

1 Introduction

1.1.1. Government policies need to be evaluated ex-post, in order to inform the ongoing development of future policy. The aim of this study (*An Evaluation of the Air Quality Strategy*) has been to evaluate selected air quality policies over a period of major change, from 1990 onwards, and to assess their cost effectiveness in achieving air quality improvements and consequent health and other benefits. The study also aims to provide information on which policies have been successful and which have not. Finally, it aims to investigate how the response to legislation can sometimes be different to the anticipated effect, to help inform future appraisals.

1.1.2. The study has not considered all policies, in all sectors, from the Air Quality Strategy (AQS). Tackling all of these would have been far too broad a remit. Instead the study has assessed the most important sectors and policies, following a scoping analysis that was undertaken early in the study. The scoping work assessed the list of policies by the following sector classifications:

- Transport,
- Industry,
- Business,
- Domestic, and
- Electricity generation.

1.1.3. The selection of sectors and policies was made in agreement with the study steering group. The selection was based on the emissions improvements achieved (Figure 1-1).

- It is clear that the dominant source of SO₂ has been, and still is, the electricity supply industry (ESI). The emissions reductions of SO₂ achieved over the past decade are largely due to the policies in this ESI.
- For NO_x, the dominant source of emission is road transport. Most of the emission reductions achieved over the past decade have arisen from policies in the road transport sector (and to a lesser extent the ESI).
- For PM₁₀, emissions are more evenly split between sectors. However, while emissions reductions have occurred across all sectors, the largest reductions (as a %) have occurred in the ESI and road transport sectors.

1.1.4. The scoping analysis also considered the suitability of the different policies for evaluation. This considered:

- Whether an appraisal of the policy existed?
- Whether the policy could be clearly defined?
- Whether cause and effect was clearly evident?
- Whether adequate cost data existed?
- Whether there was a clear counterfactual scenario?

1.1.5. The use of these selection criteria has biased the policies selected for evaluation. However, as Treasury guidance stresses, policy evaluation is critically dependent on finding the best answer to the question ‘what would have happened in the absence of this policy?’

Here it is a question of developing a feasible and meaningful alternative to the observed outcome, and having the ability to model the outcome of the counterfactual scenario. If it is not possible to identify a clear counter-factual scenario for a policy, the subsequent evaluation of air quality improvements, benefits and costs is impossible.

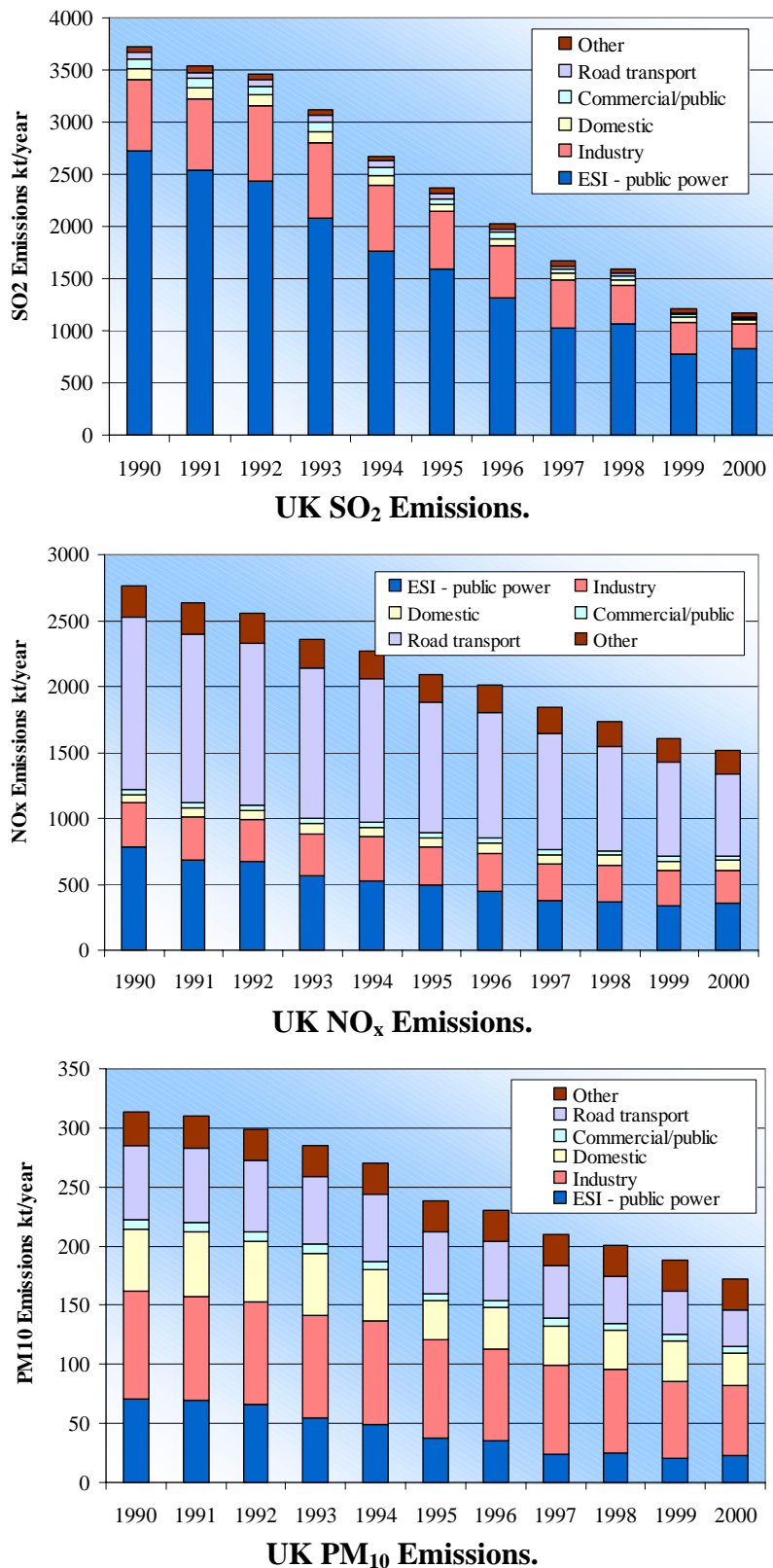


Figure 1-1. UK Air Emissions by Sector (source: NAEI, 2003).

1.1.6. The year 1990 was fixed as the starting point for the analysis for the study in the Invitation to Tender. However, it is noted that in both sectors, a number of significant measures affecting emissions were already planned or in place at this point (e.g. unleaded petrol, ESI privatisation, etc). The study has included these policies as part of the overall air quality evaluation, though the benefits analysis has only comprised the period post 1990.

1.1.7. A number of other policies were also reviewed by the study team in the scoping phase, but were excluded in the analysis. These were:

- The EC CAFE Programme. Whilst this policy may be of considerable interest for future air quality, this policy is not sufficiently advanced to evaluate.
- The UK Climate Change Strategy and UK Emission Trading Scheme (ETS). Whilst measures to reduce climate change emissions will usually have some benefits for air quality, DEFRA has undertaken other work to investigate cost evaluations in this area.
- The UK Sustainable Development Strategy. The broad ranging nature of the strategy would make it less directly relevant for air quality.
- Government programmes (such as the Energy Efficiency programme, or wider marketing or information programmes) include a very broad range of measures, and are less specific in relation to cause and effect. They generally include a large number of individual measures across very wide ranges of sub-sectors. They are therefore not suited for evaluation analysis in the same way as the policies selected.

1.1.8. Therefore the study evaluates the major air quality policies that have been implemented over the past decade in the road transport and electricity supply industry (ESI)¹⁵, with the following objectives.

- To quantify the costs to the UK economy of policies to reduce air pollution (since 1990) and to compare against the benefits of air quality improvements achieved.
- To compare estimates of costs made before the legislation was implemented (*ex-ante*) with actual costs after implementation (*ex-post*).
- To assess the relative contributions made to improvements in air pollution by different legislative approaches, and to help inform the development of future air policy.

1.1.9. For the road transport sector (Chapter 2), the study has primarily assessed European command and control policies affecting vehicle emissions and fuel quality, though a number of national initiatives using duty differentials (market based instruments) have also been considered. The policies include the introduction of unleaded petrol, successive controls on the sulphur content of diesel and petrol, and successive Euro standards (Euro I to IV). These policies follow a clear order of introduction (i.e. they are sequential). The analysis only applies to road transport: it excludes aviation, rail transport and shipping.

1.1.10. For the ESI (Chapter 3), the study has considered a much wider number of policy types, including European command and control policies, international protocols, national

¹⁵ We highlight that the study has focused on the major policy initiatives in these sectors and we have not considered all measures introduced such as some Government programmes (such as wider marketing or information programmes). No inferences should therefore be drawn from the study about the relative effectiveness of instruments or policies beyond those explicitly covered in the study, or the effectiveness in other sectors. Note the consideration of the other sectors (particularly industry and the domestic sector) is one of the priorities identified for future research.

environmental policy and market-based instruments (e.g. renewable subsidies). These policies do not follow a sequential order. Moreover, since 1990, the UK electricity sector has undergone a radical restructuring and liberalisation that has introduced competition in both generation and supply.

1.1.11. For each sector, the analysis has considered the emission reductions of all policies compared against a scenario of no policies, the so called ‘no abatement’ scenario. The ‘no abatement’ scenario assesses *what would have happened in the absence of the policies* (that have since been implemented). It is based on the conditions in 1990, but takes account of the economic/activity growth over the period. The analysis assumes no policies through the entire evaluation period, and the projected period (e.g. to 2010): it does not re-assesses the baseline conditions in 2001 at the end of the evaluation period.

1.1.12. The analysis for the road transport sector has been undertaken over the period 1990 – 2020 and for the ESI over the period 1990 -2010. We stress that the data from 1990 – 2000 represents the estimated actual emissions, as recorded and reported in the National Atmospheric Emissions Inventory. We can undertake an ex post evaluation on this data, and compare it to the expected ex ante predictions. The data for 2000 – 2020 is based on our current best estimate of the likely out-turn (i.e. in fact this is an ex ante forecast). Where possible, all data has therefore been split into the period 1990 – 2000 (actual) and 2000 – 2020 (projected).

1.1.13. For each sector, the analysis has also considered the progress towards the UK/European Union (EU) air quality objectives/limit values from policies, compared to the ‘no abatement’ scenario. This has involved modelling the air quality concentrations under different scenarios for the two sectors. The modelling analysis has then been used to assess the health and non-health benefits achieved by the policies, including the monetary benefits, compared to the ‘no abatement’ scenario;

1.1.14. Finally, for each sector, the analysis has assessed the ex ante and ex post costs of the policies, and undertaken a preliminary analysis of their wider economic costs (also ex ante and ex post). These costs have been compared to the benefits of different policies to assess whether the introduction of these policies can be justified by ex post cost-benefit analysis.

1.1.15. The study has also undertaken an additional analysis of local (urban) transport measures in improving air quality. This analysis has assessed the ex ante and ex post costs and benefits of these measures, and compared them to the effectiveness of national road transport policies. The analysis has been based on a review of measures in cities across the UK and Europe. The data from these studies have been applied to an urban case study (Sheffield), to try and assess the comparative costs and benefits of the measures.

Box 1.1. Explanation of Study Terms

In assessing policies, we have compared:

- The **target** out-turn (as predicted in **policy appraisal**– *ex ante*) based on forecast and projection against;
- The **actual** out-turn (as assessed in **evaluation** –based on actual data – *ex post*).

The key aim of the evaluation is to compare individual policy out-turn with the target out-turn, and from this to evaluate:

- Why the out-turn differed from predicted;
- How effective it was in meeting policy;
- Its cost-effectiveness;
- What the results imply for future policy decisions.

For the analysis and graphs in this report, we have used a number of interchangeable terms.

For each sector, the analysis has considered **the actual out-turn with policies in place**, referred to as the ‘**real**’ or ‘**baseline**’ or ‘**with all policies**’ predicted outcome. This is the **ex post** analysis. This actual out-turn has been compared against the policy appraisal (the ex ante analysis).

In order to assess the impact of the policies ex post, the analysis has had to consider the out-turn **in the absence of policies**, referred to as the ‘**no abatement**’ scenario. This is our **counterfactual** analysis. This assesses *what would have happened in the absence of the policy (or policies)*. The difference between the counterfactual no abatement scenario, and the real ex post scenario, is the benefit of the policy.