EU-wide BAT—an expensive suit that doesn't fit everybody!

What light does the CAFE programme shed on the concept of a common EU-wide BAT in the context of the IPPC Directive?

The 'Clean Air For Europe' (CAFE) programme, carried out over the past three years by the EU Commission's DG Environment, has resulted in the recent publication of the 'Thematic Strategy on Air Pollution' (TSAP) which provides a 'road map' for the review of existing Directives and the drafting of any new legislation. CAFE addressed multi-pollutant, multi-effects issues with the declared goal to identify cost-effective solutions. A major building block of the programme has therefore been the use of Integrated Assessment Modelling (IIASA's RAINS model) to inform and shape the resulting policy initiatives. RAINS employs an 'effect driven' optimisation strategy aimed at delivering given environmental improvements in the most cost-effective manner.

One of the existing Directives to be reviewed is the so-called IPPC Directive (Integrated Pollution Prevention and Control, Council Directive 96/61/EC) which tackles pollutants to air, water and soil. The major thrust of this Directive is the concept of 'Best Available Techniques' (BAT) for industrial installations. In setting forth the notion of BAT, the Directive recognises:

(a) the importance of focusing on the health/ environmental impact of a given installation's emissions rather than on their emission levels *per se*;

(b) the need to consider the influence of the technical characteristics of the installation on applicability/ costs of a given abatement technique.

To quote from Article 9.4 of the Directive:

"… the emission limit values and the equivalent parameters and technical measures … shall be based on the best available techniques, without prescribing the use of any technique or specific technology, ***but taking into account the technical characteristics of the installation concerned, its geographical location and local environmental conditions.****"*

The IPPC Directive clearly recognises that the notion of BAT is local rather than universal or EU-wide.

In this article we affirm the importance of retaining this notion of 'local BAT' in any future revision of the IPPC Directive. Indeed this is fully consistent with the effect-driven, cost-effective approach underpinning the Thematic Strategy on Air Pollution, while contributing to a better alignment of health and environmental legislation with the Commission's drive to ensure EU competitiveness.

Using a relevant example, we show that, in contrast, an 'EU-wide BAT' (expressed as a common emission limit) would seriously depart from the approach underpinning the TSAP. For a given improvement ambition, it would result in significantly higher financial burdens both for the EU as a whole and for many individual Member States (MS).

We have chosen the case of exposure to fine particulates because, within CAFE, it (a) represents the priority concern; and (b) involves controlling four of the five pollutants considered (SO_2, NO_x, NH_3 and Primary $PM_{2.5}$). The results that follow are derived from a side-by-side analysis using the following two basic strategies to bring about a reduction in the exposure of EU citizens to fine particulates:

1. The progressive application of increasingly stringent '**Common EU-wide BATs**' (expressed as common emission limits). In the analysis, this was achieved by applying the same marginal cost threshold to the emission reduction cost curve for each Member State, then reading across the corresponding emission reduction. This is indeed a fair representation of a common BAT inasmuch as the cost of a given technology is similar in all Member States. The process was repeated for each of the four pollutants, with a progressively increased cost threshold to generate the curve of cost versus reduction in exposure to fine particulates.
2. The so-called '**optimum EU solution**' approach. Here the emission reductions for each Member State and each pollutant were determined in such a way that a

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given reduction in PM exposure was achieved at the lowest overall cost to the EU. This approach is in line with the Integrated Assessment modelling work undertaken in CAFE, using IIASA's RAINS model.

In both cases, the databases and algorithms used in the analysis are entirely consistent with those of the RAINS model. We also made full use of the results of the final round of scenario analysis undertaken by IIASA as input to DG Environment's development of the TSAP.

In essence the first approach is 'Technology Driven' and the second 'Environmental Quality Driven'. Before looking at the resulting overall cost burdens, it is worth exploring the principal differences in burden sharing between the two approaches in a little more detail.

EU-wide BAT: a 'Technology-driven' approach

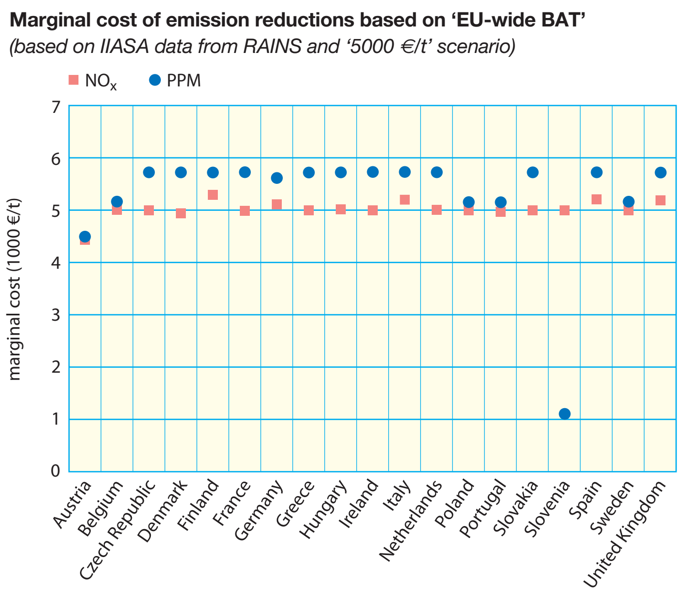
As explained above, this approach is based on setting the same marginal cost level for emission reduction (€/tonne) in each Member State. When set against the overall objective to reduce human exposure and its impact on health e.g. the 'years of life lost' (YOLL) concept, this approach results in a very different burden sharing between Member States from a 'polluter pays' principle, i.e. what each Member State is paying for a unit improvement in the statistic that the EU is seeking to improve. This is because the relationship between emission level and exposure is very different amongst the Member States, i.e. the environmental potency of a tonne of pollutant (YOLL/tonne) varies significantly between different areas of Europe. This is illustrated in Figures 1 and 2.

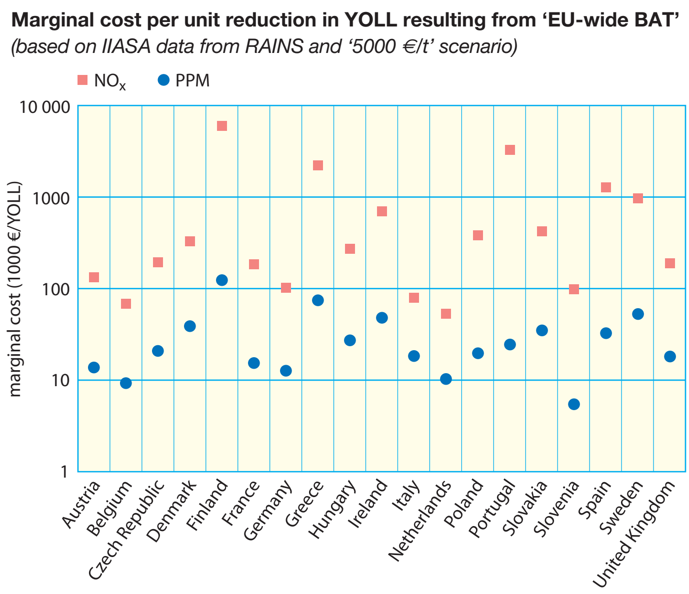
Figure 1 shows, for a common cost threshold of 5000 €/t, the actual marginal cost per unit reduction in emissions for NO_x and PM pollutant by individual Member State (the variations around 5000 are due to the discrete increments in the IIASA cost curves i.e. the nearest point to 5000 is chosen). In Figure 2 the corresponding marginal cost per unit YOLL (€/YOLL) is shown. As seen from the plot (note it is a logarithmic scale), a seemingly even burden sharing (per tonne of pollutant emitted) results in widely different costs towards solving the problem at hand, some Member States, particularly those in southern Europe, paying up to an order of magnitude higher contribution per unit reduction in YOLL than others.

This illustrates the economic inefficiency of the technology-driven approach as a means of delivering a given improvement in YOLL. The implications in terms of increased burden to the EU and to individual Member States are explored later. For now let's turn to the alternative 'Optimised EU' or environmental quality driven approach.

Figure 1 (below left)
Marginal costs per unit reduction in NO_x and Primary $PM_{2.5}$ emissions for each Member State, and . . .

Figure 2 (below right)
. . . the corresponding marginal costs per unit reduction in YOLL. This illustrates the economic inefficiency of an 'EU-wide BAT' approach as a means of delivering a given improvement in YOLL.





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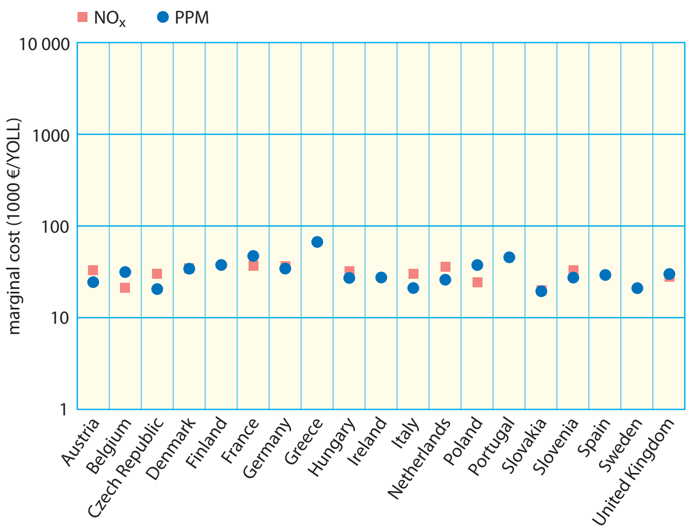
Marginal cost per unit reduction in YOLL based on 'local BAT'
(based on IIASA data from RAINS and CAFE scenario A 'PM Only')



Marginal cost of emission reductions based on 'local BAT'
(based on IIASA data from RAINS and CAFE scenario A 'PM Only')

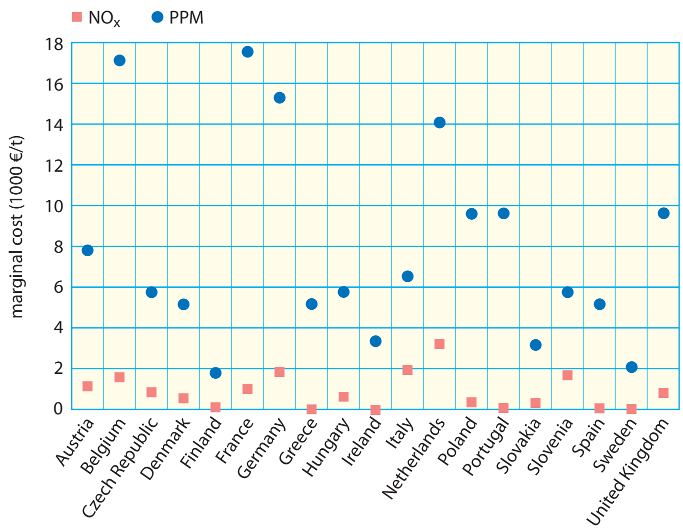


Figure 3 (above left)
A 'local BAT' approach results in virtually the same cost per unit change in YOLL for all Member States.

Figure 4 (above right)
The marginal cost of emission reductions now varies significantly between Member States.

Local BAT: an 'environmental quality-driven approach'

In this approach the first step is to define the environmental or health target for the EU. Emission reductions by pollutant/Member State are then determined using optimisation techniques to achieve the target at the least cost to the EU as a whole. Fundamentally, this represents a commitment to the 'polluter pays' principle, where individual Member State burdens are based on an equal cost per unit improvement towards meeting the environmental or health-based target.

As illustrated in Figure 3, the application of this 'least cost' concept results in virtually the same cost per unit change in YOLL for all Member States (within the minor scatter stemming from the discrete steps in the cost curve). This indeed represents the minimum cost case since no Member State is spending either more or less than any other Member State for a unit improvement in YOLL. As such the plot serves to demonstrate that the RAINS optimiser has found the optimum for this ambition level. The consequence of this 'optimised approach' however, is that the marginal cost for a unit reduction in emissions now varies significantly between Member States (Figure 4).

Comparison of the two approaches

The foregoing demonstrates that a common emission standard by pollutant, i.e. an 'EU-wide BAT', cannot deliver the least cost solution for the EU. This is confirmed by the resulting cost burden versus gap closure[1] plots that follow.

Figure 5 provides a comparison of the two approaches in terms of annual cost to EU-25 as a whole for various improvement ambitions (the so-called 'gap closure'). Consistent with the scope of the IPPC Directive the measures considered here are exclusively those applicable to stationary sources.

Figure 5 clearly shows the significant increase in economic burden to the EU as a whole in moving away from the optimised approach of CAFE to the application of common emission limits ('EU-wide BAT'). At a gap closure ambition of 65%, the economic burden to the EU roughly doubles. This represents an additional burden of more than 3 G€/a, increasing to 5 G€/a at 75% gap closure. This additional cost does not achieve any further improvement, but simply represents the economic consequence of an inefficient means of delivering the benefits!

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[1] *With a starting point of 2020, the 'Gap' is defined as the maximum further reduction in impacts that can be achieved by the application of all available technical abatement measures (Maximum Technically Feasible Reductions). The 'Gap Closure' is the extent to which further measures move toward this point expressed as a percentage.*

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Figure 5 Costs v. PM2.5 gap closure: annual costs of 'EU-wide BAT' and 'local BAT' approaches compared for EU-25

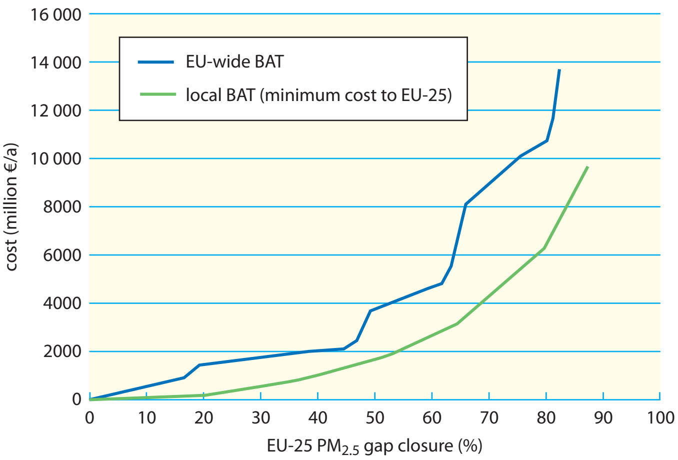


Figure 6 Costs v. PM2.5 gap closure: annual costs of 'EU-wide BAT' and 'local BAT' approaches compared for Germany

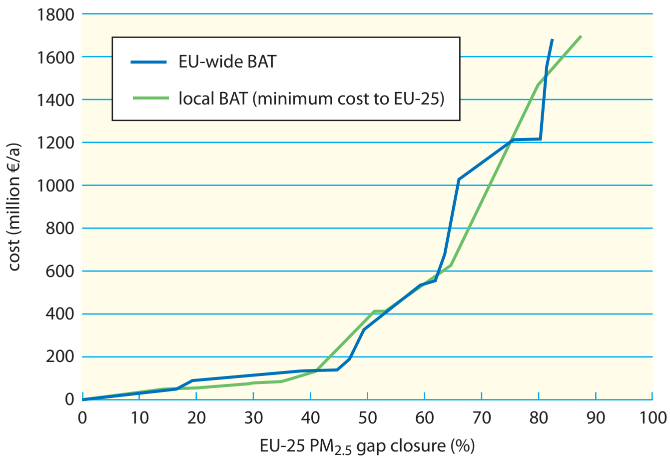


Figure 7 Costs v. PM2.5 gap closure: annual costs of 'EU-wide BAT' and 'local BAT' approaches compared for Poland

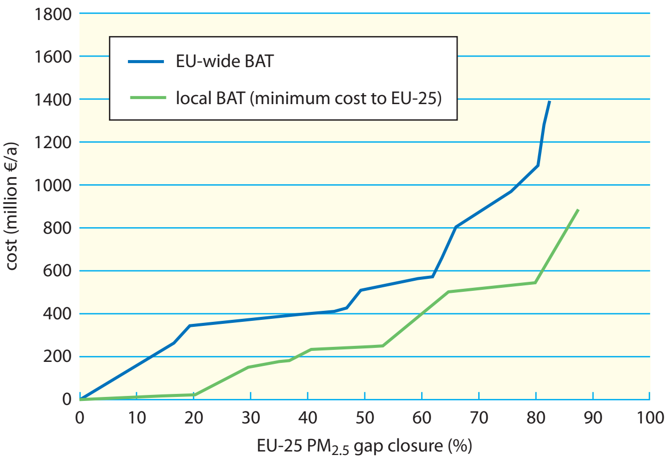
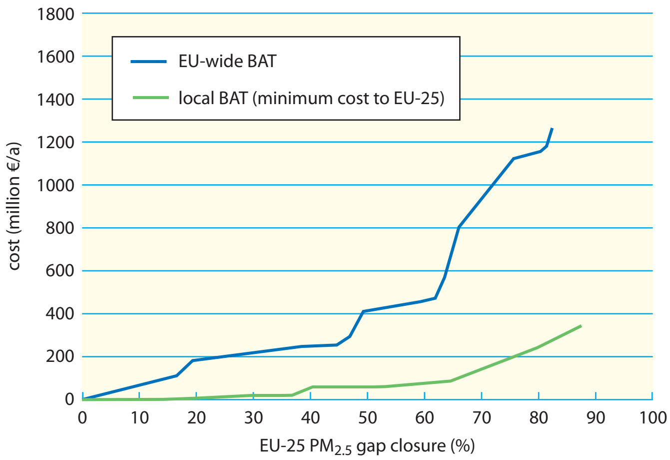


Figure 8 Costs v. PM2.5 gap closure: annual costs of 'EU-wide BAT' and 'local BAT' approaches compared for Spain



At the individual Member State level, the impact of a shift to the concept of 'EU-wide BAT' varies significantly. The shift has little impact on Germany which, as a result of the cross-boundary effects of reductions in neighbouring countries, would in fact face a lower economic burden at ambitions beyond 75% (Figure 6). Similar curves apply for both Belgium and the Netherlands.

This stands in stark contrast to the situation in southern European countries and new Member States. For Poland (Figure 7) the shift to an 'EU-wide BAT' would represent a twofold increase in the economic burden, a similar ratio applying to Italy. For Spain (Figure 8) and Greece the increase would be as much as seven to tenfold.

CONCAWE believes that the results of this analysis strongly support the need to retain and strengthen the concept of 'local BAT' in any future revision of the IPPC Directive. The dramatic differences in costs between the 'EU-wide' BAT approach and the 'Optimum EU Solution' approach, at both overall EU level and in many Member States, clearly demonstrates the economic inefficiency of the 'EU-wide BAT' concept. In contrast, the retention and strengthening of the concept of 'local BAT' ensures that legislation designed to tackle human health and environmental concerns is better aligned with the Commission's commitment to ensure EU competitiveness.

Figures 5–8

The Figures compare an 'EU-wide BAT" approach (application of equal EU-25 BAT) with a 'local BAT" (minimum cost to EU-25) approach in terms of the cost burden to the EU-25, Germany, Poland and Spain, respectively.

Figure 5 shows the significant increase in cost to the EU in moving away from the optimised approach of CAFE to the application of common emission limits ('EU-wide BAT").