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COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and he Committee of the Regions a Clean Air Programme for Europe

Proposal for a Directive of the European Parliament and of the Council on the limitation of emissions of certain pollutants into the air from medium combustion plants

Proposal for a Directive of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC

Proposal for a Council Decision on the acceptance of the Amendment to the 1999 Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone

{COM(2013) 917 final}
{COM(2013) 918 final}
{COM(2013) 919 final}
{COM(2013) 920 final}
{SWD(2013) 532 final}

5. BASELINE

5.1 Compliance with NO2 limit values

The decline in NO_x emissions projected by the baseline should significantly improve future compliance with NO_2 air quality limit values.

A new methodology has been developed to estimate with the GAINS model future NO_2 concentrations at traffic stations (Kiesewetter et al. 2013). This enables the assessment of the impacts of the Europe-wide emission reduction scenarios on compliance with the air quality limit values for each of these stations.

However, due to data gaps, this approach could not be implemented for all monitoring sites in Europe, but is restricted for NO_2 to 2000 sites for which sufficient monitoring data have been provided to AIRBASE, and for PM10 for 1900 sites. Obviously, this sub-set of stations is not necessarily representative, and there are large differences in station numbers across Member States. To facilitate representative conclusions, stations have been allocated to their respective air quality management zones established under the Air Quality Daughter Directive. The analysis presented here determines the compliance status of each zone along the highest concentration modelled at any AIRBASE monitoring site located within the zone.

It has been shown for NO_2 that achievement of the annual limit value of 40 $\mu g/m^3$ is more demanding than compliance with the hourly limit value of 200 $\mu g/m^3$. Thus, modelling for NO_2 is restricted to the annual limit value.

To reflect unavoidable uncertainties in monitoring data, modelling techniques and future meteorological conditions, three compliance categories with the annual limit value are distinguished.

Computed annual mean concentrations of NO_2 below 35 $\mu g/m^3$ indicate likely compliance. If concentrations are computed in the range between 35 and 45 $\mu g/m^3$, compliance is possible but uncertain due to the factors mentioned above. This is also the range where additional local measures (e.g., traffic management) have a realistic chance to achieve safe compliance, even under unfavourable conditions. In contrast, compliance is unlikely if computed NO_2 concentrations exceed 45 $\mu g/m^{3.}$

On this basis, it is estimated that the number of air quality management zones in the EU-28 where compliance with the current limit values is unlikely will decline from about 100 zones (21%) in 2010 to 38 zones (8%) in 2020 under baseline conditions (for this, 500 zones have been considered). However, this estimate is conservative as it does not consider benefits from local measures (e.g., traffic management or low emission zones), which could be quite effective for reducing the large share of NO_2 from near-by emission sources.

Conversely, in 2020 safe compliance will be achieved in 80% of the zones, compared to 63% in 2010 (Table 3). Obviously, by 2020 Europe will not fully reach the ultimate target of bringing all Europe in compliance. However, as shown in Figure A5.2, Europe will be on track towards such a target, with non-compliances rapidly decreasing following fleet renewal. For the baseline projection, which does not consider additional local measures, the number of non-compliance zones is estimated to decline to 13 in 2025 and five in 2030 (Figure A5.3). The additional measures of the MTFR scenario could eliminate 99% of the robust non-compliance cases.

Figure A5.2: Compliance with air quality limit values for NO_2 in the air quality management zones

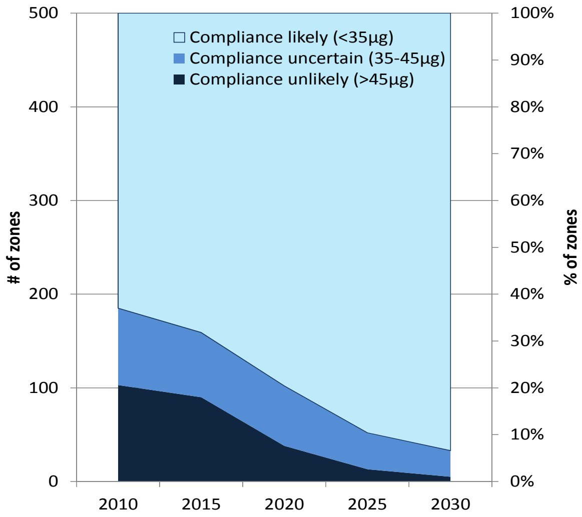


Figure A5.3: Compliance with air quality limit values for NO_2 in the air quality management zones

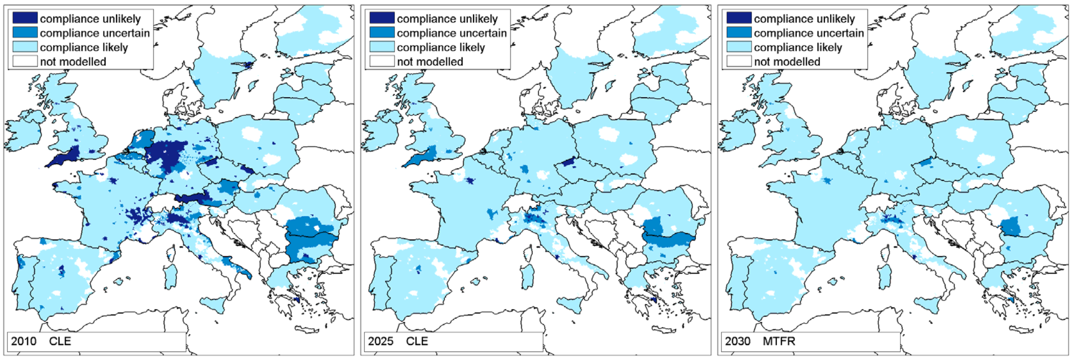


Table A5.7: Compliance with NO_2 limit values (number and % of zones). Note that this calculation does not include effects of additional local policies, such as low-emission zones.

	Compliance					
	unlikely	uncertain	likely	unlikely	uncertain	Likely
2010	103	82	315	*21%*	*16%*	*63%*
2020	38	64	398	*8%*	*13%*	*80%*
2025	13	39	448	*3%*	*8%*	*90%*
2030	5	28	467	*1%*	*6%*	*93%*
2030 MTFR	4	22	474	*1%*	*4%*	*95%*

Table A5.8: Population living in air quality management zones with different compliance with the NO_2 limit values (million people, % of European population)

	Compliance					
	unlikely	uncertain	likely	unlikely	uncertain	likely
2010	124.6	63.3	238.6	*29%*	*15%*	*56%*
2020	68.7	55.6	302.1	*16%*	*13%*	*71%*
2025	30.8	49.7	345.9	*7%*	*12%*	*81%*
2030	8.9	48.0	369.5	*2%*	*11%*	*87%*
2030 MTFR	8.1	33.5	384.7	*2%*	*8%*	*90%*

5.2 Compliance with PM10 limit values

For PM10, the limit on 35 allowed daily exceedances of 50 µg/m^3 is more difficult to attain than the annual mean limit value of 40 µg/m^3. However, there is a strong linear correlation between the 36th highest daily values and the annual mean concentrations, both in observations and model results. As an annual mean of 30 µg/m^3 corresponds well to the 36th highest daily concentration of 50 µg/m^3, this threshold is used as the criteria for the GAINS modelling, which is conducted on an annual mean basis. As for NO_2, uncertainty ranges of ±5 µg/m^3 are employed.

For the 516 zones for which sufficient monitoring data are available, it is calculated that in 2010 about 60 zones (12%) did not comply with the PM10 limit value. The decrease in precursor emissions of the TSAP-2013 Baseline should halve this number to about 30 by 2020 (Figure A5.4). As for NO_2, this estimate does not consider additional measures at the urban scale, which could achieve further improvements.

However, in contrast to NO_2, the TSAP-2012 baseline does not suggest additional reductions beyond 2020. Remaining problems will prevail in the new Member States where, due to continued reliance of solid fuels for domestic heating, only little further declines in the emissions from the domestic sector are anticipated.

Technical emission control measures, together with the switch to cleaner fuels and/or to centralized heating systems could bring down PM10 concentrations below the limit value also in urban areas in the new Member States. The third panel in Figure A5.5 illustrates the MTFR case that does not assume additional expansion of central heating systems.

Figure A5.4: Compliance of the air quality management zones with air quality limit values for PM10

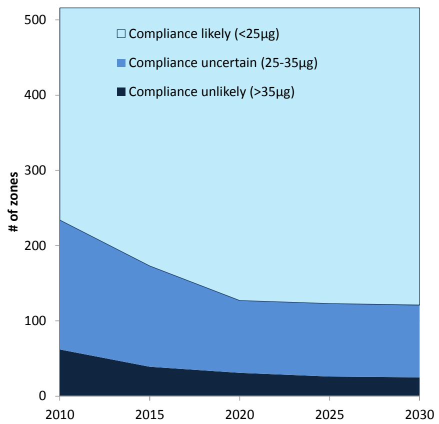


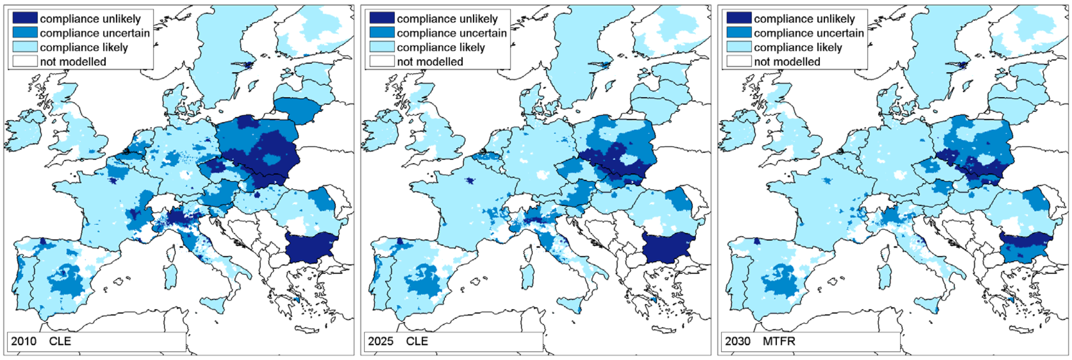
Table A5.9: Compliance with PM10 limit values in 2025 (number and % of zones)

	Compliance					
	unlikely	uncertain	likely	unlikely	uncertain	likely
2010	62	172	282	12%	33%	55%
2020	31	96	389	6%	19%	75%
2025	26	97	393	5%	19%	76%
2030	25	96	395	5%	19%	77%
2030 MTFR	17	56	443	3%	11%	86%

Table A5.10: Population living in air quality management zone with different compliance with PM10 limit values (million people, % of European population)

	Compliance					
	unlikely	uncertain	likely	unlikely	uncertain	likely
2010	81.3	132.0	213.5	19%	31%	50%
2020	48.8	85.3	292.7	11%	20%	69%
2025	39.5	92.6	294.6	9%	22%	69%
2030	40.3	86.8	299.7	9%	20%	70%
2030 MTFR	21.4	74.1	331.3	5%	17%	78%

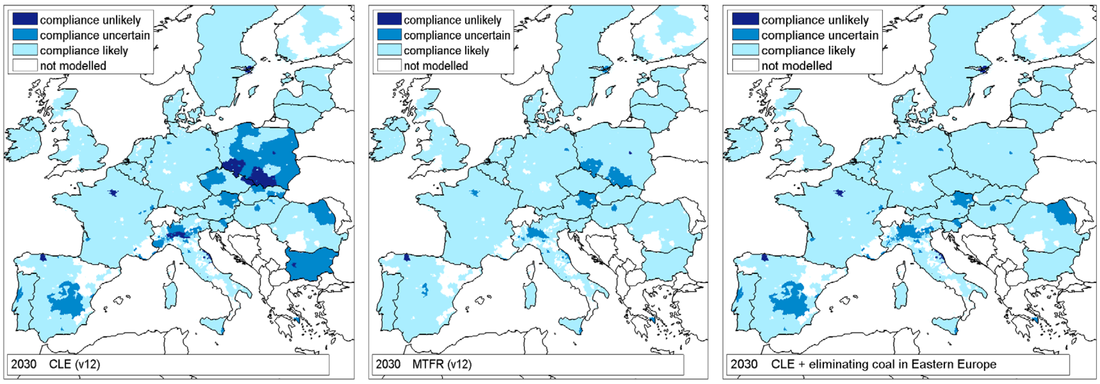
Figure A5.5: Compliance with the air quality limit values for PM10 in the air quality management zones



Alternatively to the MTFR, a hypothetical scenario assuming a complete switch of coal and biomass domestic heating to natural gas starting 2020 in four countries: Poland, Czech Republic, Slovakia and Bulgaria, which are the countries with largest projected compliance problems for PM10, where domestic solid fuel combustion plays a significant role.

Figure A5.6 compares the 2030 current legislation baseline (CLE) case with the MTFR and with the domestic solid fuel phase out case in the four countres mentioned. Furthermore, this simulation assumes that 75% of the unexplained PM2,5 component in the four countries is related to domestic solid fuel combustion[307].

Figure A5.6: Compliance with the air quality limit values for PM10 in the air quality management zones in 2030 for the CLE, MTFR and domestic coal phase-out scenarios. 75% of unexplained component linked to doemstic heating is assumed



The results confirm that eliminating the most polluting domestic sources would be able to resolve almost entirely the PM non-compliance problems even in the currently most affected areas. Once reasonable assumptions are made for the linkage between domestic heating and the fraction of PM concentrations that models cannot explain with existing emission inventories, it becomes apparent that -even without fuel switching- the application of state-of-

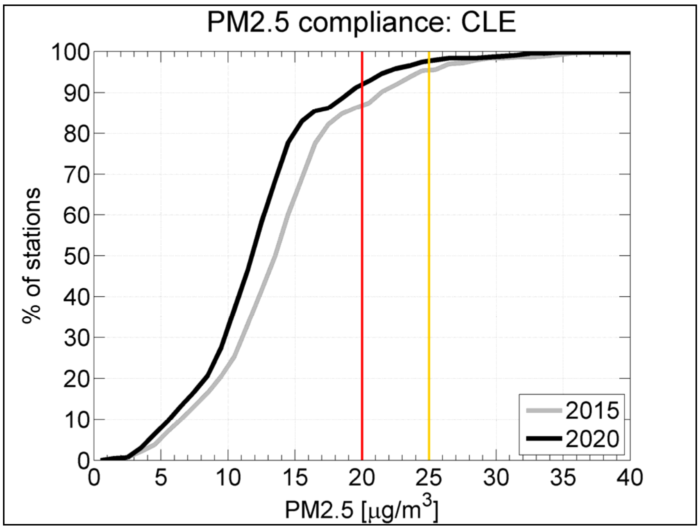
307 Explaining the high observed PM10 concentrations in regions such as Southern Poland poses a considerable challenge to CTM models even with the most recent gridded emission inventory. Concentrations of 50-60µg/m3 annual mean are measured at several background stations in this area, and state of the art models in many cases can only explain less than 50% of these concentrations. From the annual cycles of observed concentrations (closely following temperature-heating cycles) and from evidence provided by local experts to IIASA, it is highly likely that roughly 75% of the unexplained component be linked to combustion of solid fuels not reported in the inventories.

the-art solid fuel combustion techniques would be able to resolve the majority of non-compliance situations related to domestic solid fuel use.

5.3 Compliance with PM2,5 standards

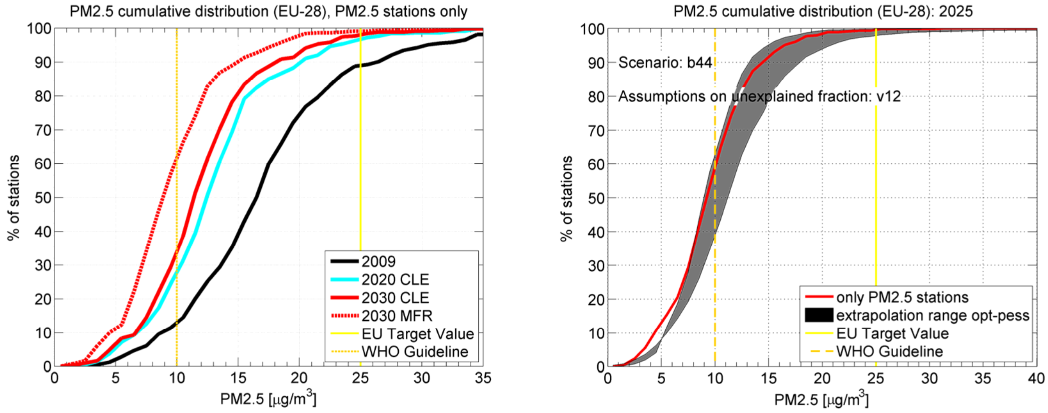
For PM2,5, the 25 µg/m^3 target value will become a binding limit value. For $PM_{2.5}$ the baseline projections show very high projected compliance in 2015 (Figure A5.7), with around 96% of stations meeting the standard. The AAQD provides for the tightening of the $PM_{2,5}$ LV from 25 to 20 µg/m^3 in 2020, subject to feasibility; 99% of stations would comply with the 25 µg standard but only 92% of them with the tighter 20 µg standard. Note that even the 20 µg standard is well above the WHO guideline value of 10µg/m^3.

Figure A5.7: Projected compliance with PM 2.5 limit values (2015 and 2020)



With a view to examining the range of PM2,5 limit values that could be set and ralistically enforced furhter in the future, Figure 0.11 shows the projected compliance picture further in the future; the left panel shows that in 2009 almost 90% of stationswere below 25 µg/m^3 and only 10% below the WHO guideline value of 10 µg/m^3. The situation is projected to gradually improve up to 2030, when 99% of stations would be below 25 µg/m^3 and 35% below the WHO guidance value. The MTFR would be able to bring 60% of stations below the WHO guidance value. The right panel shows the compliance situation projected for policy option 6C, taking into account also the uncertainty range due to possible different assumptions on the fraction of PM2,5 concentration that is not explained by CTM modelling. Under this case, the 25 µg/m^3 limit value would be safely met virtually by all stations. A tighter LV of 20 µg/m^3 would be complied with by 94-99% of stations. The uncertainty range progressively increases, with 80-96% of stations below 15 µg/m^3 and 40-65% below 10 µg/m^3.

Figure A5.8: Projected compliance with PM 2.5 limit values in: [LHS] 2009, 2020 (CLE), 2030 (CLE) and 2030 (MTFR); and [RHS] 2025 for option 6C. In the latter case, the uncertainty range is related to assumptions for the component unexplained by CTM modelling



6. FUTURE AIR POLLUTION IMPACTS UNDER THE BASELINE SCENARIO

6.1 Health impacts from PM2,5

The decrease in the precursor emissions of ambient PM2.5 of the TSAP-2013 Baseline projection suggests a decline of the loss of statistical life expectancy attributable to the exposure to fine particulate matter (PM2.5) from 8.5 months in 2005 to 5.3 months in 2025. However, in Belgium, Poland, the Czech Republic, Hungary and Romania people would still lose more than six months even in 2030 (See Annex 7 Appendix).

It is noteworthy that the PRIMES2012-3 baseline results in larger future health impacts compared to the PRIMES2010 baseline, mainly due to higher primary emissions of PM2.5 from expanded biomass combustion in small installations. Thereby, higher primary PM2.5 emissions compensate the benefits from lower precursor emissions of secondary PM2.5, i.e., SO_2, NO_x, NH_3 and VOC.

With the additional technical measures that could be implemented within the EU, life shortening could be further reduced by up to 1.4 months, or by 2030 down to about 3.6 months on average.

Overall, despite implementation of current emission control legislation, population in the EU-28 would still lose between 200 and 220 million years of life after 2020 (See Annex 7 Appendix). The additional measures could gain approximately 60-70 million life years.

Figure A5.9: Loss in statistical life expectancy from exposure to PM2.5 from anthropogenic sources; top: 2005, mid: 2025 CLE, bottom: MTFR 2030

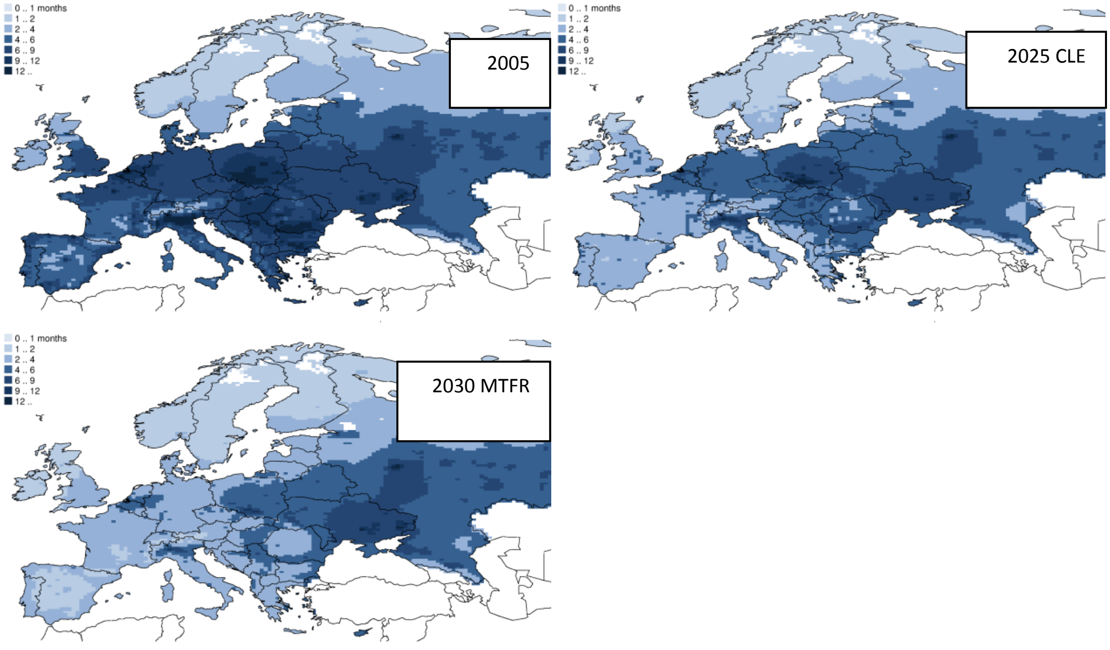
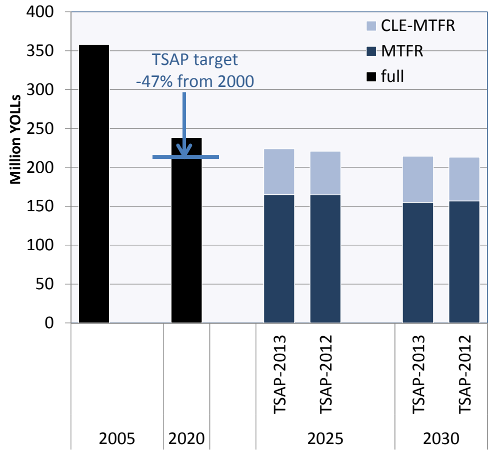


Figure A5.10: Years of life lost (YOLLs) due to exposure to fine particulate matter, EU-28



Despite progress, the TSAP-2013 Baseline would not meet the environmental target for health impacts from PM that has been established in the 2005 Thematic Strategy on Air Pollution for 2020. Instead of the 47% improvement in years of life lost (YOLL) relative to 2000, the current legislation case of the TSAP-2013 would reach only a 45% reduction.

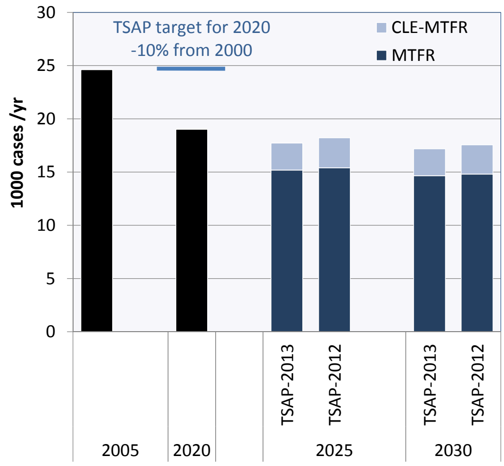
6.2 Health impacts from ground level ozone

The TSAP-2013 Baseline suggests for 2025 approximately 18,000 cases of premature deaths from exposure to ground-level ozone in the EU-28 (Figure A5.11). This is safely below the 10% reduction target (25,000 cases) that was established by the 2005 Thematic Strategy on

Air Pollution for 2020 relative to 2000, mainly due to more optimistic expectations on the development of hemispheric background ozone levels.

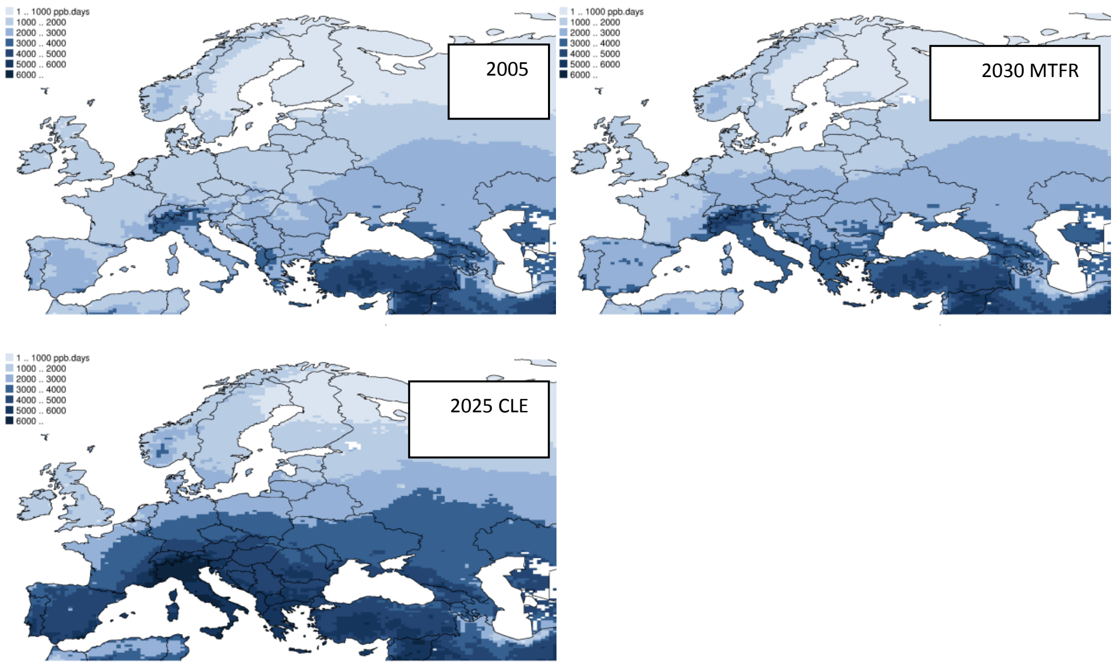
Additional emission reduction measures within the EU-28 could save another 2,500 cases of premature deaths.

Figure A5.11: Cases of premature deaths due to exposure to ground-level ozone, EU-28



The spatial pattern of the health-relevant SOMO35 indicator, and how this will be influenced by the different emission reduction scenarios, is presented in Figure A5.12

Figure A5.12: The SOMO35 indicator that is related to premature mortality from ground-level ozone

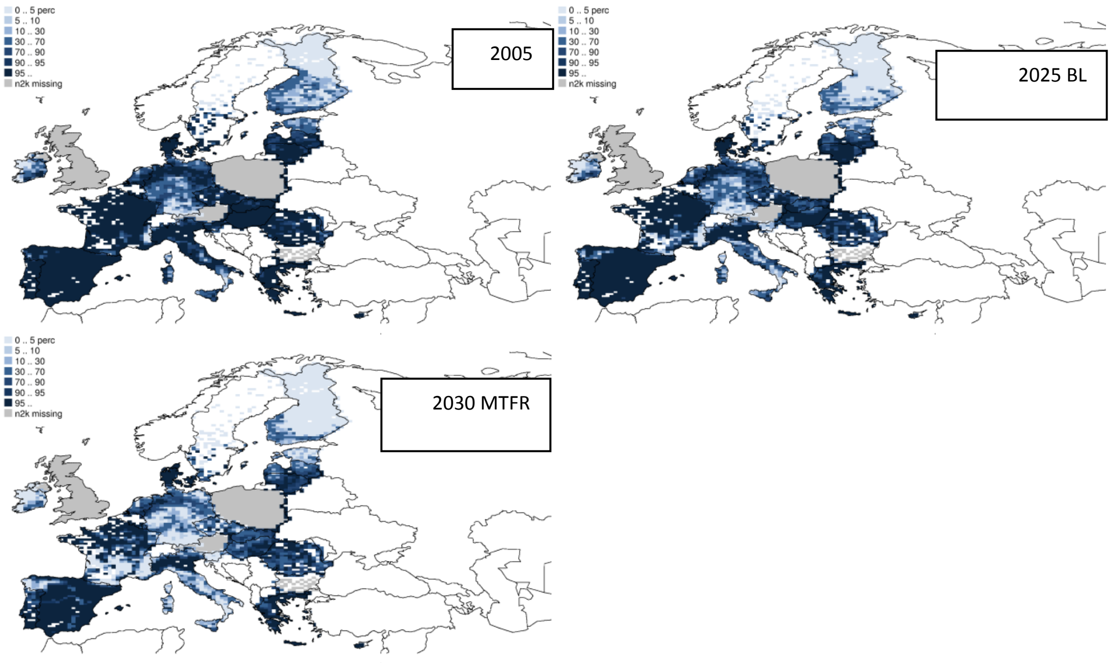


6.3 Eutrophication and biodiversity

Threat to biodiversity of Natura2000 areas

In addition to fragmentation and climate change, excess nitrogen deposition constitutes an important threat to biodiversity in areas that are protected under the Birds Directive and the Habitat Directive (i.e., Natura2000 areas).

Figure A5.13: Percentage of Natura2000 areas with nitrogen deposition above their critical loads for eutrophication. Top: 2005, mid: 2025 CLE, bottom: MTFR 2030



For 2005, it is calculated that biodiversity was under threat from excess nitrogen deposition in 77% (423,000 km^2) of the protected zones. By 2025, the expected declines in NO_x emissions would reduce the threatened area to 62%, leaving 343,000 km^2 unprotected. By 2030, full application of the available reduction measures, especially for ammonia emissions, could provide protection to another 95,000 km^2 of the nature protection areas in Europe (See Annex 7 Appendix).

Threat to biodiversity of all ecosystems

In 2005, more than 1.1 million km^2 (i.e., 66%) of the European ecosystems were exposed to nitrogen deposition that exceeded their critical loads for eutrophication. The future development will be mainly influenced by the fate of NH_3 emissions. In 2025, the TSAP2013 Baseline would reduce the area under threat to about 0.9 million km^2, while higher NH_3 emissions in the TSAP-2012 Baseline would leave about 0.94 million km^2 unprotected. The available additional emission reduction measures could safeguard another 180,000 to 200,000 km^2.

Due to less progress in the reduction of NH_3 emissions than anticipated, the TSAP-2013 Baseline would fail to meet the environmental targets for eutrophication that have been established in the 2005 Thematic Strategy on Air Pollution for 2020. Instead of the 31% improvement in ecosystems area with nitrogen deposition above critical loads for eutrophication relative to 2000, the current legislation case of the TSAP-2013 would achieve only a 24% reduction (Figure A5.14).

Figure A5.14: Ecosystems area with nitrogen deposition in excess of the critical loads for eutrophication, EU-28

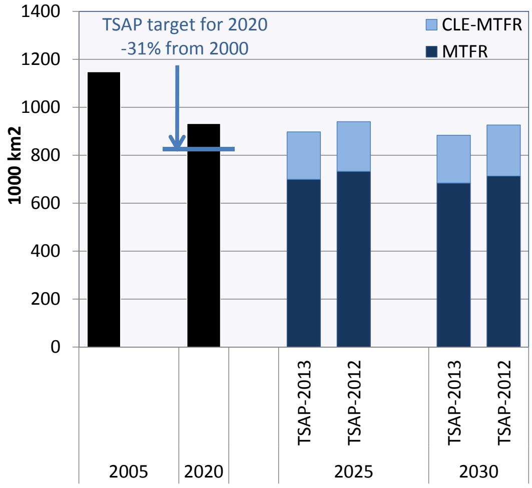
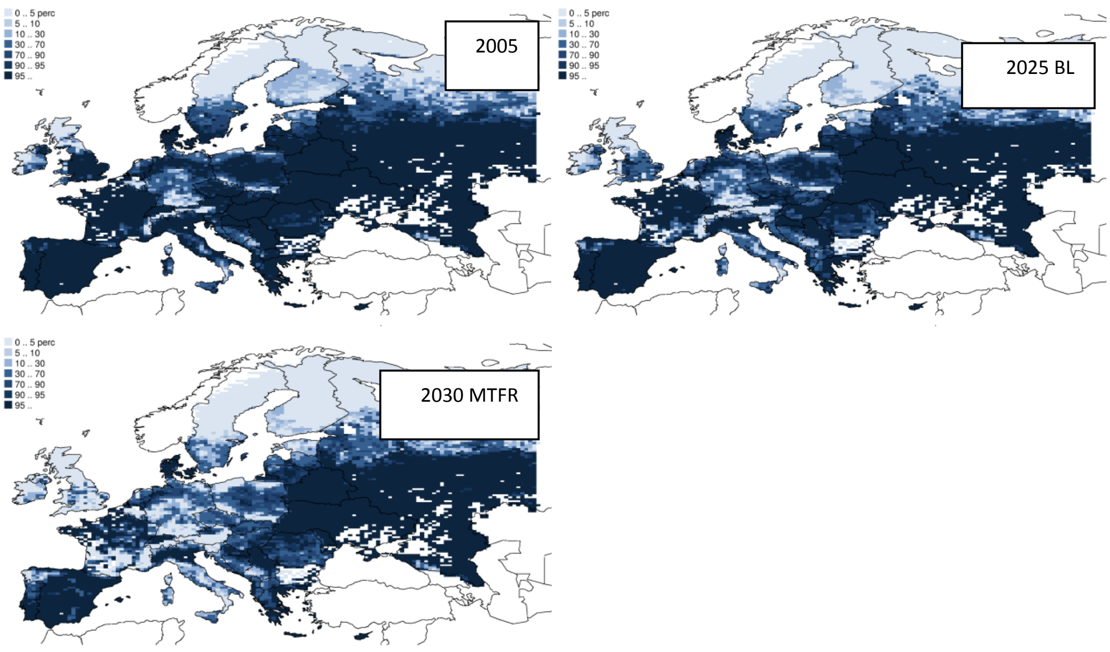


Figure A5.15: Percentage of ecosystems area with nitrogen deposition above their critical loads for eutrophication.

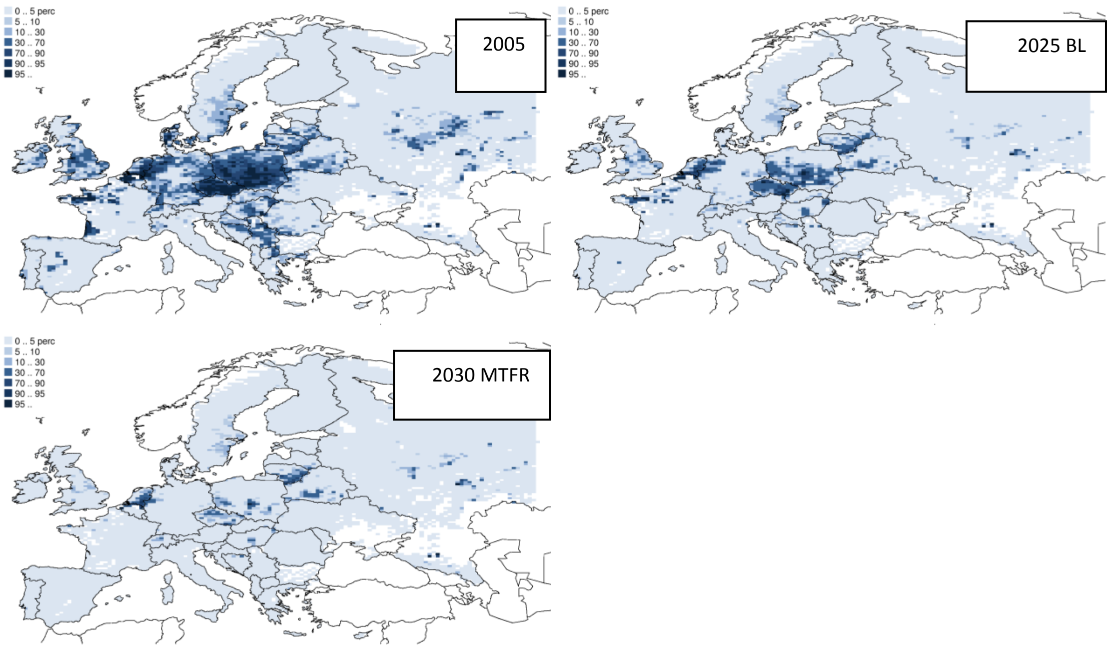


6.4 Acidification

Acidification of forest soils

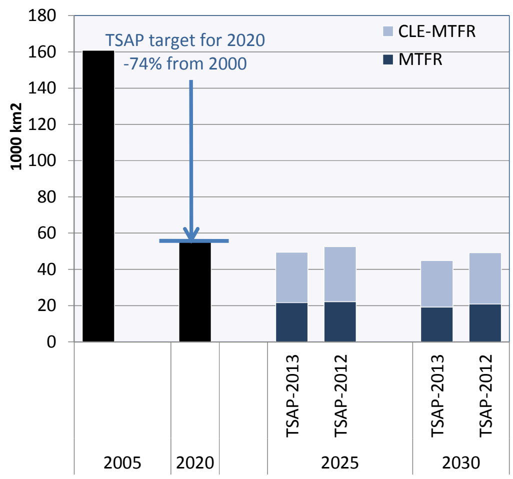
With the 2012 data set on critical loads (Posch et al. 2011), it is calculated that in 2005 critical loads for acidification have been exceeded in a forest area of 160,000 km^2, i.e., in about 12% of the forests within the EU-28 for which critical loads have been reported.

Figure A5.16: Percentage of forest area with acid deposition above the critical loads for acidification. Top: 2005, mid: 2025 CLE, bottom: MTFR 2030



Especially the anticipated further decline in SO_2 emissions will resolve the threat for another 110,000 km^2 up to 2025. Additional measures could provide sustainable conditions for another 30,000 km^2 up to 2030, and leave only 0.45% of European forests threatened by acidification (See Annex 7 Appendix). These measures would especially benefit the former ‘black triangle’ (i.e., in Poland, Czech Republic and the eastern parts of Germany), while residual problems would remain in the Netherlands due to high ammonia density. Thereby in 2020, the Baseline would achieve the 74% target for acidification of the TSAP 2005 (Figure A5.17).

Figure A5.17: Forest area with acid deposition in excess of the critical loads for acidification, EU-28



ANNEX 6 ELEMENTS OF A FUTURE EUROPEAN CLEAN AIR PROGRAMME TO SUPPORT MEMBER STATE ACTION ON REDUCING AIR POLLUTION

1. INTRODUCTION

The ex-post analysis of the present EU air quality policy framework assessed in detail the reasons for the outstanding compliance issues with respect to the AAQD and NECD. The analysis is documented in detail in Annex 4 with projections underpinning the compliance prospects further developed in Annex 5. The main conclusions are brought forward in Chapter 3 of the main impact assessment report.

In addition to a number of pollutant specific drivers of the problems, a number of drivers causing the outstanding were attributed to "governance" related issues, including the lack of capacity to effectively assess local air pollution problems and manage them efficiently and the scope for increasing synergies between national and local air pollution management efforts driven respectively by the NECD and the AAQD. The following key areas merited further attention (see in particular the description of options in Chapter 5.1):

- Enhanced capacity building for "local" air quality assessment and management to enable developing and implementing better targeted and cost-effective air pollution reduction strategies and policies for the purpose of reaching compliance and avoiding penalties resulting from ongoing infringement cases;
- Fostering enhanced synergies between local and/or national air quality management and other relevant plans developed and implemented at the national and/or local level (e.g. on climate change mitigation, sustainable energy, mobility, and urban development);
- Broadening the toolbox available to national and local authorities for assessing and managing air pollution and supporting best practice exchange nationally and across the EU (notably related to urban AQ management);
- Fostering enhanced public awareness, participation, and support for national and local action on air pollution, including the marketing and sales of "green" products;

It was suggested in Chapter 5 that the above actions could be usefully grouped into a future European Clean Air Programme also for the purpose of engaging all relevant bodies involved in implementing air quality measures. Considering the specific target groups, these actions are regrouped as follows:

- Action to improve the urban air quality
- Action to abate ammonia emissions
- Action at EU level to promote exchange of good practice and broaden the air quality management tool box
- Action at international level

It is furthermore noted that addressing the governance related issues hampering full compliance by 2020 will also benefit the proper implementation of the policy framework defined for the period beyond 2020 (as described in Chapter 6) inter alia by offering a platform for early action and dedicated stakeholder consultations.

2. ACTION TO IMPROVE THE URBAN AIR QUALITY

Many of the air quality-related problems are related to and concentrated in urban "hotspot areas", i.e. areas with a dense population, high levels of economic activity, and intense traffic. To address the challenges facing these areas, a combination of action is needed at all policy levels.

2.1. Action better identify and address key air pollution sources in urban areas

Based also on the outcome of the Air Implementation Pilot, and effective urban clean air action programme would include the exchange of good practice and, where appropriate, the development of common guidelines, for the following components:

- High quality and comparable local emission inventories, including enhanced synergies with the national emission inventories;
- High quality monitoring networks, including deriving the maximum information from existing networks;
- Source apportionment, i.e. the identification of key pollutant sources contributing to the air quality exceedances (based on matching emission inventories and monitoring data and using models to map the relative importance and abatement potential)
- Emission and air quality forecasting tools capable also ex-ante cost-effectiveness analysis;
- Air pollution abatement options applied across European (and possibly international) urban areas, including technical and non-technical costs and benefits;
- Integrated cost-benefit analysis integrating national and local conditions based on better understood trends in transboundary air pollution levels;
- Enhanced public information, including the development of harmonized and easy to understand air quality indexes to promote greater public awareness and guiding purchase decisions;

Enhanced capacity in these areas would serve to better integrate (and monitor) air quality consideration in other policy initiatives notably in the field of sustainable mobility and energy at national and local level. It could help assessing the air quality related benefits (or needs) related to upgrading (retrofitting) municipal transport fleets, plans for promoting alternative means of transport including cycling and walking as well as the roll out of e-mobility initiatives. It could furthermore help developing (more) effective low emission zones combined with road pricing schemes or access restrictions, optimized inter-modality plans, etc.

EU level support would be built around the new integrated projects foreseen under the new LIFE regulation which would also offer better access to other EU funds for more targeted action such as fuel switching programmes in certain particularly challenging areas in the EU.[308]

Project-based initiatives would be supported by horizontal services including the regular hosting of EU-wide platforms for reviewing progress, exchange of good practice, and identifying common challenges and solutions. Horizontal services could also deliver common

[308] The Partnership Agreements with Member States on priorities for the ‘big five’ EU funding instruments include a strong air quality component. Several Member States with particular air quality problems often have favourable access to structural funds (in terms of co-financing rate), and these funds can have an instrumental role in tackling urban air quality problems, e.g. by promoting fuel switching to reduce pollution from the domestic combustion sector.

guidelines in other fields than those mentioned above such as guidelines for air-quality-related retrofit programmes (possibly also including certification standards for practitioners); Voluntary programmes identifying and supporting the uptake of "Super Ultra Low Emission Standards" (SULES) to further limit emissions from industrial activities, vehicles, and heating appliances emission heaters, as a voluntary tool for national and local authorities to help achieve compliance with EU air quality legislation, and at the same time promote technical innovation, etc.

2.2. Action to improve the governance of air quality management at national and EU level

A major cause behind non-compliance has been attributed to poor or lacking co-ordination between the various levels of government whose actions affect air pollution. For example, national vehicle taxation policies have brought about the preponderance of diesels which – emphasized by the real world emissions problem for the Euro standards – has made it more challenging to reach the NO2 air quality standards. For particulates, more than half of concentrations in many locations can be due to pollution from outside the urban borders which makes it challenging to adequately address the situation without effective co-ordination of policies and measures at national level.

Eligibility for EU support of integrated programmes could be made subject to commitments made by the various national governance level in the Member States to tackle air pollution in a more integral and coherent way, including also appropriate arbitrage platforms to ensure that local air quality management needs are taking into account at regional and national level. Such provisions could also be made part of an amended NECD.

3. ACTION TO ABATE AGRICULTURAL AIR POLLUTION EMISSIONS

One of the main conclusions drawn from the ex-post evaluation of EU air quality policy is the need to give higher priority abating emissions from the agricultural sector, notably related to ammonia where there is a large untapped potential for cost-effective action.

Focal areas would include emission reductions from livestock manures during various stages of the animal production and manure management chains linked to animal feeding, manure management, manure storage systems and manure application to crop land, as well as inorganic fertilizer application (especially from urea-based nitrogen fertilizers).

Advanced ammonia abatement methodologies are available and have been tried and tested for many years, but have yet to be applied at a wider scale. Costs incurred are often offset by the combined benefits to the farmer, such as increased nitrogen use efficiency, whereby nutrients are taken up by the crops rather than emitted to the air, reduced need for costly mineral fertilizers, improved agronomic flexibility, reduced emissions of other environmental pollutants, a healthier working environment for the farmer, and limited odours. While some Member States have taken the lead by developing national standards and good practice, others have done little to address the issue as yet. At EU level, ammonia emissions are largely unregulated, and support measures through the Common Agricultural Policy have so far been limited. To further reduce ammonia emissions in future, the following elements for action will be instrumental.

- Formulation of national emission reduction potential and emission reduction options available (also for the purpose of assisting implementation of the ammonia ceilings contained in a revised NECD);

- Listing cost-effective source control measures to abate ammonia emissions from agriculture and assessing them in a national context, including their impacts on urban air quality challenges. Defaults options could include manure management options (storage, application techniques), feeding strategies, animal housing, fertilizer management (e.g. urea substitution), and balanced fertilization through national nitrogen budgets, extending nitrate vulnerable zones under the Nitrates Directive and/or applying the same rules outside designated nitrate vulnerable zones,

Horizontal support at EU level could entail the hosting of regular sector specific exchange platforms (e.g. a Agriculture Clean Air Forum) that could form the basis for discussing possible regulatory or quasi regulatory option including a review and update of the existing Best Available Techniques (BAT) Reference Document for pigs and poultry under the IED by 2014, including the adoption of new BAT Conclusions, consideration of appropriate labelling provisions as well as requirements for urease inhibitors in the context of the on-going revision of the Fertilizers Regulation, regulation of manure management on the basis of the conclusions and recommendations from a recent study on the collection and analysis of data for the control of emissions from the spreading of manure.

Initiatives would be linked to relevant initiatives and funding opportunities under the new Common Agricultural Policy, notably for those related to food production, sustainable management of natural resources and climate action, and balanced territorial development.

4. ACTION AT INTERNATIONAL LEVEL

EU air quality is largely influenced by emission sources outside the EU, and to achieve the long-term air quality objectives to protect human health and the environment, future international cooperation to reduce air pollution outside the EU and to and address short-lived climate pollutants (SLCP) is of crucial importance to limit background and hemispheric air pollution in the EU.

The regional cooperation in Europe and North America on air pollution has a long history, with the 1979 UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP) providing the main framework. Early work was focussing on improving and coordinating air pollution research and monitoring, but over the last few decades a range of legally binding multilateral agreements and protocols have been agreed that set out reduction measures and cap national air pollution emissions. More recently, the CLRTAP has also reached out to other regional initiatives and frameworks, particularly in Asia.

In order to enhance international cooperation to reduce emissions from EU neighbouring countries and regions, future work should focus on the following elements for action.

- Broadening ratification of the (new) amended Gothenburg Protocol and supporting neighbouring countries with the implementation of the new Gothenburg Protocol by enabling targeted technical assistance by the CLRTAP secretariat, subsidiary groups, EMEP, and International Cooperate Programmes and promoting bilateral and multilateral development and cooperation programmes in the EECCA countries, in particular those under development and assistance programmes under EU neighbourhood policy, such as the EU Air Quality Governance Project (http://www.airgovernance.eu).
- Improve the global cooperation on air quality, incuding through information sharing platforms such as Global Atmospheric Pollution Forum (GPF) under the International Union of Air Pollution Associations, the UNEP Climate and Clean Air Coalition

(CCAC), the Global Methane Initiative (GMI), the Task Force on Hemispheric Transport of Air Pollution (TF HTAP) under the CLRTAP, and the World Health Organization (WHO)

- Promote further action on air quality within the IMO and the newly established the European Sustainable Shipping Forum focusing in particular on full and rapid implementation of the new sulphur standards in existing and possibly new Sulphur Control Areas, the creation of Nitrogen Emission Control Areas in the EU regional seas, Monitoring, Reporting and Verification of key air pollutants (SOx, NOx and PM), possibly also the establishment of an EU NOx Fund or maritime shipping to promote rapid uptake of abatement technologies.
- Further developing bilateral cooperation on air pollution with key EU trading partners including the United States' Environmental Protection Agency (EPA), Japan, and China.

ANNEX 7 ANALYSIS OF POLICY SCENARIOS RELATED TO TARGETS FOR THE PERIOD UP TO 2030

1. EMISSION REDUCTIONS DELIVERED BY THE RESPECTIVE OPTIONS

The measures listed in **Error! Reference source not found.** of chapter 6 would reduce pollutant emissions in different proportions in the various options.

Options 6A and 6B would mostly reduce primary PM emissions, SO2 and ammonia and rely only to a lesser extent on measures reducing NOx and VOCs; while deeper cuts in emissions of these two pollutants are delivered by options 6C and 6D.

These qualitative conclusions equally hold for emission reductions in 2025 and 2030.

Table A7.1: Emission reductions by pollutant delivered by the options for post 2020. Percentage changes vs year 2005 and Option 1.

2025			6A			6B			6C			6D		
	2005	Option1	KT	vs 2005	vs opt1	KT	vs 2005	vs opt1	KT	vs 2005	vs opt1	KT	vs 2005	vs opt1
SO2	8172	2446	2188	-73%	-11%	1903	-77%	-22%	1694	-79%	-31%	1593	-81%	-35%
NOx	11538	4616	4535	-61%	-2%	4484	-61%	-3%	4096	-64%	-11%	3525	-69%	-24%
PM2,5	1647	1266	1059	-36%	-16%	960	-42%	-24%	844	-49%	-33%	690	-58%	-46%
NH3	3928	3658	3390	-14%	-7%	3122	-21%	-15%	2767	-30%	-24%	2566	-35%	-30%
VOC	9259	5604	5322	-43%	-5%	5157	-44%	-8%	4648	-50%	-17%	3308	-64%	-41%
2030			6A			6B			6C			6D		
	2005	Option1	KT	vs 2005	vs opt1	KT	vs 2005	vs opt1	KT	vs 2005	vs opt1	KT	vs 2005	vs opt1
SO2	8172	2211	1999	-76%	-10%	1720	-79%	-22%	1510	-82%	-32%	1383	-83%	-37%
NOx	11538	4051	3970	-66%	-2%	3921	-66%	-3%	3544	-69%	-13%	2947	-74%	-27%
PM2,5	1647	1200	994	-40%	-17%	904	-45%	-25%	802	-51%	-33%	607	-63%	-49%
NH3	3928	3663	3375	-14%	-8%	3099	-21%	-15%	2762	-30%	-25%	2568	-35%	-30%
VOC	9259	5460	5199	-44%	-5%	5043	-46%	-8%	4569	-51%	-16%	3191	-66%	-42%

For individual Member States, the associated emission reductions per pollutant in 2025 and 2030 are listed in Appendix 7.1. In the Appendix, % emission reductions are expressed against the 2005 benchmark, since this is the benchmark year for emission reduction commitments in the Gothenburg Protocol.

2. IMPACT REDUCTIONS DELIVERED BY THE RESPECTIVE OPTIONS FOR POST 2020 TARGETS

2.1. Health and environmental impacts

The impact indicators summarising the health and environmental improvements delivered by options 6A-D are presented in table A7.3. As described in chapter 3.5, health impacts due to exposure to particulate matter and to ground-level ozone include both mortality and morbidity effects. Table A7.3 is restricted to the headline effects on premature mortality due to chronic PM effects and to acute ozone effects, while the impact on the full range of health effects is provided in Appendix 7.2.

As well as the 2005 level, the health impacts in 2025 under option 1 are indicated. So, option 6A would lead to a reduction in premature deaths of 21,000 due PM2.5 compared to option 1 (308,000 less 287,000) etc.

Table A7.2: Impact indicators of the options for 2025 and 2030, and compared to 2005. [premature deaths, ozone: cases of premature deaths/yr, eutrophication and acidification: 1000 km2 of forests/ecosystems left unprotected]. Changes refer to year 2005 and to Option 1.

2025			6A			6B			6C			6D		
	2005	Option1		vs 2005	vs opt1		vs 2005	vs opt1		vs 2005	vs opt1		vs 2005	vs opt1
PM2,5-chronic-premature deaths	494000	307000	287000	-42%	-7%	266000	-46%	-14%	245000	-50%	-20%	225000	-54%	-27%
Ozone-acute-premature deaths	24600	17800	17500	-29%	-2%	17300	-30%	-3%	16500	-33%	-7%	15000	-39%	-16%
Eutrophication, unprotected '000 sq Km	1125	885	850	-24%	-4%	814	-28%	-8%	747	-34%	-16%	684	-39%	-23%
Acidification, unprotected '000 sq Km	161	47	37	-77%	-21%	31	-81%	-30%	24	-85%	-45%	20	-87%	-52%
2030			6A			6B			6C			6D		
	2005	Option1		vs 2005	vs opt1		vs 2005	vs opt1		vs 2005	vs opt1		vs 2005	vs opt1
PM2,5-chronic-premature deaths	494000	304000	284000	-43%	-7%	263000	-47%	-13%	243000	-51%	-20%	216000	-56%	-28%
Ozone-acute-premature deaths	24600	17200	17000	-31%	-1%	16800	-32%	-2%	16000	-35%	-7%	14400	-41%	-16%
Eutrophication, unprotected '000 sq Km	1125	870	832	-26%	-4%	794	-29%	-9%	726	-35%	-17%	665	-41%	-24%
Acidification, unprotected '000 sq Km	161	42	33	-79%	-21%	27	-83%	-36%	21	-87%	-50%	18	-89%	-57%

Detailed tables of impacts per MS are presented in Appendix 7.3.

2.2. Economic impacts

The economic analysis is undertaken by setting a constraint (a gap closure of 50%, say) and identifying the least-cost combination of available technical measures to achieve it. The modelling of the constraint also identifies the measures that meet it at least cost, which are then identified in Table A7.2.

At first, each percentage point of reduction is relatively cheap. However, the more ambitious the option is, the more expensive each percentage point reduction becomes (in economic terms, this is a standard marginal abatement cost curve).

Those factors are further analysed with the computable general equilibrium (CGE) model GEM-E3[309] taking into account the interaction between different sectors, the labour and capital markets and foreign trade. This is crucial to understand the full impacts of the direct compliance costs, which are investments as well as operation & maintenance costs, to all parts of the economy. Expenditure on pollution abatement is an economic opportunity for the sectors that produce the required capital goods; on the other hand, higher production costs in the complying sectors are reflected in price increases that reduce the domestic consumption and international competitiveness of the affected products.

[309] www.GEM-E3.net

2.2.1 Direct compliance costs

The direct cost of policy is the annualised investments required in different sectors to install pollution abatement equipment, as well as operation and maintenance (O&M) of that investment. These costs are presented in Tables A7.3 and A7.4 and are compared to the MTFR costs and to the baseline costs deriving from implementation of current pollution control legislation.

Table A7.3: compliance costs per Member state in 2025 by option, expressed in M€ and in % of GDP.

2025	Option 1	*GDP%*	Opt 6A	*GDP%*	Opt 6B	*GDP%*	Opt 6C	*GDP%*	Opt 6D	*GDP%*
Country				*additional*		*additional*		*additional*		*additional*
Austria	1908	*0,53%*	2	*0,00%*	7	*0,00%*	96	*0,03%*	1040	*0,29%*
Belgium	2333	*0,53%*	7	*0,00%*	22	*0,01%*	114	*0,03%*	759	*0,17%*
Bulgaria	1310	*2,73%*	1	*0,00%*	18	*0,04%*	76	*0,16%*	713	*1,49%*
Croatia	411	*0,66%*	1	*0,00%*	7	*0,01%*	34	*0,05%*	408	*0,66%*
Cyprus	140	*0,65%*	0	*0,00%*	0	*0,00%*	1	*0,00%*	48	*0,22%*
Czech Rep.	1912	*0,95%*	5	*0,00%*	18	*0,01%*	118	*0,06%*	1187	*0,59%*
Denmark	1105	*0,38%*	0	*0,00%*	0	*0,00%*	26	*0,01%*	774	*0,26%*
Estonia	298	*1,38%*	0	*0,00%*	0	*0,00%*	5	*0,02%*	323	*1,50%*
Finland	1373	*0,60%*	0	*0,00%*	0	*0,00%*	13	*0,01%*	1006	*0,44%*
France	11880	*0,48%*	15	*0,00%*	59	*0,00%*	375	*0,02%*	7675	*0,31%*
Germany	13741	*0,47%*	23	*0,00%*	169	*0,01%*	835	*0,03%*	5265	*0,18%*
Greece	2030	*0,84%*	1	*0,00%*	32	*0,01%*	81	*0,03%*	1163	*0,48%*
Hungary	999	*0,86%*	2	*0,00%*	19	*0,02%*	93	*0,08%*	652	*0,56%*
Ireland	1044	*0,46%*	0	*0,00%*	2	*0,00%*	22	*0,01%*	456	*0,20%*
Italy	10515	*0,58%*	30	*0,00%*	261	*0,01%*	655	*0,04%*	3841	*0,21%*
Latvia	373	*1,41%*	0	*0,00%*	0	*0,00%*	19	*0,07%*	592	*2,24%*
Lithuania	356	*0,93%*	0	*0,00%*	1	*0,00%*	23	*0,06%*	601	*1,58%*
Luxembourg	196	*0,37%*	0	*0,00%*	0	*0,00%*	3	*0,01%*	41	*0,08%*
Malta	97	*1,24%*	0	*0,00%*	0	*0,00%*	0	*0,00%*	18	*0,23%*
Netherlands	3855	*0,53%*	1	*0,00%*	9	*0,00%*	63	*0,01%*	913	*0,13%*
Poland	9864	*1,90%*	70	*0,01%*	236	*0,05%*	715	*0,14%*	5910	*1,14%*
Portugal	1353	*0,68%*	4	*0,00%*	29	*0,01%*	82	*0,04%*	832	*0,42%*
Romania	2457	*1,47%*	4	*0,00%*	41	*0,02%*	215	*0,13%*	2905	*1,73%*
Slovakia	760	*0,80%*	1	*0,00%*	15	*0,02%*	86	*0,09%*	777	*0,81%*
Slovenia	447	*0,99%*	0	*0,00%*	1	*0,00%*	48	*0,11%*	146	*0,32%*
Spain	7729	*0,55%*	9	*0,00%*	68	*0,00%*	306	*0,02%*	4747	*0,34%*
Sweden	1456	*0,31%*	0	*0,00%*	0	*0,00%*	14	*0,00%*	602	*0,13%*
Un. Kingdom	7229	*0,32%*	45	*0,00%*	187	*0,01%*	511	*0,02%*	3610	*0,16%*
EU-28	87171	*0,56%*	221	*0,00%*	1202	*0,01%*	4629	*0,03%*	47007	*0,30%*

Table A7.4: compliance costs per Member state in 2030 by option, expressed in M€ and in % of GDP.

2030	Option	GDP%	Opt 6A	GDP%	Opt 6B	GDP%	Opt 6C	GDP%	Opt 6D	GDP%
Country				*additional*		*additional*		*additional*		*additional*
Austria	1983	*0,51%*	2	*0,00%*	7	*0,00%*	88	*0,02%*	1099	*0,29%*
Belgium	2469	*0,52%*	7	*0,00%*	29	*0,01%*	113	*0,02%*	853	*0,18%*
Bulgaria	1212	*2,35%*	1	*0,00%*	18	*0,03%*	55	*0,11%*	752	*1,46%*
Croatia	423	*0,63%*	1	*0,00%*	7	*0,01%*	33	*0,05%*	440	*0,65%*
Cyprus	155	*0,64%*	0	*0,00%*	0	*0,00%*	1	*0,00%*	49	*0,20%*
Czech Rep.	1936	*0,88%*	4	*0,00%*	18	*0,01%*	108	*0,05%*	1269	*0,58%*
Denmark	1117	*0,35%*	1	*0,00%*	1	*0,00%*	12	*0,00%*	814	*0,26%*
Estonia	298	*1,24%*	0	*0,00%*	0	*0,00%*	5	*0,02%*	363	*1,51%*
Finland	1422	*0,58%*	0	*0,00%*	0	*0,00%*	13	*0,01%*	1035	*0,43%*
France	11905	*0,44%*	17	*0,00%*	58	*0,00%*	351	*0,01%*	7783	*0,29%*
Germany	13101	*0,44%*	34	*0,00%*	182	*0,01%*	829	*0,03%*	5576	*0,19%*
Greece	2051	*0,80%*	3	*0,00%*	18	*0,01%*	66	*0,03%*	1241	*0,48%*
Hungary	1061	*0,83%*	2	*0,00%*	19	*0,01%*	93	*0,07%*	695	*0,55%*
Ireland	1177	*0,45%*	0	*0,00%*	1	*0,00%*	19	*0,01%*	516	*0,20%*
Italy	11034	*0,56%*	26	*0,00%*	181	*0,01%*	572	*0,03%*	3950	*0,20%*
Latvia	408	*1,37%*	0	*0,00%*	0	*0,00%*	3	*0,01%*	621	*2,09%*
Lithuania	397	*0,95%*	0	*0,00%*	1	*0,00%*	13	*0,03%*	664	*1,59%*
Luxembourg	204	*0,35%*	0	*0,00%*	0	*0,00%*	3	*0,01%*	45	*0,08%*
Malta	103	*1,20%*	0	*0,00%*	0	*0,00%*	0	*0,00%*	17	*0,20%*
Netherlands	6977	*0,91%*	1	*0,00%*	9	*0,00%*	64	*0,01%*	1517	*0,20%*
Poland	9993	*1,77%*	55	*0,01%*	173	*0,03%*	625	*0,11%*	6849	*1,21%*
Portugal	1495	*0,68%*	4	*0,00%*	16	*0,01%*	69	*0,03%*	922	*0,42%*
Romania	2605	*1,46%*	4	*0,00%*	45	*0,03%*	117	*0,07%*	3010	*1,68%*
Slovakia	826	*0,78%*	1	*0,00%*	15	*0,01%*	86	*0,08%*	852	*0,81%*
Slovenia	467	*0,96%*	0	*0,00%*	1	*0,00%*	44	*0,09%*	147	*0,30%*
Spain	8628	*0,54%*	13	*0,00%*	71	*0,00%*	313	*0,02%*	5131	*0,32%*
Sweden	1484	*0,29%*	0	*0,00%*	0	*0,00%*	15	*0,00%*	635	*0,13%*
Un. Kingdom	7172	*0,29%*	36	*0,00%*	159	*0,01%*	473	*0,02%*	3836	*0,16%*
EU-28	92103	*0,55%*	212	*0,00%*	1032	*0,01%*	4182	*0,03%*	50682	*0,30%*

2.2.2. Affected industries and sectorial impacts

Tables A7.5 and A7.6 show the distribution of compliance costs in 2025 and 2030 for air pollution control in the baseline and in the different policy scenarios based on a technology-oriented classification of emission sources controlled[310].

[310] SNAP: Selected Nomenclature for Air Pollution

Table A7.5: effort required per SNAP sector in 2025 by option, expressed in M€ and in % increase compared to option 1.

2025, EU28	*Option 1*	*Option 6A*		*Option 6B*		*Option 6C*		*Option 6D*	
Costs by SNAP sector (million €/yr, increase compared to baseline)									
Power generation	9561	44	*0,46%*	125	*1,31%*	470	*4,92%*	3519	*37%*
Domestic combustion	9405	74	*0,78%*	497	*5,29%*	1680	*18%*	17791	*189%*
Industrial combustion	2513	19	*0,75%*	156	*6,20%*	641	*25%*	1796	*71%*
Industrial Processes	5017	17	*0,34%*	125	*2,49%*	331	*6,61%*	3964	*79%*
Fuel extraction	695	0	*0,00%*	0	*0,00%*	6	*0,81%*	583	*84%*
Solvent use	1176	1	*0,08%*	2	*0,15%*	56	*4,76%*	12204	*1038%*
Road transport	48259	0	*0%*	0	*0%*	0	*0%*	0	*0%*
Non-road machinery	8760	1	*0,01%*	5	*0,06%*	145	*1,66%*	1451	*17%*
Waste	1	6	*786%*	7	*941%*	9	*1154%*	9	*1203%*
Agriculture	1783	59	*3,33%*	285	*16%*	1292	*72%*	5675	*318%*
Total	87171	221	*0,25%*	1202	*1,38%*	4629	*5,31%*	46992	*54%*

Table A7.6: effort required per SNAP sector in 2030 by option, expressed in M€ and in % increase compared to option 1.

2030, EU28	*Option 1*	*Option 6A*		*Option 6B*		*Option 6C*		*Option 6D*	
Costs by SNAP sector (million €/yr, increase compared to baseline)									
Power generation	7122	36	*0,50%*	99	*1,39%*	436	*6,12%*	3658	*51%*
Domestic combustion	8928	52	*0,59%*	305	*3,41%*	1217	*14%*	19622	*220%*
Industrial combustion	2567	24	*0,93%*	175	*6,81%*	672	*26%*	1850	*72%*
Industrial Processes	5032	17	*0,34%*	125	*2,49%*	334	*6,64%*	4054	*81%*
Fuel extraction	619	0	*0,00%*	0	*0,00%*	5	*0,82%*	556	*90%*
Solvent use	1147	14	*1,20%*	15	*1,28%*	72	*6,25%*	12214	*1065%*
Road transport	52633	0	*0%*	0	*0%*	0	*0%*	0	*0%*
Non-road machinery	12271	1	*0,01%*	5	*0,04%*	146	*1,19%*	3007	*25%*
Waste	1	6	*782%*	7	*938%*	9	*1148%*	9	*1196%*
Agriculture	1784	61	*3,44%*	300	*17%*	1292	*72%*	5711	*320%*
Total	92103	212	*0,23%*	1032	*1,12%*	4182	*4,54%*	50682	*55%*

In option 1, the largest share of compliance costs implied by existing legislation is related to pollution control equipment in the transport sector (more than 50% of total costs), followed by the power sector, the domestic sector[311], non-road machinery and other industries. It is noteworthy that the distribution of additional cost-effective control measures in more stringent pollution control scenarios is very different from the baseline, reflecting the relatively lesser residual potential in sectors that have been more stringently regulated in the past (such as the power sector) and the large untapped potential in other sectors such as agriculture, the domestic sector and solvent applications.

The pollution control expenditure above is expressed in terms of type of activities (combustion, process, etc.) requiring additional investment to abate pollution through technical measures. Further detail on the nature and costs of the technical measures that would be required of individual economic sectors for each of options 6A-6C is provided in Annex 10 (Sectorial impacts and competitiveness proofing).

The costs in tables A7.5 and A7.6 are allocated by type of activity (combustion, solvent use, etc.) but these activities can take place in different economic sectors as defined in national accounts (chemicals, refineries, etc). Table A7.7 presents the costs per economic sector, and Annex 9 provides further analysis of sectorial impacts and their competitiveness implications for each option.

Table A7.7: Effort required per economic sector in 2025 by option, expressed in M€ and in % of sector output. Household expenditure expressed as % of total household consumption. Total cost as % increased compared to option 1 (baseline).

	6A		6B		6C		6D	
Costs by economic sector								
(million €/yr, % of sectorial output, % of total household consumption, or % of EU GDP)								
Agriculture	64	*0,01%*	338	*0,07%*	1425	*0,27%*	5841	*1,12%*
Chemical Products	12	*0,00%*	36	*0,00%*	174	*0,01%*	9111	*0,60%*
Coal extraction	0	*0,00%*	0	*0,00%*	0	*0,00%*	0	*0,00%*
Construction	0	*0,00%*	1	*0,00%*	25	*0,00%*	43	*0,00%*
Consumer Goods Industries	5	*0,00%*	15	*0,00%*	98	*0,00%*	5360	*0,22%*
Oil extraction	1	*0,00%*	1	*0,00%*	1	*0,00%*	6	*0,01%*
Electricity supply	16	*0,00%*	76	*0,02%*	264	*0,07%*	1572	*0,44%*
Ferrous and non-ferrous metals	11	*0,00%*	104	*0,01%*	231	*0,02%*	861	*0,08%*
Market Services	13	*0,00%*	24	*0,00%*	54	*0,00%*	669	*0,01%*
Non Market Services	2	*0,00%*	2	*0,00%*	3	*0,00%*	9	*0,00%*
Refineries	32	*0,01%*	103	*0,04%*	342	*0,13%*	1221	*0,48%*
Other energy intensive	14	*0,00%*	83	*0,01%*	389	*0,03%*	3854	*0,34%*
Transport	0	*0,00%*	3	*0,00%*	19	*0,00%*	60	*0,01%*
Transport equipment	0	*0,00%*	0	*0,00%*	1	*0,00%*	128	*0,01%*
Water Transport	1	*0,00%*	1	*0,00%*	102	*0,05%*	320	*0,15%*
Households	51	*0,00%*	416	*0,01%*	1501	*0,02%*	17937	*0,27%*
Sum	221	*0,00%*	1202	*0,01%*	4629	*0,03%*	46992	*0,31%*

311 The domestic sector includes residential, commercial and institutional activities. The pollution control measures attributed to this sector are improvements to heating appliances. The corresponding expenditure is calculated as the cost premium for the improved appliance compared to the basic type. Note that the pollution abatement costs for private cars (such as the cost of catalytic exhaust systems) are attributed not to the domestic but to the transport sector.

For a 25% gap closure (option 6A) the additional compliance cost is modest and concentrated in the household sector, agriculture and (to a lesser extent) energy intensive industries; for all sectors the additional effort required is less than or of the order of 0,01% of total output. For the 50% and 75% gap closures (options 6B and 6C), households and agriculture remain prominent, but energy intensive industries progressively contribute more. Option 6C (which delivers 75% of the maximum health benefits) requires additional expenditure of 0,27% of the sectorial output in agriculture, 0,13% for refineries, 0,07% for the power sector and much less for all other industries. The effort required of households is 0,023% of their total consumption, on average ca. €3/year per EU citizen.

Option 6D (MTFR) shows a rather different picture, reflecting the fact that all commercially available technical measures are tapped, irrespective of their cost. Highest additional costs are in the chemicals and consumer goods industries (food, clothing, furniture, etc.), related to relatively expensive VOC abatement measures.

2.2.3. Direct economic benefits due to reduced health and environmental impacts

Reducing air pollution delivers substantial direct economic benefits which are summarised in Tables A7.8 and A7.9.

- *Labour productivity gains from reducing the lost working days:* Avoided economic loss from improved productivity alone ranges between €0,7bn and almost €3bn. These can offset by more than a factor 2 the direct emission control expenditure on option 6A, fully compensates it on option 6B, and cover about half those on option 6C.
- *Savings from reduced damage to the built environment:* Benefits due to reduced corrosion and soiling of infrastructure and buildings range between about €53-162M per year in options 6A-6D.
- *Savings from reduced crop losses:* Ground-level ozone damages plants, hampering the growth of trees as well as food crops. The damage to potato and wheat alone is currently estimated at about €2,6bn per year.[312] Emission reductions can reduce this damage by between €61 and 630M per year (options 6A-D). Timber losses are not included.
- *Savings from reduced healthcare costs:* These are evaluated where data are available. However, due to the lack of sufficient data for a number of symptoms (including lower respiratory symptoms, restricted activity days and child morbidity), the estimate is not a full account of overall healthcare costs from air pollution. Even so, the benefits delivered by options 6A-D are substantial, ranging between €219 and 886M per year.

[312] EU27 + CH and NO

Table A7.8: reducing direct economic damage due to air pollution in 2025 options.

2025, EU28	2005	Option 1	Opt. 6A	Opt.6B	Opt. 6C	Opt. 6D
Lost working days, Million	136	82	76	71	65	60
Value of lost working days, M €	17,629	10,651	9,925	9,230	8,514	7,820
% of total labour days lost	0.30%	0.18%	0.17%	0.16%	0.15%	0.13%
Damage to built environment, M €	1,593	503	450	396	358	340
Crop value losses, M €	4,867	2,176	2,114	2,074	1,897	1,545
Respiratory and cardiac hospital admissions	850	641	609	580	542	494
Chronic bronchitis	3,782	2,762	2,574	2,386	2,204	2,023
Total healthcare where quantified	4,631	3,403	3,183	2,966	2,746	2,517

Table A7.9: reducing direct economic damage due to air pollution in 2030 options.

2030, EU28	2005	Option 1	Opt. 6A	Opt.6B	Opt. 6C	Opt. 6D
Lost working days, Million	136	76	71	66	61	55
Value of lost working days, M €	17,629	9,902	9,237	8,594	7,942	7,097
% of total labour days lost	0.30%	0.17%	0.16%	0.15%	0.14%	0.12%
Damage to built environment, M €	1,593	452	408	356	317	293
Crop value losses, M €	4,867	1,985	1,926	1,887	1,716	1,354
Respiratory and cardiac hospital admissions	850	635	605	577	540	483
Chronic bronchitis	3,782	2,668	2,490	2,311	2,139	1,913
Total healthcare where quantified	4,631	3,303	3,094	2,888	2,679	2,396

2.2.4. Broader economic impacts

Direct compliance costs as presented in tables A7.5 and A7.6 are calculated as additional annualised capital and O&M expenditure in the various sectors. Such compliance costs are not to be interpreted as societal costs. This is on the one hand because the investment demand generated represents an economic opportunity for the manufacturers of those investment goods, and on the other hand because the costs of compliance impact production costs and may affect the competitiveness of the affected sectors including at the international level. The analysis needs therefore to take into account:

- Which sectors benefit from expenditure in pollution control by delivering the investment goods, and which other expenditure would be crowded out
- Price effects, and the consequences of price changes for international competitiveness and for consumers.

These aspects were analysed with the CGE model GEM-E3. The required investments and other direct costs per industry were introduced as additional expenditure in the corresponding sectors[313]. Additional benefits in terms of reduced loss of working days are considered and presented separately by proportionately adjusting the labour supply (+0,012 to +0,048% in options 6A to 6D, see table A7.9) in the 'health' case in the table below. Other direct economic benefits such as improved crop yields, reduced healthcare expenditure, and damage to utilitarian buildings were not included in this analysis and are to be considered separately. The results in terms of GDP impact, sectorial output and exports by sector are presented in tables A7.10 and A7.11; the exact figures are for 2025 with the results, being calculated as percentage changes, are –considering also the error margin- not significantly different for 2030.

Table A7.10: GDP and sectorial output change in options, the effects of health benefits to labour productivity are presented seprately as "health"case

	6A		*6B*		*6C*	
Change in sectorial output in the EU28 (2025), and GDP change; % compared to option 1						
	base	*health*	base	*health*	base	*health*
Agriculture	-0,01%	0,00%	-0,06%	-0,04%	-0,22%	-0,20%
Chemical Products	0,00%	0,01%	0,01%	0,03%	0,03%	0,05%
Construction	0,00%	0,01%	0,02%	0,03%	0,07%	0,08%
Consumer Goods Industries	0,00%	0,00%	-0,01%	0,00%	-0,04%	-0,01%
Electric Goods	0,00%	0,02%	0,03%	0,05%	0,10%	0,13%
Electricity supply	0,01%	0,01%	0,02%	0,04%	0,10%	0,12%
Ferrous and non-ferrous metals	0,00%	0,01%	-0,01%	0,02%	0,00%	0,03%
Natural Gas	0,00%	0,00%	0,00%	0,00%	0,01%	0,02%
Market Services	0,00%	0,01%	0,00%	0,01%	0,00%	0,02%
Non Market Services	0,00%	0,00%	0,00%	0,01%	0,00%	0,01%
Petroleum Refining	-0,01%	0,00%	-0,03%	-0,02%	-0,10%	-0,08%
Other energy intensive	0,00%	0,01%	-0,01%	0,01%	-0,02%	0,01%
Other Equipment Goods	0,00%	0,01%	0,02%	0,05%	0,06%	0,11%
Transport	0,00%	0,00%	0,00%	0,01%	-0,01%	0,02%
Transport equipment	0,00%	0,01%	0,01%	0,04%	0,04%	0,09%
GDP	**-0,001%**	***0,007%***	**-0,007%**	***0,009%***	**-0,025%**	***-0,000%***
Direct benefits not included	***0.007%***	***0.002%***	***0.013%***	***0.004%***	***0.020%***	***0.007%***
indicators calculated as relative changes do not differ significantly for 2025 and 2030. Exact figures reported are for 2025.						

Excluding health effects on labour productivity (which, together with the other direct benefits of table 18, would be equivalent to 0,020% of GDP), the estimated aggregate GDP impact is very small even on Option 6C, at 0,025%. Including those productivity gains overturn the direct expenditure effect for options 6A and 6B, and still fully offset the negative impact on GDP making it neutral on option 6C. This is without considering other direct benefits (healthcare, crop yield, infrastructure impacts); as shown in Table A7.8, additional quantifiable direct benefits would amount in option 6C to 1080 M€, equal to 0,007% of GDP, and so option 6C would have an overall small positive effect on GDP.

Several of the sectors that require additional efforts in terms of pollution abatement investment, such as ferrous and non-ferrous metals, chemicals and the power sector, also

[313] Any possible measures with negative costs (i.e. no regret measures that would provide savings for operators at no extra compliance cost) were removed and excluded from the analysis.

benefit from additional demand for the delivery of the required investment goods throughout the economy and see a net output increase. The sectors that bear a comparatively larger share of the burden are agriculture and the refinery sector.

2.3. Social impacts of gap-closure options

Table A7.11 summarises the employment impacts of options 6A to 6C by sector. In all cases the effect is essentially neutral (max 2000 jobs in option 6C, which is within the uncertainty range), even without taking labour productivity gains into consideration. When those are considered there is a net employment increase (37-112 thousand jobs). This result is the sum of additional productivity of existing jobs (accounting for around two-thirds of the total) and net creation of new jobs due to increased competitiveness of EU industries.

Table A7.11: Sectorial employment change in options, the effects of health benefits to labour productivity are presented seprately as "health"case. Last row shows the net welfare effect.

	6A		*6B*		*6C*	
Change in Sector employment in EU28 (2025) in '000 jobs; and welfare change in % compared to option 1						
	base	*health*	base	*health*	base	*health*
Agriculture	-1,697	0,631	-6,051	-1,644	-24,574	-17,589
Chemical Products	0,055	0,886	0,294	1,912	1,264	3,711
Construction	0,826	3,825	4,209	10,148	16,237	25,043
Consumer Goods Industries	-0,095	1,668	-0,132	3,345	-0,878	4,398
Electric Goods	0,097	0,487	0,576	1,413	2,173	3,379
Electricity supply	0,127	0,355	0,428	0,855	2,387	3,066
Ferrous & non-ferrous metals	0,057	1,155	-0,883	1,234	0,697	3,947
Natural Gas	0,000	0,013	-0,031	-0,007	0,043	0,085
Market Services	0,008	10,299	-0,258	19,693	2,661	32,405
Non Market Services	0,102	6,268	0,427	12,165	3,283	21,101
Petroleum Refining	-0,013	-0,003	-0,044	-0,025	-0,111	-0,082
Other energy intensive	0,014	0,785	-0,578	0,922	-1,405	0,867
Other Equipment Goods	0,464	2,727	2,357	6,638	9,602	16,223
Transport	0,025	2,400	0,106	4,729	1,471	8,450
Transport equipment	0,107	1,004	0,634	2,329	2,857	5,424
TOTAL	-0,069	37,605	0,821	73,691	2,119	112,256
Impact on aggregate household consumption	**-0,002%**	**0,012%**	**-0,009%**	**0,017%**	**-0,030%**	**0,008%**

indicators do not differ significantly for 2025 and 2030. Exact figures reported are for 2025.

2.4. Monetised impacts of gap-closure options

Following the approach described in chapter 3, the health impacts described in table A7.3 can be translated into economic loss figures based on a well-established literature of contingent valuation studies (Tables A7.12 and A7.13 for 2025 and 2030). The direct health and non-health impact endpoints that are valued in the previous section are also reported.

Table A7.12: Monetised Air Quality impacts in 2005 and in options for the year 2025, in M€/year

	metric	2005	Option 1	Option 6A	Option 6B	Option 6C	Option 6D
Chronic mortality, low estimate	PM	268,792	160,066	149,167	138,448	127,643	117,023
Chronic mortality, high estimate	PM	916,190	685,035	638,815	592,247	546,445	501,559
Acute mortality	O3	16,121	11,774	11,057	10,247	9,460	8,732
Chronic Bronchitis	PM	42,571	30,405	28,339	26,264	24,268	22,258
Restricted Activity Days (RAD)	PM	9,341	6,656	6,391	6,143	5,793	5,279
Other morbidity	PM	268,792	160,066	149,167	138,448	127,643	117,023
Total, low estimate		**338,479**	**210,217**	**196,250**	**182,383**	**168,390**	**154,402**
Total, high estimate		**985,877**	**735,186**	**685,898**	**636,182**	**587,191**	**538,938**
Value of lost working days, M €		17,629	10,651	9,925	9,230	8,514	7,820
Healthcare cost (quantified)		4,631	3,403	3,183	2,966	2,746	2,517
Crop value losses, M €		4,867	2,176	2,114	2,074	1,897	1,545
Damage to built environment, M €		1,593	503	450	396	358	340

Note: to avoid any double counting, the value of lsot workind days has been subtracted from the total external cost of RADs; likewise, healthcare costs have been subtracted from the exteranl costs related to illnesses (morbidity)

Table A7.13: Monetised Air Quality impacts in 2005 and in options for the year 2030, in M€/year

	metric	2005	Option 1	Option 6A	Option 6B	Option 6C	Option 6D
Chronic mortality, low estimate	PM	268,792	149,724	139,727	129,817	119,996	107,110
Chronic mortality, high estimate	PM	916,190	678,255	633,258	587,778	543,620	485,982
Acute mortality	O3	1,654	1,322	1,302	1,288	1,232	1,109
Chronic Bronchitis	PM	16,121	11,375	10,615	9,852	9,121	8,153
Restricted Activity Days (RAD)	PM	42,571	29,508	27,540	25,562	23,674	21,157
Other morbidity	PM	9,341	6,456	6,206	5,971	5,638	5,062
Total, low estimate		**338,479**	**198,387**	**185,390**	**172,490**	**159,661**	**142,592**
Total, high estimate		**985,877**	**726,917**	**678,920**	**630,451**	**583,285**	**521,464**
Value of lost working days, M €		17,629	9,902	9,237	8,594	7,942	7,097
Healthcare cost (quantified)		4,631	3,303	3,094	2,888	2,679	2,396
Crop value losses, M €		4,867	1,985	1,926	1,887	1,716	1,354
Damage to built environment, M €		1,593	452	408	356	317	293

In 2025, external costs due to air pollution are projected to reduce about 37% compared to 2005, and 40% in 2030. However, in option 1 they would remain in the range between 225 and 760 billion €/year in 2025 and 215-740 in 2030. Additional action beyond option 1 could reduce up to 60-200 billion €/year. Of these, more than 4 billion € could be direct economic savings due to less work absenteeism, healthcare costs, crop damage and deterioration of buildings and infrastructure.

3. POLICY INSTRUMENTS TO ACHIEVE THE INTERIM TARGETS

The policy measures to deliver options 6A to 6E are set out in Table A7.1. While measures related to product standards (heating appliances in the domestic sector, emission limits for non-road machinery, inorganic fertilizers) are harmonised at EU level to meet the needs of the single market, other measures could in principle either be enacted either at national level or as EU-wide source controls. In practice, we will always look at a combination of both. A range of different sensitivity analysis has been undertaken for the central case Option 6C*, to investigate if and how different choices as regards the main policy instruments adopted may impact the costs of achieving the same overall environmental and health objectives. The analysis compared applying a maximum level of subsidiarity (i.e. NECD ceilings only) to applying various combinations of source controls and NECD ceilings, as well as including emission reductions from international marine shipping in the scope of the NECD.

As a general principle, constraining the range of policy instruments and technical measures that can be used will restrict access to cost-effective measures and so increase the costs of meeting a given set of environmental and health targets. Leaving full flexibility to Member States to decide on which emission sources to control and which technical measures to apply to achieve a national emission ceiling will normally always be the most cost effective option. However, EU source controls may be necessary and useful for levelling the playing field and improving administrative efficiency. In the public consultation, 94% of government respondents advocated more stringent source controls at EU level to support the achievement of emission ceilings.[314] Harmonised measures at EU level would to some extent result in lower cost-effectiveness, but this may be well justified in consideration of these benefits. Several different measures at EU level were analysed, and the additional implementation cost estimated.[315] The results are summarised as follows; details about the specific measures are provided in Annex 8:

Table A7.14: Additional pollution control costs entailed by taking EU-wide harmonised measures in specific sectors

Sector	*Control costs (vs base Option 6C*)*	*Policy instrument*
BASE case 6C*	4680 M€	NEC Directive only
Agriculture	51-67 M€ (+ 1,1-1,4%)	Possible specific EU initiative for e.g. integrated manure management, BREF revision, BAT conclusions
Medium combustion (1-50 MWth)	162 M€ (+3,4%)	Specific legislative initiative described in detail in Annex 12
Chemicals; Solvents	2 M€ (+0,05%)	BREF revision, BAT conclusions
Cement&Lime; Glass	63 M€ (+1,3%)	BREF revision, BAT conclusions
Petroleum Refining	24 M€ (+0,5%)	BREF revision, BAT conclusions

[314] Either alone (34%) or in combination with more stringent NEC ceilings (57%)

[315] Note that measures related to product standards are always assumed to be taken at EU-wide scale due to single market provisions. These include: emission standards for road vehicles and non-road machinery; solvent content of consumer products; minimum standards under the Ecodesign directive.

International marine shipping	Only NECA: 37 M€ (+0,7%) SECA+NECA: 433-1921 M€ (+9-40%)	Establishment of additional emission control areas for SO2 and NOx under IMO Marpol Annex VI rules

The conclusion is that taking further emission control measures at harmonised EU level in several industrial sectors as well as in agriculture and for medium-scale combustion plants would help the Member States to achieve the emission reductions required to meet their air quality targets in the post-2020 horizon by providing certainty on the emission controls covered by EU legislation and at the same time ensuring a level playfield for businesses across Europe; this would be achieved with relatively minor cost-effectiveness compromises. The EU could deliver the needed source controls with a combination of existing and new policy initiatives: emission limit values for many industrial activities are updated through the periodic revision of sectorial BREFs[316] under the Industrial Emissions Directive (IED) resulting in the adoption of BAT conclusions (as Commission implementing decisions). The Member States, through their vote on the draft Decisions in the IED Article 75 Committee, will eventually have a decisive voice in defining the stringency level of future BAT conclusions. This way Member States will determine the share of emission reductions to be delivered at EU-wide scale and the share to be left for them to deliver with national measures.

Combustion installations below the 50 MWth threshold set in the Large Combustion Plants directive (now merged in the IED) will be addressed by a specific proposal, for which Annex 12 provides details and supporting analysis. The bottom-up analysis shows that, depending on the emission level option chosen, this will reduce emissions of SO2, NOx and total PM (dust) by 127-139, 76-338 and 42-45 kilotons per year. Total annualised compliance costs for implementing the corresponding measures are in the range of 355 M€ - 3296 M€, with the upper end of the range being determined by expensive end-of-pipe measures for NOx abatement on all existing plants. When considering those particular techniques only for specific groups of plants, costs drop to the lower end of the range above, and the cost-effectiveness is in line with the ranges found under options 6A to 6C. In the central case Option 6C* (**Error! Reference source not found.**), pollution abatement expenditure attributed to MCP totals 220 M€ (see Annex 8 for detailed information). Additional costs for the MCP segment beyond those included in Option 6C* are thus 162 M€ in the preferred options (i.e. excluding end-of-pipe NOx controls) described in Annex 12. Administrative costs for regulating these plants may be limited by avoiding an integrated permitting regime.

Ammonia emissions from agriculture are challenging to regulate at EU level, partly because of the structure of the sector, covering a wide range of different farming activities and consisting of many small and medium-sized farms. In addition, ammonia emissions are influenced by several country-specific and local factors, such as soil and climate conditions, properties of different animal manure (linked to type of animal feed, species, age and weight), timing and rate of application of manure to agricultural land, type of housing facilities and manure storage systems, the proportion of time spent indoors or grazing by farm animals, as well as different local farm traditions and practices.

[316] Best Available Techniques (BAT) Reference documents

Some abatement measures for ammonia could be addressed in the NECD itself, through appropriate provisions and more detailed guidance for Member States on how to control agricultural activities in order to achieve the national ammonia ceilings. Such an approach would be complemented by strengthened IED BAT provisions at EU level for large pig and poultry installations, which are due for revision in 2014. Moreover, a recent review in accordance with Article 73 (2)(b) of the IED concluded that reducing emissions from the spreading of manure offer the highest benefit-to-cost ratio, and this option will be further explored as a matter of priority. There is also an opportunity to consider appropriate measures in the Fertilizers Regulation[317], which is to be reviewed in 2013. The regulation is a product regulation designed to harmonize the inorganic fertilizer market in the EU, provide adequate information to farmers about the nutrient content through labelling requirements, and ensure that fertilizers do not harm the environment or human health. Finally, a comprehensive non-legislative Action Plan for Ammonia Abatement will accompany the revised Thematic Strategy.

Further measures in international maritime shipping combining (further) emission control areas both for SO2 and for NOx would not be cost-effective to achieve the targets of the policy options 6A-6C or 6C*, as they would be more expensive than equivalent land-based emission reductions. This conclusion may however be reviewed in future as it depends on a variety of factors including: low-sulphur fuel price premiums; the availability of cost-effective alternative technical solutions (scrubbers, LNG); the fact that only impacts on EU land are considered; and the exact definition of control areas. The current analysis suggests that the designation of NECAs not combined with further SECAs would offer good cost-effectiveness even in the absence of further technical advancements.

Although an EU-level pollution levy has already been rejected as a possible instrument to deliver the EU-wide pollution reduction objectives, taxation at MS level may well remain an effective policy instrument to reduce pollution and at the same time stimulate growth and employment, as part of green tax reforms. As an example, Denmark has introduced several air pollution-related taxation levies; a 1997 2,7€/kg levy on sulphur content of fuels above 500 ppm led to a sharp decline of SO2 emissions, and in 2007 a levy of 3,2€/ per Kg NOx emitted from large and medium-sized point sources was introduced. The potential of fiscal instruments in this context is analysed with macroeconomic modelling.

4. TRAJECTORY TO ACHIEVING THE LONG-TERM OBJECTIVE BY 2050

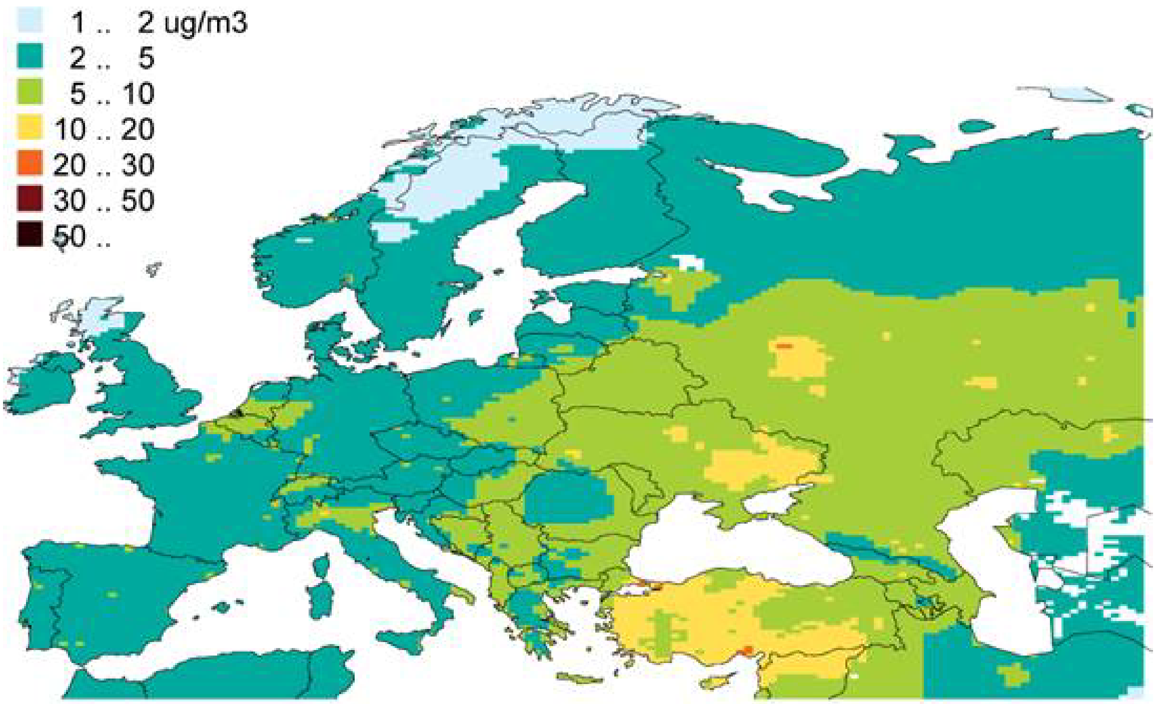
With a view to understanding whether or not the achievement of the long-term objective of no significant impact from air pollution could be within reach by 2050, a Maximum Control Effort (MCE) scenario was developed for the years 2030 and 2050, combining the effect of further phasing out of the most polluting sources (coal), increased electrification, energy efficiency gains as well as the application of available technical pollution control measures. Table A7.16 shows that the MCE scenario in 2050 would achieve virtually everywhere in the EU (99,5% of locations and 99% of population exposed) background PM2,5 concentrations below the 10 $\mu g/m^3$ limit recommended by the WHO. Fig. A7.1 shows the concentration map.

[317] Regulation 2003/2003/EC

Table A7.16: Percentage of EU territory and of EU population exposed to PM2,5 concetration ranges in 2050 in the MCE

PM2.5 range, µg m^{-3}	No. 28km grids	Population	% territory	% population
< 2	322	511328	5.5%	0.1%
2 - 3	1421	26628607	24.1%	5.5%
3 - 4	1657	112866725	28.1%	23.4%
4 - 5	1452	174130410	24.6%	36.1%
5 - 6	645	97956199	10.9%	20.3%
6 - 7	253	35728954	4.3%	7.4%
7 - 8	93	22420033	1.6%	4.7%
8 - 9	17	5712484	0.3%	1.2%
9 - 10	15	1189239	0.3%	0.2%
10 - 11	12	4556864	0.2%	0.9%
11 - 12	14	307425	0.2%	0.1%
12 - 13	3	6795	0.1%	0.0%
13 - 14	0	0	0.0%	0.0%
14 - 15	1	1422	0.0%	0.0%
15 - 16	1	264	0.0%	0.0%

Fig A7.1: Anthropogenic PM2,5 conentrations across Europe in the 2050 MCE scenario



Achieving this level starting in 2025 from the point delivered by the 6C* policy option would require reducing emissions of SO2 16,7% every 5 years; NOx 15%; PM2,5 12,4%; ammonia 6%; and VOC 10%. Table A7.17 reports the pathway to reaching this goal in 2050. Compared to 1990 levels, the 2050 emissions would be 97% lower for

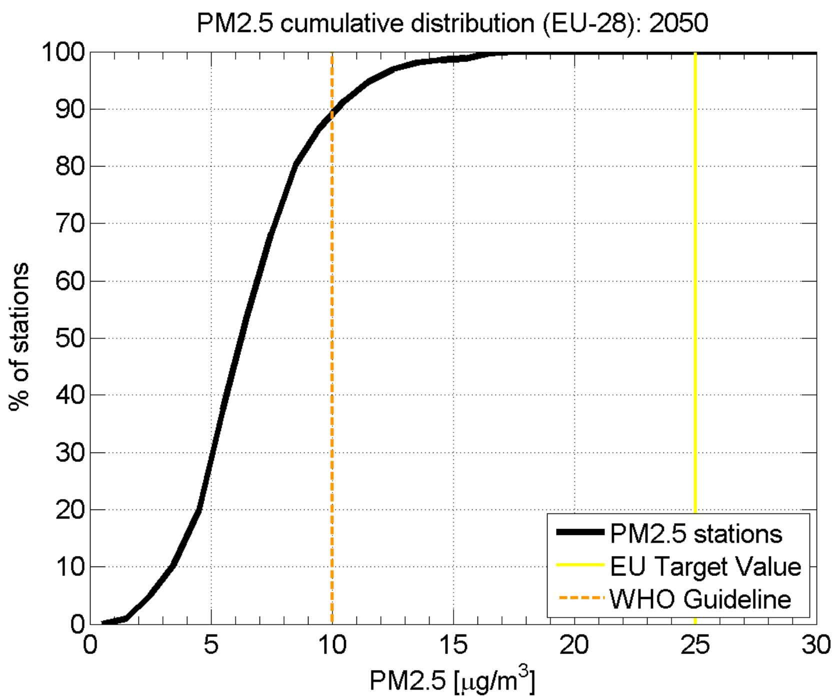
SOx, 89% lower for NOx, 84% for VOC, 74% for PM2,5 and 60% for ammonia, with average reduction percentage for the five pollutants of 80%. Whilst these reductions would all be feasible under the MCE assumptions, they could not be cost-effectively achieved by technical measures alone; the trajectory should be considered therefore indicative. Details by Member State are reported in Appendix 7.7.

Table A7.17: Emission reduction trajectory towards achieving the WHO guideline values in 2050; emissions in kilotons, reductions compared with 2005 emissions

EU28	2005	2025	2030	2040	2050
SO2	8172	-79%	-82%	-87%	-91%
NOx	11538	-65%	-70%	-78%	-83%
PM2,5	1647	-48%	-54%	-64%	-72%
NH3	3928	-30%	-34%	-42%	-48%
VOC	9259	-50%	-55%	-64%	-71%

Figure A7.2 shows compliance projections for the 2050 MCE scenario. Even at the level of individual monitors, 90% of stations would meet the 10 g/m3 limit. The residual 10% would be addressed by taking proportionate specific local measures to address particular hotspot situations.

Fig A7.2: Porjected distribution of concentrations at existing monitoring stations for PM2,5



APPENDIX 7.1 EMISSION REDUCTIONS PER MEMBER STATE AND PER OPTION IN 2025 AND 2030 (% VS 2005)

SO2 emissions in 2025, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	25	14	*-43%*	13	*-46%*	13	*-46%*	12	*-52%*	12	*-53%*
Belgium	140	59	*-58%*	54	*-62%*	51	*-63%*	46	*-67%*	46	*-67%*
Bulgaria	890	137	*-85%*	135	*-85%*	101	*-89%*	81	*-91%*	80	*-91%*
Croatia	68	21	*-70%*	20	*-71%*	11	*-84%*	9	*-86%*	7	*-89%*
Cyprus	38	2	*-95%*	2	*-95%*	2	*-95%*	1	*-97%*	1	*-98%*
Czech Rep.	208	81	*-61%*	74	*-64%*	68	*-67%*	65	*-68%*	62	*-70%*
Denmark	21	10	*-53%*	10	*-53%*	10	*-54%*	9	*-56%*	8	*-60%*
Estonia	66	23	*-66%*	23	*-66%*	23	*-66%*	20	*-70%*	18	*-73%*
Finland	90	64	*-29%*	63	*-29%*	63	*-29%*	63	*-30%*	59	*-34%*
France	444	124	*-72%*	117	*-74%*	108	*-76%*	103	*-77%*	100	*-78%*
Germany	549	333	*-39%*	317	*-42%*	308	*-44%*	295	*-46%*	291	*-47%*
Greece	505	66	*-87%*	65	*-87%*	65	*-87%*	52	*-90%*	39	*-92%*
Hungary	129	28	*-78%*	28	*-79%*	20	*-85%*	17	*-86%*	17	*-87%*
Ireland	71	18	*-75%*	17	*-76%*	16	*-77%*	13	*-81%*	13	*-82%*
Italy	382	142	*-63%*	119	*-69%*	106	*-72%*	93	*-76%*	75	*-80%*
Latvia	5	3	*-39%*	3	*-41%*	3	*-41%*	3	*-47%*	2	*-53%*
Lithuania	42	24	*-42%*	24	*-43%*	23	*-45%*	11	*-74%*	9	*-77%*
Luxembourg	2	2	*-20%*	2	*-20%*	1	*-25%*	1	*-44%*	1	*-56%*
Malta	11	0	*-96%*	0	*-96%*	0	*-96%*	0	*-98%*	0	*-99%*
Netherlands	70	34	*-52%*	33	*-52%*	31	*-56%*	30	*-57%*	28	*-60%*
Poland	1256	528	*-58%*	414	*-67%*	370	*-70%*	332	*-74%*	319	*-75%*
Portugal	111	49	*-56%*	45	*-60%*	33	*-71%*	23	*-79%*	19	*-83%*
Romania	706	101	*-86%*	97	*-86%*	63	*-91%*	55	*-92%*	50	*-93%*
Slovakia	92	45	*-51%*	44	*-51%*	29	*-68%*	20	*-78%*	19	*-79%*
Slovenia	40	6	*-85%*	6	*-85%*	5	*-86%*	5	*-88%*	5	*-88%*
Spain	1328	228	*-83%*	222	*-83%*	178	*-87%*	149	*-89%*	133	*-90%*
Sweden	38	32	*-15%*	32	*-15%*	32	*-15%*	32	*-16%*	31	*-19%*
Un. Kingdom	850	274	*-68%*	210	*-75%*	169	*-80%*	153	*-82%*	150	*-82%*
EU-28	8172	2446	*-70%*	2188	*-73%*	1903	*-77%*	1694	*-79%*	1593	*-81%*

SO2 emissions in 2030, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*
Austria	25	13	*-47%*	13	*-49%*	12	*-49%*	11	*-54%*	11	*-55%*
Belgium	140	58	*-59%*	52	*-63%*	49	*-65%*	44	*-68%*	44	*-68%*
Bulgaria	890	112	*-87%*	109	*-88%*	76	*-92%*	53	*-94%*	52	*-94%*
Croatia	68	20	*-70%*	19	*-71%*	11	*-84%*	9	*-87%*	6	*-91%*
Cyprus	38	2	*-95%*	2	*-95%*	2	*-95%*	1	*-97%*	1	*-98%*
Czech Rep.	208	74	*-64%*	67	*-68%*	61	*-70%*	59	*-72%*	56	*-73%*
Denmark	21	9	*-56%*	9	*-56%*	9	*-56%*	9	*-58%*	8	*-63%*
Estonia	66	22	*-67%*	22	*-67%*	22	*-67%*	19	*-71%*	15	*-78%*
Finland	90	64	*-29%*	63	*-29%*	63	*-29%*	63	*-30%*	59	*-35%*
France	444	117	*-74%*	111	*-75%*	103	*-77%*	98	*-78%*	92	*-79%*
Germany	549	295	*-46%*	278	*-49%*	269	*-51%*	258	*-53%*	246	*-55%*
Greece	505	50	*-90%*	51	*-90%*	50	*-90%*	38	*-92%*	26	*-95%*
Hungary	129	27	*-79%*	26	*-80%*	18	*-86%*	16	*-88%*	15	*-88%*
Ireland	71	14	*-80%*	14	*-80%*	13	*-81%*	11	*-84%*	11	*-85%*
Italy	382	142	*-63%*	119	*-69%*	105	*-72%*	92	*-76%*	73	*-81%*
Latvia	5	3	*-40%*	3	*-42%*	3	*-42%*	3	*-47%*	2	*-54%*
Lithuania	42	25	*-41%*	24	*-41%*	24	*-43%*	12	*-72%*	10	*-77%*
Luxembourg	2	2	*-21%*	2	*-21%*	1	*-25%*	1	*-44%*	1	*-56%*
Malta	11	0	*-97%*	0	*-97%*	0	*-97%*	0	*-98%*	0	*-99%*
Netherlands	70	32	*-54%*	32	*-54%*	30	*-58%*	28	*-59%*	26	*-63%*
Poland	1256	453	*-64%*	362	*-71%*	317	*-75%*	278	*-78%*	261	*-79%*
Portugal	111	49	*-56%*	44	*-60%*	33	*-71%*	23	*-79%*	17	*-84%*
Romania	706	99	*-86%*	95	*-87%*	60	*-92%*	51	*-93%*	45	*-94%*
Slovakia	92	46	*-50%*	45	*-50%*	29	*-68%*	20	*-79%*	19	*-80%*
Slovenia	40	6	*-85%*	5	*-86%*	5	*-87%*	5	*-89%*	4	*-89%*
Spain	1328	232	*-83%*	226	*-83%*	179	*-87%*	148	*-89%*	130	*-90%*
Sweden	38	32	*-16%*	32	*-16%*	32	*-16%*	32	*-16%*	31	*-19%*
Un. Kingdom	850	214	*-75%*	173	*-80%*	144	*-83%*	128	*-85%*	124	*-85%*
EU-28	8172	2211	*-73%*	1999	*-76%*	1720	*-79%*	1510	*-82%*	1383	*-83%*

NOx emissions in 2025, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	230	77	*-67%*	77	*-67%*	77	*-67%*	71	*-69%*	65	*-72%*
Belgium	295	146	*-50%*	142	*-52%*	141	*-52%*	123	*-58%*	111	*-62%*
Bulgaria	167	68	*-59%*	68	*-59%*	68	*-59%*	65	*-61%*	52	*-69%*
Croatia	76	36	*-52%*	36	*-53%*	35	*-53%*	27	*-64%*	17	*-78%*
Cyprus	21	7	*-67%*	7	*-67%*	7	*-67%*	7	*-67%*	5	*-78%*
Czech Rep.	296	130	*-56%*	129	*-56%*	127	*-57%*	114	*-61%*	98	*-67%*
Denmark	182	70	*-62%*	69	*-62%*	69	*-62%*	63	*-65%*	55	*-70%*
Estonia	40	18	*-55%*	18	*-55%*	18	*-55%*	18	*-55%*	13	*-69%*
Finland	201	110	*-45%*	110	*-45%*	110	*-45%*	110	*-45%*	92	*-54%*
France	1351	502	*-63%*	501	*-63%*	486	*-64%*	453	*-66%*	393	*-71%*
Germany	1397	608	*-56%*	575	*-59%*	572	*-59%*	522	*-63%*	460	*-67%*
Greece	407	150	*-63%*	134	*-67%*	133	*-67%*	133	*-67%*	108	*-74%*
Hungary	155	59	*-62%*	59	*-62%*	58	*-62%*	53	*-66%*	42	*-73%*
Ireland	150	63	*-58%*	63	*-58%*	63	*-58%*	55	*-64%*	49	*-68%*
Italy	1306	514	*-61%*	506	*-61%*	489	*-63%*	447	*-66%*	418	*-68%*
Latvia	36	24	*-34%*	23	*-35%*	23	*-35%*	23	*-36%*	19	*-49%*
Lithuania	62	31	*-50%*	30	*-51%*	30	*-51%*	30	*-52%*	25	*-60%*
Luxembourg	47	13	*-73%*	13	*-73%*	13	*-73%*	13	*-73%*	12	*-75%*
Malta	10	1	*-86%*	1	*-86%*	1	*-86%*	1	*-86%*	1	*-89%*
Netherlands	380	158	*-58%*	158	*-58%*	155	*-59%*	134	*-65%*	119	*-69%*
Poland	797	438	*-45%*	437	*-45%*	435	*-45%*	404	*-49%*	343	*-57%*
Portugal	268	103	*-62%*	101	*-62%*	100	*-63%*	85	*-68%*	68	*-75%*
Romania	311	140	*-55%*	139	*-55%*	137	*-56%*	112	*-64%*	95	*-69%*
Slovakia	95	50	*-47%*	50	*-48%*	48	*-49%*	42	*-55%*	35	*-63%*
Slovenia	50	18	*-63%*	18	*-63%*	18	*-63%*	17	*-66%*	15	*-69%*
Spain	1513	496	*-67%*	485	*-68%*	485	*-68%*	441	*-71%*	365	*-76%*
Sweden	216	82	*-62%*	82	*-62%*	82	*-62%*	82	*-62%*	72	*-67%*
Un. Kingdom	1480	504	*-66%*	503	*-66%*	502	*-66%*	450	*-70%*	380	*-74%*
EU-28	11538	4616	*-60%*	4535	*-61%*	4484	*-61%*	4096	*-64%*	3525	*-69%*

NOx emissions in 2030, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*
Austria	230	65	*-72%*	65	*-72%*	65	*-72%*	60	*-74%*	54	*-76%*
Belgium	295	134	*-55%*	131	*-56%*	130	*-56%*	112	*-62%*	95	*-68%*
Bulgaria	167	60	*-64%*	60	*-64%*	60	*-64%*	57	*-66%*	41	*-75%*
Croatia	76	33	*-56%*	33	*-56%*	33	*-57%*	25	*-68%*	14	*-81%*
Cyprus	21	6	*-70%*	6	*-70%*	6	*-70%*	6	*-70%*	4	*-81%*
Czech Rep.	296	112	*-62%*	111	*-62%*	110	*-63%*	99	*-67%*	83	*-72%*
Denmark	182	61	*-66%*	60	*-67%*	60	*-67%*	56	*-70%*	46	*-75%*
Estonia	40	16	*-61%*	16	*-61%*	16	*-61%*	16	*-61%*	10	*-74%*
Finland	201	99	*-51%*	99	*-51%*	99	*-51%*	99	*-51%*	82	*-59%*
France	1351	441	*-67%*	440	*-67%*	424	*-69%*	395	*-71%*	332	*-75%*
Germany	1397	530	*-62%*	495	*-65%*	491	*-65%*	442	*-68%*	380	*-73%*
Greece	407	126	*-69%*	113	*-72%*	112	*-72%*	112	*-72%*	91	*-78%*
Hungary	155	52	*-66%*	52	*-67%*	52	*-67%*	46	*-70%*	35	*-77%*
Ireland	150	43	*-71%*	43	*-71%*	43	*-71%*	35	*-76%*	28	*-82%*
Italy	1306	456	*-65%*	449	*-66%*	432	*-67%*	391	*-70%*	360	*-72%*
Latvia	36	20	*-44%*	20	*-44%*	20	*-44%*	20	*-44%*	15	*-58%*
Lithuania	62	28	*-54%*	28	*-55%*	28	*-55%*	27	*-56%*	22	*-65%*
Luxembourg	47	10	*-79%*	10	*-79%*	10	*-79%*	10	*-79%*	9	*-80%*
Malta	10	1	*-89%*	1	*-89%*	1	*-89%*	1	*-89%*	1	*-92%*
Netherlands	380	143	*-62%*	143	*-62%*	141	*-63%*	121	*-68%*	105	*-72%*
Poland	797	379	*-52%*	378	*-53%*	376	*-53%*	343	*-57%*	280	*-65%*
Portugal	268	92	*-65%*	91	*-66%*	90	*-67%*	75	*-72%*	57	*-79%*
Romania	311	127	*-59%*	127	*-59%*	124	*-60%*	100	*-68%*	81	*-74%*
Slovakia	95	47	*-51%*	46	*-51%*	45	*-52%*	39	*-59%*	31	*-67%*
Slovenia	50	16	*-69%*	16	*-69%*	15	*-69%*	14	*-72%*	12	*-75%*
Spain	1513	434	*-71%*	422	*-72%*	422	*-72%*	378	*-75%*	300	*-80%*
Sweden	216	76	*-65%*	76	*-65%*	76	*-65%*	75	*-65%*	64	*-70%*
Un. Kingdom	1480	441	*-70%*	440	*-70%*	439	*-70%*	391	*-74%*	316	*-79%*
EU-28	11538	4051	*-65%*	3970	*-66%*	3921	*-66%*	3544	*-69%*	2947	*-74%*

NH3 emissions in 2025, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	% red	2025	% red	2025	% red	2025	% red	2025	% red
Austria	63	67	*7%*	59	*-6%*	56	*-11%*	51	*-19%*	46	*-26%*
Belgium	74	74	*0%*	69	*-8%*	66	*-10%*	62	*-16%*	60	*-19%*
Bulgaria	65	64	*-2%*	62	*-5%*	61	*-6%*	58	*-11%*	57	*-13%*
Croatia	29	29	*0%*	28	*-5%*	26	*-12%*	21	*-27%*	18	*-38%*
Cyprus	6	6	*-6%*	6	*-7%*	5	*-12%*	5	*-21%*	4	*-33%*
Czech Rep.	80	63	*-21%*	60	*-25%*	55	*-31%*	52	*-35%*	52	*-35%*
Denmark	73	51	*-31%*	49	*-33%*	49	*-34%*	46	*-37%*	39	*-46%*
Estonia	12	13	*7%*	12	*6%*	12	*-1%*	11	*-10%*	8	*-30%*
Finland	34	31	*-8%*	30	*-11%*	30	*-11%*	28	*-17%*	24	*-29%*
France	675	638	*-5%*	580	*-14%*	534	*-21%*	463	*-31%*	425	*-37%*
Germany	593	570	*-4%*	485	*-18%*	392	*-34%*	318	*-46%*	299	*-50%*
Greece	57	47	*-16%*	46	*-19%*	43	*-25%*	41	*-28%*	38	*-32%*
Hungary	78	67	*-13%*	62	*-20%*	54	*-31%*	48	*-38%*	48	*-38%*
Ireland	104	101	*-4%*	101	*-4%*	98	*-6%*	92	*-11%*	85	*-18%*
Italy	422	386	*-9%*	364	*-14%*	330	*-22%*	299	*-29%*	296	*-30%*
Latvia	13	15	*16%*	15	*14%*	15	*13%*	13	*3%*	12	*-5%*
Lithuania	44	49	*12%*	49	*11%*	48	*8%*	46	*4%*	32	*-28%*
Luxembourg	6	6	*-10%*	5	*-18%*	5	*-22%*	5	*-25%*	5	*-27%*
Malta	2	2	*-7%*	2	*-7%*	1	*-21%*	1	*-25%*	1	*-34%*
Netherlands	146	112	*-23%*	112	*-24%*	111	*-24%*	111	*-24%*	110	*-25%*
Poland	344	331	*-4%*	300	*-13%*	294	*-14%*	245	*-29%*	227	*-34%*
Portugal	71	71	*0%*	65	*-8%*	62	*-13%*	55	*-22%*	49	*-30%*
Romania	161	142	*-12%*	136	*-16%*	134	*-17%*	122	*-24%*	112	*-31%*
Slovakia	28	24	*-16%*	21	*-25%*	18	*-35%*	17	*-41%*	17	*-42%*
Slovenia	19	17	*-12%*	15	*-18%*	15	*-20%*	14	*-25%*	14	*-28%*
Spain	366	352	*-4%*	334	*-9%*	303	*-17%*	258	*-29%*	211	*-42%*
Sweden	54	48	*-10%*	48	*-10%*	47	*-13%*	44	*-19%*	39	*-27%*
Un. Kingdom	308	282	*-8%*	275	*-11%*	257	*-17%*	240	*-22%*	236	*-23%*
EU-28	3928	3658	*-7%*	3390	*-14%*	3122	*-21%*	2767	*-30%*	2566	*-35%*

NH3 emissions in 2030, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*
Austria	63	68	*8%*	60	*-5%*	56	*-11%*	51	*-19%*	47	*-26%*
Belgium	74	73	*-1%*	68	*-9%*	66	*-11%*	62	*-16%*	60	*-19%*
Bulgaria	65	64	*-1%*	62	*-4%*	61	*-6%*	59	*-10%*	57	*-12%*
Croatia	29	30	*2%*	28	*-4%*	26	*-12%*	22	*-26%*	19	*-36%*
Cyprus	6	6	*-4%*	6	*-5%*	6	*-10%*	5	*-20%*	4	*-31%*
Czech Rep.	80	62	*-22%*	59	*-26%*	55	*-32%*	51	*-36%*	51	*-36%*
Denmark	73	51	*-31%*	49	*-33%*	48	*-34%*	46	*-38%*	39	*-47%*
Estonia	12	13	*9%*	13	*7%*	12	*1%*	11	*-9%*	8	*-29%*
Finland	34	31	*-8%*	30	*-11%*	30	*-11%*	28	*-17%*	24	*-29%*
France	675	639	*-5%*	574	*-15%*	527	*-22%*	458	*-32%*	424	*-37%*
Germany	593	565	*-5%*	472	*-20%*	379	*-36%*	312	*-47%*	294	*-50%*
Greece	57	48	*-16%*	46	*-18%*	43	*-25%*	41	*-28%*	39	*-32%*
Hungary	78	67	*-13%*	62	*-20%*	54	*-31%*	49	*-37%*	48	*-38%*
Ireland	104	101	*-3%*	101	*-3%*	98	*-5%*	93	*-11%*	86	*-18%*
Italy	422	389	*-8%*	367	*-13%*	329	*-22%*	302	*-28%*	299	*-29%*
Latvia	13	15	*19%*	15	*17%*	15	*15%*	14	*6%*	13	*-3%*
Lithuania	44	51	*15%*	50	*13%*	49	*11%*	47	*6%*	33	*-26%*
Luxembourg	6	6	*-11%*	5	*-19%*	5	*-24%*	5	*-25%*	5	*-27%*
Malta	2	2	*-8%*	2	*-8%*	1	*-22%*	1	*-26%*	1	*-35%*
Netherlands	146	111	*-24%*	110	*-24%*	110	*-25%*	109	*-25%*	109	*-25%*
Poland	344	332	*-3%*	300	*-13%*	294	*-14%*	245	*-29%*	228	*-33%*
Portugal	71	73	*3%*	66	*-7%*	63	*-11%*	57	*-20%*	50	*-29%*
Romania	161	141	*-12%*	136	*-16%*	133	*-18%*	121	*-25%*	112	*-31%*
Slovakia	28	24	*-16%*	21	*-25%*	18	*-35%*	17	*-41%*	17	*-42%*
Slovenia	19	17	*-12%*	15	*-18%*	15	*-20%*	14	*-25%*	14	*-28%*
Spain	366	349	*-5%*	330	*-10%*	300	*-18%*	258	*-30%*	209	*-43%*
Sweden	54	49	*-9%*	49	*-9%*	47	*-12%*	44	*-18%*	39	*-27%*
Un. Kingdom	308	287	*-7%*	279	*-10%*	260	*-16%*	244	*-21%*	239	*-22%*
EU-28	3928	3663	*-7%*	3375	*-14%*	3099	*-21%*	2762	*-30%*	2568	*-35%*

VOC emissions in 2025, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	171	107	*-38%*	105	*-39%*	104	*-39%*	90	*-47%*	54	*-68%*
Belgium	158	99	*-37%*	97	*-39%*	97	*-39%*	89	*-44%*	68	*-57%*
Bulgaria	139	73	*-47%*	66	*-52%*	66	*-53%*	56	*-60%*	36	*-74%*
Croatia	79	51	*-36%*	47	*-41%*	47	*-41%*	38	*-52%*	27	*-66%*
Cyprus	9	4	*-52%*	4	*-53%*	4	*-53%*	4	*-53%*	3	*-68%*
Czech Rep.	251	143	*-43%*	137	*-46%*	136	*-46%*	113	*-55%*	73	*-71%*
Denmark	130	65	*-50%*	61	*-53%*	61	*-53%*	55	*-58%*	37	*-72%*
Estonia	38	29	*-24%*	28	*-27%*	28	*-27%*	26	*-31%*	10	*-73%*
Finland	173	102	*-41%*	101	*-41%*	101	*-41%*	96	*-44%*	53	*-69%*
France	1117	616	*-45%*	610	*-45%*	606	*-46%*	573	*-49%*	413	*-63%*
Germany	1235	850	*-31%*	800	*-35%*	795	*-36%*	720	*-42%*	514	*-58%*
Greece	283	121	*-57%*	112	*-60%*	100	*-65%*	93	*-67%*	66	*-77%*
Hungary	144	83	*-42%*	82	*-43%*	82	*-43%*	63	*-56%*	47	*-67%*
Ireland	63	44	*-31%*	44	*-31%*	44	*-31%*	43	*-32%*	24	*-62%*
Italy	1237	667	*-46%*	622	*-50%*	596	*-52%*	568	*-54%*	409	*-67%*
Latvia	69	40	*-42%*	39	*-44%*	39	*-44%*	30	*-57%*	16	*-76%*
Lithuania	84	43	*-49%*	39	*-54%*	39	*-54%*	34	*-59%*	19	*-78%*
Luxembourg	13	6	*-54%*	6	*-54%*	6	*-54%*	5	*-58%*	4	*-66%*
Malta	4	3	*-31%*	3	*-32%*	3	*-32%*	3	*-32%*	1	*-64%*
Netherlands	205	142	*-31%*	142	*-31%*	139	*-32%*	135	*-34%*	106	*-48%*
Poland	615	412	*-33%*	405	*-34%*	340	*-45%*	287	*-53%*	210	*-66%*
Portugal	227	137	*-40%*	130	*-43%*	126	*-45%*	122	*-46%*	92	*-60%*
Romania	460	256	*-44%*	231	*-50%*	230	*-50%*	171	*-63%*	104	*-77%*
Slovakia	77	54	*-30%*	53	*-31%*	53	*-31%*	47	*-39%*	29	*-63%*
Slovenia	41	30	*-27%*	30	*-27%*	30	*-28%*	15	*-62%*	11	*-74%*
Spain	934	597	*-36%*	518	*-45%*	513	*-45%*	485	*-48%*	363	*-61%*
Sweden	210	138	*-34%*	137	*-34%*	137	*-34%*	137	*-35%*	103	*-51%*
Un. Kingdom	1093	694	*-37%*	675	*-38%*	638	*-42%*	552	*-50%*	419	*-62%*
EU-28	9259	5604	*-39%*	5322	*-43%*	5157	*-44%*	4648	*-50%*	3308	*-64%*

VOC emissions in 2030, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*
Austria	171	102	*-40%*	100	*-41%*	100	*-41%*	89	*-48%*	52	*-70%*
Belgium	158	99	*-37%*	98	*-38%*	98	*-38%*	90	*-43%*	67	*-57%*
Bulgaria	139	67	*-51%*	60	*-57%*	60	*-57%*	52	*-62%*	32	*-77%*
Croatia	79	48	*-39%*	44	*-44%*	44	*-44%*	36	*-54%*	25	*-68%*
Cyprus	9	4	*-53%*	4	*-54%*	4	*-54%*	4	*-54%*	3	*-69%*
Czech Rep.	251	140	*-44%*	133	*-47%*	133	*-47%*	111	*-56%*	69	*-72%*
Denmark	130	63	*-51%*	59	*-55%*	59	*-55%*	54	*-58%*	35	*-73%*
Estonia	38	27	*-31%*	25	*-34%*	25	*-34%*	24	*-37%*	9	*-75%*
Finland	173	96	*-44%*	98	*-43%*	98	*-43%*	92	*-47%*	48	*-72%*
France	1117	591	*-47%*	590	*-47%*	586	*-48%*	560	*-50%*	396	*-65%*
Germany	1235	840	*-32%*	788	*-36%*	783	*-37%*	710	*-43%*	502	*-59%*
Greece	283	116	*-59%*	108	*-62%*	96	*-66%*	89	*-68%*	60	*-79%*
Hungary	144	81	*-44%*	80	*-45%*	79	*-45%*	61	*-58%*	45	*-69%*
Ireland	63	43	*-32%*	43	*-32%*	43	*-32%*	43	*-33%*	22	*-65%*
Italy	1237	646	*-48%*	610	*-51%*	587	*-53%*	555	*-55%*	400	*-68%*
Latvia	69	37	*-46%*	35	*-49%*	35	*-49%*	30	*-56%*	16	*-77%*
Lithuania	84	40	*-53%*	36	*-57%*	36	*-57%*	33	*-60%*	18	*-78%*
Luxembourg	13	6	*-55%*	6	*-55%*	6	*-55%*	5	*-58%*	4	*-67%*
Malta	4	3	*-30%*	3	*-31%*	3	*-31%*	3	*-31%*	1	*-64%*
Netherlands	205	141	*-31%*	140	*-32%*	138	*-33%*	133	*-35%*	103	*-50%*
Poland	615	403	*-34%*	399	*-35%*	335	*-45%*	281	*-54%*	192	*-69%*
Portugal	227	137	*-40%*	130	*-43%*	127	*-44%*	123	*-46%*	92	*-60%*
Romania	460	238	*-48%*	213	*-54%*	213	*-54%*	165	*-64%*	96	*-79%*
Slovakia	77	53	*-31%*	53	*-32%*	53	*-32%*	47	*-39%*	27	*-65%*
Slovenia	41	28	*-33%*	28	*-33%*	27	*-33%*	15	*-63%*	10	*-75%*
Spain	934	596	*-36%*	518	*-45%*	513	*-45%*	485	*-48%*	358	*-62%*
Sweden	210	132	*-37%*	132	*-37%*	132	*-37%*	131	*-37%*	98	*-53%*
Un. Kingdom	1093	684	*-37%*	666	*-39%*	631	*-42%*	546	*-50%*	410	*-62%*
EU-28	9259	5460	*-41%*	5199	*-44%*	5043	*-46%*	4569	*-51%*	3191	*-66%*

PM2,5 emissions in 2025, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	24	17	*-31%*	16	*-35%*	15	*-39%*	11	*-54%*	10	*-60%*
Belgium	28	19	*-33%*	18	*-36%*	16	*-43%*	15	*-46%*	14	*-52%*
Bulgaria	35	26	*-24%*	19	*-45%*	18	*-47%*	14	*-60%*	11	*-69%*
Croatia	15	11	*-26%*	7	*-56%*	6	*-58%*	5	*-66%*	3	*-78%*
Cyprus	3	1	*-70%*	1	*-72%*	1	*-72%*	1	*-73%*	1	*-75%*
Czech Rep.	43	34	*-21%*	28	*-34%*	28	*-35%*	23	*-47%*	18	*-59%*
Denmark	28	15	*-47%*	14	*-49%*	14	*-49%*	11	*-62%*	8	*-70%*
Estonia	20	13	*-36%*	12	*-42%*	12	*-42%*	10	*-48%*	4	*-80%*
Finland	29	21	*-25%*	21	*-27%*	21	*-28%*	18	*-37%*	13	*-55%*
France	271	184	*-32%*	166	*-39%*	162	*-40%*	154	*-43%*	124	*-54%*
Germany	123	87	*-29%*	82	*-33%*	78	*-36%*	73	*-41%*	67	*-45%*
Greece	62	32	*-49%*	24	*-61%*	17	*-72%*	16	*-75%*	13	*-79%*
Hungary	29	19	*-35%*	16	*-44%*	16	*-46%*	11	*-61%*	9	*-69%*
Ireland	13	9	*-29%*	9	*-29%*	9	*-31%*	9	*-32%*	8	*-43%*
Italy	147	128	*-12%*	113	*-23%*	86	*-41%*	82	*-44%*	75	*-49%*
Latvia	19	14	*-26%*	12	*-34%*	12	*-35%*	9	*-52%*	5	*-74%*
Lithuania	15	12	*-23%*	8	*-47%*	8	*-47%*	7	*-55%*	4	*-71%*
Luxembourg	3	2	*-42%*	2	*-42%*	2	*-42%*	2	*-47%*	2	*-51%*
Malta	1	0	*-75%*	0	*-79%*	0	*-79%*	0	*-79%*	0	*-82%*
Netherlands	24	17	*-29%*	16	*-32%*	16	*-35%*	15	*-38%*	14	*-44%*
Poland	225	216	*-4%*	197	*-13%*	174	*-22%*	154	*-31%*	124	*-45%*
Portugal	63	41	*-34%*	27	*-58%*	22	*-65%*	19	*-69%*	17	*-73%*
Romania	113	91	*-19%*	66	*-42%*	58	*-48%*	44	*-61%*	29	*-74%*
Slovakia	32	20	*-36%*	19	*-42%*	18	*-44%*	12	*-62%*	8	*-74%*
Slovenia	9	6	*-35%*	6	*-39%*	6	*-39%*	2	*-73%*	2	*-75%*
Spain	156	124	*-20%*	69	*-56%*	65	*-58%*	60	*-61%*	52	*-67%*
Sweden	31	25	*-19%*	25	*-19%*	25	*-19%*	21	*-33%*	14	*-55%*
Un. Kingdom	87	82	*-6%*	67	*-23%*	53	*-39%*	46	*-47%*	41	*-52%*
EU-28	1647	1266	*-23%*	1059	*-36%*	960	*-42%*	844	*-49%*	690	*-58%*

PM2,5 emissions in 2030, baseline and further control options. % reduction vs 2005

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*	2030	*% red*
Austria	24	16	*-34%*	15	*-38%*	14	*-42%*	11	*-55%*	9	*-62%*
Belgium	28	19	*-33%*	18	*-36%*	16	*-43%*	15	*-46%*	13	*-53%*
Bulgaria	35	24	*-30%*	17	*-52%*	16	*-53%*	12	*-64%*	9	*-75%*
Croatia	15	11	*-28%*	6	*-59%*	6	*-60%*	5	*-67%*	3	*-82%*
Cyprus	3	1	*-70%*	1	*-72%*	1	*-72%*	1	*-73%*	1	*-75%*
Czech Rep.	43	32	*-25%*	27	*-37%*	26	*-38%*	22	*-49%*	15	*-65%*
Denmark	28	13	*-53%*	13	*-55%*	13	*-55%*	10	*-64%*	7	*-75%*
Estonia	20	12	*-41%*	10	*-48%*	10	*-48%*	10	*-52%*	3	*-85%*
Finland	29	20	*-30%*	19	*-33%*	19	*-33%*	17	*-41%*	11	*-62%*
France	271	169	*-38%*	152	*-44%*	148	*-45%*	141	*-48%*	107	*-61%*
Germany	123	84	*-32%*	79	*-36%*	75	*-39%*	70	*-43%*	62	*-49%*
Greece	62	30	*-51%*	23	*-63%*	18	*-70%*	17	*-72%*	14	*-78%*
Hungary	29	18	*-37%*	16	*-46%*	15	*-48%*	11	*-63%*	8	*-73%*
Ireland	13	9	*-33%*	9	*-33%*	9	*-34%*	9	*-35%*	7	*-49%*
Italy	147	119	*-19%*	105	*-28%*	83	*-44%*	78	*-47%*	69	*-53%*
Latvia	19	12	*-34%*	11	*-42%*	11	*-43%*	8	*-54%*	4	*-80%*
Lithuania	15	11	*-28%*	7	*-52%*	7	*-52%*	6	*-57%*	4	*-75%*
Luxembourg	3	2	*-43%*	2	*-43%*	2	*-44%*	2	*-48%*	2	*-54%*
Malta	1	0	*-76%*	0	*-80%*	0	*-80%*	0	*-80%*	0	*-83%*
Netherlands	24	17	*-30%*	16	*-33%*	16	*-36%*	15	*-39%*	13	*-45%*
Poland	225	198	*-12%*	181	*-19%*	160	*-29%*	140	*-38%*	98	*-56%*
Portugal	63	41	*-35%*	26	*-59%*	22	*-65%*	19	*-69%*	16	*-74%*
Romania	113	84	*-25%*	59	*-48%*	52	*-54%*	41	*-64%*	23	*-80%*
Slovakia	32	20	*-38%*	18	*-43%*	18	*-45%*	12	*-62%*	7	*-78%*
Slovenia	9	6	*-40%*	5	*-44%*	5	*-44%*	2	*-74%*	2	*-76%*
Spain	156	125	*-20%*	70	*-55%*	66	*-58%*	61	*-61%*	50	*-68%*
Sweden	31	25	*-19%*	25	*-19%*	25	*-20%*	20	*-34%*	14	*-56%*
Un. Kingdom	87	82	*-6%*	65	*-26%*	52	*-40%*	46	*-48%*	38	*-56%*
EU-28	1647	1200	*-27%*	994	*-40%*	904	*-45%*	802	*-51%*	607	*-63%*

APPENDIX 7.2 ANNUAL HEALTH IMPACTS DUE TO AIR POLLUTION PER OPTION IN 2025 AND 2030, EU 28

IMPACTS 2025	EU28		Option 1	Opt 6A	Opt 6B	Opt 6C	Opt 6D
Acute Mortality (All ages)	Premature deaths	O3	17800	17500	17300	16500	15000
Respiratory hospital admissions (>64)	Cases	O3	19080	18775	18572	17803	16168
Cardiovascular hospital admissions (>64)	Cases	O3	84028	82710	81762	78162	70666
Minor Restricted Activity Days (MRADs all ages)	Days	O3	85600047	84247689	832916	79751306	72291776
Chronic Mortality (All ages) LYL (1)	Life years lost	PM	2712818	2528130	2346405	2163449	1983531
Chronic Mortality (30yr +) deaths (1)	Premature deaths	PM	306981	286271	265399	24488	224769
Infant Mortality (0-1yr)	Premature deaths	PM	1062	989	919	845	773
Chronic Bronchitis (27yr +)	Cases	PM	242262	225787	209296	193324	177412
Bronchitis in children (aged 6 to 12)	Added cases	PM	4620688	4306510	3992889	3688243	3384315
Respiratory Hospital Admissions (All ages)	Cases	PM	105003	97733	91027	83753	76791
Cardiac Hospital Admissions (>18 years)	Cases	PM	80583	75205	69965	64399	59086
Restricted Activity Days (all ages)	Days	PM	275871902	257139250	238147099	220117469	201831060
Asthma symptom days (children 5-19yr)	Days	PM	8183267	7627288	7076647	6551034	6012666
Lost working days (15-64 years)	Days	PM	136552072	127245001	118334181	109151738	100259715

Note (1) Alternative expressions of the same effect, not additive

IMPACTS 2030	EU28		Option 1	Opt 6A	Opt 6B	Opt 6C	Opt 6D
Acute Mortality (All ages)	Premature deaths	O3	17200	17000	16800	16000	14400
Respiratory hospital admissions (>64)	Cases	O3	20061	19751	19541	1874	16914
Cardiovascular hospital admissions (>64)	Cases	O3	87708	86383	85409	81673	73336
Minor Restricted Activity Days (MRADs all ages)	Days	O3	83560018	82295930	81380787	77947523	70210465
Chronic Mortality (All ages) LYL (1)	Life years lost	PM	2540459	2370845	2202668	2036090	1817522
Chronic Mortality (30yr +) deaths (1)	Premature deaths	PM	304106	283932	263538	243741	217902
Infant Mortality (0-1yr)	Premature deaths	PM	943	880	818	755	673
Chronic Bronchitis (27yr +)	Cases	PM	234058	218409	202726	187672	167765
Bronchitis in children aged 6 to 12	Added cases	PM	4459198	4161137	3863144	3576416	3196594
Respiratory Hospital Admissions (All ages)	Cases	PM	100929	94054	87642	8085	7213
Cardiac Hospital Admissions (>18 years)	Cases	PM	77246	7216	67154	61964	55314
Restricted Activity Days (all ages)	Days	PM	269964452	251973103	233769290	216594842	193573166
Asthma symptom days (children 5-19yr)	Days	PM	7733781	7218182	6707800	6222191	5568248
Lost working days (15-64 years)	Days	PM	126944403	118424645	110185096	101818106	90984180

Note (1) Alternative expressions of the same effect, not additive

APPENDIX 7.3 IMPACT REDUCTIONS PER MEMBER STATE AND PER OPTION IN 2025 AND 2030 (% REDUCTIONS VS IMPACTS IN 2005)

Million Years of life lost (YOLL), calculated with constant 2010 population. 2025

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	% red	2025	% red	2025	% red	2025	% red	2025	% red
Austria	5,17	3,20	*-38%*	3,03	*-41%*	2,91	*-44%*	2,56	*-50%*	2,37	*-54%*
Belgium	9,11	5,47	*-40%*	5,14	*-44%*	4,88	*-46%*	4,55	*-50%*	4,25	*-53%*
Bulgaria	6,92	3,64	*-47%*	3,46	*-50%*	3,28	*-53%*	2,98	*-57%*	2,77	*-60%*
Croatia	2,96	1,68	*-43%*	1,58	*-47%*	1,50	*-50%*	1,37	*-54%*	1,26	*-57%*
Cyprus	0,59	0,53	*-9%*	0,53	*-9%*	0,53	*-10%*	0,52	*-11%*	0,52	*-12%*
Czech Rep.	7,91	5,31	*-33%*	4,93	*-38%*	4,68	*-41%*	4,21	*-47%*	3,82	*-52%*
Denmark	2,94	1,68	*-43%*	1,61	*-45%*	1,56	*-47%*	1,41	*-52%*	1,30	*-56%*
Estonia	0,53	0,43	*-19%*	0,42	*-21%*	0,42	*-22%*	0,40	*-26%*	0,33	*-38%*
Finland	1,68	1,28	*-24%*	1,26	*-25%*	1,26	*-25%*	1,19	*-29%*	1,09	*-35%*
France	46,02	24,73	*-46%*	23,36	*-49%*	22,44	*-51%*	21,04	*-54%*	18,54	*-60%*
Germany	53,90	34,50	*-36%*	32,29	*-40%*	30,47	*-43%*	28,19	*-48%*	26,53	*-51%*
Greece	11,65	6,15	*-47%*	5,97	*-49%*	5,33	*-54%*	5,08	*-56%*	4,73	*-59%*
Hungary	8,41	5,06	*-40%*	4,76	*-43%*	4,46	*-47%*	3,96	*-53%*	3,66	*-57%*
Ireland	1,34	0,86	*-36%*	0,84	*-38%*	0,81	*-39%*	0,78	*-42%*	0,73	*-45%*
Italy	51,51	32,52	*-37%*	30,69	*-40%*	26,59	*-48%*	25,08	*-51%*	22,99	*-55%*
Latvia	1,10	0,83	*-24%*	0,80	*-27%*	0,79	*-28%*	0,72	*-35%*	0,64	*-42%*
Lithuania	1,76	1,37	*-22%*	1,30	*-26%*	1,27	*-28%*	1,17	*-34%*	1,07	*-39%*
Luxembourg	0,39	0,23	*-40%*	0,22	*-44%*	0,21	*-46%*	0,19	*-51%*	0,18	*-54%*
Malta	0,25	0,13	*-47%*	0,13	*-48%*	0,12	*-50%*	0,12	*-51%*	0,12	*-53%*
Netherlands	12,22	7,21	*-41%*	6,83	*-44%*	6,52	*-47%*	6,16	*-50%*	5,82	*-52%*
Poland	36,91	28,52	*-23%*	26,21	*-29%*	24,26	*-34%*	21,91	*-41%*	19,61	*-47%*
Portugal	8,21	3,67	*-55%*	3,29	*-60%*	2,98	*-64%*	2,73	*-67%*	2,49	*-70%*
Romania	20,18	11,62	*-42%*	10,83	*-46%*	10,25	*-49%*	8,97	*-56%*	7,87	*-61%*
Slovakia	3,80	2,75	*-28%*	2,58	*-32%*	2,41	*-37%*	2,10	*-45%*	1,89	*-50%*
Slovenia	1,43	0,85	*-41%*	0,80	*-44%*	0,76	*-47%*	0,62	*-57%*	0,58	*-59%*
Spain	28,57	16,21	*-43%*	14,46	*-49%*	13,63	*-52%*	12,69	*-56%*	11,54	*-60%*
Sweden	2,66	1,84	*-31%*	1,80	*-33%*	1,76	*-34%*	1,69	*-37%*	1,58	*-41%*
Un. Kingdom	29,96	20,14	*-33%*	18,35	*-39%*	16,45	*-45%*	15,19	*-49%*	14,35	*-52%*
EU-28	358,09	222,38	*-38%*	207,45	*-42%*	192,51	*-46%*	177,58	*-50%*	162,64	*-55%*

Million Years of life lost (YOLL), calculated with constant 2010 population. 2030

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	2,22	3,05	*-41%*	2,89	*-44%*	2,76	*-47%*	2,45	*-53%*	2,22	*-57%*
Belgium	4,04	5,28	*-42%*	4,96	*-46%*	4,70	*-48%*	4,40	*-52%*	4,04	*-56%*
Bulgaria	2,60	3,47	*-50%*	3,30	*-52%*	3,12	*-55%*	2,86	*-59%*	2,60	*-62%*
Croatia	1,22	1,66	*-44%*	1,56	*-48%*	1,47	*-50%*	1,35	*-54%*	1,22	*-59%*
Cyprus	0,54	0,56	*-5%*	0,56	*-5%*	0,55	*-5%*	0,55	*-6%*	0,54	*-7%*
Czech Rep.	3,53	5,05	*-36%*	4,69	*-41%*	4,44	*-44%*	4,00	*-49%*	3,53	*-55%*
Denmark	1,24	1,60	*-46%*	1,53	*-48%*	1,49	*-49%*	1,37	*-53%*	1,24	*-58%*
Estonia	0,32	0,42	*-21%*	0,41	*-23%*	0,41	*-24%*	0,39	*-27%*	0,32	*-40%*
Finland	1,06	1,25	*-25%*	1,24	*-26%*	1,23	*-26%*	1,17	*-30%*	1,06	*-37%*
France	16,86	23,19	*-50%*	21,85	*-53%*	20,96	*-54%*	19,71	*-57%*	16,86	*-63%*
Germany	24,70	32,88	*-39%*	30,67	*-43%*	28,88	*-46%*	26,75	*-50%*	24,70	*-54%*
Greece	4,50	5,94	*-49%*	5,77	*-50%*	5,21	*-55%*	4,97	*-57%*	4,50	*-61%*
Hungary	3,50	4,93	*-41%*	4,64	*-45%*	4,34	*-48%*	3,86	*-54%*	3,50	*-58%*
Ireland	0,69	0,82	*-39%*	0,80	*-41%*	0,77	*-42%*	0,74	*-45%*	0,69	*-49%*
Italy	21,67	30,84	*-40%*	29,18	*-43%*	25,53	*-50%*	24,08	*-53%*	21,67	*-58%*
Latvia	0,61	0,81	*-27%*	0,78	*-29%*	0,77	*-30%*	0,71	*-36%*	0,61	*-44%*
Lithuania	1,04	1,34	*-24%*	1,28	*-27%*	1,25	*-29%*	1,15	*-34%*	1,04	*-41%*
Luxembourg	0,17	0,22	*-43%*	0,21	*-46%*	0,20	*-49%*	0,18	*-53%*	0,17	*-57%*
Malta	0,12	0,13	*-47%*	0,13	*-48%*	0,12	*-49%*	0,12	*-50%*	0,12	*-52%*
Netherlands	5,53	6,93	*-43%*	6,58	*-46%*	6,28	*-49%*	5,94	*-51%*	5,53	*-55%*
Poland	17,51	26,78	*-27%*	24,79	*-33%*	22,87	*-38%*	20,58	*-44%*	17,51	*-53%*
Portugal	2,43	3,64	*-56%*	3,25	*-60%*	2,97	*-64%*	2,73	*-67%*	2,43	*-70%*
Romania	7,43	11,19	*-45%*	10,41	*-48%*	9,82	*-51%*	8,80	*-56%*	7,43	*-63%*
Slovakia	1,79	2,67	*-30%*	2,51	*-34%*	2,34	*-38%*	2,04	*-46%*	1,79	*-53%*
Slovenia	0,56	0,81	*-43%*	0,77	*-46%*	0,73	*-49%*	0,60	*-58%*	0,56	*-61%*
Spain	11,15	16,11	*-44%*	14,39	*-50%*	13,54	*-53%*	12,60	*-56%*	11,15	*-61%*
Sweden	1,56	1,81	*-32%*	1,77	*-33%*	1,74	*-35%*	1,67	*-38%*	1,56	*-42%*
Un. Kingdom	13,53	19,01	*-37%*	17,47	*-42%*	15,79	*-47%*	14,59	*-51%*	13,53	*-55%*
EU-28	152,10	212,41	*-41%*	198,35	*-45%*	184,27	*-49%*	170,35	*-52%*	152,10	*-58%*

Premature deaths from ozone (cases/yr) 2025

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	469	312	*-33%*	308	*-34%*	304	*-35%*	288	*-39%*	257	*-45%*
Belgium	316	265	*-16%*	262	*-17%*	259	*-18%*	248	*-22%*	221	*-30%*
Bulgaria	814	543	*-33%*	537	*-34%*	533	*-35%*	510	*-37%*	468	*-43%*
Croatia	358	222	*-38%*	218	*-39%*	215	*-40%*	200	*-44%*	174	*-51%*
Cyprus	51	42	*-18%*	42	*-18%*	42	*-18%*	41	*-20%*	39	*-24%*
Czech Rep.	547	374	*-32%*	368	*-33%*	364	*-33%*	344	*-37%*	307	*-44%*
Denmark	164	127	*-23%*	126	*-23%*	125	*-24%*	120	*-27%*	110	*-33%*
Estonia	38	28	*-26%*	28	*-26%*	28	*-26%*	27	*-29%*	25	*-34%*
Finland	99	71	*-28%*	71	*-28%*	70	*-29%*	69	*-30%*	63	*-36%*
France	2497	1704	*-32%*	1684	*-33%*	1667	*-33%*	1601	*-36%*	1451	*-42%*
Germany	3673	2715	*-26%*	2674	*-27%*	2649	*-28%*	2533	*-31%*	2279	*-38%*
Greece	924	643	*-30%*	633	*-31%*	624	*-32%*	605	*-35%*	564	*-39%*
Hungary	828	533	*-36%*	526	*-36%*	520	*-37%*	488	*-41%*	435	*-47%*
Ireland	56	50	*-11%*	49	*-13%*	49	*-13%*	48	*-14%*	46	*-18%*
Italy	5294	3674	*-31%*	3591	*-32%*	3530	*-33%*	3377	*-36%*	3007	*-43%*
Latvia	93	65	*-30%*	65	*-30%*	64	*-31%*	62	*-33%*	57	*-39%*
Lithuania	144	103	*-28%*	102	*-29%*	101	*-30%*	98	*-32%*	91	*-37%*
Luxembourg	15	12	*-20%*	12	*-20%*	12	*-20%*	11	*-27%*	10	*-33%*
Malta	26	19	*-27%*	19	*-27%*	18	*-31%*	18	*-31%*	16	*-38%*
Netherlands	380	338	*-11%*	334	*-12%*	330	*-13%*	316	*-17%*	284	*-25%*
Poland	1669	1172	*-30%*	1158	*-31%*	1139	*-32%*	1083	*-35%*	979	*-41%*
Portugal	591	449	*-24%*	443	*-25%*	440	*-26%*	428	*-28%*	399	*-32%*
Romania	1597	1074	*-33%*	1061	*-34%*	1052	*-34%*	986	*-38%*	903	*-43%*
Slovakia	307	203	*-34%*	200	*-35%*	197	*-36%*	185	*-40%*	165	*-46%*
Slovenia	135	85	*-37%*	84	*-38%*	83	*-39%*	77	*-43%*	67	*-50%*
Spain	2085	1609	*-23%*	1573	*-25%*	1564	*-25%*	1516	*-27%*	1402	*-33%*
Sweden	240	172	*-28%*	171	*-29%*	169	*-30%*	164	*-32%*	152	*-37%*
Un. Kingdom	1207	1192	*-1%*	1181	*-2%*	1167	*-3%*	1123	*-7%*	1040	*-14%*
EU-28	24614	17794	*-28%*	17517	*-29%*	17318	*-30%*	16566	*-33%*	15009	*-39%*

Premature deaths from ozone (cases/yr) 2030

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	% red	2025	% red	2025	% red	2025	% red	2025	% red
Austria	469	298	*-36%*	294	*-37%*	291	*-38%*	275	*-41%*	243	*-48%*
Belgium	316	258	*-18%*	255	*-19%*	252	*-20%*	241	*-24%*	214	*-32%*
Bulgaria	814	526	*-35%*	520	*-36%*	516	*-37%*	495	*-39%*	448	*-45%*
Croatia	358	212	*-41%*	208	*-42%*	206	*-42%*	191	*-47%*	165	*-54%*
Cyprus	51	43	*-16%*	43	*-16%*	43	*-16%*	42	*-18%*	40	*-22%*
Czech Rep.	547	359	*-34%*	353	*-35%*	349	*-36%*	330	*-40%*	292	*-47%*
Denmark	164	124	*-24%*	122	*-26%*	121	*-26%*	117	*-29%*	106	*-35%*
Estonia	38	27	*-29%*	27	*-29%*	27	*-29%*	26	*-32%*	24	*-37%*
Finland	99	69	*-30%*	69	*-30%*	68	*-31%*	67	*-32%*	61	*-38%*
France	2497	1642	*-34%*	1624	*-35%*	1607	*-36%*	1545	*-38%*	1389	*-44%*
Germany	3673	2623	*-29%*	2582	*-30%*	2558	*-30%*	2447	*-33%*	2185	*-41%*
Greece	924	632	*-32%*	624	*-32%*	615	*-33%*	597	*-35%*	553	*-40%*
Hungary	828	510	*-38%*	504	*-39%*	498	*-40%*	466	*-44%*	412	*-50%*
Ireland	56	49	*-13%*	49	*-13%*	49	*-13%*	47	*-16%*	45	*-20%*
Italy	5294	3546	*-33%*	3474	*-34%*	3418	*-35%*	3267	*-38%*	2896	*-45%*
Latvia	93	64	*-31%*	63	*-32%*	63	*-32%*	61	*-34%*	56	*-40%*
Lithuania	144	100	*-31%*	100	*-31%*	99	*-31%*	96	*-33%*	88	*-39%*
Luxembourg	15	11	*-27%*	11	*-27%*	11	*-27%*	11	*-27%*	10	*-33%*
Malta	26	18	*-31%*	18	*-31%*	18	*-31%*	17	*-35%*	16	*-38%*
Netherlands	380	329	*-13%*	325	*-14%*	322	*-15%*	308	*-19%*	274	*-28%*
Poland	1669	1130	*-32%*	1117	*-33%*	1099	*-34%*	1044	*-37%*	936	*-44%*
Portugal	591	441	*-25%*	435	*-26%*	432	*-27%*	420	*-29%*	390	*-34%*
Romania	1597	1041	*-35%*	1029	*-36%*	1020	*-36%*	958	*-40%*	869	*-46%*
Slovakia	307	194	*-37%*	192	*-37%*	189	*-38%*	177	*-42%*	156	*-49%*
Slovenia	135	81	*-40%*	80	*-41%*	79	*-41%*	73	*-46%*	63	*-53%*
Spain	2085	1574	*-25%*	1540	*-26%*	1531	*-27%*	1484	*-29%*	1366	*-34%*
Sweden	240	167	*-30%*	165	*-31%*	164	*-32%*	159	*-34%*	146	*-39%*
Un. Kingdom	1207	1171	*-3%*	1160	*-4%*	1147	*-5%*	1105	*-8%*	1018	*-16%*
EU-28	24614	17239	*-30%*	16980	*-31%*	16792	*-32%*	16067	*-35%*	14461	*-41%*

Square Kilometres of forest area exceeding acidification critical loads. 2025

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	63	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*
Belgium	668	29	*-96%*	29	*-96%*	28	*-96%*	19	*-97%*	4	*-99%*
Bulgaria	0	0		0		0		0		0	
Croatia	1333	297	*-78%*	252	*-81%*	142	*-89%*	51	*-96%*	21	*-98%*
Cyprus	0	0		0		0		0		0	
Czech Rep.	1902	916	*-52%*	704	*-63%*	535	*-72%*	381	*-80%*	281	*-85%*
Denmark	1438	37	*-97%*	28	*-98%*	23	*-98%*	11	*-99%*	9	*-99%*
Estonia	119	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*
Finland	25	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*
France	15403	3199	*-79%*	1768	*-89%*	958	*-94%*	403	*-97%*	150	*-99%*
Germany	32633	4361	*-87%*	2762	*-92%*	1522	*-95%*	867	*-97%*	639	*-98%*
Greece	1217	198	*-84%*	149	*-88%*	94	*-92%*	73	*-94%*	73	*-94%*
Hungary	3326	1077	*-68%*	926	*-72%*	560	*-83%*	432	*-87%*	330	*-90%*
Ireland	696	4	*-99%*	3	*-100%*	3	*-100%*	1	*-100%*	0	*-100%*
Italy	1060	60	*-94%*	40	*-96%*	28	*-97%*	2	*-100%*	1	*-100%*
Latvia	5275	1066	*-80%*	878	*-83%*	790	*-85%*	614	*-88%*	472	*-91%*
Lithuania	6563	5781	*-12%*	5648	*-14%*	5556	*-15%*	5403	*-18%*	5024	*-23%*
Luxembourg	165	118	*-29%*	117	*-29%*	96	*-42%*	3	*-98%*	3	*-98%*
Malta	0	0		0		0		0		0	
Netherlands	4785	3816	*-20%*	3699	*-23%*	3576	*-25%*	3380	*-29%*	3229	*-33%*
Poland	52295	19166	*-63%*	13987	*-73%*	11506	*-78%*	7537	*-86%*	5887	*-89%*
Portugal	1387	190	*-86%*	168	*-88%*	140	*-90%*	135	*-90%*	116	*-92%*
Romania	2930	80	*-97%*	56	*-98%*	1	*-100%*	0	*-100%*	0	*-100%*
Slovakia	2103	523	*-75%*	402	*-81%*	217	*-90%*	47	*-98%*	42	*-98%*
Slovenia	203	4	*-98%*	3	*-99%*	3	*-99%*	0	*-100%*	0	*-100%*
Spain	2620	48	*-98%*	41	*-98%*	28	*-99%*	4	*-100%*	1	*-100%*
Sweden	19376	5243	*-73%*	4867	*-75%*	4572	*-76%*	4216	*-78%*	3836	*-80%*
Un. Kingdom	3315	967	*-71%*	760	*-77%*	542	*-84%*	395	*-88%*	309	*-91%*
EU-28	160900	47178	*-71%*	37287	*-77%*	30920	*-81%*	23972	*-85%*	2042 8	*-87%*

Square Kilometres of forest area exceeding acidification critical loads. 2030

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	63	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*
Belgium	668	29	*-96%*	28	*-96%*	26	*-96%*	11	*-98%*	2	*-100%*
Bulgaria	0	0		0		0		0		0	
Croatia	1333	294	*-78%*	250	*-81%*	133	*-90%*	47	*-96%*	19	*-99%*
Cyprus	0	0		0		0		0		0	
Czech Rep.	1902	787	*-59%*	577	*-70%*	439	*-77%*	275	*-86%*	213	*-89%*
Denmark	1438	32	*-98%*	27	*-98%*	13	*-99%*	10	*-99%*	9	*-99%*
Estonia	119	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*
Finland	25	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*	0	*-100%*
France	15403	2364	*-85%*	1452	*-91%*	759	*-95%*	216	*-99%*	113	*-99%*
Germany	32633	3561	*-89%*	2129	*-93%*	1098	*-97%*	623	*-98%*	434	*-99%*
Greece	1217	150	*-88%*	115	*-91%*	94	*-92%*	75	*-94%*	75	*-94%*
Hungary	3326	1065	*-68%*	872	*-74%*	524	*-84%*	430	*-87%*	260	*-92%*
Ireland	696	3	*-100%*	3	*-100%*	2	*-100%*	0	*-100%*	0	*-100%*
Italy	1060	48	*-95%*	40	*-96%*	28	*-97%*	2	*-100%*	1	*-100%*
Latvia	5275	1045	*-80%*	865	*-84%*	754	*-86%*	608	*-88%*	451	*-91%*
Lithuania	6563	5773	*-12%*	5612	*-14%*	5532	*-16%*	5399	*-18%*	5009	*-24%*
Luxembourg	165	118	*-29%*	116	*-29%*	68	*-59%*	3	*-98%*	3	*-98%*
Malta	0	0		0		0		0		0	
Netherlands	4785	3731	*-22%*	3612	*-25%*	3460	*-28%*	3219	*-33%*	3035	*-37%*
Poland	52295	16483	*-68%*	11756	*-78%*	9346	*-82%*	5765	*-89%*	4334	*-92%*
Portugal	1387	190	*-86%*	168	*-88%*	140	*-90%*	135	*-90%*	115	*-92%*
Romania	2930	69	*-98%*	56	*-98%*	1	*-100%*	0	*-100%*	0	*-100%*
Slovakia	2103	447	*-79%*	309	*-85%*	119	*-94%*	42	*-98%*	40	*-98%*
Slovenia	203	4	*-98%*	3	*-99%*	1	*-99%*	0	*-100%*	0	*-100%*
Spain	2620	44	*-98%*	35	*-99%*	27	*-99%*	4	*-100%*	1	*-100%*
Sweden	19376	4931	*-75%*	4634	*-76%*	4452	*-77%*	4044	*-79%*	3615	*-81%*
Un. Kingdom	3315	827	*-75%*	658	*-80%*	481	*-86%*	340	*-90%*	218	*-93%*
EU-28	160900	41995	*-74%*	33317	*-79%*	27496	*-83%*	21247	*-87%*	17948	*-89%*

Square Kilometres of ecosystem area exceeding eutrophication critical loads. 2025

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	% red	2025	% red	2025	% red	2025	% red	2025	% red
Austria	29569	17369	*-41%*	13823	*-53%*	11507	*-61%*	8524	*-71%*	6235	*-79%*
Belgium	253	28	*-89%*	10	*-96%*	5	*-98%*	1	*-99%*	1	*-100%*
Bulgaria	31978	14250	*-55%*	14182	*-56%*	14115	*-56%*	12943	*-60%*	11576	*-64%*
Croatia	28901	24465	*-15%*	23818	*-18%*	23389	*-19%*	21968	*-24%*	21038	*-27%*
Cyprus	2528	2528	*0%*	2528	*0%*	2528	*0%*	2528	*0%*	2528	*0%*
Czech Rep.	2094	1702	*-19%*	1583	*-24%*	1423	*-32%*	1213	*-42%*	1030	*-51%*
Denmark	4275	4234	*-1%*	4231	*-1%*	4227	*-1%*	4156	*-3%*	4068	*-5%*
Estonia	10886	4475	*-59%*	4356	*-60%*	4030	*-63%*	3482	*-68%*	2647	*-76%*
Finland	30047	7963	*-73%*	7144	*-76%*	6711	*-78%*	5611	*-81%*	4316	*-86%*
France	157035	121429	*-23%*	113945	*-27%*	104304	*-34%*	88184	*-44%*	74833	*-52%*
Germany	65668	50700	*-23%*	45879	*-30%*	40361	*-39%*	33971	*-48%*	31391	*-52%*
Greece	57928	55006	*-5%*	54533	*-6%*	54292	*-6%*	54121	*-7%*	53185	*-8%*
Hungary	23844	19136	*-20%*	17393	*-27%*	16169	*-32%*	15900	*-33%*	15856	*-34%*
Ireland	1621	615	*-62%*	595	*-63%*	539	*-67%*	443	*-73%*	342	*-79%*
Italy	98149	56516	*-42%*	52093	*-47%*	46273	*-53%*	38668	*-61%*	35439	*-64%*
Latvia	32738	26928	*-18%*	26034	*-20%*	25547	*-22%*	23354	*-29%*	20236	*-38%*
Lithuania	19343	18932	*-2%*	18874	*-2%*	18784	*-3%*	18354	*-5%*	16916	*-13%*
Luxembourg	1156	1117	*-3%*	1116	*-3%*	1106	*-4%*	1084	*-6%*	1065	*-8%*
Malta	0	0		0		0		0		0	
Netherlands	4142	3899	*-6%*	3861	*-7%*	3752	*-9%*	3530	*-15%*	3506	*-15%*
Poland	74127	59685	*-19%*	56348	*-24%*	54066	*-27%*	45796	*-38%*	40264	*-46%*
Portugal	32716	32590	*0%*	32430	*-1%*	32141	*-2%*	30670	*-6%*	28729	*-12%*
Romania	94774	88682	*-6%*	88121	*-7%*	87800	*-7%*	85212	*-10%*	81946	*-14%*
Slovakia	22184	19661	*-11%*	19353	*-13%*	19082	*-14%*	18512	*-17%*	17856	*-20%*
Slovenia	9716	2158	*-78%*	1593	*-84%*	1103	*-89%*	515	*-95%*	366	*-96%*
Spain	211578	202275	*-4%*	201083	*-5%*	198777	*-6%*	192785	*-9%*	181272	*-14%*
Sweden	91924	44863	*-51%*	42207	*-54%*	39439	*-57%*	33551	*-64%*	26665	*-71%*
Un. Kingdom	8924	4054	*-55%*	3624	*-59%*	2795	*-69%*	1755	*-80%*	1346	*-85%*
EU-28	1148097	885262	*-23%*	850757	*-26%*	814266	*-29%*	746831	*-35%*	684651	*-40%*

Square Kilometres of ecosystem area exceeding eutrophication critical loads. 2030

Country		Option 1		Option 6A		Option 6B		Option 6C		Option 6D	
	2005	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*	2025	*% red*
Austria	29569	16210	*-45%*	12569	*-57%*	10283	*-65%*	7278	*-75%*	5214	*-82%*
Belgium	253	25	*-90%*	6	*-98%*	4	*-98%*	1	*-100%*	1	*-100%*
Bulgaria	31978	14250	*-55%*	14115	*-56%*	14115	*-56%*	12943	*-60%*	11576	*-64%*
Croatia	28901	24105	*-17%*	23566	*-18%*	23080	*-20%*	21785	*-25%*	20617	*-29%*
Cyprus	2528	2528	*0%*	2528	*0%*	2528	*0%*	2528	*0%*	2528	*0%*
Czech Rep.	2094	1659	*-21%*	1508	*-28%*	1356	*-35%*	1071	*-49%*	875	*-58%*
Denmark	4275	4231	*-1%*	4230	*-1%*	4214	*-1%*	4140	*-3%*	4013	*-6%*
Estonia	10886	4419	*-59%*	4201	*-61%*	3891	*-64%*	3363	*-69%*	2517	*-77%*
Finland	30047	7322	*-76%*	6513	*-78%*	6198	*-79%*	5171	*-83%*	4022	*-87%*
France	157035	117867	*-25%*	108306	*-31%*	98435	*-37%*	82080	*-48%*	71303	*-55%*
Germany	65668	49440	*-25%*	43827	*-33%*	38191	*-42%*	32419	*-51%*	29743	*-55%*
Greece	57928	54678	*-6%*	54366	*-6%*	54185	*-6%*	53828	*-7%*	52852	*-9%*
Hungary	23844	18452	*-23%*	16611	*-30%*	15997	*-33%*	15884	*-33%*	15848	*-34%*
Ireland	1621	586	*-64%*	568	*-65%*	520	*-68%*	428	*-74%*	318	*-80%*
Italy	98149	54504	*-44%*	50186	*-49%*	43442	*-56%*	36505	*-63%*	33288	*-66%*
Latvia	32738	26468	*-19%*	25754	*-21%*	25048	*-23%*	22982	*-30%*	19959	*-39%*
Lithuania	19343	18923	*-2%*	18864	*-2%*	18762	*-3%*	18332	*-5%*	16834	*-13%*
Luxembourg	1156	1116	*-3%*	1106	*-4%*	1106	*-4%*	1071	*-7%*	1046	*-9%*
Malta	0	0		0		0		0		0	
Netherlands	4142	3886	*-6%*	3829	*-8%*	3683	*-11%*	3508	*-15%*	3439	*-17%*
Poland	74127	58839	*-21%*	54771	*-26%*	52450	*-29%*	43737	*-41%*	37690	*-49%*
Portugal	32716	32580	*0%*	32378	*-1%*	32024	*-2%*	30527	*-7%*	28404	*-13%*
Romania	94774	88362	*-7%*	87930	*-7%*	87373	*-8%*	84439	*-11%*	80852	*-15%*
Slovakia	22184	19416	*-12%*	19228	*-13%*	18923	*-15%*	18283	*-18%*	17336	*-22%*
Slovenia	9716	1936	*-80%*	1267	*-87%*	878	*-91%*	460	*-95%*	286	*-97%*
Spain	211578	201558	*-5%*	200233	*-5%*	197487	*-7%*	190457	*-10%*	178497	*-16%*
Sweden	91924	43196	*-53%*	40343	*-56%*	37594	*-59%*	31698	*-66%*	24834	*-73%*
Un. Kingdom	8924	3927	*-56%*	3529	*-60%*	2527	*-72%*	1635	*-82%*	1225	*-86%*
EU-28	1148097	870482	*-24%*	832334	*-28%*	794295	*-31%*	726551	*-37%*	665117	*-42%*