

## Workshop Summary Report

### **Synergies and trade-offs between climate and air pollution policies: Optimising opportunities and preventing risks**

(By Pieter Hammingh and Koen Smekens)

#### **Context and focus of the workshop**

To support the Dutch Government with adequate information on synergies and trade-offs between climate and air pollution policies, a Dutch research programme on air and climate (BOLK) has been set up. On 18 June 2010, the main outcomes from the BOLK programme were presented at a workshop in Utrecht, the Netherlands. The workshop was organised by the Netherlands Environmental Assessment Agency (PBL) and the Dutch Ministry of Housing, Spatial Planning, and the Environment (VROM).

In the workshop, the focus was on the potential co-benefits and disbenefits of specific climate measures on air polluting emissions, and of the European and national greenhouse gas mitigation plans. Furthermore, attention was paid to short-term climate forcing effects of air pollutants and macro economic assessment of possible international climate policies and EU air pollution policies. Such knowledge could be used for optimising an integrated approach in climate and air pollution policies, and to prevent possible risks, such as increased air pollution or global warming.

#### **The workshop programme**

- 'Introduction' by Jan Wijmenga (Dutch Ministry of Housing, Spatial Planning and the Environment);
- 'Developments in climate and air pollution policies' by Klaas-Jan Koops (Dutch Ministry of Housing, Spatial Planning and the Environment);
- 'Biofuels in road transport and effects on air pollutants' by Ruud Verbeek (Netherlands Organisation for Applied Scientific Research(TNO));
- 'Bio-energy use in stationary installations and air pollution' by Arjen Boersma (Energy research Centre of the Netherlands (ECN);
- 'Air polluting emissions from bio-energy supply chains' by Michele Koper (Ecofys);
- 'Effects on air polluting emissions from carbon capture and storage in power generation and industry' by Toon van Harmelen (Netherlands Organisation for Applied Scientific Research (TNO));
- 'The role of biomass in UK climate plans and effects on air pollutants' by Peter Coleman (Defra, UK);
- 'Effects of air pollution mitigation strategies on short-term climate forcing' by Zbigniew Klimont (International Institute for Applied Systems Analysis (IIASA), Austria);
- 'International climate policies and EU air pollution policies – a macro-economic assessment' by Corjan Brink (Netherlands Environmental Assessment Agency (PBL));
- 'Effects of climate policies on air polluting emissions in the Netherlands' by Pieter Hammingh (Netherlands Environmental Assessment Agency (PBL));
- 'What have policymakers learned', discussion led by Joop Oude Lohuis (Netherlands Environmental Assessment Agency (PBL)).

## Summary of the workshop Presentations

1. About 55 participants were welcomed by Jan Wijnenga of the Dutch Ministry of Housing, Spatial Planning and the Environment. He explained the importance of combining climate change and air pollution mitigation policies. Climate change policies can yield significant co-benefits for air pollutant emissions. However, it is not always easy to estimate these co-benefits, and disbenefits can also occur with certain climate measures. Therefore, every country should carefully analyse the interactions between their national policies on climate change and air pollution. Such a national analysis can support the ongoing European policy process for the revision of the national emissions ceilings for 2020.
2. ‘Developments in climate and air pollution policies’: Mr. Klaas-Jan Koops (Dutch Ministry of Housing, Spatial Planning and the Environment) explained that the Dutch climate policy targets include a 30% reduction in greenhouse gas emissions, by 2020, compared to those of the base year 1990. The national target is more ambitious than the European target for the Netherlands which is a 20% reduction. Also the national targets for the share of renewable in electricity production and energy efficiency improvements are stricter. Important European instruments are the EU-ETS, CO<sub>2</sub> standards for road vehicles, ECO design, IPPC for non-ETS installations, and the biofuel targets for transport. Important national instruments are subsidies for energy efficiency investments in industry and for wind power at land and sea, improving energy efficiency in the residential, services and agricultural (horticulture) sectors. Carbon capture and storage is seen by the Dutch government as a cost-effective temporary measure on the way to a full renewable energy generation. The cost-effectiveness for reducing greenhouse gas emissions is one of the more important arguments within the decision making processes. So far, air quality has not been an important argument amongst climate policymakers in the Netherlands, mainly due to lack of information on the co-benefits and disbenefits.
3. ‘Biofuels in road transport and effects on air pollutants’: the effects on tail pipe air pollutant emissions of three biofuel scenarios for 2020, that meet the EU 10% biofuel target, were presented by Mr. Ruud Verbeek (TNO). The scenarios include a scenario with mainly first generation biofuels, a scenario with a higher share of second generation biofuels and a scenario with higher shares of electric vehicles and the relatively cleaner biofuels such as biogas, hydro treated vegetable oil (HVO) and biomass-to-liquid (BTL or FT diesel). The main conclusion from the study was that the effects of those biofuel scenarios on nitrogen oxide and particulate matter (tail pipe) emissions are rather small, provided that the durability issues (e.g. failing emission control equipment) related to the use of high blends of first generation (FAME) biodiesel can be controlled or avoided. To reduce risks for air quality, he advocated that better and more comprehensive technical guidelines and requirements should be provided for trucks using high blends of first generation (FAME) biodiesel. Also appropriate monitoring of biofuel quality and durability of engines and emission control equipment should be arranged. The study showed that bio-ethanol, HVO and BTL/FT can be used to reach

higher shares of biofuels without compromising (or even improving) the air quality. It was also pointed out that for higher shares, one class of high blends (e.g. 30-40% bio-ethanol) is to be preferred in stead of a variety of blends, because of the complexity of adapting the main stream vehicles to biofuels use and the monitoring of effects on emissions and durability issues.

4. 'Bio-energy use in stationary installations and air pollution': Mr. Arjen Boersma (ECN) presented the study on the co-impacts on air pollutants from increasing small to medium-scale bio-energy generation in the Netherlands from 2 to about 6% of the total primary energy use in 2020. It was assumed that large scale power and heat generation is being replaced. The study results indicate increases in most of the air pollutants in 2020. Increases in NMVOC and PM<sub>10</sub> are expected to be most substantial. These effects are explained by the fact that small to medium-sized installations emit relatively higher amounts of air pollutants because these installations use less advanced combustion technologies and flue gas cleaning systems. The Dutch government has already anticipated on this issue by setting relatively stricter standards in the recent Dutch decree on emission limit values for small-medium sized installations using fossil or bioenergy fuels. With more bioenergy, SO<sub>2</sub> emissions decrease because biomass generally contains less sulphur than fossil fuels. The study also showed that an increased use of small scale combined heat and power generation leads to substantially higher NMVOC emissions but also to somewhat lower NO<sub>x</sub> and SO<sub>2</sub> emissions. The study indicates that if more substantial shares of bioenergy generation (with smaller installations) are needed, more substantial increases in certain air pollutants may occur if no additional measures are taken. Mr. Boersma emphasized that the results from this study should be regarded as indicative, because of the limited availability of reliable energy and environmental data for actual and future small-medium scale installations that utilize bio-energy.
5. 'Air polluting emissions from bio-energy supply chains': In addition to the many life cycle assessments for the greenhouse gas performance of bioenergy chains, a study was carried out on the air polluting emissions occurring in the supply or production chains of biomass, biofuels and biogas (excluding tail pipe emissions). Mrs. Michèle Koper (Ecofys) explained that chain emissions, within and outside the Netherlands, have been estimated for various current and innovative biofuels that can replace fossil diesel and gasoline. In addition, chain emissions have been determined for wood and biogas as replacers for coal and natural gas in stationary energy generation. The main conclusion was that innovative biofuel chains (Fisher Tropsch diesel, biogas, and ethanol from wood as transport fuels) in general have lower air pollutant chain emissions than their fossil references, because they are mostly based on residues. Current biofuel chains in general have higher emissions of NH<sub>3</sub> and PM<sub>10</sub> but lower emissions of SO<sub>x</sub> than their fossil references. The changes in air polluting chain emissions (within the Netherlands) due to the current Dutch renewable energy and biofuel targets, are still relatively small compared to the total air polluting emissions in the Netherlands. With more stringent targets for renewable in transport and power, the changes in chain emissions become more relevant. In some cases, additional policies may be needed to prevent increases in certain air pollutants.

6. 'Effects on air polluting emissions from carbon capture and storage in power generation and industry': Mr. Toon van Harmelen (TNO) presented an informative overview of the effects on air pollutants of different combinations of combustion type with carbon capture technology (post-combustion, pre-combustion and oxyfuel). The most mature technology, post-combustion capture, could lead to increased emissions of NO<sub>x</sub>, PM<sub>10</sub> and NH<sub>3</sub>, and lower SO<sub>2</sub> emissions. Technical measures are available to reduced increased emissions. The other less developed technologies are expected to have a better environmental performance. It was concluded that changes in air pollutant emissions are not a bottleneck for carbon capture and storage implementation in power and industry. Since part of the study is based on literature and desktop studies, Mr. van Harmelen stressed the need to monitor the effects on air pollutants from CO<sub>2</sub> capture in the future pilot projects. Currently, it is unclear whether air pollutants will be monitored in the expected pilots in the Netherlands.
7. 'The role of biomass in UK climate plans and effects on air pollutants': The UK Renewable Energy Strategy and the UK Low Carbon transition plan, aiming at a 15% share of renewable in 2020, were introduced by Mr. Peter Coleman (Defra, UK). Besides measures like stimulating wind power, the stimulation of biomass in larger but also smaller (domestic) installations plays an important role in those plans. However, an increased use of biomass in residential areas and the replacement of natural gas result in higher urban PM<sub>10</sub> concentrations. To curb increases in air pollutants, the UK Government has agreed, as part of an incentive package for renewable heat, to require minimum emission standards for particles and NO<sub>x</sub>. Mr. Coleman concluded that building a low carbon economy will reduce air pollution – but the extent of the reduction depends on the path we chose to reach our targets. By selecting measures which are positive for both climate change and air quality, we can reduce the negative impact on human health and cut the damage costs from air pollution.
8. 'Effects of air pollution mitigation strategies on short term climate forcing': Zbigniew Klimont (International Institute of Applied System Analysis, Austria) presented the work that currently is being carried out for including black carbon and other Short-Term Climate Forcers (STCF) in the multi-pollutant/multi-effect modeling framework (GAINS). This work is partly funded by the Dutch government. The aim is to develop an air quality strategy that reduces health effects but that does not lead to increase in near-term climate forcing or that does contribute to reduction in radiative forcing. The work comprises: the development of emissions projections for black carbon (BC), organic carbon (OC), carbon monoxide (CO), determine radiative forcings by sectors and pollutant, rank measures for their effects per pollutant on radiative forcing, and in the end carry out optimizations including effects on STCF. With regard to measures, it was shown that BC (warming component) in OECD countries can be reduced by measures such as diesel particulate filters on road vehicles and off-road machinery and replacement of stoves burning wood logs with pellet stoves and boilers. The potential to reduce BC in non-OECD countries is higher than in the OECD. Preliminary

calculations indicate that air pollution abatement (up to maximum technically feasible reduction levels) in, for example, the Benelux and Germany, lead to reductions in health effects (expressed in Years Of Life Lost-YOLL) as well as in Radiative Forcing (RF).

9. 'International climate policies and EU air pollution policies – a macro-economic assessment': Corjan Brink (Netherlands Environmental Assessment Agency-PBL) presented work in progress. With the WorldScan model he studied the interaction between European air and climate policies considering both end-of-pipe and structural measures (changing production methods, fuel shifts/renewable energy) and economic feed-back mechanisms (such as changing prices, demand shifts, reshuffling production structures and relocation of economic activities). It was found that more stringent EU air quality targets also contribute to GHG mitigation through measures like fuel switches, energy savings, and changes in production levels. A result of more stringent air quality targets may be that CO<sub>2</sub> prices go down. The Worldscan model indicated that more stringent GHG targets in Europe reduce SO<sub>2</sub> more than NO<sub>x</sub>, which is a confirmation of what has been found in other studies.
10. 'Effects of climate policies on air polluting emissions in the Netherlands': Mr. Pieter Hammingh (Netherlands Environmental Assessment Agency-PBL) outlined the ongoing UNECE (and EU) policy process for the revision of the national emissions ceilings for 2020. In this process, the co-impacts for air pollutants from the EU climate and energy package play an important role. These co-impacts, for all of the EU-27 countries, are estimated by the UNECE (and the EU) with the GAINS and PRIMES models. The Dutch study is intended as a second opinion for those European estimates. The Dutch study included detailed co-impacts studies covering biofuels, biomass and CCS, and also estimates by ECN for the co-impacts of the whole Dutch climate programme. The Dutch study shows substantial net co-benefits for NO<sub>x</sub> and SO<sub>2</sub> emissions and smaller net disbenefits for NMVOC and NH<sub>3</sub> emissions. A comparison between the EU and national estimates for the Dutch co-impacts reveals that the EU methodology may overestimate the net co-benefits for NO<sub>x</sub> emissions. In general, the estimated Dutch co-impacts for air pollutants in 2020 can be substantial but are rather uncertain since: the fully required Dutch climate measure package is not agreed upon yet, it is still uncertain whether the Dutch government (and also the Dutch ETS sector) will use flexible mechanisms (credits from abroad) to reach their climate and energy targets in 2020, and a national analysis of co-impacts under post-crisis economic growth conditions is still missing.

### **Summary of the workshop Discussion**

During the last part of the workshop Joop Oude Lohuis (Netherlands Environmental Assessment Agency-PBL) used two propositions for the discussion. The first proposition was: 'The co-benefits of national climate policy packages that meet European or national targets are yet too uncertain to take into account in the revisions of the national emission ceilings. The revisions need to be postponed'.

Shell-Netherlands and the Dutch Ministry of Economic Affairs responded that new emissions ceilings for the Netherlands should not be stricter than in the neighbouring

countries. Therefore, the Dutch government should carefully take into account the uncertainties surrounding the co-impact estimates of climate policies while negotiating about future national air pollutant emissions ceilings. Do not take more risks than other countries.

The Dutch Ministry of Housing, Spatial Planning and the Environment disagreed with the proposition to postpone the revision. In that case, little progress in air pollution abatement can be achieved in the remaining timeframe up to 2020. It was mentioned however, that the EC is discussing about postponing the revision of the NEC to 2013. With regard to the uncertainties surrounding the co-impacts it was mentioned that policy making is about balancing all uncertainties to set ceilings, taking into account all co-benefits or disbenefits.

The NGO's emphasized that also other countries will consider the co-benefits of climate policies while negotiating about new emissions ceilings for 2020. The NGO's disagree on the postponement since the benefits for human health and nature, of taking action, still outweighs the costs. Also they agree with the Dutch Ministry of Housing, Spatial Planning and the Environment that less can be achieved if ceilings will enter into force later.

The second proposition for the discussion was: 'There is a clear coherent vision on climate change mitigation and air pollution abatement on the long term (2050). Consequences for policy decisions in the short term are clear'. Joop Oude-Lohuis (PBL) added that the current focus of both climate and air pollution policies, is strongly on 2020, but he questioned whether we should put more focus on 2050?

Defra (UK) responded that the UK government has explored a climate change mitigation study to 2050 but they found that it was not currently possible given the resulting societal changes were so large and currently poorly understood and accepted by the public and policy makers to do more than explore possible scenarios for 2050 rather than estimate a central 'most likely' case. More information:

[http://www.decc.gov.uk/en/content/cms/what\\_we\\_do/lc\\_uk/2050/2050.aspx](http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/2050/2050.aspx)

Shell-Netherlands mentioned that the EU already developed a Roadmap 2050 and questioned about the implications for the Netherlands of that roadmap for air polluting emissions? Why not extend greenhouse gas scenarios for 2050 with air pollutants scenarios and perform some back-casting analysis for the period in between 2020-2050? IIASA (Austria) responded that the IPCC scenarios for the longer term do contain information on air polluting emissions, so they can be used as a start. In developed countries air polluting emissions will go down in these scenarios with climate policy. For developing countries, the picture is less clear.

The Dutch Ministry of Housing, Spatial Planning and the Environment pointed at the fact that implementing CCS, biomass, and some other greenhouse mitigation technologies do not always lead to less air polluting emissions and hence do not guarantee to solve the air pollution problems in the longer term (2050). A better guarantee for an improved air quality is provided for by stricter national emissions ceilings for 2020/2030 and later. These may require additional European and national air pollutant abatement measures. IIASA agreed that climate policy alone will not solve the air pollution problems that we face in Europe. Gradually tightening air pollution targets is still the best way to go in order to get closer to the goals of the air pollution policies: to reach levels that do not harm human health and nature.