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1.CityZen, PEGASOS and ÉCLAIR are all supported by the European Commission under the Seventh Framework Programme. See:http://cityzen-project.eu/; www.eclaire-fp7.eu; http://pegasos.iceht.forth.gr/

2.See: www.iiasa.ac.at/web/home/research/researchPrograms/Energy/Home-GEA.en.html

European Commission

Science for Environment Policy

Ozone and NOx air pollution predicted to fall in Europe

A new study has estimated that nitrogen oxide (NOx) and harmful ozone levels will fall significantly in Europe, by 2030, if all current and planned air quality legislation is implemented. The co-beneficial effects of climate change policies could also reduce levels of these air pollutants by a further 40%.

Conducted under the EU projects CityZen, PEGASOS and ECLAIRE[1], the research set out to provide a robust estimate of European air quality until the year 2030 by using an 'ensemble' of models to provide future projections of NOx and ozone pollution.

They estimated air pollution for two scenarios from the Global Energy Assessment (GEA)[2], to try and understand the potential future impact of policies. The first 'reference scenario' assumed all current and planned air quality legislation would be in place until 2030, and the second 'sustainable scenario' also considered the additional pollution-reducing effects of climate change policies designed to limit global warming by 2°C by the end of the century.

Six models designed to capture pollutant transport and transformation were combined to provide the future projections of air quality, including regional models and global models, to capture a range of different details across the continent.

The results suggest that, by 2030 and under the reference scenario, total NOx emissions in Europe will be reduced to around half the level of emissions measured in 2005. In the sustainable scenario, which also includes climate policies, NOx emissions will fall even further, by about a third.

Since the reaction of NOx in sunlight is a major contribution to ozone levels, the results indicate that ozone background levels will also substantially decrease throughout Europe during this period. However, annual mean ozone concentrations are likely to slightly increase in some high density industrial areas that are currently saturated with NOx, such as Benelux. This is because at very high NOx concentration levels a complex chemical process (titration) occurs, which destroys atmospheric ozone; at such high NOx concentrations, therefore, the initial response to NOx reduction is an increase of ozone concentration, whilst deeper NOx concentration reductions would be necessary to move away from the NOx-saturated regime and result in a decrease in ozone level.

It should be noted however that this titration process primarily affects low ozone levels. In order to highlight projected exposure to high ozone episodes, the researchers then assessed future exposure to ozone pollution using five air quality indicators. The indicators included SOMO35, which assesses exposure in terms of human health impacts, and AOT40df, which assesses exposure in terms of detrimental effects on deciduous forests. They estimated that, by 2030, SOMO35 levels would be reduced to about 70% of their 2005 levels for the reference scenario. For the sustainable scenario, this figure is 45%. AOT40df levels were estimated to drop to around 60% of their 2005 levels for the reference scenario, and to 25% for the sustainable scenario.

According to current European legislation, the maximum daily ozone level should not exceed 120 micrograms (μg) per m^3 of air for more than 25 days a year. The projections of exposure levels indicate that the number of European citizens experiencing exposure above this threshold will decrease substantially by 2030, by 55% in the reference scenario and by 85% in the sustainable scenario.

The study provides an approach for more comprehensive assessments of future air quality, including assessments of climate policy's co-benefits for air quality. Its results indicate that, in combination, air quality and climate change policies could have substantial effects on future ozone levels.