Future EU air legislation

Target or technology driven?

Historically, environmental legislation has been driven by either 'available technology' or 'environmental quality'. In the former approach, available technology is applied to progressively reduce emissions of the pollutants of concern. It implies that a common solution is required within the geographical scope of the legislation (e.g. the EU). The process involves an assessment of the capability of available abatement technologies to derive an emission limit which is then enshrined in legislation. In effect this emission limit becomes a surrogate for the chosen technology or technologies. Since, in this case, the only definition of 'clean' is zero emissions, progressive updates of the legislation, with tougher emission limits, are made at regular intervals to reflect the developments in available technology. Concepts like the application of Best Available Techniques, sometimes embracing the notion of 'Not Entailing Excessive Costs', are derived from this approach.

In the alternative environmental quality driven approach, the starting point is the establishment of environmental targets. For air-related legislation this could be air quality standards, based on human health concerns, or critical loads/levels, based on ecological concerns. The vulnerability of ecosystems varies significantly in the EU territory so that, in the latter case, the targets may differ from region to region.

The appropriate use of urban scale and regional scale modelling allows the relationship between emission sources and their contribution to the environmental concern to be established. Using these relationships within an 'Integrated Assessment Modelling' (IAM) framework then allows the determination of the least-cost mix of measures required to deliver the target(s). In this case, 'clean' is the point at which the environmental targets are achieved. This approach accounts for the variation in the intensity of environmental problems across a geographical area and indeed, in the case of ecological concerns, the variations in environmental targets.

This environmental quality driven approach has dominated the development of both EU and UN-ECE air related legislation over the past decade. Examples of this are the European Auto/Oil programmes, the second UN-ECE sulphur protocol, the UN-ECE Gothenburg Protocol and the parallel EU National Emission Ceilings Directive (NECD). While advocating the need for appropriate processes for setting environmental targets and the need to account for uncertainties that influence policies, the European oil industry strongly supports this 'rational approach' that seeks to solve environmental problems in the most cost-effective way.

The benefits of the major environmental initiatives mentioned above are already emerging. All indications are that air quality targets will be attained in most of the EU during the next few years. But what about the future? Will new programmes such as Clean Air For Europe (CAFE) maintain the focus on environmental quality? While the 6th Environment Action Programme of the European Community, 'Environment 2010: Our Future, Our Choice', affirms such a commitment there are some worrying signals in recent developments, such as the revision of the Large Combustion Plant Directive (LCPD), of a shift towards a more 'technology driven' approach.

In this article we briefly explore why the oil industry is concerned over the potential of such a shift by comparing the NECD with the LCPD revision. We focus on sulphur since this avoids the complexities associated with NO_x, which contributes not only to acidification but also to ozone.

The simplified 'cost curves' shown in Figure 1a and 1b illustrate how the process of Integrated Assessment can be used to arrive at the 'least-cost' environmental solution. The width of the bar represents the emission reduction capability of a given measure (e.g. tonnes of SO_2 reduction) while the height of the bar represents the marginal cost of that measure (e.g. EUR/t). The measures are ranked from lowest marginal cost to highest marginal cost.

Figure 1a
The emission reduction target is achieved by implementing measures 1 to 3; additional measures are not justified on either cost or environmental grounds.

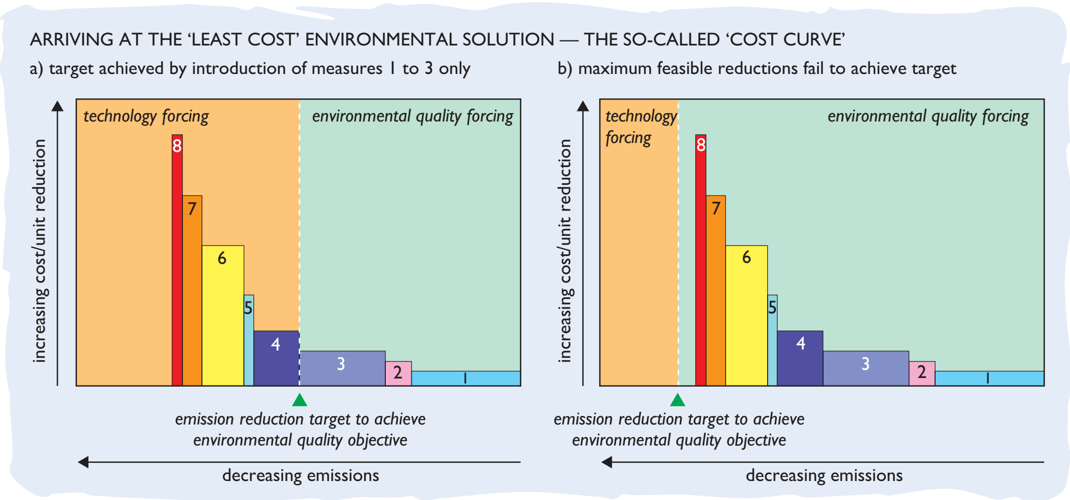


Figure 1b
The emission reduction target cannot be achieved, even if maximum feasible reductions (MFR) are mandated.

The green arrow shows the emission reduction required to achieve the environmental target, as would be determined by modelling. Figure 1a indicates the target can be achieved by introducing measures 1 to 3. Since measures are ranked from least to highest marginal costs, this represents the least-cost solution. Introducing additional measures beyond 'measure 3' moves away from an environmental quality driven regime (the green area) to a technology forcing regime (orange area) with attendant additional costs that are not justified on environmental grounds.

Of course the emission reduction required to deliver the environmental target can vary significantly across a geographical area (or over a range of urban environments). Figure 1b illustrates a situation where the required reduction cannot be achieved even if all feasible measures (maximum feasible reductions or MFR) were mandated. Driving EU-wide legislation according to 1b would result in significant unnecessary expenditure in geographical areas that are more akin to the situation described in 1a.

When it comes to addressing the concern over acidification in the EU, Figures 1a and 1b are respectively typical of southern and northern Europe. While such differences were accounted for in the establishment of the sulphur ceilings associated with the NECD, they were ignored in the setting of EU-wide emission limits in the revision of the LCPD.

Figure 2a shows the large variation in critical loads for acidification across Europe. The very sensitive areas of northern Europe have critical loads up to two orders of magnitude lower than much of southern Europe. Figure 2b clearly illustrates the consequential 'north-south' divide in

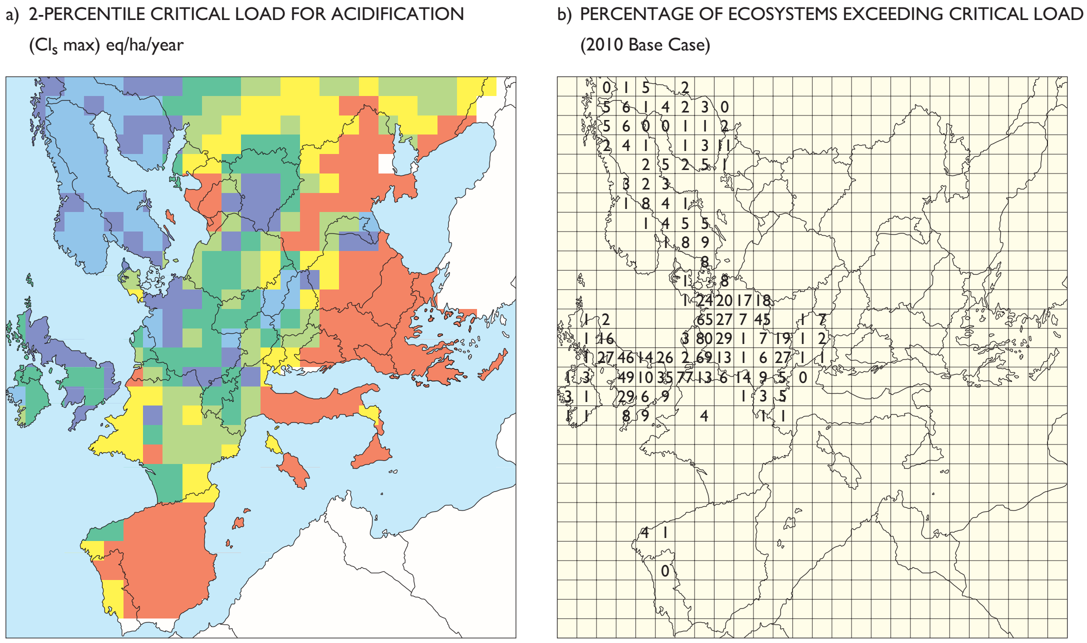


Figure 2a
There is considerable variation in critical loads for acidification across Europe.

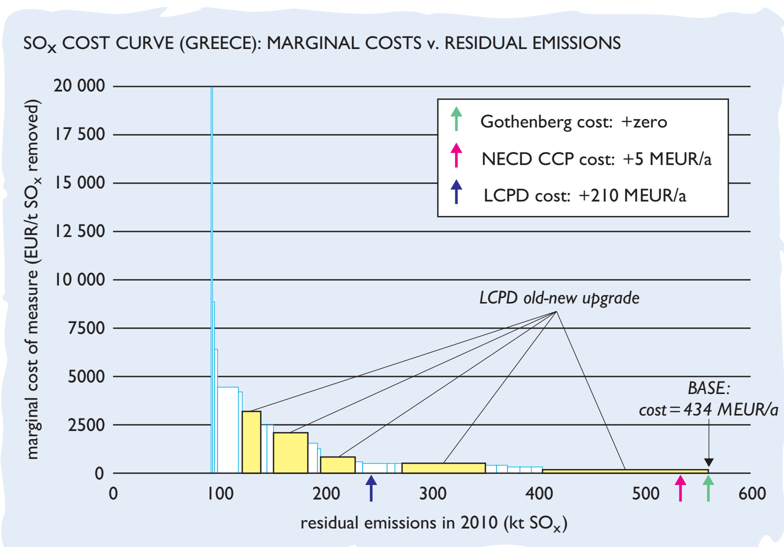
Figure 2b
Zero exceedances of critical loads in Southern Europe contrast with significant exceedances in parts of central EU in 2010 (after application of already-agreed measures).

terms of the percentage of ecosystems anticipated to exceed their critical loads in the EU in 2010 after application of the already agreed measures (i.e. prior to the Gothenburg protocol, the NECD and the revision of the LCPD). Southern Europe is already expected to meet the long-term goal of 'zero exceedances' of critical loads. In contrast, significant residual exceedances are anticipated in parts of central EU (e.g. Belgium, Germany, The Netherlands). This explains why the national ceilings for these EU Member States (or those contributing significantly to deposition in these areas), are generally much more demanding than those of the southern Member States.

The particular situation for Greece will serve to illustrate this. As seen in Figure 2b, no exceedance of critical loads is anticipated in Greece after application of already mandated measures. Accordingly the IAM work that underpinned the Gothenburg protocol and the NECD determined that virtually no further sulphur emission reduction was required for Greece. This is illustrated by the actual sulphur cost curve for Greece shown in Figure 3[1]. Of course Greece will still need to continue to spend more than 400 MEUR/a on sulphur reduction measures to achieve the base case.

However, applying the 'existing plant' upgrading requirements of the revision of the LCPD drives sulphur emissions much further down in Greece. The measures that reflect these upgrading requirements are highlighted in yellow on the cost curve. Such further reduction, costing an additional 200 MEUR/a, is not justified on the basis of attaining critical loads but arises simply from the revised LCPD requirement for uniform EU-wide upgrading of existing plants.

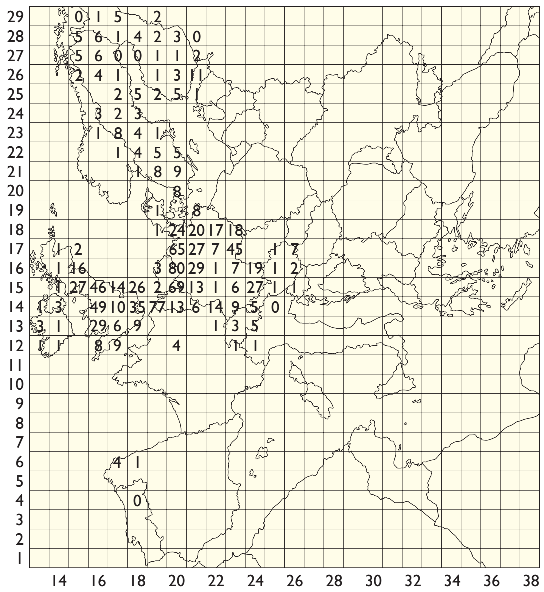
Figure 3
The cost of EU-wide 'existing plant' upgrades required by the revised Directive would not be justified on the basis of attaining critical loads.



[1] *IIASA 6th Interim Report on the NECD (October 1998)*

SO_2 EMISSION REDUCTIONS FOR NECD v. REDUCTION FROM 'OLD PLANT' LCPD REQUIREMENTS (IIASA 1/01)

Figure 4
The LCPD 'existing plant' upgrade requirements result in SO_2 reductions which greatly exceed those required to meet the obligations of NECD and the Gothernberg protocol.



	CCP	Kt/year EP	LCPD
Denmark	39	39	45
France	73	230	23
Finland	45	45	0
Germany	61	118	0
Greece	23	23	274
Italy	92	92	163
Netherlands	23	23	0
Portugal	14	33	63
Spain	396	396	657
Sweden	0	0	0
UK	501	585	312

The IIASA analysis shown in Figure 4[2] confirms that such a picture is not confined to Greece. All the SO_2 reductions shown in this table are additional reductions beyond those achieved by 'Base Case' measures[3]. These data clearly highlight the fact that the LCPD 'existing plant' upgrading requirements for southern European countries drive sulphur emission reductions well beyond those required to meet the obligations of NECD and the Gothenburg protocol. It also shows that EU Member States with the most significant residual exceedances have already upgraded, or will upgrade, their LCPs as part of the base case since they are not affected by the revised LCPD (i.e. zero further reductions).

The fact that these Member States have already had to invest to upgrade or replace existing plants in response to their more severe acidification problems has every potential to generate a political incentive for them to support EU-wide adoption of a technology-driven approach. With attendant common EU-wide emission limits this 'levels the playing field' for their indigenous industries that would otherwise have to bear higher financial burdens than those in southern Europe. Clearly such a stance is not driven by environmental need but rather by national competitiveness and the concern that less stringent emission reduction requirements in southern Europe might lead to preferential investment in this region.

How this dynamic will play itself out in the recently launched CAFE programme remains to be seen. The environmental quality driven approach clearly remains the most efficient route to achieving the EU environmental goals. The technology-driven approach would result in unnecessary and very significant environmental expenditure. For the EU in total, the additional costs (beyond the base case) of achieving the emission requirements for all the pollutants covered by the Gothenburg protocol would be about 1.5 billion euro per annum while the 'ultimate' technology forcing to MFR would drive the cost to as much as 42 billion euro per annum[4].

[2] *IASA 'Emission Reductions from Existing Large Combustion Plants Resulting From Amendments of the LCPD', January 2001*
[3] *The base case includes measures already mandated but not the further reductions stemming from the Gothenburg protocol, the NECD and the revised LCPD.*
[4] *IIASA 7th and 8th interim reports for the NECD January 1999/January 2000*