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OECD SERIES ON EMISSION SCENARIO DOCUMENTS
Number 1

Guidance Document on Emission Scenario Documents

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OECD Environmental Health and Safety Publications

Series on Emission Scenario Documents

No. 1

**GUIDANCE DOCUMENT ON
EMISSION SCENARIO DOCUMENTS**

**Environment Directorate
Organisation for Economic Co-operation and Development
Paris 2000**

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The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organisation in which representatives of 29 industrialised countries in North America, Europe and the Pacific, as well as the European Commission, meet to co-ordinate and harmonize policies, discuss issues of mutual concern, and work together to respond to international problems. Most of the OECD's work is carried out by more than 200 specialised Committees and subsidiary groups composed of Member country delegates. Observers from several countries with special status at the OECD, and from interested international organisations, attend many of the OECD's Workshops and other meetings. Committees and subsidiary groups are served by the OECD Secretariat, located in Paris, France, which is organised into Directorates and Divisions.

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The Environmental Health and Safety Programme co-operates closely with other international organisations. This document was produced within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC).

The Inter-Organization Programme for the Sound Management of Chemicals (IOMC) was established in 1995 by UNEP, ILO, FAO, WHO, UNIDO and the OECD (the Participating Organizations), following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. UNITAR joined the IOMC in 1997 to become the seventh Participating Organization. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organizations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

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INTRODUCTION

1. This Guidance Document intends to provide an introduction to Emission Scenario Documents (ESDs) and thereby, to facilitate their development and use in Member countries and at the OECD level. It is also expected that this Guidance Document could contribute to the increase of consistency of emission scenario documents at various levels (e.g., national, regional, international).

2. Emission scenario documents are one of the useful information sources on the use of chemicals and their releases into the environment when assessing their risks. Taking into consideration the need to share information on the use and releases of chemicals among Member countries, the OECD's Task Force on Environmental Exposure Assessment launched a pilot project in 1998 to investigate the feasibility of developing OECD-wide emission scenario documents. The conclusion from this pilot project was that the development of emission scenario documents at the OECD level would be possible and that wider acceptance of emission scenario documents would help to reduce duplicative efforts made by Member countries and industry in the gathering of exposure information and improve the consistency and transparency of exposure assessments.

3. One of the lessons learnt from the pilot project was that it would be necessary to improve understanding of the emission scenario document concept (i.e., what they are, how they can be developed and how they can be used), particularly outside the EU region. Following the endorsement at the 29th Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology, the Task Force initiated work on preparing a Guidance Document. This project was led by the UK Environment Agency in consultation with the Task Force on Environmental Exposure Assessment.

4. This Guidance Document is an introduction to emission scenario documents and does not include detailed guidance on how to use emission scenario documents. Member countries are invited to consult another paper, entitled "OECD Environmental Exposure Assessment Strategies for Existing Industrial Chemicals in OECD Member Countries (OECD Environmental Health and Safety Publications, Series on Testing and Assessment No.17) if they wish to know about more details on how to conduct release estimates in environmental exposure assessment. This paper can be downloaded via the Environmental Health and Safety Division's homepage at <http://www.oecd.org/ehs/>.

1. PURPOSE OF EMISSION SCENARIO DOCUMENTS

5. The Task Force on Environmental Exposure Assessment proposed the following definition for an Emission Scenario Document (ESD):

An Emission Scenario is defined as a set of conditions about sources, pathways, production processes and use patterns that quantify the emissions (or releases) of a chemical from production, formulation, processing, private use (or use in the household) and recovery/disposal into water, air and solid waste.

It should be noted that from the above, an ESD should cover all aspects of the lifecycle of substances used in the area concerned. However, in some cases parts of the lifecycle may also come under other areas of industry and may be dealt with more easily in these other areas, so that any one ESD may not in itself cover all the relevant areas (see paragraph 29 below).

6. ESDs can provide estimates of releases from point sources, which can be used to estimate local exposure concentrations. They can also provide information about more diffuse sources, such as from products in widespread use, which contribute to the wider background exposure.

7. ESDs are intended to provide the information to make estimates of emissions into the compartment of the environment where release initially occurs. They do not deal with the subsequent behaviour and fate of the substances in the environment.

8. The information in ESDs can be used in the estimation of concentrations in the environment. Different types of estimated concentration are required by Member countries, depending on the level and purpose of the assessment being carried out. The different approaches to exposure assessment have been reviewed in the Task Force's strategy paper, entitled "Environmental Exposure Assessment Strategies for Existing Industrial Chemicals in OECD Member Countries" (OECD Environmental Health and Safety Publications, series on Testing and Assessment No.17) and its Annex. In this, the different types of estimated concentration are summarised as:

- (i) a value that likely exceeds actual exposures (a "bounding" or "worst-case" estimate),
- (ii) a value that is representative of the "high end" of actual exposures (a "reasonable worst-case" estimate, the 90th percentile is often used),
- (iii) a value that is representative of "typical" exposures, or
- (iv) the complete set of actual exposure values resulting from those conditions.

Type (i), (ii) and (iii) Predicted Environmental Concentrations (PECs) are point estimates which can be used in risk quotient (e.g., PEC/PNEC) calculations. Type (iv) PECs are represented as frequency distributions, which can be incorporated into risk analyses graphically. To date, the majority of ESDs have aimed to produce estimates of type (ii), 'high end' or 'realistic worst case' concentrations. However, there is no reason why the documents cannot contain information to allow the calculation of emissions suitable to estimate any of these types of concentration.

9. The main users of ESDs are expected to be those who need to make estimates of emissions of chemicals into the environment from their production, use and disposal. These will include regulatory agencies, chemical producers assessing the potential impact of current and new products, potential users of chemicals comparing alternatives etc. They may also be of use in developing estimates of releases for Pollution Release and Transfer Registers. The qualitative information on routes of release to the environment is also useful to those involved in hazard assessment.

10. A potential indirect benefit of the development of ESDs is improved understanding and communication between the developer of the ESD (usually a regulatory authority) and the industry concerned. The developer can gain a detailed knowledge of the processes and use patterns in the industry area, while the industry can gain an understanding of the assessment process and how information is used in the assessment.

11. ESDs can also help communication and understanding where those involved were not concerned with the development of the document. In addition to providing specific estimates, they can also provide a basis for discussions between the different parties involved in assessments by providing a description of the processes involved, allowing all those involved to see the assumptions and the data on which the assessment is based, and help in targeting further work where necessary.

12. Further information about the use and release of industrial chemicals, including the development of ESDs, can be obtained via the OECD's Database on Use and Release of Industrial Chemicals (accessible via <http://www.oecd.org/ehs/>).

2. WHAT SHOULD BE INCLUDED IN AN EMISSION SCENARIO DOCUMENT

13. The areas of chemical use which may be covered by an ESD can vary considerably, and so it is not possible to provide a detailed list of the information to be included. However, ESDs should ideally cover the following areas.

2.1 A description of the industry or use area

14. This should include the structure of the industry in the area, and how the various companies involved relate to each other. It should describe what kinds of operations are involved, and whether these are integrated at sites or whether companies specialise in particular aspects. This type of information can apply at different levels. For example, at one level the use of a chemical may involve blending with other substances to give a product which is then used, and these two steps may take place on the same site or at different locations. At another level, details of whether these steps take place in closed systems, and on a continuous or batch scale, is also important. This more detailed information may fit better into the section on estimates of release as described below (paragraphs 19-21).

15. The comments above relate mostly to use in an industrial context. ESDs should also cover the release from products in widespread use where this is appropriate. Examples would be PVC window frames, rubber car tyres and household detergent products. The ESD should include descriptions of the types of products made by the industry area, how they are used and their expected lifetimes.

16. Possibilities for recovery and re-use of products or substances should be included where appropriate or possible. This may occur at the sites where the substance or products are made, but it may also involve the recycling of part or all of the products at the end of their lifetime. Disposal of old products may also need to be considered (but see note in paragraph 29 below).

17. This section should also indicate steps in the lifecycle which are not included in this ESD, and include references to other ESDs which may cover these, and any related areas of use (see paragraphs 28-29).

2.2 A description of the types of substance used and their function in the industry area

18. This section may include specific examples, or may refer to substances by the functional groups present in the molecule in order to provide the required function. It should describe why the substances are used and what happens to them in each life cycle step. Where substances are used in products, information on the concentrations at which they are used should be included. If the substance is used in a reactive process, then information on residual levels in the product is also useful.

2.3 Identification of the potential points of release in this use area, and estimates of the amounts of substance released at these points

19. Ideally these should be in the form of factors related to the quantity of substance or product used or made at a site so that they can be applied to different circumstances. These factors may be dependent on the properties of the substance (for example air emissions related to vapour pressure) and it should be possible to take account of this in the estimates where relevant. The extent of release may also relate to the

functionality of the substance, for example types of dyes having different rates of fixation to materials and so different potential for release in waste water. Factors may also be related to the technology employed in the use area, and these may be more transferable to other areas employing the same or similar technology. The time basis for emissions should also be considered (see also Section 2.4 below).

20. For releases from products in use, slightly different factors may be needed. Some products such as household detergents may be considered to be used once and released completely to the waste water system. For products with a longer intended lifetime, the factors need to reflect the loss of substance to the environment on a time basis relevant to the lifetime of the product. These may not be defined in terms of amount lost per tonne of substance used, but more likely in terms of loss per unit surface area or similar measures. The ESD therefore has to contain supplementary information about the products such as the total surface area produced, or methods to convert the emissions into the more standard loss per mass of substance used. The time basis for the estimates needs to be made clear, whether these are per year or over the lifetime of the product.

21. This section should also contain the information on the basis of these estimates (see 4. Points to Consider below). This should be as detailed as possible, to allow the user to judge how relevant the information is for the intended purpose. Known limitations on the available information could be stated here.

2.4 Information on the scale or size of operations in the industry area

22. This should cover the quantities of products typically used on sites, and ideally the size distribution of these sites. Related information such as water usage or ventilation rates, or the use of on-site waste water treatment plants, will also be relevant in many cases where the industry area has specific requirements. The number of days for which the processes are operated should also be included. Information on how such values vary between regions or countries would help to make the document of use to a wider range of users. Information which relates more to the resulting concentrations in the environment could also be included, such as representative effluent dilution rates.

23. Information on the level of use of products by individuals, countries or regions should be included where appropriate to allow diffuse emissions to be estimated. Some of this information may be relevant to more than one use area and hence more than one ESD (for example, information on car use could relate to emissions from the fuel industry, from tyres and from car washes) and so it might be useful to collect this information separately.

24. A combination of the information under this and the previous heading should allow a release to be estimated in kg/day for a generic site. It should also be possible to combine items of information from these two headings with specific information from actual locations to provide estimates of release from specific sites when full information on the site is not available. It should also be possible to estimate emissions on larger scales, both for a combination of point sources and for more diffuse releases.

2.5 Information on emission control methods for the industry

25. This section should cover whether methods are available, information on the extent to which they are employed in the industry area, and information on whether the scale of the operation affects the likelihood of their being used. Ideally such methods are accounted for in the form of additional factors which can be applied to the basic release estimate where appropriate.

2.6 Instructions on how to use the information in the document, and examples of calculations

26. This section should describe how to bring together the different items of information in the document to produce useful emission estimates. It should include examples of calculations on different scales, local and regional, where appropriate for the use area. It may be possible to develop formulae to ease the calculation of emission rates for relevant release pathways.

27. The above list is intended as a guide. It may not be possible to cover all of the points in the same depth, but this can still result in a useful document - some information is generally better than none. There may also be other areas which are important for specific industries which are not included above. It is important to let the nature of the specific industry determine what needs to be covered.

3. SUGGESTED STEPS IN THE PRODUCTION OF AN EMISSION SCENARIO DOCUMENT

3.1 Selection of the area to cover

28. There could be a number of reasons for wishing to produce an ESD in a particular industry area. Examples might be a number of new substances intended for use in the same area, a large number of existing chemicals used in an area without an existing document, or the revision or updating of an existing document. A check should be made as to whether a document already exists for the area. The OECD web-site provides information on some existing documents in this area and on current activity, and it is also worth checking for any EU activity. If possible, checks on activity in individual countries would be worthwhile although this may be more difficult. It is important to try to avoid duplication as there can be considerable effort involved in the production of the ESD.

3.2 Consider a scoping study to identify what needs to be covered

29. Look for overlap in areas with an existing document. For example, if the area being considered is the use of surfactants in the textile industry, then information from the ESD on dyes would be of use. Limits to the area to be covered should be defined, for instance how much of the disposal of end products should be taken into account - are parts of this process still within the industry area and so best considered here. The possibilities for recycling within the industry which might give rise to potential releases could also be considered. (Common disposal methods such as incineration and landfill could be considered as an industry area of their own). If the industry area covers a very wide range of activities then it may be appropriate to divide the area into smaller units and develop separate ESDs for these units.

3.3 Initial overview

30. It may be useful to produce an initial overview of the selected industry area through easily available sources such as text books, trade literature etc. This can also include the identification of potential sources of information - relevant trade associations or research organisations related to the industry area, lists of companies active in the area. It is important to involve practitioners in the industry area if at all possible - they are likely to have access to the best information if it is not available in published form. The initial overview should be used to decide on the structure for the ESD. Although general subject areas are indicated in this guidance, the nature of the industry itself should govern the final structure. This step could be combined with the scoping study.

3.4 Collection of detailed information

31. This should be based on the scoping study and initial overview. A literature search for published information may be useful. It is also worth investigating whether parts of the industry area are required to submit emission information for a PRTR. There may already be some methods for estimation which could be useful. It is more likely that there will be a need to approach the industry itself. This could be done directly if enough companies can be identified, or it may be easier to involve an appropriate trade association or research organisation. These need to have clear connections with the industry area concerned, and there may not be relevant organisations for some industry areas; the situation is also likely to vary between countries. It may be possible to use a questionnaire approach to generate the information. Such questionnaires have been used in a number of contexts in OECD and EU studies and these could be

used as a basis, along with the preliminary scoping study. [An example of a questionnaire which has been used by the UK to gather information for an existing substance assessment is included as an annex]. The questionnaire could be tested on a small number of companies, and then circulated more widely. It may also be useful to visit sites where possible to gain a clearer picture of how the industry operates.

3.5 Appraisal of the information obtained

32. Some points to consider in the appraisal of the data obtained are discussed below (paragraph 33). It is important to make clear where the information comes from and to give a good indication of its credibility. This may vary considerably across the information found. A good way to check the information is to generate examples from the data, and then to test these out on the industry, and on outside groups (for example the OECD Task Force on Exposure Assessment). This will test both the understanding of the way in which chemicals are used, and also the reliability of the data. There may then be revisions to the ESD. It may also be necessary to highlight areas where data are missing.

4. POINTS TO CONSIDER

4.1 Quality of information

33. In general there should be a preference for “hard” data, based on measurements, and statistically derived values (but see the note below on the interpretation of measured data). However it may not be possible to get this type of information in many cases. Often the best estimates available are those based on the experience of those working in area - this is a good reason to involve the industry as much as possible in the process. These estimates can still be very useful - they are likely to be much better than the best guesses of those outside the industry.

34. It may be possible to use the information gathered through the use of a questionnaire to derive statistical values for the emissions, so that predictions for different levels (bounding, realistic worst case, average - see paragraph 8) can be made. Such a treatment will also need to discuss the extent to which the responses cover the industry, and how well the results can be considered to represent the area.

35. The ESD should always make clear how the values were obtained or derived, and provide as much back-up information as possible (statistics, numbers of sites, ranges of values) to make the estimates more useful. The type of estimates produced with the information, in terms of ‘bounding estimate’, ‘realistic worst case’, ‘average’ (see paragraph 8), should also be made clear.

36. Statistically derived values are more likely to be available for river flows, air exchange rates etc.

37. Data on releases may be available from submissions to a regulatory authority, for example as tonnes per year. The basis for such release figures needs to be made clear, for example if they are based on measurements or estimated using agreed factors.

4.2 Involvement of industry

38. This is seen as crucial in areas where there is little or no published information, which is likely to be the case in developing ESDs in new areas. It is worth spending a significant amount of time explaining the purpose of the document to any industry contacts and what information is required. In particular, concepts such as realistic worst case may not be familiar, and can be important where hard data do not exist and the estimates are likely to depend on the experience of the industry. Ideally some estimate of the likely range of values possible is most useful. It is also important to make clear that the requirement is for generic information, not for specific locations or for aggregated releases (e.g. estimate for UK). (Although specific information may be useful as a basis for developing generic values).

4.3 Use of measured data

39. Many of the considerations from the OECD Workshop on the use of monitoring data in exposure assessment can be applied here (see Report of the OECD Workshop on Improving the Use of Monitoring Data in the Exposure Assessment of Industrial Chemicals (OECD Environmental Health Safety Publications, Series on Testing and Assessment, No.18)), with reference to the representativeness of the data. In particular, there is a need to be very clear about where the measurements were taken, and how they relate to the potential emission sources. It may be difficult to work back from such measurements to generate emission factors. For example, concentrations measured in surface water are the result of other

processes such as waste water treatment and dilution in water acting on the emission. The most useful concentration measurements are probably those in the immediate effluent stream (water or air). These will need to be combined with appropriate flow rates if they are to be converted to emissions per day (and processed tonnages will be needed to allow conversion to emission factors per tonne).

40. It is important to try to cover all routes of release to the environment and to all relevant compartments. ESDs have up to now tended to focus on the aquatic compartment (with some exceptions), but they should if possible include air releases (and possibly soil releases) and estimates of solid wastes (and their eventual disposal method). The ESD should make as clear as possible where the release to the environment actually occurs. For example, volatile releases from a high temperature process are likely to be to air initially, but there may be air cleaning equipment in use which removes much of the release onto filters or into water, so the eventual release is to solid waste or water. It is therefore important to know what effect any clean-up methods have on the releases.

41. When developing a ESD it should be borne in mind that there may be wide interest in the document, and that it is likely to be more useful if it has as wide a coverage in terms of countries and regions as possible. On the other hand, it may be easier to develop a document on a national basis initially, as this should make it more likely that good coverage of the industry will be achieved. This can then be used as a basis for further international development, making it easier for consultees to focus their comments and input.

ANNEX

Example of a Questionnaire Used in Obtaining Emission Data for a Risk Assessment

Note: This questionnaire was sent to the producers and users of the substance. It probably goes further than would be necessary for an ESD, and asks for more detail, so it would need to be revised before using it. It was also intended to gather information on only one substance, and so a more general form would be needed for an ESD. It might be possible to design the questionnaire to fit the branch of industry being studied. There are probably also issues of confidentiality which would have to be considered.

1. Company Details

Company Name

Company
Address

Contact name

Telephone

Fax

e-mail

Description of company's main business activities

Description of processes your company operates that use the substance.

2. Use of the substance

Please complete a separate sheet for each process, which uses the substance.
Please answer for your company only.

Description of process (e.g.. polymer production)

--

How is the substance used (e.g.. additive, monomer)

--

Fate of the substance (e.g. incorporated into matrix)

--

Number of sites within the EU carrying out this process	
---	--

Amount of the substance used in the process	In EU	
	Per site	

3. Environment releases

Please give details of possible sources of the substance release to the environment including releases to air, water and soil. Include any details on emission recovery operated on site. It would also be useful if you could indicate the basis of estimation e.g. calculated or measured. For measured values details of the sampling regime and the analytical method used would be useful. If data is only in an aggregated form please just fill one of the boxes below and indicate that the data is aggregated for the site.

Please complete for each site that processes the substance.

Processes using the substance on site	
---------------------------------------	--

Raw materials handling	Air	
	Water	
	Soil	

Processing	Air	
	Water	
	Soil	

Disposal of spent material	Air	
	Water	
	Soil	

Waste water treatment (If applicable)

How are effluents containing the substance treated?

Waste water treatment plant	Yes/No	Please give details below
Incineration	Yes/No	
Discharge directly to receiving waters with no pre-treatment	Yes/No	Please give details below
Discharge directly to receiving water with pre-treatment (e.g. settlement of solids)	Yes/No	Please give details below
Other/Not known	Yes/No	Please give details below

Waste water treatment plant details

Capacity of waste water treatment plant	
Plant operating conditions	
Influent concentration of the substance	
Effluent concentration of the substance	
Removal rate of the substance	
% of the substance removed on sludge	
% of the substance removed by biodegradation	
Fate of sludge produced	
Dilution rate of effluent in receiving water	

Details of any pre-treatment of effluent.

--

Details about receiving waters (i.e. flow rate, dilution of effluent in)

--

3. Any other information

Please give details of any other information that may be useful in the risk assessment procedure.