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# Limiting Global Climate Change to 2°C: the way ahead for 2020 and beyond

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# Workshop “Limiting Global Climate Change to 2°C: the way ahead for 2020 and beyond”, 28 June 2007, European Parliament, Brussels

## Summary of the findings and the discussion

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## *Opening and welcome*

Satu Hassi MEP (Greens, FI) welcomed speakers and participants and explained that climate change is currently a hot topic and a big challenge, in particular for the European Union. Invited expert panels highlighted recent scientific findings on the possible impacts of climate change and the need for more stringent emission reduction measures.

## *First expert panel: impacts of climate change and tipping points for catastrophic change.*

### *Chair: Mr Jason Anderson (IEEP)*

Prof. Jean-Pascal van Ypersele[1] mentioned that Article 2 of the Climate Convention[2] states that greenhouse gasses in the atmosphere need to be stabilised at a level that would prevent dangerous anthropogenic interference with the climate system. In the meantime, science has detected key vulnerabilities in terms of impacts of climate change. Prof. van Ypersele stressed that climate change is happening now, mostly as a result of human activities. Impacts will be happening all around the world, with biggest damages in developing countries.

IPCC has shown (in its latest assessment report) that climate models can only explain the observed temperature difference when anthropogenic forcing through greenhouse gas emissions is included. Climate sensitivity[3] is estimated in the range of 2 to 4.5°C. Temperature rise beyond 4.5°C cannot be excluded. Prof. Van Ypersele explained that if we want to limit climate change to 2 - 2.4°C, $CO_2$ concentrations need to be stabilised at 450 to 490 ppm. This implies, contrary to the current target established by the European Union that emissions would need to be reduced by 50 - 85% in the year 2050, compared to year 2000.

Prof. Andreas Fischlin[4] said that supporting services of ecosystems have been valued twice the world GDP. The most vulnerable ecosystems already show the impacts of climate change: coral reef bleaching and threats to sea-ice dependent species. Prof. Fischlin stated that 20 to 30% of plants and animal species are at risk from extinction if temperatures rise more than 1.5 to 2.5°C compared to current status, and that significant extinctions can occur if warming is over 4°C. This assumption is based on 19 studies carried on higher plant species and higher animal species (i.e. vertebrates and butterflies).

Some species adapt by migrating to different areas; other species have difficulties to adapt. Ocean acidification is a particular issue to be further assessed which poses a potential risk to calcifying organisms in oceans. There are studies suggesting that terrestrial carbon uptake may decline in the second half of this century in response to rising temperatures, and consequently may lead to extra emissions. Prof. Fischlin concluded that ecosystems face unprecedented challenges, as their resilience is likely to be exceeded by warming, droughts, and disturbance regimes such as fires and insect invasions. IPCC states that for ecosystems a warming of 2 to 3°C marks the difference between dangerous and not-so-dangerous climate change.

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[1] Institut d'Astronomie et de Géophysique Georges Lemaître, Université catholique de Louvain, Louvain-la-Neuve, Belgium and vice chair of Working Group II of the Intergovernmental Panel on Climate Change (IPCC).
[2] United Nations Climate Convention, entry into force 21 March 1994 (http://unfccc.int/2860.php).
[3] Climate sensitivity is the change of temperature resulting from a doubling of $CO_2$ concentrations.
[4] Institute of Integrative Biology, Eidgenössische Technische Hochschule, Zürich, Switzerland and coordinating lead author of the chapter on ecosystems in the IPCC fourth assessment report.

## *General discussion*

*Questions:*

1. MEP Satu Hassi remarked the incoherence between EU referring to risks of relative warming to pre-industrial times, while IPCC refers to year 2000.
2. MEP Vittorio Prodi asked whether the acidity of the oceans and the decreasing solubility of $CO_2$ could be balanced. Higher temperatures would imply that less $CO_2$ could be dissolved. The overall behaviour of the carbon cycle and $CO_2$ uptake seems to be non-linear.
3. MEP Henrik Lax questioned to what extent climate change is really a result of human activity. What is the role of $CO_2$ on temperature, and what is the role of the sun, and other polluting substances? Members of the European Parliament need to understand this in support of their arguments for emission reductions, and some guidance on these topics would be helpful.
4. MEP Satu Hassi asked about potential risks for freshwater resources. One of the biggest threats to human societies is the shortage of freshwater. There seems to be a high risk if global warming is higher than 2°C.
5. Mr. Artur Runge-Metzger of the European Commission wished to know the difference of temperature since pre-industrial times in Europe. European temperatures also depend on the Gulf Stream. Which temperature rise will cause Greenland ice sheet melting?
6. MEP Elisa Ferreira said that forest fires in Southern Europe are becoming almost uncontrollable. Greenhouse gas emission reductions will not be sufficient. The European Union must improve fire prevention. So what is the relative contribution of emissions to forest fire risks? And what is the relative contribution of different gasses and from which sectors do they come?

*Answers:*

1. Prof. Jean-Pascal van Ypersele responded that this distinction is very important. The numbers he showed (2 to 2.4°C) refer to pre-industrial concentrations. Additionally, the saturation effect of the natural carbon sinks may occur due to warming, as was explained by Prof. Fischlin.
2. Prof. Andreas Fischlin replied that these processes all work at different time scales. It seems that there will be increasing of ocean acidity, and it is known that species respond to both acidity and temperature in various ways. Even with so-called geo-engineering solutions to reduce warming, $CO_2$ would still rise, and the acidity of the oceans would still increase.
3. Prof. Jean-Pascal van Ypersele replied that human activities are at least partly responsible. Working Group I of the IPCC has concluded that if you do not take greenhouse gas emissions into account, you cannot reproduce the warming that is observed during the last 50 years. Solar activity can only explain partially global warming.

   Dr. Myles Allen added that previous climate change predictions have indeed, occurred and are still happening. Therefore scientists have some confidence in their predictions.

4. Prof. Andreas Fischlin responded that water resources are indeed important; for example similar problems are foreseen in the Swiss Alps. In general, summers will see a decrease in water availability for agriculture, in particular in Southern Europe; while there will be an increase in wintertime. Knowledge on ice's reduction and its impacts on water resources are not complete yet, although the general patterns are becoming clearer.

5. Prof. Jean-Pascal van Ypersele replied that temperature increased on average (since pre-industrial times) at global scale about 0.74°C and about 1.1°C for Europe during the last 100 years. Weakening of the Gulf Stream would result in a local relative cooling effect. This would likely be overwhelmed by global warming effect, and will only result in a reduced warming, not cooling in Europe. Greenland ice reduction is a huge concern. A 2°C global temperature increase would melt all Greenland ice over a period of a few centuries to one thousand years, leading to between 6 and 7 metres sea-level rise.

   Dr. Myles Allen added that there will be changes that scientists cannot predict, and getting advanced signals is crucial for emission reduction and adaptation strategies. The climate system is very responsive, and it is certain that some things being told during the workshop will in fact turn out to be wrong.

6. Prof. Andreas Fischlin replied that greenhouse gas emission reductions would indirectly reduce forest fire risks.

## *Second expert panel: acceptable greenhouse gas concentrations and emission pathways.*

***Chair: Mr R. Andreas Kraemer (Ecologic)***

Dr. Myles Allen[5] presented different ways of thinking about climate change. An increase of atmospheric greenhouse gas concentrations to 450 ppm would mean doubling of concentrations relative to pre-industrial levels, and we know that increases may be higher. However, the optimistic message is that it takes a long time for climate change response to emerge. Dr. Allen said that we therefore need to think beyond stabilisation, and we need to consider bringing concentrations back down in the long term. If we fix current concentrations, high temperatures could occur long after stabilisation, up to the year 2300. But if we first stabilise and then let atmospheric concentrations decline, we have a better chance of avoiding a 2°C temperature increase.

There is a simple solution to the problem: we need to define the total acceptable emissions, instead of a stabilisation target. Dr. Allen said that if we are able to reach a 2% emission reduction per year, then why not continue so that atmospheric concentrations would in fact decline. Stabilisation carries a substantial risk of exceeding 2°C warming, but if we bring carbon dioxide down again, we can reduce this risk. Dr. Allen summarised that warming is related to the total amount of carbon released, rather than to the atmospheric concentrations. A 2°C warming corresponds to approximately 1 trillion tonnes of carbon, and as up to now about half that amount has been released, the problem seems to be containable. We need to consider measures for keeping excess carbon underground.

[5] Department of Atmospheric, Oceanic and Planetary Physics, Oxford University, Oxford, UK

Dr. Detlef van Vuuren[6] considered in his presentation the links between atmospheric greenhouse gas concentrations and emissions, and the links between emissions and reduction measures. Scientific studies suggest that emission reductions beyond 3% per year are hardly possible. However, emissions in 2050 need to be reduced by 35% below 1990 levels in order to reach an atmospheric concentration of 450 ppm, which corresponds to a 50% chance of staying under 2°C global warming. Timing is very important according to Dr. Van Vuuren, as any delays would require subsequent increased reduction rates in order to reach the target. Waiting too long would imply that it is technically no longer feasible to reach the goals.

Dr. Van Vuuren showed that there is a range of technically feasible reduction measures. Only a combination of different techniques will give the required reduction. Energy efficiency, carbon capture and storage (CSS), and the reduction of non-$CO_2$ gasses are important in this mix. The costs as percentage of GDP would peak around the period 2030-2050. Carbon taxes would need to be in the order of 200 to 600-800$ per ton of carbon, in order to reach 650 or 450 ppm atmospheric concentrations, respectively. Dr. Van Vuuren concluded that there is a pay-off between the costs and the gains, the latter expressed as a likelihood of reaching a climate change target.

## *General discussion*

*Questions:*

1. MEP Dorette Corbey asked why in the projections of Dr. Van Vuuren the share of renewables by 2100 is limited, while the EU target for the share of biofuels is much larger (set at 10% of road fuels by 2020 in the European Commission's Energy Package of 2007). Mrs. Corbey would expect wind power and solar power to be fully developed by then. The underlying question is which technology would be most cost-effective for reaching the 30% emission reduction target by 2020. And in which sector can we achieve this?

   MEP Elisa Ferreira asked additionally which costs are meant here: are these the investment costs, the operational costs, or other?

2. Mr Artur Runge-Metzger of the European Commission stressed that it is important to handle the cost calculations beyond 25 years very carefully. For instance, the numbers may be wrongly interpreted, as costs of 1.4% of GDP cannot be compared to a 2.4% target for GDP growth. Additionally, the co-benefits of emission reductions are tremendous and need to be considered as well, such as health effects from the reduction of sulphate emissions and other air pollutants that occur together with $CO_2$ emissions. The gains for energy security are difficult to quantify, but need to be taken into account.

*Answers:*

1. Dr. Detlef van Vuuren responded that the projected share of renewables results from the use of a particular model that favours other technologies. Other models may suggest that the share of renewables is higher. He said that his research group is quite positive about CSS. The costs presented are investment costs, as the model is an energy systems model.

[6] Netherlands Environment Assessment Agency, Bilthoven, The Netherlands

Dr. Myles Allen added that you could also make sure that the total amount of emitted carbon is fixed, as the damage to the climate system from carbon is cumulative. We could consider if an objective of a cumulative emission dose is a helpful framework for policy. If we decide to release in total not more than 1 trillion tonnes of carbon, others can decide *how* to release that amount.

2. Dr. Van Vuuren replied that he agreed with Mr Runge Metzger's analysis of the cost estimates. And indeed, co-benefits may not be sufficiently accounted for, but the models may also be too optimistic about emissions trading.

## *Concluding remarks by Satu Hassi (MEP, Greens)*

MEP Satu Hassi was pleased with the presentations and the discussion. She remarked that the risks related to climate changes are far bigger than other acceptable risks in other policy areas. Today's hearing has given us more reasons for being worried, but fortunately also some positive messages. For instance, that human activities do not have to stop reducing emissions after stabilisation. There has been some criticism on 2°C target, and countries like USA and China still refuse to take over such an fundamental objective. Also, G8 plans are not sufficient, but for the current political situation the agreement could be considered a major step forward. The European Union has set an example by settling a target and a trading system: certainly an example to be followed.