


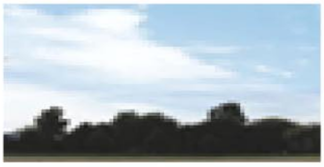


Assessment of the Effectiveness of European Air Quality Policies and Measures

B4-3040/2003/365967/MAR/C1

FINAL REPORT ON TASK 3.2:
Case Studies Comparing the EU Experience with the Experience of the USA and Other Countries

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Abbreviations

AQ	Air quality
CH_4	Methane
C_6H_6	Benzene
CO	Carbon monoxide
EPA	Environmental Protection Agency
EPER	European Pollution Emission Register
GHG	Greenhouse gases
IPPC	Integrated pollution prevention and control
LCP	Large combustion plant
LR	Local representative
MoE	Ministry of Environment
MS	Member State
NEC	National Emissions Ceiling
NGO	Non-governmental organisation
NH_3	Ammonia
NO_x	Nitrogen oxides
O_3	Ozone
Pb	Lead
PM_{10}	Particulate matter < 10 µg in diameter
$PM_{2.5}$	Particulate matter < 2.5 µg in diameter
SO_2	Sulphur dioxide

Executive Summaries of the Task 3.2 Case Studies

CASE STUDY 1: ON THE EU AND US APPROACHES TOWARDS ACIDIFICATION, EUTROPHICATION AND GROUND-LEVEL OZONE

This case study compares the EU and US approaches to the regional air quality problem of acidification, eutrophication and ground level ozone.

In the US, acidification efforts have focused on SO_2 from stationary sources whereas European regulations have aimed at addressing the combined effects of SO_2, NO_x and NH_3. This is because in Europe emissions from traffic as well as from agriculture are also significant sources of acidifying and eutrophying pollutants.

Since acidifying, eutrophying, and ozone forming air pollutants can be transported over thousands of kilometres to cause damaging effects far away, the EU has addressed these impacts by setting in place controls over emissions that cut across all Member State jurisdictions. Regional differentiation of emissions reduction targets for certain pollutants has been agreed among the different countries in the context of the UNECE Convention of Long-Range Transport of Air Pollution (CLRTAP) and its Protocols on emissions reductions, which started with SO_2 in the early 1980s and expanded to include NO_x, VOCs, PM and NH_3.

Within the EU, remarkable emission reduction results were achieved through a command and control approach. Directives were developed for regulation of stationary and mobile sources, largely based on so-called "command and control" regulations (e.g., the Large Combustion Plant and IPPC Directives) but with some application of economic instruments in specific countries (emissions taxes for specific pollutants and sectors in Sweden, Denmark, France, and the Netherlands). The National Emissions Ceiling (NEC) Directive and sets country-specific targets for reducing SO_2, NO_x and NH_3 emissions, based on the critical loads concept (a concept used more generally in the EU than in the US).

The US has also achieved significant emission reduction results over the same period but has opted to utilize market-based mechanisms to a greater extent than – in particular emissions trading systems to control SO_2 and in some areas emissions related to ozone. Each approach has been uniquely tailored to the given emission of concern and the impacts associated with those emissions. For example, the Acid Rain Trading Program establishes a national cap due to the transport of acidifying pollution, while the NO_x SIP Call has focused on only a portion of the country based upon assessments of regional transport of the pollutants associated with ozone formation.

In 2001, US emissions of NO_x and SO_2 - the pollutants contributing to acidification - are considerably higher per capita and in relation to GDP than in the EU-15 (Per capita NOx emissions in US: 71.5 kg/person: in EU-15: 26,0; Per capita SO2 emissions in US: 50,5 and in EU: 15,5). This can have implications for both the effectiveness of the EU air quality rules in light of growing GDP and population, the decoupling of the economy from the environment, and the EU's ability to reduce emissions further.

Greater SO_2 and NO_x reductions have been achieved in the EU-15 (78 and 26 percent) than in the US (39 and 18 percent) since 1980. Greater VOC reductions have been achieved in the US (42 percent) than in the EU-15 (40 percent) since 1980.

Emissions of SO_2 and NO_x from energy industries have declined in both regions since 1980, but the intensity of emissions (in kg/MWh) from energy industries is lower in the EU-15 than in the US (2001 emissions from energy in EU-15: 1681 Ktonnes and in US: 4437 Ktonnes). The US has achieved greater reductions in NO_x emissions from transport, but total transport emissions are still higher than those in the EU-15. Progress has been made in reducing ground level ozone formation in both regions; however, ozone formation is still a problem in many parts of the two regions.

In the EU, "command-and-control" regulatory action helped to spur some technological innovation such as desulphurization technology. Economic incentives such as emission taxes also encouraged technological advancement in certain countries (e.g. Sweden). The US's Acid Rain Trading Program clearly led to technological innovation. First, rail deregulation lowered the costs of low sulphur coal and secondly, the cost of scrubber technology in Phase I reduced considerably.

Recent analysis found that environmental controls in Europe had not placed European industries at a competitive disadvantage vis-à-vis operations in other countries. The statistics on air pollution expenditures suggest broadly similar absolute levels of expenditures between Europe, US and Japan.

CASE STUDY 2: ON THE EU AND US AIR QUALITY STANDARDS AND PLANNING REQUIREMENTS

This case study compares the air quality planning programmes that are in place in the EU-15 with those in place in the US.

Under both the EU and US systems, air quality limit values trigger planning requirements. Under the EUs Air Quality Framework Directive (AQFD), pollution reduction plans have to be drawn up so that limit values can be met. Under the US system of National Ambient Air Quality Standards, air quality control regions must submit State Implementation Plans (SIPS). The EU system also features planning requirements for achieving overall emissions reductions at national level, e.g., for all sources of emissions under the NEC Directive.

While both regions have established emissions reduction targets for specific pollutants, the mechanisms differ. The EU-15 has established national emissions ceilings for a number of pollutants that cover all sources, while the US has not explicitly established national emissions ceilings that cover emissions for all sectors. However, the US SIP process establishes implicit emissions limits for all sources in order to meet the NAAQS.

In the EU, MS are free to determine how they delineate AQ management zones and there is no EU-level review of this process. In the US, States put forward proposals for AQ management regions but these are reviewed at central level and modifications are sometimes required in order to address regional air quality problems more effectively.

Where regional AQ problems can be found in cross-border regions, the EU system only requires MS to consult with one another. Under the US system, the federal government can compel regional planning organizations to be formed to develop coordinated efforts.

The differentiation of areas according to the severity of their air quality problems does not occur in the EU-15, while this occurs for most pollutants in the US. Though the AQFD does provide some differentiation between zones in exceedence by reference to the “margin of tolerance”, the US uses a system, especially for ozone, that provides much more differentiation according to the severity of the air quality problem, e.g., moderate and serious. Such a system could prove useful within the EU to help focus efforts on areas according to their air quality problems.

The types of information required to be in air quality plans are similar in the US and EU, but the US system places more stringent planning requirements on areas according to the severity of their air quality problems. For example, the US requires non-attainment areas for ozone to carry out more stringent planning and control measures according to the degree of this classification. In addition the SIP planning process has more explicit links between controls over emission sources and air quality objectives.

Both regions have mechanisms to address regional transport of emissions. However, the US system has in place explicit legal mechanisms for states to request that the US Environmental Protection Agency address transport emissions from another region. Both areas have in place mechanisms to enforce the proper development of plans. However, it appears that the US system of compliance has been used to a greater extent. Measures to encourage compliance used in the US include requiring non-attainment areas to reduce emissions at other facilities by twice the amount of projected emissions at any new facilities (2-to-1 emission offset) or by withholding federal funds for new highway projects.

The case study concludes by noting how the debate In the US is now shifting to a realisation that more federal actions are needed to reduce source emissions, in order to effectively address regional transport issues and to alleviate competitiveness concerns on the part of some States. In the EU context, it may well be that there is a similar need for more centralised regulatory actions in order to support local and regional air quality planning efforts.

CASE STUDY 3: ON THE EU AND US APPROACHES TOWARDS CONTROLLING EMISSIONS FROM HIGH-EMITTING VEHICLES

This case study evaluates the contrasting approaches taken in the EU and USA to address the problem of polluting emissions from old cars. Two specific programmes are considered: inspection and maintenance and scrappage programs. Limited information is also presented on the Canadian and Japanese situations.

The EU requires Member States implement the requirements of the Roadworthiness Framework Directive which requires compulsory vehicle inspection to ensure owners have carried out necessary maintenance. Non-catalyst petrol vehicles must be tested for carbon monoxide, hydrocarbon and nitrogen oxides. Two different types of scrappage schemes have been implemented in several European countries – the first type gives a certain reward for any scrapped car, whatever the subsequent replacement decision taken by the consumer, whereas the second type gives a bonus conditional upon a specific kind of replacement. Also, some European countries have used tax incentives successfully to encourage replacement of old cars with passenger cars with more strict emission standards or with lower fuel consumption.

The US also has established Enhanced I/M programmes and similarly gives states discretion in how to implement programmes. Since there are no required guidelines for designing enhanced I/M programs under the Clean Air Act, the approaches that have been introduced vary by State and often between cities within the State. However, as a part of EPA's review of SIPs, the I/M program in each area is subject to approval by EPA. Vehicle scrappage programmes have been implemented to a much more limited extent than in the EU. California has run a "voluntary accelerated vehicle retirement" programme for the South Coast, but this programme is yet to be fully funded.

Canada has introduced inspection and maintenance (I/M) and vehicle scrappage programs in a number of provinces and cities. British Colombia currently operates an AirCare II scheme in in Vancouver and the Lower Fraser Valley and Ontario has conducted an I/M program since 1999 called Drive Clean. There are currently seven scrappage programs in Canada

Japan's 1992 Motor Vehicle NOx law has resulted in 196 designated "significantly polluted" communities required to introduce measures to reduce the total volume of automobile NOx. Amendment to this law in 2001 also set in place controls on particulates. Tokyo's Diesel Retrofit Requirement has required since 2000 that existing diesel buses, trucks, and special category vehicles operating in the city be retrofitted with particulate matter emissions control systems.

The case study concludes that only limited information is available on the cost-effectiveness of programmes to control emissions from "gross emitters". I&M policies have been found to be relatively cost-effective in some regions; however, there are a variety of design issues of concern that could influence the emissions reductions benefits and therefore the cost-effectiveness. Modifications, such as remote sensing to identify high-polluting cars for special control, could help improve the cost-effectiveness of these programmes.

The cash for-for scrappage programmes are considered more cost-effective than the cash-for-replacement programs, and small scale programs more cost-effective than the large programs, especially if they are focused on technology shifts. A variety of other economic incentives like tax instruments have been applied in Europe with some success, especially in the parts of Europe where taxation is a normal economic instrument.

CASE STUDY 4: ON THE EU AND US CASE APPROACHES TOWARDS PARTICULATE MATTER

This case study looks at how the EU and the USA have handled the problem of particulate air pollution. The case study focuses mostly on the effectiveness of measures taken regarding PM_{10}, since it is only recently that $PM_{2.5}$ has become such a pressing issue.

EU-level efforts to reduce PM pollution in Europe began in the 1950s with standards for black smoke or soot and more recently for PM_{10}. Currently, PM_{10} is regulated by the first daughter directive under the Air Quality Framework Directive. The EU also has legislation to control emissions from different industrial sources, such as LCP and IPPC, both of which set limits for dust. The EU's control of mobile sources (especially road traffic) is based on emission limits for vehicles and fuel quality standards. Currently particles emitted from shipping, domestic heating (solid fuel), aviation, off-road machinery, farming, foresting, and constructions are not controlled in the EU.

In the USA, controls were initially focused on total suspended particles and PM_{10} through early National Ambient Air Quality Standards (NAAQS). The Environmental Protection Agency revised its PM standards in 1997, adding a new NAAQS for $PM_{2.5}$. The USA also has emissions controls for specific sources, such as engine emissions and fuel standards for "heavy-duty" vehicles. Regional haze from PM is considered a problem in the USA and measures have been introduced at regional level to address this.

In terms of environmental achievements, both the EU-15 and the US have achieved significant emissions reductions of PM precursors - SO_2, NO_x, and NH_3. Overall PM_{10} emissions in both regions are relatively similar, with slightly larger levels in the US since 1990 (2001 PM_{10} emissions in US: 2995 ktonnes; EU: 2342 ktonnes). The EU-15 has achieved greater emissions reductions of PM_{10} since 1990 than the US (1990 – 2001 total PM_{10} reductions in US: -76 ktonnes; and in EU-15: 531 ktonnes).

The case study highlights the lack of information available on PM emissions in Europe, especially for $PM_{2.5}$. The US began collecting data on $PM_{2.5}$ a number of years ago, while the EU is just at the beginning of putting a systematic data collection system in place for $PM_{2.5}$. Estimated emission data for $PM_{2.5}$ is only now being collected in the EU-15, so comparisons of emissions levels and progress with that of the US are not yet possible. While $PM_{2.5}$ trends are not available for the EU-15, the US has witnessed an increase in $PM_{2.5}$ emissions since 1990 of 19 percent.

While some areas in the US have experienced reduced concentrations of PM_{10}, several areas still have concentrations that exceed the national limit values. The EU-15 has witnessed an overall decline in PM_{10} concentrations. It appears that both the EU and US have a number of areas where $PM_{2.5}$ concentrations exceed 15 ug/m^3.

Both regions have similar emissions rates for the energy industry—0,2 kg/MWh. The EU-15, however, has achieved a reduction in the emissions rate—25 percent—while the US has seen its emissions rate rise—77 percent.

Both regions have witnessed a similar decline in transport PM_{10} emissions since 1990—25 percent in the US and 30 percent in the EU-15.

TASK 3.2 CASE STUDIES COMPARING THE EU EXPERIENCE WITH THE EXPERIENCE OF THE USA AND OTHER COUNTRIES

Introduction and Methodology Used

Over the last forty years in the EU-15 and the US, significant efforts have been undertaken to control air emissions from a variety of sources. Over this period a number of measures have effectively achieved their stated objective, others have been modified over time as the science surrounding the pollutant has changed or the approach was found to be ineffective, and still others have been abandoned. A number of efforts to address specific problems have had great success, such as efforts to eliminate lead from petrol. Some may have been successful, but not as successful as other approaches in different jurisdictions, while for others it may be too early to judge.

This report is the result of the project team's work on Task 3.2 -- a comparison of standards and compliance. As a part of this Task, the team was to conduct a "systematic comparison between EC standards on air quality, emission and products linked with air quality and those in other relevant countries".

The report assesses the effectiveness of European air quality policies and measures *inter alia* by comparing the EU experience with the approaches taken in other regions and their effects. We largely focused on comparing the efforts in the EU-15 and US, but also discussed the Canadian and Japanese approaches for a limited set of issues.

The EU-15 and the US are comparable in many ways that influence the way in which the two regions design air quality policy, e.g., similar economical status, technological level, size of population and area, infrastructure, political situation and environmental problems and possible solutions.

There are also several general differences that influence their respective approaches to air quality. The EU is a co-operation between its Member States while the US is a single federal country. The European environmental policy making in general started at national level in the late 1960s and each country developed their own timetable, beginning in the Northern and Western countries and later in the Southern and the Eastern countries. Today European policy is a mix of country specific and EU-wide measures. Also, the countries' governmental and regulatory structure and the nature of the air quality problems have determined the regulation chosen.

On the other hand, policy in the U.S. is a mix of state and federal regulation, but with a growing concentration at the federal level. Also, the regions' governmental and regulatory structure and the nature of the air quality problems in those respective jurisdictions have determined the regulation approach, emission goals, and timing of the air quality controls.

In order to better compare the approaches used by the two regions, the team decided to use a case study approach. In consultation with the Commission, as well as in light of the key air quality issues in the past and those likely to be major issues in the future, we chose to focus on four specific case studies with a separate section for each:

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