Guidance on

information requirements and chemical safety assessment

Chapter R.18: Estimation of exposure from waste life stage

July 2008

LEGAL NOTICE

This document contains guidance on REACH explaining the REACH obligations and how to fulfil them. However, users are reminded that the text of the REACH regulation is the only authentic legal reference and that the information in this document does not constitute legal advice. The European Chemicals Agency does not accept any liability with regard to the contents of this document.

PREFACE

This document describes the information requirements under REACH with regard to substance properties, exposure, use and risk management measures, and the chemical safety assessment. It is part of a series of guidance documents that are aimed to help all stakeholders with their preparation for fulfilling their obligations under the REACH regulation. These documents cover detailed guidance for a range of essential REACH processes as well as for some specific scientific and/or technical methods that industry or authorities need to make use of under REACH.

The guidance documents were drafted and discussed within the REACH Implementation Projects (RIPs) led by the European Commission services, involving stakeholders from Member States, industry and non-governmental organisations. These guidance documents can be obtained via the website of the European Chemicals Agency (http://echa.europa.eu/reach_en.asp). Further guidance documents will be published on this website when they are finalised or updated.

This document relates to the REACH Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006[1]

1 Corrigendum to Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006); amended by Council Regulation (EC) No 1354/2007 of 15 November 2007 adapting Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) by reason of the accession of Bulgaria and Romania (OJ L 304, 22.11.2007, p. 1).

Convention for citing the REACH regulation

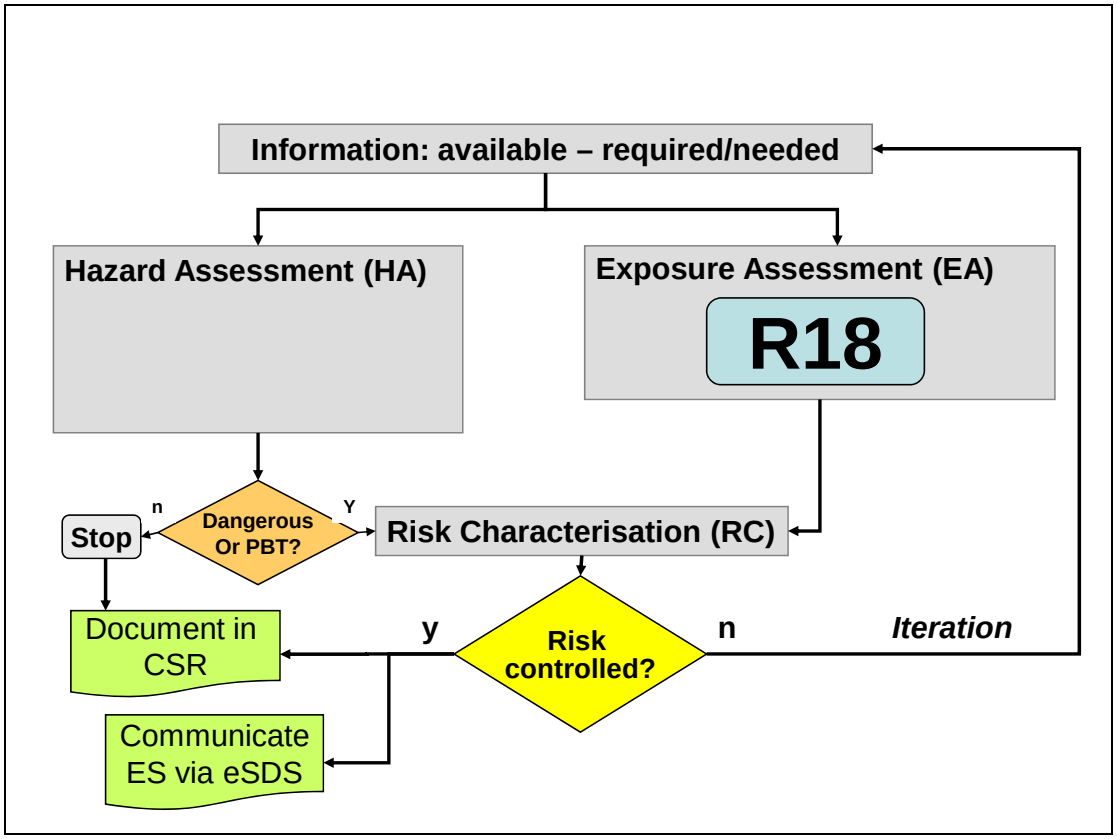
Where the REACH regulation is cited literally, this is indicated by text in italics between quotes.

Table of Terms and Abbreviations

See Chapter R.20

Pathfinder

The figure below indicates the location of Chapter R.18 within the Guidance Document



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R.18 EXPOSURE ASSESSMENT FOR THE WASTE LIFE STAGE

R.18.1 Aim of this chapter

Manufacture and identified uses may generate waste containing the substance. Exposure scenarios and exposure estimation need to cover these waste life stages. During waste operations (e.g., handling at sites where waste is generated, storage and different waste treatment processes), the substance may be released into the environment, and man may be exposed via the environment.

Art. 2.2 of REACH provides that *"waste as defined in Directive 2006/12/EC of the European Parliament and of the Council is not a substance, preparation or article within the meaning of Article 3 of this Regulation."* Therefore, REACH requirements for substances, preparations and articles do not apply to waste and waste operations are not downstream uses under REACH. Risks in waste operations are to be primarily controlled based on requirements set by waste legislation. Nevertheless manufacturers and importers of substances, downstream users and eventually recipients of articles have a number of duties under REACH related substances in waste. These are explained in Chapter R.13.2.6.

In particular, according to Article 3(37) exposure scenarios are defined as *"set of conditions, including operational conditions and risk management measures, that describe how the substance is manufactured or* ***used during its life-cycle*** *and how the manufacturer or importer controls, or recommends downstream users to control, exposures of humans and the environment. […]"*. This includes considerations related to the waste stage of substances as confirmed in Annex I paragraph 5.2.2 where the life-cycle is explicitly said to cover the waste stage. In addition, Annex I paragraph 5.1.1 of REACH also makes it clear that the Risk Management Measures of an Exposure Scenario should *cover waste management measures to reduce or avoid exposure during waste disposal and/or recycling.*

The current chapter aims to illustrate and to exemplify how exposure scenarios for the waste life stage may be defined. Based on that, the chapter outlines the basic workflow and methodology how Tier 1 emission estimates can be derived. It also explains the basic approach how to handle the interface between the REACH regime and the waste regime in practical terms. Guidance on the legal status of substances in recycling streams is not provided in the following.

R.18.2 Characterising waste streams arising from manufacture, use and subsequent life cycle stages

Waste streams may be generated at each stage in the supply chain, and M/I is required to collect the following type of information on operational conditions of waste generation and existing/suitable waste management routes:

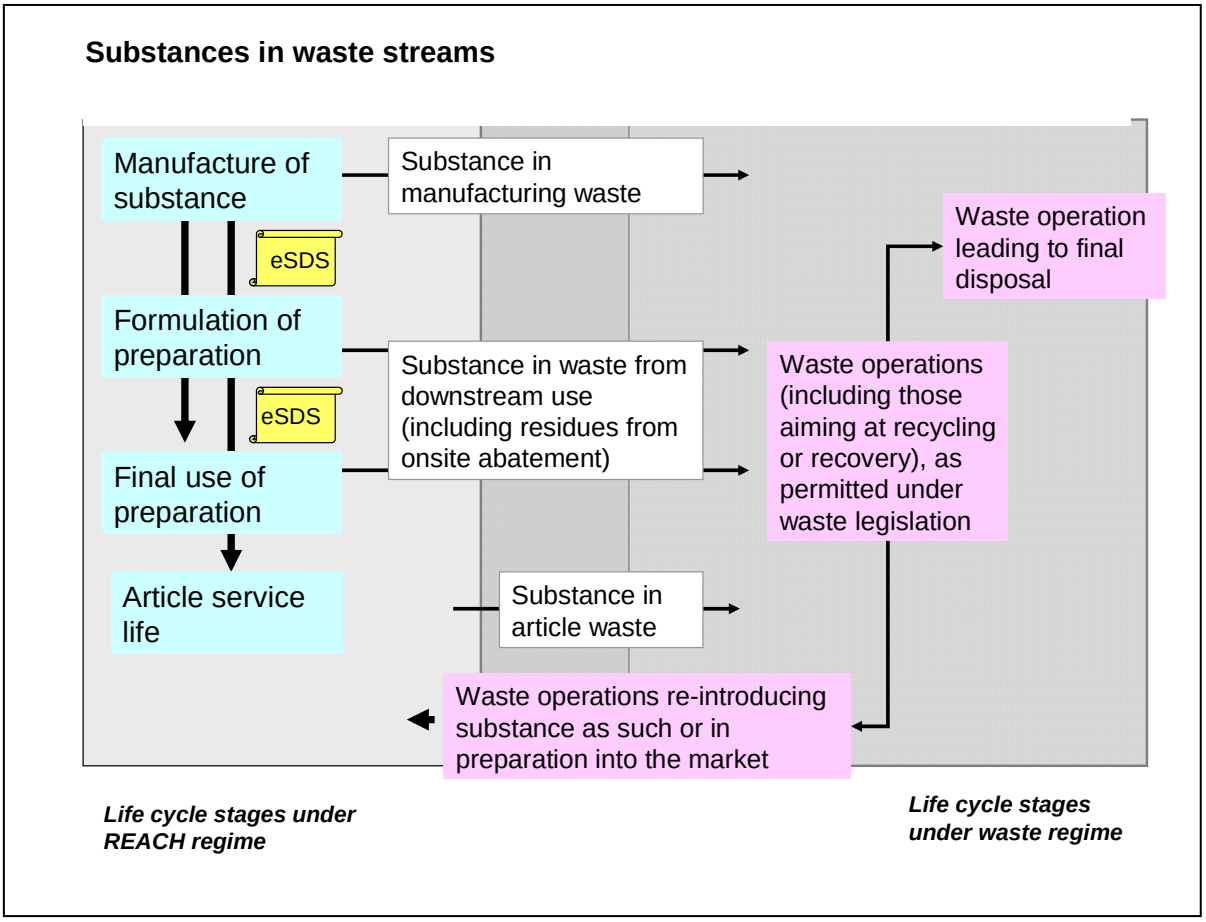
- Residues from **manufacture** of a substance: It can be assumed that M/I has all necessary knowledge available in-house: Mass balancing calculations (fraction of substance to waste) can be taken from the IPPC application or solvent management plans under the VOC Directive, and hence this information can be used to determine the amount of substance in waste. M/I should also know which waste management route(s) can be used.
- Residues from **formulating** preparations (e.g. cleaning operations, low quality charges) and transfer of substances from/to containers further downstream: The waste operations may need risk management comparable to that applied to the preparation. M/I may contact downstream

users and their sector organizations to obtain information on usually applied and most appropriate waste treatment routes. For the purpose of clearly identifying the wastes, suitable waste codes should be used, preferably those of the European waste catalogue. Also, information on the fraction of substance remaining in empty containers and the losses to waste occurring during cleaning operations of mixing equipment are likely to be available at formulators' level.

- Residues from **use of preparations** (e.g. spent lubricants, overspray from spray painting, exhausted baths): The composition and the physical state of such waste may or may not largely differ from the applied chemical. Residual liquids from dying/finishing textiles or surplus of printing inks or coatings may be similar in composition compared to the preparation applied. In other cases, like for example spent lubricants or metal cutting fluids, the chemical applied in the process will have largely changed its composition. This also applies to substances contained in residues from air purification or on-site waste water treatment. The risks of handling the waste (and the corresponding risk management) may be driven by these changes in composition rather than the registered substances in the waste. M/I may contact downstream users and their sector organizations to obtain information on usually applied and most appropriate waste treatment routes. For the purpose of clearly identifying the wastes, suitable codes should be used, preferably those of the European waste catalogue for typical waste types (e.g. spray paint sludge). Also, information on the fraction of a preparation entering into the waste stream is likely to be available at DU level, e.g. from IPPC applications or solvent management plans under the VOC Directive.
- Residues from **processing articles** (in which the substance has been incorporated) in the production of articles. M/I has no direct access to information through the supply chain (processing of articles is no downstream use under REACH), and thus needs to work with default assumptions from literature or obtained from specialised waste companies or their associations. However such waste (e.g. paper scrap, plastic scrap, metal scrap) is principally recycled along the same routes like corresponding waste from articles at the end of service life.
- Articles at the **end of their service life** (post-consumer waste). M/I has no direct access to information through the supply chain (use of articles is no downstream use under REACH), and thus needs to work with default assumptions from literature or obtained from specialised waste companies or their associations. This are for example companies dismantling cars, household appliances, or electronic articles, companies collecting and processing waste paper or packaging material, or companies dismantling buildings..
- Residues from treatment in dedicated **waste treatment** facilities, e.g. slags or filter dust from waste incineration, residues from re-distillation of solvents, dust fractions from milling end-of life articles. M/I has no access to information through the supply chain and thus need to work with default assumptions from literature or obtained from specialised companies or their associations.

Figure R.18-1 illustrates the interface between the REACH regime (from manufacturer to final downstream user) and the waste regime (from waste generator to final disposal or recovery operation). Thus companies may have two roles at the same time: Downstream user and waste generator; waste-recycler and placer on the market of a (recycled) substance.

Figure R.18-1: Interface between REACH regime and waste regime



In order to handle the interface between the two legislative systems in a corrected way M/I and DU should take note of the following:

Internal handling of substances in waste: the DU is still responsible to apply the OC and RMM identified in the exposure scenario, although the waste regime may already apply. This relates for example to occupational and environmental measures to prevent exposure from internal collection and storage of waste, and onsite pre-treatment of residues, for example by extracting water. The DU is also responsible to send the waste to appropriate waste treatment as identified in the ES and in line with waste management legislation. The duties of the DU under REACH *end*, when the residues have been transferred into the responsibility of an authorised waste management company.

Cleaning and regeneration of empty/contaminated/used processing aids or product aids (e.g. redestillation of cleaners, washing of cleaning wipes) outside waste legislation is regarded a downstream use under REACH. Such operations will not be covered in this section.

Residues that may occur in onsite pre-treatment of waste-water and exhaust air (= result of environmental risk management measures) and which are to be disposed of in waste treatment facilities are to be covered in the waste management section of the relevant exposure scenarios.

R.18.3 Waste operations: Recovery or disposal of waste

Recovery

Recovery processes usually involve a homogenisation and/or separation step (e.g. mechanical or thermal treatment) followed by recovery of the target substance/material. The recovered substance or material may be reprocessed for the original type of substance, preparation or article and return into life-cycle stages already assessed before. However it may also be processed into a new type of substance, preparation or article.

In some cases, another substance, preparation or article may be recycled, and the substance assessed is present as a contamination. An organic substance present in a photographic bath for example, will be discharged to waste water after silver recovery. A substance present in printing ink will be released with wastewater and de-inking sludge at paper recycling.

Disposal

Disposal processes aim to convert waste (including the substance contained) into a form and/or to store it permanently in a way that exposure is prevented or minimised (incineration and/or landfill). While incineration may achieve a high efficiency in destroying organic substances, metals contained in waste will leave the incinerators with slags, scrubber dust and air emissions. Slags may be recovered as road construction material. The distribution of the metals across the three pathways is driven by the properties of the metal and the condition of incineration.

Landfills operated at standards set by EU legislation are designed in a way that emissions are controlled (reduction of water and wind access, collection and treatment of leachate, collection and treatment of gas if relevant). The share of bio-reacting landfills is assumed to continuously decrease in Europe.

In addition to being recovered or disposed of in incineration or landfills, substances in articles at the end of their service life may be released, either intentionally or unintentionally, to the environment. They may intentionally be left in the environment after their service life (e.g. cables buried in soil). Fragments of articles may also be lost during use (e.g. paint flakes, car undercoating). The emissions during this life-cycle stage are addressed in chapter R.17.

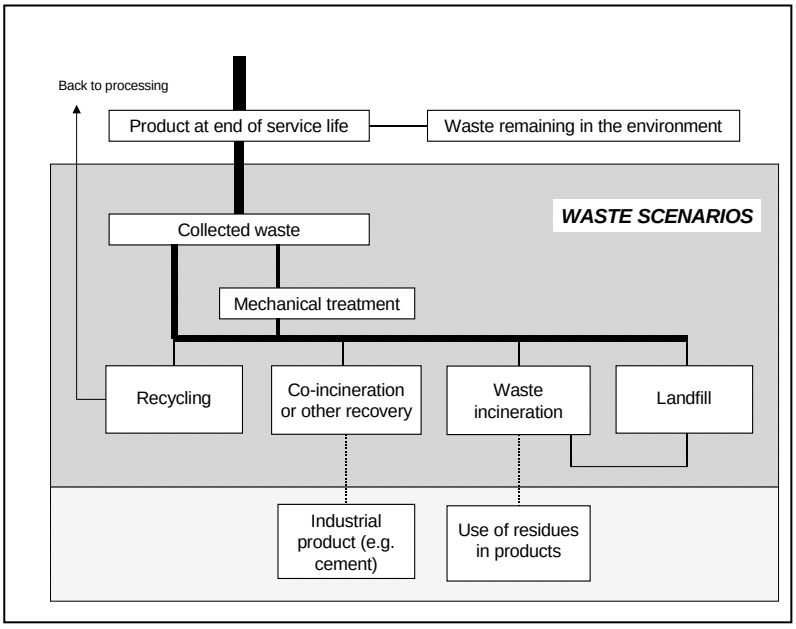


Figure R.18-2: Waste life stage of a substance

R.18.4 General Workflow in M/I's assessment related to waste stage

In the following section a general workflow is outlined on how to carry out exposure assessment for the waste life stage.

1. Select the life cycle stage (LCS) of the substance for which the waste treatment be examined (see R.18.2); consult the exposure scenarios already developed for information on use conditions of the substance as such, in a preparation or in an article for the selected LCS. The description of use (see descriptor system in Chapter R.12) may help to identify i) suitable waste category from the European waste list (EWL) and ii) waste categories with special EU requirements under waste regulation. Where no information is available, contact representative customers. **The Outputs** are:
   - Types of chemical products and articles that may become waste during the life cycle. Based on this the appropriate entries in the European waste Catalogue can be identified.
   - Identification of residues from environmental risk management measures applied during the life cycle.
   - Relevant requirements from EU waste legislation with regard to particular waste streams.
2. Document available information on the amount and the nature of generated waste; quantify the waste streams for the identified use; if necessary use a mass balance scheme for the quantification of waste streams. Check whether the substance may cause particular, waste related risks not yet covered in any of the ES for the other life cycle stages (see checklist in Appendix 1 to Chapter 13).
3. Select one or more of the general waste management strategies suitable for handling, recovery or disposal of the waste in line with EU legislation; consider if EU waste legislation is available that regulates the treatment techniques to be applied; identify requirements for best available technique in the corresponding BREF Document (see Appendix R.18-1). **Outputs**:
   - Identification of particular risks that may occur in the waste life stage of the substance and the corresponding need for particular advice to be communicate to downstream users
   - Waste quantities and concentration of substances for waste stream of particular concern
   - Identification of suitable/required waste management strategies and/or techniques to be documented in the CSR.
4. Insert relevant information into the initial exposure scenario or select an available generic exposure scenario for the relevant waste operation. **Output**: First draft of initial exposure scenario related to the waste life stage.
5. If the available information does not provide a basis to carry out an emission estimate, assign an *environmental release category* (ERC) or more specific pre-set for the selected treatment operation. Section R.18.5 and appendix R.18.1 provides guidance on: i) Emission estimation of organic substances and metals from waste incineration, co-incineration and landfills, ii) emission estimation for dismantling of articles after service life and iii) any waste operation that can be assigned to one of the environmental release classes (ERCS) (see appendix R.16-1 and chapter R.16.2). Feed in information on the quantity of waste and the concentration of substance in that waste (from step 2), in order to arrive at a release estimate. If contacts with the waste treatment company exist, cross check whether the release estimate is reasonable. **Output**: Tier 1 release estimates that can be fed into exposure estimation and risk characterisation.
6. If the comparison with relevant PNECs indicates that control of risk cannot be demonstrated based on the initial run of the tier 1 release estimates, further collection of available information may be needed: Literature; communication with downstream users; communication with waste management industries at a voluntary level. Iterate the CSA with the additional information.

7. Refine and complete the exposure scenario with information identified when assigning and adjusting the relevant ERCS, for example: fraction of waste life stage volume, amount of substance in waste per treatment site, less conservative emission factors.
8. Carry out a risk characterisation and derive the final exposure scenario information
9. Include the use specific waste management advice into section 7 of the exposure scenarios annexed to the extended safety data sheet. Include a summary of the relevant information into section 13 of the extended safety data sheet. Include the exposure scenarios for the relevant waste treatment operations into the annex of the safety data sheet.

Based on the workflow described, exposure scenarios covering the waste operations relevant for the identified use of the substance can be developed. The recommended standard formats are contained in appendix R.18-2. This includes

1. advice on handling, recovery and disposal in the exposure scenario related to a certain use (section 7 of the ES) and
2. generic exposure scenarios related to certain waste treatment techniques.

Occupational risk management measures in waste treatment and waste handling can be identified via the risk management library (see Section R.13.4)[2]. Occupational exposure during waste treatment operation can be assessed based on the tier 1 tools described in section D.5.3, since waste operations do not principally differ from processes applied in industrial and professional processing. The descriptor on processes (PROC) in the use descriptor system (see Chapter R.12) may support the integration of risk management advice into the generic exposure scenarios related to waste operations.

R.18.5 Tier 1 Emission estimation

R.18.5.1 Pre-sets for the emission pattern in time and space

The following section provides guidance on how M/I can identify releases of the substance from the waste life stage into the environment. The ERCs are used as a starting point to derive the input to a first tier exposure estimation. For the most abundant waste operations, appendix R.18-1 gives an overview on information sources that may contain information, from which emission factors can be derived. Most of the waste operations can be assigned to an environmental release category (ERCs), based on similarities in conditions of use related to processes and products.

Releases from the waste life stage may occur several decades after manufacture and downstream use of the substance under assessment. These delays are determined, inter alia, by:

- the service life span of the substance as such, or preparation or article;
- intermediate storage after service life before waste collection (e.g. exhausted batteries);

[2] Four guidance documents related to occupational risks in waste operations have been identified in Germany: Classification and labelling related to handling of waste to be disposed of (TRGS 201, July 2002). Guidance related to the handling of dangerous chemical in recycling of end-of-life-vehicles (LASI/ALMA recommendation 26, 2002); Guidance related to manual dismantling of screens and electric devices (LASI/ALMA recommendation 27, 2002): Guidance related to recycling of plastic (LASI/ALMA recommendation 32). http://lasi.osha.de/de/gfx/publications/lasi_publications.php

- articles “forgotten” in the environment after service life (e.g. buried cables)
- exposure of residues (secondary waste) from waste incineration. This source could be of particular relevance if the residues are re-introduced into the market as products (e.g. building material) exposed to water;
- exposure of waste in landfills to water.

Thus, when carrying out the CSA, the registrant needs to consider the time pattern of releases. This should be done by applying the following rules:

- Project the releases from the waste life stage into the year when marketing of the substance takes place, in order to take account of the stocking up processes (see Chapter R.17). Assume steady state: What is disposed of will be replaced with a new product containing the same substance.
- If applicable, include building material produced from residues of waste incineration into the release estimates from the waste life stage (e.g. for metals)
- Assume a landfill situation typical for construction waste (no capture of fugitive emissions, rain water and radiation access to the waste, waste water collection). Assume that the conditions are similar to outdoor use of construction material.
- M/I may need to consider other landfill situations as well (e.g. for manufacturing waste; or bio-reacting municipal landfills as long as existing in Europe)

The registrant also needs to consider, which fraction of his market volume enters into the waste life stage (fraction of waste life volume). The following differentiation can be made for a tier 1 release estimate:

- For substances manufactured into articles which are not used under release promoting conditions (see ERC 10b/11b) it can be assumed that 100% of M/Is market volume enters into waste treatment operations.
- For substances used in processing aids, the assumption which fraction enters into the waste life stage depends on whether the processing aid is disposed of to the waste water (e.g. water based cleaning agents) or released into the air (solvents) from the processing stage. After having assessed the earlier life-cycle stages in the CSA, M/I will have sufficient information to make a reasonable estimate on the fraction of the substance entering into the waste life stage.
- For substances in processing aids typically used in closed systems (e.g. motor oils, hydraulic fluids), for a Tier 1 exposure estimate it can be assumed that 85% to 95 % enters into the waste life stage, taking into account the losses over service life (see nota 5) to ERC 9b in Appendix R.16-1)
- For intermediates and substances reacting on use, only a minor fraction can be expected to enter into the waste life stage, since the substance is designed to be consumed in use. It should be assumed that usually less than 5% of the manufactured volume will enter into emissions including waste (see ERC 6 and 8d).

Regarding the spatial distribution of emission sources related to treatment of the fraction of substance that enters into the waste life stage (fraction of waste life volume), M/I can make the following assumptions:

- Treatment of municipal waste and related article waste streams: Treatment of municipal waste (including small industries) can be compared to the discharge of preparation in wide disperse use to the municipal sewage system. As also suggested in section R16.2.5.1 for re-

leases from indoor service life of articles, it can be assumed that the emissions from waste treatment operation are released from point sources to local air and water. These point sources are for example municipal waste incinerators, landfills, installations for milling end-of-service-life consumer equipment (vehicles, electric and electronic articles). The assumption in ERCs on diffuse emissions at the local scale ('town scenario') is that the local emission is 0.2% of the regional market volume of articles (fraction of main local source). The number of emission days is assumed to be 300 days, like for an industrial installation in continuous operation.

- Treatment of hazardous waste and other waste in non-municipal waste operations: To get a tier 1 exposure assessment started, the processes can be regarded as industrial point sources covered by ERC 1 to 7. This will lead to a very conservative release estimate due to the default of 100% regional emission (fraction of main source = 1) and 20 release days. However, wherever M/I has collected representative information on the overall number of installations in a typical region, the distribution of capacity and the way of operation (continuous or batch), he can overwrite the default with more realistic assumptions.
- Use of primary or secondary mineral waste in open applications (e,g. slags from incineration, crushed demolition material) as construction material would best be addressed by a regional scenario based on ERC 10a.

Table R.18-1: Pre-sets for the tier 1 exposure estimate from waste life stage[3]

	Fraction of substance volume entering into waste life stage *(= Fraction of waste life volume*)	Fraction of substance in waste treated in one local source (= *Fraction of main source from waste life volume*)	Emission days
Articles and cured preparations	1	0.002 for municipal treatment + disposal	300 or 365
Processing aids in closed systems	0.85 to 0.95	1	20
Processing aids in open systems	Follows from assessment of previous life cycle stages	1	20
Substances reacted on use	0.05	1	20

For some waste operations (incineration, solvent recovery), emission calculation modules are being developed by waste industries. M/I is advised to make himself aware on progress made in these developments that could help to replace the conservative release estimations based on ERCs with more realistic emission factors. Solvent balancing according to Directive 1999/13/EC, Annex III may be a useful tool in this context.

The table in appendix R.18.1 assigns ERCs to a selection of relevant waste treatment operations. In order to carry out an initial tier 1 exposure estimate, the fraction of main source in the selected ERC should be overwritten with the product of *the fraction of waste life volume* multiplied with the *fraction of main source for the treatment operation* (as indicated in Table R.18.1*)* Also the pre-set emission days can be adjusted accordingly. While at tier 1 assessment, processing of waste can be largely treated like any other industrial or professional processes, there are no specific ERCs yet available for incineration and land-filling. However, the next section also includes advice on a preliminary work-around for this problem.

[3] See Appendix R.16-1 for background of the figures given in this table

The subsequent exposure estimation and risk characterization is not different from assessment for other life-cycle stages, and thus does not need particular guidance in the current chapter (see chapter R.16).

R.18.5.2 Examples for treatment specific pre-sets

R.18.5.2.1 Emission from landfills

Although various models exist to predict releases from landfills, none of these models is sufficiently checked against reality to suggest substance specific release factors. It is therefore proposed either i) to assume landfills operated under the requirements of the EU landfill Directive are outside the scope of the CSA or ii) to treat substances in land-filled article-waste as if this was a prolonged service life (e.g. for construction and demolition waste). Option b) is based on the consideration that landfill of "inert" waste materials will go on in future, and that construction waste landfills are usually operated without top layer sealing. If option b) is to be applied: The release estimation would start from ERC 10a:

Fraction of waste life volume: 100%

- Fraction of main municipal source: 0.2%
- Release time: 365 days
- Sewage treatment plant: leachate is collected and disposed of in the municipal STP
- Annual release to air: 0.05%
- Annual release to waste water (before treatment): 3%

The releases from landfills and residues from waste incineration residues usually take place over a long time period, thus the load from the single waste batch is diluted in time. In order however to take account of the stocking up process of waste in landfills, the emission is projected into 1 year (accumulated over the waste life stage). The emission factors above assume a waste life stage under leaching conditions of about 20 years. If available, monitoring data may be a valuable source of information to refine these assumptions. The need for a long-term release assessment should be decided on a case-by-case basis, in particular for metals or organic substances that are persistent and toxic.

R.18.5.2.2 Emission from incineration and co-incineration

Modern incineration processes can be expected to achieve destruction rates of more than 99.99 %. For metals emission factors can be calculated from information available in EU Reference Document on Best Available Techniques for Waste Incineration (August 2006), By comparing average ranges of metal concentrations in municipal waste with average ranges of metal emission from municipal incinerators, the following conservative emission factors to air and water can be derived:

Table R.18-2: Emission factors for metals from municipal waste incinerators

	To air after abatement (controlled emission)	To water after abatement (controlled emission)
Hg	0.1	0.0002
Cd	0.002	0.0002

As	0.002	0.0002
Pb	0.002	0.0001
Co	0.002	
Ni	0.0003	0.0002
Cr	0.0003	0.0001

The emission factors for hazardous waste incineration, municipal waste incineration and co-incineration in industrial combustion plants do not need to be differentiated at tier 1. For municipal waste incineration the same pre-set as for land-filling should be applied (except for the emission factor). For hazardous waste incineration and co-incineration the complete pre-set for a local industrial site should be applied (ERC 1-7). It is assumed that co-incineration takes place in compliance with the EU Incineration Directive (2000/76/EC)

Municipal waste incineration

The release estimate should start from ERCxxx (to be developed)

- Fraction of waste life volume: 100%
- Fraction of main source: 0.2%
- Release time: 300 days
- Release to air: 0.01% [organic substance] and 0.2% [metals except mercury]

Hazardous waste incineration and Co-incineration

- Fraction of waste life volume: Depending on technical purpose of the substance; to be determined based on the emission during previous life-cycle stages.
- Fraction of main source: 100%
- Release time: 20 days
- Release to air: 0.01% [organic substance] and 0.2% [metals except mercury]

Recovery of slag from waste incineration

Regarding metals, the process aims to include the substance into a matrix (slag) or to filter it out. Land-filling of secondary waste from waste treatment is not further considered here, but assumed to be safe by definition. The fraction that leaves the incineration bound into a slag-matrix and which is likely to be used as construction material needs to be included in release estimates. The most appropriate ERC would be again 10a.

R.18.5.2.3 Emission from milling vehicles and electric/electronic goods

Dismantling and milling of vehicles, household appliances and electronic goods at the end of there service life is to be treated as an industrial source. The process aims at homogenization and pelletisation in order to allow for further separation. Dust may be formed and emission on water pathway could occur if swim-sink operations would by applied. ERC 3 is the most appropriate category since the substance is included in a matrix and the process aims at homogenization. Significant emission to air in form of dust can occur:

- Fraction of waste life volume: 100%

- Fraction of main municipal source: 0.2%
- Release time: 300 days
- Release to air: 0.5% [4]
- Release to local waste water: 0.2 %

Other waste operations

In the same way as here demonstrated for landfill, incineration and dismantling processes, the releases from other waste treatment operations can be estimated. If safe disposal cannot be demonstrated based on the ERC-pre-sets, further information needs to be collected. This includes OECD Emission Scenario Documents and the relevant EU BREF Documents (see appendix R.18-1). Also, some waste industries may prepare emission calculation tools and other information relevant to exposure from waste life stage to support Chemicals Safety Assessment at M/I and the communication down the chain.

[4] 30% air emission as in ERC 3 over-conservative for dismantling; to be adjusted to 0.5% based on the EU RAR on DEHP (*Matrix* Report 2006, UBA FKZ 204 67 456/RIVM Report no 60120006, Branch and product related emission estimation tool for manufacturers, importers and downstream users within the REACH system,2006)

Appendices

APPENDIX R.18-1: ENVIRONMENTAL RELEASE INFORMATION FOR 14 WIDELY APPLIED WASTE TREATMENT TECHNIQUES

Waste treatment techniques	Type[5]	Available reference documents	ERCs	Reasoning for selection of ERC
• Municipal waste incineration (including slags exposed to leaching) • Hazardous waste incineration in dedicated facilities (including slags exposed to leaching), operated according to the EU Waste Incineration Directive • Co-incineration in industrial facilities, operated according to the EU Waste Incineration Directive	D10 or R1 D10 R1	Reference Document on the Best Available Techniques for Waste Incineration, August 2006 (638 pages) Reference Document on Best Available Techniques for Large Combustion Plants, July 2006 (618 pages) → Co-combustion of waste and recovered fuels	./. 10a	No suitable ERC available for incineration processes yet; to be developed; Utilisation of incineration slags is well covered by ERC 10a on outdoor use of articles.
• Landfills operated according to the EU Landfill Directive; (construction and demolition waste only)	D1/D3/ D5/D12		10a	For a construction waste landfill without top-liner containment over operation time, outdoor use of construction articles with connection to sewer is the most suitable ERC.
• Oil-water separation and/or chemical/physical treatment of emulsions and/or aqueous overspray-sludge from spray painting	D9+ R12+	Reference Document on the Best Available Techniques in Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector, February 2003 (472 pages) → OECD ESD No 12: Metal Finishing	4	Substance processed based on its partitioning behaviour at industrial site, no chemical reaction. Wide range of emission factor possible.
• Chemical oxidation of aqueous waste from industrial processing	D9+ R12+		6b	Reactive processing of waste at industrial sites
• Chemical-physical treatment of metal- containing aqueous waste (e.g. precipitation, ion-exchange)	D9+ R12+		6b	Reactive processing of waste at industrial sites
• Shredder and other dismantling activities re-	R4		3	Similar to milling of solid materials as a process

[5] Waste treatment type according to Council Directive 91/156/EEC as incorporated into the revised EU Waste Directive (agreement between Council and Parliament in June 2008)

Waste treatment techniques	Type[5]	Available reference documents	ERCs	Reasoning for selection of ERC
lated to end-of-life vehicles, home appliances, electronic waste				step within production of granulates for solid preparations.
• Washing of drums	R12+reuse, R4	OECD ESD No … on transport and storage of chemicals (……)	4	Substance processed based on its partitioning behaviour at industrial site, no chemical reaction. Wide range of emission factor possible.
• Preparing waste fuels from waste	D13/R12		2	Mixing process at industrial sites
• Refining waste oils	R9	OECD ESD No. 10 Lubricants and Lubricant Additives	1	Similar to chemical or refinery processes in the manufacture of substances
• Regeneration of waste solvents • Brake fluid recovery	R2		1	Similar to chemical or refinery processes in the manufacture of substances
• Paper recycling	R3	Reference Document on Best Available Techniques in the Pulp and Paper Industry, December 2001 (509 pages) OECD ESD No 17 on Recovered Paper Mills (2006) OECD ESD No …. On Recycling Paper (….)	4 6b	Substance processed based on its partitioning behaviour at industrial site, no chemical reaction. Wide range of emission factor possible. If bleaching step involved, ERC 6b may be more appropriate
• Plastic Recycling	R3	OECD ESD No 3 (2004) on Additives in Plastic	3	Process similar to primary plastic compounding and conversion
• Battery recycling	R4		./.	Multi stage process, to be assessed case by case
• Recycling of photographic baths	R4	OECD ESD No. 5 (2004) , Photographic industry	6b	Reactive processing of waste at industrial sites

APPENDIX R.18- 2A: WASTE RELATED INFORMATION IN THE EXPOSURE SCENARIO FOR AN IDENTIFIED USE

1. Short title of Exposure Scenario	Sector of use [SU], Preparation category [PC], Process category [PROC], Article category [AC]
2. Description of activities/processes	
3. Duration and frequency	
4.1 Physical state	
4.2 Concentration	
4.3. Amount per activity	
5. Other operational conditions	• Fraction of substance entering into waste during the identified use; • Source and type of waste (e.g overspray; residues in containers;)
6. Risk management measures	
7. Waste related measures needed to ensure control of risk at the different life cycle stages (including articles at the end of service life)	Waste types from EWL and suitable waste treatment and/or recycling routes (including concentration thresholds if relevant) Reference to technical requirements for safe disposal operations, documented in BREF or waste legislation, Information about measures to control particular risks related to waste, e.g.: • Substance may significantly contribute to the halogen or metal content of a waste. Make sure that the input thresholds of the chosen waste treatment company are kept. • Substance as such or in waste should/must be disposed of ore recycled separately. • Do not dispose of into sewage system Apply suggested measures unless national legislation or local waste schemes require different measures.
8. Exposure prediction and reference to its source	
9. Guidance to DU to evaluate whether he works inside the boundaries set by the ES	

APPENDIX R.18- 2B - WASTE RELATED INFORMATION IN AN EXPOSURE SCENARIO FOR SPRAY PAINTING

1. Short title of Exposure Scenario	SU 19: Manufacture of building and construction PC 9: Coating PROC 7: Spraying in industrial setting
2. Description of activities/processes	Manual spray painting indoor in spray booth
3. Duration and frequency	
4.1 Physical state	Liquid (low viscosity)
4.2 Concentration	Max. 10% of the material (w/w)
4.3. Amount per activity	
5. Other operational conditions	• 5% to waste from residues in containers and spray equipment[6] • 50% overspray waste with conventional gun[7]; (35% HVLP spray gun)
6. Risk management measures	
7. Waste related measures needed to ensure control of risk at the different life cycle stages (including articles at the end of service life)	Dispose of waste paint or sludge from cleaning of equipment under *European Waste Code*[8] 0801 11 or 0801 13 to incineration. Dispose of aqueous sludge or suspensions containing substances > 10% [9] under *European Waste Code* 0801 15 or 0801 17 to incineration. Dispose of dry filters and other material contaminated with dried coating xyz > 10 % under *European Waste Code* 0801111 to incineration. The incineration should take place under conditions as defined in the EU BREF Documents on Waste Incineration (08.06) and Waste Treatment (08.06) and the EU Directive on Hazardous Waste Incineration (2000/76/EC). Apply suggested measures unless national legislation, local waste schemes or IPPC permit conditions state otherwise.
8. Exposure prediction and reference to its source	
9. Guidance to DU to evaluate whether he works inside the boundaries set by the ES	

[6] OECD ESD 11 Automotive spray (2004), ESD No on Coating Applications (…..) [under development]

[7] comments CEPE, 01.08.2007

[8] European Waste Catalogue (EWC 2002)

[9] Waste classification limit for an R41 substances according to annex III to Directive 91/689/EEC

APPENDIX R18-2C: EXPOSURE SCENARIO FORMAT FOR A WASTE OPERATION

1. Short title of Exposure Scenario	Waste Treatment Operation xyz [BREF titles or Categories from EU waste legislation]
2. Description of activities/processes	Types of waste in which the substance could be contained (for identified uses only) and suitable waste operations
3. Duration and frequency,	Not relevant
4.1 Physical state	Physical state of waste if relevant to control the risk
4.2 Concentration	Concentration of the substance in the relevant waste streams if relevant for suitability of waste treatment operation
4.3. Amount per activity	Amount of substance expected to enter into the relevant waste operations [not to be communicated down the chain]
5. Other operational conditions	Relevant processing parameters like temperature, oxygen-content of combustion air, residence time of substance;
6. Risk management measures	Particular waste gas or waste water techniques needed Particular occupational protection needed
7. Waste related measures needed to ensure control of risk at the different life cycle stages (including articles at the end of service life)	Amount and type of secondary waste: If not land-filled or incinerated, indicate recovery operation; [not to be communicated down the chain]
8. Exposure prediction and reference to its source	PECs to be expected [not to be communicated down the chain]
9. Guidance to DU to evaluate whether he works inside the boundaries set by the ES	