CLEARING THE AIR

A CRITICAL GUIDE TO THE NEW NATIONAL EMISSION CEILINGS DIRECTIVE

AirClim

ClientEarth

EUROPEAN ENVIRONMENTAL BUREAU

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EXECUTIVE SUMMARY

Air pollution is responsible for over 430.000 premature deaths in the EU every year. That's more than a thousand deaths every day.

The updated National Emission Ceilings (NEC) Directive requires national governments to develop appropriate policies to fight this invisible killer. It sets binding air pollution limits for a number of harmful air pollutants, for both 2020 and 2030.

'Clearing the Air: A critical guide to the new National Emission Ceilings Directive' offers an initial analysis of this new law. It explores the effect the Directive will have on emissions in the European Union and what the new rules mean for both those causing pollution and those fighting to stop it.

As a result of the new Directive, the health impact of air pollution in the EU is expected to be halved by 2030, compared to 2005 levels. But this is clearly not enough: close to 250,000 Europeans are still expected to die prematurely because of air pollution in 2030, even after full implementation of the Directive. Greater progress would have been made if original proposals from the European Commission and Parliament had not been watered down by national governments in the Council, who even managed to remove methane from the Directive entirely.

This report contains three chapters.

Chapter 1 introduces the NEC Directive and explains the limits it sets. It introduces 'NERCs' – National Emission Reduction Commitments – which are set for both 2020 and 2030. It explains why only the 2030 limits are expected to have any meaningful effect in improving air quality. The 2030 NERCs are expected to drive new action to cut dangerous emissions of ammonia and $PM_{2.5}$.

Chapter 2 explores how the new Directive works and what Member States will have to do to comply with the new rules. It covers the 'inventory reporting' that Member States will be required to undertake and more importantly the National Air Pollution Control Programmes (NAPCPs) which must detail the measures they will put in place to reduce emissions. These NAPCPs will have to be regularly updated and must be based on public consultation. This chapter also reveals the flexibilities on offer to Member States that have the potential to escape legal action if granted by the Commission, whose role in enforcement will be crucial.

Chapter 3 presents concrete options to facilitate compliance with the NEC Directive's emission reductions as well as opportunities to provide more substantial cuts in harmful pollutants. Three key sectors offering significant emissions reductions are explored: agriculture, residential heating and coal power.

The report concludes by making key recommendations to national governments and the European Commission.

Member States must:

- **Quickly and effectively implement the NEC Directive** and other EU air quality legislation, going beyond the minimum requirements they set.
- **Put in place rigorous surveillance systems** to check air pollution laws are being respected.
- **Address the most harmful sources of air pollution** and climate change including fossil fuel combustion, intensive farming, transport and domestic heating.

The European Commission must:

- **Ensure new and existing legislation is enforced.**
- **Speed up legal actions** against Member States failing to comply with air pollution laws.
- **Reject the flexibilities** which Member States can apply for from early 2017.
- **Propose new, effective sector-specific legislation** to tackle the various sources of pollution.
- **Finally address methane emissions.**
- **Align EU ambient air quality limits with the most recent WHO recommendations.**

CHAPTER 1
THE NEC DIRECTIVE: WHAT DOES IT DO?

EU air Pollution laws

National Emission Ceilings
Total caps

The NEC Directive sets national emission limits for a number of harmful air pollutants. These 'ceilings' limit the total amount of air pollution which can be emitted by each Member States every year.

INTERNATIONAL SHIPPING

Standards to limit the sulphur content of marine fuel in the EU do exist but on the whole the EU relies heavily on standards adopted by the International Maritime Organisation (IMO). These standards are either too weak or simply not properly implemented.

Emissions from international shipping are not covered by the NEC Directive.

AGRICULTURE

The EU lacks comprehensive policy to prevent air pollution from agriculture. Only large poultry and pig facilities are regulated through the Industrial Emissions Directive (IED). Cattle – which are responsible for 60% of total EU ammonia emissions - remain unaddressed.

ROAD TRANSPORT

Emissions from road transport are regulated through 'Euro' standards for cars, vans and heavy duty vehicles. EU type approval rules are currently being updated and "Real Driving Emissions test procedures" (RDE) being developed to better reflect on-the-road emissions.

CONSTRUCTION MACHINES

The Regulation on Non-Road Mobile Machineries (NRMM) addresses emissions from combustion engines installed in construction machines, railcars, locomotives, and inland waterway vessels. It defines emission limits and lays down the procedures engine manufacturers have to follow to be allowed to sell their engines in the EU market.

LARGE INDUSTRY

Energy generation, the production of metals, minerals and chemicals and waste management are addressed through the Industrial Emissions Directive (IED). Installations must be granted permits based on "Best-Available Techniques" (BAT) which are described in so-called BAT reference Documents (BREFs).

SMALLER INDUSTRY

Boilers, heaters, engines and turbines used for electricity generation, residential heating and cooling, and heating and steam for industrial processes are addressed through the Medium Combustion Plant (MCP) Directive. It sets emission limits which are much less stringent than what is technically feasible.

RESIDENTIAL HEATING

Air pollution from domestic heating boilers and stoves is addressed by the Ecodesign implementing regulations which set rules for the marketing and use of energy-using products. The current emission limits set for boilers and stoves are very weak compared to what is technically feasible, they will also only apply to future installations from 2020 onwards.

SOLVENTS

Products containing solvents such as paints, varnishes, deodorants and nail polish are responsible for emissions of volatile organic compounds (VOC) which are precursors of ground-level ozone. Emission limits for paints and varnishes are set in the 2004 Paints Directive. VOC emissions from other products are not addressed by any EU legislation.

Ambient air quality

These rules ensure a minimum quality for the air we breathe. Member States must measure air pollution levels and comply with concentration limits for a number of harmful pollutants. When air quality levels are breached, air quality plans must be developed to address the problem.

THE NEC DIRECTIVE IN CONTEXT

More than 430,000 people die prematurely every year because of air pollution in the EU.[1] Air pollution is also the cause of many serious diseases leading to associated economic costs like extra medication, hospitalisations and millions of lost working days. It also causes great harm to biodiversity and ecosystem as well as crop yields, buildings and monuments.

The NEC Directive is the EU's main legal instrument to reduce overall emissions of air pollution. It sets limits on the amount of air pollution which can be emitted by each Member States each year. By doing so, it ensures emission reductions throughout the entire EU, which is crucial given the transboundary nature of air pollution.

The existing NEC Directive, which was adopted in 2001 sets limits for four pollutants to be achieved by 2010 and every year thereafter. The Directive was revised in 2016 to include new limits for 2020 and 2030 and to cover a new pollutant – $PM_{2.5}$. The 2001 Directive is still in effect until 2019, after which the new 2020 limits will kick in.

The NEC Directive complements other instruments which also aim to improve air quality in the EU:

- **The Ambient Air Quality Directive[2]** (AQD) sets limits for the *concentrations* of a variety of pollutants in the air, including PM_{10}, NO_2, $PM_{2.5}$ and SO_2. The NEC Directive and AQD are complementary: while the NEC Directive addresses the overall amounts of emissions (in kilotons), the AQD addresses the quality of the air (in µg/m^3). Many Member States are in breach of one of more limits set in the AQD. In November 2016, the European Commission had opened infringement proceedings against 19 Member States. By reducing overall emissions nationally, the NEC Directive helps national, regional and local authorities to comply with the air quality requirements of the AQD.[3]
- The EU also sets **emission standards for specific sources in different sectors** such as large industries (Industrial Emissions Directive), road vehicles (Euro standards), or household heating (Ecodesign). Some sectors like shipping and agriculture remain poorly or not regulated at EU level.
- At the international level, the EU and its Member States are party to the **Convention on Long-Range Transboundary Air Pollution** and its **Gothenburg Protocol**. The Convention brings together the EU, Central and Eastern European countries, the United States and Canada. The 1999 Gothenburg Protocol was revised in 2012 to include 2020 emission reduction commitments which have been directly copied into the revised NEC Directive.
- The **7th Environmental Action Programme** also includes objectives for air quality for 2020.[4] The objectives are to ensure that air pollution and its impacts are further reduced with the long-term aim of not exceeding the air quality guidelines set by the World Health Organisation (WHO) to protect health and the critical loads and levels for protection of plants and ecosystems.[5]
- Indirectly, **climate policies** play an essential role in bringing air pollution levels down. In particular, reduced fossil fuel consumption (e.g. through improved energy efficiency and energy savings, as well as greater use of cleaner renewable sources of energy) leads to reductions of air pollutants such as SO_2, NO_x, and $PM_{2.5}$.
- Transport, energy and agriculture policies can help to cut air pollutant emissions.

The NEC Directive is the EU's main legal instrument to reduce overall emissions of air pollution. It sets limits on the amount of air pollution which can be emitted by each Member States each year.

Table 1 – Air pollutants covered by the NEC Directive

Air pollutant	Impacts	What does the NEC Directive require Member States to do?
Particulate matter (PM)	Short and long-term exposure to PM causes respiratory and cardiovascular disease, atherosclerosis (thickening of the arteries), adverse birth outcomes, impacts on children's development of the brain and nervous system, diabetes, and can result in death. PM is also linked to respiratory infections and asthma in young children. Depending on their size, PM are referred to as either PM_{10}, which are coarser particles, or $PM_{2.5}$, which are finer particles. The smaller the particles, the greater the harm to human health.	Annual emission limits must be achieved by 2020 and 2030; Emissions must be reported annually and information made public.
Nitrogen oxides (NO_x)	Exposure can increase symptoms of bronchitis in asthmatic children and cause reduced lung function growth. NO_x emissions also contribute to the formation of ozone and PM. NO_X contributes to acid deposition and eutrophication which can lead to damages to soil and water quality.	
Sulphur dioxide (SO_2)	Exposure can damage the respiratory system, the functioning of the lungs and irritate the eyes. It can lead to aggravation of asthma and chronic bronchitis and makes people more prone to infections of the respiratory tract. Hospital admissions for cardiac disease and mortality increase on days with higher SO_2 levels. SO_2 emissions contribute to PM formation. SO_2 emissions also contribute to the acidification of soil, lakes and rivers. SO_2 is responsible for acid rain which is a cause of deforestation.	
Ammonia (NH_3)	Reacts in the air to form secondary PM, which is particularly harmful to health. NH_3 emissions cause eutrophication of soil and water and acidification of soil, lakes and rivers.	
Non-Methane Volatile Organic Compounds (NMVOCs)	Contribute to the formation of ground level ozone. In indoor environment, VOCs can lead to higher rates of allergies and asthma in children.	
Methane (CH_4)	Powerful greenhouse gas also involved in the formation of ground-level ozone which is harmful to human health and vegetation.	Not covered by the Directive (despite methane limits being part of the original European Commission proposal).
Ozone (O_3)	Short-term exposure can lead to more frequent hospital admissions and increase the risk of death from heart and respiratory disease. Ozone is also suspected to harm children's cognitive development and contribute to premature births. Ozone also damages vegetation, forests and crops.	Indirectly addressed through limits on VOCs and NO_x which cause ozone formation.
Black carbon (BC)	Black carbon has similar health effects to PM and contributes to the melting of arctic ice.	BC must be addressed as part of measures taken to reduce $PM_{2.5}$.

THE 2020 LIMITS AND THE ROAD TO 2030

The 2020 emission reduction commitment: a total lack of ambition

⊕ $PM_{2.5}$ included for first time

⊖ Total lack of ambition

The new NEC Directive sets targets known as National Emissions Reduction Commitments, or 'NERCs' to be attained by 2020 for five air pollutants: sulphur dioxide (SO_2), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), ammonia (NH_3) and particulate matter ($PM_{2.5}$). Particulate matter ($PM_{2.5}$) was not covered by the previous Directive, whereas all other pollutants were.

The 2020 NERCs show only very limited ambition. Projections indicate that Member States will already achieve these reduction commitments, in many cases by a wide margin, just by implementing existing legislation.

22 Member States were already in compliance with at least one of their 2020 NERCs in the year 2012.[6] Out of all 140[7] NERCs, 36 were already met in 2012, in most cases SO_2 and NH_3 NERCs.

In some cases, the proposed NERCs would even allow for higher emissions in 2020 than what was permitted under the 'old' NEC Directive for 2010.[8] For instance, Austria's NO_x NERC for 2020 is 40% higher than the 103,000 tons maximum permitted for 2010.

As a result of this lack of ambition, air pollution due to $PM_{2.5}$ exposure is expected to cause more than 300,000 premature deaths in the EU in the year 2020.[9] The annual health costs of air pollution are expected to amount to €243-€775 billion and two thirds of EU air quality zones would still breach the WHO recommended level for $PM_{2.5}$.[10]

A more ambitious scenario based on "maximum technically feasible reductions" (MTFR) could have saved tens of thousands of additional lives in 2020 (see infobox, 'MTFR', page 13 and table 3 below). Additional non-technical solutions such as increased energy efficiency could reduce emissions further, leading to greater health benefits. Unfortunately, none of these options were considered as part of the revision of the NEC Directive.

Table 2 – EU-28 emission reductions for 2020, relative to 2005
(including 2012 for reference)

	2012	2020 CLE*	2020 NEC	2020 MTFR†
	Already achieved reductions	Expected reductions due to existing legislation	Reductions required by NEC Directive	Possible reductions using recognised techniques
SO_2	-48%	-66%	-59%	-78%
NO_x	-27%	-50%	-42%	-60%
$PM_{2.5}$	-12%	-8%	-22%	-44%
NH_3	-5%	0%	-6%	-29%
NMVOC	-24%	-31%	-28%	-57%

Sources: IIASA reports TSAP#16 and TSAP#6
* see infobox 'Baseline or Current Legislation (CLE) Scenario', page 13
† see infobox 'Maximum Technically Feasible Reductions' (MTFR), page 13

Table 3 – EU-28 premature deaths due to $PM_{2.5}$ in 2020

	2013	2020 NEC	2020 MTFR
	Based on reported emissions	Expected following NEC Directive	Possible using recognised techniques
Premature deaths	436,000	325,000	233,000

Sources: Commission impact assessment summary, EEA 2016 air quality report, EMRC for EEB air-o-meter.

What is a NERC?

National Emissions Reduction Commitments (NERCs) are reductions in emissions which Member States must deliver for certain air pollutants by a certain date, to push down total air pollution across the EU. There are NERCs for five different air pollutants (SO_2, NO_x, NMVOCs, NH_3 and $PM_{2.5}$) and for both 2020 and 2030 target years.

They have been calculated based on computer models searching for a lowest cost solution to attain a given health and environmental goal. The variation between national targets is due to the model taking into account different parameters.

There are 280 NERCs in total (28 Member States x 5 pollutants x 2 target years) and are all listed in the Directive's Annex II (and Annex I of this report). They are expressed in percentage reductions between 2005 levels and the given target year.

Example: Belgium's 2030 NERC
Belgium will have to cut its $PM_{2.5}$ emissions by 39% by 2030, compared to 2005 absolute levels.

What is CLE?

The baseline, or **Current Legislation (CLE) scenario** gives estimates of projected emissions by a given date, assuming full implementation of existing EU policies, but nothing more. It uses projections of economic growth, energy use, transport activities and agricultural production. It is important to note that the baseline scenario referred to in this report does not include the most recent climate and energy models published in June 2016 by the European Commission (new PRIMES scenario).[11] The latter are expected to show greater emission reductions as a result of updated, more ambitious, climate and energy policies.

What is MTFR?

The so-called '**maximum technically feasible reductions**' (MTFR) scenario demonstrates the extent to which emissions could be further reduced through the application of readily available technical measures. It should be noted that structural changes (e.g. in the energy or transport sectors) or behavioural changes by consumers are not included, and that the changes expected to result from the EU's new climate and energy policy are also not included.[12] Despite its name, it is therefore a relatively conservative concept.

The 2025 trajectory: a toothless, informative tool

⊕ Member States must provide information about their emissions reductions which allows for progress checks

⊖ No binding limits for 2025
⊖ Member States set their own, non-enforceable limits

During the negotiations, the European Parliament pushed for binding NERCs for 2025.[13] But the Member States in the Council refused to commit themselves to any binding reductions for this target year.

Instead, Member States now only have to indicate which levels they expect to meet in 2025. By default, such levels should follow a linear trajectory defined by the 2020 and 2030 NERCs, but Member States can decide to deviate from this trajectory for whichever technical or economic reason. If so, they must ensure that the non-linear trajectory converges progressively towards the linear trajectory as from 2025 and that this will not affect the attainment of their 2030 NERCs.

If a Member State does not meet its indicative 2025 trajectory, it must simply explain the reasons for that deviation as well as the measures that would bring it back on the trajectory in its inventory report (see page 20).

The 2025 provisions are therefore doubly weak. First, Member States have full discretion in defining the levels they want to achieve in 2025. Secondly, Member States are not bound by the trajectory they define themselves, making it nearly impossible for the European Commission and/or citizens to enforce the trajectory.

The provision can nevertheless be useful to track progress towards better air quality. Member States are obliged to provide information about the trajectory and must consult the public when determining their intermediate levels. They are also obliged to provide information in their 2027 inventory report in case of failure to comply with the trajectory, and to detail measures that would bring them back on the right track. **Such information can be useful for citizens and the European Commission to track the effective progress towards the achievement of the 2030 NERCs**. It can also be an important way for NGOs to influence which levels are set for 2025, through their involvement in the development of Nation Air Pollution Control Programmes (see page 23).

THE 2030 NERCS: THE CORE OF THE NEW DIRECTIVE

Emission reduction commitments to be achieved by 2030

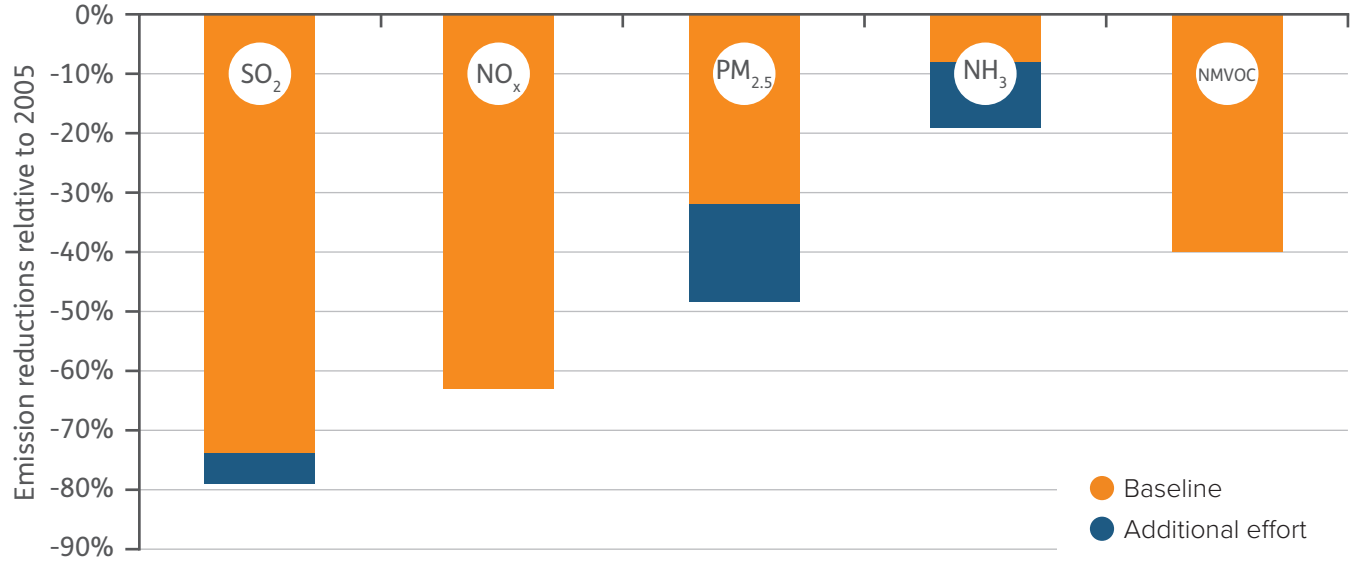
- ⊕ Expected to save around 78,000 lives in 2030 if fully implemented
- ⊕ Expected to drive much-needed action to cut ammonia and $PM_{2.5}$ emissions
- ⊖ Leaves 249,000 premature deaths EU-wide in 2030 unaddressed
- ⊖ Contains flexibilities which undermine ambition level
- ⊖ Very little effort required for SO_2, NO_x and NMVOCs beyond baseline

Table 4 – EU-28 emission reductions for 2030, relative to 2005
(including 2012 for reference)

EU 28	2005	2012	2020 NEC	2030 CLE*	2030 NEC	2030 MTFR†
	Total emissions (kt)	Already achieved reductions	Reductions required by NEC Directive	Expected reductions due to existing legislation	Reductions required by NEC Directive	Possible reductions using recognised techniques
SO_2	7710	-48%	-59%	-74%	-79%	-84%
NO_x	11531	-27%	-42%	-63%	-63%	-73%
$PM_{2.5}$	1414	-12%	-22%	-32%	-49%	-62%
NH_3	3878	-5%	-6%	-8%	-19%	-35%
NMVOC	8775	-24%	-28%	-40%	-40%	-61%

Sources: Final agreement on the NEC Directive (30 June 2016) and IIASA TSAP report #16a (January 2015)
* see infobox 'Baseline or Current Legislation (CLE) Scenario', page 13
† see infobox 'Maximum Technically Feasible Reductions' (MTFR), page 13

Figure 1 – Comparing the 2030 NERCS with baseline



Sources: Final agreement on the NEC Directive and IIASA TSAP report #16a

What will the NERCs mean in practice?

In order to understand what the NERCs will actually deliver, it can be useful to compare them against emission reductions that are already expected to occur as the result of existing EU legislation (the so-called "baseline scenario", see infobox: "What is CLE", page 13).

The greatest effort will be required for Member States to achieve their NERCs for particulate matter ($PM_{2.5}$) and ammonia (NH_3) by 2030. The limits established for these pollutants will require action beyond what is already expected to result from implementing existing legislation (see figure 1).

- **Ammonia** emissions will have to be cut by 19% by 2030, relative to 2005 levels. This overall reduction effort is relatively low compared to SO_2 and NO_x for which emissions will have to be cut by more than half. But ammonia is the pollutant which will require most additional action beyond the baseline. **Apart from Ireland, Greece and Denmark, the NEC Directive will require all Member States to take additional action to reduce ammonia emissions**. This is clearly a step forward, even though the NERCs have been significantly watered down compared to what was initially proposed by the European Commission.[14]

- **$PM_{2.5}$ emissions** will have to be cut by 49% by 2030, relative to 2005 levels. As for ammonia, additional measures will be essential to achieve the emission reduction commitments. **Apart from Greece and Malta, all Member States will have to take additional measures in order to meet their 2030 NERCs for $PM_{2.5}$**. Measures to reduce emissions from residential heating by burning solid fuels (wood and coal) are expected to form a large part of these additional efforts.[15]

The picture is different for three other pollutants regulated by the new Directive. The NERCs set for SO_2, NO_x and NMVOCs are relatively weak when compared to the baseline (see Figure 1).

- **SO_2 is the pollutant facing the greatest cut in absolute terms**, with a 79% decrease for the whole of the EU between 2005 and 2030. But most of their reduction is expected to result from legislation that is already in place. The proper implementation of the Industrial Emission Directive (IED) and changes in activity levels, such as the declining use of higher-sulphur fuels like coal and heavy fuel oils will already contribute to a significant cut in SO_2 emissions. Out of the 79% emission reductions required, only 5% is expected to trigger additional measures.[16] **Eight Member States (Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, the Netherlands, and Malta) have even been allocated SO_2 NERCs which are actually equal to, or even weaker than, what they are currently projected to emit, thereby requiring absolutely no extra action to reduce air pollution.**

- **NO_x emissions** will have to be cut by 63% by 2030, relative to 2005 levels. This may sound like a big effort but is in fact purely the result of expected changes in activity levels and existing legislation, most notably the implementation of Euro standards for road vehicles. In contrast, if all best available techniques were to be implemented, a further 10% cut could be achieved.[17] **Thirteen Member States (Austria, Bulgaria, Cyprus, Estonia, Finland, Greece, Ireland, Latvia, Luxembourg, Malta, Poland, Spain and Sweden) have even been allocated NERCs for NO_x which require no additional action to reduce air pollution**.

- **NMVOC emissions** show a similar picture to NO_x, with no additional measures likely to be necessary to achieve the 40% reduction required for the EU as a whole. **Twelve Member States (Austria, Bulgaria, Denmark, Germany, Ireland, Latvia, Luxembourg, the Netherlands, Poland, Portugal, Romania and Sweden) have even been allocated NMVOC NERCs which are equal or even weaker than their projected baseline**.

This means that the revised NEC Directive is not expected to be the primary driver for much further emission reductions of SO_2, NO_x and NMVOCs. Of course, this assumes that all EU existing legislation fully delivers, which is not necessarily the case in practice. For instance, Member States could be implementing EU environmental legislation too late or insufficiently, leading to emissions which are higher than the baseline scenario. Emissions can also turn out to be higher in reality than what is prescribed by EU legislation, as in the case of NO_2 emissions from diesel vehicles in real-driving conditions. Diesel cars have been shown to exceed the legal Euro standards by up to 15 times.[18] **For these reasons, NERCs can still provide a useful legal framework to speed up emission reductions, even for SO_2, NO_x and NMVOCs.[19]**

The greatest effort will be required for Member States to achieve their NERCs for particulate matter and ammonia by 2030.

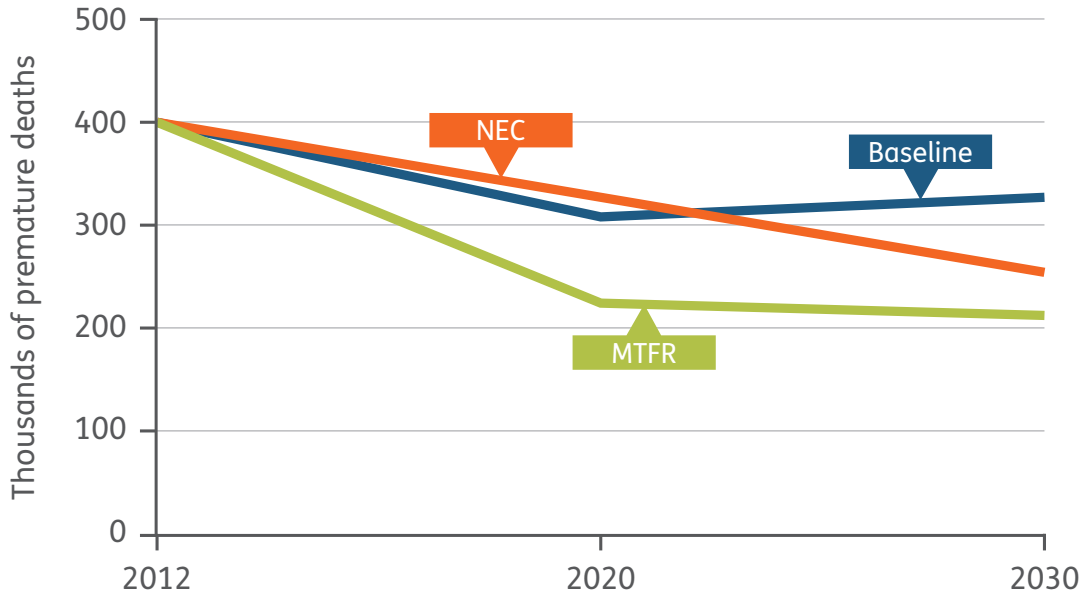
Expected health improvements

Table 5 – Premature deaths due to $PM_{2.5}$: with and without the NEC Directive

EU 28	2013	2020 NEC	2030 CLE*	2030 NEC[Ø]	2030 MTFR[†]
	Based on reported emissions	Expected following NEC Directive	Expected due to existing legislation	Expected following NEC Directive	Possible using recognised techniques
Premature deaths	436,000	325,000	327,000	249,000	218,000

Sources: Commission impact assessment summary, EEA 2016 air quality report, EMRC for EEB air-o-meter.
Ø 2030 NEC premature deaths are 49.6% less than 2005 levels, according to preliminary estimates by the European Commission and Council. Final numbers are expected to be published in the course of 2017.
* see infobox 'Baseline or Current Legislation (CLE) Scenario', page 11
† see infobox 'Maximum Technically Feasible Reductions' (MTFR), page 11

Figure 2 – Number of premature deaths due to $PM_{2.5}$ exposure

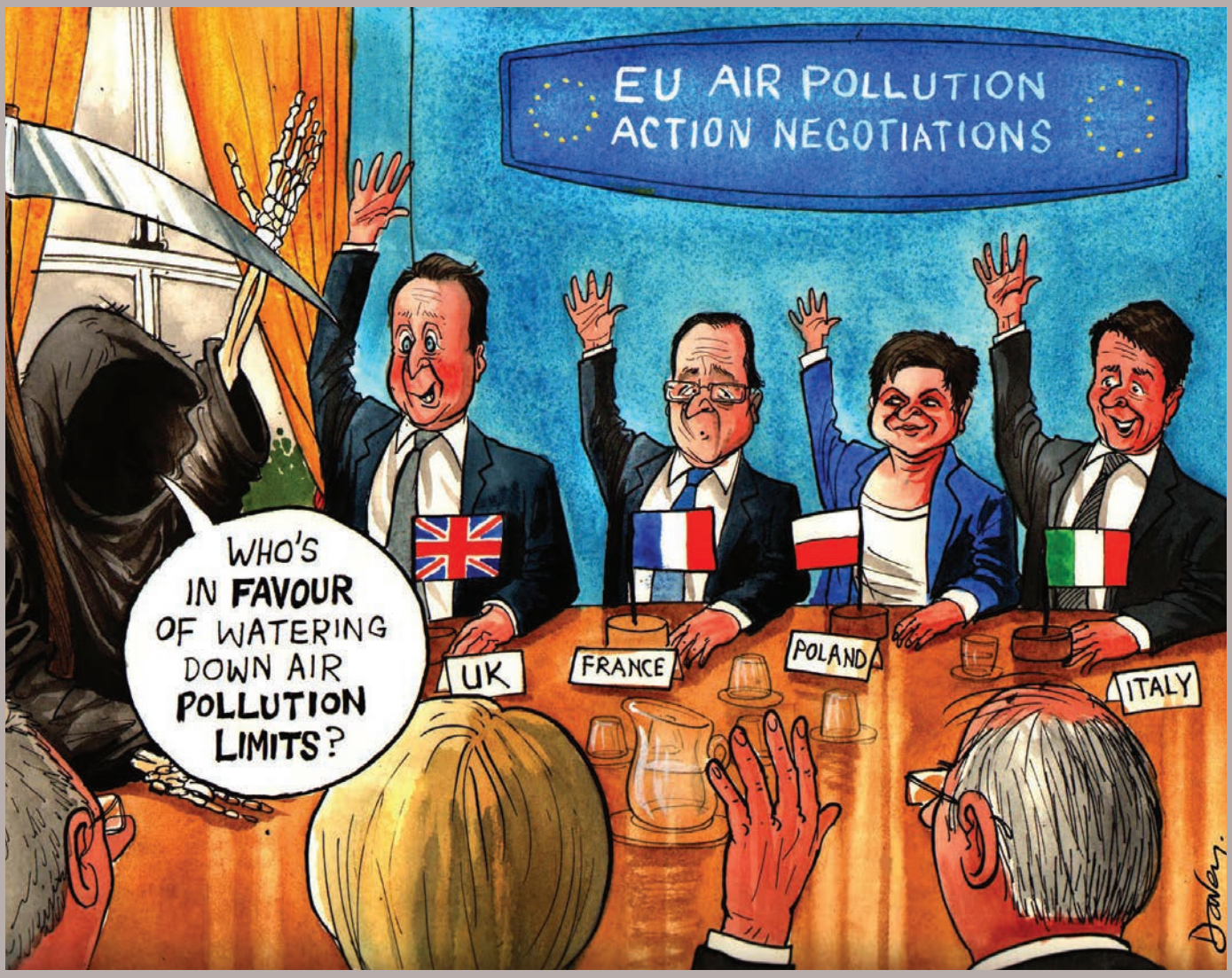


Sources: Commission impact assessment summary, EEA 2016 air quality report, EMRC for EEB air-o-meter.

- Compared to 2005 levels, **the 2030 NERCs are expected to reduce the health impacts of air pollution by 49.6% in 2030**, i.e. cut premature deaths from $PM_{2.5}$ by almost half. The initial Commission proposal would have saved an additional 12,000 lives each year.
- Compared to the business as usual scenario, the NEC Directive will offer a 24% health improvement, or 78,000 lives saved in 2030.
- When looking at the EU's air quality objective set in the 7th Environmental Action Programme, the 2030 NERCs are still far from sufficient to deliver on the EU's ambition of achieving "levels of air quality that do not give rise to significant negative impacts on, and risks to human health and the environment".
- **249,000 Europeans are still expected to die prematurely because of air pollution in 2030**, even after the full implementation of the Directive.

Estimates of air pollution's damage to ecosystems under the new NEC Directive, for instance due to eutrophication, are not yet available. This information is expected to be published by the European Commission in the course of 2017.

BEHIND THE SCENES: MEMBER STATES LOBBYING FOR WEAKER TARGETS



The agreed NERCs are much less ambitious than what was first proposed by the European Commission. Of the 140 NERCs for 2030, 79 are weaker than the initial proposal. This is the result of a strong push back from the Council. Some national governments were particularly successful in watering down their NERCs:

- **Bulgaria, Greece and Romania** managed to weaken their NERCs for all five pollutants;
- **Austria, Denmark, Italy, Poland and the UK** lowered their targets for four of the five pollutants.

For the EU as a whole, **ammonia and NMVOC** are the pollutants for which the ambition level has been downgraded the most, by six percentage points. This outcome for ammonia is particularly remarkable as the initial emission reductions proposed for this pollutant were much less ambitious than those for the other pollutants.

Member States also managed to **remove methane completely from the Directive**, despite objections from the European Parliament and the Commission and criticism from civil society.

The industrial farming lobby was extremely active and successful in getting rid of methane NERCs and drastically lowering the ambition for ammonia.

On top of that, Member States introduced a variety of **additional flexibilities** in order to make it easier for them to comply with their NERCs (see page 24).

COMING UP: REVIEW BY 2025

The European Commission is obliged to review the Directive by the end of 2025, with a view to bringing the EU closer to the Directive's objectives set in Article 1 and in the 7th Environmental Action Programme. Those objectives include meeting air quality levels in line with the World Health Organisation (WHO) guidelines as well reducing air pollution impacts on ecosystems and biodiversity in line with critical loads and levels.[20] The European Commission will also have to look into the possible inclusion of **mercury**, a highly transboundary pollutant with significant adverse impacts on human health. Based on its assessment, the European Commission will decide whether to propose new policies to further address air pollution in the EU. This could materialise in new sector policies, new limits for ambient air quality, and/or a revised NEC Directive with post-2030 objectives.

TARGETED: BLACK CARBON

Black carbon is emitted in the form of $PM_{2.5}$ through the incomplete combustion of fossil fuels, biofuels, and biomass. In addition to its severe impacts on human health, black carbon contributes significantly to the melting of arctic ice.[21] **The new NEC Directive is the first piece of EU legislation which specifically addresses black carbon emissions**. The text does not set NERCs for black carbon but requires Member States to prioritise emission reduction measures for this pollutant when taking action on $PM_{2.5}$.[22] Member States must also report their annual black carbon emissions, but only if such inventories are available.[23]

WANTED: EMISSION REDUCTIONS FOR METHANE

In the EU, it is estimated that around half of all methane emissions come from agriculture (mainly livestock farming), a third comes from waste (solid waste disposal and wastewater treatment) and around 14% comes from fuel extraction and distribution (coal mining and distribution of natural gas).[24]

Methane is one of the "basket of six" greenhouse gases covered by the Kyoto Protocol at international level and by the Effort Sharing Decision (ESD) at EU level. Under the ESD, Member States are required to meet an overall reduction target for these greenhouse gases. They can decide which greenhouse gases to reduce, and do not have to address methane specifically.

There is currently no legislation which specifically addresses methane emissions in the EU, and the fact that methane contributes to ground-level ozone. The European Commission attempted to address this by including NERCs for methane in their proposal for the revised NEC Directive, but this was rejected by the Council, as a result of strong pressure from the agriculture lobby.[25]

Under existing legislation, methane emissions are expected to drop by 24% by 2030, relative to 2005. A so-called "maximum technically feasible reductions scenario" (MTFR) could lead to reductions of 46% by 2030.[26]

CHAPTER 2
THE NEC DIRECTIVE: HOW DOES IT WORK?

ANNUAL EMISSION INVENTORIES

Every year, before the 15th of February, Member States must report their national emissions to the European Commission. Emissions occurring during a given year are reported two years after that year. For example, Member States will have to report their 2015 emissions before 15 February 2017.

Emission inventories are publicly available and are used for the purpose of assessing compliance with the NERCs:

- **From 2017 until 2021** inclusive, Member States will report emissions for the period 2015-2019, for the purpose of complying with the old Directive's 2010 ceilings.
- **In February 2022** and every year until 2031, Member States will report emissions for the purpose of complying with the 2020 NERCs.
- **As of 2032**, Member States will have to annually report their emissions for the purpose of complying with the 2030 NERCs. As there is no "expiration date" for the 2030 NERCs, Member States will have to continue reporting their emissions every year and in theory indefinitely – or until new limits come into force.

The new Directive brings several changes to the inventories process, including two positive ones:

- ⊕ **The European Commission is now obliged to regularly review national emission inventories and verify their transparency, accuracy, consistency, comparability and completeness**, with the help of the European Environmental Agency. If the corrections proposed by the Commission are challenged by the Member State, the Commission has the final say. It can adopt a Decision laying the technical corrections to be applied to the Member State concerned.[27] This provision should help overcome one the previous Directive's shortcomings, namely the lack of detail in, and consistency of, national emission inventories.[28]
- ⊕ Unlike under the 'old' Directive, **Member States must now report entire time series, starting from 1990**.[29] This means that in 2017, Member States will report their emissions for 2015 and every year back to 1990. This will improve the quality of reporting.

The new rules' major weakness is the possibility for Member States to "adjust" their emission inventories to ensure compliance with their NERCs. Such an adjustment will be possible in three cases[30]:

- ⊖ The breach is due to emissions from a new source which was not known at the time the NERC was set; or
- ⊖ The breach is due to a significantly different emission factor used for determining emissions from a given source; or
- ⊖ The breach is due to different methodologies used for determining emissions from a given source.

The last two conditions are tightened up from 2025. After this date, Member States who want to adjust emission factors must demonstrate that "the significantly different emission factor" is not due to its failure to implement or enforce EU source policy domestically.[31] The Member State must also have highlighted the difference in emission factor to the Commission. There are some open questions concerning the interpretation of these conditions, which will largely depend on the Commission's interpretation and willingness to restrict the use of flexibilities.

Member States who wish to make use of the adjustment must explain how they fulfill these conditions in their **informative inventory report** to be submitted by 15 March of the reporting year. This report must also be made available to the public.[32] After receipt of the report, the Commission has nine months to oppose the use of the flexibility. If the Commission does not raise any objections, the flexibility is deemed to have been approved.

It should be noted that the adjustment of emission inventories can also apply for the purpose of complying with the old Directive's 2010 ceilings. Some Member States are therefore expected to use it in 2017 when reporting on their 2015 emissions. They will have to justify such use in their inventory report by 15 March 2017, and the Commission will have until the end of December 2017 to oppose it.

Environmental NGOs were critical of the introduction of this flexibility during the negotiations between the Parliament and Council.[33] The second condition was particularly criticised as it allows greater emissions in case an emission factor turns out to be greater than expected, as was recently found to be the case with emissions of oxides of nitrogen (NO_x) from diesel cars.

Instead of pushing Member States to take immediate action to compensate for possible unforeseen emissions from one sector, the new rules are likely to leave any increased emissions and associated health and environmental impacts unaddressed.

In addition to their obligation to annually report emissions, Member States must calculate future emission projections (which must be reported every two years) and must monitor the impacts of air pollution on ecosystems (reporting every four years). On the basis of Member States' national inventories and projections, the Commission will annually prepare EU wide inventories, projections and inventory reports.[34]

The new rules' major weakness is the possibility for Member States to "adjust" their emission inventories.

ADJUSTMENTS APPROVED UNDER THE LRTAP CONVENTION

The Convention on Long-Range Transboundary Air Pollution (CLRTAP) is the international instrument for cutting air pollution across several continents. It was formed within the UN Economic Commission for Europe, of which all the countries of Europe are members, as well as the United States and Canada. The LRTAP Convention has several Protocols, one of which is called the "Gothenburg Protocol" and sets limits on emissions of SO_2, NO_x, NH_3, NMVOCs and $PM_{2.5}$ to be attained by 2020 (but no limits for 2030).

The possibility for adjusting emission inventories was introduced in the Gothenburg Protocol, and later added to the NEC Directive.

In 2016, seven EU Member States have applied for adjustments to their emission inventories under the LRTAP Convention for the purpose of complying with their 2010 Gothenburg Protocol commitments. Many adjustments relate to new sources in emission inventories (e.g. NMVOC from agriculture) as well as for the increased real-driving NO_x emission from vehicles. All of them have been approved.[35]

It is likely that the same countries will apply for adjustments under the NEC Directive. However, **it is important to note that the approval of an adjustment under the LRTAP Convention does not necessarily mean that the same adjustment will be approved for the NEC Directive at EU level.**

ADJUSTMENT OF EMISSION INVENTORIES APPROVED UNDER THE LRTAP CONVENTION IN 2016

Country	Pollutant	Sector concerned	Decision
Belgium	NO_x	Road transport	✓
	NO_x	Agriculture – manure management and soils	✓
	VOC	Agriculture – manure management and crops	✓
Denmark	VOC	Agriculture – manure management	✓
	NH_3	Agriculture – fertilisers and crops	✓
Finland	NH_3	Road transport	✓
	NH_3	Industry, residential, agriculture	✓
France	NO_x	Road transport	✓
Germany	NO_x	Road transport	✓
		Agriculture – manure management	✓
		Agriculture – fertilisers	✓
	VOC	Agriculture – crops	✓
	NH_3	Agriculture – other	✓
Luxembourg	NO_x	Road transport	✓
		Agriculture – manure management	✓
	VOC	Agriculture – crops	✓
Spain	NO_x	Road transport	✓

Source: UNECE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NATIONAL AIR POLLUTION CONTROL PROGRAMMES (NAPCPS)

In order to meet their national emission reduction commitments (NERCs) and contribute to the Directive's objectives, **Member States must develop and adopt so-called "National Air Pollution Control Programmes"** (NAPCPs). NAPCPs already exist under the old NEC Directive but have proven to be relatively poor and to lack consistency among Member States.[36] The new NEC Directive aims to make NAPCPs a more effective and reliable tool for improving air quality.

Minimum requirements for NAPCPs

The Directive contains a new set of minimum binding requirements for the content of NAPCPs.[37] In particular:

- Member States must detail the **policy options** considered for attaining their 2020 and 2030 NERCs as well as their 2025 trajectory but also to "further improve the air quality" beyond their NERCs.
- Member States must assess how the selected measures will ensure **coherence with other relevant programmes**, such as those taken to meet the Ambient Air Quality Directive's standards for human health.[38]
- The **authority responsible** for the implementation of the programme must be designated.
- A **timetable** for implementation and review of the selected measures must be detailed.

All this information was largely missing from previous national programmes.[39]

The Directive contains a second set of measures which are specifically targeted at emissions from farming.[40] This check-list is there to compensate for the absence of EU legislation to address air pollution from agriculture. Unfortunately, all provisions are voluntary, with the exception of the establishment of a "national advisory code of good agricultural practice to control ammonia emissions" and the ban of ammonia carbonate fertilisers.

Updates

While the 'old' Directive required only one programme update in 2006, the new Directive requires regular updates. The first NAPCPs are expected to be reported to the European Commission in the first quarter of 2019.[41] After that, Member States will have to update their NAPCPs:

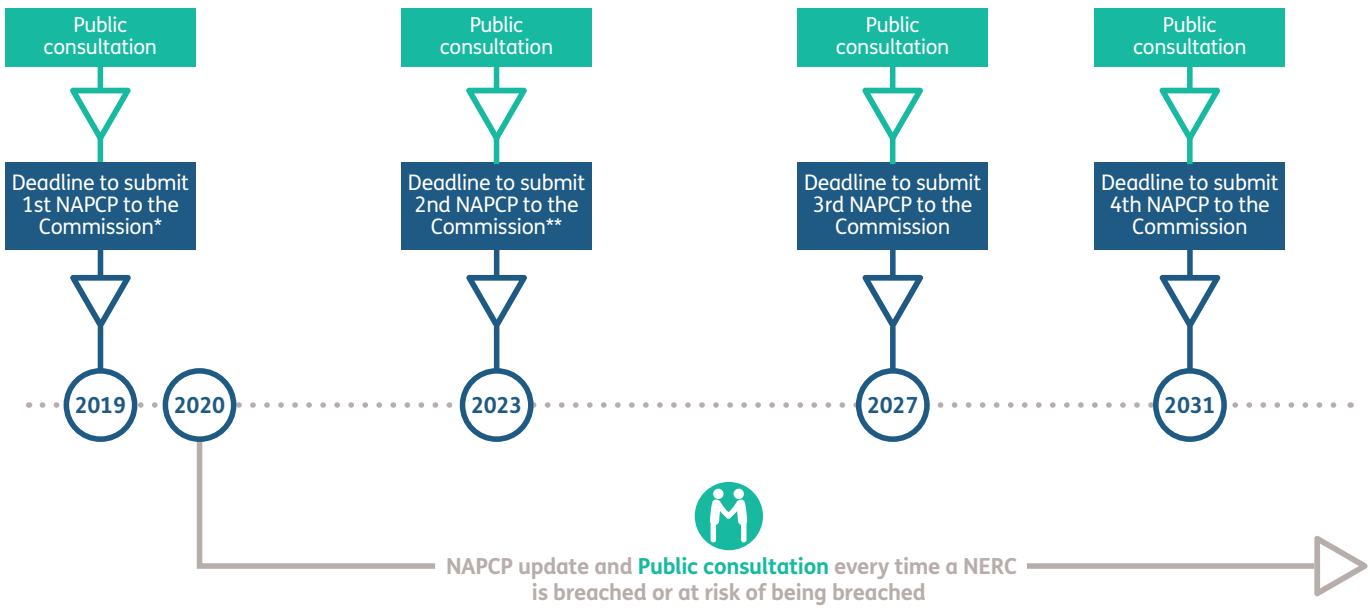
- Every four years; or
- Every time it appears one of their NERCs is breached or is at risk of being breached.[42]

Regular updates will force Member States to address air pollution problems more systematically. It will provide an opportunity for assessing and reviewing their policies, and to involve the public at regular intervals. It will also provide the European Commission with better information about progress and possible compliance problems.

Public consultation

The new NEC Directive provides an explicit obligation for Member States to consult the public when drawing up and adopting NAPCPs. An analysis of previous national programmes had shown that the consultation of the public was not systematic.[43]

Figure 3 – Timeline for NAPCP adoption



*27 months after Directive's entry into force
** 4 years after 1st NAPCP

European Commission's supporting and supervising role

The European Commission is expected to support the elaboration of NAPCPs by providing guidance and facilitating exchanges of best practices between Member States. In particular, the Commission will have to define a common format for NAPCPs, and is expected to update the list of measures related to farming based on developments under the LRTAP convention. Finally, the Commission must facilitate the elaboration and implementation of the NAPCPs, for example though an exchange of best practice and via the "European Clean Air Forum" set up by the Directive.[44]

- **The inclusion of binding rules for the development of NAPCPs is a positive feature of the new NEC Directive. It will help improve their effectiveness and consistency between domestic air pollution policies.**
- **The inclusion of a right for the public to participate in the development of the NAPCPs is also welcome.**

Going beyond the limits

When developing their NAPCPs, Member States should not only focus on meeting their NERCs but also strive for the achievement of the Directive's health and environmental objectives. This includes meeting safe levels of air quality in line with the World Health Organisation (WHO) guidelines which is a much more adequate criterion than the NERCs for protecting people's health.

Going beyond the targets set in the NEC Directive is needed for health and environmental reasons. The pollution targets adopted by the European Parliament and Council would still leave us far from the "safe" air pollution levels recommended by the WHO.[45] **Even if all NERCs are met, nearly a quarter of a million EU citizens would die prematurely due to air pollution in the year 2030 alone.**

Greater reductions are possible, as shown by the European Commission's initial proposal and impact assessment. **Even in the most ambitious policy scenario considered by the Commission in 2013, benefits proved to be higher than the costs**. The cost was estimated at about €50 billion/year in 2030 while the health benefits alone are valued at €58 – €207 billion/year, i.e. a difference of €8 – €157 billion.[46]

Greater progress will also be made possible by the positive effects of climate and energy policies on air quality. Reduced fossil fuel combustion would lead to fewer emissions of SO_2, NO_x, PM and other harmful pollutants. When implementing the Directive and developing their NAPCPs, the NERCs should be the absolute minimum targets that Member States set. **Greater efforts will provide greater benefits to human health and the environment.**

FLEXIBILITIES

A major weakness of the Directive lies in the number of "flexibilities" which have been introduced by the Council during negotiations, despite opposition by the European Parliament and strong criticism by civil society.[47] These flexibilities list a number of situations in which Member States would not be held accountable for breaching their NERCs. This section contains a brief description of the main flexibilities introduced by the new Directive.

Member States who wish to make use of any flexibility must explain how they fulfill the flexibility's conditions in their informative inventory report to be submitted by 15 March of the reporting year. After receipt of the report, the Commission has nine months to oppose the use of the flexibility. If the Commission does not raise any objections, the flexibility is deemed to have been approved.

Some flexibilities can also be found in the LRTAP Convention (see infobox on page 21). It should be noted that the approval of a flexibility under LTRAP convention does not mean that the European Commission will automatically approve it for the NEC Directive. **It is therefore crucial that the Commission carefully scrutinises the use of flexibilities by Member States and rejects them where the relevant conditions have not fully been met**.

Adjustment of national emission inventories

(see page 20)

The possibility for Member States to adjust their own emission inventories has the biggest scope of application and is therefore potentially the most damaging of the flexibilities. It is expected to be widely used by Member States, starting in 2017 as they "excuse" their breach of the 2010 ceilings in 2015.

3-year averaging

The new Directive allows Member States to calculate their emissions based on a three-year average in the event of an exceptionally cold winter or an exceptionally dry summer.[48]

This flexibility raises several concerns. Firstly, "exceptionally cold winters" and "exceptionally dry summers" are not defined and can be subject to various interpretations, with a risk of abuse by Member States. Secondly, extreme weather conditions can exacerbate air quality problems, making it particularly important that Member States minimise pollution during these periods. Thirdly, the possibility of calculating the three-year average will delay by at least a year the time by which the Commission can determine whether a breach of the Directive has occurred, further delaying the prospect of effective enforcement.

Pollutant swapping

The Council introduced another flexibility which allows Member States to exceed certain NERCs for a maximum of five years in case the NERC is set at a more stringent level than the cost-effective reduction identified in the initial commission proposal[49] and after having implemented all cost-effective measures to comply with the NERC. If so, the Member State can compensate the non-compliance by an equivalent emission reduction of another pollutant in Annex II.[50]

NERCs which could be exceeded through pollutant swapping

Country	NERC
Croatia	Ammonia
Czech Republic	$PM_{2.5}$
Denmark	NO_x
Finland	Ammonia
Germany	SO_2, NO_x, $PM_{2.5}$
Ireland	SO_2, $PM_{2.5}$
Latvia	SO_2, Ammonia
Lithuania	Ammonia
Luxembourg	SO_2
Netherlands	$PM_{2.5}$
Poland	$PM_{2.5}$
Portugal	NO_x
Slovakia	NO_x
Slovenia	SO_2
Spain	SO_2
Sweden	SO_2, $PM_{2.5}$

This flexibility raises several concerns. In particular, the methodology for compensating emissions is not defined in the Directive and might raise serious difficulties. Using the concept of "PM equivalence" as an exchange rate between pollutants is a possible option, but this would give primary $PM_{2.5}$ much higher importance than other pollutants. This means that health impacts from other pollutants and ecosystem protection are regarded as less important and could, for example, result in more damage to ecosystems through nitrogen deposition.

Exceptional events related to the energy sector

The Council introduced another flexibility that would excuse breaches of a NERC if it was caused by unforeseeable events leading to a sudden and exceptional interruption of the power and/or heat supply or production system which could not reasonably have been foreseen.[51] The use of this flexibility is limited to a maximum of three years and subject to two cumulative conditions:

- Member States must demonstrate that all reasonable efforts have been put in place to meet the NERC and should continue to do so to keep the period of non-compliance as short as possible.
- Member States must demonstrate that additional measures would have lead to disproportionate costs, substantially jeopardised national energy security or posed a substantial risk of energy poverty to a significant part of the population.

Like all other flexibilities, the European Commission will play an important role in restricting abuse by Member States. If the conditions are strictly applied by the Commission, this flexibility could be limited in practice.

The flexibilities pushed by the Council are one of the main weaknesses of the new NEC Directive. It is now up to the European Commission to strictly limit the use of flexibilities to exceptional cases and to interpret the Directive's conditions in a restrictive way. In particular, it should not be influenced by the decisions taken under the LRTAP convention. This is essential in order to avoid undermining the effectiveness of the Directive and to avoid increased emissions and associated health and environmental damage.

It is crucial that the European Commission carefully scrutinises the use of flexibilities.

ENFORCEMENT

It is essential that the rules laid down in the NEC Directive are complied with if it is to deliver reductions in pollution and the resulting benefits to human health and the environment.

Enforcement by the Commission

The Commission has primary responsibility for ensuring that Member States comply with EU law.

It ultimately has the power to bring legal action against Member States where they fail to meet one of their NERCs. However, this process would not normally start until the Member State had breached its NERC according to official data reported to the Commission. This means if **a Member State breached its 2030 NERC, the Commission could not even start legal proceedings until 2032**. The legal process is very lengthy, taking an average of four to five years from the first warning letter to a first court judgment.[52] So **a breach of a 2030 target would likely not result in a court judgment until 2036**.

Given these timescales, it is essential that the Commission takes appropriate pre-emptive action before targets are breached. The Commission must:

- Check the correct and complete transposition of the Directive by Member States.
- Use its powers of scrutiny to ensure that Member States comply with their reporting obligations and prepare adequate NAPCPs.
- Strictly apply the conditions applicable for the use of the flexibilities by rejecting applications by Member States where the conditions are not satisfied in full.
- Be prepared to start infringement proceedings when Member States fail to comply with any procedural requirements of the Directive, not just breaches of the NERCs (in particular if a Member State fails to prepare an adequate NAPCP, or fails to provide adequate information to the public or the Commission.)

The Court of Justice of the EU has repeatedly held that concerned groups and individuals have the right to go to court to enforce air pollution laws.

Enforcement by the public

Citizens and NGOs also have a crucial role in enforcing the NEC Directive.

The Commission has limited resources and has no powers of inspection, so must accept on trust information reported to it by Member States. **Members of the public can assist the Commission by providing information and making official complaints where there has been a breach of the Directive**. The Commission can then use this information to bring legal action against Member States, but is under no obligation to do so.

More importantly, members of the public can enforce compliance with the national rules by taking legal action before national courts.

The Court of Justice of the EU has repeatedly held that concerned groups and individuals have the right to go to court to enforce air pollution laws. In the *Janecek* case[53], it was established that where air quality limit values are not achieved, or there is a risk that they will not be, the public has the right to go before national courts to demand an action plan. National courts must also review the adequacy of the measures included in plans and if necessary, provide effective judicial remedies to ensure a lawful plan is adopted.[54]

These principles were then extended to national programmes required under Article 6 of the original NEC Directive.[55] This is now confirmed by the new NEC Directive's Recital 27.

As with the Commission infringement action, national legal action should not wait until after a breach of the NERCs has occurred – as by then the damage has occurred and there is little that the Court can do to remedy the situation. **National enforcement action should therefore focus on early action to challenge any breaches of procedural rules laid down in the NEC Directive**, such as the requirements to make information on emissions publicly available and to prepare adequate NAPCPs. National courts have a duty to uphold such rules, regardless of the possibility of legal action by the Commission.

CHAPTER 3
THE NEC DIRECTIVE: HOW TO COMPLY?
FOUR CONCRETE ACTIONS TO TACKLE AIR POLLUTION

ADDRESS AGRICULTURAL EMISSIONS

AIR POLLUTION FROM AGRICULTURE

- **AMMONIA**. 95% of ammonia emissions are caused by agriculture. Ammonia emissions react in the atmosphere to form secondary particulate matter which is harmful to human health. They also cause eutrophication of soil and water which negatively impacts biodiversity and water quality.
- **METHANE**. Around half of EU methane emissions come from farming. In addition to being a powerful greenhouse gas, methane is involved in the formation of ground-level ozone which is harmful to human health and vegetation.
- **PARTICULATE MATTER (PM)**. In addition to secondary PM due to ammonia, farming can be responsible for primary PM, mainly due to the burning of agricultural waste. This practice is banned by cross-compliance rules under the Common-Agricultural Policy (CAP) and in many Member States' domestic laws but is still common practice according to satellite observations.

Unlike in other sectors, emissions from farming have not decreased in past decades and are expected to stay stable or increase in the coming years if no action is taken.[56] This is due to a lack of legislation in this sector. The EU only regulates emissions of large pigs and poultry farms through the Industrial Emissions Directive (IED), but cattle – the largest emitter of ammonia – is excluded from the scope of the IED. Even for pigs and poultry, the new standards adopted in 2016 are very weak compared to what best available techniques could achieve.[57]

Addressing both ammonia and methane emissions from agriculture was one of the main objectives of the original Commission proposal, given these pollutants contribution to secondary PM and ground-level ozone. The initial proposal was set to cut ammonia and methane emissions by 29% and 33% respectively by 2030. However, due to strong pressure from the agricultural lobby on national governments and at the European Parliament, it was decided to entirely remove methane from the scope of the Directive and to water down the EU ammonia limit by as much as 10 percentage points.

As a result, Member States are under no obligation to reduce their methane emissions. However, they will have to take action to limit ammonia emissions from the farming sector, as well as primary PM from agricultural waste burning.

Due to strong pressure from the agricultural lobby, it was decided to entirely remove methane and to water down ammonia limits.

How to reduce emissions emissions from agriculture?

There is a great untapped potential to cut ammonia emissions. In the EU, 95% of ammonia emissions come from agriculture: from chemical fertilisers on the one hand, and manure and slurry from livestock on the other hand.

Solutions are well documented and listed in the Directive's Annex III. Some of the most promising areas for emission reductions are:

- **Improved storage of manure**. Low-emissions housing methods including building techniques and the use of chemical or biological air scrubbers have become compulsory for new stables in Flanders.
- **Improved application of manure**. One of the most effective ways of cutting ammonia is by injecting the manure and slurry directly into the soil. In Flanders, since 2007, manure must be incorporated within 2 hours or injected on arable land. As a result, ammonia emissions from manure spreading were cut by 80% since the 1990s.
- **Improved application of urea fertiliser or substitution by ammonium nitrate**. Urea accounts for about 20% of the nitrogen fertilisers in the EU. It emits far more ammonia than other fertilisers. Losses may exceed a fifth of the applied nitrogen. Techniques to minimise losses exist, such as the use of chemical inhibitors which limit the conversion of urea to ammonium. Another solution is to substitute urea fertilisers with ammonium nitrate-based fertilisers.
- **Focus on the largest farms**. Around 80% of EU ammonia emissions come from just 5% of farms.[58] The ammonia NERCs can therefore be easily met by addressing merely 2-3% of all EU farms, i.e. the largest industrial ones.

Also, Member States should keep in mind that:

- The promotion and financial support for **biogas** would also bring down ammonia emissions, while simultaneously cutting methane emissions.
- More generally, **sustainable agricultural practices** should be promoted. These include lower stocking density, organic fertilising methods and crop rotations which would both help air quality and the climate by reducing ammonia and greenhouse gas emissions.
- **Reduced meat and dairy consumption** is another very effective way of reducing air pollution and climate change, while freeing up large areas of farmland and offering significant health benefits to consumers. If everyone in the EU halved their meat and dairy consumption, greenhouse gas emissions from agriculture would be reduced by 25 to 40% and nitrogen pollution by 40%.[59]

Around 80% of EU ammonia emissions come from just 5% of farms.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IMPROVE DOMESTIC HEATING

In 2010, domestic heating was responsible for about 43% of the harmful particulate matter $PM_{2.5}$ emissions in the EU. In the coming years, the growing use of particulate filters for diesel vehicles is expected to reduce exhaust-related primary $PM_{2.5}$ from road transport by almost two thirds, while emissions from domestic heating will remain a predominant source of $PM_{2.5}$ emissions and concentrations, especially where coal or biomass are being burnt.[60] In 2030, domestic heating is expected to cause 41% of all $PM_{2.5}$ emissions, 78% of which will be burning of solid biomass (see Figure 4).[61]

With the entry into force of the new NEC Directive, $PM_{2.5}$ emissions will have to be cut by 49% by 2030, relative to 2005 levels. Existing legislation will only deliver limited reductions (32%), meaning that Member States and/or the EU will have to come up with additional policies to cut $PM_{2.5}$ emissions further. **Given the large share of domestic heating in the $PM_{2.5}$ emissions in 2030, the sector will play an important role in the successful implementation of the Directive.**

Addressing $PM_{2.5}$ emissions from domestic heating would also help achieve lower concentrations in cities, where levels of air quality are the worst. Most European cities are still no way near reaching the $PM_{2.5}$ levels set in WHO guidelines.[62] Many cities are even in breach of the PM_{10} legal limits.[63]

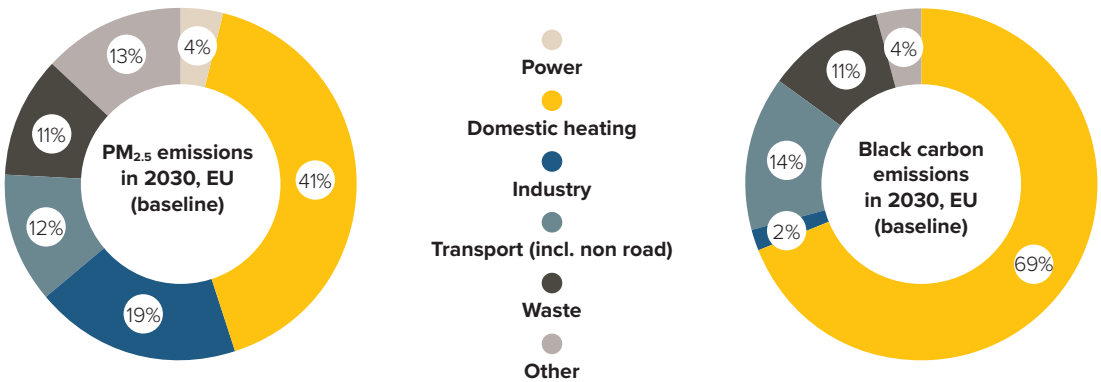
Domestic heating is also expected to account for nearly 70% of EU black carbon emissions in 2030 (see Figure 4).[64] Given that Member States will have to prioritise measures addressing black carbon in their NAPCPs, tackling pollution from domestic heating will be critical when implementing the new Directive.

Domestic heating will also play a role in NMVOC emission reductions.[65]

How to reduce emissions from domestic heating?
There is a great potential for cutting emissions from solid fuel burning. Here are some examples of measures Member States could take to reduce their emissions:

- Use **economic incentives** to promote the replacement of old domestic combustion installations with better home insulation, heat pumps, solar heating, new wood pellet installations or, in cities, with district heating based on renewable sources of energy or excess heat from industry.
- Prohibit or **restrict domestic solid fuel burning in residential areas,** promote alternatives and the use of exhaust cleaning technologies.
- **Inform consumers** about the cleanest installations and about how to operate them efficiently. $PM_{2.5}$ emissions may be up to 250 times higher if a stove is not properly operated.[66]
- Introduce **labels** to inform consumers about the cleanest stoves and boilers on the market.
- Increase resources for **market surveillance** to ensure effective emission reductions.

Figure 4 – PM and BC emissions in the EU (2030, expected)



Source: IIASA GAINS model, 2016

CLOSE COAL-FIRED POWER STATIONS

Despite being regulated by the Industrial Emissions Directive (IED), large industries are still significant contributors to SO_2, NO_x, PM and NMVOC emissions in the EU. Coal-fired power plants are particularly harmful to human health and the environment: in 2013, coal power plants were responsible for 52% of reported SO_2 emissions, 40% of reported NO_x and 37% of reported PM emissions from industry in the EU.[67] They also contribute to a large share of CO_2 and mercury emissions.[68] **In 2013 alone, emissions from the 257 operating coal power generation in the EU were responsible for 22,900 premature deaths, about 11,800 extra cases of chronic bronchitis and over €63.2 billion of externalised health costs.[69]**

Emission reductions in the industry sector will be primary driven by the full implementation of the IED and its "Best Available Techniques Reference Documents" (BREFs) which are regularly updated. A revised BREF for Large Combustion Plants is due to be adopted in early 2017. **A recent NGO report shows that 20,000 European lives could be saved every year by setting and enforcing air pollution limits in line with best available techniques (BAT) for the 257 European coal plants** (bringing down the number of deaths from 22,900 to 2,600 annually). The associated health costs savings would amount to €56.1 billion each year.[70]

What is 'BAT'?

Best Available Techniques, or 'BAT', are a set of operating standards agreed upon following an information exchange between Member States, the European Commission, and industry and NGO representatives.

Data gathered from currently operating plants is used to inform the decision as to what constitutes 'BAT'. In order to be judged as BAT, the technique must have been successfully implemented at an operational plant. They have therefore been tried-and-tested and demonstrated as economically and technically achievable.

Implementing the strictest "Best Available Techniques" (BAT) standards and phasing-out coal would be an effective and rapid way of complying with the NEC Directive's NERCs, in many cases allowing this to be achieved much earlier than 2030. It would also help Member States reduce emissions beyond what is required by the NEC Directive, providing a welcome boost to the health of their citizens, in particular to meet the air quality levels recommended by the WHO.

As shown in Annex II of this report, **some Member States would meet or almost meet their 2030 NERCs for SO_2 and NO_x from the day they shut their coal power plants**, provided that emissions from other pollution sectors remain stable compared to 2013:

- **Bulgaria**, the **Czech Republic** and **Romania** would meet their 2030 NERCs for SO_2 overnight if they were to shut their remaining coal/lignite plants.
- In **Germany**, **Italy**, **Portugal**, **Spain**, **Slovakia** and **Slovenia** a coal-phase would significantly ease compliance with the SO_2 NERCs. Over 60% of their required SO_2 emission reductions would be achieved just by phasing-out coal. Additional efforts in other sectors would therefore be minimal.
- In **Bulgaria**, the **Czech Republic** and **Poland,** a coal-phase would significantly ease compliance with the NO_x NERCs. Over 60% of their required NO_x emission reductions would be achieved by a coal phase-out. Only minimal additional efforts in other sectors would be required.

Even without phasing out coal, applying the stricter BATs on coal fired power stations would lead to significant emission reductions.

Finally, addressing large coal fired power stations is a cost effective way of cutting overall air pollution levels as it focuses on very few but large point sources. It also benefits climate policies at the same time it helps air and water quality.

ENFORCE AIR QUALITY STANDARDS FOR DIESEL AND PETROL CARS

On paper, Member States will not need to take additional measures to address emissions from road transport to meet their 2030 emission reduction commitments. All NERCs could in theory be met by targeting other sectors.[71] However, this is based on assumptions that existing policies (i.e. the Euro standards) will deliver in the real world, which is still uncertain. For instance, it has been shown that even new Euro 6 diesel cars emit four to five times their official limit for nitrogen oxides (NO_x) when driven on the road. Further, the new generation of Euro 6 petrol cars (GDIs) emit even more particle pollution than diesel cars, especially the tiny particles most dangerous for human health.[72]

Meeting EU air pollution standards (both in the Ambient Air Quality and NEC Directives) requires urgent action to properly enforce the legal limits and ensure that road transport standards deliver in real world conditions.

Progress is expected from 2017 when a new on-road vehicle tests (Real-world Driving Emissions, or RDE) will be used for compliance with Euro standards. However, the car industry managed to win some leeway and will still be allowed to emit 50% more than the regulatory limits after 2020 and is still trying to push for postponement of the introduction of the new RDE tests.

To achieve the required air quality benefits from road transport in real-world driving conditions the new RDE tests must be introduced without delay as promised by the legislators; they should also be extended to measure all pollutants and include all driving situations encountered on the road, e.g. cold starts and regeneration events. Only then will the performance of vehicles as measured during the test be close to what drivers actually emit on the road, and car manufacturers will finally use the effective exhaust after-treatment technology, such as urea solutions and petrol particle filters, which are needed to make vehicles clean.

Even new Euro 6 diesel cars emit four to five times their official limit for nitrogen oxides.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The new NEC Directive will help deliver cleaner air throughout the EU by 2030. By setting new national emission limits, it creates further obligations on EU Member States to develop appropriate policies to fight air pollution responsible for 400,000 premature deaths in EU every year.

- Overall, **the health impact of air pollution is expected to be halved by 2030, compared to 2005 levels.** It should be noted that close to 250,000 Europeans are still expected to die prematurely because of air pollution in 2030, even after full implementation of the Directive.

- Due to the very weak 2020 limits and the absence of mandatory limits for 2025, **the new NEC Directive is expected to deliver very little additional progress by 2020 and 2025**. On the other hand, significant effort will be required to meet most of the 2030 commitments, so it should act as a major driver of national action in the longer-term.

- **For most Member States, $PM_{2.5}$ and ammonia are the pollutants which will require most additional efforts by 2030**. New measures addressing agriculture and domestic heating will be particularly important to drive $PM_{2.5}$ and ammonia reductions. Other pollutants (NO_x, SO_2, VOCs,) will also have to be reduced, but these reductions are expected to be largely driven by already existing legislation – provided that this legislation is implemented and enforced properly.

- **The implementation of the Directive is expected to be improved as a result of detailed and binding standards for the content of National Air Pollution Control Programmes (NAPCPs)**. In particular, **Member States will have to consult the public when elaborating their NAPCPs**. Emission inventories are also expected to be improved through a new system of quality check by the European Commission.

- **A main weakness of the new NEC Directive lies in the multiplication of flexibilities which make it overly complex and, more importantly, more difficult to enforce properly**. Flexibilities such adjustment of inventories, the three-year averaging system, and pollution swapping mechanisms are likely to result in higher emissions and associated health impacts. **The European Commission will play an essential role in accepting or rejecting the use of flexibilities by Member States**.

- In order to meet health standards recommended by the WHO, **Member States must look beyond the 2030 NERCs. They should use their NAPCPs to develop appropriate policies to effectively protect their population and environment against the harmful effects of air pollution**, which will require going beyond the Directive's NERCs. The European Commission will also have to reassess its policies with the aim of improving air quality further. The new NEC Directive will be reviewed for this purpose by 2025.

The implementation of the Directive is expected to be improved as a result of detailed and binding standards for the content of National Air Pollution Control Programmes (NAPCPs).

RECOMMENDATIONS TO MEMBER STATES

- **Transpose and implement the Directive as soon as possible.**
- **Aim for more than the "minimum"** NERCs. Reaching WHO concentration guidelines and protecting biodiversity should be the primary focus when implementing the Directive, as stated in the Directive's first article and objectives.
- **Develop national and local policies addressing all causes of air pollution**, including transport, agriculture, industry, and residential heating.
- **Put in place independent and robust surveillance** and inspection plans to ensure that policies deliver in real life.
- **Develop measures that help fight climate change** e.g. by focusing on speeding up the phase-out of fossil fuels and by including measures specifically addressing methane and black carbon emissions.
- **Speed up the implementation of other air quality policies**, in particular the Ambient Air Quality Directive.

RECOMMENDATIONS TO THE EUROPEAN COMMISSION

- **Guarantee the Directive's effectiveness** by limiting the use of flexibilities to the strict minimum. In particular, the CLRTAP process should not interfere with the Commission's own assessment of flexibilities.
- **Ensure a strict and timely enforcement of the new Directive's provisions**. Enforcement should not wait until 2032, when the first breaches of the 2030 NERCs may be recorded, and should not be limited to breaches of the NERCs. The Commission should take early action against any breach of the Directive, e.g. if a Member State fails to make information on emissions publicly available or to prepare an adequate NAPCP.
- **Enforce the 2001 Directive's ceilings** and the ambient air quality limits without delay in order to speed up emission reductions and improve air quality.
- **Support methane emission reduction at EU and international level**, in particular when the Gothenburg Protocol is revised.
- **Align EU ambient air quality limit values with the most recent WHO recommendations** and health research.
- **Adopt ambitious sector-specific legislation** and take action to cut emissions from all major sources of air pollution, including:

Swift publication of the revised BREF for **large combustion plants** (LCP) and a review of the IED minimum limits to reflect updated BAT levels set in the revised LCP BREF.[73]

New emission standards and economic instruments (e.g. levy and fund) to address NO_x/PM emissions from **shipping** in EU seas.[74]

Euro 7 and VII standards for **cars, vans, trucks and buses** with the aim of meeting WHO guidelines in urban areas and aligning petrol and diesel limits.

Revised Ecodesign standards addressing PM and BC emissions from **residential heating** for including stricter emission limit values as well as a harmonised and more realistic measurement procedure for the type approval of stoves and boilers, reflecting the actual emission performance.

Revised EU standards addressing **VOC emissions** at the source, including by extending the scope of the Paints Directive to corrosion protection coatings, road markings and households' products such as hairsprays and deodorants.[75]

Align standards for **non-road mobile machinery** such as construction machines and diesel trains with Euro VI limits for heavy duty vehicles and address both new and existing machinery (through retrofit provisions).

ANNEX I – NATIONAL EMISSION REDUCTION COMMITMENTS (NERCS)

- **National Emission Reduction Commitments** (NERCs) are expressed in percentage reductions between 2005 levels and the given target year. 2005 levels are absolute figures, expressed in kilotons (see infobox: 'What is a NERC' on page 13).

- **CLE** (Current legislation) is the 'baseline' scenario, i.e. projected emission levels without any further action taken as a result of the new NEC Directive (see infobox: 'What is CLE' on page 13).

- **MTFR** is the so-called Maximum Technically Feasible Reduction scenario, which explores the extent to which emissions could be further reduced through the full application of the available technical measures, without changes in the energy structures and without behavioural changes of consumers (see infobox: 'What is MTFR' on page 13).

AUSTRIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	27	-36%	-26%	-38%	-41%	-52%
NO_x	237	-24%	-38%	-71%	-69%	-77%
$PM_{2.5}$	22	-16%	-20%	-38%	-46%	-60%
NH_3	63	-1%	-1%	12%	-12%	-31%
VOC	165	-18%	-22%	-38%	-36%	-65%

BELGIUM

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	144	-66%	-43%	-58%	-66%	-68%
NO_x	290	-33%	-38%	-56%	-59%	-67%
$PM_{2.5}$	36	-11%	-20%	-15%	-39%	-51%
NH_3	72	-6%	-2%	0%	-13%	-22%
VOC	146	-28%	-20%	-25%	-35%	-46%

BUGARIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	776	-58%	-78%	-87%	-88%	-94%
NO_x	154	-20%	-41%	-62%	-58%	-74%
$PM_{2.5}$	27	10%	-20%	-41%	-41%	-72%
NH_3	48	-21%	-3%	-6%	-12%	-25%
VOC	85	-4%	-38%	-59%	-42%	-77%

CROATIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	64	-60%	-55%	-72%	-83%	-91%
NO_x	81	-27%	-32%	-50%	-57%	-79%
$PM_{2.5}$	11	-10%	-18%	-26%	-55%	-75%
NH_3	44	-6%	-1%	3%	-25%	-38%
VOC	101	-32%	-34%	-45%	-48%	-73%

CYPRUS

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	38	-57%	-83%	-94%	-93%	-99%
NO_x	21	-1%	-45%	-69%	-55%	-80%
$PM_{2.5}$	3	-39%	-46%	-69%	-70%	-80%
NH_3	6	-17%	-10%	-6%	-20%	-41%
VOC	14	-35%	-55%	-47%	-50%	-65%

CZECH REPUBLIC

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	219	-28%	-45%	-68%	-66%	-75%
NO_x	278	-24%	-35%	-61%	-64%	-71%
$PM_{2.5}$	21	-4%	-17%	-28%	-60%	-56%
NH_3	68	-6%	-7%	-20%	-22%	-42%
VOC	182	-29%	-9%	-43%	-50%	-68%

DENMARK

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	25	-49%	-35%	-62%	-59%	-68%
NO_x	186	-38%	-56%	-64%	-68%	-73%
$PM_{2.5}$	26	-14%	-33%	-53%	-55%	-69%
NH_3	88	-13%	-33%	-27%	-24%	-46%
VOC	114	-31%	-36%	-48%	-37%	-68%

ESTONIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	76	-47%	-32%	-72%	-68%	-89%
NO_x	37	-12%	-20%	-46%	-30%	-71%
$PM_{2.5}$	20	-14%	-15%	-35%	-41%	-76%
NH_3	10	11%	-1%	15%	-1%	-26%
VOC	40	-16%	-18%	-24%	-28%	-66%

FINLAND

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	69	-26%	-30%	-34%	-34%	-42%
NO_x	169	-14%	-35%	-47%	-47%	-58%
$PM_{2.5}$	41	-10%	-30%	-28%	-34%	-48%
NH_3	38	-3%	-20%	-9%	-20%	-29%
VOC	136	-23%	-35%	-47%	-48%	-67%

FRANCE

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	460	-50%	-55%	-71%	-77%	-80%
NO_x	1404	-30%	-50%	-67%	-69%	-74%
$PM_{2.5}$	246	-26%	-26%	-48%	-57%	-63%
NH_3	686	-1%	-4%	-8%	-13%	-32%
VOC	1261	-44%	-43%	-51%	-52%	-64%

GERMANY

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	460	-7%	-21%	-49%	-58%	-62%
NO_x	1565	-19%	-43%	-60%	-65%	-71%
$PM_{2.5}$	125	-10%	-26%	-33%	-43%	-47%
NH_3	572	-5%	-5%	-7%	-29%	-47%
VOC	1124	-15%	-13%	-31%	-28%	-56%

GREECE

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	541	-55%	-74%	-90%	-88%	-95%
NO_x	417	-38%	-31%	-68%	-55%	-75%
$PM_{2.5}$	-35%	-51%	-71%	-75%	-50%	0%
NH_3	68	-9%	-22%	-21%	-10%	-38%
VOC	220	-31%	-54%	-56%	-62%	-75%

HUNGARY

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	43	-26%	-46%	-57%	-73%	-75%
NO_x	165	-26%	-38%	-62%	-66%	-75%
$PM_{2.5}$	27	13%	-13%	-38%	-55%	-70%
NH_3	78	-16%	-10%	-23%	-32%	-50%
VOC	124	-16%	-30%	-44%	-58%	-71%

IRELAND

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	72	-68%	-65%	-80%	-85%	-87%
NO_x	129	-43%	-49%	-70%	-69%	-79%
$PM_{2.5}$	11	-27%	-18%	-37%	-41%	-48%
NH_3	110	-5%	-1%	-6%	-5%	-25%
VOC	57	-23%	-25%	-32%	-32%	-56%

ITALY

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	405	-56%	-35%	-61%	-71%	-79%
NO_x	1214	-30%	-40%	-62%	-65%	-71%
$PM_{2.5}$	142	-11%	-10%	-35%	-40%	-59%
NH_3	416	-3%	-5%	-8%	-16%	-29%
VOC	1204	-29%	-35%	-43%	-46%	-60%

LATVIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	7	-64%	-8%	-38%	-46%	-49%
NO_x	42	-15%	-32%	-40%	-34%	-54%
$PM_{2.5}$	29	-5%	-16%	-40%	-43%	-78%
NH_3	17	9%	-1%	15%	-1%	-10%
VOC	56	-3%	-28%	-39%	-38%	-78%

LITHUANIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	43	-16%	-55%	-47%	-60%	-77%
NO_x	62	-8%	-48%	-49%	-51%	-63%
$PM_{2.5}$	23	7%	-20%	-32%	-36%	-74%
NH_3	39	-3%	-10%	9%	-10%	-23%
VOC	68	-13%	-32%	-41%	-47%	-76%

LUXEMBOURG

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	2	-18%	-34%	-42%	-50%	-75%
NO_x	62	-26%	-43%	-85%	-83%	-86%
$PM_{2.5}$	4	-27%	-15%	-40%	-40%	-48%
NH_3	7	-3%	-7%	-9%	-22%	-28%
VOC	13	-32%	-30%	-47%	-42%	-65%

MALTA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	11	-32%	-77%	-95%	-95%	-98%
NO_x	9	-7%	-42%	-79%	-79%	-86%
$PM_{2.5}$	1	-38%	-25%	-72%	-50%	-79%
NH_3	2	-4%	-4%	-8%	-24%	-37%
VOC	3	-5%	-23%	-26%	-27%	-59%

NETHERLANDS

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	64	-47%	-28%	-55%	-53%	-63%
NO_x	365	-27%	-45%	-59%	-61%	-67%
$PM_{2.5}$	19	-33%	-33%	-32%	-45%	-46%
NH_3	143	-16%	-13%	-19%	-21%	-22%
VOC	174	-16%	-8%	-19%	-15%	-37%

POLAND

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	1217	-30%	-59%	-66%	-70%	-79%
NO_x	851	-4%	-35%	-49%	-39%	-63%
$PM_{2.5}$	141	-2%	-16%	-11%	-58%	-53%
NH_3	272	-3%	-1%	1%	-17%	-37%
VOC	575	10%	-25%	-34%	-26%	-67%

PORTUGAL

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	177	-75%	-63%	-73%	-83%	-90%
NO_x	256	-37%	-36%	-59%	-63%	-75%
$PM_{2.5}$	69	-19%	-23%	-39%	-53%	-71%
NH_3	50	-9%	-7%	-5%	-15%	-35%
VOC	207	-19%	-18%	-40%	-38%	-56%

ROMANIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	643	-60%	-77%	-84%	-88%	-93%
NO_x	309	-27%	-45%	-55%	-60%	-71%
$PM_{2.5}$	106	7%	-28%	-39%	-58%	-76%
NH_3	199	-20%	-13%	-13%	-25%	-34%
VOC	425	-16%	-40%	-54%	-45%	-80%

SLOVAKIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	89	-34%	-57%	-73%	-82%	-85%
NO_x	102	-20%	-43%	-44%	-50%	-63%
$PM_{2.5}$	37	-21%	-36%	-36%	-49%	-73%
NH_3	29	-12%	-15%	-22%	-30%	-48%
VOC	73	-16%	-18%	-22%	-32%	-57%

SLOVENIA

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	41	-75%	-63%	-86%	-92%	-90%
NO_x	48	-6%	-41%	-64%	-65%	-70%
$PM_{2.5}$	16	9%	-25%	-23%	-60%	-77%
NH_3	19	-8%	-1%	-10%	-15%	-32%
VOC	48	-17%	-32%	-31%	-53%	-68%

SPAIN

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	1252	-69%	-67%	-83%	-88%	-90%
NO_x	1311	-36%	-42%	-65%	-62%	-74%
$PM_{2.5}$	90	-22%	-15%	-19%	-50%	-68%
NH_3	376	0%	-2%	-6%	-16%	-42%
VOC	802	-28%	-22%	-29%	-39%	-54%

SWEDEN

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	36	-23%	-22%	-14%	-22%	-18%
NO_x	175	-25%	-36%	-66%	-66%	-70%
$PM_{2.5}$	30	-10%	-19%	-16%	-19%	-48%
NH_3	56	-8%	-15%	-10%	-17%	-33%
VOC	198	-6%	-25%	-39%	-36%	-54%

UK

	2005	2012	2020 NEC	2030 CLE	2030 NEC	2030 MTFR
SO_2	709	-40%	-59%	-80%	-88%	-91%
NO_x	1592	-33%	-55%	-72%	-73%	-80%
$PM_{2.5}$	93	-17%	-30%	-28%	-46%	-57%
NH_3	302	-8%	-5%	-8%	-16%	-27%
VOC	1160	-28%	-37%	-37%	-39%	-52%

ANNEX II – HOW PHASING OUT COAL COULD HELP ACHIEVE THE 2030 SO_2 AND NO_X NERCS

The table below gives estimates of total SO_2 emissions in 2013 if Member States were to shut down their operating coal-fired power stations.

	SO_2 emissions from coal plants operational in 2013[76]	SO_x emissions 2013[77]	2030 SO_2 NERC	SO_2 maximum allowed 2030[78]	SO_2 emissions under coal phase out scenario 2013
Austria	258	16,000	41%	15,340	15,742
Belgium	965	45,000	66%	48,620	44,035
Bulgaria	127,694	196,000	88%	93,480	68,306
Czech Republic	82,714	138,000	66%	70,720	55,286
Denmark	1,252	13,000	59%	10,660	11,748
Finland	11,349	47,000	34%	46,200	35,651
France	46,944	217,000	77%	107,410	170,056
Germany	146,103	410,000	58%	199,080	263,897
Greece	48,256	227,000	88%	64,920	178,744
Hungary	7,875	30,000	73%	11,070	22,125
Ireland	7,160	25,000	85%	11,100	17,840
Italy	21,917	145,000	71%	118,030	123,083
Netherlands	8,644	30,000	53%	30,080	21,356
Poland	278,454	853,000	70%	373,800	574,546
Portugal	5,790	39,000	83%	30,090	33,210
Romania	157,425	203,000	88%	72,120	45,575
Slovakia	34,123	53,000	82%	16,020	18,877
Slovenia	5,486	12,000	92%	3,280	6,514
Spain	84,651	259,000	88%	153,360	174,349
Sweden	232	27,000	22%	28,080	26,768
United Kingdom	171,724	386,000	88%	85,320	214,276

The table below gives estimates of total NO_x emissions in 2013 if Member States were to shut down their operating coal-fired power stations.

	NO_x emissions from coal plants operational in 2013[79]	NO_x emissions[80]	2030 NO_x NERC	NO_x maximum allowed 2030[81]	NO_x emissions under coal phase out scenario 2013
Austria	1,421	162,000	69%	72,850	160,579
Belgium	1,689	147,000	59%	130,380	145,311
Bulgaria	33,651	127,000	58%	77,700	93,349
Czech Republic	57,113	181,000	64%	100,440	123,887
Denmark	4,338	123,000	68%	64,960	118,662
Finland	16,539	145,000	47%	99,110	128,461
France	33,503	815,000	69%	442,990	781,497
Germany	185,124	1,045,000	65%	550,200	859,876
Greece	33,003	250,000	55%	187,650	216,997
Hungary	9,325	121,000	58%	70,140	111,675
Ireland	4,890	78,000	69%	42,470	73,110
Italy	24,916	816,000	65%	437,150	791,084
Netherlands	9,278	260,000	61%	143,130	250,722
Poland	194,327	774,000	39%	519,110	579,673
Portugal	6,700	160,000	63%	95,090	153,300
Romania	37,030	220,000	60%	126,800	182,970
Slovakia	5,624	83,000	50%	52,000	77,376
Slovenia	8,718	44,000	65%	18,200	35,282
Spain	75,965	819,000	62%	540,360	743,035
Sweden	1,087	138,000	66%	61,880	136,913
United Kingdom	222,929	1,036,000	73%	436,590	813,071

ENDNOTES

1 EEA 2016 Air Quality Report, November 2016.
2 Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
3 The WHO states that there is no such thing as 'safe levels of air pollution' but sets air quality guidelines for health protection which would lead to significant reductions in risks for acute and chronic health effects from air pollution: http://www.who.int/mediacentre/factsheets/fs313/en/
4 Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet'.
5 "Critical loads and levels" means the concentration of pollutants in the atmosphere above which significant harmful effects on sensitive elements of the environment may occur according to current knowledge. In simpler terms, they are the limits of what "nature can tolerate".
6 All Member States expect Bulgaria, the Czech Republic, Finland, Latvia, Lithuania and Slovakia.
7 28 Member States x 5 NERCs = 140 NERCs.
8 This is the case for Austria (NO_x), Spain (NO_x and NH_3), Germany (NMVOCs and NH_3), the Netherlands (NMVOCs), and Portugal (NMVOCs).
9 EMRC, 2015, for EEB's Air O Meter. Data data available here: http://www.eeb.org/air-o-meter/methodology/EEB-Air-O-Meter-matrix-09062015.xlsx
10 European Commission's Impact Assessment, pages 24 and 28: http://ec.europa.eu/environment/archives/air/pdf/Impact_assessment_en.pdf
11 https://ec.europa.eu/energy/en/news/reference-scenario-energy
12 See for instance TSAP report #10, IIASA, February 2013: http://ec.europa.eu/environment/air/pdf/TSAP-Report-10.pdf
13 Text adopted by Parliament in Plenary on 28 October 2015: http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=EN&reference=P8-TA-2015-0381 http://www.europarl.europa.eu/oeil/popups/summary.do?id=1409680&t=e&l=en (summary)
14 The European Commission had initially proposed to slash ammonia emissions by 27% in 2030, relative to 2005 levels.
15 See section on domestic heating page 30
16 IIASA TSAP report #16a, January 2015, page 14-15
17 This refers to the so-called 'Maximum technically feasible reduction' (MTFR) scenario – see page 13
18 Dieselgate report, T&E, September 2016, available here: https://www.transportenvironment.org/publications/dieselgate-who-what-how
19 This principle is however undermined by the possible use of so-called 'flexibilities' in the NEC Directive. See chapter 2.
20 "Critical loads and levels" means the concentration of pollutants in the atmosphere above which significant harmful effects on sensitive elements of the environment may occur according to current knowledge. In simpler terms, they are the limits of what "nature can tolerate".
21 Bounding the role of black carbon in the climate system: A scientific assessment, Journal of Geophysical Research: Atmospheres 119, T.C. Bond, et al. 2013
22 Article 6 paragraph 2 (c)
23 Annex I table A
24 European Commission Impact Assessment, page 278
25 The European Parliament's agriculture committee also wanted to reject methane NERCs, but the limits stayed in the text voted by the Strasbourg plenary (with an exemption for enteric methane). The methane NERCs were deleted from the final text as a result of pressure by the Council during the final stages of negotiations.
26 European Commission Impact Assessment, pages 278-281
27 Article 10, paragraph 3, point (c)
28 Entec UK Limited, July 2005
29 With the exception of PM_{10}, $PM_{2.5}$ and BC emission inventories which have to be reported from 2000 instead of 1990.
30 Annex IV part 4
31 Article 5, paragraph 1 point (a)
32 Article 14 paragraph 1 (b)
33 Flexibilities in the National Emission Ceilings (NEC) Directive: undermining effective law making, January 2016, by EEB, Client Earth and AirClim. Available here: http://www.eeb.org/index.cfm/library/flexibilities-in-the-national-emission-ceilings-nec-directive-undermining-effective-law-making/
34 Article 8, paragraph 6
35 UNECE ECE/EB.AIR/GE.1/2016/10-ECE/EC.AIR/WG.1/2016/18, 4 July 2016 http://www.unece.org/fileadmin/DAM/env/documents/2016/AIR/EMEP/ece.eb.air.ge.1.2016.10_ece.eb.air.wg.1.2016.18.pdf
36 "National Emission Ceilings Directive Review – Task 1: in-depth analysis of the NEC national programmes", Entec UK Limited, July 2005
37 Annex III part 1
38 This is echoed in recital 18 which states that NAPCPs should "contribute to the successful implementation of air quality plans enacted under Article 23 of Directive 2008/50/EC".
39 Entec UK Limited, July 2005
40 Annex III part 2
41 The first NAPCP must be sent to the European Commission within 27 months of the entry into force of the Directive. If the directive is published in the official journal on 31 December 2016, the first NAPCP will have to be sent to the Commission before 31 March 2017.
42 In this case the update must be within 18 months of the submission of the latest national emission inventory or emission projections.
43 For example, Italy has not carried out any consultation. Other Member States have carried out "some form of consultation with other public bodies and/or relevant stakeholders and the public." National Emission Ceilings Directive Review Task 1: In-depth analysis of the NEC national programmes', Entec UK, 2005
44 The new "Clean Air Forum" will be composed of representatives from EU Member States, industry, civil society and the scientific community. Its role is to facilitate the implementation of air quality legislation and to provide exchange of good practices. See Article 12.
45 The WHO states that there is no such thing as 'safe levels of air pollution' but sets air quality guidelines for health protection which would lead to significant reductions in risks for acute and chronic health effects from air pollution: http://www.who.int/mediacentre/factsheets/fs313/en/
46 The Final Policy Scenarios of the EU Clean Air Policy Package, IIASA TSAP Report #11, February 2014, page 21
47 Flexibilities in the National Emission Ceilings (NEC) Directive: undermining effective law making, January 2016, by EEB, Client Earth and AirClim. Available here: http://www.eeb.org/index.cfm/library/flexibilities-in-the-national-emission-ceilings-nec-directive-undermining-effective-law-making/
48 Article 5 paragraph 2
49 At the level set in IIASA's report TSAP 16
50 Article 5 paragraph 3
51 Article 5 paragraph 4
52 See Statistics on environmental judgments by the EC Court of Justice, Journal of Environmental Law, 2006, Ludwig Krämer, p. 407
53 Case C-237/07 Janecek v Freistaat Bayern
54 See Client Earth's handbook on air quality litigation: http://www.documents.clientearth.org/?post_type=dlm_download&p=6758
55 Joined cases C-165/09 Stichting Natuur en Milieu and Others v College van Gedeputeerde Staten van Groningen and C-166/09 College van Gedeputeerde Staten van Zuid-Holland
56 TSAP report # 10 Version 1.0, IIASA, March 2013, page 19. It should be noted that the end of the milk quota is likely to lead to increased emissions which were not accounted for in the report.
57 BAT Conclusions adopted on 3 October 2016, not yet published in the Official Journal of the EU. For instance, the ammonia limit for fattening pigs is set at 2.6kg per animal place per year while NGOs and five other Member States supported a limit of 2.2kg. Also, manure/slurry incorporation into the soil must happen "as soon as possible", which allows up to 4 hours, a period which can go to 12 hours if "human and machinery resources are not economically available".
58 IIASA GAINS, 2016
59 Nitrogen on the Table – executive summary of the European Nitrogen Assessment Special Report on Nitrogen and Food, 25 April 2014, UNECE Task Force for Reactive Nitrogen
60 TSAP report #12, IIASA, October 2014
61 IIASA GAINS model, 2016
62 EEA air quality report 2015
63 According to the European Commission's infringement database, there were 14 pending infringement cases for breaches of the PM_{10} limit value in October 2016 (against Belgium, Bulgaria, the Czech Republic, France, Greece, Hungary, Italy, Latvia, Poland, Romania, Slovakia, Slovenia, Spain and Sweden).
64 GAINS model 2016
65 TSAP#16 A page 17: domestic heating could deliver 48% of the needed VOC emission reductions
66 Preparatory Studies for Ecodesign Requirements of EuPs (II), Lot 15: Solid fuel small combustion installations, Task 4, Mugdal, Shailendra et al., 2009
67 E-PRTR 2013
68 42% and 43% respectively
69 "Lifting Europe's Dark Cloud: How cutting coal saves lives", EEB, HEAL, CAN-EU, WWF and Sandbag, 2016 http://www.eeb.org/?LinkServID=E3882544-5056-B741-DBB3E8DE57F619F6&showMeta=0&aa
70 "Lifting Europe's Dark Cloud"
71 TSAP#16 A and B
72 See 'Gasoline particulate emissions: The next auto scandal?', T&E, October 2016 https://www.transportenvironment.org/sites/te/files/publications/2016_10_Gasoline_particulate_emissions_briefing_0.pdf
73 See Chapter 4 of the 'Lifting Europe's Dark Cloud report'
74 See benefits of levy and fund in the study "NO_x controls for shipping in EU seas", June 2016, available here: https://www.transportenvironment.org/sites/te/files/publications/2016_Consultant_report_shipping_NO_x_abatement.pdf
75 ÖKOPOL studies on the implementation and review of Directive 2004/42/EC:
76 E-PRTR
77 EEA report No 16/2016, table 3.6
78 Calculated based on 2005 emission levels (EEA report No 16/2016, table 3.6)
79 E-PRTR
80 EEA report No 16/2016, table 3.4
81 Calculated based on 2005 emission levels (EEA report No 16/2016, table 3.4)