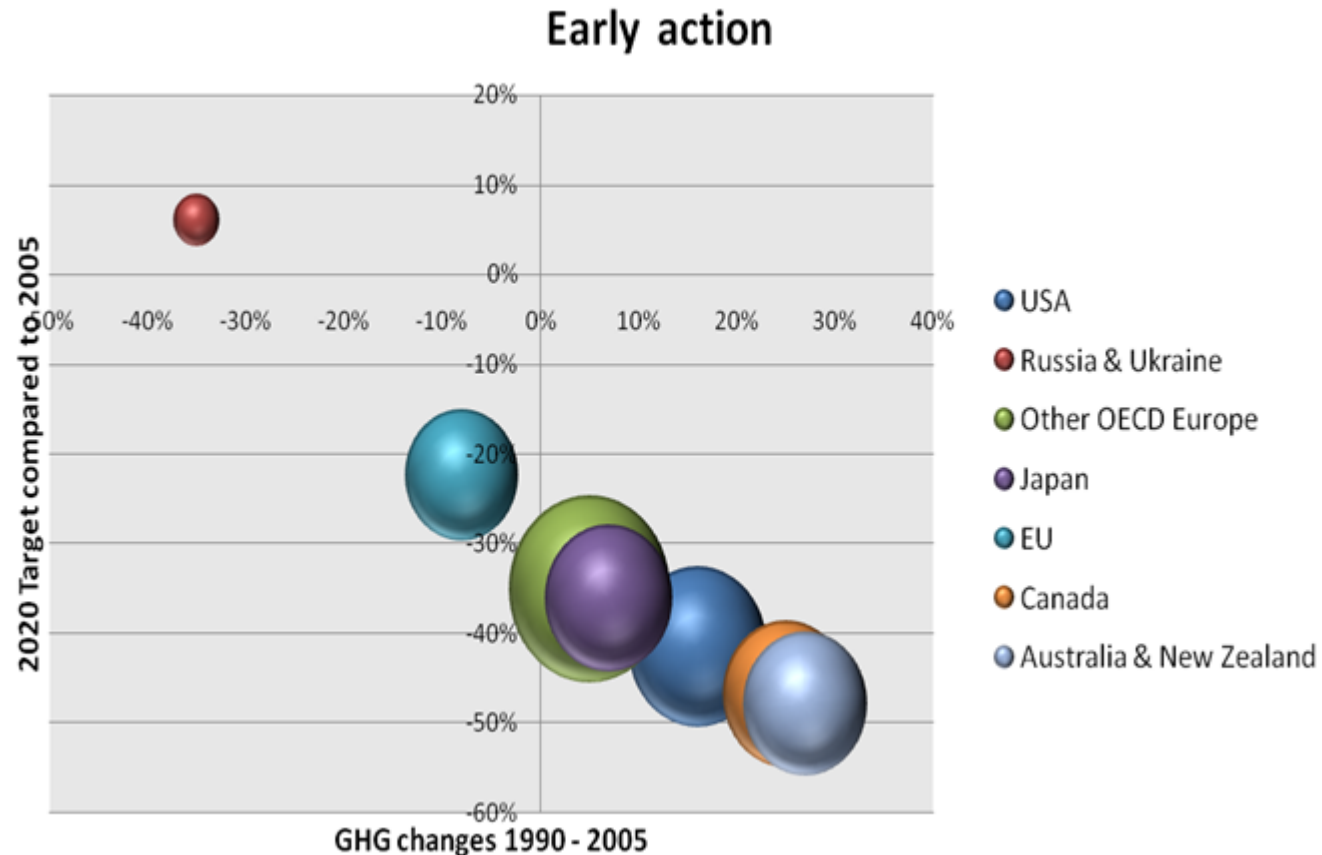
- Population trend is an indicator that gives an indication on the pressures of emission changes when population numbers change:
 - Given similar GDP growth rates per capita in your economy
 - Given similar yearly efficiency improvements in your economy

- Total ambition is -30% compared to 1990 by 2020
- But country targets expressed to a recent base year, i.e. 2005



- The change in GHG emissions since 1990 gives an indication of economic efforts/impacts that took place to reduce GHG emissions

- Total ambition is -30% compared to 1990 by 2020
- But country targets expressed to a recent base year, i.e. 2005



Quantitative Example for Targets developed countries based on individual indicators

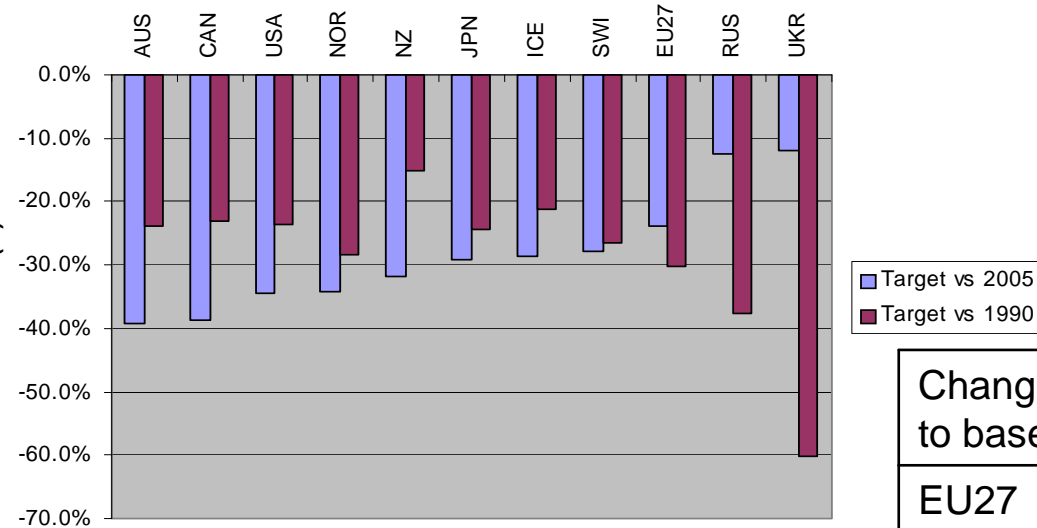
Targets based on individual indicators do not lead to a balanced outcome!

Impact on GDP if targets are based on:				
	GDP/Cap	GHG/GDP	Early action	Population trends
EU27	-1.5%	-1.0%	-1.3%	-2.1%
USA	-1.2%	-0.5%	-1.0%	-0.5%
Japan	-1.0%	-0.2%	-0.9%	-0.9%
Canada	-2.0%	-1.5%	-2.7%	-0.9%
Australia & New Zealand	-2.0%	-1.8%	-2.8%	-1.0%
Other OECD Europe	-4.8%	-0.3%	-1.3%	-1.0%
CIS	-2.6%	-7.3%	-2.5%	-6.6%
Developed countries	-1.4%	-0.8%	-1.2%	-1.2%

Quantitative Example for Targets developed countries based on 4 indicators

	Share according to GDP/cap	Share according to GHG/GDP	Share according to GHG '90-'05	Share according to Population '90-'05	Target relative to 2005
	(a)	(b)	(c)	(d)	(e) = (a+b+c+d)
EU27	-10.2%	-10.1%	-5.2%	1.7%	-24%
USA	-14.3%	-12.3%	-15.9%	8.2%	-34%
Japan	-12.8%	-5.6%	-12.5%	1.7%	-29%
Canada	-12.6%	-14.6%	-19.3%	7.8%	-39%
Australia & New Zealand	-12.2%	-16.3%	-19.9%	10.0%	-38%
Other OECD Europe	-17.9%	-4.4%	-11.9%	3.7%	-30%
Commonwealth of Independent States	-1.0%	-20.0%	8.0%	0.6%	-12%
Average developed countries	-10.5%	-12.8%	-8.5%	4.5%	-27%

Quantitative Example for Targets developed countries based on 4 indicators



A scheme based on 4 indicators yields impacts that, for every country, are between the extremes of those delivered by allocations based on single indicators.

Change compared to baseline	GDP	Employment	Private Consumption
EU27	-1.2%	-0.4%	-1.8%
USA	-0.8%	-0.4%	-1.2%
Japan	-0.6%	-0.3%	-1.0%
Canada	-2.0%	-0.7%	-3.4%
Australia & New Zealand	-2.0%	-0.8%	-3.2%
Other OECD Europe	-1.0%	-0.1%	-2.0%
CIS	-3.0%	-1.5%	-3.4%
Developed Countries	-1.0%	-0.6%	-1.5%

GHG per capita: a useful indicator to define reduction efforts?

Is GHG per capita a balanced criteria? An example:

•If GHG per capita would be a criteria:

- Should we then conclude that Norway, EU, Korea and Russia should have similar targets compared to a recent base year even though Russia's should be a bit higher than Norway?
- Should the USA and Australia do much more than the rest, maybe even the double?

GHG per capita tells you very little about the specific national issues. You need to see the country specific elements to give insight on the potential to take on reduction commitments on the short term.

GHG per capita will indeed need to converge on the long term but this is no good criteria on the short term to decide on targets for developed countries, actually neither for appropriate action by developing countries (cfr example South Africa!)

Ton of CO₂ per capita
from Energy (2005)*

South Africa	7
Norway	8
EU	8
South Korea	9
Japan	10
Russia	11
Australia	18
USA	20

*IEA statistics

Conclusion: Method to assess comparability of efforts

- Indicators need to be available and easy to understand
- No single indicator will result in a balanced outcome
- Criteria to assess comparability should make use of a balanced combination of criteria, such as:
 - the capability to pay for domestic emission reductions and to purchase emission reduction credits from developing countries;
 - the GHG emission reduction potential;
 - domestic early action to reduce GHG emissions;
 - population trends
- Indicators will lead to a spread in values for QELROs compared to 2005 and also compared to 1990

Other issues that influence the effort undertaken:
LULUCF accounting rules
Accounting rules surplus AAUs

Accounting rules LULUCF are under revision. Different options can lead to different outcomes. Based on historic data an estimate is made on sink/source potential for LULUCF for different accounting options under a BAU scenario (historic data is proxy for BAU scenario)

- **Option 0:** no changes to accounting rules, forest management cap equal to the one used up to 2012
- **Option 1:** no changes to accounting rules except mandatory accounting for all activities, and different forest management discounts rates instead of the present 'arbitrary' cap.
- **Option 2:** no changes to accounting rules except mandatory accounting for all activities, and net-net accounting for the forest management sector compared to a base period.
- **Option 4:** Full land based accounting as done at present under the UNFCCC inventories with net-net accounting for all sectors.

Net emissions: % compared to 1990 GHG without LULUCF (accounting period: 2001-2005)											
when relevant, net -net activities with→		1990 base year					1990-1999 base period				
Options →	0 (KP rules) ¹	1 ^{2,3}			2 ²	4	1 ^{2,3}			2 ²	4
Discount for FM(%)		100	85	0			100	85	0		
EU	-1,2	-0,6	-1,6	-6,7	-1,9	-1,9	-0,7	-1,9	-6,6	-1,0	-0,6
Australia	8,4	8,4	7,8	4,6	10,2	-18,6	8,4	7,8	4,6	10,0	-5,3
Belarus	0,0	-0,3	-3,4	-20,9	-1,2	-2,4	-0,1	-3,2	-20,7	0,4	0,0
Canada	2,0	2,0	1,8	0,6	22,9	18,2	2,4	2,2	1,0	9,9	6,0
Croatia	0,0	0,0	-3,6	-24,3	-11,0	-10,7	0,0	-3,6	-24,3	1,3	1,3
Iceland	-2,6	-2,9	-3,0	-3,5	-3,1	-7,7	-2,8	-2,9	-3,4	-2,9	-5,6
Japan	-4,0	0,0	-1,1	-7,0	-1,0	-0,6	-0,1	-1,2	-7,1	-0,9	-0,6
Liechtenstein	-2,6	-2,6	-3,9	-11,0	-2,9	1,1	-2,6	-3,9	-11,0	-2,7	0,7
Monaco	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
New Zealand	4,7	4,7	-1,3	-35,5	-1,0	-2,2	4,7	-1,3	-35,5	-3,8	-6,4
Norway	-9,9	-7,5	-16,5	-67,6	-37,0	-34,5	-7,3	-16,3	-67,4	-38,6	-35,6
Russian Federation	-3,6	-0,4	-2,0	-11,5	-7,3	-7,5	2,7	1,0	-8,5	-0,8	-0,9
Switzerland	-3,5	0,7	0,2	-2,5	4,4	3,7	0,7	0,2	-2,5	4,8	4,2
Turkey	-0,3	-0,3	-4,8	-30,5	-4,7	-13,8	-0,3	-4,8	-30,5	-2,9	-4,8
Ukraine	-2,4	6,2	4,4	-5,6	7,5	3,0	4,0	2,2	-7,8	5,2	2,5
USA	0,0	0,0	-1,4	-9,7	-1,8	-1,5	0,0	-1,5	-9,7	-1,3	-1,1
Other AI	-1,0	0,6	-0,9	-9,4	-1,3	-2,6	1,3	-0,2	-6,7	0,0	-0,7
TOTAL AI	-1,1	0,2	-1,2	-9,2	-1,5	-2,4	0,7	-0,7	-6,7	-0,3	-0,6

¹ Only the 3.4 activities already selected by Parties for the 1st commitment period were included.

² All 3.4 activities were selected, not to prejudge which activities Parties will elect.

³ For illustrative purposes, the full range (0-100%) of discount factors is shown. The eventual use of a discount factor will be subject to negotiations.

- There is a risk that accounting rules reward business as usual behaviour in this sector and potentially even do not relate to real differences in actions in this sector
- In order not to distort the comparability of efforts between developed countries, the accounting rules should ensure that only real additional action is rewarded in this sector.
- If this is achieved, the risk in large distortions on comparability of efforts seem to be limited
- To assess comparability, LULUCF accounting rules need to be determined before final efforts/targets are agreed upon

	Target 2008- 2012	Base year	1990	2008-2012 emissions (using 2006 as proxi)	2008-2012 Average annual target in absolute emissions	Annual Surplus (+), deficit (-)
EU 15	-8%	4266	4244	4151	3924	-227
EU 10	-7%	1494	1320	979	1388	410
Russia	0%	3323	3326	2190	3323	1133
Ukraine	0%	921	922	443	921	478
Iceland	10%	3	3	4	4	-1
Norway	1%	50	50	54	50	-3
Switzerland	-8%	53	53	53	49	-5
New Zealand	0%	62	62	78	62	-16
Australia^a	8%	516	416	536	557	21
Japan	-6%	1261	1272	1340	1186	-154
Canada	-6%	594	592	721	558	-162
Total KP ratifiers		12543	12261	10549	12022	1474
USA		6135	6135	7017		

^a For Australia, the base year data includes emissions from LULUCF according to Art. 3.7 of the Kyoto Protocol

- Surplus AAUs from the period 2008-2012 constitute a significant risk for the environmental effectiveness of the reduction targets for the period after 2012, could amount to be worth **>7 Gt** of emissions
- Not taking this into account might reduce the overall ambition level significantly for 2020 (a 30% target compared to 1990 by 2020 might result in real emission reduction of only -26% or even less (depends also on use of CDM and LULUCF sinks in the first commitment period that could increase surplus!)).

Economic analysis and the role of the global carbon market

GDP growth

- Incorporates financial crisis. 2009 GDP growth decreases as projected by IMF last autumn to increase back to normal by 2011

Oil prices

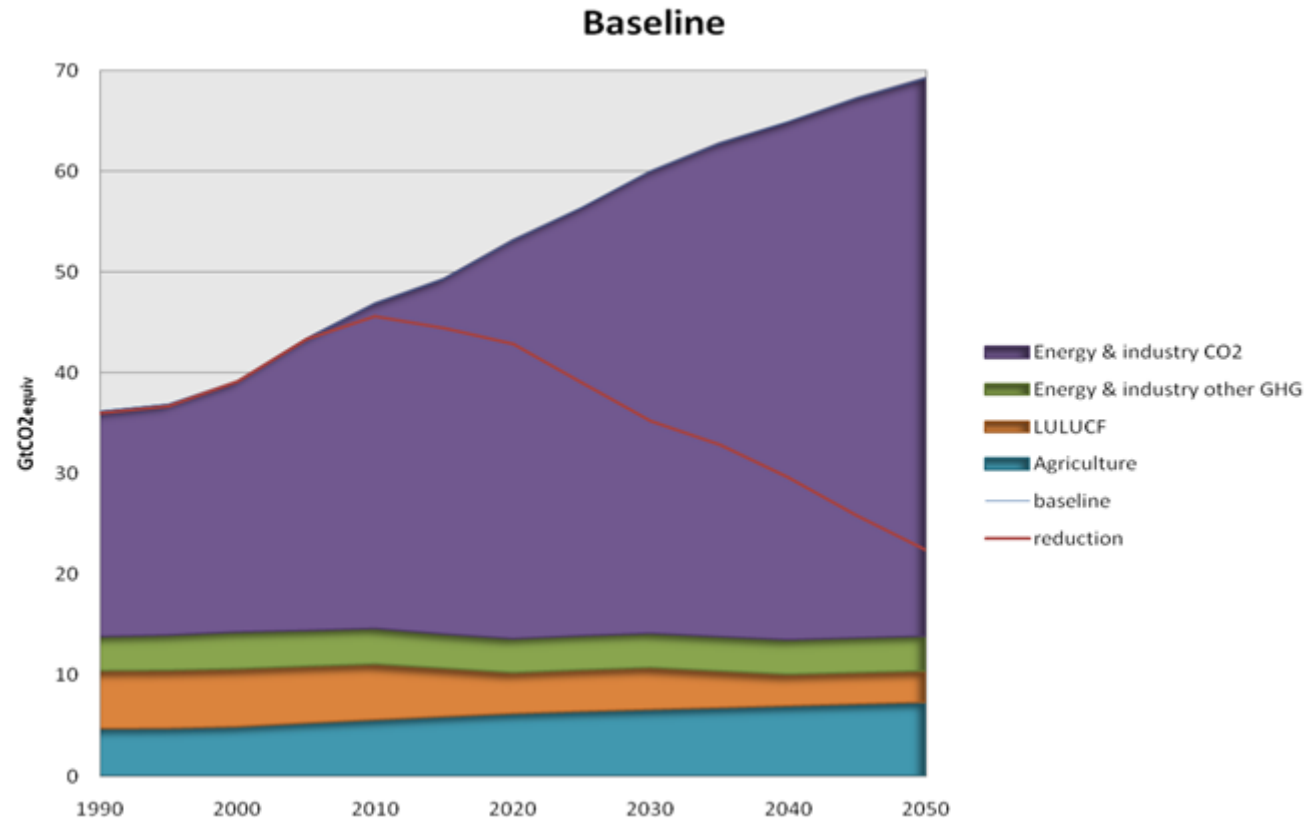
- Higher than in the 2007 assessment but lower as projections IEA last year

Oil prices (US \$ per barrel)	2020	2030
2007 Poles Projections*	53	61.5
2008 IEA WEO 2008**	110	122
2009 Poles Projections*	73	91
* 2005 prices, ** 2007 prices		

Total GDP growth over period 2005 -2020

POLES Baseline	No inclusion financial crisis	Inclusion financial crisis
World	81,80%	76,60%
Developed countries	50,00%	43,30%
EU	42,30%	36,10%
USA	53,00%	45,50%
Japan	37,30%	31,20%
Russia	108,40%	103,00%
Developing countries	121,20%	117,80%
Brazil	62,10%	59,60%
China	173,50%	169,90%
India	147,50%	142,50%

- Emissions developed countries increase marginally over the period 2005 – 2020
- Almost all net growth takes place in developing countries

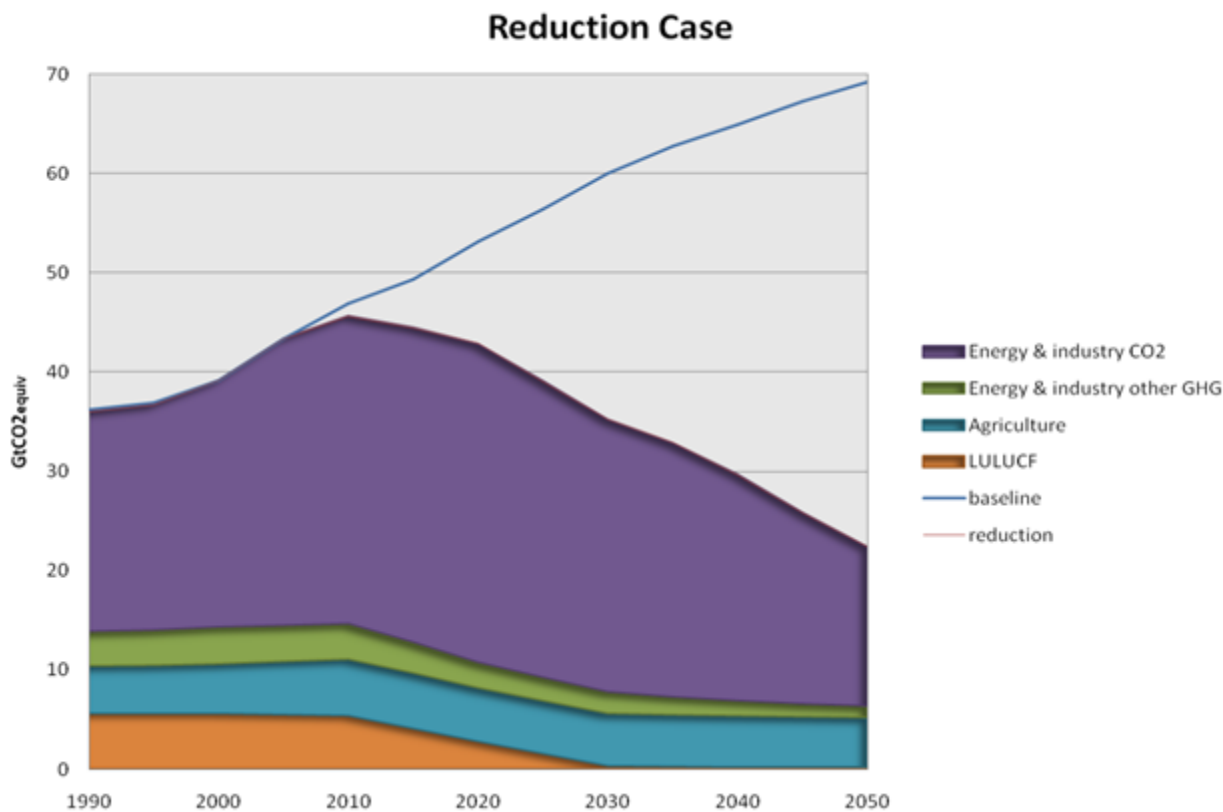


*** Baseline includes:**

- Carbon price EU ETS of 20 € in 2010 going to 22 € in 2020 and a carbon price of 5€ in other developed countries 'ETS sectors' to simulate impact expectations of industry towards future regulations;
- A lower GDP growth;
- Impact peak energy prices of 2008 on energy consumption on the mid-term

Global GHG emissions in the baseline and appropriate global action scenarios:

- In baseline, the bulk of emission growth come from the energy and industrial CO₂
- GHG emissions need to have peaked globally by 2020 to stay on course for a scenario that has a 50% chance of not **surpassing** the +2 C threshold



1. No Carbon Market

-30% target in developed, developing still doing their appropriate action, no emission trade

2. Gradual Carbon Market

A global carbon market only develops gradually over time and only on those sectors that are typically identified with the EU ETS.

In 2020 most DCs have a carbon price signal in the ETS sectors that is half the level of that in Developed countries.

Other sectors do not participate in the global carbon market.

Developed and developing countries introduce in addition to energy efficiency improvements, policies that introduce a carbon price. In developing countries, only energy efficiency policies in these sectors are implemented.

3. Perfect Carbon Market

Carbon prices equalise perfectly after 2012 across countries and sectors but do not go below level in baseline

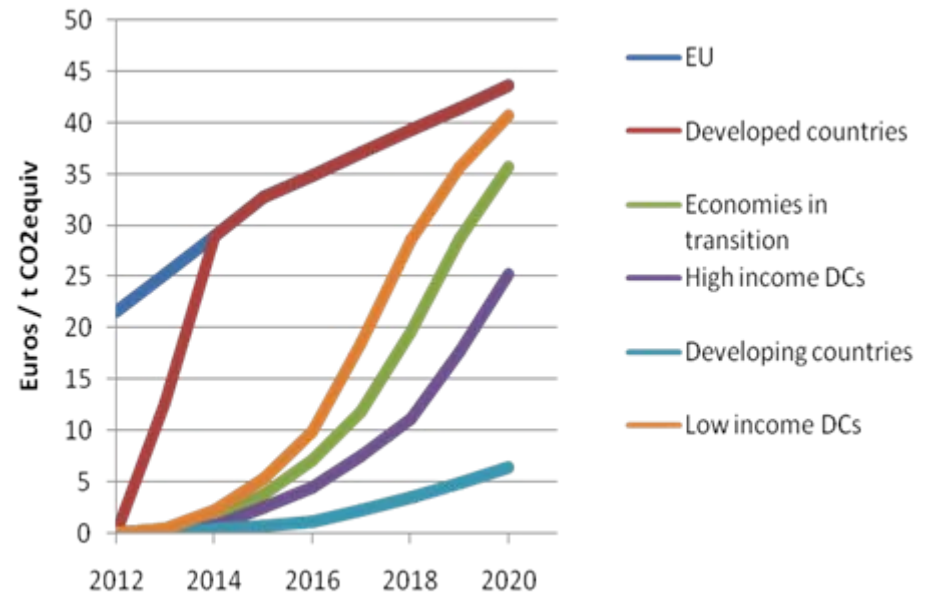


Table below gives Net additional/incremental mitigation costs, without taking into consideration the revenues from emission auctioning and trading nor the cross-sectoral macroeconomic impact

If one does not take into account the potential role of a global carbon market, efforts would result in high cost within developed countries

	Total incremental costs 2020, not taking into account compensation through trade in credits (Billion €, 2005 prices)		
	No global carbon market	Gradual global carbon market	Perfect global carbon market
Carbon price per ton CO ₂ in developed countries ETS, 2020	72 €	43 €	22 €
World	213	152	113
Developed countries	166	81	39
Developing countries	48	71	75

	Total incremental costs 2020 (Billion €, 2005 prices)	
	Not taking into account revenues or expenditure for carbon trade in 2020	Taking into account revenues or expenditure for carbon trade in 2020
World	152	152
Developed countries	81	119
Developing countries	71	33
EU	23	37
USA	34	57
Japan	7	13
Russia	7	-3

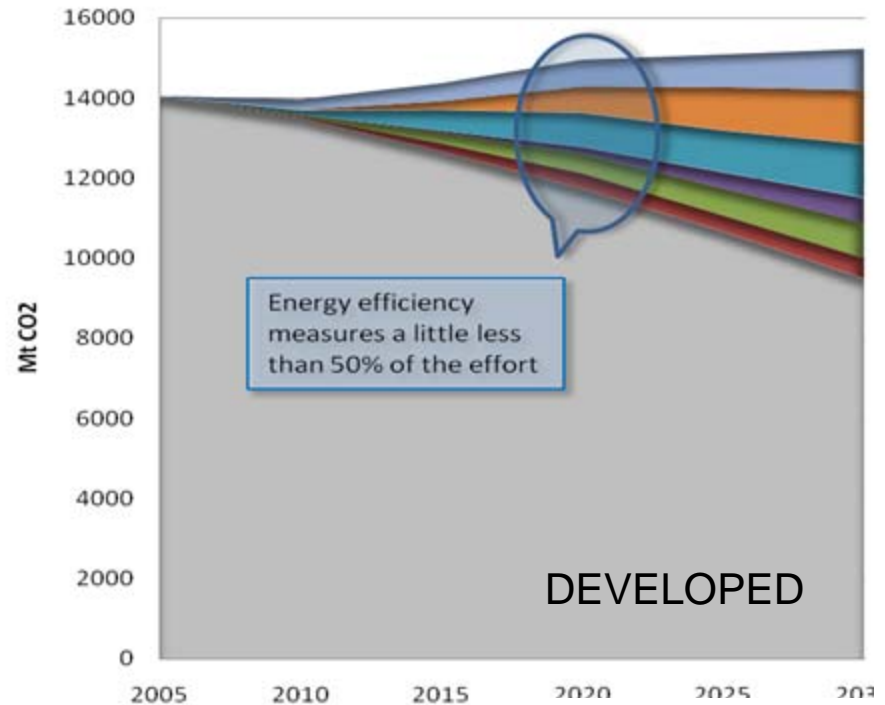
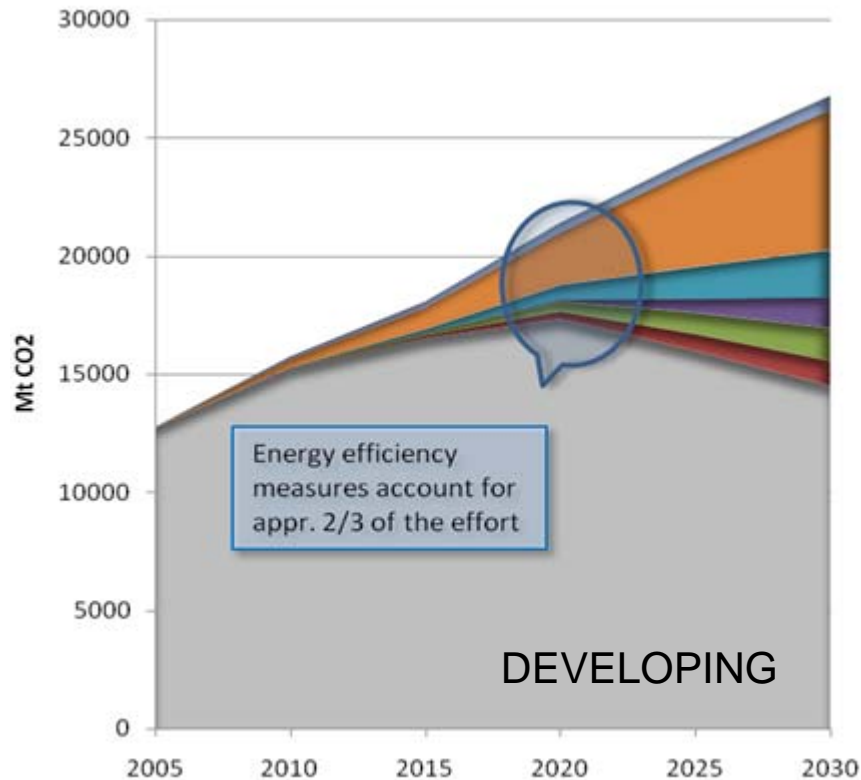
Developing countries would benefit from further developing the carbon market, if well designed this could also support own internal action

Certain developed countries would benefit substantially from introducing cap and trade mechanisms, i.e. win-win results for Russia

- Carbon markets decrease costs significantly, even if targets are 'fairly' allocated (\neq cost efficiently).
- Carbon market do not need to be perfect to deliver significant benefits, but without a gradual developing carbon markets, costs do increase substantially.
- Not taking the global carbon market into account when determining efforts by developed countries, would overestimate potential impacts.
- Some developed countries would benefit significantly of introducing cap and trade mechanisms due to large reduction potential internally

Actions and costs in developed countries

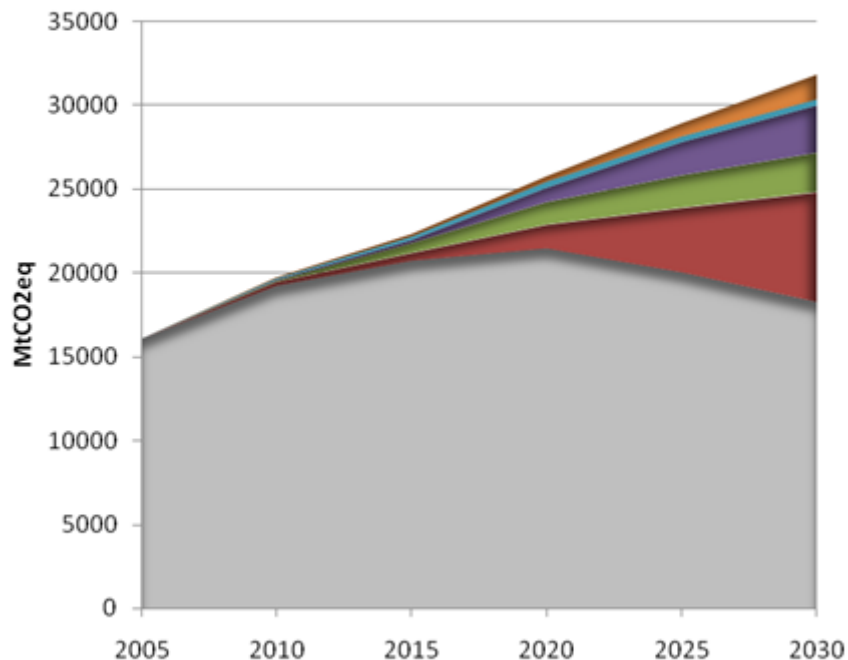
A sectoral perspective



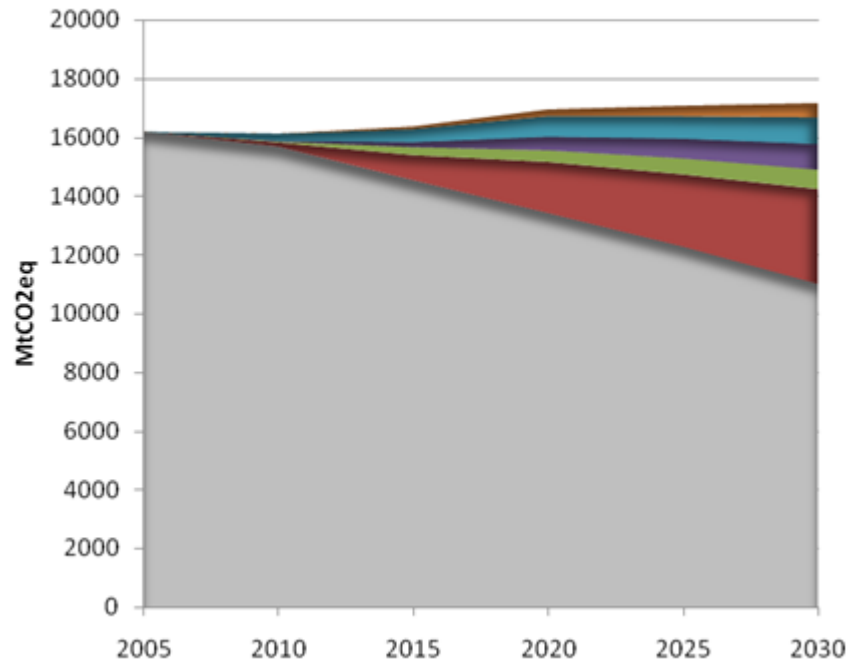
- Energy savings in transport
- Energy savings in other sectors
- Fossil fuel switch
- Carbon sequestration
- Nuclear energy
- Renewable energies
- GHG reduction scenario

The POLES model was used to analyse (partial-equilibrium approach) the impact of the emission reduction scenario with respect to the baseline

Developing countries



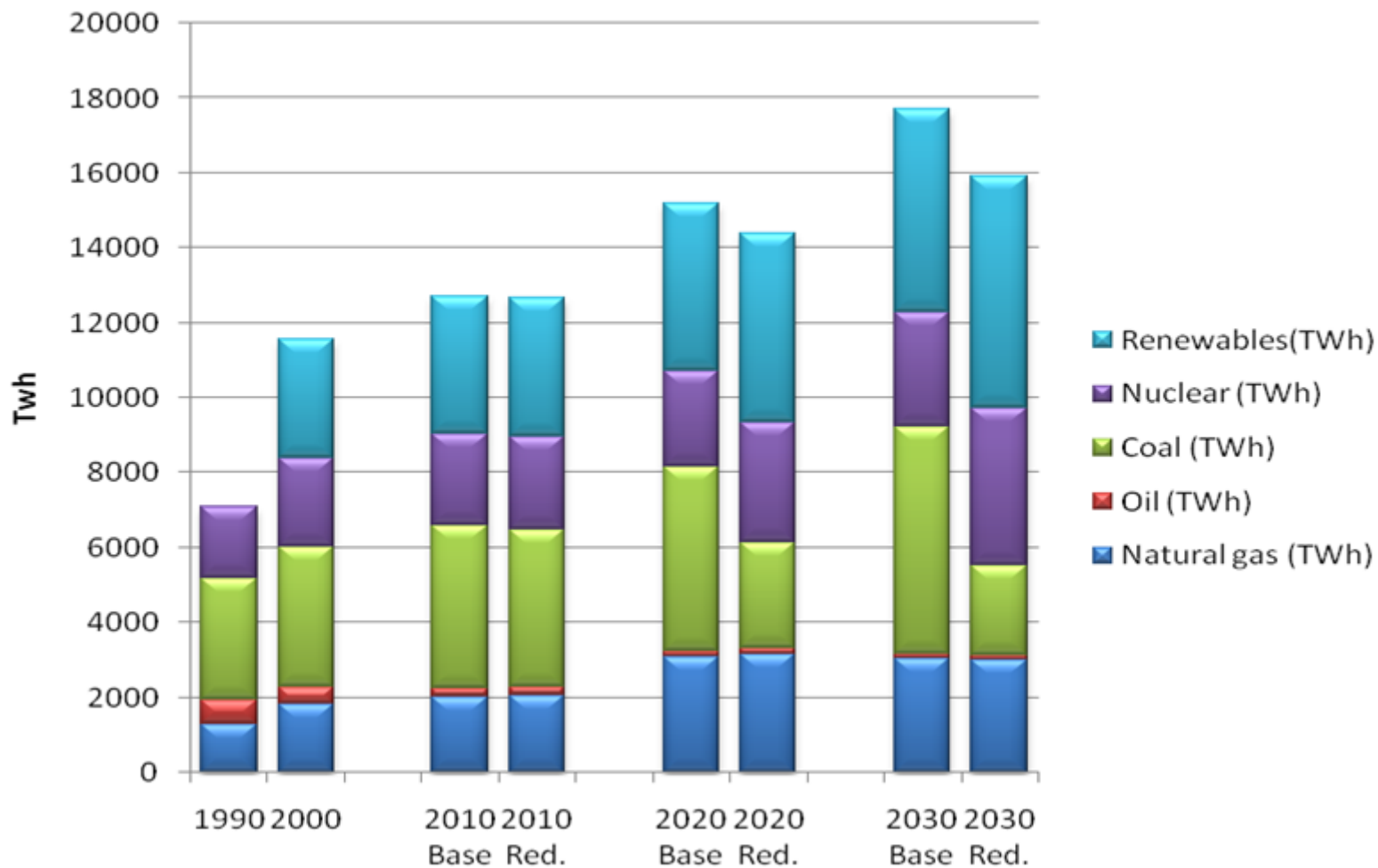
Developed countries



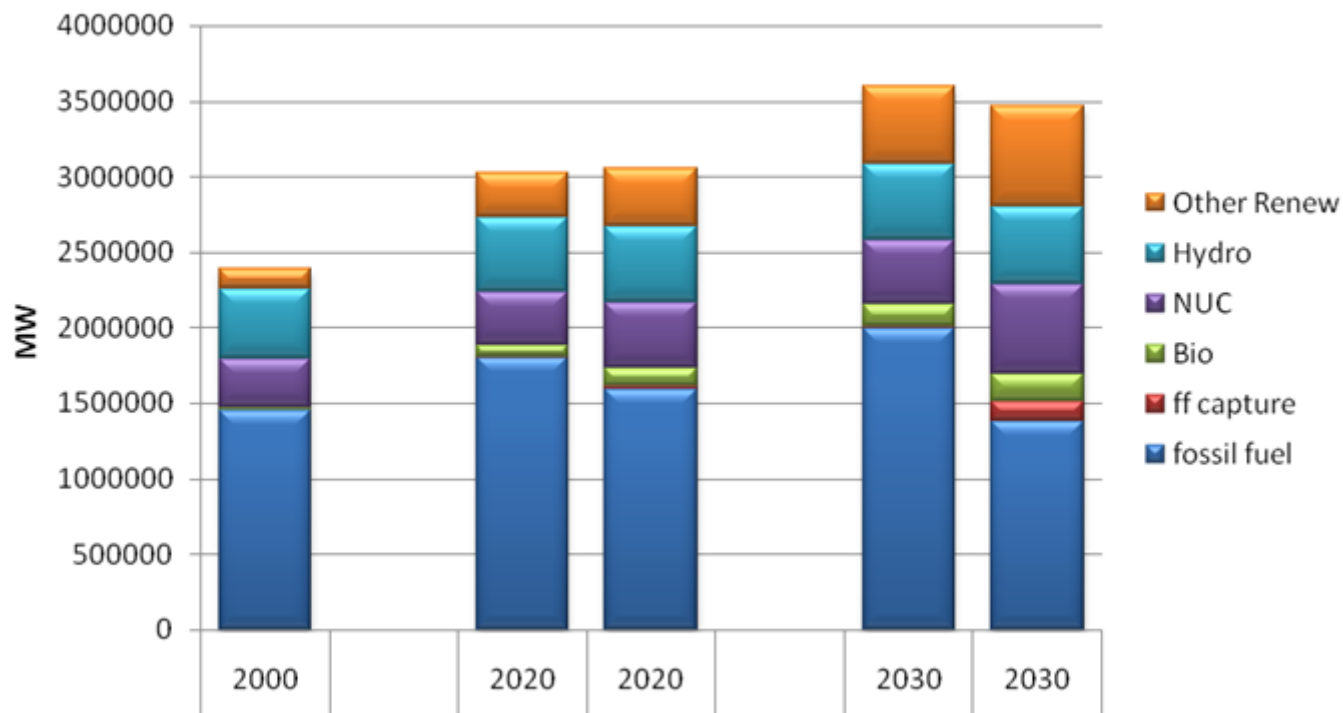
- GHG em. reduction from residential services
- GHG em. reduction from transport
- GHG em. reduction from industry

- GHG em. Reduction from other conversion
- GHG em. reduction from Power Sector
- Reduction Scenario

Power generation by fuel



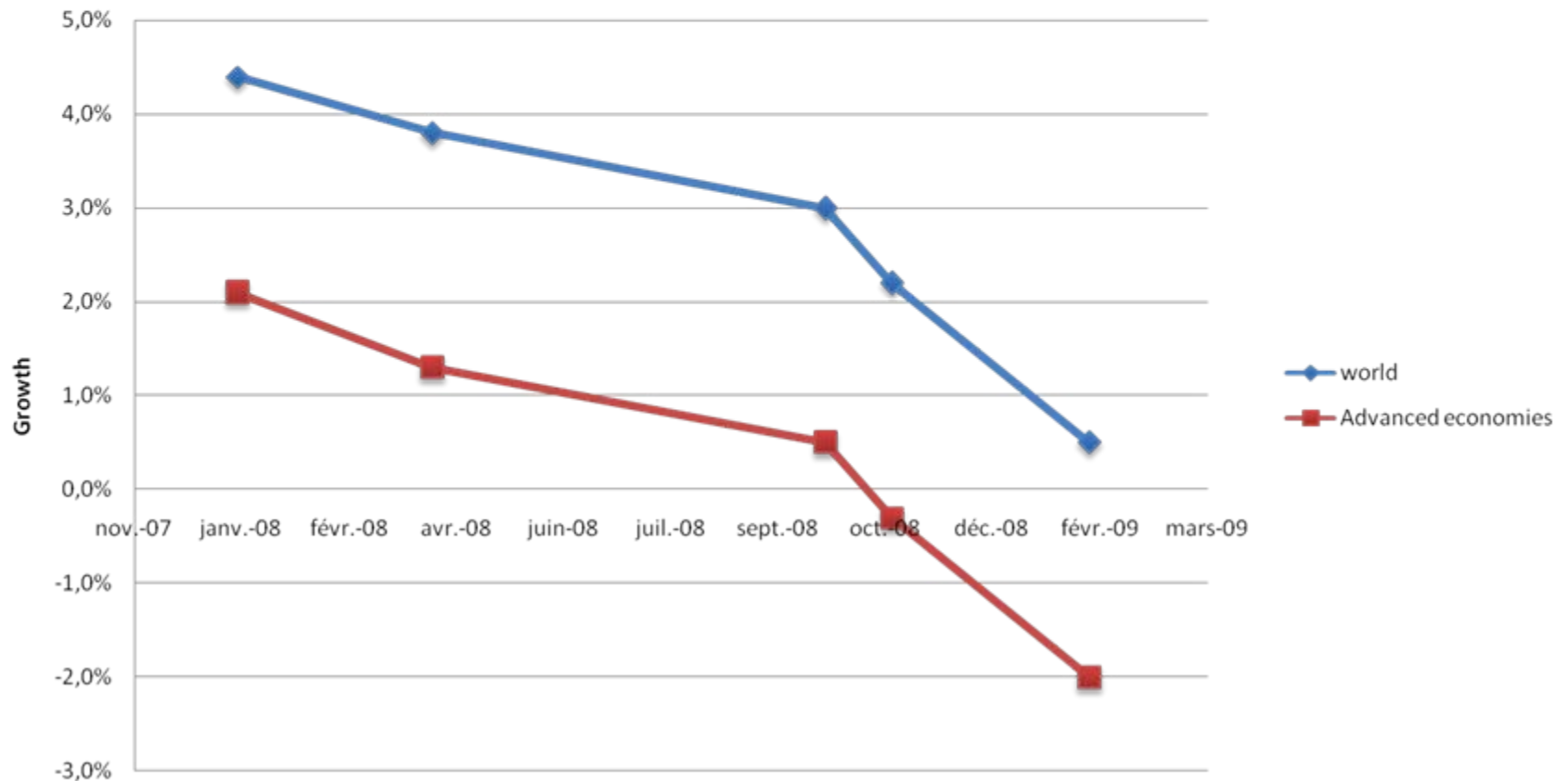
Power Generation Capacities



Impact of the financial crisis?

The cost impact of the financial crises

IMF WEO growth estimates for 2009



The cost impact of the financial crises

	Average annual cost of reductions in for the energy and industry sectors in 2020, Billion €(2005 prices)	
	Not taking into account the potential impact of the financial crisis	Taking into account the potential impact of the financial crisis
World	171	152
Developed countries	94	81
Developing countries	77	71

Source: POLES

Reduction in costs is larger in developed countries than developing countries, this is inline with larger economic slowdown in developed countries

All documents available at:

**[http://ec.europa.eu/environment/climat/
future_action.htm](http://ec.europa.eu/environment/climat/future_action.htm)**