

EXECUTIVE NOTE

THE AIR QUALITY STANDARDS (SCOTLAND) REGULATIONS 2010

SSI 2010/204

Introduction

The Air Quality Standards (Scotland) Regulations 2010 (“the Regulations”) implement Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (“the Directive”), together with Directive 2004/107/EC of the European Parliament and of the Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAHs) in ambient air (“the Fourth Daughter Directive”), which flows from the Air Quality Framework Directive 1996/62/EC (“the Framework Directive”). The Directive consolidates the Framework Directive and the First, Second and Third Daughter Directives (1999/30/EC, 2000/69/EC and 2002/3/EC) along with a related Council Decision on the exchange of information, with the intention of simplifying this legislation. The Directive also introduces three new provisions:

- (i) time extensions to meet EU limit values for particulate matter (PM₁₀) (until 2011) and nitrogen dioxide (NO₂) and benzene (from 2010 to 2015), subject to strict conditions imposed by the Commission, including assessment of air quality plans produced by Member States setting out how the limit values will be achieved by the extended deadlines;
- (ii) the discounting of natural sources of pollution, such as sea salt, when assessing compliance against limit values; and
- (iii) a new control framework for fine particulate matter (PM_{2.5}), reflecting the latest health evidence suggesting that smaller particles may have even greater effects on human health than the larger PM₁₀ size fraction.

The principal aim of both the Directive and the Fourth Daughter Directive is to achieve a high degree of protection for human health and the environment against the effects of ambient air pollution. The Regulations replace and revoke the Air Quality Standards (Scotland) Regulations 2007 (SSI 2007/182). The Regulations are made under section 2(2) of the European Communities Act 1972 and are subject to negative resolution procedure.

Both the Directive and the Fourth Daughter Directive contain a large amount of technical detail. In order to simplify the Regulations and make them more accessible to the reader, only those Annexes considered to be of particular interest to the public have been included in the Schedules to the Regulations. In other cases, references have been made to the relevant parts of the Directives.

Content of the Regulations

Regulation 2 defines certain terms used in the Regulations.

Regulation 3 designates the Scottish Ministers as the competent authority in Scotland for the purposes of the Directive (other than Article 3(f) of that Directive) and the Fourth Daughter Directive.

Regulation 4 requires the Scottish Ministers to divide Scotland into zones and agglomerations for the purposes of the Regulations. Throughout the Regulations, references to zones includes those zones which have been classed as agglomerations.

Regulation 5 requires the Scottish Ministers to classify each zone according to whether the upper or lower assessment thresholds specified in the Directive are exceeded for benzene, carbon monoxide (CO), lead, nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), particulate matter and sulphur dioxide (SO₂).

Regulation 6 sets out the assessment criteria to be used for the purposes of Regulation 5.

Regulation 7 specifies the location and number of sampling points to satisfy the requirements in the Directive and also includes provision for monitoring to be supplemented by modelling or indicative measurements provided certain conditions are met.

Regulation 8 covers assessment criteria and **regulation 9** covers location and number of sampling points for ozone.

Regulation 10 covers assessment thresholds, **regulation 11** covers assessment criteria and **regulation 12** covers location and number of sampling points in relation to arsenic, cadmium, nickel and benzo(a)pyrene (BaP).

Regulation 13 lists the other PAHs in addition to BaP which must be monitored by the Scottish Ministers, and contains provision for others to be included as the Scottish Ministers see fit. It also lists the monitoring requirements for these PAHs.

Regulation 14 sets out the requirements for background monitoring of arsenic, cadmium, mercury, nickel and PAHs.

Regulations 15 and 16 specify the data quality objectives and reference methods for sampling these pollutants.

Regulation 17 requires the Scottish Ministers to ensure that the limit values for SO₂, NO₂, benzene, CO, lead and particulate matter are met.

Regulation 18 requires the Scottish Ministers to take all necessary measures not entailing disproportionate costs to meet the target values for PM_{2.5}, ozone, arsenic, cadmium, nickel and BaP.

Regulation 19 provides that the limit and target values referred to in regulations 17 and 18 apply from the dates specified in the Directive for each pollutant, or when the Regulations come into force if no date is specified.

Regulation 20 outlines the requirements in relation to long term objectives for ozone.

Regulation 21 requires the Scottish Ministers to inform the public where the information or alert threshold for the pollutants referred to in Schedule 5 are exceeded.

Regulation 22 provides that the critical levels for the protection of vegetation set out in Schedule 6 must not be exceeded.

Regulation 23 relates to the new exposure reduction targets for PM_{2.5}. Until now, air pollution legislation and policy have focused on achieving specific targets for each pollutant. Where these are met, no further action is required. Exposure reduction recognises that for some pollutants, most notably particulate matter, there is no currently identified threshold below which concentrations can be considered to have negligible effects on human health. Exposure reduction thus requires PM_{2.5} concentrations to be reduced by a fixed percentage across the whole of each Member State, irrespective of whether limit or target values are being achieved in any given area.

The exposure reduction target, which will be set for the UK as a whole, is to be achieved by 2020 and will be based on average background levels over the period 2009-11. Regulation 23 requires the Scottish Ministers to take all necessary measures not entailing disproportionate costs in relation to Scotland with a view to attaining the exposure reduction target. It also requires the Scottish Ministers to ensure that all appropriate measures are taken in relation to Scotland with a view to ensuring that the average exposure indicator for 2015 does not exceed 20 µg/m³ as an interim step.

Regulation 24 sets out requirements for the Scottish Ministers to produce an action plan where limit or target values are being exceeded, outlining how these values will be met.

Regulation 25 provides for short term action plans to address immediate pollution episodes or incidents. In some cases, there is a discretion as to whether or not such plans should be produced.

Regulation 26 requires the Scottish Ministers to consult the public when preparing air quality or short-term action plans under Regulations 24 or 25.

Regulation 27 sets out the requirements for making air quality information publicly available.

Regulation 28 requires the Scottish Ministers to publish annual reports for all pollutants and sets out what should be included in these reports.

Regulation 29 revokes the 2007 Regulations.

Schedule 1 sets out in detail how sampling points for SO₂, NO₂ and NO_X, particulate matter, lead, benzene and CO must be located.

Schedule 2 lists the limit values and **Schedule 3** sets out the target values, whilst **Schedule 4 provides for** the long term objectives for ozone.

Schedule 5 lists the information and alert thresholds.

Schedule 6 lists the critical levels for the protection of vegetation.

Schedule 7 outlines the information to be included in air quality plans and **Schedule 8** the information to be made publicly available when alert and information thresholds are exceeded.

Financial implications

A Regulatory Impact Assessment has been prepared. Transposition of the Directive is estimated to deliver a total net benefit of at least £875 million for the UK as a whole. The impact on business will be negligible, as responsibility largely falls to the Scottish Ministers and, for UK wide provisions, the Secretary of State.

Consultation

Local authorities, environmental NGOs, industry and other interested bodies were consulted on the proposals. Six responses were submitted and all were generally content with the proposed Regulations.

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TRANSPPOSITION NOTE

Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (OJ No. L152, 11.06.08, p1)

The Scottish Ministers rely, from the transposition deadline of 11 June 2010, on the provisions of the Air Quality Standards (Scotland) Regulations 2010 set out in the Table below in respect of the transposition of the above Directive in Scotland. The Regulations apply to the following pollutants: sulphur dioxide, nitrogen dioxide, oxides of nitrogen, particulate matter, lead, benzene, carbon monoxide and ozone.

Directive Article	Objectives	Implementation	Responsibility
Article 1	Objectives of the Directive as a whole.	Implicit in the Regulations as a whole	Scottish Ministers
Article 2	Definitions	Regulation 2	
Article 3	Establishes the designation of competent authorities responsible for the assessment (including methodology) of ambient air quality and liaison with other member states and the European Commission.	Regulation 3	Scottish Ministers, except Article 3(f) for which the Secretary of State is responsible
Article 4	Requires member states to divide their territories into zones for the assessment and monitoring of pollutants.	Regulation 4	Scottish Ministers
Article 5	Establishes a regime for the assessment of pollutant (excluding ozone) concentrations including upper and lower thresholds in accordance with Annex II.	Regulation 5	Scottish Ministers
Article 6	Establishes the assessment criteria for the collation of information on pollutant concentrations (excluding ozone), including that on monitoring and modelling measurements.	Regulation 6	Scottish Ministers
Article 7	Establishes the location and number of pollutants (excluding ozone) sampling points.	Regulation 7, Schedule 1	Scottish Ministers
Article 8	Establishes reference methods for the assessment of pollutant (excluding ozone) concentrations in accordance with sections A, B and C of Annex VI.	Regulation 6	Scottish Ministers
Article 9	Establishes the assessment criteria in relation to ozone concentrations.	Regulation 8	Scottish Ministers
Article 10	Establishes the location and number of sampling points in relation to ozone assessment.	Regulation 9	Scottish Ministers

Article 11	Requires the application of reference measurement methods in relation to ozone assessments as prescribed in Annex VI.	Regulation 8	Scottish Ministers
Article 12	Obligations for maintaining pollutant (excluding ozone) concentrations below the limit values prescribed in Annexes XI and XIV.	Regulation 17, Schedule 2	Scottish Ministers
Article 13	Establishes obligations for compliance with pollutant (excluding ozone) limit values and alert thresholds prescribed in Annexes XI and XII.	Regulations 17,19 and 21 Schedules 2 and 5	Scottish Ministers
Article 14	Establishes obligations for compliance with critical levels prescribed for sulphur dioxide and oxides of nitrogen in Annex XIII.	Regulations 7 and 22, Schedule 6	Scottish Ministers
Article 15	Establishes obligations for compliance with a national PM _{2.5} exposure reduction target as prescribed in Annex XIV and the number of sampling points on which the PM _{2.5} average exposure indicator should be based as prescribed in Annex V.	Regulation 23. Otherwise transposed by Air Quality Standards Regulations (S.I. 2010/1001)	Scottish Ministers
Article 16	Establishes obligations for compliance with new PM _{2.5} target and limit values as prescribed in Annex XIV.	Regulations 17,18 ,19 and 24(4), Schedules 2 and 3	Scottish Ministers
Article 17	Requires that target values and long-term objectives for ozone are met and establishes obligations in relation to zones and agglomerations where they are not.	Regulations 18, 19, 20 and 24(3)	Scottish Ministers
Article 18	Establishes obligations in relation to zones and agglomerations where concentrations of ozone meet its long-term objectives.	Regulation 20	Scottish Ministers
Article 19	Requirement to inform the public and European Commission of exceedences in pollutant information (as prescribed in Annex XII) or alert thresholds.	Regulation 21, Schedule 5 Transposition not required for reporting of information to the Commission	Scottish Ministers
Article 20	Exceedences attributable to natural sources of pollution (e.g. sea salt) are to be discounted when assessing compliance of pollutants against their limit values.	Regulation 17	Scottish Ministers
Article 21	Exceedences attributable to winter-sanding or -salting of roads are to be discounted as above.	24(2)	Scottish Ministers
Article 22	Exemption from the obligation to apply limit values and postpone attainment deadlines for certain pollutants.	Regulation 19	Scottish Ministers
Article 23	Establishes obligations for the implementation of air quality plans when pollutant limit and target values have been exceeded.	Regulation 24	Scottish Ministers
Article 24	Establishes obligations for the implementation of short term action plans when there is risk of exceedences in pollutant limit and target values and/or alert thresholds.	Regulations 25 and 26	Scottish Ministers

Article 25	Establishes obligations in relation to incidences of transboundary pollution.	Transposed by Air Quality Standards Regulations 2010	Scottish Ministers
Article 26	Prescribes the information which must be provided to the public and appropriate bodies on pollutant concentrations and how the information is communicated.	Regulations 27 and 28	Scottish Ministers
Article 27	Provision of information to the European Commission by member states on air quality compliance in their territory including any assessment on contributions from natural sources.	Transposition not required	
Article 28	Implementing measures for the European Commission.	Transposition not required	European Commission
Article 29	Committee provisions for the European Commission.	Transposition not required	European Commission
Article 30	Establishes obligation for member states to establish a penalty regime for breaches of the Directive.	The Regulations rely on public law remedies in relation to breach by the Scottish Ministers. Penalties in relation to specific polluters are set out in applicable sectoral legislation	Scottish Ministers
Article 31	Repeal and transitional provisions	Transposition not required	
Article 32	Duties for the European Commission to review provisions on PM _{2.5} and other pollutants as appropriate.	Transposition not required	European Commission
Article 33	Prescribes obligations for making national legislation to transpose the Directive and the availability of appropriate number of PM _{2.5} monitoring stations by January 2009.	Transposition not required	Scottish Ministers
Article 34	Directive entry into force date.	Transposition not required	European Commission
Article 35	Provision to address Directive to member states.	Transposition not required	
Annex I	Prescribes data quality objectives in relation to the pollutant monitoring and assessment.	Regulations 6, 7(4), 8 and 9	Scottish Ministers
Annex II	Prescribes pollutant (excluding ozone) upper and lower assessment thresholds and criteria for the determination of exceedences in these thresholds.	Regulation 5	Scottish Ministers
Annex III	Prescribes criteria for the assessment of pollutant concentration and location of sampling points.	Schedule 1	Scottish Ministers
Annex IV	Criteria for measurements at rural background locations.	Regulation 6	Scottish Ministers
Annex V	Criteria for determining minimum number of sampling points for fixed measurement concentrations of certain pollutants.	Regulations 7 and 9.	Scottish Ministers

Annex VI	Prescribed criteria for the reference methods to be used in assessing pollutant concentrations.	Regulations 6 and 8	Scottish Ministers
Annex VII	Prescribed target values and long-term objectives for ozone	Schedules 3 and 4	Scottish Ministers
Annex VIII	Criteria for the classification and location of ozone sampling points.	Regulation 9	Scottish Ministers
Annex IX	Criteria for the minimum number of sampling points for ozone assessment.	Regulation 9	Scottish Ministers
Annex X	Criteria for the measurement of ozone precursor substances.	Regulation 9	Scottish Ministers
Annex XI	Prescribed pollutant limit values and margins of tolerance.	Schedule 2	Scottish Ministers
Annex XII	Prescribed pollutant alert thresholds	Schedule 5	Scottish Ministers
Annex XIII	Prescribed critical levels for protection of vegetation.	Schedule 6	Scottish Ministers
Annex XIV	Prescribed PM _{2.5} national exposure reduction target, target value and limit value.	Schedules 2 and 3 for limit and target values. Exposure reduction target set by Secretary of State in accordance with the Air Quality Standards Regulations 2010.	Scottish Ministers
Annex XV	Prescribes information to be included in air quality plans.	Regulation 24, Schedule 7	Scottish Ministers
Annex XVI	Prescribes the information which must be provided to the public and appropriate bodies on pollutant concentrations.	Regulations 27 and 28, Schedule 8	Scottish Ministers
Annex XVII	Correlation table	Not applicable	

TRANSPOSITION NOTE

Directive 2004/107/EC of the European Parliament and of the Council relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (OJ No L 23, 26.01.05, p3)

The Scottish Ministers rely, from 11 June 2010, on the provisions of the Air Quality Standards (Scotland) Regulations 2010 set out in the Table below in respect of the transposition of the above Directive in Scotland. These Regulations replace the Air Quality Standards (Scotland) Regulations 2007 (SSI 182).

Directive Article	Objectives	Implementation	Responsibility
Article 1	Objectives of the Directive as a whole.	Implicit in Regulations as a whole	Scottish Ministers
Article 2	Definitions	Regulation 2	
Article 3	Establishes requirements for compliance with target values prescribed in Annex I.	Regulation 18, Schedule 3	Scottish Ministers
Article 4	Establishes the regime for assessing pollutant concentrations and deposition rates	Regulations 10, 11,12, 13, 14, 15, 16	Scottish Ministers
Article 5	Establishes the reporting requirements and deadlines for the provision of information to the Commission with the target values prescribed in Annex I.	Transposition not required	Scottish Ministers
Article 6	Committee provisions for the European Commission	Transposition not required	European Commission
Article 7	Prescribes the information which must be provided to the public and appropriate bodies on pollutant concentrations and how the information is communicated.	Regulations 27 and 28	Scottish Ministers
Article 8	Prescribes obligations for the Commission to provide by the end of 2010 a report reviewing the implementation of the Directive and proposing necessary amendments to the Directive.	Transposition not required	European Commission
Article 9	Establishes obligation for member states to establish a penalty regime for breaches of the Directive.	The Regulations rely on public law remedies in relation to breach by the Scottish Ministers. Penalties in relation to specific polluters are set out in applicable sectoral legislation.	Scottish Ministers
Article 10	Prescribes measures for member states to implement the Directive.	Transposition not required.	Scottish Ministers

Article 11	Date for when the Directive must come into force.	Transposition not required.	Scottish Ministers
Annex I	Prescribes pollutant target values.	Schedule 3	Scottish Ministers
Annex II	Prescribes upper and lower assessment thresholds for the pollutants and criteria for the determination of exceedences in these thresholds.	Regulation 10	Scottish Ministers
Annex III	Prescribes criteria for the location and minimum number of sampling points.	Regulation 12	Scottish Ministers
Annex IV	Prescribes data quality objectives and requirements for air quality models.	Regulation 15	Scottish Ministers
Annex V	Prescribed criteria for the reference methods to be used in assessing pollutant concentrations.	Regulation 16	Scottish Ministers

Summary: Intervention & Options

Department /Agency: Defra	Title: Transposition of the Air Quality Directive (2008/50/EC).	
Stage: Consultation	Version: 1	Date: 22/10/2009
Related Publications: Impact Assessment for PM ₁₀ time extension notification (http://www.defra.gov.uk/corporate/consult/air-quality/index.htm)		

Available to view or download at:

Contact for enquiries:

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What is the problem under consideration? Why is government intervention necessary?

Council Directive 2008/50/EC contains options for seeking additional time to meet limit values for certain pollutants, requires deduction of natural sources from compliance assessments and consideration of the costs of additional action to achieve reductions in fine particulate matter (PM_{2.5}) in urban background areas. A separate IA has been produced to support the UK time extension notification for particulate matter (PM₁₀) and one is being prepared for the UK nitrogen dioxide (NO₂) notification consultation. The impacts of the deduction of natural sources and the PM_{2.5} controls are assessed here.

What are the policy objectives and the intended effects?

New controls for PM_{2.5} will further protect public health and the environment. This is balanced with provisions to secure additional time to meet PM₁₀ and NO₂ limit values in response to challenges faced across Europe, and a new duty to deduct natural sources such as sea-salt from compliance assessment reports (for PM₁₀). The Directive must be transposed into national legislation by June 2010 and our aim is to do this in an effective, timely and proportionate manner to achieve the objectives of the Directive whilst minimising the burdens on business.

What policy options have been considered? Please justify any preferred option.

1. Do not transpose the Directive
2. Transposition, using the new provisions in relation to time extensions, deducting natural sources and meeting the obligatory standards on the control of PM_{2.5}.

Option 2 is our preferred option because it meets our statutory obligations providing flexibilities to improve air quality without imposing disproportionate costs.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

The Directive is due to be reviewed in 2013 and the UK will review the costs and benefits of PM_{2.5} controls prior to then.

Ministerial Sign-off For CONSULTATION STAGE Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:

.....Date:

Summary: Analysis & Evidence

Policy Option: Option 2	Description: Transpose the Air Quality Directive
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COSTS	ANNUAL COSTS		Description and scale of key monetised costs by 'main affected groups' The key costs of this option are the health costs associated with not delivering additional improvement in air quality.
	One-off (Transition)	Yrs	
	£ 0		
	Average Annual Cost (excluding one-off)		
	£ 46.5 Million	20	Total Cost (PV) £ 684 Million
Other key non-monetised costs by 'main affected groups' The costs focus primarily on chronic mortality impacts and does not reflect any potential wider benefits either on morbidity or other environmental benefits.			

BENEFITS	ANNUAL BENEFITS		Description and scale of key monetised benefits by 'main affected groups' Reduced mitigation costs including technology costs, resources costs and cleaning costs.
	One-off	Yrs	
	£ 0		
	Average Annual Benefit (excluding one-off)		
	£ 106 Million	20	Total Benefit (PV) £ 1,559 Million
Other key non-monetised benefits by 'main affected groups' This estimate excludes the potential benefit of time extensions, of at least £3.9bn for PM.			

Key Assumptions/Sensitivities/Risks

Key assumptions relate to the link between air pollution and chronic mortality and the approach to mitigating air pollution. The notable risk is that air pollution is shown to have wider health impacts than currently understood that might change the balance of the impacts.

Price Base Year 2008	Time Period Years 20	Net Benefit Range (NPV) £ 875 Million	NET BENEFIT (NPV Best estimate) £ 875 Million
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What is the geographic coverage of the policy/option?	UK
On what date will the policy be implemented?	June 2010
Which organisation(s) will enforce the policy?	Defra and DA's
What is the total annual cost of enforcement for these organisations?	£ 0
Does enforcement comply with Hampton principles?	Yes
Will implementation go beyond minimum EU requirements?	No
What is the value of the proposed offsetting measure per year?	£ N/A
What is the value of changes in greenhouse gas emissions?	£ 3 million saving
Will the proposal have a significant impact on competition?	No
Annual cost (£-£) per organisation (excluding one-off)	Micro Small Medium Large
Are any of these organisations exempt?	No No N/A N/A

Impact on Admin Burdens Baseline (2005 Prices)		(Increase – Decrease)
Increase of £ 0	Decrease of £ 0	Net Impact £ (<£5m)

Key: Annual costs and benefits: Constant Prices

Introduction

Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC) consolidates the framework and three daughter directives on ambient air quality together with the Council Decision on the Exchange of Information into a single directive, with the intention of simplifying the existing legislation. It also introduces three key new provisions reflecting the experiences of member states in implementation and improved understanding on the health impacts of particulate matter:

- I. Additional time to meet limit values for PM₁₀¹ and NO₂, subject to consideration by the Commission of air quality plans setting out how the limit values would be achieved by the extended deadlines.
- II. A requirement for the deduction of natural contributions when assessing compliance with limit values;
- III. A new control framework for PM_{2.5};

Other minor changes have been introduced, many of which are points of clarification. The Directive must be transposed into national legislation by 11 June 2010.

Policy Options

This IA analyses the impacts of the following 2 options;

Option 1; Do nothing. Under this option, the UK government would not transpose the new Directive and would continue to be bound by the existing legislative framework. This option represents a reference point against which Option 2 is compared.

Given the attainment date for PM₁₀ was 2005 and is 2010 for NO₂ this option would require additional measures be undertaken to immediately meet limit values across the UK.

Option 2; Transposition of the Air Quality Directive. Under this option, government uses the new time extension provisions, deducts natural sources for PM₁₀ and meets obligatory standards on the control of PM_{2.5} (the Exposure Concentration

¹ Particulate Matter (PM) is generally categorised on the basis of the size of the particles (for example PM_{2.5} is particles with a diameter of less than 2.5µm). PM is made up of a wide range of materials and arise from a variety of sources. Concentrations of PM comprise primary particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. PM derives from both human-made and natural sources (such as sea spray and Saharan dust). In the UK the biggest human-made sources are stationary fuel combustion and transport. Road transport gives rise to primary particles from engine emissions, tyre and brake wear and other non-exhaust emissions. Other primary sources include quarrying, construction and non-road mobile sources. Secondary PM is formed from emissions of ammonia, sulphur dioxide and oxides of nitrogen as well as from emissions of organic compounds from both combustion sources and vegetation.

Obligation and the Limit Value), with any justified action taken to ensure progress towards the National Exposure Reduction Target for PM_{2.5} by 2020.

Under this option, UK would transpose the new Air Quality Directive by means of:

- **Using the additional time** available to meet limit values for PM₁₀ and NO₂, subject to consideration by the Commission of air quality plans setting out how the limit values would be achieved by the extended deadlines.
- Deduction of **natural contributions** when assessing compliance with limit values in relation to PM₁₀, and hence the case for seeking additional time (see above);
- Compliance with a new limit value and Exposure Concentration Obligation for PM_{2.5};

This option therefore assesses the impact of these provisions within the UK. To assess the costs and benefits it is necessary to consider the three key provisions individually.

The **additional time provision** provides important flexibility for the UK to achieve compliance in those small parts of the country where limit values are not already being achieved. Given the importance of this provision any such application has been or will be subject to public consultation.

In April 2009 following public consultation, the UK submitted to the Commission a notification to seek additional time to meet the limit value for PM₁₀ and a separate Impact Assessment was produced in relation to that². The notification sets out what actions will be taken to meet the limit values by the extended deadline of 2011. Details are set out in the Technical Report³ to accompany the UK Time Extension notification forms.

The evidence undertaken for this notification suggested that use of the additional time would create a net benefit of around £3.3 billion, within a range of £0.7 - £5.5 billion. These benefits arise as a result of the avoided technology and operational costs associated with the necessary abatement to achieve compliance as soon as possible.

The UK will also be submitting a notification for additional time to meet the NO₂ limit value and a separate Impact Assessment will be produced in association with that. This will be subject to a separate public consultation in 2010.

As the PM₁₀ decision on the time extension is still subject to Commission approval, and there are clear uncertainties around the detail of an application in relation to NO₂, the potential impacts are not included in the central benefit figures presented for this option. It must however be noted that the possibilities of additional time do present potential major benefits to the UK.

Related to the time extension notification for PM₁₀, the second key provision relates to the treatment of **natural sources** when assessing compliance with the limit values. The level of PM in ambient air is the result of both human activity (anthropogenic sources) as well as natural processes. Currently compliance against limit values is assessed against the total modelled levels of PM. The new provision in the Directive (Article 20 of Directive 2008/50/EC) requires Member States (under specific conditions) to deduct contributions of PM that occur naturally for the purpose of compliance reporting:

Where the commission has been informed of an exceedance attributable to natural sources.....that exceedance shall not be considered as an exceedance for the purposes of this Directive⁴.

² The full consultation including the IA is available from <http://www.defra.gov.uk/corporate/consult/air-quality/index.htm>

³ The technical report is available from: <http://www.defra.gov.uk/environment/quality/air/airquality/eu-int/eu-directives/airqual-directives/documents/090423-pm10-tech-doc.pdf>

⁴ Directive 2008/50/EC (Article 20 (b))

Pending formal Commission Guidance, Member States have been advised to use what they consider to be the most appropriate methodology for the deduction of natural sources. In the UK the main natural source of PM₁₀ is sea salt (Sodium Chloride). Unlike anthropogenic sources of particulate matter, sea-spray cannot be controlled. Furthermore, scientific evidence suggests that natural sources of PM (including sea salt) are relatively harmless to human health and the environment as compared with anthropogenic sources of PM, though the evidence on this is not conclusive⁵.

Assessing compliance excluding the contribution of natural sources has the effect of reducing any identified exceedences. Depending on the extent of the contribution of sea-salt, the effect might be that the exceedences would no longer exist. In other cases, it would reduce the level of a reported exceedences.

Given that the Secretary of State is obliged to take action to achieve compliance in the event of exceedences being reported, this provision will reduce the level of abatement necessary to achieve compliance.

The analysis therefore looks to model the additional abatement that is avoided through the exclusion of the contribution from natural sources in considering exceedences. It should be noted that in compiling the UK time extension notification for PM₁₀, natural sources were taken into account.

Finally, the Directive introduces **new controls for PM_{2.5}**. These aim to minimise the exposure of the whole population to PM_{2.5} – this new ‘exposure reduction’ approach is focused on driving down concentrations across urban background areas. Certain elements of the new controls are mandatory – the limit value, and the exposure concentration obligation.

The PM_{2.5} **limit value** applies everywhere from 2015 and aims to ensure a minimum standard of air quality for all people. There is also a PM_{2.5} target value to aim for from 2010. Table 1 sets these out.

Table 1; Limit and target value (applying everywhere).

Standards applying across zones/agglomerations (compliance assessed in accordance with Annex III)		Compliance date
Target value	25 µg/m ³	January 2010
Limit value	25 µg/m ³	January 2015

The Exposure Concentration Obligation applies across UK urban background areas. It must be attained by 2015 – and will be calculated as the 3 year mean concentration averaged over the relevant sampling points for 2013--15.

The National Exposure Reduction Target is a % reduction in average concentration in UK urban background locations, to be achieved by 2020 by taking measures not entailing disproportionate costs. The target for 2020 is determined by the mean concentration in urban background locations over the 3 years 2009 -2011 (this is termed the Average Exposure Indicator for 2010). The directive (Annex XIV) also specifies how the AEI for 2020 shall be calculated. The target for the UK therefore cannot yet be finally determined.

⁵ “There is a view that some components of particles from natural sources are less toxic than some components of particles from anthropogenic sources. However, this observation is based on more general principles rather than specific evidence. For example, sea salt (sodium chloride) is a common constituent of the body so is therefore assumed to be relatively harmless. There have been several studies of the effects of particles from different sources but these have not shown conclusively that all constituents of particles from natural sources are harmless. For example, the dust from Saharan dust storms has been shown to have some health effects” (Perez et al 2008).

Table 2; Standards for urban background areas.

Standards applying across urban background areas		Compliance date
Exposure Concentration <u>Obligation</u>	20 µg/m ³	2015
National Exposure Reduction <u>Target</u>	% reduction according to the AEI	2020

The new provisions to a large extent mirror those set out in the 2007 Air Quality Strategy (see Box 1 below).

Box 1 *Developments since the Air Quality Strategy 2007*

The Air Quality Strategy (AQS 2007) presents data which show the UK to be on target to meet a 15% Exposure Reduction, assuming we put in place Measure Q. Measure Q included the early introduction of the Euro 5, 6 and VI vehicle emission standards, a programme to incentivise low emission vehicles, and reductions in emissions from international shipping.

The baseline used for the current assessment includes Euro 5, 6 and VI (their early introduction will make little difference to levels of uptake in 2020) and some of the impact of the agreement on a revised Annex VI to the MARPOL convention, which has a similar or stronger effect than the shipping measures proposed in AQS 2007. Nevertheless, whereas AQS 2007 showed that baseline plus measure Q gave a 16.1% exposure reduction from 2010 to 2020, the baseline used in this assessment shows only 6.4%⁶. AQS 2007 Volume 2 (pp 124-126) discusses the uncertainties in the PM_{2.5} projections used for the AQS 2007 assessment, and the assessment used in this impact assessment is within the range suggested.

The main reasons for the difference in the two sets of projections are:

- changes to the energy projections used – AQS 2007 used Updated Energy Projection (UEP) 12, whereas the work to support this assessment used UEP 30. Differences in the level of energy projected and in particular the level of coal used for energy generation can have a significant impact on the level of secondary particles, and therefore the background concentrations of PM_{2.5}.
- While, the same basic model was used for both sets of projections, there have been a number of changes to the assumptions used. Most significant is the relationship between the emission of secondary particle precursor gases (mainly SO₂, NO_x and NH₃) and the formation of secondary particles. Secondary particles are a major component of PM_{2.5} and so trends over time are very sensitive to changes in this relationship, as is shown by the analysis in AQS 2007 Volume 2. The outcome of the changes made to the model is that secondary particulate levels, and therefore PM_{2.5}, are not reduced as much for the same reduction in SO₂ and NO_x emissions in the second set of projections
- The AQS 2007 projections assumed a greater proportion of the PM_{2.5} mass was nitrate, and therefore changed with changes in precursor emissions. The model was adjusted to reflect more recent knowledge and apportioned a greater part of the mass to components such as sea salt, secondary organic aerosol and iron and calcium rich dusts, which tend not to change with changes in “controlled” emissions. This means that emission controls assumed for the decade 2010-2020 will have a lower impact on PM_{2.5} concentrations.

⁶ 7.4% if only prospective monitoring sites are used, rather than population weighted mean values used in the other assessments

Though there are considerable uncertainties attached to projections of PM_{2.5} concentrations our current assessment is that both the limit and target values (Table 1) and the legally binding 2015 Exposure Concentration Obligation in urban areas (Table 2) will be achieved under business as usual (BAU) measures. This is based on the projections prepared for the PM₁₀ time extension notification⁷.

In addition, the projections indicate that the UK's National Exposure Reduction Target will likely be 10%. This would mean a target to abate particulates to reduce exposure to PM_{2.5} by 10% in 2020 relative to the Average Exposure Indicator (AEI) for 2010. The 10% reduction target is determined by the expectation that the initial concentration of PM_{2.5} for the AEI will be in the range of 8.5 µg.m⁻³ and 13 µg.m⁻³.

On the basis of these projections, additional abatement would be necessary in order to fully deliver meet the National Exposure Reduction Target, which Member States must take all necessary actions, not imposing disproportionate costs, to achieve by 2020. Option 2 assumes that foreseeable measures under development but which cannot yet be factored into the baseline projections would ensure further progress towards the National Exposure Reduction Target without incurring disproportionate costs. This is considered further in the section on sensitivities and uncertainties.

Cost Benefit Analysis

Option 1: Do nothing (do not transpose)

This option provides the base case or counterfactual for the other options and so by definition the marginal impacts are zero. This does not however mean that this is a zero cost option but rather that in order to estimate its costs it is necessary to define an alternate base case.

It is UK government policy to transpose directives into national legislation. Not transposing the directive is therefore not an option.

Option 2: Transposition of the Air Quality Directive (using time extension notification provisions, deduction of natural sources and meeting legally binding standards for PM_{2.5}). Option 2 does not include taking specific additional actions to achieve compliance with the PM_{2.5} National Exposure Reduction Target by 2020.

This appraisal focuses on the deduction of natural sources of PM₁₀ emissions from compliance assessments. The time extension decisions are subject to bespoke analysis.

To assess the impact of excluding for compliance purposes exceedences attributable to natural sources it is necessary to assess the changes in the level of abatement and resulting ambient concentrations. The analysis assumes a concentration of 1.9µg.m⁻³ can be attributed to natural sources of PM₁₀, as defined by the methodology used in the UK Time Extension Notification for PM₁₀⁸. The methodology used to derive this figure is explained on pages 42-49 of the Technical Document which supported this notification, and assumes that all natural PM can be attributed to sea salt. The analysis used here assumes that the exclusion of natural sources would reduce the amount of abatement undertaken to achieve compliance by 1.9µg.m⁻³.⁹

⁷ <http://www.defra.gov.uk/environment/airquality/eu-int/eu-directives/airqual-directives/notification.htm>

⁸ <http://www.defra.gov.uk/environment/airquality/eu-int/eu-directives/airqual-directives/documents/090423-pm10-tech-doc.pdf>

⁹ The level of PM₁₀ attributable to natural sources varies across the country, and 1.9µg.m⁻³ is the figure derived for the London area. Given that this is the area with by far the greatest residual PM₁₀ compliance problem, it was considered appropriate to use this figure.

In order to assess the associated impacts of abatement this analysis assumes that the marginal abatement method is retrofitting Diesel Particulate Filters (DPF) to the vehicle fleet. This measure has been selected as the marginal method as it was applied in the evidence base for the PM₁₀ time extension notification. More information on the reasoning for selecting this as the marginal approach is provided in the previous impact assessment.

This analysis therefore estimates the impacts of not introducing a measure to uptake retrofitting to reduce concentrations by 1.9µg.m⁻³. It must be noted in practice that this is a conservative assumption of the impacts as it only reflects the non-transposition costs of the treatment of natural sources. In practice non-transposition would also remove the potential time extensions that could also deliver notable benefits.

Benefits

The assumed marginal technology means that Option 2 will result in the reduced requirement to fit diesel particulate filters (DPFs) to the existing fleet. The benefits of the fleet management are equivalent to the 'avoided costs' of abatement that otherwise would be incurred while complying with the more stringent abatement target. These benefits can be separated into three components:

- *Technology costs (avoided):* The unit costs of the DPF technology and the operational costs for the different vehicle types are outlined in Table 3 below. The costs presented are the costs per unit of producing the technology. The costs are annualised over the lifetime of the measure taking into account the vehicle survival rates.

Table 3: Resource costs per unit of technology¹⁰

Vehicle Type	Unit Resource costs	Annual Cleaning costs
Diesel car	£614	£0
Diesel LGV	£1,106	£0
Articulated HGVs	£1,750	£240
Rigid HGVs	£1,350	£160
Captive Fleet	£1,350	£160

- *Cleaning costs of HGV diesel particulate filters:* The efficient operation of DPFs on HGVs also requires that they are cleaned annually. This cost therefore has been estimated using the cleaning costs set out in Table 3.
- *Resource costs (avoided) of fuel:* DPF technology also can have a negative impact on fuel economies for some vehicle types. A negative impact on fuel economy implies that the particular vehicle will use more fuel per km than a the vehicle did before the retrofitting took place (i.e. a fuel penalty). This measure also estimates the carbon impacts due to the negative impact on fuel economies (valued in accordance with Department for Transport guidance) and the resulting additional carbon emissions (valued according to the latest guidance from the Department for Energy and Climate Change) when DPFs are fitted. Fuel economy assumptions for the different vehicle types in this measure are presented in the Table 4

¹⁰ Source Air Quality Strategy (2007) available from www.defra.gov.uk

Table 4: Fuel penalty of retrofitting DPFs by vehicle type¹¹

Vehicle Type	Impact on fuel economy
Diesel Car	- 5%
Diesel LGV	- 5%
Articulated HGV	0%
Rigid HGV	0%
Captive fleet ¹	0%
¹ Buses and Coaches	

The benefits (avoided costs) of this measure as described above are discounted at the standard appropriate HM Treasury Green Book rate and annualised over the lifetime of this measure (2009 – 2029) and presented in Table 5 below.

Table 5: Benefits of fleet management scheme (avoided costs relative to the baseline) retrofitting (£ millions)

Annualised Technology Costs avoided.	Annualised Resource cost of extra fuel consumed.	Annualised carbon cost from extra fuel consumed	Annualised cleaning costs of DPFs on HGVs avoided.	Annual PV of Benefits (Avoided Costs)
£88	£8	£3	£7	£106

Costs

The costs of this option relate to the health benefit that is being forgone by not undertaking the above abatement measure.

The benefits of this option have been based on retrofitting across the road vehicle fleet. However, it is important to highlight that the scenario analysed in this section only considers the retrofitting of diesel and petrol cars. Therefore, the impacts of scrapping HGV, LGVs and buses are omitted from this analysis giving a conservative estimate of the costs. Introducing this scheme was assumed not to change behavioural decisions such as distance travelled or the rate at which the vehicle fleet renews itself.

The emissions reductions from this technology are modelled to fall over time as the retrofitted vehicles exit the fleet. This natural fleet turnover combined with the uptake rate in Table 5 estimate the impact upon emissions and ambient concentrations associated with Option 2 as outlined in Table 6 below. These reflect the missed reductions in emissions resulting from the reduced level of abatement.

¹¹ The impact on fuel efficiencies are taken from the Updated Third Report of the Interdepartmental Group on Costs and Benefits released alongside the Air Quality Strategy (2007). Available from www.defra.gov.uk.

Table 6: Increase in emissions for Option 2

Country	Pollutant	Increase in Emissions (tonnes)				
		2010	2015	2020	2025	2030
UK	PM ₁₀	2,884	831	239	69	26

The Government's Interdepartmental Group on Costs and Benefits (IGCB) impact-pathway methodology has been used to estimate the health impacts of the increase in emission resulting from the deduction of natural sources from compliance reports¹². The IGCB methodology is best practice air quality appraisal guidance¹³. This option is assumed not to have any impact after 2030 when all the retrofitted vehicles are estimated to have left the fleet. Table 7 provides the health impacts generated by the above changes in emissions. This represents the number of life years lost, as well as the number of hospital admissions.

Table 7: Quantified costs of Option 2

PM life years lost (,000s)	PM – RHA (2010 p.a.) (,000s)	PM – CHA (2010 p.a.) (,000s)
30.4	49.1	49.1
PM – RHA Respiratory Hospitable Admissions attributable to changes in particulate matter PM – CHA Cardiovascular Hospitable Admissions attributable to changes in particulate matter		

These health costs have then been monetised using the per tonne damage costs under the IGCB methodology. The relevant annual damage cost estimate has been applied to the changes in emissions between 2010 and 2030, for each year within this change it has been assumed that the emission change applies to the mid-point of year. The costs are outlined in Table 8;

Table 8: Annual present value of health impacts of Option 2 (£millions)

PM life years saved	PM – RHA	PM – CHA
45.87	0.05 – 0.30	0.05 – 0.30
PM – RHA Respiratory Hospitable Admissions attributable to changes in particulate matter PM – CHA Cardiovascular Hospitable Admissions attributable to changes in particulate matter		

Consolidated costs and benefits of Option 2

Table 9 below presents the annual Net Present Value (NPV) of this option. The £106 million in benefits (avoided costs) are derived by summing all the benefits in Table 5. Likewise, the £46.5 million in costs is derived by summing the costs in Table 8. Therefore, Option 2 has a present value annual benefit of £59.5 million.

¹² It should be noted that non-health impacts were not modelled for this option therefore the benefits may be marginally underestimated. However, the non-health impacts of PM typically only account for less than 0.5% of the health impacts.

¹³ More information on the IGCB and its methodology is available from <http://www.defra.gov.uk/environment/quality/air/airquality/panels/igcb/index.htm>

Table 9: Annual costs and benefits of implementing Option 2 (£millions)

Annual PV of Benefits (£ million)	Annual PV of costs (£ million)	Annual NPV (£ million)
106	46.5	59.5

Table 10 below represents the annualised data in table 9 in the form of net present values for the year 2010, these have been calculated over a 20 year appraisal period;

Table 10: Net Present Value of Option 2 (£million).

PV of Benefits (£million)	PV of costs (£million)	NPV (£million)
1,559	684	875

The results above indicate that the benefits of transposition substantially outweigh the costs. This analysis suggests that omitting natural sources from the assessment of compliance with the limit values would create a net annual benefit of £59.5million for each year over the life time of the retrofitted technology. This equates to a net benefit of £875 million between 2010 and 2030.

It should also be noted that these impacts are not evenly distributed over time. The majority of the £1,559 million PV of benefits (avoided costs) would be gained in the first year as the cost of the new technology is around £1,300 million. The ongoing costs of around £300 million, of additional fuel, carbon emissions and DPF cleaning, are also skewed towards the early period with over a fifth of the costs (22%) occurring in 2010 and only a fiftieth (2%) half way through the life of the vehicles in 2020.

The costs are also skewed towards the early years after the retrofitting scheme. Of the £684 million in costs, over a fifth (21%) occur in 2010 falling to under a fiftieth (2%) half way through the life of the vehicles in 2020.

Sensitivities and uncertainties

A number of features of both the projections of air quality and the measure itself need to be borne in mind when considering the evidence :

1. **Uncertainty in PM₁₀ projections:** as noted in the Time Extension Notification for the achievement of the PM₁₀ Limit Values¹⁴, the PM₁₀ data for this period was based on measurements using Partisol gravimetric analysers. In 2008, problems with the data produced by these instruments resulted in the data being corrected to account for certain systematic bias. This introduced further uncertainty into the base dataset.
2. **Distributional impacts:** sources of air pollution and consequently the exposure to air pollution are not evenly distributed across the UK. Urban areas in particular can be seen to suffer from worse air pollution whilst typically rural areas benefit from relatively good air quality. As a result the impacts of changes in air quality would not be expected to have the same impacts across different groups. This

creates a potential for specific groups to be particularly affected by air pollution such as particular racial groups. While this variation is recognised, given the scale of the social benefits of the preferred option, it is not judged to be sufficient to alter the preferred option.

3. **Baseline components:** the baseline used for this analysis draws on UEP 30, in addition to emission controls such as the introduction of Euro 5 and 6, which have already been agreed. However, this baseline omits a number of features which may have a significant impact on air quality and the costs and benefits of measures over the period 2010-2020:
- Climate change measures: in July 2009, the Government, led by DECC, published the UK Low Carbon Transition Plan - a package of policy measures and initiatives setting out the strategy on carbon reduction up to 2022. This included the Renewable Energy Strategy which sets out potentially radical changes to the way in which electricity, transport energy and heat are produced. This could impact on air quality in a number of ways:
 - reducing fossil fuel based electricity production will probably mean the reduction in emissions of SO₂ and NO_x from large combustion plant, with a consequent reduction in secondary PM₁₀. This will in turn reduce background PM₁₀ concentrations over the period;
 - encouraging the uptake of low carbon vehicles could result in an increase in diesel powered vehicles (unless retrofit), with a consequent increase in PM emissions. However, it is anticipated that the period will also see an uptake of electric vehicles as technologies improve and costs reduce. This will have a reducing effect on PM₁₀ concentrations, especially when coupled with low carbon electricity production (see above).
 - the use of non-combustion renewables for heat production (e.g. ground source heat pumps or solar thermal) will reduce PM₁₀ emissions. However, the increased use of biomass to produce heat, especially where it replacing gas fired heating, will increase PM emissions. The Renewable Energy Strategy contains some measures to minimise this impact but it is likely that space heating emissions of PM will become more significant over the period.
 - International action: as was set out in the Time Extension Notification for PM₁₀, transboundary movement of pollutants from other countries, principally those in Northern Europe, make a significant contribution to background levels of PM₁₀ in the UK. Those countries who are part of the European Union are subject to the same EU legislation as the UK, both on air quality and national emissions. It is expected that the European Commission will soon publish proposals for a new National Emissions Ceilings Directive with targets for 2020, which will reduce emissions of the precursors of secondary PM both in the UK and across the European Union. This and other measures (such as the application of the Renewable Energy Directive) will tend to reduce transboundary pollution and have a beneficial effect on background PM₁₀ concentrations across the period.
 - Technology costs: the analysis of the measure to improve air quality concentrations of PM relies exclusively on the uptake (through retrofitting) of new vehicle technologies. The technology costs used reflect today's prices.

However, over the period, pressure to reduce the carbon emissions from transport is likely to result in both significant research and innovation and more widespread uptake of such technologies, with the result that the technology costs will reduce significantly. While this reduction cannot be quantified at this point, it is a pattern that has been seen with almost all new emission reduction technologies introduced in recent decades.

- Environmental impacts: the evidence provided above does not monetise and value the impacts on the natural environment from the identified measure to improve air quality. This potentially understates the costs of Option 2.

Conclusions and policy recommendation.

The preferred option is to transpose the Directive undertaking additional abatement as justified to make progress towards the expected PM_{2.5} National Exposure Reduction Target by 2020 (Option 2). This option is estimated to deliver a total net benefit of at least £875 million with substantial potential additional benefits arising from the opportunities for additional time to meet limit values where required.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

See comments on distributional impacts on page 11.

Type of testing undertaken	<i>Results in Evidence Base?</i>	<i>Results annexed?</i>
Competition Assessment	No	No
Small Firms Impact Test	No	No
Legal Aid	No	No
Sustainable Development	Yes	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	Yes	No
Race Equality	Yes	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No