Reducing air pollution
National emission ceilings for air pollutants

SUMMARY
Despite significant progress in recent decades, air pollution levels in the European Union still have adverse impacts on the environment and on health. The European Commission estimates that health-related costs of air pollution in the EU range from 390 to 940 billion euros per year.

The proposed directive, which would replace the current National Emission Ceilings Directive, sets binding national reduction objectives for six air pollutants (SO$_2$, NO$_x$, NMVOCs, NH$_3$, PM$_{2.5}$ and CH$_4$) to be met by 2020 and 2030. It will also implement the Gothenburg Protocol as amended in 2012. The European Commission estimates that implementation costs would range from 2.2 to 3.3 billion euros per year.

Stakeholders have been divided over the level of ambition of the proposed ceilings. Both EU advisory committees have issued opinions and some national parliaments have made comments on the proposal. The Council held a policy debate in June 2015. The ENVI Committee adopted its report on 15 July 2015. A vote in plenary is expected to take place in October.


<table>
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<tr>
<th>Committee responsible:</th>
<th>Environment, Public Health and Food Safety (ENVI)</th>
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<td>Rapporteur:</td>
<td>Julie Girling (ECR, UK)</td>
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<tr>
<td>Next steps expected:</td>
<td>Vote in plenary: 26-29 October 2015</td>
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This briefing updates an earlier edition, of 12 May 2015.
Introduction

In December 2013, the Commission presented the 'Clean air policy package' containing, besides the proposal on the reduction of national emissions, a 'Clean air programme for Europe' communication, a proposed directive for medium-sized combustion plants and a proposal for ratification of the amended Gothenburg Protocol.

According to the Commission communication, the proposal will deliver progress towards the strategic long-term objective of 'achieving levels of air quality that do not give rise to significant negative impacts on and risks to human health and the environment.' In practical terms, the long-term objective translates as meeting World Health Organisation (WHO) air quality guidelines as well as critical pollutant levels for ecosystems. The proposal also aims to transpose into EU law international obligations agreed under the amended Gothenburg Protocol, to be met by 2020.

The proposal was initially not included in the Commission's 2015 work programme. However, it was not withdrawn and Commissioner Karmenu Vella has indicated that the Commission will put forward modifications in the course of ongoing negotiations.

Context

Air quality has improved considerably in recent decades, while GDP and population have grown, as shown in figure 1. However, despite considerable improvements, the European Environment Agency (EEA) indicates that the EU is still far from achieving levels that do not result in unacceptable risks to humans and the environment.

Many Europeans are affected, especially in urban areas (see figure 2). Ecosystems and biodiversity are also widely affected, with 62% of the area of EU ecosystems considered as exceeding eutrophication limits in 2010. Moreover, several air pollutants contribute to global warming, while some reduce it by blocking solar radiation.
WHO air quality guidelines

The air quality guidelines defined by the World Health Organisation are intended as policy guidance. They are based solely on health considerations and are regularly updated with the latest scientific knowledge. WHO guidelines do not consider the technical feasibility or the economic, political and social aspects of achieving these levels. Moreover, health risks may still exist at or below concentrations set in the air quality guidelines.

Air pollutants can be emitted directly in the atmosphere (i.e. ‘primary pollutants’) or formed in the atmosphere on the basis of ‘precursor’ substances (i.e. ‘secondary pollutants’). Emission reductions do not necessarily produce a corresponding drop in atmospheric concentrations, especially for secondary pollutants such as O₃ and particulate matter (PM). The table below presents an overview of pollutants, their impacts and how they interact.

### Table 1 – Short description of selected pollutants

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Description and sources</th>
<th>Adverse impacts on</th>
<th>Precursor to</th>
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<tbody>
<tr>
<td>Particulate matter (PM)</td>
<td>Solid or liquid particles of varying sizes and chemical composition. PM₁₀ (PM₂.₅) are 10 (2.₅) micrometres or smaller. PM is emitted directly or forms from emissions of SO₂, NOₓ, NH₃ and NMVOCs, mainly from anthropogenic sources.</td>
<td>Health Climate</td>
<td>–</td>
</tr>
<tr>
<td>Ozone (O₃)</td>
<td>Ground level ozone is not emitted directly in the atmosphere. It forms on the basis of complex chemical interactions involving sunlight and precursor pollutants, mainly NOₓ, CO, NMVOCs and CH₄.</td>
<td>Health Environment Climate</td>
<td>–</td>
</tr>
<tr>
<td>Nitrogen oxides (NOₓ)</td>
<td>NOₓ are nitrogen monoxide (NO) and nitrogen dioxide (NO₂). They are emitted during fuel combustion, e.g. from industrial facilities and the transport sector (mainly from diesel cars).</td>
<td>Health Environment</td>
<td>O₃ PM</td>
</tr>
<tr>
<td>Sulphur dioxide (SO₂)</td>
<td>SO₂ is emitted mainly through the combustion of fuels containing sulphur.</td>
<td>Health Environment</td>
<td>PM</td>
</tr>
<tr>
<td>Ammonia (NH₃)</td>
<td>NH₃ emissions come mainly from the use of manure and nitrogenous fertilisers in the agricultural sector.</td>
<td>Health Environment</td>
<td>PM</td>
</tr>
<tr>
<td>Non methane volatile organic compounds (NMVOCs)</td>
<td>NMVOCs are emitted from anthropogenic (mainly paints, solvents, dry-cleaning, road transport) and natural sources.</td>
<td>Health O₃ PM</td>
<td></td>
</tr>
<tr>
<td>Methane (CH₄)</td>
<td>CH₄ is produced by both anthropogenic (mainly from agriculture, waste, coal mining and gas) and natural sources.</td>
<td>Climate O₃</td>
<td></td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>CO is emitted due to incomplete combustion. Important sources of CO include road transport, businesses, households and industry.</td>
<td>Health O₃</td>
<td></td>
</tr>
</tbody>
</table>

Notes: “a” pollutants directly covered by the proposal; “b” pollutants indirectly covered (through precursors) by the proposal; “c” high impacts are indicated in bold. Source: European Environment Agency, 2014.

Various sectors of the economy contribute to the emission of air pollutants. Data from the national emission inventories compiled by the EEA (figure 3) show the following picture: PM is emitted mainly by heating, industry and transport; NOₓ mainly by the transport sector; the bulk of SO₂ emissions come from energy production and non-road
transport; almost all NH₃ emissions come from agriculture; NMVOCs come mainly from 'solvent and product use' (paints and chemicals used in manufacture and maintenance); CO emissions come from heating and transport; and most CH₄ emissions come from the agriculture, waste and energy sectors.

EEA data indicate a decrease in emissions of most pollutants between 2003 and 2012, with the notable exception of benzo-a-pyrene (BaP). The largest reductions were in SOₓ (54%) and nickel (44%). Of all sectors, the transport sector has achieved the highest reductions in CO (61%), NMVOC (63%) and NOₓ (34%), while the industry and energy sectors reduced their NOₓ emissions by 29% each.

**Figure 3 – Sources of selected air pollutants in EU28, in thousand tonnes (2003-12)**

Air pollution has considerable adverse impacts on health. The European Environment Agency estimates that in 2011, PM₂.₅ and ozone concentrations were responsible respectively for 430 000 and 16 000 premature deaths in the EU28. Findings compiled by the WHO show that air pollution increases the risk of a wide range of diseases (respiratory, cardiovascular and cancer), with short-term (acute) as well as long-term (chronic) effects. Recent studies suggest exposure during pregnancy and in early life can significantly affect foetus and child development and trigger diseases later in life. Health impacts are mainly associated with PM, O₃, SO₂, as well as BaP and heavy metals (arsenic, cadmium, lead, mercury, nickel).

Air pollution’s main effects on the environment are:

- eutrophication, an excess of nutrients in soil or water which often causes 'algal blooms' in water bodies, and may ultimately lead to a depletion of the oxygen supply with impacts on ecosystems and biodiversity;
- acidification, a change in the soil's pH level, caused mainly by sulphur and nitrogen compounds, damaging plant and animal life on land and in water; and
- damage to vegetation from ground-level ozone, which harms plant cells and impairs their ability to grow, leading in turn to reduced agricultural crop yields, decreased forest growth and reduced biodiversity.
Eutrophication is associated with NO$_x$ and NH$_3$, while acidification is associated with NO$_x$, NH$_3$ and SO$_2$. Toxic metals, which do not break down in the environment, tend to accumulate in soils, plants and animals, and can end up in our food.

The total health-related costs of air pollution in the EU are in the range of €330–940 billion per year (including €15 billion from lost workdays, €4 billion from healthcare costs, €3 billion from crop yield loss and €1 billion from damage to buildings), according to the impact assessment drawn up by the Commission (This has been analysed by the Ex-Ante Impact Assessment Unit of EPRS; see 'Parliamentary analysis', below.). The OECD estimated in 2014 that the health impact of air pollution costs OECD countries about €1 500 billion per year, and, in 2015, published estimated costs of air pollution compared to gross domestic product (GDP), which show wide differences between Member States. The OECD points out that although damage to health affects GDP through higher absenteeism and lower productivity, a large part of these effects fall on the non-working population, and health effects may increase demand, for example, for health services.

**Existing situation**

EU air quality policy rests on the 2013 Clean Air Programme for Europe, a range of acts related to sources of pollution, and three major legal acts. The Ambient Air Quality Directive defines binding limit values for the atmospheric concentration of the main air pollutants (PM, O$_3$, NO$_2$, SO$_2$, CO, benzene and lead) and requires Member States to define zones to assess and manage ambient air quality, to monitor long-term trends and to make the information available to the public. The Directive on arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air sets non-binding targets for the atmospheric concentration of these substances. The National Emission Ceilings Directive, which is to be replaced by the proposed directive, sets maximum amounts of four pollutants responsible for acidification, eutrophication and ground-level ozone (NO$_x$, SO$_2$, NH$_3$, NMVOCs) that each Member State is entitled to emit per year as of 2010.

The EU and Member States are also bound by international agreements regarding air pollution. The Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP), which came into force in 1983, aims to protect humans and the environment from air pollution. It has been complemented by eight protocols, including the Gothenburg Protocol on acidification, eutrophication and ground-level ozone which is implemented in EU law by the National Emission Ceilings Directive. The Protocol, as amended in 2012, sets targets for 2020. Annex 6 of the International Convention for the Prevention of Pollution from Ships (MARPOL) sets limits on SO$_x$ and NO$_x$ emissions from ship exhausts. It came into force in 2005.
In respect of the **implementation of the National Emission Ceilings Directive**, the Commission launched infringement proceedings against four Member States that had failed to transpose the Directive in 2004. A majority of Member States have reached the emission ceilings to be met by 2010. However, nine Member States had not reached their ceilings in 2011, in particular those for NO\textsubscript{x}.\(^6\)

### The changes the proposal would bring

The **proposed directive**, which would repeal the current National Emission Ceilings Directive while continuing to be based on the principle of national emission ceilings,\(^7\) sets binding reduction objectives for 2020 and 2030 and indicative reduction objectives for 2025. The proposal would transpose international obligations, agreed under the amended **Gothenburg Protocol**, to be met by 2020. The objective is to achieve 70% of the 'maximum technically feasible reduction' by 2030, compared with a 2005 baseline.\(^8\) In addition, the proposal amends the **Directive on public participation in the preparation of programmes related to the environment** to ensure it covers national air pollution control programmes.

In addition to the pollutants covered by the National Emission Ceilings Directive (SO\textsubscript{2}, NO\textsubscript{x}, NMVOCs, NH\textsubscript{3}), the proposal introduces ceilings for two new pollutants: PM\textsubscript{2.5} (in particular black carbon, the sooty part of particulates emitted from combustion) and CH\textsubscript{4}. It also introduces the possibility for Member States to use flexibility mechanisms, for instance as regards accounting for some emission reductions achieved by the shipping sector, and joint implementation of CH\textsubscript{4} commitments.

The Commission estimates that benefits would largely outweigh costs: while the benefits (decrease in external costs of air pollution) are expected to reach at least €40 billion per year,\(^9\) meeting the targets would cost between €3.3 billion (initial estimates from December 2013) or €2.2 billion (updated estimates from January 2015) per year. The Commission also suggests that about 40 000 new jobs would be created as a result of the entire clean air policy. According to the Commission, the proposal would benefit all EU citizens (especially children and the elderly), and also industry, thanks to a boost to innovation and competitiveness in the field of green technology.

In its impact assessment, the Commission indicates that potential adverse impacts on competitiveness would focus on sectors exposed to international competition. The most significantly affected sectors would be petroleum refining and agriculture, although other sectors, such as chemicals and iron and steel, would be affected as well.\(^10\)

As sources of air pollutants and greenhouse gases are often the same, air pollution policy is interlinked with climate change policy. Meeting reduction targets is expected to trigger benefits for climate change. Conversely, climate change policy can also help reduce air pollution (see 'Parliamentary analysis', below). A **paper** by the US Environmental Protection Agency summarises the interaction between the two policies.

The proposal has attracted some criticism from experts. According to **Roy Harrison**, Professor of Environmental Health at the University of Birmingham, focusing only on primary pollutants could have adverse effects (ozone levels in cities could rise because of cuts in urban NO\textsubscript{x} emissions from traffic, due to its complex atmospheric chemistry).
He also warns that some PM emissions, for instance from non-exhaust road traffic, wood combustion or cooking, are likely to be very difficult to control, and highlights that a large part of the reductions in emissions to be achieved by 2020 have already been completed.

**Preparation of the proposal**

The European Environment Agency published a report in 2012 on the achievement of health and environmental objectives under the National Emission Ceilings Directive.

In December 2013, the Commission presented an impact assessment of the proposals in the ‘Clean air package’ (See ‘Parliamentary Analysis’, below, for details of analysis of this by EPRS’s Ex-Ante Impact Assessment Unit). The impact assessment (executive summary) considered five policy options for which health, environmental, economic and social impacts were assessed. The Commission also published a study analysing in detail the main reasons for non-compliance with the 2010 national emission ceilings.

The International Institute for Applied Systems Analysis (IIASA) has published a series of reports since 2012 supporting the European Commission in the review of EU air pollution policy. Six of these were published after the Commission tabled its proposal. At the request of the Council Presidency, the IIASA carried out bilateral consultations with Member State experts in the course of 2014 with a view to clarifying the cost-effectiveness analysis related to the ceilings. In September 2014, the IIASA proposed a system of trade-offs between pollutants at Member State level aimed at reducing the cost of compliance. In January 2015, the IIASA published updated data suggesting a larger decrease in PM emissions than foreseen in the baseline case, which would reduce the emission reduction requirements as well as the costs.

**Parliament's starting position**

Throughout the adoption of the National Emission Ceilings Directive in 2001, Parliament supported the stricter targets proposed by the Commission (except for ammonia) against Council’s push for weaker targets.

In its resolution of 26 September 2006 on the thematic strategy on air pollution, Parliament called for more ambitious emission reduction targets for VOC, PM$_{2.5}$ and NO$_x$, on the basis that it would lead to greater health and employment benefits, while maintaining a balanced approach between costs and benefits. Parliament also called for the introduction of target and limit values for particulate matter concentration.

During the adoption of the Ambient Air Quality Directive in 2007, Parliament called for EU measures to reduce emissions at source, and successfully pushed for an indicative limit value for PM$_{2.5}$ to be achieved by 2020.

**Stakeholders' views**

A number of stakeholders highlight that some sectors have already managed to reduce their emissions significantly, and call for technical and economic feasibility to be taken into account when defining emission ceilings. Among them, BusinessEurope, the European association of business federations, advocates a 'safeguard clause' to ensure industry is not forced to take additional steps beyond the Industrial Emissions Directive even if targets are not met; ACEA, the European automobile manufacturers association, calls for realistic, feasible and cost-effective requirements and for sufficient lead-time to meet them; Cefic, the European chemical industry council, encourages decision-makers to base policies on comprehensive scientific information.
Stakeholders from sectors likely to be most affected by the proposal put forward concrete suggestions. Copa-Cogeca, the European association of farmers and agri-cooperatives, warns of the risk of over-regulation and 'ammonia leakage', and calls for methane to be regulated by climate change policy rather than by the proposal on the reduction of national emissions. FuelsEurope, the association of fuel refineries in Europe, calls for 2020 targets aligned with the Gothenburg Protocol, mandatory targets only for 2030, and ceilings achieving only 50% of the 'maximum technically feasible reduction'. It warns that the proposed ambition levels risk being unattainable and having detrimental effects on EU competitiveness and jobs.

Other stakeholders call for more ambitious goals. Among them, Eurocities, an association of major European cities, calls for binding national ceilings for 2025 instead of 2030, advocates more ambitious targets for PM2.5, NOx and NH3 (based on the option identified in the Commission’s impact assessment as delivering 'the maximum net benefit'); a coalition of environmental NGOs (AirClim, ClientEarth, EEB, HEAL, T&E) advocates ambitious 2030 ceilings that would not give rise to significant negative impacts or risks to health and environment, with binding ceilings (including for methane and mercury) for 2020 and 2025. Besides, the European Environmental Bureau criticises the Gothenburg Protocol for setting commitments that are weaker than the levels expected to be achieved under a 'business as usual' scenario.

These stakeholders also put forward concrete suggestions. Eurocities supports a revision of Euro-emission-standard testing procedures for vehicles, to reduce emissions under urban driving conditions. The coalition of environmental NGOs advocates explicit recognition of citizens' and NGOs' right to access national courts to challenge breaches of the directive and recommends addressing all relevant sectors (e.g. domestic heating, transport, agriculture, solvents) through national and EU measures.

**Advisory committees**

In its opinion of 10 July 2014 on the 'Clean air package', the European Economic and Social Committee regrets that the 2025 objectives are not binding and calls for a series of 'firm actions', among others: emission reduction requirements for methane in 2020 and for mercury in 2020, 2025 and 2030; specific measures to reduce ammonia and methane in the agricultural sector; the introduction of 'real-world' measurements for vehicle emissions; the implementation of the International Maritime Organisation’s NOx and SO2 standards for ships by 2016, as agreed in 2008; and medium to long-term predictability in policies.

In its opinion of 7 October 2014 on the 'Clean air package', the Committee of the Regions calls for the proposed 2030 emission reduction commitments at least to remain unchanged and to be strengthened further where possible. It advocates binding 2025 interim targets and warns that the proposed flexibility mechanisms must not be used as an excuse for not intervening if the policy does not deliver the expected results.

**Council**

In early 2014, Member States requested further information from the Commission on the modelling used to draw up the proposal. Some Central European countries expressed doubts about the achievability of the 2030 targets and voiced concerns about the economic implications on certain sectors. Some Member States questioned whether the Euro 6 emission standards for cars will really deliver the reductions expected in the impact assessment. Others pointed to a discrepancy between the proposal, which is
based on fuel sales, and the Gothenburg Protocol, which is based on fuel use. Several Member States expressed concerns about the ammonia and methane targets, which would affect agriculture. However, a few Member States showed support for the proposal and called for ambitious legislation.

In a policy debate held at the Environment Council on 15 June 2015, many Member States indicated that the targets set in the proposal are too ambitious, in particular regarding ammonia from the agricultural sector. Several Member States called for less ambitious targets that allow for more flexibility. A majority of Member States advocated removing methane from the scope of the proposal.

**National parliaments**

By March 2015, parliaments in 15 Member States had examined the proposal. No Reasoned Opinions have been received. In three Member States however, national parliaments expressed some concerns: the Czech Senate and Chamber of Deputies call for due attention to be paid to the competitiveness of companies; the Polish Senate warns that 2030 reduction commitments are too high and would entail disproportionately large costs, in particular for the agricultural sector; the Romanian Chamber of Deputies expresses concern regarding the implementation of measures suggested to reduce emissions in small farms, and advocates the possibility of derogations in specific cases.

**Parliamentary analysis**

In April 2014, the Ex-Ante Impact Assessment Unit of EPRS produced an initial appraisal of the impact assessment carried out by the Commission. It concludes that the Commission impact assessment is a thorough and methodical analysis, but it remains cautious nevertheless with regard to the completeness of the assessments, the scope for further work (especially as regards agriculture, shipping and SO\(_2\) emissions) and the certainty of the conclusions drawn.

Upon request of the Environment, Public Health and Food Safety Committee, the Ex-Ante Impact Assessment Unit undertook a complementary impact assessment on interactions between EU air quality policy and the 2030 climate and energy policy presented in January 2014. The study concludes that, as a result of synergies between both policies, the costs of meeting the proposed targets would be reduced from €3.3 to 1.4 billion per year, or that more ambitious targets could be reached for the initially expected cost.

In October 2014, the EP’s Policy Department A published a study analysing WHO air quality guideline values for health in the context of the legislative proposal on the reduction of national emissions.

**Legislative process**

The Environment, Public Health and Food Safety Committee requested a complementary impact assessment, which was presented to the Committee on 6 November 2014. The EP held a public hearing on ‘EU air quality policy: reducing national emissions beyond 2020’ on 4 December 2014. The ENVI Committee adopted its report on 15 July 2015. A vote is expected to take place in plenary in October.
The report adopted by the ENVI Committee in July 2015 introduces a number of changes to the Commission proposal:

- setting binding intermediate targets for 2025 (except for methane);
- strengthening 2030 reduction targets in line with the most cost-effective option identified by the European Parliament’s complementary impact assessment (except for methane, where the Commission proposal is maintained);
- adding mercury to the scope of the proposal, with binding targets for 2025 and 2030;
- removing the possibility to offset reductions achieved in the shipping sector against emissions from land-based sources;
- strengthening provisions on reporting, stakeholder consultation, involvement of local and regional authorities, access to information, public participation and access to justice;
- ensuring effectiveness of legislation on pollution sources, especially Euro 6 standards for cars, by establishing a system of environmental inspections and market surveillance;
- securing access to funding, among other things to help the agricultural sector reduce ammonia and methane emissions.

In their opinion on the proposal, the ITRE Committee recommended a modification of the scope of the proposal, in order to remove methane and to introduce mercury, while the AGRI Committee recommended the exclusion of methane from the scope of the proposal and making ammonia targets more flexible.

As noted above, the Environment Council held a 'policy debate' on the proposal on 15 June 2015.

References

Reduction of national emissions of certain atmospheric pollutants / European Parliament, Legislative Observatory (OEIL).


Endnotes

1 Concentration levels also depend on year-by-year variation in weather conditions (including sunlight), emissions of substances and precursors by natural sources, and sources outside Europe.
2 WHO's International Agency for Research on Cancer concluded in 2013 that outdoor air pollution (especially particulate matter) is carcinogenic to humans.
3 Data are only available for EU countries that are members of the OECD. Data are not available for Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Malta and Romania.
4 The Clean air programme for Europe, presented end-2013 together with the proposal, replaces the 2005 Thematic strategy on air pollution.
5 The main legal acts relate to sources of pollutants from specific sectors, such as road transport (Euro 5 and Euro 6 Regulation, Directive on clean and energy-efficient vehicles, Directive on volatile organic compounds from petrol), non-road transport (Directive on the sulphur content of certain fuels), and industry (Pollution prevention and control Directive, Large combustion plant Directive, Industrial emissions Directive).
6 Preliminary data for 2013 (latest available) suggest ten Member States now exceed at least one ceiling.
The proposal is not about air quality standards (atmospheric concentration of pollutants governed by the Ambient Air Quality Directive). In this regard, the Commission intends to focus on compliance with existing air quality standards ‘by 2020 at the latest.’

The ‘maximum technically feasible reduction’ is based on technical measures commercially available in 2012. The impact assessment indicates that because it does not take into account a series of measures (such as structural or behavioural ones), ‘it can be regarded as a highly conservative estimate of the scope for impact reduction.’

This includes direct economic benefits of over €2.8 billion, including labour productivity increase (€1.85 billion), reduced health care costs (€600 million), and increased crop yields (€230 million).

In all cases, the Commission estimates that the cost of compliance for specific sectors would not exceed 1% of gross value added.

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