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The co-benefits to health of a strong EU climate change policy

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THE CO-BENEFITS OF DIFFERENT AMBITION LEVELS FOR GREENHOUSE GAS ABATEMENT IN THE EU BY 2020

The Health and Environment Alliance (HEAL), Climate Action Network (CAN) and WWF Europe commissioned this report to demonstrate the huge health benefits of meeting internationally recommended targets on climate change.

The aim is to show to Members of the European Parliament the value of supporting the target of a minimum reduction of 30% in domestic EU greenhouse gas emissions by 2020 (from 1990 levels). This would replace the current target of 20%.

The findings demonstrate that if the European Union were to raise its target on greenhouse gas emissions from the current 20% to 30% in line with recommendations of the International Panel on Climate Change (IPCC), the additional health savings from control of non-greenhouse gases (fine particles, nitrogen oxide and sulphur dioxide) would amount to between 6.5 and 25 billion Euros euros per year. This calculation is based on economic evaluations of reduced loss of life and health due to cleaner air associated with climate change policy, as well as savings to industry from reduced loss of working days and to governments from reduced costs to health services.

The report also mentions other co-benefits of a higher target on climate change action, such as the protection of forests, water supplies and biodiversity. It also points to the considerable savings to European companies involved in implementing air pollution abatement measures.

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SUMMARY

The objective of this paper is to quantify important co-benefits of greenhouse gas (GHG) mitigation under scenarios where domestic GHG emissions are reduced by 30% across the European Union by 2020 compared to 1990 levels, rather than by the 20% considered in the proposal by the European Commission (EC).

These co-benefits for EU citizens result from the reduction in emissions of the air pollutants sulphur dioxide (SO2), nitrogen oxide (NOx) and particulate matter (PM) that would arise as a result of a reduction in carbon dioxide (CO2) emissions and are additional to benefits from reduced greenhouse gas emissions.

The methods used to quantify these co-benefits were developed under the Clean Air For Europe (CAFE) Programme of the European Commission's Directorate General for Environment and have been subject to detailed debate with stakeholders including the World Health Organization (WHO) and an independent peer review.

The findings show that the co-benefits to health of increasing the current European Union target of a 20% greenhouse gas emission reduction for 2020 (from 1990 levels) to a target of 30% are very significant.

While the health benefits in economic terms from achieving the 20% target are substantial (between 13 and 52 billion Euros), raising the target to 30% is estimated to increase them by 48% to between 20 and 76 billion Euros in the year 2020 alone. Additional benefits compared to the EC proposal are between 6.5 and 25 billion Euros. These benefits would accrue year on year.

In terms of health improvements, the paper estimates that the additional co-benefits in the year 2020 of better air quality due to reaching a 30% cut in greenhouse gas emissions would include:

- 105,000 reduction in life years lost
- 5,300 fewer cases of chronic bronchitis
- 2,800 less hospital admissions
- Many million fewer days of restricted activity due to respiratory symptoms.

There are other significant benefits of reduced emissions of SO2, NOx and PM. In Europe, a great deal of concern has been expressed about the effects of air pollution on forests as well as other terrestrial and freshwater ecosystems and historical buildings. These co-benefits are not quantified here and would therefore add to the health benefits described.

In moving away from the most polluting fuels, action on climate change also brings benefit to industry in terms of a reduction in the costs to companies of meeting air pollution control regulations. Though not quantified here, the Commission's Impact Assessment highlights that these savings can be of a similar magnitude to the health benefits that have been quantified.

IMPACTS OF AIR POLLUTANTS

The term "co-benefits" relates to the indirect consequences of GHG controls. The co-benefits quantified here largely concern the health impacts of three of the main air pollutants that operate at the continental scale – fine particles (PM2.5), NOx and SO2. Since these pollutants are released by some of the major sources of CO2, their emission can be reduced by many measures taken to control CO2 emissions.

Two ongoing processes demonstrate the necessity and intention in Europe to further reduce emissions of these pollutants: the revision of the National Emission Ceilings Directive (NECD) and the Gothenburg Protocol to the Convention on Long Range Transboundary Air Pollution.

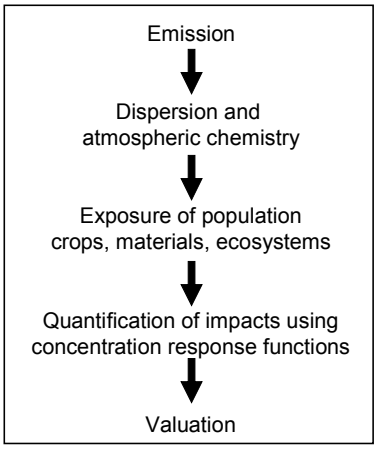
PM2.5, SO2 and NOx emissions have been linked to higher rates of death and respiratory illnesses, including bronchitis and the exacerbation of asthma symptoms, and respiratory and cardiac hospital admissions. The evidence comes from a large number of studies published over the last 20 years. Particularly compelling are the results of 'intervention' studies in which population health is monitored following action to reduce air pollution concentrations, such as after the ban on coal burning in Dublin, Ireland.

Emissions of these pollutants also damage other receptors, such as ecosystems through acidification and eutrophication (including the process whereby lakes, estuaries and streams receive excess nutrients that stimulate excessive growth of algae and other plants). The critical load for eutrophication of terrestrial ecosystems is widely exceeded across Europe, with the resulting risk of significant ecosystem change. The emissions also affect agriculture through reduced crop yields and damage to buildings including cultural heritage.

METHODS AND KEY DATA SOURCES

The methods used in this study to quantify and value the impacts of PM2.5, NOx and SO2 are based on those developed under the European Commission's Clean Air For Europe (CAFE) Programme, which underpinned the development of the Thematic Strategy on Air Pollution. The method follows the impact pathway approach, which proceeds logically through the steps between emission, impact and valuation (Figure 1).

Figure 1. The impact pathway approach for quantifying benefits of emission reductions, from emission to valuation.



These methods were developed under CAFE in partnership with WHO and various other European experts, and were adopted following extensive discussion with stakeholders and an independent peer review. For the present analysis one change has been made to the methods recommended for mortality valuation under CAFE.

In CAFE, stakeholders requested that mortality be valued using two approaches: one based on the loss of life expectancy and valued using the value of a life year (VOLY), and the other

valuation made against the number of deaths linked to pollution exposure valued using the value of a statistical life (VSL)[1]. For the former, an estimate of 52,000 Euros was adopted for the VOLY, which drew on EU research then available. However, further research on the value of a lost life year (VOLY) has been carried out in a larger number of European countries since the original CAFE methodology was agreed. This has led to a downward revision of the recommended VOLY to 40,000 Euros, a figure that has been applied here.

The analysis of co-benefits through economic valuation is most developed for health impact assessment, on which the present paper is focused. Impacts are quantified against:

- Changes in concentration of particulate matter accounting for primary particles (particles directly emitted), and,
- Secondary particles (sulphate and nitrate aerosols formed in the atmosphere following release of SO2 and NOx respectively).

Separate quantification of the direct effects of exposure to SO2 and NO2 is not performed as it is considered likely to double count some part of the effects attributed to particle exposure. Following WHO advice, the analysis assumes that the different types of particle are equally damaging per unit mass and that there is no threshold for impacts at the level of the population[2].

This assessment is largely based on consideration of the results of three studies that have applied these methods:

- Association of European Airlines (AEA) (2006) assessment of the air quality benefits of further climate measures up to 2020 on behalf of the European Commission[3]
- International Institute for Applied Systems Analysis (IIASA) (2006) consideration of the co-benefits of climate policy in relation to air quality for the European Environment Agency[4], and
- European Commission (2008) Annex to the joint impact assessment on the package of implementation measures for the EU's objectives on climate change and renewable energy for 2020[5].

SCENARIOS

The positions examined by the European Commission[5] focused on cuts in emissions of GHGs of 20% and 30% by 2020. The 20% cut is achieved purely through domestic savings, whereas the 30% cut also permits access to the Joint Implementation and Clean Development Mechanisms (JI/CDM). The effect on EU energy demand and energy mix is almost identical for the two positions, the JI/CDM providing most of the additional 10% saving for the 30% reduction case. In this report, the co-benefits of the 30% cut are calculated for a domestic 30% GHG reduction, in other words, without accessing JI/CDM.

The scenario analysis of the Wuppertal Institute[6], demonstrating a 30% cut in EU GHG emissions by 2020 has been compared with scenarios considered by the Commission. The EC proposal without renewable energy sources trading gives a near 30% cut but by 2030 instead of 2020. The energy mix for the two scenarios is broadly similar, which implies a general consistency in the modelling. Extrapolation of the health benefits of the 20% reduction in GHG emissions by 2020 has been made to a 30% saving through consideration of the additional

[1] The present author's strong preference is for the approach based on valuation of life years lost.
[2] This does not preclude thresholds for individuals in good health.
[3] http://www.cafe-cba.org/assets/further_climate_measures_benefits.pdf
[4] http://reports.eea.europa.eu/technical_report_2006_4/en
[5] http://ec.europa.eu/environment/climat/pdf/climat_action/climate_package_ia_annex.pdf
[6] Updated study on: How to achieve a domestic 30% GHG emission reduction target in the EU by 2020. Draft, August 2008.

reduction in use of the most polluting fuels (coal, lignite and oil) estimated for the latter case.

RESULTS

Table 1 shows the benefits of stronger climate change action based on estimates of health impacts in 2020 (figures from the European Commission's proposal) and a new, second proposal giving impacts for a 30% cut in GHG emissions.

The first column of figures shows the breakdown of annual health impacts in the baseline for 2020, without additional legislation. The second column shows the change in these effects under a domestic 20% cut in GHG emissions in the EU by 2020. These figures are based on results given in the impact assessment of the European Commission's proposal. The third column shows the change in impacts from a 30% cut in domestic EU emissions for the year 2020. The final column shows the additional health benefits of the 30% proposal over the 20% proposal.

For example, it is foreseen that air pollution will reduce life expectancy across the EU population by 2.8 million life years per year in 2020 (roughly equivalent to 7 months per person). The Commission's proposal is predicted to reduce this by 218,000 life years per year. If the target were increased to 30%, an additional 105,000 life years would be saved, a 48% improvement over the 20% proposal.

Table 1. Estimated health impacts in 2020 based on the Commission's proposal and a second proposal giving a 30% cut in GHG emissions

	Air pollution impacts – baseline 2020	Change in health impacts through 20% cut by 2020	Change in health impacts through 30% cut by 2020	Additional change from 30% cut over 20% cut
Health impacts – cases attributed to air pollution exposure				
Mortality: Life years lost among people over 30 years	2,800,000	-218,182	-323,333	-105,151
Chronic bronchitis, population over 27 years	142,168	-11,078	-16,417	-5,339
Hospital admissions	75,319	-5,869	-8,698	-2,829
Restricted activity days, people of working age	246,333,947	-19,194,869	-28,445,700	-9,250,831
Days with respiratory medication use by adults and children	25,155,404	-1,960,163	-2,904,850	-944,687

Table 2 shows the valuation of these additional health benefits in monetary terms. The lower estimates use the value of life years (VOLY) for mortality valuation whilst the higher estimates use the value of statistical life (VSL). The health benefits shown for the 20% proposal are a little higher than in the Commission's Impact Assessment as they include effects of ill health as well as impacts on mortality.

Table 2. Economic equivalents of health impacts and benefits of climate policies.

	Air pollution impacts – baseline 2020	Change in health impacts through 20% cut by 2020	Change in health impacts through 30% cut by 2020	Additional change from 30% cut over 20% cut
Health benefit, million euros, Low	172,441	-13,437	-19,913	-6,476
Health benefit, million euros, High	665,895	-51,888	-76,895	-25,007

"Restricted activity days" (see Table 1) take several forms, including workdays lost, which result in a loss of productivity. Associated results on loss of workdays are shown in Table 3, noting that they are part of the results already shown, and hence not additional to them.

Table 3. Work loss days and associated productivity losses

	Baseline scenario impacts for 2020	Change in health impacts through 20% cut by 2020	Change in health impacts through 30% cut by 2020	Additional change from 30% cut over 20% cut
Loss of work days	56,531,183	-4,405,031	-6,528,004	-2,122,973
Equivalent loss in productivity, Euro million	4,975	-388	-574	-187

CONCLUSIONS

1. Climate change policies can make a substantial contribution to reducing air pollution. This would contribute to the objectives of the 6th Environmental Action Programme of the EU.

2. Existing targets to combat climate change will deliver considerable co-benefits in air pollution abatement due to a higher level of reductions in domestic green house gases (GHG) by 2020.

3. The co-benefits to health of increasing the EU's current level of ambition on reducing domestic GHG (20% reduction in emissions) to 30% will be:

   - Reduced air pollutant emissions leading to improvements in public health indicators, such as:
     - 105,000 reduction in life years lost
     - 5,300 fewer cases of chronic bronchitis
     - 2,800 less hospital admissions
     - Many million fewer days of restricted activity and days with respiratory symptoms.
   - The monetary value of this health improvement is estimated at between 6.5 and 25 billion Euros per year in 2020.
   - These benefits would accrue year-on-year.

In addition to the benefits for health and the environment, action on climate change will reduce the overall costs to industry of controlling air pollutant emissions as a result of moving away from the most polluting fuels.

The European Commission Impact Assessment[7] shows that the current cost to industry of air pollution legislation is 83 billion Euros per year and that this would fall by around 10 billion Euros per year under the proposal for a 20% cut. A 30% cut would further reduce demand for the most polluting fuels leading to a further significant fall in non-greenhouse gas emission control costs.

[7] http://ec.europa.eu/environment/climat/pdf/climat_action/climate_package_ia_annex.pdf

Climate Action Network Europe (CAN-E) is recognised as Europe's leading network working on climate and energy issues. Keeping global warming below 2 degrees Celsius is the focus of the 'Time to Lead' campaign – www.timetolead.eu – from Climate Action Network Europe, Friends of the Earth Europe, Greenpeace and WWF.

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Health and Environment Alliance (HEAL) aims to raise awareness of how environmental protection and sustainability improve health and to empower the health community to contribute their expertise to policy-making. Since its inception, HEAL's membership has grown to include a diverse network of more than 50 citizens', patients', women's, health professionals' and environmental organisations across Europe which together have a strong track record in increasing public and expert engagement in both EU debates and the decision-making process.

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WWF is one of the world's largest and most respected independent conservation organisations, with almost 5 million supporters and a global network active in over 100 countries. WWF's mission is to stop the degradation of the earth's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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