



Briefing on the European Commission Proposal for a Directive relating to arsenic, cadmium, mercury, nickel and PAH (fourth daughter directive under the Air Framework Directive) COM (2003) 423

Prepared for the European Parliament Committee on Environment, Public Health and Consumer Policy

INTRODUCTION

The Committee on Environment, Public Health and Consumer Policy of the European Parliament has made a contract with the European Academies' Science Advisory Council (EASAC) for the provision of technical-scientific advice in the area of Environment Public Health and Food Safety (project EP/IV/A/2003/09/02). As part of the contract, the Committee has commissioned a review of the European Commission's proposal for a Directive on hazardous materials in ambient air, contained in the Commission document COM (2003) 423. This proposed Directive relates to arsenic, cadmium, mercury, nickel and PAH and would become the fourth Daughter Directive to be agreed under the Air Framework Directive.

Five independent EASAC experts have reviewed some scientific aspects of the draft Directive, and their comments are summarised in this paper. The experts come from Austria, Italy, the UK, Sweden and Denmark. Their expertise covers the fields of materials, inorganic, environmental and atmospheric chemistry, ecotoxicology and environmental health. They include an expert advisor to WHO on aspects of chemical safety.

This review focuses on the scientific and technical merits of the proposal. In particular it provides an opinion of the Commission's assessment of the eco-toxicological impacts of these materials, and of the broad approach the Commission has proposed for managing them, including the assessment thresholds suggested. As agreed, it does not address issues of cost, which are beyond the competence of the EASAC member Academies.

SUMMARY

In this document, the Commission sets out the case for action on a number of important environmental pollutants within the EU and suggests target levels for their atmospheric concentration. The scientific rationale for the proposal was provided by a series of Technical Working Groups each chaired by experts from the member states. In preparing the proposal, the Commission consulted widely, including with the World Health Organisation (WHO).

In the case of a specific material, benzo(a)pyrene (BAP), a polycyclic aromatic hydrocarbon (PAH), the Commission suggests a regulation to ensure that levels in the EU do not exceed the target level. For the other materials, the Commission proposes a regime of monitoring and assessment in order to determine

atmospheric concentrations and deposition levels in the EU. It also makes provisions for reporting this information to the Commission and to the public in member states. The document includes a draft Directive for bringing these proposals into EU law.

There is a broad consensus amongst the EASAC reviewers that this draft Directive from the Commission is underpinned by a sound and up-to-date understanding of the current state of knowledge about these materials and their effects. It is considered to be consistent with the best current international scientific consensus, contained in the Environmental Health Criteria (EHC) published by the International Programme on Chemical Safety (IPCA). The IPCA was set up under the United Nations, with sponsorship from the UN Environment Programme, the International Labour Organisation and the World Health Organisation (WHO), and is widely recognised as an authority on issues of chemical safety.

In the opinion of the reviewers, the statement provided by the Commission in support of its proposal is a good reflection of the current understanding. The substances covered by the Directive are known or strongly suspected to be harmful to human health in certain circumstances, and proposals aimed at managing them need to given serious consideration. There is a shortage of information about environmental levels of these materials and it is the opinion of reviewers that the provisions for assessment are useful and should lead to improved understanding. It will be important to ensure that assessment is consistent across member states and that it is backed by high quality measurements.

There are, however, a number of points of detail that have been raised by our reviewers and these are discussed below.

DETAIL

Scope of the Commission's proposal

The proposed Directive contains target levels for the concentration in air of arsenic, cadmium, nickel and a particular polycyclic aromatic hydrocarbon (PAH), benzo(alpha)pyrene (BaP). It also contains provision for assessment of total gaseous mercury and a number of other specific PAHs in addition to BaP. Reviewers agreed that the scope of the proposal is broadly correct. In the case of mercury, it was suggested that the particular importance of the methyl-mercury form should be specifically mentioned. One reviewer commented that the inclusion of dioxins would strengthen the part of the proposal that dealt with organic compounds (PAH). Although dioxins are distinct from PAH (through the inclusion of chlorine in their molecular structure) they come from similar sources (in particular combustion) and there are advantages in managing them together.

Target levels

The Commission's approach to characterising the risk of the hazardous materials covered by this proposal is based on the concept of "unit risk", the extra risk of developing cancer from an exposure to $1 \mu\text{g}/\text{m}^3$ over a lifetime. For pollutants with a linear dose-response relationship this is considered to be the most appropriate means of associating harm with exposure. In order to produce target levels from these unit risks, however, it is necessary to decide on a level of "acceptable risk".

This has proved a difficult matter and reviewers noted that it has not been satisfactorily resolved, even by the WHO. The approach the Commission has taken in this proposal is to refer back to Directive 98/83/EC on drinking water quality, which takes the additional lifetime risk of one in a million as a starting point. The Commission's Working Group for the current proposal has then taken a view on the unit risks proposed by WHO and an appropriate level of acceptable risk and suggested the atmospheric concentrations for the different materials that would minimise harmful effect on human health.

In the case of arsenic, for example, the WHO unit risk is 1.5×10^{-3} for $1 \mu\text{g}/\text{m}^3$ over a lifetime so that, for an acceptable risk of one in a million, the target level would be $0.67 \text{ ng}/\text{m}^3$. The Commission's Working Group took the view that this overestimated the risk and set a level of $6 \text{ ng}/\text{m}^3$, which corresponds to accepting a maximum risk of about 10 cases per million. Similarly, for cadmium, the excess lifetime risk associated with the suggested target level is 20 cases per million and for nickel it is about 8 per million.

Reviewers commented that this is unclear and could benefit from further thought. A clear statement from WHO would be helpful but, pending this, further work should be done, possibly by the Commission's Working Groups, to determine what level of risk is considered acceptable across Europe. Reviewers noted in particular that the total exposure to these materials comes through a number of routes, including inhalation. For some of these materials, arsenic and some PAHs for example, the major exposure routes are likely to be through ingestion of, respectively, water or food. This should be taken into account in considering the lifetime risk acceptable from air alone.

As a whole, however, the target levels, given in Annex 1 of the Commission's proposal follow on from the Commission's approach and are considered by our reviewers to be consistent with the WHO guidance on unit risks and the current state of knowledge as expressed in the IPCS monographs.

It was considered that the concentrations generally found in the EU do not exceed these threshold levels, except in particular areas of high pollution such as near metal works or where traffic densities are high. For example, annual mean levels of arsenic and cadmium measured in Austria are at 20% of the Annex 1 target values and for nickel they are at less than 10%. Even levels of BaP measured in Austria in winter, when there is considerable use of fossil fuel, are only 60% of the target level. These target levels therefore provide a considerable margin of safety for the less polluted parts of the European Union and may need to be revisited in the light of progress in other, less well-protected, parts.

One of the problems consistently mentioned by reviewers, however, is the current shortage of reliable and standardised data on air concentrations and on deposition of these materials. The data available for the EU are not comprehensive in their geographical coverage and such data as exist were produced by a variety of methods, so comparisons between them are difficult. This is something that the Commission's proposal goes some way towards rectifying.

Assessment

The principle application of the target levels in the Draft Directive in this proposal is that they should be the trigger point for a regime of assessment. The Directive envisages a preliminary assessment following which those areas that are subject to levels of these materials about the target level will become the focus of more detailed assessment through monitoring and modelling.

The environmental concentrations of the materials under consideration may be assessed by direct measurement or, where that is not practicable, by calculation based on models. In the Commission's proposal, there is provision for dispersion modelling to be used to calculate the levels of the materials arising from specific sources. However, in the opinion of reviewers, the use of models should always be backed by measurements, standardised across the EU, for validating model calculations. There should also be greater emphasis on the models themselves. For example, although models have an established reputation for handling the dispersion of gaseous materials, they do not always work so well in calculating the dispersion of particles, which is important in the case of the materials covered by this proposal. Models should be standardised through intercomparison exercises to ensure that the performance of the assessments made in different member states is truly comparable.

The Commission's assessment of current levels, however, is consistent with our reviewers' understanding, though it might be helpful if, in its explanatory memorandum, the Commission provided a more complete summary of current monitoring data and separated it from assessments made from models. It is also important to ensure that the different forms of the materials in question are clearly distinguished. For example, in the case of mercury it is the methyl-mercury form that is of particular interest and this should be mentioned specifically. The source allocation that should be possible with a combination of modelling and monitoring would help in distinguishing between natural and anthropogenic sources and, in the latter for example, between industrial and agricultural production of PAHs. The information this would provide would be helpful in developing abatement strategies.

The Commission's proposal does not consider the wider impacts of emissions of these materials, despite a reference to UNEP work on global pollution assessment. For example, mercury and some PAHs are highly mobile in the environment and accumulate in the fat of animals at the top of the food chain. There are, therefore, particular impacts of these materials on people who rely, for example, on fish and seals as part of their diet. These should be considered in the proposal.

The monitoring provisions in the proposal are relatively onerous in terms of the number and density of monitoring sites, yet the provisions for locating sites, for standardisation of measurements and for quality controls are sketchy. In particular, the standard of measurement is critical as the quality of data is as important as its geographic coverage. In terms of investment, it may be better to have fewer high quality measurements than many of questionable quality. Bio-monitoring, for example using moss, lichens or assays of animal fats, should be included.

Abatement strategies

The Commission's proposal focuses principally on monitoring and assessment, but it also contains a single, though significant, proposal for an abatement strategy for BaP, one of the PAHs. The proposal contained in the Draft Directive is for the application of all necessary measures not entailing excessive costs in order to ensure that levels of BaP do not exceed the target levels. One of our reviewers commented that this was linked to the provisions of the IPPC (Integrated Pollution Prevention and Control) Directive for the application of Best Available Techniques (BAT) and that the results would be critically dependant on an assessment of economic feasibility. This might allow some existing (and highly polluting) plant to continue to operate. It would be important therefore to ensure that the target value was respected and that there would be further action if economic feasibility alone became a reason for keeping old and polluting plant in operation.

CONCLUSIONS

The EASAC reviewers consider that this draft Directive reflects the current state of understanding about the effects of these materials and their presence in the environment.

The analysis of health effects and the arguments for the target levels were considered to reflect current knowledge. However, there should be more thinking on the levels of risk that should be accepted and the WHO should be pressed to provide guidance on this matter.

There is a considerable need for monitoring to provide quality measurements in support of further work on assessment and effects, both on human health and on ecosystems, and the proposals to require monitoring as part of an assessment regime recognise and respond to this.

Modelling is a well-established means of assessing environmental impacts of sources of pollution, but should always be backed by measurements. The provisions for ensuring quality of measurement and assessment by modelling in the Commission's proposal could usefully be strengthened, by standardising the measurements and by intercomparison of the models.

The abatement strategies for BaP should include provisions for dealing with old plant that, however, cost effective in operation, might contribute to exceedences of target levels.

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