GREENHOUSE GASES AND AIR POLLUTANTS IN THE EUROPEAN UNION

BASELINE PROJECTIONS UP TO 2030
EC4MACS INTERIM ASSESSMENT

European Consortium for Modelling Air pollution and Climate Strategies

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Executive Summary

During the last decades Europe has successfully eliminated the most visible and immediately harmful effects of air pollution. However, there is ample and robust scientific evidence that even at present rates Europe's emissions to the atmosphere pose a significant threat to human health, ecosystems and the global climate, though in a less visible and immediate way.

Refined scientific methods reveal that, e.g., via the long-term exposure to fine particulate matter, current levels of air pollution shorten statistical life expectancy of the European citizens by several months. Biodiversity and Europe's genetic resource base is under threat from the excessive release of nitrogen to the atmosphere from energy combustion and intensive agriculture. Europe's greenhouse gas emissions, currently twice as high on a per-capita basis as the world average, and historically responsible for about a quarter of current concentrations in the atmosphere, make a significant contribution to global climate change.

This report presents an outlook into the likely development of emissions of greenhouse gases and air pollutants and their impacts up to 2030 as can be envisaged from current expectations on economic development and the implementation of existing legislation on air pollution controls in the European Union. This report adopts the most recent post-economic crisis projections as a central assumption, as they incorporate the economic downturn that occurred in 2008 and 2009. It considers national and EU-wide energy, climate, agricultural and air pollution policies that have been implemented by spring 2009.

The analysis starts from a recent projection of population development, which suggests a 6% increase in the population of the EU-27 due to continued immigration. By 2020 total GDP in the EU-27 is assumed to be 30% higher than in 2005, and 50% in 2030. Recent energy and climate policies will show distinct effects on future energy consumption in Europe and decouple the levels of economic activity (GDP) from energy consumption. Total energy consumption is assumed to remain at the 2005 level up to 2030. Although renewable energy will increase its market share to some extent, no major changes in the composition of fuel use are projected up to 2030 despite the assumed 50% increase in GDP. Increases in car ownership in the new Member States will be compensated by saturation effects in the old Member States. Further growth, however, will occur for freight transport, although the 33% increase to 2030 is lower than the assumed growth in GDP. For the agricultural sector the baseline suggests a decline in the numbers of cattle and sheep and increases in pigs and chicken.

These changes in human activity levels, together with dedicated policies to reduce emissions of greenhouse gases and air pollutants, will have distinct impacts on future pollution of the atmosphere in Europe. Most notably, the baseline projection suggests a certain decline of greenhouse gas emissions, reaching -8% in 2020 and -16% in 2030 relative to 2005. Larger reductions (between 33% and 66%) are expected for emissions of air pollutants (i.e., SO_2, NO_X, PM2.5, VOC), due to the ongoing structural changes in the economy and the effects of new emission control legislation.

These changes in baseline emissions will have distinct impacts on air pollution impacts on human health, forests, vegetation, freshwater, crops and materials. Health impacts from exposure to fine particulate matter, which is associated for the year 2000 with a shortening of statistical life expectancy of 8.6 months in the EU, would decline by 45% in 2020 and by 52% in 2030. The number of premature deaths that are attributable to exposure to ground-level ozone (26000 in 2000) would decline by one third in 2020 and by 39% in 2030. Similarly positive impacts are computed for vegetation and ecosystems. For instance, the area of European forests that are under threat of acidification (as they receive acid deposition above their critical loads) will decline by about 70%.

However, despite these significant improvements, the anticipated baseline development of emissions to the atmosphere will not be sufficient to achieve sustainable environmental conditions that safeguard human health and ecosystems services. Per-capita greenhouse gas emissions will still be at 9.2 tons CO_2eq/person/yr in 2020 and at 8.3 tons/person/yr in 2030, which is significantly higher than the approximately two tons that would be available in a budget approach that allocates equal GHG emissions to all people in the world while limiting temperature increase to 2 degrees Celsius. Also for air pollution, despite the impressive reductions in precursor emissions, fine particulates in ambient air will still cause life shortening of more than four months to the European population. Biodiversity will continue to be threatened by excessive input of harmful air pollution in wide areas in Europe, and particularly in many of the Natura2000 habitat protection areas. As these improvements do not reach the environmental targets that have been established in the EU Thematic Strategy on Air Pollution for 2020, further measures to reduce emissions will be necessary.

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More information on the Internet

More information about the EC4MACS methodology and interactive access to models and their results is available at the Internet at
http://www.ec4macs.eu.

Glossary of terms used in this report

CAFE	Clean Air For Europe Programme of the European Commission
CAPRI	Agricultural model developed by the University of Bonn
CH_4	Methane
CLRTAP	Convention on Long-range Transboundary Air Pollution
CO_2	Carbon dioxide
EC4MACS	European Consortium for Modelling Air Pollution and Climate Strategies
EMEP	European Monitoring and Evaluation Programme
ETS	Emission Trading System of the European Union for CO2 emissions
EU	European Union
F-gases	Fluorinated gases
GAINS	Greenhouse gas - Air pollution Interactions and Synergies model
GW	gigawatts = 109 watts
IIASA	International Institute for Applied Systems Analysis
kt	kilotons = 103 tons
LULUCF	Land use, land use change and forestry
Mt	megatons = 106 tons
N_2O	Nitrous oxide
NEC	National Emission Ceilings
NH_3	Ammonia
NO_x	Nitrogen oxides
N_2O	Nitrous oxides
O_3	Ozone
PJ	petajoule = 1015 joule
PM10	Fine particles with an aerodynamic diameter of less than 10 µm
PM2.5	Fine particles with an aerodynamic diameter of less than 2.5 µm
PRIMES	Energy Systems Model of the National Technical University of Athens
SO_2	Sulphur dioxide
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile organic compounds

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