

EMISSION SCENARIO DOCUMENT

Emission Scenario Document for Product Type 6

Preservatives for Products during Storage

ABC

LEGAL NOTE

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Version	Changes

**Drafted by SCC GmbH on behalf of the German Umweltbundesamt
(Forschungskennzahl [3711 65 413])**

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Executive summary

The German Federal Environment Agency (UBA) has initiated the research and development project „Revision and Supplementation of the emission scenario document (ESD) Product-Type 6: Preservatives for Products during Storage“ (UBA project FKZ 3711 65 413), the aim of which is to further develop the evaluation method for the emission estimation of in-can preservatives (PT 6). The present draft for a revised ESD has been prepared by SCC GmbH on behalf of the German UBA.

PT6 biocidal products are used in many different end-products and as a consequence many different “normal uses of end-products” would need to be assessed. Due to the variety of such end-products, the existing ESD for PT6 from 2004 does not contain calculation sheets for the emission estimation of each end-product, but refers to the ESDs of other product-types (PTs). In 2011 it was already discussed on EU-level whether worst-case scenarios could be defined for each sub-category of in-can preservatives to simplify and harmonise their environmental assessment.

This revised ESD should give the possibility to cover the use of a PT6 biocidal product in several end-products on the basis of few worst case scenario(s) for each life cycle step. The life cycle steps are the incorporation of the in-can preservative into the end-product (i.e. formulation of the end-product) as well as the uses of the end-products (application and service life) within a sub-category.

On the basis of example calculations, worst-case scenarios for the different environment compartments have been defined and are presented in this report for the different sub-categories of in-can preservatives. In addition to the worst-case scenarios, calculation sheets for the estimation of the emission from other uses are provided as Appendices, so that the emission from other end-products (non-worst-case scenarios) can be calculated as well, by using this ESD.

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List of Abbreviations

A&B-tables	Estimates for the emission factors (fractions released) and estimates for the fraction of the main source and the number of days for emission, Appendix I of Vol. IV Part B (2015)
A.I.S.E.	International Association for Soaps, Detergents and Maintenance Products
a.s.	Active substance
BAM	Bundesanstalt für Materialforschung und –prüfung (Federal Institute for Materials Research and Testing)
BP	Biocidal product
BPD	Directive 98/8/EC concerning the placing of biocidal products on the market
BPR	Regulation (EU) 528/2012 concerning the making available on the market and use of biocidal products
CA	Competent Authority
CAR	Competent Authority Report
CEFIC	European Chemical Industry Council
CEPE	European Council of Paint and Printing Ink producers
Ctgb	College voor de toelating van gewasbeschermingsmiddelen en biociden (Board for the Authorisation of Plant Protection Products and Biocides)
DEPA	Danish Environmental Protection Agency
EC	European Commission
ECHA	European Chemicals Agency
ERA	Environmental risk assessment
ESD	Emission Scenario Document
FEICA	Fédération Européenne des Industries de Colles et Adhésifs (Association of the European Adhesive & Sealant Industry)
FTE	Full-time equivalent
HPVC	High production volume chemical
IHCP	Institute for Health and Consumer Protection
JRC	Joint Research Centre
MC	Main category
MOTA	Manual of Technical Agreements of the Biocides Technical Meeting

MS	Member state
Msperc	Realistic worst case estimate of the amount of a substance used per day at a typical site
PRTR	Pollutant Release and Transfer Register
PT	Product-type
REACH	Regulation (EC) 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
RIVM	Rijksinstituut voor Volksgezondheid en milieu (National institute for public health and the environment)
RMM	Risk mitigation measure
RMS	Rapporteur Member State
SoC	Substance of concern
spERCs	Specific Environmental Release Categories
TAB	Technical Agreements for Biocides
TEGEWA	Association for textile auxiliaries (TExtilhilfsmittel), tanning agents (GErbstoffe) and detergent raw materials (WASchrohstoffe)
TGD	Technical Guidance Document on Risk Assessment
TM	Technical Meeting
UBA	Umweltbundesamt (German Federal Environment Agency)
UC	Use category
Vol. IV Part B	ECHA (2015): Guidance on the BPR: Volume IV Environment, Part B Risk Assessment (active substances)

1. Introduction

1.1 Background

Biocidal products of product-type 6 are used as in-can preservatives¹ for the preservation of manufactured products, other than foodstuffs, feeding stuffs, cosmetics or medical products or medical devices by the control of microbial deterioration to ensure their shelf life.

In- can preservatives can be used in washing and cleaning fluids, paints and coatings, in the production of paper, textiles and leather, in metalworking fluids, in fuels, in glues and adhesives and in other products to be preserved during storage. Furthermore, in-can preservatives are widely used in plant protection products. However, this use is within the scope of Regulation (EC) No 1107/2009 (Regulation concerning the placing of plant protection products on the market) and therefore outside the scope of the BPR.

One objective of the Regulation (EU) No 528/2012 (BPR) is to provide EU-wide rules for the assessment of biocidal active substances and biocidal products.

The BPR implements an authorisation process for biocidal products containing active substances listed in the Union list of approved active substances (Art. 9(2)) and Annex I. Active substances may be added to the Union list of approved substances after undergoing an assessment of the risks they pose to the users of the biocides, the general public and the environment. For the required environmental risk assessment, Environmental Emission Scenario Documents (ESDs) provide a tool for the assessment process, and a methodology for estimating the quantities of active substances which may be released to the environment during the various stages of a biocidal product's lifecycle.

According to Annex VI of the BPR the risk assessment shall cover the proposed normal use of the biocidal product, together with a realistic worst-case scenario including any relevant production and disposal issues (Annex VI, paragraph 14).

PT6 biocidal products are used in many different end-products and as a consequence many different "normal uses of end-products" would need to be assessed. The "Background Document for Discussion of Emission Scenarios for biocides used as in-can preservatives (PT6)" prepared by Poland (TMI2011_ENV-item5c_Exposure assessment for PT6) initiated a discussion on EU level whether worst-case scenarios could be defined for each sub-category of in-can preservatives to simplify and harmonise their environmental assessment.

This revised ESD tries to cover with one or few worst-case scenario(s) for each life cycle step all possible "normal uses" of a biocidal product, which is the incorporation of the in-can preservative into the end-product (formulation) as well as the uses of the end-products (application and service life) within a sub-category.

On the basis of example calculations worst-case scenarios for the different environment compartments have been defined and presented in this report for the different sub-categories of in-can preservatives. In addition to the worst-case scenarios, calculation sheets for the

¹ According to the BPR the definition of product-type 6 is: "Preservatives for products during storage" instead of the previous definition "in-can preservatives" (BPD 98/8/EC). The previous name "in-can preservatives" is used as a synonym in the present document since the project started under the rules of the BPD 98/8/EC before the BPR has been implemented. Furthermore, the name "in-can-preservative" is a definition which is closely linked to PT6, well known by all parties and the shorter name streamlines the wording of the ESD for PT6.

estimation of the emission from other uses are provided as Appendices, so that the emission from other end-products (non-worst-case scenarios) can be calculated as well, by using this ESD.

The discussion whether and how aggregated exposure from different use scenarios should be taken into account is still ongoing. The **guidance on aggregated environmental exposure assessment** was at the final stage of preparation at the date of finalisation of the ESD. Please refer to the guidance related ECHA webpage² for the publication of the guidance, which will contain a specific chapter on PT 6.

The existing emission scenarios considered are listed in chapter 1.4.

At the beginning of the project the available draft CARs provided by UBA were evaluated to see how the PT6-substances have been assessed so far. Furthermore, a survey was started to retrieve specific information regarding PT6 substances and their life cycle from the industry as well as from the authorities.

The aim of this revised ESD is to set up methods for the estimation of the emission of in-can preservatives to the primary receiving environmental compartments. The calculation of PEC values using environmental interactions, for example movement of emissions to secondary environmental compartments (e.g. from soil to groundwater) is considered to be outside the scope of this ESD.

However, the refinement options agreed for the PTs on which basis the current ESD was developed (e.g. degradation of the preservative in soil by direct or indirect release during the service life of the end-product) should also apply to the emission estimation provided in the present PT 6 ESD.

Disclaimer: The present ESD for PT6 describes the current status of the emission estimation for the different sub-categories. ESDs are living documents; since the product-type 6 consists of several different scenarios of various PTs, it is possible that scenarios or default values might be changed in future. These changes and amendments are then relevant for the PT6 ESD too. Such information is normally described in the latest version of the TAB (previous MOTA) or it can be found in amended (new) ESDs of the other PTs, if available. It is advised that the ESD will be updated regularly to reflect new information.

1.2 Structure of the document

This ESD is divided in the following Chapters:

- Chapter 1: Overview on the background, the structure of this document, the sub-categories covered, the relevant sources of information and the definition of parameter types
- Chapter 2: Information concerning the assessment of the exposure during the production of the active substance and the biocidal product (in-can preservative) as well as information on the waste stage. In addition general information on the

² <https://echa.europa.eu/guidance-documents/guidance-on-biocides-legislation>

emission during the incorporation (formulation) of the biocidal product into the products to be preserved is provided

- Chapter 3: Emission scenarios of the in-can preservatives for the different sub-categories: incorporation of the in-can preservative in the products to be preserved (end-products), application and service life of the end-products.
- Chapter 4: Cumulative Risk assessment and Aggregated Environmental Exposure Assessment.
- Chapter 5: References
- Appendices providing the calculation sheets for the different sub-categories

For some of the available emission scenarios a market penetration can be taken into account. ECHA has recently provided a discussion paper regarding the revision of the market share factors for different product-types. Since the discussion within the member states is still ongoing, this document is not yet finalised.

1.3 Sub-categories in Product-Type 6

Since in-can preservation is needed for a great variety of different end-products, many industries are affected and different sub-categories of in-can preservatives are distinguished. The following numbering of the sub-categories has been agreed at the TM IV 08 (MOTA v.6, 2013, page 46):

Table 1: Sub-categories in PT 6 according to MOTA v.6 (2013)

Sub-category	Description
6.1	Washing and cleaning fluids and human hygienic products
6.1.1	Washing and cleaning fluids (human hygienic products)
6.1.2	Washing and cleaning fluids (general) and other detergents
6.2	Paints and coatings
6.3	Additives used in paper, textile and leather production
6.3.1	Additives used in paper production
6.3.2	Additives used in textile production
6.3.3	Additives used for leather production
6.4	Metal working fluid
6.4.1	Lubricants
6.4.2	Machine oils
6.5	Fuel
6.6	Glues and adhesives

MOTA v.6 (2013), p. 46

The numbering and description of these sub-categories were also used in this ESD with the exception of sub-category 6.1. Sub-category 6.1 was re-named from “washing and cleaning fluids, human hygienic products and detergents” into “detergents and cleaning fluids” since most human hygienic products fall under the cosmetic regulation ((EC) 1223/2009) and in-can

preservation of cosmetic products is outside the scope of the BPR (Article 2(2); MOTA v.6, 2013, p. 47). The “human hygienic products” were therefore removed from this sub-category.

However, if a specific use requires that an environmental exposure assessment has to be performed for a human hygienic product, the respective calculation sheets for human hygienic products as provided in Appendix 3.1 could be used.

The following PT 6 sub-categories are covered in this ESD:

Table 2: Sub-categories in PT 6 covered in this ESD

Sub-category	Description
6.1	Detergents and cleaning fluids
6.2	Paints and coatings
6.3	Additives used in paper, textile and leather production
6.3.1	Additives used in paper production
6.3.2	Additives used in textile production
6.3.3	Additives used for leather production
6.4	Metal working fluids
6.5	Fuels
6.6	Glues and adhesives
6.7	Other

It is acknowledged that these tables only cover a small fraction of the products preserved. Other uses of preservatives involve concrete additives, plasters and putties, fillers and sealants, lithographic solutions, photographic emulsions, etc., etc. It is outside the scope of this document to present a conclusive list of all potential uses. If a specific use is to be assessed, it is advised to carefully consider if this use is covered by one of the sub-categories presented in Table 2. If additional calculations are needed, it is recommended to use agreed emission scenario documents developed for other PTs as much as possible, and adapt these where necessary (see further below).

The aim of the project is to define worst-case scenario(s) per sub-category in order to cover with one or few assessment(s) all possible uses within a sub-category. This is of major importance for PT 6 products since many different end-products need to be considered and the applicants for PT 6 products or active substances have often no detailed knowledge on the products preserved. A clustering of products on sub-category level is therefore required.

If applicable, both tonnage- and consumption-based scenarios are presented in order to define the worst-case scenario.

The currently used ESD for PT 6 (DG ENV/RIVM, 2004) builds up the basic concept but there are missing information and calculations. Nevertheless, for almost all PT 6 sub-categories ESDs from other product-types already exist (e.g. PT 2, PT 7, PT 9, PT 10) which are the basis for the emission calculations provided in this revised ESD.

The emission pathways for in-can preservatives for the life cycle stages formulation, application, service life and waste stage are reflected in respective emission scenario documents developed for other PTs. However, such already existing ESDs cannot be used for

the assessment of in-can preservatives without certain adaptation. Adaptation is needed taking into consideration the generally low concentrations of in-can preservatives in the end-products and the fact that most uses of in-can preservatives are wide dispersive and that their service life is limited to the shelf life of the end-product in the can. Adaptations need to be made to the emission factors for the tonnage-based approach, if applicable to the market penetration factor or degradation of the in-can preservative during the shelf life of the end-product. In addition it must be distinguished between fast and slow reacting substances: while fast reacting in-can preservatives may have disappeared by the end of the shelf-life, slow reacting in-can preservatives can be expected to be present to a great extent at the end of the shelf-life of the end-product. Although the industry survey has indicated that most of the used in-can preservatives are rather slow reacting substances to be used for long-term preservation also fast reacting substances are used as in-can preservatives.

1.4 Sources of information

- ▶ Existing models and other ESD relevant sources
- ▶ Evaluation of draft CARs provided by UBA (see Appendix 1 for further information)
- ▶ Evaluation of questionnaires sent to the authorities and industry (2012, see Appendix 1 for further information)

1.4.1 Existing models and other ESD relevant sources of information

The following documents are the basis for this revised ESD:

- ▶ EC (2003): TGD Part II. Technical Guidance Document (TGD) in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances and on Commission Regulation (EC) No. 1488/94 on Risk Assessment for existing substances and on Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market.
- ▶ ECHA (2015): Guidance on the BPR: Volume IV Environment, Part B Risk Assessment (active substances)
- ▶ EC (2003): TGD Part IV. Technical Guidance Document (TGD) in support of Commission Directive 93/67/EEC on Risk Assessment for new notified substances and on Commission Regulation (EC) No. 1488/94 on Risk Assessment for existing substances and on Directive 98/8/EC of the European Parliament and of the Council concerning the placing of biocidal products on the market.
- ▶ European Commission DG ENV/RIVM (2004): Environmental Emission Scenarios for biocides used as human hygiene biocidal products (Product type 1).
- ▶ ESD for PT 2 (2001): van der Poel (2001), Emission Scenarios document for Product Type 2: Private and public health area disinfectants and other biocidal products (sanitary and medical sector)
- ▶ ESD for PT 2 (2011): JRC-IHCP (2011), Emission Scenario Document for Product Type 2 Private and public health area disinfectants and other biocidal products
- ▶ HERA (A.I.S.E and CEFIC) (2005): Human & Environmental Risk Assessment on Ingredients of Household Cleaning Products: Guidance Document Methodology.
- ▶ European Commission DG ENV/RIVM (2004): Environmental Emission Scenarios for Biocides used as Film Preservatives (Product type 7).
- ▶ OECD (2013): OECD Series on Emission Scenario Documents Number 2. Revised Emission Scenario Document for Wood Preservatives, Paris, France.

- ▶ Migné, V. (2002): Supplement to the methodology for risk evaluation of biocides. Emission scenario document for biocides used as masonry preservatives (Product type 10). INERIS-BPno2.
- ▶ European Commission DG ENV/RIVM (2004): Supplement to the methodology for risk evaluation of biocides. Environmental Emission Scenarios for biocides used as In-can Preservatives (PT 6). TMI04-item5-PT6-doc
- ▶ OECD (2004): Emission Scenario Document on coating application via spray-painting in the automotive refinishing industry, Number 11.
- ▶ OECD (2009): Emission Scenario Documents on coating industry (Paints, Laquers and Varnishes). OECD Series on emission scenario documents Number 22.
- ▶ Tissier, C. & Migné, V. (2001): Supplement to the methodology for risk evaluation of biocides. Emission scenario document for biocides used in paper coating and finishing (PT 6, 7 & 9)
- ▶ ESD PT 12: European Commission DG ENV/RIVM (2003): Supplement to the methodology for risk evaluation of biocides. Harmonisation of Environmental Emission Scenarios for Slimicides (PT 12).
- ▶ Tissier, C., Chesnais, M. & Migné, V. (2001): Supplement to the methodology for risk evaluation of biocides. Emission scenario document for biocides used as preservatives in the textile processing industry (PT 9 & 18) INERIS-DRC-01-25582-ECOT-CTi-n01DR0176
- ▶ Tissier, C. & Chenais, M. (2001) Supplement to the methodology for risk evaluation of biocides. Emission scenario document for biocides used as preservatives in the leather industry (PT 9). INERIS-DRC-01-25582-ECOT-CTi-n01DR0165
- ▶ OECD (2006): Emission scenario documents on kraft pulp mills, OECD Series on Emission Scenario Documents, Number 15.
- ▶ OECD (2006): Emission scenario documents on non-integrated paper mills, OECD Series on Emission Scenario Documents, Number 16.
- ▶ OECD (2006): Emission scenario documents on recovered paper mills, OECD Series on Emission Scenario Documents, Number 17.
- ▶ OECD (2009): Emission scenario documents on pulp, paper and board industry, OECD Series on Emission Scenario Documents, Number 23.
- ▶ OECD (2004) Emission scenario documents on Textile Finishing Industry, OECD Series on Emission Scenario Documents, Number 7.
- ▶ OECD (2004): Emission Scenario Document in Leather processing. OECD Series on emission scenario documents number 8.
- ▶ ESD for PT 13: European Commission DG ENV/RIVM van der Aa (2003). Supplement of the methodology for risk evaluation of biocides: Harmonisation of Environmental Emission Scenarios for biocides used as metalworking fluid preservatives (Product type 13)
- ▶ OECD (2011): Emission Scenario Document on the use of metalworking fluids. Series on Emission Scenario Documents Number 28

1.5 Definition of parameter types and overview on the emission scenarios provided

The emission scenarios are presented in text and tables in this report. In the tables, the input and output data and calculations are specified, and units according to EUSES are used. The input and output data are divided into four groups:

- S data Set Parameter must be present in the input data set for the calculation to be executed (no method has been implemented in the system to estimate this parameter; no default value is set, data either to be supplied by the applicant or available in the literature).
- D Default Parameter has a standard value. Nevertheless, most defaults can be changed by the user.
- O Output Parameter is the output from another calculation.
- P Pick list Parameter value can be chosen from a „pick list“ of values.

In the following table the worst-case emission scenarios for the relevant life cycle steps are provided for each sub-category. The selection of a “worst-case scenario” is the result of example calculations, which were performed, if several scenarios for the same life cycle step within the same sub-category are available. The same input parameters were used for the calculations (e.g. concentration in the end-product, tonnage data). For the application of PT 6.1 for instance, five emission scenarios with a consumption-based approach are available. In the example calculations (see Appendix 3.1) these five scenarios were used for the emission estimation and the scenario with the highest emission was chosen as the worst case scenario. The break-even point was not considered in this comparison; the worst-case scenario was either defined for tonnage or for consumption-based scenarios. In case only one scenario was available, this is mentioned in the text relating to the respective scenario.

Table 3: Overview on main scenarios for each sub-category and for the relevant life cycle stage³

Life cycle stage	Approach	Scenario	Remark
PT 6.1 Detergents and cleaning fluids			
Formulation	Tonnage	Vol. IV Part B (2015), IC5/IC6, UC-9	--
Application	Tonnage	ESD PT2 (2011), Table 3	Disinfectants for sanitary purposes
	Consumption	ESD PT2 (2001), Table 3.9	Laundry scenario
PT 6.2 Paints and coatings			
Formulation	Tonnage	Vol. IV Part B (2015), IC14	--
Application	Tonnage	OECD ESD no. 22 (2009), figure 4.1	General public use of decorative paints
	Consumption	ESD PT10 (2002), Table 12, ESD PT 8 (2013) Table 4.1.1& 4.1.3; Table 4.3.9	Treating of a façade and surfaces by spraying or by brushing/rolling
Service life	Consumption	ESD PT10 (2002), ESD PT8 (2013) and the City scenario provided by Ctgb/NL	--
PT 6.3.1 Preservation of additives used in paper production			
Formulation	Tonnage	Vol. IV Part B (2015), IC12	--
Application	Consumption	OECD ESD no. 23	--
PT 6.3.2 Preservation of additives used in textile production			
Formulation	Tonnage	Vol. IV Part B (2015), IC13	--
Application	Consumption	OECD ESD no. 7	--
PT 6.3.3 Preservation of additives used in leather production			
Formulation	Tonnage	Vol. IV Part B (2015), IC7	--
Application	Tonnage	Vol. IV Part B (2015), A&B-tables	--
	Consumption	OECD ESD no. 8	--
PT 6.4 Metal working fluids			
Formulation	Tonnage	Vol. IV Part B (2015), IC8, UC-29 and UC-35	--
Application	Tonnage	Vol. IV Part B (2015), A&B-tables	--
	Consumption	--	In the refinement of the ESD for ESD for PT 13 (2015), a proposal for a revised ESD was made.
PT 6.5 Fuels			

³ The break-even point was not considered in the comparison.

Formulation	Tonnage	Vol. IV Part B (2015), IC9, UC-27 and UC-28	--
Application	--	--	To be prepared in future, subject for further research.

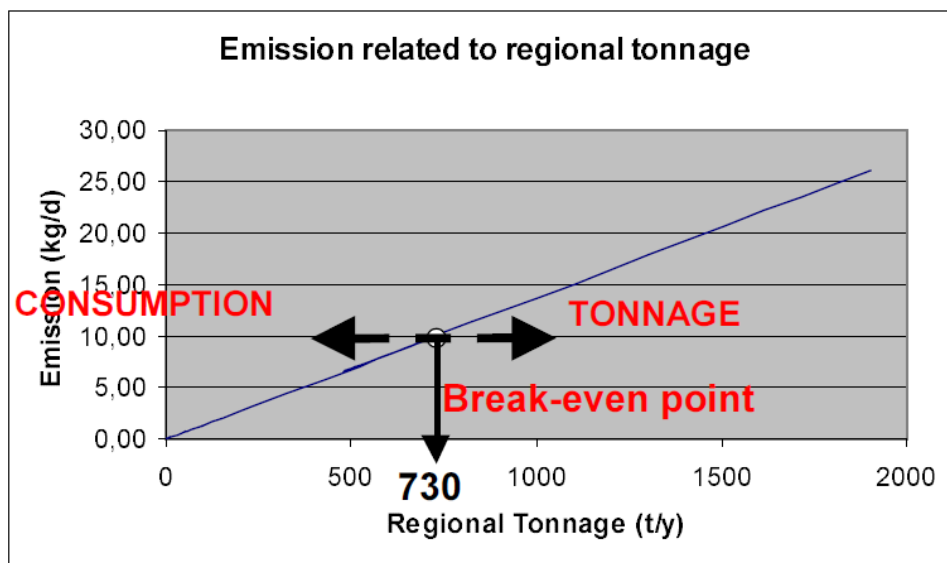
PT 6.6 Glues and adhesives⁴

Formulation	Tonnage	Vol. IV Part B (2015), IC0, UC-2	--
Application	Tonnage	Vol. IV Part B (2015), IC0, UC-2	--

For diffuse emissions the break-even point calculation as provided by RIVM (van der Poel & Bakker; 2001) can be used to decide whether the consumption- or the tonnage-based approach is more appropriate.

The comparison of the tonnage- versus the consumption-approach is described in detail in Appendix 2 of the RIVM report (van der Poel & Bakker; 2001), page 257ff. The following illustrates the estimation of the break-even point.

Figure 1: Estimation of the break-even point



Source: RIVM (van der Poel & Bakker; 2001)

⁴ Note that a decision was taken at WG meeting level that no emission should be calculated for these uses (please refer to section 3.6 for further details).

2. Preservatives for products during storage (PT 6)

2.1 Manufacturing of the active substance and the biocidal product

According to the BPR, information on the manufacturing process of the active substance and on the exposure associated with production and formulation of the biocidal product has to be provided by the applicant for the active substance in Annex II/2.8 and for the biocidal product in Annex III/7.10.2 of the dossier.

The emissions from industrial processes are regulated in many EU member states under national legislations and therefore need not to be considered in biocide specific emission scenarios.

Nevertheless the authorities request in accordance to the BPR that information on the manufacture of the active substance and the biocidal products has to be submitted. However, such information would mean descriptions of the respective processes and a qualitative assessment of possible environmental exposure but not the provision of measured or calculated data. Therefore, emission scenarios for the manufacture of the active substance and the formulation of the biocidal products do not need to be developed. However, the incorporation of the biocidal product (i.e. the in-can preservative) into the end-product (please refer to chapter 2.2) is taken into account for the different sub-categories. The application and the service life of the end-products are described in chapter 3 for each sub-category.

2.2 Formulation step of in-can preserved end-products

Emission estimation for the formulation step of in-can preserved products (= incorporation of the biocidal product into the end-product) should be performed according to Vol. IV Part B (2015) based on the A&B tables. Since the concentration of in-can preservatives in end-products are rather low, the specific emission factors need to be adapted as agreed at TMI2011⁵.

2.2.1 Description of use area

The incorporation of the biocidal product into the end-product to be preserved is similar for all sub-categories. Usually, in-can preservatives are added as early as possible in the production process to obtain early protection against contaminants.

In-can preservatives are added to the respective end-product in semi-closed or closed systems (according to information retrieved from a questionnaire).

2.2.2 Environmental release pathways

Emissions to waste water, soil and air (depending on the vapour pressure) may occur during this life cycle step. In the A&B tables (see Appendix 1, Vol. IV Part B (2015)) emission factors are provided for the formulation of in-can preserved end-products.

On a case-by-case basis, default values in the A&B table can be replaced by values that are more specific provided in spERCs but such a replacement needs the agreement of the WG.

Replaced default values agreed by the WG will be recorded in the TAB.

⁵ TMI2011_ENV-item5c_Exposure assessment for PT 6.

2.2.3 Emission scenario

The scenario provided in Vol. IV Part B (2015) is a tonnage-based approach. The release factors presented in table A2.1 of Vol. IV Part B are the basis for the emission estimation of the formulation stage. In addition to this Table A2.1 for two subcategories (PT 6.1 and PT 6.3) further A-tables are proposed to be used. These tables are presented in the chapter of the respective sub-category.

The following formula needs to be used according to Vol. IV Part B (page 41, formula 5, adapted):

$$E_{\text{local}_{\text{comp.}}} = \text{TONNAGE}_{\text{reg}} \times 10^3 \times F_{\text{mainsource}} \times F_{\text{comp}} / T_{\text{emission}}$$

$E_{\text{local}_{\text{comp.}}}$ = local emission during episode to compartment during formulation [kg.d⁻¹]

$\text{TONNAGE}_{\text{reg}}$ = total tonnage in a region (tonnage in the EU * 0.1; according to Vol. IV Part B (2015), 10% of the EU tonnage) [t]

$F_{\text{mainsource}}$ = fraction of the main local source [-]

F_{comp} = release fraction to the environmental compartment [-]

T_{emission} = number of emission days [d⁻¹]

The determination of the parameters F_{comp} , T_{emission} and $F_{\text{mainsource}}$ would result in unrealistic values if the total $\text{TONNAGE}_{\text{reg}}$ was used. The reason is that the concentration of in-can preservatives in end-products (products to be preserved) is rather low. $\text{TONNAGE}_{\text{reg}}$ should therefore be corrected according to RIVM (2001, van der Poel and Bakker) by considering the concentration of the active substance in the formulation as follows:

$$\text{TONNAGE}_{\text{reg}_{\text{form}}} = \frac{1}{F_{\text{chem}_{\text{form}}}} \times \text{TONNAGE}_{\text{reg}}$$

$\text{TONNAGE}_{\text{reg}_{\text{form}}}$ = total tonnage in a region for the formulation (= end-product) [t]

$F_{\text{chem}_{\text{form}}}$ = fraction of the active substance in the formulation (=end-product) [-]

The calculated parameter $\text{TONNAGE}_{\text{reg}_{\text{form}}}$ is used to determine the respective parameters (e.g. F_{comp} , T_{emission} and $F_{\text{mainsource}}$) of the A&B-tables.

The input parameter F_{comp} refers to the release into the specific environmental compartment. In Table A2.1 of Vol. IV Part B (2015), default values for this parameter are deduced for all sub-categories in PT6. Three main categories (MC) are distinguished:

MC 1b (dedicated equipment and (very) little cleaning operations)

MC 1c (dedicated equipment and frequent cleaning operations)

MC 3 (multi-purpose equipment)

Since MC 3 is the worst-case, only this main category is provided in Table 4 below, which reflects Table A2.1 of Vol. IV Part B (2015).

Table 4: Estimates for the emission factors (according to table A2.1, MC 3, Vol. IV Part B (2015))

Compartment	T (tonnes/year)	Vapour pressure (Pa)	Emission factors	
			All MC's	MC=3 ¹⁾
Air		<10		0.0025
		10-100		0.005
		100-1000		0.01
		≥1000		0.025
Wastewater	< 1,000 ≥ 1,000		0.02	
			0.003	
Soil			0.0001	

¹⁾ Default

Source: Vol. IV Part B (2015), p. 221

In addition, F_{comp} can be refined by specific Environmental Release Categories (spERCs) which are used under REACH.

The two additional input parameters "fraction of main local source" ($F_{mainsource}$) and "number of emission days" ($T_{emission}$) are provided for each sub-category in the respective B-tables of Vol. IV Part B (2015).

The calculation of the emission estimation for each sub-category is described in the respective chapter of each sub-category (please refer to chapter 3).

2.3 Disposal of the active substance and the biocidal product

According to Article 2 (9) of the BPR, the disposal of active substance and biocidal products should be carried out in accordance with the Union and national waste legislation in force. Emissions generated from the waste of the formulation of end-products as well as from the disposal of end-products are regulated in many EU countries by specific national legislations. The waste stage is therefore not considered in this ESD.

3. Specific emission scenarios for sub-categories in product-type 6

In the following the emission scenarios for each sub-category are described in separate sections, which all have the same structure.

3.1 PT 6.1 Preservation of detergents and cleaning fluids

3.1.1 Description of this use area

This sub-category covers in-can preservatives used to preserve detergents and cleaning products. Preservation of such products is carried out to prevent deterioration during storage in containers.

They are released to wastewater after private/professional or industrial use.

The use in human hygienic products is not considered in this document, since most of these products are outside of the scope of the BPR. However, if for specific uses emission estimation is required, the respective emission calculation sheets can be found in Appendix 3.1.

Detergents covered by this sub-category can be defined as *"any of numerous synthetic water-soluble or liquid organic preparations that are chemically different from soaps but are able to emulsify oils, hold dirt in suspension, and act as wetting agents"* (ESD PT 6; 2004)

The detergents used in lubricating oils belong to the sub-category PT 6.4 metal working fluids and are discussed in Chapter 3.4.

3.1.2 Life cycle stages

The following life cycle stages are considered for sub-category 6.1:

- ▶ Formulation of the preserved product (i.e. incorporation of the biocidal product into an end-product)
- ▶ Application phase (i.e. use of the end-product)

The service life of the end-product is not relevant for this sub-category, since the life cycle ends with the use of the end-product and its release into the sewer system.

3.1.3 Environmental release pathways

The preserved end-products in this sub-category are exclusively applied with water. Hence, the emission pathway is to the sewer system, i.e. wastewater will be released to the sewage treatment plant (STP).

In the previous version of the ESD for PT 6 (2004) it is stated:

The environmental emission from biocides used in washing and cleaning fluids and human hygienic products is very diffuse. After application the products will usually be rinsed or

washed off immediately or at a later stage. As a worst-case it is assumed that 100% is discharged to the sewage treatment plant (Vol. IV Part B (2015), IC5&IC6 in EC 2003a)⁶.

The only relevant primary receiving compartment is therefore the sewage treatment plant.

3.1.4 Emission scenario

Two life cycle stages have to be considered for PT 6.1 (formulation and application of the end-product). For the formulation step only a tonnage-based approach is taken into account in this revised ESD whereas for the application phase a tonnage as well as a consumption-based approach is presented. The derivation of the local emission factors to the respective compartments (air, wastewater, soil) during formulation is described in chapter 2.2.3.

Example calculations have been performed using the cited scenarios below. The calculation sheets for each scenario of the application phase are enclosed in Appendix 3.1. The emission estimation of the formulation step is based on the information provided in chapter 2.2.

For the application phase (i.e. the use of the end-product), the scenarios listed below were considered to cover the in-can preservation of detergents and cleaning fluids used in private, industrial and institutional sectors. The selected scenarios presented in section 3.1.4.2 represent the worst-case tonnage-based and worst-case consumption-based and covers all the other scenarios listed below.

Emission scenarios covering the use of preservatives in detergents and cleaning fluids (application phase. i.e. use of end-product)

Tonnage-based

- ▶ ESD for PT 2 (2011) Table 3: Emission scenario for calculating the release of disinfectants used for sanitary purposes based on the annual tonnage applied (Van der Poel 2001).

Consumption-based

- ▶ ESD for PT 2 (2011) Table 2 Emission scenario for calculating the release of disinfectants used in industrial areas.
- ▶ ESD for PT 2 (2011) Table 4: Emission scenario for calculating the releases of disinfectants used for sanitary purposes based on average consumption (Van der Poel 2001).
- ▶ ESD for PT 2 (2001) Table 3.9 Emission scenario for calculating the release of disinfectants used for doing biologically contaminated laundry from hospitals in washing streets.
- ▶ Emission scenario for non-professional laundry use provided in a PT 6 draft CAR (2010; evaluated by Danish EPA).

For detergents and cleaning fluids only one tonnage-based scenario is available, while for the consumption-based approach the scenario for which the highest emission to wastewater was calculated, has been chosen as worst-case. Both scenarios are presented in the following sections.

⁶ Vol. IV Part B (2015) Part II

Emission scenarios covering the use of preservatives in human hygiene biocidal products (application phase. i.e. use of end-product)

Although it was decided (meeting at the UBA in May 2013) to take the human hygienic fluids not into account, the relevant emission calculation sheet from the ESD for PT 1 is enclosed in Appendix 3.1 and could be used, if required.

Tonnage-based

- ▶ ESD for PT 1 (2004) Table 4.1 Emission scenario for calculating the release of disinfectants used in human hygiene biocidal products (for private use) based on the annual tonnage applied (as described in IC5&6 in Vol. IV Part B (2015)).

Consumption-based

- ▶ ESD for PT1 (2004) Table 4.2 Emission scenario for calculating the release of disinfectants used in human hygiene biocidal products (private use) based on an average consumption for products containing the biocide.
- ▶ ESD for PT1 (2004) Table 4.5 Emission scenario for calculating the release of disinfectants used for skin and hand application in hospitals based on an average consumption.

3.1.4.1 Formulation

The emission estimation for the formulation process of the detergents and cleaning fluids is calculated according to Vol. IV Part B (2015), IC5 (amateur)/IC6 (professional), UC 9: Cleaning/washing agents and additives. For further information please refer to chapter 2.3.

The equation for the estimation of the daily emission is:

$$E_{local_{comp.}} = TONNAGE_{reg} \times 10^3 \times F_{mainsource} \times F_{comp}/T_{emission}$$

TONNAGE_{reg} is calculated based on the tonnage data provided by the applicant. The parameters F_{mainsource}, T_{emission} and F_{comp} are derived from the respective A&B tables of Vol. IV Part B (2015).

TONNAGE_{reg_{form}} was used to estimate the fraction of the main source and the number of emission days (according to the ESDs for biocides [RIVM, 2001]).

For the emission factors please refer to Table 5. The input parameters from the respective B-table are summarised in Table 6. Further information regarding the formulation step is provided in chapter 2.2.

Table 5: Estimates for the emission factors for IC 5: Personal/Domestic (according to Table A2# for UC = 9 (cleaning/washing agents) and UC15 (cosmetics), Vol. IV Part B (2015))

Compartment	Emission factors			
	Regular powder	Compact powder	Liquid	Unknown
Air	0.0002	0.0002	0.00002	0.0002
Wastewater	0.0001	0.00001	0.0009	0.0009
Solid waste	0.0073	0.0081	0.0032	0.0081

Source: Vol. IV Part B (2015), p. 226

Table 6: Estimates for the fraction of the main source and the number of days for emissions for IC 5: Personal/Domestic (according to Table B2.1 and B2.3, Vol. IV Part B (2015))

Table B2.1 for non-HPVC		
T (tonnes/year)	f main source	No. of days
<100	1	2f * T
100-500	0.6	f * T
500-1,000	0.6	0.5f * T
≥1,000	0.4	300

Table B2.3 for HPVC		
T (tonnes/year)	f main source	No. of days
< 3,500	1	300
3,500-10,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300

Source: Vol. IV Part B (2015), p. 247 & 248

In addition, F_{comp} can be refined by specific Environmental Release Categories (spERCs) which are used under REACH. The association A.I.S.E. provided revised spERCs in October 2012 of which a relevant excerpt is provided in Appendix 2. The current spERCs are publically available on the webpage of A.I.S.E.. If spERCs should be used for the emission estimation the TONNAGE_{reg} needs to be corrected to the TONNAGE_{reg} of the formulated end-product.

Note that the formulation step is done in modern industries where the releases to the environment is expected to be minimal due to filtration systems for air and waste management. The main release pathway therefore will be to sewer system (i.e. "Wastewater" as noted in Table 5 above) and therefore to the STP.

3.1.4.2 Application phase

The use of detergents and cleaning fluids is similar to the use of disinfectants in the private and health area. Therefore, the Emission Scenario Document for Product Type 2 by van der Poel (2001) as well as the supplement to the ESD PT 2 (2011) was used as basis for the emission estimation during the application phase. The default values for daily consumption per

capita provided in the PT 2 scenario are based on the consumption of detergents. The use of these values for PT 6 assessment has been discussed and adjusted in WG-IV-2015 and WG-V-2015.

In the ESD for PT 2 (van der Poel; 2001) application rates for cleaning fluids are provided. These application rates could also be applied for the emission estimation for in-can preservatives used in washing and cleaning fluids. Since the provided application rate is not related to disinfectants it is an application rate covering cleaning fluids in general. Different scenarios covering preservation of several types of detergents are presented below.

Since both a tonnage-based and consumption-based scenarios are available for the application phase, the calculation of the “break-even point” can be used for the decision whether the consumption- or the tonnage-based approach is more appropriate. The following scenarios were identified as covering the preservation of detergents:

Tonnage-based

In the ESD PT 2 (2011) a tonnage-based scenario is described for calculating the release of disinfectants used in institutional areas. This scenario is appropriate to cover the tonnage-based approach and is therefore summarised in the following table:

Table 7: Tonnage-based scenario for calculating the release of detergents and cleaning fluids (according to ESD PT 2 (2011), Table 3)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
A) Relevant tonnage in the EU for this application	TONNAGE		[t yr ⁻¹]	S
Fraction for the region	F _{prodvol_{reg}}	0.1	[-]	D
B) Relevant tonnage in the region for this application	TONNAGE _{reg}		[t yr ⁻¹]	O
A + B) Fraction of the main source (STP)	F _{mainsource}	0.002	[-]	D
Fraction of substance disintegrated during or after application (before release to the sewer system)	F _{dis} ¹⁾	0	[-]	D
Fraction released to waste water	F _{water}	1	[-]	D
Number of emission days (institutional areas) ⁷	T _{emission}	260	[d]	D
Market penetration factor ²⁾	F _{penetr}	0.5	[-]	D
Output				
Emission rate to wastewater	E _{local_{water}}		[kg d ⁻¹]	O

⁷ Note that the if privat use area is assessed, the default value for T_{emission} should be set to 365 days.

Parameter/variable	Symbol	Value	Unit	Origin
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Calculation

$$E_{\text{local water}} = \text{TONNAGE}_{\text{reg}} * 10^3 * F_{\text{mainsource}} * (1 - F_{\text{dis}}) * F_{\text{water}} * F_{\text{penetr}} / T_{\text{emission}}$$

1) If the active substance degrades during or after the application this can be considered by the additional factor of F_{dis} .

2) According to TAB v1.3, ENV 22 a market share factor of 0.5 should be used in a Tier I assessment. This factor can be refined if supportive data are provided.

Consumption-based

Different consumption-based scenarios are available in the ESD PT 2 (2001) and the supplement ESD PT 2 (2011) as mentioned in chapter 3.1.4. For preservation of detergents, three possible areas of use are foreseen:

- PT 6.1.1 Preservation of human hygienic products
Use area: soaps, shampoos
- PT 6.1.2
 - A) Preservation of washing and cleaning fluids for professional use
Use area: detergents used in industry for large surfaces, in large scale laundry
 - B) Preservation of washing and cleaning fluids for non-professional use
Use area: detergents for dish washing, fabric washing, surface cleaning

These scenarios discussed and adjusted in WG-IV-2015 and WG-V-2015 are summarised in the following tables.

PT 6.1.1 Preservation of human hygienic products

Table 8 ESD PT 1 (2004), Table 4.2 Emission scenario for calculating the release of disinfectants used in human hygiene biocidal products (private use) based on an **average consumption** for products containing the biocide

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Number of inhabitants feeding one STP	N_{local}	10,000	[-]	D
Fraction released to wastewater	F_{water}	1		D
Active substance in product:				
A)	$C_{\text{form volume}}$		[g L ⁻¹]	S
B)	$C_{\text{form weight}}$		[g kg ⁻¹]	S
C) Consumption per inhabitant per day				
C1)	$V_{\text{form inh}}$	5.4	[mL d ⁻¹]	P
C2)	$Q_{\text{form inh}}$	5.4	[g d ⁻¹]	P
D) Consumption per application				
D1)	$V_{\text{form appl}}$	10	[mL]	P
D2)	$Q_{\text{form appl}}$	10	[g]	P
Number of applications	N_{appl}	3	[d ⁻¹]	P

Fraction of inhabitants using product N	Finh	0.05	[-]	p ²⁾
Market share of disinfectant ¹⁾	Fpenetr	0.5	[-]	D
Specific density of detergent	RHOform	1000	[kg m ⁻³]	D
Output				
Emission rate to wastewater	Elocal _{water}		[kg d ⁻¹]	
Model calculations				
C1 and A)				
$E_{local\ water} = N_{local} * F_{water} * V_{form\ inh} * C_{form\ volume} * F_{penetr} * 10^{-6}$				
C1 and B)				
$E_{local\ water} = N_{local} * F_{water} * V_{form\ inh} * RHO_{form} * C_{form\ weight} * F_{penetr} * 10^{-9}$				
C2 and A)				
$E_{local\ water} = N_{local} * F_{water} * Q_{form\ inh} / RHO_{form} * C_{form\ volume} * F_{penetr} * 10^{-3}$				
C2 and B)				
$E_{local\ water} = N_{local} * F_{water} * Q_{form\ inh} * C_{form\ weight} * F_{penetr} * 10^{-6}$				
D1 and A)				
$E_{local\ water} = N_{local} * N_{appl} * F_{inh} * F_{water} * V_{form\ appl} * 10^{-6} * C_{form\ volume} * F_{penetr}$				
D1 and B)				
$E_{local\ water} = N_{local} * N_{appl} * F_{inh} * F_{water} * V_{form\ appl} * 10^{-9} * RHO_{form} * C_{form\ weight} * F_{penetr}$				
D2 and A)				
$E_{local\ water} = N_{local} * N_{appl} * F_{inh} * F_{water} * Q_{form\ appl} / RHO_{form} * C_{form\ volume} * F_{penetr} * 10^{-3}$				
D2 and B)				
$E_{local\ water} = N_{local} * N_{appl} * F_{inh} * F_{water} * Q_{form\ appl} * C_{form\ weight} * F_{penetr} * 10^{-6}$				

¹⁾ F_{penetr}: The market penetration factor could be lowered, if the applicant provides reliable data, which shows that a reduction is justified. For disinfectants used in private households, a market share of 0.5 is used as "best guess".

²⁾ Please refer to the TAB.

PT 6.1.2 A) Preservation of washing and cleaning fluids for professional use (Use area: detergents used in industry for large surfaces, in large scale laundry)

Table 9: Emission scenario for calculating the release of preservatives applied in professional detergents used for laundry from hospitals in washing streets (according to ESD PT 2 (2001), Table 3.9)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Number of washing tubes (with disinfectant)	N _m	3	[-]	D
Capacity of washing tube (laundry)	Cap	8000	[kg d ⁻¹]	D
Amount of detergent per kg laundry	V _{product}	6 x 10 ⁻³	[L kg ⁻¹]	D
Concentration of active substance in detergent	C _{detergent}		[kg L ⁻¹]	S
Concentration reduction in washing process	F _{red}	0	[-]	D
Market penetration factor ⁸	F _{penetr}	1	[-]	D
Output				
Local release to waste water (without pre-treatment) - General purpose	E _{local,water}		[kg d ⁻¹]	O
Calculation				
$E_{local,water} = V_m * Cap * V_{product} * C_{detergent} * (1 - F_{red}) * F_{penetr}$				

Table 10: Emission scenario for calculating the release of preservatives used in professional detergents for surface cleaning in industrial areas

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Application rate of diluted detergent ¹⁾	V _{form}	0.1	[L m ⁻²]	D
Concentration of active substance in the concentrate detergent	C _{form}		[g L ⁻¹]	S
Fraction of concentrate in the diluted detergent	F _{conc}	0.01	[-]	D
Surface area to be cleaned (canteen as a worst case)	AREA _{surface}	2000	[m ²]	D
Number of applications per day	N _{appl}	1	[d ⁻¹]	D
Fraction of substance disintegrated during or after application (before release to the sewer system)	F _{dis}	0	[-]	D

⁸ A market penetration factor of 1 is appropriate for this professional use of detergents as the scenario is restricted to one activity on one place (agreed in ENV WG IV 2015).

Parameter/variable	Symbol	Value	Unit	Origin
Fraction released to waste water	F_{water}	1	[-]	D
Market penetration factor ²⁾	F_{penetr}	1	[-]	D

Output

Local release to waste water (without pre-treatment)	$E_{\text{local}_{\text{water}}}$		[kg d ⁻¹]	O
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Calculation

$$E_{\text{local}_{\text{water}}} = V_{\text{form}} * C_{\text{form}} * F_{\text{conc}} * \text{AREA}_{\text{surface}} * N_{\text{appl}} * (1 - F_{\text{dis}}) * F_{\text{water}} * F_{\text{penetr}} / 1000$$

¹⁾ This corresponds to 1 ml/m² of undiluted detergent (i.e. end-product) considering 100 times dilution of the detergent.

²⁾ A market penetration factor of 1 is appropriate for this professional use of detergents as the scenario is restricted to one activity in one place.

PT 6.1.2 B) Preservation of washing and cleaning fluids for non-professional use (Use area: detergents for dish washing, fabric washing, surface cleaning)

Table 11: Emission scenario for calculating the release of preservatives used in non-professional detergents for fabric washing

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Number of houses feeding one STP	N_{house}	4000	[-]	D
Number of laundry washes per household per day	N_{wash}	0.61	[d ⁻¹]	D
Fraction released to wastewater	F_{water}	1	[-]	D
Fraction of washes performed with liquid laundry detergents	F_{liquid}	0.6	[-]	D
Dosage of liquid laundry detergents	$\text{DOSE}_{\text{liquid}}$	0.075	[L]	D
Dosage of fabric softeners	$\text{DOSE}_{\text{fabricsoftener}}$	0.040	[L]	D
Active substance in the product	$C_{\text{form}_{\text{volume}}}$		[kg L ⁻¹]	S
Market penetration factor ⁹⁾	F_{penetr}	0.5	[-]	D
Output				
Local release to waste water per day	$E_{\text{local}_{\text{water}}}$		[kg d ⁻¹]	O
	$E_{\text{local}_{\text{water}}}$		[kg d ⁻¹]	O
Calculation				
$E_{\text{local}_{\text{water}}} = N_{\text{house}} * N_{\text{wash}} * F_{\text{water}} * C_{\text{form}_{\text{volume}}} * [(F_{\text{liquid}} * \text{DOSE}_{\text{liquid}}) + \text{DOSE}_{\text{fabricsoftener}}] * F_{\text{penetr}}$				

⁹⁾ According to TAB v1.3, ENV 22 a market share factor of 0.5 should be used in a Tier I assessment. This factor can be refined if supportive data are provided.

Table 12: Emission scenario for calculating the release of preservatives used in non-professional detergents for dish washing, non-professional (TGD IV/IC5)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Number of inhabitants feeding one STP	N_{local}	10,000	[-]	D
Consumption rate of detergent per inhabitant per day	$V_{form_{inh}}$	$2.9 \cdot 10^{-3}$	[L d ⁻¹]	D
Fraction released to wastewater	F_{water}	1	[-]	D
Active substance in the product	$C_{form_{volume}}$		[kg L ⁻¹]	S
Market penetration factor ⁹	F_{penetr}	0.5	[-]	D
Output				
Local release to waste water per day	$E_{local_{water}}$		[kg d ⁻¹]	O
	$E_{local_{water}}$		[kg d ⁻¹]	O
Calculation				
$E_{local_{water}} = N_{local} * V_{form_{inh}} * F_{water} * C_{form_{volume}} * F_{penetr}$				

Table 13: ESD PT 2 (2011), Table 4: Emission scenario for calculating the releases of preservatives used in detergents for sanitary purposes based on average consumption

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Number of inhabitants feeding one STP	N_{local}	10,000	[-]	D
Fraction released to wastewater	F_{water}	1	[-]	D
Concentration at which active substance is used	C_{form}		[kg kg ⁻¹]	S
Consumption per capita ¹⁾	Q_{form}	10	[g d ⁻¹]	D
Fraction of substance disintegrated during or after application (before release to the sewer system)	F_{dis}	0	[-]	D
Market penetration factor ²⁾	F_{penetr}	0.5	[-]	D
Output				
Local release to waste water	$E_{local_{water}}$		[kg d ⁻¹]	O
Calculation				

Parameter/variable	Symbol	Value	Unit	Origin
$E_{\text{local}_{\text{water}}} = N_{\text{local}} * Q_{\text{form}} * C_{\text{form}} * F_{\text{penetr}} * (1 - F_{\text{dis}}) * F_{\text{water}}$				

¹⁾ General purpose and lavatory must not be summed up by default but could be summed up in accordance with the intended use proposed by the applicant.

²⁾ F_{penetr} : The market penetration factor could be lowered, if the applicant provides reliable data, which shows that a reduction is justified.
For disinfectants used in private households a market share of 0.5 is proposed as default value in the ESD PT 2 (2011).

3.2 PT 6.2 - Preservation of paints and coatings

3.2.1 Description of this area of use

From the survey on the paint and coating industry it became evident that the main sector of use of in-can preservation seems to be the production of water based paints for indoor and outdoor use. As mentioned in "Gathering and Review of Environmental Emission Scenarios for Biocides" by Baumann et al (2000), *water-based paints are typically more prone to contamination and need an anti-microbial or biocide to act as an in-can preservative. In-can microbial growth or degradation occurs most frequently from contaminants, bacteria and yeast in the raw materials. The organic paint components act as the microbial food source, causing possible discoloration, gas generation, foul odours, coagulation, rheology changes and can corrosion.*

The substrates treated with paints and coatings are metal, mineral, synthetic substrates, textiles and wooden surfaces. Thus, the field of use of paints and coatings may be divided into two categories: Paints for buildings and decoration (professional and non-professional use) and industrial use (ESD PT 6, 2004).

According to the ESD for PT 7 (2004), paints, lacquers and varnishes are distinguished as follows:

- ▶ A paint is a pigmented material that, when applied as a liquid to a surface, forms, after a time, a dry adherent film.
- ▶ A lacquer is a coating which dries by evaporation of the solvent – a thin-bodied, quick-drying, coating material which forms a hard protective film.
- ▶ A varnish is a transparent coating material based essentially on resins or drying oil and solvent.

It should be noted that all three categories of products contain volatile and non-volatile components.

Paints and varnishes are applied for their decorative and/or protective function. Vol. IV Part B (2015), in IC-14 (EC 2003), distinguishes paints and varnishes. They may be used as pastes or powders. After physical or chemical processes they form a thin adherent film on the surface of the substrate. The treated substrates are mainly metal surfaces (motor vehicles, metal frames, furniture), wooden surfaces (construction elements, toys, furniture, frames) and miscellaneous surfaces (concrete, road marking paints, antifoulings). The field of use of paints and varnishes may be divided into two categories, i.e. paints for buildings and decoration (both professional and non-professional) and industrial use. Ingredients of paints and varnishes can be classified into the following main categories: binder, solvent, pigment, colorants, fillers and additives. The latter category, which forms less than 3% in the formulation, includes a.o. in-can and film preservatives (EC 2003).

'Coatings' is a term used to describe any material that may be applied as a thin continuous layer to a surface (Tissier et al. 2001). A UK project specifically focused on the subset of coatings accounted for by paints, lacquers and varnishes. These products are applied to surfaces for both decorative (colour, gloss or optical effects) and protective purposes (EA-UK 2002).

During the formulation stage the in-can preservative is added to paints and coatings. Next, for a longer period the product is left on the shelf. After application of the product, professionally as well as non-professionally, on average the product (paint or coating) has a long service life.

Waste treatment can be very variable; from disposal of the material with the product via the normal routings of municipal waste to stripping off the paint or coating from the material. Some articles (e.g. steel or aluminium) are recycled. Thus the emission of in-can preservatives in paints and coatings during industrial and private use may be estimated using the scenarios developed for the emission of other additives as described in the ESD for IC-14. The EA-UK (2002) report gives emission estimates per sector of the coating industry. The ESD developed for Masonry Preservatives (PT 10) and agreed upon within the EUBEES 2 Working Group, and the ESD for Wood Preservatives (PT 8) developed by the OECD presents descriptions of the use of paints or coatings in specific applications and thus they may also be used to estimate the emission of In-can Preservatives used in these specific products (ESD PT 6; 2004).

The emission scenarios provided in the ESD PT 10 only cover the application and service life stage of decorative paints and coatings for buildings. The ESD PT 8 solely covers wooden surfaces. The industrial use of preserved paints, coatings and lacquers, e.g. the use of preserved coatings in the automotive industry, is not covered. Neither the active substance evaluation (information received from draft CARs) nor the industry survey provides sufficient information to define a worst-case scenario for these uses.

For some industrial uses (e.g. use of coatings in the automobile industry) information on the emission estimation during application can be found in the OECD, ESD 22 (2009).

However, especially for these industrial uses it can be assumed that closed automated processes are involved and that specific national legislations are in place, which regulates the emission from the industrial use into the environment.

The service life of paints and coatings for buildings is covered by the provided worst-case scenarios for "painted house" (see below). For the application phase (including the release to the STP) different scenarios are available.

Biocidal active substances typically applied in these areas

According to Hoffman et al. (2000), the most important and typical in-can preservative chemicals for paints and coatings are isothiazolones, for instance CMIT (5-Chlor-2-methyl-2HH-isothiazol-3-on) and MIT (2-Methyl-2H-isothiazol-3-on), and formaldehyde donors.

The survey on the paint and coating industry from 2012 (n=7) confirms the conclusion of Hoffmann et al. (2000) that isothiazolones are the most used active substances for in-can preservation of paints and coatings. In Table 9 below typical concentrations of active substances used as in-can preservative in paints and coatings are provided which are based on information from industry (survey 2012).

Table 14: Typical concentrations of in-can preservatives in paints and coatings as reported in the survey in 2012 on the paints and coatings industry or published Assessment Reports.

Active substance	Concentrations
BIT	0.0075-0.3%
C(M)IT/MIT	0.0015-0.3%
MIT	0.0075-0.01%
MIT/BIT	≤ 0.05%
IPBC	0.01 – 1%

3.2.2 Life cycle stages

The following life cycle stages are considered for sub-category 6.2:

- ▶ Formulation of the preserved product (i.e. incorporation of the biocidal product into the end-product)
- ▶ Application phase (i.e. use of the end-product, for slow reacting substances which are still present in the end-product after their shelf life)
- ▶ Service life of the end-product (for slow reacting substances, which are still present in the end-product after their shelf-life)
- ▶

3.2.3 Environmental release pathways

During the application of the product by professional or private persons, emission to air, soil and waste water may occur.

During the service life of paints or coatings, the active substance(s) may remain in the dry film. Here they are exposed to rainfall and can be leached out according to the ESD for PT 10 (2002) into soil (countryside scenario) or into the STP via the sewer system (city scenario, NL, 2013). Leaching is not relevant for paints which are applied only indoor.

3.2.4 Emission scenario

For the paints and coatings the following life cycle steps needs to be considered:

- ▶ Formulation (tonnage-based)
- ▶ Application (tonnage-/consumption-based)
- ▶ Service life (consumption-based)

Several emission scenario documents are available. Some of them are recommended in the Background paper from Poland (2010) from which the following ESDs have been taken into account in the example calculations provided in Appendix 3.2:

- ▶ EU – TGD (EC 2003), Part IV, IC-14 Paints, lacquers and varnishes industry. Assessment of the environmental release of chemicals from the paints, lacquers and varnishes industry.
- ▶ ESD for Biocides used as Film Preservatives (PT 7), EC DG ENV / RIVM (2004).
- ▶ ESD for Biocides used as Masonry Preservatives (PT 10), INERIS Migné (2002).
- ▶ OECD (2013) ESD Number 2; Revised Emission Scenario Document for Wood Preservatives.

In addition to the above cited ESDs, the following documents are also considered:

- OECD (2009) ESD Number 22; Emission Scenario Documents on Coating Industry (Paints, Lacquers and Varnishes).
- The Netherlands (2013): Leaching from paints, plasters, and fillers applied in urban areas; final discussion during TMIII-2013 (city scenario, NL, 2013).

Example calculations have been performed for selected scenarios of the ESDs in order to define the worst-case scenario for each life-cycle stage. The results of these calculations are presented in Appendix 3.2. In the following only the worst-case scenarios are described.

3.2.4.1 Formulation

The emission estimation for the formulation process of paints and coatings is calculated according to Vol. IV Part B (2015), IC-14 Paints, lacquers and varnishes. The general equation for calculating of the daily emission should be used:

$$E_{\text{local}_{\text{comp}}} = \text{TONNAGE}_{\text{reg}} \times 10^3 \times F_{\text{mainsource}} \times F_{\text{comp.}} / T_{\text{emission}}$$

$\text{TONNAGE}_{\text{reg}}$ is calculated based on the tonnage data provided by the applicant. The parameters $F_{\text{mainsource}}$, T_{emission} and F_{comp} are derived from the respective A&B-tables of Vol. IV Part B (2015).

$\text{TONNAGE}_{\text{reg}_{\text{form}}}$ was used to estimate the fraction of the main source and the number of emission days for the end-product (according to the ESDs for biocides [RIVM, 2001]). The calculation of $\text{TONNAGE}_{\text{reg}_{\text{form}}}$ is described in chapter 2.3.2.

The emission factors are derived from the respective Table A2.1 as presented in Table 4. The B-tables B2.3 and B2.10 should be used for the derivation of the input parameters $F_{\text{mainsource}}$ and T_{emission} . The content of these two tables is summarized in the following Table 15:

In addition, F_{comp} can be refined by spERCs (please refer to Appendix 2.2). The newest spERCs were provided by the European association CEPE in October 2012. The current spERCs are publically available on the webpage of CEPE.

Table 15: Estimates for the fraction of the main source and the number of days for emissions for IC 14: Paints, Lacquers and Varnishes Industry (according to Table B2.3 and B2.10, Vol. IV Part B (2015))

Table B2.3 for HPVC		
T (tonnes/year)	f main source	No. of days
< 3,500	1	300
3,500-10,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300
Table B2.10 for non-HPVC		
T (tonnes/year)	f main source	No. of days
< 3,500	1	300
3,500-10,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300

Source: Vol. IV Part B (2015), p. 248 & 260

Note that the formulation step is done in modern industries where the releases to the environment is expected to be minimal due to filtration systems for air and waste management. The main release pathway therefore will be to sewer system and therefore to the STP.

3.2.4.2 Application

Tonnage-based scenarios for the application phase are provided in the ESD PT 7 (2004), but also in the OECD ESD No. 22 (2009). The OECD ESD No. 22 (2009) is more up to date, therefore the tonnage-based scenarios for decorative paints of the OECD ESD no. 22 (2009) have been chosen as adequate worst-case scenario.

For all release pathways via STP/surface water, a market penetration factor should be considered. Several in-can preservatives were notified as existing active substance and when taking the wide dispersive use of end-products into account, it is unrealistic to assume that e.g. all houses in a city are treated with a paint preserved with the same in-can preservative. The use of a market penetration factor not higher than 0.5 (as a best guess value) was already agreed for disinfectants (MOTA v.6, 2013) and should also be considered for paints and coatings.

Tonnage-based

The OECD ESD No. 22 (2009) distinguishes between professional and non-professional users. The emission to wastewater is only considered in the non-professional scenario. Hence, this scenario is selected as worst-case and is presented in the following table:

Table 16: Emission estimates for general public use of decorative paints (according to OECD ESD no. 22 (2009))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
EU-production volume of the in-can preservative for the use in decorative paints	TONNAGE		[t yr ⁻¹]	S
Quantity of the active substance in the coating	Q _{subst_in_coat}		[kg kg ⁻¹]	S
Fraction of EU production volume per region	F _{reg}	0.1	[-]	D
Number of emission days	T _{emission}	300	[d]	Vol. IV Part B (2015), Tables B4.4/B4.5
Fraction of the main source (STP)	F _{mainsource}	0.002	[-]	Vol. IV Part B (2015), Tables B4.4/B4.5
Volatiles¹⁰				
Direct losses (evaporation) fraction (%) of substance released to air	F _{init_coat, direct_loss, air}	93	[%]	S
Solids¹⁰				

¹⁰ The fate of the volatile and the solid fraction of decorative paints needs to be distinguished. The fractions given here refer to the respective fractions only, not to the amount of the initial product. Please see OECD No. 22, 4.3 "Emission estimates" and table 4.2 for further advice and typical compositions of paints on the market.

Parameter/variable	Symbol	Value	Unit	Origin
Brush residues fraction (%) of substance released to water	$F_{init_coat, brush_resid, water}$	1.5	[%]	S
Can residues fraction (%) of the initial product (substance released to waste)	$F_{init_coat, can_resid, waste}$	25	[%]	S
Output "Volatiles"				
Quantity of coating product produced per year	$Q_{init_coat_ann}$		[t yr ⁻¹]	O
release of substance to air during application	$E_{init_coat, air}$		[kg d ⁻¹]	O
Output "Solids"				
Quantity of coating product produced per year	$Q_{init_coat_ann}$		[t yr ⁻¹]	O
release of substance to water during application	$E_{init_coat, water}$		[kg d ⁻¹]	O
release of substance to waste during application	$E_{init_coat, waste}$		[kg d ⁻¹]	O
Calculation				
$Q_{init_coat_ann} = \text{Tonnage} / Q_{subst_in_coat}$				
$E_{init_coat, air} = Q_{init_coat_ann} * 1000 * F_{reg} * Q_{subst_in_coat} * (F_{init_coat, direct_loss, air} / 100) * F_{mainsource} / \text{Temission}$				
$E_{init_coat, water} = Q_{init_coat_ann} * 1000 * F_{reg} * Q_{subst_in_coat} * (F_{init_coat, brush_resid, water} / 100) * F_{mainsource} / \text{Temission}$				
$E_{init_coat, waste} = Q_{init_coat_ann} * 1000 * F_{reg} * Q_{subst_in_coat} * (F_{init_coat, can_resid, waste} / 100) * F_{mainsource} / \text{Temission}$				

Consumption-based

The scenarios described in the ESD for PT 10 should be used for the emission calculation during brush/roll application. The spray scenario has to be chosen from the OECD ESD PT 8 (2013) as it is the currently agreed scenario for spraying outdoors. It is not necessary to distinguish between losses due to spraying on wooden or mineral surfaces. In addition, in the ESD for PT 10 two locations of application are distinguished: the treatment of houses in a city, where the emission is discharged into the sewer system and afterwards to the sewage treatment plant, and the treatment of a house in the countryside, where a direct emission to soil occurs. In the countryside scenario only one house has to be taken into account, but in the city the simultaneous treatment of 3 houses should be considered according to a recent TM agreement (TMII2013). This number of 3 houses to be considered is based on a calculation of The Netherlands taking into consideration the total number of houses in a city and the duration of the service-life (see TMIV2012 for details).

It was decided (meeting with UBA in May 2013) that only the treatment of the façade should be considered in the scenario. The simultaneous treatment of the roof with the same paint containing also the same active substance seems to be unlikely.

Spray applications are mainly performed by professionals (OECD ESD PT 8, 2013), a differentiation between professionals and non-professionals is therefore not considered here.

The application by brush/roller can be performed by professionals and non-professionals (OECD ESD PT 10 (2002) and OECD ESD PT 8 (2013)). The loss during application by a non-professional is higher than for a professional and can consequently be regarded as worst-case since this use covers the application by professionals. The default values F_{drift} , F_{runoff} and F_{dep} used in Table 12 are described in chapter 4.4.5 of the OECD ESD no. 2 (2013) in detail.

The spraying and the brushing scenario are presented in Table 12 and 13:

Table 17: Emission scenario for calculating the releases from a façade treated by sprayer (according to the OECD ESD for PT 8 (2013))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Treated area of a façade per day	$AREA_{\text{façade}}$	125	[m ²]	D
Application rate of the product	$Q_{\text{application, product}}$		[L m ⁻²]	D/S ¹¹
Fraction of active substance in product	F_{ai}		[-]	S
Density of product	RHO_{product}		[kg m ⁻³]	D/S ¹¹
Fraction of product lost during application by spray drift	F_{drift}	0.1	[-]	D
Fraction of product lost during application due to runoff	F_{runoff}	0.2	[-]	D
Fraction of spray drift depositing to a 0.5 m wide soil band 1-1.5 m distant from the house (tier 2)	F_{dep}	0.33	[-]	D
Run off: soil volume adjacent to treated surface	$V_{\text{soil, runoff}}$	13	[m ³]	D
Drift: soil volume to which deposition occurs in tier 1	$V_{\text{soil, drift - tier 1}}$	13	[m ³]	D
Drift: soil volume to which deposition occurs in tier 2	$V_{\text{soil, drift - tier 2}}$	15	[m ³]	D
Bulk density of wet soil	RHO_{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
Local emission of active substance during application due to spray drift (tier 1 and tier 2)	$E_{\text{local spray_drift, façade}}$		[kg d ⁻¹]	O
Local emission of active substance during application due to runoff	$E_{\text{local runoff, façade}}$		[kg d ⁻¹]	O
<u>City</u>				

¹¹ If information on the application rate and the density of the product is not available, the default values of 0.25 L/m² and of 1.4 kg/L can be adapted.

Parameter/variable	Symbol	Value	Unit	Origin
Local emission of active substance during application (sprayer) to storm water	$E_{\text{local}_{\text{spray,façade,water}}}$		[kg d ⁻¹]	O
Countryside				
Local concentration at the end of the day of active ingredient in soil (distant to treated surface) resulting from application due to spray drift (tier 1 and tier 2)	$C_{\text{local}_{\text{soil,spray_drift_tier 1 or tier 2}}}$		[kg kg _{wwt} ⁻¹]	O
Local concentration at the end of the day of active substance in soil (adjacent to treated surface) resulting from application due to run off	$C_{\text{local}_{\text{soil,runoff}}}$		[kg kg _{wwt} ⁻¹]	O
Total concentration in local soil at the end of the day of application due to spray drift and run off	$C_{\text{local}_{\text{soil, total}}}$		[kg kg _{wwt} ⁻¹]	O

Calculation

$$E_{\text{local}_{\text{spray_drift,façade_tier 1}}} = \text{AREA}_{\text{façade}} * Q_{\text{application, product}} * F_{\text{ai}} * \text{RHO}_{\text{product}} * F_{\text{drift}} * 10^{-3}$$

$$E_{\text{local}_{\text{spray_drift,façade_tier 2}}} = \text{AREA}_{\text{façade}} * Q_{\text{application, product}} * F_{\text{ai}} * \text{RHO}_{\text{product}} * F_{\text{drift}} * 10^{-3} * F_{\text{dep}}$$

$$E_{\text{local}_{\text{runoff,façade}}} = \text{AREA}_{\text{façade}} * Q_{\text{application, product}} * F_{\text{ai}} * \text{RHO}_{\text{product}} * F_{\text{runoff}} * 10^{-3}$$

City:

$$E_{\text{local}_{\text{spray,façade,water}}} = 3 * (E_{\text{local}_{\text{spray_drift,façade}}} + E_{\text{local}_{\text{runoff,façade}}})$$

Countryside:

$$C_{\text{local}_{\text{soil,spray_drift_tier 1}}} = E_{\text{local}_{\text{spray_drift,tier 1}}} / (V_{\text{soil, drift - tier 1}} * \text{RHO}_{\text{soil}})$$

$$C_{\text{local}_{\text{soil,spray_drift_tier 2}}} = E_{\text{local}_{\text{spray_drift,tier 2}}} / (V_{\text{soil, drift - tier 2}} * \text{RHO}_{\text{soil}})$$

$$C_{\text{local}_{\text{soil_runoff}}} = E_{\text{local}_{\text{runoff,façade}}} / (V_{\text{soil,runoff}} * \text{RHO}_{\text{soil}})$$

$$C_{\text{local}_{\text{soil, total, tier 1}}} = C_{\text{local}_{\text{soil,spray_drift_tier 1}}} + C_{\text{local}_{\text{soil_runoff}}}$$

$$C_{\text{local}_{\text{soil, total, tier 2}}} = C_{\text{local}_{\text{soil,spray_drift_tier 2}}}$$

Table 18: Emission scenario for calculating the releases from a façade treated with roller or brush (according to the ESD for PT 10 (2002) and ESD PT 8 (2013))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Treated area of a façade per day	AREA _{façade}	125	[m ²]	D
Application rate of the product	Q _{application, product}		[L m ⁻²]	S
Fraction of active substance in product	F _{ai}		[-]	S
Density of product	RHO _{product}		[kg m ⁻³]	S
Fraction of product lost during application due to dripping	F _{dripping}			D
	professional	0.03	[-]	Table 7, ESD PT 10 (2002) or Table 4.11 ESD PT 8 (2013)
	amateur	0.05	[-]	D
Soil volume adjacent to surface treated	V _{soil}	13	[m ³]	D
Bulk density of wet soil	RHO _{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
calculated for amateur				
Local emission of active substance during application	E _{localdrip,roll,façade}		[kg d ⁻¹]	O
<u>City</u>				
Local emission of active substance during application (roller) to storm water	E _{localroll,façade,water}		[kg d ⁻¹]	O
<u>Countryside</u>				
Local concentration of active ingredient in soil (adjacent to treated surface) resulting from application	C _{localroll,façade,soil}		[kg kg _{wwt} ⁻¹]	O
Calculation				
$E_{localdrip,roll,façade} = AREA_{façade} * Q_{application, product} * F_{ai} * RHO_{product} * F_{dripping} * 10^{-5}$				
<u>City:</u>				
$E_{localroll,façade,water} = 3 * E_{localdrip,roll,façade}$				
<u>Countryside:</u>				
$C_{localroll,façade,soil(a)} = E_{localdrip,roll,façade} / (V_{soil} * RHO_{soil})$				

3.2.4.3 Service life

Consumption-based

For the service life two different locations (city and countryside) are distinguished. Since the service-life in the city is not addressed in the ESD for PT 10 (2002) or the ESD PT 8 (2013), the scenario developed by Ctgb (CA NL) for urban areas is used instead. This scenario was discussed on the Technical Meetings (TM) since TMII2012. The calculations in the following represent the final status for façades after endorsement at TMIII 2013. Defaults for indoor uses are available as well.

Furthermore, to cover also direct emissions to surface water, the scenario for a bridge over pond needs to be taken into account for a realistic worst-case emission estimation.

City Scenario

Table 19: Emission scenario for calculating the releases during service life from a façade (according to the city scenario from The Netherlands (2015))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Time for the initial assessment period	T_{initial}	30	[d]	D
Time for the longer assessment period (remaining service life)	T_{longer}	1795	[d]	D
Service life	$T_{\text{service-life}}$	1825	[d]	D
Number of houses in a city	N_{house}	4000	[-]	D
Fraction of the houses on which paints, plasters, or fillers are applied (market share = 1.0) ¹⁾	f_{house}	1	[-]	D
Cumulative quantity of an active substance, leached over the initial assessment period	$Q_{\text{leach,time1}}$		[kg m ⁻²]	S
Cumulative quantity of an active substance, leached over a longer assessment period	$Q_{\text{leach,time2}}$		[kg m ⁻²]	S
Area of the treated surface per house	AREA	125	[m ²]	D
Output				
Number of houses in a city recently treated	$N_{\text{house,initial}}$		[-]	D
Number of houses in a city treated more than 30 days ago	$N_{\text{house,longer}}$		[-]	D
Daily emission to the sewer	E_{local}		[kg d ⁻¹]	O
Calculation				
$N_{\text{house,initial}} = \frac{T_{\text{initial}}}{T_{\text{service-life}}} \times N_{\text{house}} \times f_{\text{house}}$				
$N_{\text{house,longer}} = \frac{T_{\text{longer}}}{T_{\text{service-life}}} \times N_{\text{house}} \times f_{\text{house}}$				

Parameter/variable	Symbol	Value	Unit	Origin
$E_{\text{local}} = \frac{(N_{\text{house.initial}} \times Q_{\text{leach.time1}} \times \text{AREA})}{T_{\text{initial}}} + \frac{(N_{\text{house.longer}} \times Q_{\text{leach.time2}} \times \text{AREA})}{T_{\text{longer}}}$				

¹⁾ Unless sufficiently substantiated with tonnage data

The market share factor (F_{house}) could be lowered, if the applicant provides reliable data, which shows that a reduction is justified. The emission during service life is only relevant on rainy days and not every day. Nevertheless, the model for the exposure assessment (e.g. EUSES 2.1.2) requires the calculated emission to the sewer system (E_{local}) on a daily basis.

Countryside scenario – House scenario, direct emission to soil

Table 20: Emission scenario for calculating the direct releases to soil during service life from a façade (according to OECD ESD no. 2 for PT 8 (2013), Table 4.15)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Leachable area of a façade proposed in the relevant scenarios	AREA _{façade}	125	[m ²]	D
Duration of the initial assessment period	TIME 1	30	[d]	D
Duration of the long-term assessment period	TIME 2	1825	[d]	D
Cumulative quantity of an active substance, leached over the initial assessment period	Q _{leach,time1}		[kg m ⁻²]	S
Cumulative quantity of an active substance, leached over a longer assessment period	Q _{leach,time2}		[kg m ⁻²]	S
Soil volume	V _{soil}	13	[m ³]	D
Bulk density of wet soil	RHO _{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
Concentration in local soil at the end of the initial assessment period	C _{localsoil,leach,time1}		[kg kg ⁻¹]	O
Concentration in local soil at the end of a longer assessment period	C _{localsoil,leach,time2}		[kg kg ⁻¹]	O
Calculation				
C _{localsoil(a),leach,time1} = Q _{leach,time1} * AREA _{façade} / (V _{soil} * RHO _{soil})				
C _{localsoil(a),leach,time2} = Q _{leach,time2} * AREA _{façade} / (V _{soil} * RHO _{soil})				

Bridge over pond scenario, direct emission to surface water

Table 21: Emission scenario for calculating the releases during service life from a bridge (according to OECD ESD no. 2 for PT 8 (2013), Table 4.15)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Leachable area of wood proposed in the relevant scenario	AREA _{bridge}	10	[m ²]	D
Duration of the initial assessment period	TIME1	30	[d]	D
Duration of the long-term assessment period	TIME2	1825	[d]	D
Cumulative quantity of an active substance, leached over the initial assessment period	Q _{leach,time1}		[kg m ⁻²]	S
Cumulative quantity of an active substance, leached over a longer assessment period	Q _{leach,time2}		[kg m ⁻²]	S
Water volume	V _{water}	1000	[m ³]	D
Output				
Concentration in local water at the end of the initial assessment period	C _{local,water,leach,time1}		[kg m ⁻³]	O
Concentration in local water at the end of a longer assessment period	C _{local,water,leach,time2}		[kg m ⁻³]	O
Calculation				
$C_{local,water(a),leach,time1} = Q_{leach,time1} * AREA_{bridge} / (V_{water})$				
$C_{local,water(a),leach,time2} = Q_{leach,time2} * AREA_{bridge} / (V_{water})$				

3.2.5 Status of the discussion on leaching during the service-life of wood preservatives and paints

Two workshops, dealing with the leaching of biocides, took place during the project period in 2013/2014. These workshops gave an overview on the current status of the on-going discussions on EU level concerning relevance, acceptance and use of leaching data. The first workshop (2nd EU Leaching Workshop on Wood Preservatives, Varese, 2013) dealt with the leaching of wood preservative (PT 8) while the second workshop (“Leaching behaviour of biocides from preservatives”, Berlin, 2014) was on the leaching of biocides in PT 7, 9 and 10. The results of these workshops are summarised in Appendix 4.

3.3 PT 6.3 Preservation of additives used in paper, textile and leather production

The sub-category PT6.3 contains three different sectors of industry for which different ESDs are available. The same structure as used for each of the sub-categories before is also applied for each sector of industry in the present sub-category.

3.3.1 PT 6.3.1 Paper production

3.3.1.1 Description of this area

In paper coating and finishing industry, biocidal substances are used for preservation of the paper (film preservatives) and for the preservation of pulp and other aqueous preparations involved in the paper production process (in-can preservatives). The in-can preservatives are intended to prevent preparations and coatings from microbial growth during their shelf-life.

In the previous version of the ESD for PT 6 (2004) the use of biocidal products as in-can preservatives in the paper production process is described as follows:

“Many of the biocides used in coating additives are used as In-can Preservatives and as Film preservatives. In-can Preservatives must not degrade quickly since they are often used to treat a coating, solutions or slurries of coating binders, speciality additives or the complete coatings that are stored in a tank for a period of time. They extend the shelf life as they retard microbial growth, including bacteria, fungi, and molds. Typically, preservatives would be needed to preserve the following types of preparations involved in paper coating: filler slurry, starch slurry, cooked starch, protein slurry, cooked protein, latex binders, coating thickeners, coating lubricants and pigmented coatings (PT 6, 7 & 9 in the TGD, EC 2003).

Biocides usually represent less than 1% of the sizing solution. Biocides used are ascorbic acid, ascorbates, benzoic acid, sodium benzoate, formic acid, glutardialdehyde, 2-bromo-2-nitropropanediol, isothiazolinones, bromohydroxy-acetophenone, dodecylguanidine hydrochloride. For In-can Preservatives the substance is not designed for fixation onto fibres and it can be assumed that no specific fixation occurs (Tissier and Migné, 2001).”

3.3.1.2 Life cycle stages

The following life cycle stages are considered for sub-category 6.3.1:

- ▶ Formulation of the preserved product (i.e. incorporation of the biocidal product into an end-product)
- ▶ Application phase (i.e. use of the end-product)

The end-product is used during the production process of the paper. It is assumed that the substance which is used as in-can preservative does not remain in the paper product (no fixation – see chapter above). Hence, the service-life is not relevant for this sub-category.

3.3.1.3 Environmental release pathways

The paper production is associated with high water consumption during the process and many process-integrated measures are in place to reduce the fresh water consumption, but also to reduce the pollution load of waste water. Therefore, it can be assumed that any waste water is

treated in an on-site/pre-treatment or off-site sewage treatment plant before it is released into the surface water.

3.3.1.4 Emission scenario

For paper application several scenarios are available:

- ▶ EU – TGD (EC 2003), Part IV, IC-12 Pulp, paper and board industry. Assessment of the environmental release of chemicals used in the pulp, paper and board industry.
- ▶ ESD PT 6, 7 and 9 (2001): Biocides used as preservatives in paper coating and finishing. Assessment of the environmental release of biocides used in paper coating and finishing.
- ▶ RIVM/NL and FEI/Finland ESD for biocidal products applied in the paper and cardboard industry (van der Poel and Braunschweiler 2002). This scenario is described in detail in the document Harmonisation of Environmental Emission Scenarios for Slimicides (product type 12) EUBEES 2003 (van der Aa and Balk 2003).
- ▶ OECD (2009) ESD No. 23. Emission Scenario Documents on pulp, paper and board industry.
- ▶ Vol. IV Part B, A&B-table for IC-12 Pulp, paper and board industry.

In addition, three further OECD emission scenario documents are available:

- ▶ OECD (2006) ESD No. 15. Emission Scenario Documents on kraft pulp mills.
- ▶ OECD (2006) ESD No. 16. Emission Scenario Documents on non-integrated paper mills.
- ▶ OECD (2006) ESD No. 17. Emission Scenario Documents on recovered paper mills.

Further information for refinement on a case-by-case basis can be found in the JRC Science and Policy Report on BAT for production of pulp, paper and board:

- ▶ Best Available Techniques (BAT 2015) Reference Document for the Production of Pulp, Paper and Board. Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control).

The last three ESDs mentioned above cover different phases of paper production. The OECD ESD no. 15 for instance was developed for craft paper mills, which are much more common in North and South America and the Scandinavian countries than in continental Europe. The two additional scenarios (no. 16 and no. 17) were designed for the emission estimation in non-integrated (i.e. without integrated pulp production) and recovered paper mills (using recycled paper). Many default values mentioned in these ESDs were derived from the Canadian paper industry and thus it seems questionable whether they can be used for Europe.

Example calculations performed by SCC according to the three OECD ESDs (15, 16, 17) resulted in daily emissions which were higher than calculations performed following the respective EU ESDs (using the same input parameters).

However, as already mentioned above, the three OECD ESD (15, 16, 17) are based on the experiences and default values from the Canadian paper industry which cannot be applied on the European paper industry in general. Therefore, though the three OECD ESDs provide the highest emission values and thus worst-cases, they are not further considered for the definition of worst-case scenarios. Nevertheless, the calculation sheets of the OECD ESDs no. 15, 16 and 17 are provided in Appendix 3.3 for the sake of completeness.

3.3.1.4.1 Formulation

The emission estimation for the formulation process of additives used in the paper production is calculated according to Vol. IV Part B (2015), IC12 pulp, paper and board industry.

The equation for the estimation of the daily emission is:

$$E_{\text{local,comp}} = \text{TONNAGE}_{\text{reg}} \times 10^3 \times F_{\text{mainsource}} \times F_{\text{comp}} / T_{\text{emission}}$$

$\text{TONNAGE}_{\text{reg}}$ is calculated based on the tonnage data provided by the applicant. The parameters $F_{\text{mainsource}}$, T_{emission} and F_{comp} are derived from the respective A&B tables of Vol. IV Part B (2015).

$\text{TONNAGE}_{\text{reg,form}}$ is used to estimate the fraction of the main source and the number of emission days (according to the ESDs for biocides [RIVM, 2001]). The calculation of $\text{TONNAGE}_{\text{reg,form}}$ is described in chapter 2.3.2.

For the emission factors (F_{comp}) please refer to Table 4. The input parameters from the respective B-table are summarised in the following Table 22. It is a summary of three B-tables of Vol. IV Part B (2015). The selection of the respective table depends on the tonnage of the active substance and the type of agent.

Table 22: Estimates for the fraction of the main source and the number of days for emissions for IC 12: Pulp, Paper and Board Industry (according to Table B2.1, B2.3 and B2.8, Vol. IV Part B (2015))

Table B2.1 for non-HPVC for UC ≠ 10 (Colouring agents) & 45 (Reprographic agents)		
T (tonnes/year)	f main source	No. of days
<100	1	2f * T
100-500	0.6	f * T
500-1,000	0.6	0.5f * T
≥1,000	0.4	300
Table B2.8 for non-HPVC for UC = 10 (Colouring agents) & 45 (Reprographic agents)		
T (tonnes/year)	f main source	No. of days
<5	1	20
5-50	1	60
50-100	1	2f * T
100-500	0.8	f * T
500-1,000	0.6	0.5f * T
≥1,000	0.4	300
Table B2.3 for HPVC		
T (tonnes/year)	f main source	No. of days
<3,500	1	300
3,500-1,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300

The formulation step is done in modern industries where the releases to the environment is expected to be minimal due to filtration systems for air and waste management. The main release pathway will therefore be to sewer system and subsequently to the STP.

3.3.1.4.2 Application phase

Consumption-based

Two different steps of the paper production process are considered in the ESDs for the application phase: the papermaking and the recycling step. Four ESDs were taken into account for the papermaking process, but the RIVM/FEI-scenario which is described in the ESD for PT 12 does not include a scenario for recycling, so that for this step only three ESDs could be considered.

Papermaking

The equations for the emission estimation in the scenario of the TGD Part IV (2003), IC-12 and the OECD ESD no. 23 (2009) are identical and consequently, the estimated emission is the same. The OECD ESD no. 23 (2009) offers the possibility to consider an on-site treatment of wastewater and sludge as a refinement option. In addition, it is stated in the ESD for PT 6, 7 & 9 (2001), that the average water consumption during the papermaking process is 23.9 m³/t paper and that therefore a higher discharge rate of the STP of 5000 m³ shall be considered. An adapted scenario based on ESD for PT 6, 7 & 9 (2001) scenario is selected as a worst-case. It is described in the following:

Table 23 ESD PT 6, 7 & 9, EUBEEES (2001), Table 10: Emission scenario for calculating the release from drying sections after size pressing and coating

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Quantity of coated paper produced per day (section 4.1, Table 3 of the ESD)	Q _{paper}		[t d ⁻¹]	P/S
Quantity of active substance applied per tonne of paper for each application step	Q _{active}		[kg t ⁻¹]	S
Evaporation rate (Table 9 of the ESD by taking medium volatility as a standard)	F _{evap}		[-]	S/P
Decomposition rate during drying	F _{decomp}	0	[-]	S/D
Output				
Local emission of active substance to waste water	E _{localair}	0.00225	[kg d ⁻¹]	O
Calculations				
E _{localair} = Q _{paper} * Q _{active} * F _{evap} * (1-F _{decomp})				

Table 24 ESD PT 6, 7 & 9, EUBEES (2001), Table 11: Emission scenario for calculating the release from "broke"

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Quantity of coated paper produced per day printing and writing tissue news-print	Q_{paper}	66 222 449	[t d ⁻¹]	D
Quantity of additives applied per tonne of paper printing and writing tissue news-print	Q_{additive}		[kg t ⁻¹]	S
Fraction of additives with active substance (market share)	$F_{\text{a.i.}}$	1	[-]	D
Concentration of active substance in the additive	$C_{\text{a.i.}}$		[mg kg ⁻¹]	S
Degree of closure to the water system printing and writing tissue news-print	F_{closure}	0.55 0.55 0.75	[-]	S/P according to TAB ENV 67 (v1.3)
Fraction of broke recycling, dry-end operations only	F_{broke}	0.2	[-]	D
Fixation rate	F_{fix}	0	[-]	S/D
Output				
Local emission of active substance to waste water	$E_{\text{local water}}$		[kg d ⁻¹]	O
Calculations				

For in-can preservatives solely used for dry-end operations:

$$E_{\text{local water}} = Q_{\text{paper}} * Q_{\text{additive}} * C_{\text{a.i.}} * F_{\text{a.i.}} * F_{\text{broke}} * (1-F_{\text{fix}}) * (1-F_{\text{closure}}) * 10^{-6}$$

For all other cases:

$$E_{\text{local water}} = Q_{\text{paper}} * Q_{\text{additive}} * C_{\text{a.i.}} * F_{\text{a.i.}} * (1-F_{\text{fix}}) * (1-F_{\text{closure}}) * 10^{-6}$$

Recycling

The scenario for paper recycling in the ESD PT 6, 7 & 9 (2001) provides the worst-case scenario for the recycling process, which is described in the following:

Table 25: Emission scenario for paper recycling (according to ESD PT 6, 7 & 9 (2001), Table 12)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Relevant tonnage in EU for this application	TONNAGE		[t yr ⁻¹]	S
Relevant tonnage in this region for this application	TONNAGE _{reg}		[t yr ⁻¹]	O
Fraction of region	F _{reg}	0.1	[-]	D
Fraction of main source	f _{mainsource}	0.1	[-]	D
Paper recycling rate	F _{recycling}	0.5	[-]	D
Deinking yield	F _{deinking}	1	[-]	D
Fraction decomposed during deinking	F _{decomp}	0	[-]	D
Fraction removed from waste water during preliminary on-site treatment	F _{preliminary}		[-]	D
	- easy soluble (> 1000 mg/L)	0.1	[-]	D EUSES 2.1.2
	- poorly soluble (< 1000 mg/L)	0.7	[-]	D EUSES 2.1.2
Number of working days	N _d	320	[d yr ⁻¹]	D
Output				
Total emission to sludge from paper recycling (excluding any biological sludge)	E _{local_{water}}		[kg d ⁻¹]	O
Calculations				

$$TONNAGE_{reg} = F_{reg} \times TONNAGE$$

$$E_{local_{water}} = TONNAGE_{reg} \times F_{recycling} \times f_{mainsource} \times F_{deinking} \times (1 - F_{preliminary}) \times (1 - F_{decomp}) \times \frac{1000}{N_d}$$

3.3.2 PT 6.3.2 Textile production

3.3.2.1 Description of this use area

In the emission scenario documents (TGD Part IV (2003); ESD PT 9&18, 2001) it is stated that *“biocides in textile industry are used to prevent deterioration by insects, fungi, algae and microorganisms and to impart hygienic finishes for specific applications”*. In the ESD PT 6 (2004) it is furthermore specified that *“biocides used in the production of textile refer mainly to treatment of the textiles (e.g., moth repellents, biocides against rot and mildew), thus for the preservation of textiles for outdoor applications. Indoor applications are in the protection of woollen articles, shower curtains and mattress ticking. However the use of In-can Preservatives in fluids for textile production is not mentioned.”*

3.3.2.2 Life cycle stages

The following life cycle stages are considered for sub-category 6.3.2:

- ▶ Formulation of the preserved product (i.e. incorporation of the biocidal product into an end-product)
- ▶ Application phase (i.e. use of the end-product)

The end-product is applied during the production process of the textile. It is assumed that the substance which is used as in-can preservative in liquids used for the production of textiles does not remain in the textile. Hence, the service-life is not relevant for this sub-category. This corresponds with the decision on the TM I 2011 (see MOTA v.6, 2013) regarding the fixation rate (F_{fix}) for textile in-can preservatives, where it was decided that the default value for this parameter is 0, since substances in PT 6 are not intended to preserve textiles.

In the background paper of the RMS Poland (2010) some MSs proposed to consider service life of the textiles. However, due to the fact that as a worst case a fixation rate was not considered in the “application” process ($F_{\text{fix}} = 0$), a possible emission to the environment which might occur during the service life of the textiles is already covered by the application phase. Furthermore, the concentration of in-can preservatives in the additives used for the production of textiles is quite low. Therefore it can be concluded that residues in the textiles based on in-can preservatives are negligible.

3.3.2.3 Environmental release pathways

The formulation process of the additives used in the textile processing industry and also the textile production process itself are industrial processes. It can be assumed that in Europe such industrial facilities are connected with the municipal sewer system and that waste water is discharged into a sewage treatment plant. Depending on the company size it can be assumed that companies, depending on their size, have their own on-site STP. In any case, waste water will be treated before it's released into surface water. Therefore, for the formulation and for the application phase, the STP is the first receiving compartment.

3.3.2.4 Emission scenario

In the Manual of Technical Agreements (MOTA v.6, 2013) the use of the following emission scenario documents is recommended:

- ▶ EU-TGD Part IV (EC 2003) IC-13 Textile processing industry
- ▶ ESD PT 9 & 18 (2001): Emission scenario document for biocides used as preservatives in textile processing industry (PT 9 and PT 18)
- ▶ OECD (2004) Series on Emission Scenario Documents Number 7: Emission scenario document on textile finishing industry.

The scenarios in Vol. IV Part B (2015) and the ESD PT 9 & 18 (2001) are identical, so in fact only two ESDs are available. The example calculations have been based on these two scenarios (TGD Part IV (2003), IC-13 and OECD ESD no. 7 (2004)). The CA Poland made a comparison of the two relevant scenarios in their background paper (2010). They concluded that *“the OECD scenario uses slightly different equations for calculation of emission from different application steps”* but that *“the idea of emission calculation is however the same.”* In addition, they summarised the discussion of the member states about several input parameters, which were later on agreed in the TM I 2011 (cited in MOTA v.6, 2013).

The following agreed input parameters have been used for the exemplary calculations of the different application steps:

- ▶ $Q_{\text{product}} = 20 \text{ kg/t}$ of fabric (as product used in textile industry)
- ▶ Q_{active} = will be deduced from the efficacy data and the Q_{product}
- ▶ $Q_{\text{fibre}} = 13 \text{ t/d}$ (daily production volume for all type of fibres)
- ▶ F_{product} = Fraction of fabric treated with one auxiliary, basic chemical or dyestuff: 1 as a worst-case and 0.3 (default in ESD)
- ▶ $F_{\text{residual liquor}}$ = Amount of residual liquors (worst-case in the OECD ESD no. 7, Table 12: 0.25)

3.3.2.4.1 Formulation

The emission estimation for the formulation process of additives used in the textile production is calculated according to Vol. IV Part B (2015), IC-13 textile processing industry.

The equation for the estimation of the daily emission is:

$$E_{\text{local}_{\text{comp}}} = \text{TONNAGE}_{\text{reg}} \times 10^3 \times F_{\text{main}_{\text{source}}} \times F_{\text{comp}} / T_{\text{emission}}$$

$\text{TONNAGE}_{\text{reg}}$ is calculated based on the tonnage data provided by the applicant. The parameters $F_{\text{main}_{\text{source}}}$, T_{emission} and F_{comp} are derived from the respective A&B-tables of Vol. IV Part B (2015).

$\text{TONNAGE}_{\text{reg}_{\text{form}}}$ is used to estimate the fraction of the main source and the number of emission days (according to the ESDs for biocides [RIVM, 2001]). The calculation of $\text{TONNAGE}_{\text{reg}_{\text{form}}}$ is described in chapter 2.3.2.

For the emission factors (F_{comp}) please refer to Table 4. The input parameters from the respective B-table are summarised in Table 26:

Table 26: Estimates for the fraction of the main source and the number of days for emissions for IC 13: Textile Processing Industry (according to Table B2.3 and B2.10, Vol. IV Part B (2015))

Table B2.3 for HPVC		
T (tonnes/year)	f main source	No. of days
< 3,500	1	300
3,500-10,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300
Table B2.10 for non-HPVC		
T (tonnes/year)	f main source	No. of days
< 3,500	1	300
3,500-10,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300

Source: Vol. IV Part B (2015), p. 248 & 260

The formulation step is done in modern industries where the releases to the environment is expected to be minimal due to filtration systems for air and waste management. The main release pathway will therefore be to sewer system and to the STP.

3.3.2.4.2 Application phase

Consumption-based

The results of the example calculations are presented in Appendix 3.4. Although the estimated emission to waste water in Vol. IV Part B scenario (IC-13) was slightly higher than in the OECD ESD no. 7 (2004) scenario, the latter scenario was nevertheless chosen as a worst-case scenario: The approach for the emission estimation is identical in both scenarios, but the OECD ESD no.7 (2004) is more comprehensive and enables to use more input parameters. Moreover, this scenario was also used by one competent authority for the evaluation of a PT 6 substance. The assessment report for this substance is meanwhile endorsed on EU-level and publically available. The OECD ESD no. 7 (2004) is described in the following:

Table 27: Emission scenario for chemicals used in textile processing (according to OECD ESD no. 7)

Parameter/variable	Symbol	Value	Unit	Origin	Remark
Input					
Mass of textile processed per day	Q_{textile}	13	[t d ⁻¹]	D	Chapter 9.1 OECD ESD no. 7
Mass of auxiliary per mass of fabric - pre-treatment - exhaust process - padding processes	Q_{product}	120 20 20	[kg t ⁻¹]	D	TAB v1.3, ENV 70 Table 10 OECD ESD no. 7
Content of active substance in preparation	$C_{\text{substance}}$		[-]	D/S	
Degree of fixation - pre-treatment - exhaust process - padding processes	F_{fixation}	0 0 0	[-]	D	Table 12 OECD ESD no. 7
Fraction of fabric treated with one auxiliary, basic chemical or dyestuff	F_{product}	0.3	[-]	D	Table 10 OECD ESD no. 7
Amount of residual liquors	$F_{\text{residual liquor}}$	0.25	[-]	D/S	Table 12 OECD ESD no. 7
Market share of in-can preservative	F_{penetr}	1	[-]	D	
Emission days	T_{emission}	225	[d]	D	
Output					
Local emission of dyestuff per day to waste water - pre-treatment - exhaust-process - padding	$E_{\text{local water}}$		[kg d ⁻¹] [kg d ⁻¹] [kg d ⁻¹]	O O O	
total (= sum of pre-treatment, exhaust-process and padding)	$E_{\text{local water}}$		[kg d ⁻¹]	O	
Calculations					
Pre-treatment:					
$E_{\text{local water}} = Q_{\text{textile}} \times Q_{\text{product}} \times C_{\text{substance}} \times (1 - F_{\text{fixation}}) \times F_{\text{penetr}}$					

Exhaust-process:

$$E_{local_water} = Q_{textile} \times F_{product} \times Q_{product} \times C_{substance} \times (1 - F_{fixation}) \times F_{penetr}$$

Padding-process:

$$E_{local_water} = \{Q_{textile} \times F_{product} \times Q_{product} \times C_{substance} \times (1 - F_{fixation}) \times F_{penetr}\} \\ + \{Q_{textile} \times F_{product} \times Q_{product} \times C_{substance} \times F_{residual\ liquor} \times F_{penetr}\}$$

In addition, in the TGD Part IV (2003) and the ESD PT 9&18 (2001) an emission scenario for calculating the releases from imported fibres/fabrics was included. A default value of 0.01 mg/kg was provided for estimating the amount of an active substance in imported material. In the background paper prepared by the CA Poland the different points of view of the member states are provided. It can be concluded from the MS's comments that imported fabrics can contain biocides in relevant concentrations. These biocides were applied to protect the textiles during their service-life. However, the biocides used as in-can preservatives are applied in considerably lower concentrations and according to MOTA v.6 (2013) no fixation of the PT 6 substances should be considered as a worst-case. Therefore, the biocide concentrations in imported fabrics are not related to the use of in-can preservatives and should consequently not be considered in PT 6.

3.3.3 PT 6.3.3 Leather production

3.3.3.1 Description of this use area

In the previous version of the ESD for PT 6 (2004) the use of biocidal products as in-can preservatives in the leather production is described as follows:

“For the use of biocides in fluids used in leather production the TGD includes a scenario for biocides used in the leather processing industry (IC-7, PT 9 in EC 2003). The document describes that biocides may be added at various stages during the production of leather to protect it during storage before tanning or finishing steps, but they can also be used during tanning and finishing. It does not explicitly mention the use of In-can Preservatives in fluids for leather production. According to van der Poel and Bakker (2001) it is not likely that fluids with In-can Preservatives will be used at all. Yet they present an adapted version of PT 9 taking into account the concentration of the in-can preservative in the fluids used in the leather production to estimate the emission to waste water.”

3.3.3.2 Life cycle stages

The following life cycle stages are considered for sub-category 6.3.3:

- ▶ Formulation of the preserved product (i.e. incorporation of the biocidal product into an end-product)
- ▶ Application phase (i.e. use of the end-product)

The end-product is used during the production process of the leather. It is assumed that the substance which is used as in-can preservative does not remain in the leather product. Hence, the service-life is not relevant for this sub-category.

3.3.3.3 Environmental release pathways

Similar to the textile production the main release pathway during leather production seems to be the waste water release into a sewage treatment plant (on-site or municipal STP). The consecutive compartments are the aquatic (surface water and sediment) and the soil compartment (after application of sewage sludge). Emissions into the air seem not to be relevant, since even if a liquid product is sprayed, the concentration of the in-can preservative in such a product is negligibly low.

3.3.3.4 Emission scenario

For leather production process the following life cycle steps needs to be considered:

- ▶ Formulation of the end-product (tonnage-based)
- ▶ Application of the end-product (tonnage-/consumption-based)

The service life is not addressed in the present document, although the service life is mentioned in the available ESDs (see below). However, these ESDs were not developed to assess the in-can preservatives of auxiliaries and chemicals used in the leather industry, but the application of biocides for the preservation of the leather (PT 9)-products. A large part of such biocides remain on the leather and can be released during their service-life. It is proposed in the MOTA v.6 (2013) that the default value for the factor of fixation of in-can preservatives should be set to 0 as a worst-case, because in-can preservatives are not intended to protect the leather. Consequently, the service-life is not a relevant life-cycle for in-can preservatives.

In addition to the scenarios recommended in the Background Paper prepared by Poland (2010), SCC considered the OECD ESD no. 8 (2004) for its example calculations, which are provided in Appendix 3.5. They are based on the following emission scenario documents:

Tonnage-based

- ▶ EU – TGD (EC 2003), Part IV, IC-7, Leather processing industry, using the A&B tables in Appendix 1 for formulation and industrial use.

Consumption-based

- ▶ EU – TGD (EC 2003), Part IV, IC-7, Leather processing industry. Assessment of the environmental release of chemicals from the leather processing industry.
- ▶ ESD PT 9 (2001): Emission Scenario Document for Biocides used as Preservatives in the Leather Industry (Product type 9).
- ▶ OECD (2004) OECD Series on Emission Scenario Documents Number 8; Emission Scenario Document on Leather Processing.

In the TGD Part IV (2003) emission estimations for the use of dyes, chemicals other than dyes and biocides are provided. The scenario for biocides is identical to the scenario presented in ESD PT 9 (2001). For the evaluation of worst-case scenario, SCC considered the calculations for dyes and chemicals other than dyes from the TGD Part IV (2003) and the PT 9-scenario according to the ESD.

The parameter “quantity of treated raw hide per day” is equal in all above cited scenarios (= 15 t/days). It is mentioned in the Background Paper of CA Poland (2010) that this default value should be accepted. It is further stated in the Polish Background Paper that the

parameter F_{fix} should be set to 0 as a worst-case, since the in-can preservative is not intended to protect the leather. It is further stated that *“the Q_{active} cannot be set by default but it would be probably be useful to set Q_{tanning} products (kg/t leather) which would represent an average quantity of products used for the tanning process.”* In order to take account of this proposal, the additional factor F_{chemical} , which is the concentration of the active substance in the products has now been introduced into the calculations for the scenarios of TGD Part IV (2003) and ESD PT 9 (2001). This factor is already included in the OECD ESD no. 8 (2004) as “content of chemical in formulation” (F_{chemical}).

In the ESD PT 9 (2001) as well as in the OECD ESD no. 8 (2004) different production steps (e.g. tanning or finishing) are considered and the respective emissions are summed up to provide a total local emission to waste water ($\sum E_{\text{local},x\text{-water}}$).

In the paper from the CA Poland (2010) it is proposed to assume that the same in-can preservative is used in all production processes in order to cover a “worst-case”. However, in the OECD ESD no. 8 (2004) it is argued that summing up the emission from all production processes is only relevant if the same biocide is indeed applied for all such processes. SCC therefore recommends taking a case by case decision on the basis of the real life applications of the product assessed. Nevertheless, for the definition of the worst-case in this report the approach by the CA Poland has been followed.

3.3.3.4.1 Formulation

The emission estimation for the formulation process of additives used in the leather production is calculated according to Vol. IV Part B (2015), IC7 leather processing industry.

The equation for the estimation of the daily emission is:

$$E_{\text{local,comp.}} = \text{TONNAGE}_{\text{reg}} \times 10^3 \times F_{\text{mainsource}} \times F_{\text{comp.}} / T_{\text{emission}}$$

$\text{TONNAGE}_{\text{reg}}$ is calculated based on the tonnage data provided by the applicant. The parameters $F_{\text{mainsource}}$, T_{emission} and F_{comp} are derived from the respective A&B-tables of Vol. IV Part B (2015).

$\text{TONNAGE}_{\text{reg,form}}$ is used to estimate the fraction of the main source and the number of emission days (according to the ESDs for biocides [RIVM, 2001]).

For the emission factors (F_{comp}) please refer to Table 4. The input parameters from the respective B-table are summarised in Table 28:

Table 28: Estimates for the fraction of the main source and the number of days for emissions for IC 7: Leather Processing Industry (according to Table B2.3, B2.4 and B2.6, Vol. IV Part B (2015))

Table B2.3 for HPVC for UC ≠ 6 (Anti-set-off and anti-adhesive agents), 9 (Cleaning/washing agents and additives), 10(Colouring agents) & 31 (Impregnation agents)		
T (tonnes/year)	f main source	No. of days
<3,500	1	300
3,500-1,000	0.8	300
10,000-25,000	0.7	300
25,000-50,000	0.6	300
≥50,000	0.4	300

Table B2.4 for non-HPVC		
T (tonnes/year)	f main source	No. of days
<10	1	2f * T
10-50	0.9	f * T
50-500	0.8	0.4f * T
500-2,000	0.75	0.2f * T
≥2,000	0.65	300

Table B2.6 for HPVC for UC = 6 (Anti-set-off and anti-adhesive agents), 9 (Cleaning/washing agents and additives), 10 (Colouring agents) & 31 (Impregnation agents)		
T (tonnes/year)	f main source	No. of days
<100,000	1	300
100,000-250,000	0.7	300
≥250,000	0.4	300

Source: Vol. IV Part B (2015), p. 248, 249 & 254

The formulation step is done in modern industries where the releases to the environment is expected to be minimal due to filtration systems for air and waste management. The main release pathway will therefore be to sewer system and to the STP.

3.3.3.4.2 Application phase

Tonnage-based

The tonnage-based approach is based on the A&B-tables which are provided for the leather processing industry (IC7). The following equation no. 5 of Vol. IV Part B (2015) is used for the release estimation:

$$E_{\text{local}} = F_{\text{main source}} \times \frac{1000}{T_{\text{emission}}} \times \text{RELEASE}$$

RELEASE = release during life-cycle stage to compartment [t yr⁻¹]

F_{main source} = fraction of release at the local main source at life-cycle stage [-]

T_{emission} = number of days per year for the emission in life-cycle stage [d yr⁻¹]

E_{local} = local emission during episode to compartment during stage [kg d⁻¹]

The emission factors to the relevant compartment (= RELEASE) are summarised in Table 29 and the parameters $F_{\text{mainsource}}$ and T_{emission} in Table 30.

Table 29: Estimates for the emission factors (fraction released) for IC 7: Leather Processing Industry (according to Table A3.6 Vol. IV Part B (2015))

Compartment	Solubility (mg/L)	Vapour pressure (Pa)	Emission factors		
			All MC's	MC=2	MC=3 ¹⁾
Air	<100	<100	0.001		
	<100	≥100	0.01		
	≥100		0		
Wastewater	< 100			0.05	0.9
	100-1,000			0.15	0.99
	≥ 1,000			0.25	0.99
Soil			0.01		

¹⁾ Default value

Source: Vol. IV Part B (2015), p. 230

Table 30: Estimates for the fraction of the main source and the number of days for emissions for IC 7: Leather Processing Industry (according to Table B3.4, Vol. IV Part B (2015))

T (tonnes/year)	f main source	No. of days
<10	0.8	2f * T
10-50	0.75	2f * T
50-500	0.6	f * T
500-1,000	0.5	0.4f * T
1,000-5,000	0.35	300
5,000-25,000	0.2	300
≥25,000	0.1	300

Source: Vol. IV Part B (2015), p. 254

Consumption-based

The worst-case scenario for the consumption-based approach is taken from the OECD ESD no. 8. It covers also the emission estimation in the scenario of Vol. IV Part B (2015) as well as the ESD (2001) for PT 9. This scenario is described in the following:

Table 31: Emission scenario for chemicals used in leather processing (according to OECD ESD no. 8 (2004))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Mass of processed raw hide per day	Q_{rawhide}	15	[t d ⁻¹]	D
Beam house, Tanning, Post-Tanning, Finishing				
Factor of remaining mass of rawhide at specific step "x"	$F_{\text{remaining-mass}}$			
Raw hide		1	[-]	D
Pelt		0.5		
Shaved pelt		0.35		
Crust leather		0.2		
Mass of chemical formulation used per mass at specific step "x" (to be given for all leather types)	$Q_{\text{chemical-formulation}}$		[kg t ⁻¹]	D/S
Fraction of a.s.in formulation	$F_{\text{in-can}}$		[-]	S (based on efficacy data)
Degree of fixation - Proportion of the substance chemically converted or fixed to the hide during processing	F_{fixation}	0	[kg t ⁻¹]	D/S
Fraction of the daily production that is treated with the specific chemical ¹	$F_{\text{daily-production}}$	1	[-]	D, Section 5.3, OECD ESD no.8
Fraction of chemical eliminated by on-site waste water treatment before discharge to a municipal sewage treatment plant ²	$F_{\text{on-site-treatment}}$	0	[-]	D/S Section 4.8, OECD ESD no.8
Market share of in-can preservative	F_{pen}	1		D/S
	$E_{\text{local},x,\text{water}}$		[kg d ⁻¹]	
Output				
Local emission of chemical to waste water per day for a specific process step "x"	$E_{\text{local},\text{beamhouse},\text{water}}$ $E_{\text{local},\text{tanning},\text{water}}$ $E_{\text{local},\text{post-tanning},\text{water}}$ $E_{\text{local},\text{finishing},\text{water}}$		[kg d ⁻¹]	O
Total local emission of active substance	$E_{\text{local},\text{total-water}}$		[kg d ⁻¹]	O
Calculations				
$E_{\text{local},x-\text{water}} = Q_{\text{rawhide}} \times F_{\text{remaining-mass}} \times Q_{\text{chemical-formulation}} \times F_{\text{in-can}} \times (1 - F_{\text{fixation}}) \times F_{\text{daily-production}} \times (1 - F_{\text{on-site-treatment}})$				
$E_{\text{local},\text{total-water}} = F_{\text{pen}} \times \sum E_{\text{local},x-\text{water}}$				

¹ For dyes, the default $F_{\text{daily-production}}$ is 0.5. For other chemicals than dyes this fraction should be taken as default value of 1.

² In generic calculations this fraction is set default = 0. Leather manufacturers may apply on-site knowledge and introduce a site-specific fraction for elimination of chemical on-site sewage treatment.

Note: If one and the same chemical e. g. active ingredient in biocides is applied in several process steps, the results of each $E_{local_{x-water}}$ must be summed.

3.4 PT 6.4 Metalworking fluids

The refinement of the emission scenario document for metal working fluids was finalised in parallel during the preparation of this ESD. Since new guidance is available for PT 13, applicable also to PT 6, for any information on the emission scenarios for in-can preservatives used in metal working fluids, please refer to the following document available on the ESD specific ECHA webpage¹²:

- ▶ ESD PT13 (2015): Refinement of the Emission Scenario Document for Product Type 13 - Working or cutting fluid preservatives.

3.5 PT 6.5 Fuels

3.5.1 Description of this use area

No biocides are added to petrol as this type of fuel mainly consist in short-chain alkanes and aromates which cannot hold water. Moreover, these constituents are highly toxic for micro-organisms.

Preservatives in fuels are used to prevent microbial growth in presence of water, the formation of slime and sludge and finally the deterioration of the fuels during storage in the tanks.

A more detailed description is presented in the previous version of the ESD for PT 6 (2004):

“Many cases of microbial fouling and spoilage of fuels have been recorded for about 65 years. The common factor in all problems is the presence of water which, because of its higher density and immiscibility, will lie below the fuel as a discrete phase. Fuel (gas, kerosine) is stored in containers. When water enters these containers through seepage or condensation, favourable conditions are created for micro-organisms. They can proliferate in the water phase while feeding on the hydrocarbons in the fuel. They include both aerobic bacteria that may cause sludge and slimy mats and aerobic bacteria that can produce corrosive acids (van Dokkum et al. 1998). If biocides are used the solubility ratio in fuel and water is a critical parameter and an agent must be selected which has the correct solubility characteristics for the planned use.”

The aqueous phase and the biocides therein are eventually discharged.

Although vast amounts of water are removed during storage of crude oils and refined product, the end-product still contains water that cannot be removed as it is incorporated in the fuel. Therefore biocides must be added to end-products as well, especially to diesel and bio-diesel. No scenario is available for the service life of the end-product - this should be subject to a future

¹² https://echa.europa.eu/documents/10162/16908203/esd_pt_13_final_en.pdf/cc11b52f-0c3e-4a56-883d-2abebcb0d5fc

revision of this document.

3.5.2 Life cycle stages

The following life cycle stage is considered for the sub-category 6.5:

- Formulation of the end-product (i.e. incorporation of the biocidal product into the end-product)

Application and service life are not relevant for this sub-category, because if the fuel ends up in an engine, the preservative will be burnt completely and thus no emissions of the in-preservative into the environment occurs. The conclusion was shared by the EU-member states at the TM I 2011 (MOTA v.6, 2013, p. 50). Therefore, an emission scenario is only provided for the formulation stage.

3.5.3 Environmental release pathways

The formulation of fuels in refineries is a highly automated process in which nearly no emission into the environment is expected. Nevertheless, it was agreed on the TM I 2011 that EU-TGD IC 9 ESD for the Mineral oil and fuel industry (TGD Part II, 2003, now Vol. IV Part B, 2015) should be used as a first choice to calculate emission of in-can preservatives of fuels resulting from the formulation step (MOTA v.6, 2013, p. 50).

It is described in the previous version of the ESD for PT 6 (2004) that *“Emissions to the environment predominantly occur when the water phase of a storage tank is discharged into the sewer (van der Poel and Bakker 2002).”*

This issue should however be considered under the waste disposal, which is regulated by national legislation.

3.5.4 Emission scenario

As described above only the emission estimation for the formulation stage is presented in the following.

3.5.4.1 Formulation

The emission estimation for the formulation process of fuels shall be calculated according to Vol. IV Part B (2015), IC9 Mineral oil and fuel industry, UC = 27 “Fuels” or UC = 28 “Fuel additives”. The equation for the estimation of the daily emission is:

$$E_{\text{local}_{\text{comp}}} = \text{TONNAGE}_{\text{reg}} \times 10^3 \times F_{\text{mainsource}} \times F_{\text{comp}} / T_{\text{emission}}$$

TONNAGE_{reg} is calculated based on the tonnage data provided by the applicant. The parameters F_{mainsource}, T_{emission} and F_{comp} are derived from the respective A&B-tables of Vol. IV Part B (2015).

TONNAGE_{reg_{form}} is used to estimate the fraction of the main source and the number of emission days (according to the ESDs for biocides [RIVM, 2001]).

The emission factors (F_{comp}) to the specific environmental compartment are provided in Table 4. The additional input-parameters $F_{mainsource}$ and $T_{emission}$ are derived from the B-tables 2.6, 2.7 and 2.8 (please refer to Table 32).

Table 32: Estimates for the fraction of the main source and the number of days for emissions days for IC 9: Mineral Oil and Fuel Industry (according to Table B2.6, B2.7, B2.8, Vol. IV Part B (2015))

Table B2.6 for HPVC for UC = 27 (Fuels) and for HPVC for UC = 28 (Fuel additives) + others		
T (tonnes/year)	f main source	No. of days
<100,000	1	300
100,000-250,000	0.7	300
≥250,000	0.4	300
Table B2.7 for non-HPVC for UC = 27 (Fuels)		
T (tonnes/year)	f main source	No. of days
<1,000	1	100
1,000-2,000	0.8	200
≥2,000	0.6	300
Table B2.8 for non-HPVC for UC = 28 (Fuels additives) + others		
T (tonnes/year)	f main source	No. of days
< 5	1	20
5-50	1	60
50-100	1	2f * T
100-500	0.8	f * T
500-1,000	0.6	0.5f * T
≥1,000	0.4	300

Source: Vol. IV Part B (2015), p. 254/256

The formulation step is done in modern industries where the releases to the environment is expected to be minimal due to filtration systems for air and waste management. The main release pathway will therefore be to sewer system and to the STP.

3.6 PT 6.6 Glues and adhesives

3.6.1 Description of this use area

“Glues and adhesives are produced in a variety of types and for a variety of purposes. Large amounts are used for short-term applications and/or dry conditions (no microbial attack), for example cardboard packaging materials. In those adhesive products little or no preservatives will be used. For long term applications and/or moist conditions preservatives are required, for example plywood for outdoors use (van der Poel and Bakker 2001). No emission scenario has been described for the application phase of glues and adhesives.”

Source: previous version of the ESD PT 6 (2004). This description refers mainly to a preservative which is used to protect the glues and adhesives during their service life. This is not the intended use of an in-can preservative. However, based on the information retrieved

from draft CARs the preservation of glues and adhesives during the storage of these products is a relevant PT 6 use.

3.6.2 Life cycle stages

The following life cycle stages are considered for sub-category 6.6:

- Formulation of the preserved product (i.e. incorporation of the biocidal product into the end-product)
- Application phase (i.e. use of the end-product)

Service-life seems not to be relevant, since no emission of active substance out of dried and hardened glues and adhesives is expected (please refer to the chapter: Environmental release pathways).

3.6.3 Environmental release pathways

The production and formulation of glues and adhesives are industrial processes. Therefore, direct emission into the environmental compartments like for instance surface water and soil can be excluded. However, during the cleaning of the machines and equipment in the manufacturing plants release of wastewater into the sewer system may occur.

Glues and adhesives are normally applied indoors, i.e. under dry conditions, so a direct release of these products to the environment is not expected. Glues and adhesives are not only used in industrial areas, but also in private households. However, the amounts which are used in the private area are very small compared to the industrial area.

During service-life of glues and adhesive, active substance will remain in the dried material. A release of the active substance from glues and adhesives, which are dried and hardened, is not expected, even though, if the material is exposed to weather conditions (e.g. rainfall). Therefore, service-life is not considered for glues and adhesives.

3.6.4 Emission scenario

For glues and adhesives no emission scenario document exists. Therefore, in the MOTA v.6 (2013) it is recommended that for a general approach the emission estimation should be based on the A&B-tables provided in TGD Part II (2003), now Vol. IV Part B (2015):

- Vol. IV Part B (2015), IC=0: others, UC-2: Adhesive, binding agents. A&B-tables

During WG-V-2015 it was agreed that there is no need to have a separate consumption based emission scenario for glues and adhesives since the area from which emission could occur is considered very small.

3.7 PT 6.7 Others

This sub-category can be used for those end-products which cannot be assigned to the existing sub-categories PT 6.1 to PT 6.6 or which need to be assessed in future.

In a document presented at the CA-meeting in September 2014 (CA-Sept14-Doc.5.5) it is stated that the use of in-can preservatives in rodenticides needs to be approved. However, SCC has not retrieved any information on such a use in rodenticides neither in the evaluated draft CARs nor in the industry survey.

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Appendix 1

4.1.1 Evaluation of the draft CA-reports provided by UBA

The nine draft CA reports provided by German UBA were evaluated by SCC in January 2012 following a matrix for evaluation which had been set up by SCC and agreed by UBA before. The evaluation of the CA reports by SCC contains confidential information, so that it cannot be attached to this document.

Screening matrix for the evaluation of the CARs

Screening points		Substance name
1	RMS	
2	Field of use envisaged	
3	Use(s)/sub-categories covered in the CAR:	
4	How are the life cycle stages defined for the in-can preservative / which life cycle stages are covered by an exposure/risk assessment?	
5	Exposure assessment: tonnage or consumption-based?	
6	Are tonnage data provided per sub-category	
7	Concentration of a.i. as in-can preservative in the end-product/ Application rate (a.i.):	
8	Has the a.i. an acute effect or a long lasting effect?	
9	Which scenarios were calculated in the exposure assessment: - several scenarios per sub-category - one worst case scenario per sub-category - one scenario as worst case	
10	Guidance documents used as basis for the exposure assessment:	
11	Identification of worst case scenarios (i.e. highest resulting PEC (either per sub-category and/or per PT)	
12	Have standard default values been altered? If yes, why, and what justification was provided?	
13	Which is the first receiving compartment?	
14	Which time frames have been considered for service life?	
15	Was a specific groundwater risk assessment conducted? If yes, based on which tool and which input parameters?	
16	Have additional scenarios been used not referenced in the ESD for PT 6? If yes, Which ones? Are they based on other existing emission scenarios (EU / non-EU)?	

Screening points		Substance name
	Are they new?	
17	Substance specific refinements or remarks	
18	Are metabolites covered in the risk assessment?	
19	Are measured concentrations in specific compartments available? If yes, are these values higher or lower than the respective calculated PEC values?	
20	Proposed risk mitigation measurements in the CAR	
21	Was a cumulative risk assessment performed? If not, is a justification provided why not?	
22	Other comments	

4.1.2

4.1.3 Evaluation of questionnaires sent to authorities and industry

A survey was performed during the first half of 2012. One questionnaire was sent to the authorities, in which the authorities were asked to summarise their experiences with the ERA for PT6 products in the context of the evaluation of active substances for Annex I inclusion (under the BPD) and/or for national authorisation. A separate questionnaire was sent to industry, in which information on the use of in-can preservatives, the technologies of the different sub-categories and the possible emissions to the environment was asked for.

The questionnaire was announced at the Technical Meeting IV/2011 and additionally in an e-mail from SCC to the members of the European Union and their candidate country Iceland as well as to Switzerland and Norway.

The German UBA sent the questionnaire in March 2012 to the EU members and to Switzerland. Lithuania, Norway and Iceland had pointed out before, that they had no experience with the product-type 6 and therefore could not complete the questionnaire.

Overall, seven member states, Denmark, Sweden, Germany, Switzerland, France, United Kingdom and The Netherlands sent the filled-in questionnaires either back to the UBA or to SCC. Although Switzerland is not a member of the EU, in the following it is outlined as a member state for the sake of convenience.

In total eleven filled-in questionnaires were sent back from industry to SCC: Nine companies and two associations answered the questionnaire. Two companies stated that they only produce the active substance (and not PT6 biocidal products) and therefore cannot provide information about the use of the end-products. Most answers (seven companies) were provided for the sub-category PT 6.2 "Paints and coatings". One of these companies produces only in-can preserved aqueous binders (intermediate products) for the use in paints and coatings. Nevertheless, this company also provided information on the sub-category PT6.6 "Glues and adhesives" and PT6.7 "Others: polymer emulsions". One of the associations commented on the sub-categories PT6.1, PT6.3, PT6.4, PT6.5 and PT6.7 whereas the other association provided only information on PT6.4.

The individual companies provided general information on the production processes or the application of the end-products for all sub-categories; however, they only provided specific

information for the sub-category PT6.2 "paints and coatings". The associations provided general information on the use of in-can preserved end-products.

Appendix 2

Appendix 2.1 Excerpt of the spERCs provided by A.I.S.E. (October 2012)

spERC Code	spERC description	Specifies ERC	Fraction used at main source	Release times per year (d/yr)	With STP:	Release fraction to air	Release fraction to waste water	Release fraction to soil	Type of On-Site risk management measure implemented	Efficiency of On-Site risk management measure	MSPERC (kg/d)
AISE spERC 2.1.a.v2	AISE - Formulation of Granular Detergents/Maintenance Products - Regular & Compact (large scale)	2	to be calculated in TRA	250	yes	0	0.0001	0	-	-	16700
AISE spERC 2.1.b.v2	AISE - Formulation of Granular Detergents/Maintenance Products- Regular & Compact (medium scale)	2	to be calculated in TRA	250	yes	0	0.001	0	-	-	4500
AISE spERC 2.1.c.v2	AISE - Formulation of Granular Detergents/Maintenance Products- Regular & Compact (small scale)	2	to be calculated in TRA	250	yes	0	0.002	0	-	-	450

AISE spERC 2.1.g.v2	AISE - Formulation of liquid Detergents/Maintena nce Products: Low Viscosity (large scale)	2	to be calculated in TRA	250	yes	0	0.0001	0	-	-	16700
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Appendix 2.1 continued

AISE spERC 2.1.h.v2	AISE - Formulation of liquid Detergents/Maintena nce Products: Low Viscosity (medium scale)	2	to be calculated in TRA	250	yes	0	0.001	0	-	-	4500
AISE spERC 2.1.i.v2	AISE - Formulation of liquid Detergents/Maintena nce Products: Low Viscosity (small scale)	2	to be calculated in TRA	250	yes	0	0.002	0	-	-	450
AISE spERC 2.1.j.v2	AISE - Formulation of liquid Detergents/Maintena nce Products: High Viscosity (large scale)	2	to be calculated in TRA	250	yes	0	0.001	0	-	-	16700
AISE spERC 2.1.k.v2	AISE - Formulation of liquid Detergents/Maintena nce Products: High Low Viscosity (medium scale)	2	to be calculated in TRA	250	yes	0	0.002	0	-	-	4500

AISE spERC 2.1.1.v2	AISE - Formulation of liquid Detergents/Maintena nce Products: High Viscosity (small scale)	2	to be calculated in TRA	250	yes	0	0.004	0	-	-	450
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Appendix 2.2 Excerpt of the spERCs provided by CEPE (October 2012)

spERC Name	Specifies ERC	spERC description	Fraction used at main source	Release times per year (d/yr)	With STP:	Release fraction to air	Release fraction to waste water	Release fraction to soil	River flow rate for dilution applied for PEC derivation (m ³ /d)	Type of On-Site risk management measure implemented	Efficiency of On-Site risk management measure	MSPERC (kg/d)
CEPE 4	2	CEPE - formulation - water borne coatings and inks large scale (>1,000 t pa solvent use) – volatiles	to be calculated in TRA	225	yes	vapour pressure >1,000 Pa: 0.022 vapour pressure <1,000 Pa: 0.004	0	0	18000	containment	0.98	substance dependent - see Fact Sheet
CEPE 5	2	CEPE - formulation - water borne coatings and inks - small scale (<1,000 t pa solvent use) - volatiles	to be calculated in TRA	225	yes	vapour pressure >1,000 Pa: 0.022 vapour pressure <1,000 Pa: 0.004	0	0	18000	containment	0.95	substance dependent - see Fact Sheet

Appendix 3

Appendix 3.1 Calculation sheets for sub-category PT6.1

Application human hygienic products (former sub-category PT6.1.1)

The use in human hygienic products is not considered under sub-category PT6.1 in chapter 3.1.1 of this document, since most of these products are outside of the scope of the BPR. However, if for specific uses emission estimation is required, the respective emission calculation sheets are presented in this Appendix.

Table A1: ESD PT1 (2004), Table 4.1, Emission scenario for calculating the release of disinfectants used in human hygiene biocidal products (for private use) based on the **annual tonnage** applied (as in IC5&6 in Vol. IV Part B (2015))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Relevant tonnage in EU for this application	TONNAGE	100	[t yr ⁻¹]	S
Fraction for the region	F _{prodvol_{reg}}	0.1	[-]	D
TONNAGE _{reg} = F _{prodvol_{reg}} * TONNAGE	TONNAGE _{reg}	10	[t yr ⁻¹]	O
Fraction of the main source (STP)	F _{mainsource}	0.002	[-]	D
Fraction released to wastewater ¹⁾	F _{water}	1	[-]	
Number of emission days per year	T _{emission}	260	[d yr ⁻¹]	D
Market penetration factor ²⁾	F _{penetr}	0.5	[-]	D
Output				
Emission rate to wastewater (standard STP)	E _{local_{water}}	0.038	[kg d ⁻¹]	O
Calculation				

$$E_{\text{local}_{\text{water}}} = \text{TONNAGE}_{\text{reg}} * 10^3 * F_{\text{mainsource}} * F_{\text{water}} * F_{\text{penetr}} / T_{\text{emission}}$$

¹⁾ F_{water} = 1 by default, but the user may alter this value in case of 'non-rinse-off' products (in that case this fraction may be below 1)

²⁾ F_{penetr}: the market penetration factor could be lowered, if the applicant provides reliable data, which shows that a reduction is justified

Application human hygienic products (former sub-category PT6.1.1)

ESD PT1 (2004), Table 3.5 Pick-list for average consumption per inhabitant per day

Product	Vforminh Qforminh	Vformappl Qformappl	Nappl	Finh
Anti-dandruff shampoo	-	12 ¹⁾	0.71 ²⁾	0.1
Antipersprants/Deodorant:	-			
- aerosol		3 ¹⁾	2 ³⁾	0.2
- stick, roll-on		0.5 ¹⁾	1 ¹⁾	0.8
Creams (e.g. anti-acne)	-	0.8 ⁴⁾	2 ⁴⁾	0.1
Mouth wash	-	10	3	0.05

1) Vol. IV Part B (2015)

2) Vol. IV Part B (2015): 2-7 times per week; default 5 times per week = 0.71 times per day

3) Vol. IV Part B (2015): 1-3 times per day

4) Data from Vol. IV Part B (2015) for facial cream: 1-2 times per day

Application Detergents and cleaning fluids**Tonnage-based scenarios:**

Table A4 (chapter 3.1.4.2, table 7): ESD PT2 (2011), Table 3: Emission scenario for calculating the release of disinfectants used for sanitary purposes (in institutional areas)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
A) Relevant tonnage in the EU for this application	TONNAGE	100	[t yr ⁻¹]	S
Fraction for the region	F _{prodvol_{reg}}	0.1	[-]	D
B) Relevant tonnage in the region for this application	TONNAGE _{reg}	10	[t yr ⁻¹]	O
A + B) Fraction of the main source (STP)	F _{mainsource}	0.002	[-]	D
Fraction of substance disintegrated during or after application (before release to the sewer system)	F _{dis}	0	[-]	D
Fraction released to waste water	F _{water}	1	[-]	D
Number of emission days for life cycle stage 4 (private use)	T _{emission}	260	[d]	D
Market penetration factor ¹⁾	F _{penetr}	1	[-]	D
Output				
Emission rate to wastewater	E _{local_{water}}	0.077	[kg d ⁻¹]	O

Calculation

$$E_{local_{water}} = TONNAGE_{reg} * 10^3 * F_{mainsource} * (1 - F_{dis}) * F_{water} * F_{penetr} / T_{emission}$$

¹⁾ F_{penetr} : The market penetration factor could be lowered, if the applicant provides reliable data, which shows that a reduction is justified.

Appendix 3.2 Calculation sheets for sub-category PT6.2

Application, tonnage-based

Table A9 (chapter 3.2.4.2, table 11): OECD ESD no. 22 (2009): Emission estimates for general public use of decorative paints, figure 4.1, page 134

Parameter/variable	Symbol	Value	Unit	Origin
Input				
EU-production volume of the in-can preservative for the use in decorative paints	TONNAGE	100	[t yr ⁻¹]	S
Quantity of the actives substance in the coating	Q _{subst_in_coat}	0.003	[kg kg ⁻¹]	S
Quantity of coating product produced per year	Q _{init_coat_ann}	33333	[t yr ⁻¹]	O
Fraction of EU production volume per region	F _{reg}	0.1	[-]	D
Number of emission days	T _{emission}	300	[d]	Vol. IV Part B (2015), Tables B4.4/B4.5
Fraction of the main source (STP)	F _{mainsource}	0.002	[-]	Vol. IV Part B (2015), Tables B4.4/B4.5
Volatiles				
Direct losses (evaporation) fraction (%) of substance released to air	F _{init_coat, direct_loss, air}	93	[%]	S
Solids				
Brush residues fraction (%) of substance released to water	F _{init_coat, brush_resid, water}	1.5	[%]	S
Can residues fraction (%) of substance released to waste	F _{init_coat, can_resid, waste}	25	[%]	S
Output "Volatiles"				
release of substance to air during application	E _{init_coat, air}	0.0620	[kg d ⁻¹]	O
Output "Solids"				
release of substance to water during application	E _{init_coat, water}	0.0010	[kg d ⁻¹]	O
release of substance to waste during application	E _{init_coat, waste}	0.0177	[kg d ⁻¹]	O

Calculation

$$Q_{init_coat_ann} = \text{TONNAGE} * Q_{subst_in_coat}$$

$$E_{init_coat, air} = Q_{init_coat_ann} * 1000 * F_{reg} * Q_{subst_in_coat} * F_{init_coat, direct_loss, air} / 100 * F_{mainsource}/T_{emission}$$

$$E_{\text{init_coat, water}} = Q_{\text{init_coat_ann}} * 1000 * F_{\text{reg}} * Q_{\text{subst_in_coat}} * F_{\text{init_coat, brush_resid, water}} / 100 * F_{\text{mainsource}}/T_{\text{emission}}$$

$$E_{\text{init_coat, waste}} = Q_{\text{init_coat_ann}} * 1000 * F_{\text{reg}} * Q_{\text{subst_in_coat}} * F_{\text{init_coat, can_resid, waste}} / 100 * F_{\text{mainsource}}/T_{\text{emission}}$$

Application, tonnage-based

Table A10: OECD ESD no. 22 (2009): Emission estimates for professional use of decorative paints, page 135

Parameter/variable	Symbol	Value	Unit	Origin
Input				
EU-production volume of the in-can preservative for the use in decorative paints	TONNAGE	100	[t yr ⁻¹]	S
Quantity of the actives substance in the coating	Q _{subst_in_coat}	0.003	[kg kg ⁻¹]	S
Quantity of coating product produced per year	Q _{init_coat_ann}	33333	[t yr ⁻¹]	O
Fraction of EU production volume per region	F _{reg}	0.1	[-]	D
Number of emission days	T _{emission}	300	[d]	Vol. IV Part B (2015), Tables B4.4/B4.5
Fraction of the main source (STP)	F _{mainsource}	0.002	[-]	Vol. IV Part B (2015), Tables B4.4/B4.5
Volatiles				
Direct losses (evaporation) fraction (%) of substance released to air	F _{init_coat, direct_loss, air}	98	[%]	S
Solids				
Brush residues fraction (%) of substance released to waste	F _{init_coat, brush_resid, waste}	1	[%]	S
Can residues fraction (%) of substance released to waste	F _{init_coat, can_resid, waste}	3	[%]	S
Output "Volatiles"				
release of substance to air during application	E _{init_coat, air}	0.0653	[kg d ⁻¹]	O
Output " Solids "				
release of substance to water during application	E _{init_coat, water}	0.0007	[kg d ⁻¹]	O
release of substance to waste during application	E _{init_coat, waste}	0.002	[kg d ⁻¹]	O

Calculation

$$Q_{\text{init_coat_ann}} = \text{Tonnage} / Q_{\text{subst_in_coat}}$$

$$E_{\text{init_coat, air}} = Q_{\text{init_coat_ann}} * 1000 * F_{\text{reg}} * Q_{\text{subst_in_coat}} * (F_{\text{init_coat, direct_loss, air}} / 100) * F_{\text{mainsource}} / \text{Temission}$$

$$E_{\text{init_coat, water}} = Q_{\text{init_coat_ann}} * 1000 * F_{\text{reg}} * Q_{\text{subst_in_coat}} * (F_{\text{init_coat, brush_resid, water}} / 100) * F_{\text{mainsource}} / \text{Temission}$$

$$E_{\text{init_coat, waste}} = Q_{\text{init_coat_ann}} * 1000 * F_{\text{reg}} * Q_{\text{subst_in_coat}} * (F_{\text{init_coat, can_resid, waste}} / 100) * F_{\text{mainsource}} / \text{Temission}$$

Application, consumption-based scenario

Table A11: OECD ESD no.2, PT8 (2013), Table 4.11: Emission scenario for House – professional/amateur

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Treated wood area	AREA _{house}	125	[m ²]	D
Application rate of the product	Q _{applic,product}	0.25	[L m ⁻²]	S
Content of a substance in product	f _{ai}	0.003	[-]	S
Density of product	RHO _{product}	1400	[kg m ⁻³]	S
Fraction of product lost to soil during application	F _{soil,brush}		[-]	P
	professional	0.03		
	amateur	0.05		
(wet) soil volume	V _{soil}	13	[m ³]	D
Bulk density of wet soil	RHO _{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
calculated for amateur				
Emission of substance to soil during the day of application	E _{soil,brush}	6.56 * 10 ⁻⁰³	[kg d ⁻¹]	O
Concentration in local soil at the end of the day of application	C _{localsoil,brush}	2.97 * 10 ⁻⁰⁷	[kg kg _{wwt} ⁻¹]	O
Calculation				
E _{localsoil,brush} = AREA _{house} * Q _{applic,product} * f _{ai} * RHO _{product} * F _{soil,brush} * 10 ⁻³				
C _{localsoil,brush} = E _{localsoil,brush} / (V _{soil} * RHO _{soil})				

Application, consumption-based scenario

Table A12 (chapter 3.2.4.2, table 12): OECD ESD no.2, PT8 (2013): Table 4.38: Emission scenario for spraying outdoors – product application (= House scenario)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Treated area of a façade per day	AREA _{façade}	125	[m ²]	D
Application rate of the product	Q _{applic,product}	0.25	[L m ⁻²]	S
Content of a substance in product	f _{ai}	0.003	[-]	S
Density of product	RHO _{product}	1400	[kg m ⁻³]	S
Fraction of product lost to soil during application by spray drift	F _{drift}	0.1	[-]	D
Fraction of product lost to soil during application due to runoff	F _{runoff}	0.2	[-]	D
Fraction of spray drift depositing to a 0.5 m wide soil band 1 – 1.5 m distant from the house (tier 2)	F _{dep}	0.33	[-]	D
Run off: soil volume adjacent to treated surface	V _{soil,runoff}	13	[m ³]	D
Drift: soil volume to which deposition occurs in tier 1	V _{soil, drift - tier 1}	13	[m ³]	D
Drift: soil volume to which deposition occurs in tier 2	V _{soil, drift - tier 2}	15	[m ³]	D
Bulk density of wet soil	RHO _{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
Emission of substance to soil during the day of application by run-off	E _{soil,runoff}	2.63*10 ⁻⁰²	[kg d ⁻¹]	O
Emission of substance to soil during the day of application by spray drift - tier 1	E _{soil,spray_drift_tier1}	1.31*10 ⁻⁰²	[kg d ⁻¹]	O
Emission of substance to soil during the day of application by spray drift - tier 2	E _{soil,spray_drift_tier2}	4.33*10 ⁻⁰³	[kg d ⁻¹]	O
Concentration in local soil at the end of the day of application due to run-off	C _{localsoil,runoff}	1.19*10 ⁻⁰⁶	[kg kg _{wwt} ⁻¹]	O
Concentration in local soil at the end of the day of application due to spray drift - tier 1	C _{localsoil,spray_drift_tier1}	5.94*10 ⁻⁰⁷	[kg kg _{wwt} ⁻¹]	O
Concentration in local soil at the end of the day of application due to spray drift - tier 2	C _{localsoil,spray_drift_tier2}	1.70*10 ⁻⁰⁷	[kg kg _{wwt} ⁻¹]	O

Continued

Parameter/variable	Symbol	Value	Unit	Origin
Total concentration in local soil at the end of the day of application due to spray drift and run-off	$C_{local\,soil,\,total_tier1}$	$1.78 \cdot 10^{-6}$	$[kg\,kg_{wwt}^{-1}]$	0
Total concentration in local soil at the end of the day of application due to spray drift and run-off	$C_{local\,soil,\,total_tier2}$	$1.7 \cdot 10^{-7}$	$[kg\,kg_{wwt}^{-1}]$	0

Calculation**Local emission to soil (tier 1 and tier 2):**

$$E_{soil,\,runoff} = AREA_{house} * Q_{applic,\,product} * f_{ai} * RHO_{product} * F_{runoff} * 10^{-3}$$

$$E_{soil,\,spray_drift_tier\,1} = AREA_{house} * Q_{applic,\,product} * f_{ai} * RHO_{product} * F_{drift} * 10^{-3}$$

$$E_{soil,\,spray_drift_tier\,2} = AREA_{house} * Q_{applic,\,product} * f_{ai} * RHO_{product} * F_{drift} * 10^{-3} * F_{dep}$$

Local concentration in soil (tier 1 and tier 2):

$$C_{local\,soil,\,runoff} = E_{soil,\,runoff} / (V_{soil_tier1} * RHO_{soil})$$

$$C_{local\,soil,\,spray_drift_tier\,1} = E_{soil,\,spray_drift_tier1} / (V_{soil_tier1} * RHO_{soil})$$

$$C_{local\,soil,\,spray_drift_tier\,2} = E_{soil,\,spray_drift_tier2} / (V_{soil_tier2} * RHO_{soil})$$

$$C_{local\,soil,\,total_tier\,1} = C_{local\,soil,\,runoff} + C_{local\,soil,\,spray_drift_tier\,1}$$

$$C_{local\,soil,\,total_tier\,2} = C_{local\,soil,\,spray_drift_tier\,2}$$

Application, consumption-based scenario

Table A13 (chapter 3.2.4.2, table 13): ESD PT10 (2002), Table 12: Emission scenario for calculating the releases from a façade treated with roller or brush

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Treated area of a façade per day	AREA _{façade}	125	[m ²]	D
Volume of product applied on area	V _{form}	0.25	[L m ⁻²]	S
Fraction of active substance in product	F _{form}	0.003	[-]	S
Density of product	RHO _{form}	1400	[kg m ⁻³]	S
Fraction of product lost during application due to dripping	F _{dripping}	0.05	[-]	D
	professional	0.03		table 7, ESD PT 10 (2002)
	amateur	0.05		
Soil volume adjacent to surface treated	V _{soil}	0.5	[m ³]	D
Bulk density of wet soil	RHO _{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
calculated for amateur				
Local emission of active substance during application	E _{local,drip,roll,façade}	6.56 * 10 ⁻⁰³	[kg d ⁻¹]	O
City				
Local emission of active substance during application (roller) to storm water	E _{local,roll,façade,water}	6.56 * 10 ⁻⁰³	[kg d ⁻¹]	O
Countryside				
Local concentration of active ingredient in soil (adjacent to treated surface) resulting from application	C _{local,roll,façade,soil(a)}	7.72 * 10 ⁻⁰⁶	[kg kg _{wwt} ⁻¹]	O
Calculation				
E _{local,drip,roll,façade} = AREA _{façade} * V _{form} * F _{form} * RHO _{form} * F _{dripping} * 10 ⁻³				
City:				
E _{local,roll,façade,water} = 3 * E _{local,drip,roll,façade}				
Countryside:				
C _{local,roll,façade,soil(a)} = E _{local,drip,roll,façade} / (V _{soil} * RHO _{soil})				

Service-life, consumption-based scenario

Table A14 (chapter 3.2.4.3, table 15): ESD PT10: Table 18: Emission scenario for calculating the releases during service life of a house (Countryside-scenario)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Leachable area of a façade proposed in the relevant scenarios	AREA _{façade}	125	[m ²]	D
Leachable area of a roof proposed in the relevant scenarios	AREA _{roof}	0	[m ²]	Not considered
Duration of the initial assessment period	time1	30	[d]	D
Duration of the long-term assessment period	time2	1825	[d]	D
Cumulative quantity of an active substance, leached over the initial assessment period	Q _{leach,time1}	0.000105	[kg m ⁻²]	S
Cumulative quantity of an active substance, leached over a longer assessment period	Q _{leach,time2}	0.00105	[kg m ⁻²]	S
Soil volume adjacent to surface treated	V _{soil}	13	[m ³]	D
Bulk density of wet soil	RHO _{soil}	1700	[kg _{wwt} m ⁻³]	D
Output				
Concentration in local soil at the end of the initial assessment period	C _{local,soil,leach,time1}	5.94*10 ⁻⁷	[kg kg ⁻¹]	O
Concentration in local soil at the end of a longer assessment period	C _{local,soil,leach,time2}	5.94*10 ⁻⁶	[kg kg ⁻¹]	O
Calculation				
C _{local,soil,leach,time1} = Q _{leach,time1} * (AREA _{façade} + AREA _{roof}) / (V _{soil} * RHO _{soil})				
C _{local,soil,leach,time2} = Q _{leach,time2} * (AREA _{façade} + AREA _{roof}) / (V _{soil} * RHO _{soil})				

Consumption-based scenario:

Table A15 (chapter 3.2.4.3 table 14): City scenario - normal case approach: leaching data is available, according to the approach proposed by The Netherlands

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Time for the initial assessment period	$T_{initial}$	30	[d]	D
Time for the longer assessment period (remaining service life)	T_{longer}	1795	[d]	D
Service life	$T_{service-life}$	1825	[d]	D
Number of houses in a city	N_{house}	4000	[-]	D
Fraction of the houses on which paints, plasters, or fillers are applied (market share = 1.0);	f_{house}	1	[-]	D
Cumulative leaching over 30 days	$Q_{leach,time1}$	0.000105	[kg m ⁻²]	S
Cumulative leaching over service life minus 30 days	$Q_{leach,time2}$	0.00105	[kg m ⁻²]	S
Area of the treated surface per house	AREA	125	[m ²]	D
Output				
Number of houses in a city recently treated	$N_{house,initial}$	66	[-]	D
Number of houses in a city treated more than 30 days ago	$N_{house,longer}$	3934	[-]	D
daily emission to the sewer	E_{local}	0.3165	[kg d ⁻¹]	O

Calculation

$$N_{houses,initial} = \frac{T_{initial}}{T_{service-life}} \cdot N_{house} \cdot f_{house}$$

$$N_{houses,longer} = \frac{T_{longer}}{T_{service-life}} \cdot N_{house} \cdot f_{house}$$

$$E_{local} = \frac{(N_{house,initial} \cdot Q_{leach,time1} \cdot AREA)}{T_{initial}} + \frac{(N_{house,longer} \cdot Q_{leach,time2} \cdot AREA)}{T_{longer}}$$

Appendix 3.3 Calculation sheets for sub-category PT6.3.1 Paper production

“Papermaking”

Table 33: Emission scenario for paper making (according to OECD ESD no. 23 (2009))

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Mass of substance used per tonne of paper	M_s		[kg t ⁻¹ paper]	S/D; Table 2.1 and Table 3.2 of OECD ESD no. 23
Fraction of a.s. in the coating	F_{in-can}		[-]	S
Quantity of paper produced at one site per day	Q_p	449	[t d ⁻¹]	D according to MOTA v.6, 2013
Fraction of substance released in water from the paper-making process	$F_{papermaking_water}$	1	[-]	S/D; Table 4.3 of OECD ESD no. 23
Fraction of substance released in sludge from the paper-making process	$F_{papermaking_sludge}$	0	[-]	S/D; Table 4.3 of OECD ESD no. 23
Fraction of substance remaining in waste water after primary treatment	$F_{primary_water}$	1	[-]	S/D; Table 4.2.3 of OECD ESD no. 23
Fraction of substance removed in sludge during primary treatment	$F_{primary_sludge}$	0	[-]	S/D; Table 4.2.3 of OECD ESD no. 23
Output				
Emission per day to water from the papermaking process	$E_{papermaking_water}$		[kg d ⁻¹]	Equation 1 in the OECD ESD no. 23
Emission per day to sludge from the papermaking process	$E_{papermaking_sludge}$		[kg d ⁻¹]	Equation 2 in the OECD ESD no. 23
Emission to waste water after primary treatment of effluent	$E_{primary_water}$		[kg d ⁻¹]	Equation 3 in the OECD ESD no. 23
Emission to sludge after primary treatment of effluent	$E_{primary_sludge}$		[kg d ⁻¹]	Equation 4 in the OECD ESD no. 23
Total emission to sludge from paper recycling (excluding any biological sludge)	E_{sludge_total}		[kg d ⁻¹]	Equation 5 in the OECD ESD no. 23
Calculations				

$$E_{papermaking_water} = M_s \times F_{in-can} \times Q_p \times F_{papermaking_water}$$

$$E_{papermaking_sludge} = M_s \times F_{in-can} \times Q_p \times F_{papermaking_sludge}$$

$$E_{primary_water} = E_{papermaking_water} \times F_{primary_water}$$

$$E_{primary_sludge} = E_{papermaking_sludge} \times F_{primary_sludge}$$

$$E_{sludge_total} = E_{papermaking_sludge} + E_{primary_sludge}$$

Table A18: Vol. IV Part B (2015), IC12, section 3.2 releases from paper making

Use rate of the substance as mass per tonne of paper is given:

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Specific consumption of substance	W_s	0.01	[kg(t*paper) ⁻¹]	S/P Vol. IV Part B (2015), IC12, Table 5
Quantity of paper produced at 1 site per day	Q	449	[t d ⁻¹]	D, according to MOTA v.6
Degree of fixation of substance	F	0	[%]	D, according to MOTA v.6
Degree of closure of water system	C	75	[%]	D, according to MOTA v.6
Output				
Emission per day	E	1.123	[kg d ⁻¹]	O
Calculations				
$E = W_s \times Q \times \frac{(100 - F)}{100} \times \frac{(100 - C)}{100}$				

Table A19: Vol. IV Part B (2015), IC12, section 3.2 releases from paper making

Use rate of the chemical as a concentration in water is given:

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Concentration of substance in water	C_s	0.000666	[kg m ⁻³]	S/P Vol. IV Part B (2015), IC12, Table 5
Water consumption per tonne of paper produced	A_s	15	[m ³ t ⁻¹]	S/P Vol. IV Part B (2015), IC12, Table 6
Quantity of paper produced at 1 site per day	Q	449	[t d ⁻¹]	S/D
Degree of fixation of substance	F	0	[%]	S/D
Output				
Emission per day	E	4.49	[kg d ⁻¹]	O
Calculations				
$E = C_s \times A_s \times Q \times \frac{(100 - F)}{100}$				

Table A20: **PT12: Slimicides used in paper industry (always wet end of the paper machine)** EUBEES ESD PT 12: Table 5.1: Common part of the models for the calculation of the theoretical average concentration (i.e. **not including** degradation before wastewater treatment, depending on the way the dosage is expressed in the user's instructions ([A], [B] or [C]), page 42.

Parameter/variable	Symbol	Value	Unit	Origin
Input				
[A]				
Amount of biocidal product per tonne of dry paper according to user's instructions	Q_{prod}	0.01	[kg t ⁻¹]	S
Amount of wastewater per tonne of dry paper	WW	15	[m ³ t ⁻¹]	D
[B]				
Amount of biocidal product according to users instructions	Q_{prod}	0.00066	[kg m ⁻³]	S
[A/B]				
Fraction of active ingredient in biocide preparation	F_{ai}	1	[-]	S
[B/C]				
Treatment of both long and short circulation with slimicide	APPL	yes	[-]	S (Fill in yes or no)
Slimicide bearing fraction of the total wastewater flow coming from the short circulation of the wire part	F_{ww1}	1	[-]	P (Value taken from APPL)
<i>Typical case: no = 0.6</i>				
<i>Reasonable worst-case: yes = 1</i>				
Connection to pulp mill	CONN	no	[-]	S (Fill in yes or no)
Fraction dilution of slimicide -free wastewater with wastewater from pulping	F_{ww2}	0	[-]	P (Value taken from CONN)
<i>Typical case: yes = 0.5</i>				
<i>Reasonable worst-case: no = 0</i>				
[C]				
Concentration according to user's instructions	C_{prod}	0.666	[g m ⁻³]	S
[A/B/C]				
Fraction of the slimicide that evaporates to air in the dry end of the paper making machine	$F_{\text{air, paper}}$	0	[-]	S
Fraction adsorbed to the paper sheets in the dry end of the papermaking machine	$F_{\text{ads, paper}}$	0	[-]	S

Continued

Parameter/variable	Symbol	Value	Unit	Origin
OR:				
Total fraction of slimicide lost in the dry end of the papermaking machine	$F_{\text{total loss, paper}}$	0.1	[-]	D
Output				
Total fraction of slimicide lost in the dry end of the papermaking machine	$F_{\text{total loss, paper}}$	0.10	[-]	O or default
[A]:				
Dose of a.i. dependent on specifications for the amount of biocide preparation (i.e. respective Q_{prod})	DOSE_{ai}	0.01	[kg t of paper ⁻¹]	O
Theoretical average concentration (i.e. assuming no degradation) before wastewater treatment	C_{paper}	0.6	[g m ⁻³]	O
[B]:				
Dose of a.i. dependent on specifications for the amount of biocide preparation (i.e. respective Q_{prod})	DOSE_{ai}	6.6×10^{-4}	[kg m ⁻³ at the wire part]	O
Theoretical average concentration (i.e. assuming no degradation) before wastewater treatment	C_{paper}	0.594	[g m ⁻³]	O
[C]				
Theoretical average concentration (i.e. assuming no degradation) before wastewater treatment	C_{paper}	0.599	[g m ⁻³]	O
Model Calculations				

$F_{\text{total loss, paper}} = F_{\text{air, paper}} + F_{\text{ads, paper}}$ or default value

[A]

$$\text{DOSE}_{\text{ai}} = Q_{\text{prod}} * F_{\text{ai}}$$

$$C_{\text{paper}} = \text{DOSE}_{\text{ai}} / \text{WW} * 1000 * (1 - F_{\text{total loss, paper}})$$

[B]

$$\text{DOSE}_{\text{ai}} = Q_{\text{prod}} * F_{\text{ai}}$$

$$C_{\text{paper}} = \text{DOSE}_{\text{ai}} * F_{\text{ww1}} * (1 - F_{\text{ww2}}) * 1000 * (1 - F_{\text{total loss, paper}})$$

[C]

$$C_{\text{paper}} = C_{\text{prod}} * F_{\text{ww1}} * (1 - F_{\text{ww2}}) * (1 - F_{\text{total loss, paper}})$$

Table A21 (chapter 3.3.1.4.2 table 17): Calculation Emission to water and emission to sludge from papermaking process according to OECD ESD no. 23 (2009)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Mass of substance used per tonne of paper	M_s	0.01	[kg t ⁻¹ paper]	S/D Substance specific data, or Table 2.1 and Table 3.2
Substance concentration in the coating	$C_{\text{substance}}$		[%]	S
Quantity of paper produced at one site per day	Q_p	449	[t d ⁻¹]	D Default 266 t.d ⁻¹ ; other information in Table 5.1
Fraction of substance released in water from the paper-making process	$F_{\text{papermaking_water}}$	1	[-]	S/D Substance specific or default from Table 4.3
Fraction of substance released in sludge from the paper-making process	$F_{\text{papermaking_sludge}}$	0	[-]	S/D Substance specific or default from Table 4.3
Fraction of substance remaining in waste water after primary treatment	$F_{\text{primary_water}}$	1	[-]	S/D Substance specific or default from Table 4.2.3
Fraction of substance removed in sludge during primary treatment	$F_{\text{primary_sludge}}$	1	[-]	S/D Substance specific or default from Table 4.2.3
Output				
Emission per day to water from the papermaking process	$E_{\text{papermaking_water}}$	4.49	[kg d ⁻¹]	Equation 1 in the OECD ESD no. 23
Emission per day to sludge from the papermaking process	$E_{\text{papermaking_sludge}}$	0	[kg d ⁻¹]	Equation 2 in the OECD ESD no. 23
Emission to waste water after primary treatment of effluent	$E_{\text{primary_water}}$	4.49	[kg d ⁻¹]	Equation 3 in the OECD ESD no. 23
Emission to sludge after primary treatment of effluent	$E_{\text{primary_sludge}}$	0	[kg d ⁻¹]	Equation 4 in the OECD ESD no. 23

Total emission to sludge from paper recycling (excluding any biological sludge)	Esludge_total	0	[kg d ⁻¹]	Equation 5 in the OECD ESD no. 23
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Continued

Calculations

$$E_{papermaking_water} = M_s \times C_{substance}/100 \times Q_p \times F_{papermaking_water}$$

$$E_{papermaking_sludge} = M_s \times C_{substance}/100 \times Q_p \times F_{papermaking_sludge}$$

$$E_{primary_water} = E_{papermaking_water} \times F_{primary_water}$$

$$E_{primary_sludge} = E_{papermaking_sludge} \times F_{primary_sludge}$$

$$E_{sludge_total} = E_{papermaking_sludge} + E_{primary_sludge}$$

"Recycling"

Table A22 (chapter 3.3.1.4.2 table 18): ESD PT6, 7 & 9, EUBEES (2001), Table 12: Emission scenario for calculating the release from paper recycling

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Relevant tonnage in EU for this application	TONNAGE	10	[t yr ⁻¹]	S
Relevant tonnage in this region for this application	TONNAGE _{reg}	1	[t yr ⁻¹]	O
Fraction of region	F _{reg}	0.1	[-]	D
Fraction of main source	F _{mainsource}	0.1	[-]	D
Paper recycling rate (table 8 of the ESD)	F _{recycling}	0.5	[-]	D/P
Deinking yield (see section 4.3.4 of the ESD)	F _{deinking}	1	[-]	S/D
Fraction decomposed during deinking	F _{decomp}	0	[-]	S/D
Fraction removed from waste water during preliminary on-site treatment	F _{preliminary}	0.1	[-]	S
	- easy soluble (> 1000 mg/L)	0.1	[-]	D EUSES 2.1.2
	- poorly soluble (< 1000 mg/L)	0.7	[-]	D EUSES 2.1.2
Number of working days	N _d	320	[d yr ⁻¹]	D
Output				
Local emission of active substance to waste water	E _{localwater}	0.14	[kg d ⁻¹]	O
Calculations				
$TONNAGE_{reg} = F_{reg} * TONNAGE$				
$E_{localwater} = TONNAGE_{reg} * F_{recycling} * F_{mainsource} * F_{deinking} * (1 - F_{preliminary}) * (1 - F_{decomp}) * 1000 / N_d$				

Table A23: Vol. IV Part B (2015), IC12, section 3.3 releases during paper recycling

Usage rate of the substance as mass per tonne of paper is given:

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Total annual consumption of substance on paper (data from notifier or calculated from paper making section)	W_r	1122.5	[kg yr ⁻¹]	S
Rate of paper recycling (default mean value for EU (Baumann and Herberg-Liedtke, 1993))	RR	50	[%]	D
De-inking rate (specific information or Table 7 and 8 of the ESD)	DR	50	[%]	P
Removal rate in on-site primary treatment (i.e. by adsorption); (specific information or see section 3.3.2)	P_a	0	[%]	S/P
Number of working days	N_d	250	[d]	D
Number of recycling sites	N_s	10	[-]	D
Output				
Emission per day	E	0.112	[kg d ⁻¹]	O
Calculations				
$E = \frac{W_r}{N_d \times N_s} \times \frac{RR}{100} \times \frac{DR}{100} \times \frac{(100 - P_a)}{100}$				

Table A24: Calculation Emission to water and emission to sludge from recycling process according to OECD ESD no. 23 (2009)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Mass of substance used per tonne of paper	M_s	0.01	[kg t ⁻¹ recycled paper]	S/D Substance specific data, or Table 2.1 and Table 3.2 in the OECD ESD no. 23
Quantity of paper recycled at one site per day	Q_r	449	[t d ⁻¹]	D Default 266 t.d ⁻¹ ; other information in Table 5.1 in the OECD ESD no. 23
Fraction of substance released to water from deinking or washing process	F_{deink_water}	0.5	[-]	S/D Substance specific or default from Table 4.4 in the OECD ESD no. 23
Fraction of substance released to sludge from de-inking or washing process	F_{deink_sludge}	0	[-]	S/D Substance specific or default from Table 4.4 in the OECD ESD no. 23
Fraction of recycled paper containing the substance	$F_{paper_with\ subst}$	0.0129	[-]	Equation 14 in the OECD ESD no. 23
Tonnage of substance used in paper in EU	TONNAGE	10	[t yr ⁻¹]	Substance specific data
Fraction of paper containing substance that is recycled	F_{recy}	0.6	[-]	General default
Total amount of paper material recycled in EU	$Q_{tot_EU_recyc}$	46,475,000	[t yr ⁻¹]	D Default in the OECD ESD no. 23
Fraction of substance remaining in waste water after primary treatment	$F_{primary_water}$	1	[-]	S/D Substance specific or default from Table 4.2.3 in the OECD ESD no. 23
Fraction of substance removed in sludge during primary treatment	$F_{primary_sludge}$	0	[-]	S/D Substance specific or default from Table 4.2.3 in the OECD ESD no. 23

Continued

Parameter/variable	Symbol	Value	Unit	Origin
Output				
Emission per day to water from de-inking or washing process	E_{deink_water}	0.029	[kg d ⁻¹]	Equation 15 in the OECD ESD no. 23
Emission per day to sludge from de-inking or washing process	E_{deink_sludge}	0	[kg d ⁻¹]	Equation 16 in the OECD ESD no. 23
Emission to waste water after primary treatment of effluent	$E_{primary_water}$	0.029	[kg d ⁻¹]	Equation 17 in the OECD ESD no. 23
Emission to sludge after primary treatment of effluent	$E_{primary_sludge}$	0	[kg d ⁻¹]	Equation 18 in the OECD ESD no. 23
Total emission to sludge from paper recycling (excluding any biological sludge)	E_{sludge_total}	0	[kg d ⁻¹]	Equation 19 in the OECD ESD no. 23
Calculations				

$$F_{paper_with_subst} = \frac{TONNAGE \times F_{recy} \times 10^3}{M_s} \times \frac{1}{Q_{tot_EU_recyc}}$$

$$E_{deink_water} = M_s \times Q_r \times F_{deink_water} \times F_{paper_with_subst}$$

$$E_{deink_sludge} = M_s \times Q_r \times F_{deink_sludge} \times F_{paper_with_subst}$$

$$E_{primary_water} = E_{deink_water} \times F_{primary_water}$$

$$E_{primary_sludge} = E_{deink_sludge} \times F_{primary_sludge}$$

$$E_{sludge_total} = E_{deink_sludge} + E_{primary_sludge}$$

Table A25: OECD ESD no. 15 on kraft pulp mills: chapter 5.3: Emission Estimation Calculations

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Substance concentration in chemical agent	$C_{\text{substance}}$	0.1	[%]	S or D Picking list in the OECD ESD no. 15
container residue as percentage of total chemical agent received by or shipped to a facility	$F_{\text{container-resid}}$	0.04		D, Table 11 OECD ESD no. 15
process residue as percentage of total chemical agent received by or shipped to a facility	$F_{\text{process-resid}}$	0.01		D, Table 12 OECD ESD no. 15
fraction of a target substance released to air	F_{air}	0	[%]	D
reaction loss as percentage of chemical agent used in production process	F_{reaction}	0	[%]	D (0%) OECD ESD no. 15
Fixation rate (fraction of chemical agent retained by product)	F_{fixation}	0	[%]	S or D
Annual operation days	$T_{\text{operation}}$	350	[d yr ⁻¹]	S or D (350 d yr ⁻¹) OECD ESD no. 15
Total Chemical Agent				
annual pulp/paper production	Q_{product}	330000	[t yr ⁻¹]	S or P
chemical agent use rate based on product mass	Q_{agent}	10	[kg t ⁻¹]	D
water consumption rate based on product mass	Q_{water}	15	[m ³ t ⁻¹]	P (72-120 m ³) OECD ESD no. 15
wastewater generation rate based on product mass	Q_{wwater}	19	[m ³ t ⁻¹]	P (65-110 m ³) OECD ESD no. 15
chemical agent use rate based on volume of water or wastewater	X_{agent}	0	[g m ⁻³] or ppm	D
intermediate calculations				
A) For use rate based on product mass:				
total chemical agent received by or shipped to a facility	Q_{total}	3473684	[kg yr ⁻¹]	O

$$Q_{\text{total}} = \frac{Q_{\text{product}} \times Q_{\text{agent}}}{(1 - F_{\text{container-resid}} - F_{\text{process-resid}})}$$

OECD ESD no. 15 continued

Parameter/variable	Symbol	Value	Unit	Origin
B) For use rate based on water volume (usually water treatment chemicals):				
total chemical agent received by or shipped to a facility	Q_{total}	0.00	[kg yr ⁻¹]	O
$Q_{total} = \frac{Q_{product} \times Q_{water} \times X_{agent} \times 10^{-3}}{(1 - F_{container-resid} - F_{process-resid})}$				
C) For use rate based on wastewater volume (usually wastewater treatment chemicals):				
total chemical agent received by or shipped to a facility	Q_{total}	0.00	[kg yr ⁻¹]	O
$Q_{total} = \frac{Q_{product} \times Q_{wwater} \times X_{agent} \times 10^{-3}}{(1 - F_{container-resid} - F_{process-resid})}$				
total chemical agent received by or shipped to a facility	Q_{total}	3473684	[kg yr ⁻¹]	O
Output				
Liquid loss		9.4286	[kg d ⁻¹]	O
Container residue		0.3970	[kg d ⁻¹]	O
Process residue		0.0992	[kg d ⁻¹]	O
Daily aqueous emission of a substance in chemical agent	E_{water}	9.9248	[kg d ⁻¹]	O
Calculations				

$$liquid\ loss = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times (1 - F_{container-resid} - F_{process-resid}) \times (1 - F_{air} - F_{reaction} - F_{fixation})$$

$$container\ residue = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times F_{container-resid}$$

$$process\ residue = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times F_{process-resid}$$

$$E_{water} = liquid\ loss + container\ residue + process\ residue$$

Table A26: OECD ESD no. 16 on non-integrated paper mills: chapter 5.3: Emission Estimation Calculations

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Substance concentration in chemical agent	$C_{\text{substance}}$	0.1	[%]	S or D Picking list in the OECD ESD no. 16
container residue as percentage of total chemical agent received by or shipped to a facility	$F_{\text{container-resid}}$	0.04		D, Table 11 OECD ESD no. 16
process residue as percentage of total chemical agent received by or shipped to a facility	$F_{\text{process-resid}}$	0.01		D, Table 12 OECD ESD no. 16
fraction of a target substance released to air	F_{air}	0	[%]	D
reaction loss as percentage of chemical agent used in production process	F_{reaction}	0	[%]	D (0%) OECD ESD no. 16
Fixation rate (fraction of chemical agent retained by product)	F_{fixation}	0	[%]	S or D OECD ESD no. 16
Annual operation days	$T_{\text{operation}}$	350	[d yr ⁻¹]	S or D (350 d yr ⁻¹) OECD ESD no. 16
Total Chemical Agent				
annual pulp/paper production	Q_{product}	83000	[t yr ⁻¹]	S or P
chemical agent use rate based on product mass	Q_{agent}	10	[kg t ⁻¹]	D
water consumption rate based on product mass	Q_{water}	23	[m ³ t ⁻¹]	P (17-30 m ³) OECD ESD no. 16
wastewater generation rate based on product mass	Q_{wwater}	21	[m ³ t ⁻¹]	P (16-26 m ³) OECD ESD no. 16
chemical agent use rate based on volume of water or wastewater	X_{agent}	0	[g m ⁻³] or ppm	D
intermediate calculations				
A) For use rate based on product mass:				
total chemical agent received by or shipped to a facility	Q_{total}	873684	[kg yr ⁻¹]	O
$Q_{\text{total}} = \frac{Q_{\text{product}} \times Q_{\text{agent}}}{(1 - F_{\text{container-resid}} - F_{\text{process-resid}})}$				
B) For use rate based on water volume (usually water treatment chemicals):				
total chemical agent received by or shipped to a facility	Q_{total}	0.00	[kg yr ⁻¹]	O

$$Q_{total} = \frac{Q_{product} \times Q_{water} \times X_{agent} \times 10^{-3}}{(1 - F_{container-resid} - F_{process-resid})}$$

OECD ESD no. 16 continued

Parameter/variable	Symbol	Value	Unit	Origin
C) For use rate based on wastewater volume (usually wastewater treatment chemicals):				
total chemical agent received by or shipped to a facility	Q_{total}	0.00	[kg yr ⁻¹]	0
$Q_{total} = \frac{Q_{product} \times Q_{wwater} \times X_{agent} \times 10^{-3}}{(1 - F_{container-resid} - F_{process-resid})}$				
total chemical agent received by or shipped to a facility	Q_{total}	873684		
Output				
Liquid loss		2.371	[kg d ⁻¹]	0
Container residue		0.100	[kg d ⁻¹]	0
Process residue		0.025	[kg d ⁻¹]	0
Daily aqueous emission of a substance in chemical agent	E_{water}	2.496	[kg d ⁻¹]	0

Calculations

$$liquid\ loss = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times (1 - F_{container-resid} - F_{process-resid}) \times (1 - F_{air} - F_{reaction} - F_{fixation})$$

$$container\ residue = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times F_{container-resid}$$

$$process\ residue = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times F_{process-resid}$$

$$E_{water} = liquid\ loss + container\ residue + process\ residue$$

Table A27: OECD ESD no. 17 Recovered paper mills: chapter 5.3: Emission Estimation Calculations

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Substance concentration in chemical agent	$C_{\text{substance}}$	0.1	[%]	S or D Picking list in the OECD ESD no. 17
container residue as percentage of total chemical agent received by or shipped to a facility	$F_{\text{container-resid}}$	0.04		D, Table 11 OECD ESD no.17
process residue as percentage of total chemical agent received by or shipped to a facility	$F_{\text{process-resid}}$	0.01		D, Table 12 OECD ESD no.17
fraction of a target substance released to air	F_{air}	0	[%]	D
reaction loss as percentage of chemical agent used in production process	F_{reaction}	0	[%]	D (0%) OECD ESD no.17
Fixation rate (fraction of chemical agent retained by product)	F_{fixation}	0	[%]	S or D
Annual operation days	$T_{\text{operation}}$	350	[d yr ⁻¹]	S or D (350 d yr ⁻¹) OECD ESD no.17
Total Chemical Agent				
annual pulp/paper production	Q_{product}	85000	[t yr ⁻¹]	S or P
chemical agent use rate based on product mass	Q_{agent}	10	[kg t ⁻¹]	D
water consumption rate based on product mass	Q_{water}	21	[m ³ t ⁻¹]	P (16-26 m ³) OECD ESD no.17
wastewater generation rate based on product mass	Q_{wwater}	19	[m ³ t ⁻¹]	P (14-24 m ³) OECD ESD no.17
chemical agent use rate based on volume of water or wastewater	X_{agent}	0	[g m ⁻³] or ppm	D
intermediate calculations				
A) For use rate based on product mass:				
total chemical agent received by or shipped to a facility	Q_{total}	894737	[kg yr ⁻¹]	O
$Q_{\text{total}} = \frac{Q_{\text{product}} \times Q_{\text{agent}}}{(1 - F_{\text{container-resid}} - F_{\text{process-resid}})}$				
B) For use rate based on water volume (usually water treatment chemicals):				
total chemical agent received by or shipped to a facility	Q_{total}	0.00	[kg yr ⁻¹]	O

$$Q_{total} = \frac{Q_{product} \times Q_{water} \times X_{agent} \times 10^{-3}}{(1 - F_{container-resid} - F_{process-resid})}$$

OECD ESD no. 17 continued

Parameter/variable	Symbol	Value	Unit	Origin
C) For use rate based on wastewater volume (usually wastewater treatment chemicals):				
total chemical agent received by or shipped to a facility	Q_{total}	0.00	[kg yr ⁻¹]	O
$Q_{total} = \frac{Q_{product} \times Q_{wwater} \times X_{agent} \times 10^{-3}}{(1 - F_{container-resid} - F_{process-resid})}$				
total chemical agent received by or shipped to a facility	Q_{total}	894737	[kg yr ⁻¹]	
Output				
Liquid loss		2.429	[kg d ⁻¹]	O
Container residue		0.102	[kg d ⁻¹]	O
Process residue		0.026	[kg d ⁻¹]	O
Daily aqueous emission of a substance in chemical agent	E_{water}	2.556	[kg d ⁻¹]	O

Calculations

$$liquid\ loss = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times (1 - F_{container-resid} - F_{process-resid}) \times (1 - F_{air} - F_{reaction} - F_{fixation})$$

$$container\ residue = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times F_{container-resid}$$

$$process\ residue = \frac{Q_{total} \times C_{substance}}{T_{operation}} \times F_{process-resid}$$

$$E_{water} = liquid\ loss + container\ residue + process\ residue$$

Appendix 3.4 Calculation sheets for sub-category PT6.3.2 Textile production

Table A28: TGD Part IV (EC 2003) IC-13 Textile processing industry (identical to ESD (2001), PT9 & 18 Textile processing industry, Table 8: Emission scenario for calculating the release from imported fibres/fabrics)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Quantity of fibres/fabrics treated per day	Q_{fibres}	23.2	[t d ⁻¹]	D/P table 14 of the ESD for PT9 & 18
Estimated content of active substance present on imported material	C_{active}	0.01	[mg kg ⁻¹]	S/D
Output				
Local emission of active substance to wastewater from imported fibres	$E_{\text{local},\text{water}}$	0.000232	[kg d ⁻¹]	0

Calculations

$$E_{\text{local},\text{water}} = Q_{\text{fibres}} \times C_{\text{active}} / 1000$$

Table A29: TGD Part IV (EC 2003) IC-13 Textile processing industry (identical to ESD (2001), PT9 & 18 Textile processing industry, Table 9: Emission scenario for calculating the releases from different application steps of biocide)

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Quantity of fibres/fabrics treated per day	Q_{fibres}	13	[t d ⁻¹]	D/P
Quantity of product applied per tonne of fibres/fabrics for one treatment step	$Q_{x-active}^*$	20	[kg t ⁻¹]	S/D
Fraction of chemical in the product	$F_{chemical}$	0.003	[-]	S/D
Fixation rate	$F_{fixation}$		[-]	D
- desizing/scouring		0		
- dyeing		0		
- finishing		0		
Output				
Local emission of active substance to wastewater for one treatment step				
- desizing/scouring	$E_{local,x,water}$	0.78	[kg d ⁻¹]	O
- dyeing		0.78		
- finishing		0.78		
Summation of E_{local} for each treatment step	$\sum E_{local,x,water}$	2.34	[kg d ⁻¹]	
Local emission of active substance to wastewater from imported fibres	$E_{local,i,water}$	0.000232	[kg d ⁻¹]	O, calculated acc. to Table 8 of the ESD PT9 &18
Total local emission of active substance	$E_{local,tot,water}$	2.340232	[kg d ⁻¹]	O
Calculations				

$$E_{local,x,water} = Q_{fibres} \times Q_{x-active} \times F_{chemical} \times (1 - F_{fix})$$

$$E_{local,tot,water} = E_{local,i,water} + \sum E_{local,x,water}$$

* x represents a treatment step (desizing/sourcing, dyeing, finishing)

Table A30 (chapter 3.3.2.4.2 table 20): OECD ESD no. 7 (2004): Emission scenario for chemicals used in textile processing

Parameter/variable	Symbol	Value	Unit	Origin	Remark
Input					
Mass of textile processed per day	Q_{textile}	13	[t d ⁻¹]	D	Chapter 9.1 OECD ESD no. 7
Mass of auxiliary per mass of fabric - pre-treatment - exhaust process - padding processes	Q_{product}	120 20 20	[kg t ⁻¹]	D	Table 10 OECD ESD no. 7
Content of active substance in preparation	$C_{\text{substance}}$	0.001	[-]	D/S ¹⁾	
Degree of fixation - pre-treatment - exhaust process - padding processes	F_{fixation}	0 0 1	[-]	D	Table 12 OECD ESD no. 7
Fraction of fabric treated with one auxiliary, basic chemical or dyestuff	F_{product}	0.3	[-]	D	Table 10 OECD ESD no. 7
Amount of residual liquors	$F_{\text{residual liquor}}$	0.25	[-]	D/S	Table 12 OECD ESD no. 7
Market share of in-can preservative	F_{penetr}	1	[-]	S	
Emission days	T_{emission}	225	[d]	D	
Output					
Local emission of duestuff per day to waste water - pre-treatment - exhaust-process - padding	$E_{\text{localwater}}$	1.56 0.078 0.975	[kg d ⁻¹] [kg d ⁻¹] [kg d ⁻¹]	O O O	
total (= sum of pre-treatment, exhaust-process and padding)	$E_{\text{localwater}}$	2.61	[kg d ⁻¹]	O	

OECD ESD no. 7 (2004) continued

Calculations

Pre-treatment:

$$E_{local_water} = Q_{textile} \times Q_{product} \times C_{substance} \times (1 - F_{fixation}) \times F_{penetr}$$

Exhaust-process:

$$E_{local_water} = Q_{textile} \times F_{product} \times Q_{product} \times C_{substance} \times (1 - F_{fixation}) \times F_{penetr}$$

Padding-process:

$$E_{local_water} = \{Q_{textile} \times F_{product} \times Q_{product} \times C_{substance} \times (1 - F_{fixation}) \times F_{penetr}\} \\ + \{Q_{textile} \times F_{product} \times Q_{product} \times C_{substance} \times F_{residual\ liquor} \times F_{penetr}\}$$

¹⁾ If the content of active substance in the preparation is not available, it should be assumed as 100%.

Appendix 3.5 Calculation sheets for sub-category PT6.3.3 Leather production

Please note: The following scenario is identical to that scenario provided in the TGD Part IV (2003), IC-7 LEATHER PROCESSING INDUSTRY

Table A31: ESD PT9 (2001), Table 7: Emission scenario for calculating the releases biocides used as preservatives in the leather industry

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Quantity of treated raw hide per day	Q_{leather}	15	[t d ⁻¹]	D
Quantity of active substance applied per tonne of leather: active_salting	Q_{active}	5	[kg t ⁻¹]	S/D
Quantity of active substance applied per tonne of leather: active_soaking	Q_{active}	5	[kg t ⁻¹]	S/D
Quantity of active substance applied per tonne of leather: active_pickling	Q_{active}	5	[kg t ⁻¹]	S/D
Quantity of active substance applied per tonne of leather: active_tanning	Q_{active}	5	[kg t ⁻¹]	S/D
Quantity of active substance applied per tonne of leather: active_finishing	Q_{active}	3	[kg t ⁻¹]	S/D
Content of chemical in formulation	F_{chemical}	0.03	[kg t ⁻¹]	adapted
Fixation rate	F_{fix}	0	[-]	S/D
Output				
Local emission of active substance to wastewater for one treatment step	$E_{\text{local, salting, water}}$	2.25	[kg d ⁻¹]	O
	$E_{\text{local, soaking, water}}$	2.25		
	$E_{\text{local, pickling, water}}$	2.25		
	$E_{\text{local, tanning, water}}$	2.25		
	$E_{\text{local, finishing, water}}$	1.35		
Total local emission of active substance	$E_{\text{local, tot, water}}$	10.35	[kg d ⁻¹]	O
Calculations				

$$E_{local,x,water} = Q_{leather} \times Q_{active} \times F_{chemical} \times (1 - F_{fix})$$

$$E_{local,tot,water} = \sum E_{local,x,water}$$

Table A32 (chapter 3.3.3.4.2 table 24): OECD ESD no. 8 (2004): Emission scenario document on leather processing, Table 7: Emission scenario for chemicals used in leather processing

Parameter/variable	Symbol	Value	Unit	Origin
Input				
Mass of processed raw hide per day	$Q_{rawhide}$	15	[t d ⁻¹]	D
Beamhouse				
Factor of remaining mass of rawhide at specific step "x"	$F_{remaining-mass}$	1	[-]	D; (worst-case according to Table 4 of the OECD ESD no.8)
Mass of chemical formulation used per mass at specific step "x"	$Q_{chemical-formulation}$	10	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8; here: Na₂S/NaSH
Content of chemical in formulation	$F_{chemical}$	0.03	[-]	S
Degree of fixation - Proportion of the substance chemically converted or fixed to the hide during processing	$F_{fixation}$	0	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Local emission of chemical to waste water per day for a specific process step "beamhouse"	$E_{local,beamhouse,water}$	4.5	[kg d ⁻¹]	O
Tanning				
Factor of remaining mass of rawhide at specific step "x"	$F_{remaining-mass}$	0.5	[-]	D; (worst-case according to Table 4 of the OECD ESD no.8)
Mass of chemical formulation used per mass at specific step "x"	$Q_{chemical-formulation}$	20	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Content of chemical in formulation	$F_{chemical}$	0.03	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Degree of fixation - Proportion of the substance chemically converted or fixed to the hide during processing	$F_{fixation}$	0	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8

Local emission of chemical to waste water per day for a specific process step "tanning"	$E_{\text{local,tanning,water}}$	4.5	[kg d ⁻¹]	0
Post-Tanning				
Factor of remaining mass of rawhide at specific step "x"	$F_{\text{remaining-mass}}$	0.35	[-]	D; (worst-case according to Table 4 of the OECD ESD no.8)
Mass of chemical formulation used per mass at specific step "x"	$Q_{\text{chemical-formulation}}$	2	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Content of chemical in formulation	F_{chemical}	0.03	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Degree of fixation - Proportion of the substance chemically converted or fixed to the hide during processing	F_{fixation}	0	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Local emission of chemical to waste water per day for a specific process step "post-tanning"	$E_{\text{local,post-tanning,water}}$	0.315	[kg d ⁻¹]	0
Finishing				
Factor of remaining mass of rawhide at specific step "x"	$F_{\text{remaining-mass}}$	0.2	[-]	D; (worst-case according to Table 4 of the OECD ESD no.8)
Mass of chemical formulation used per mass at specific step "x"	$Q_{\text{chemical-formulation}}$	15	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Content of chemical in formulation	F_{chemical}	0.03	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Degree of fixation - Proportion of the substance chemically converted or fixed to the hide during processing	F_{fixation}	0	[kg t ⁻¹]	D/S; specific or Table 4 of the OECD ESD no.8
Local emission of chemical to waste water per day for a specific process step "finishing"	$E_{\text{local,finishing,water}}$	1.35	[kg d ⁻¹]	0
Fraction of the daily production that is treated with the specific chemical ¹	$F_{\text{daily-production}}$	1	[kg t ⁻¹]	S/D
Fraction of chemical eliminated by on-site waste water treatment before discharge to a municipal sewage treatment plant ²	$F_{\text{on-site-treatment}}$	0	[-]	S/D

Output

Local emission of chemical to waste water per day for a specific process step "x"	$E_{local,beamhouse,water}$	4.5	[kg d ⁻¹]	0
	$E_{local,tanning,water}$	4.5		
	$E_{local,post-tanning,water}$	0.315		
	$E_{local,finishing,water}$	1.35		
Total local emission of active substance	$E_{local,tot,water}$	10.665	[kg d ⁻¹]	0

Calculations

$$E_{local,x-water} = Q_{rawhide} \times F_{remaining-mass} \times Q_{chemical-formulation} \times F_{chemical} \times (1 - F_{fixation}) \times F_{daily-production} \times (1 - F_{on-site-treatment})$$

$$E_{local,total-water} = \sum E_{local,x-water}$$

Remark:

If one and the same chemical e. g. active ingredient in biocides is applied in several process steps, the results of each $E_{local,x-water}$ must be summed.

¹ For dyes, the default $F_{daily-production}$ is 0.5. For other chemicals than dyes this fraction should be taken as default value of 1.

² In generic calculations this fraction is set default = 0. Leather manufacturers may apply on-site knowledge and introduce a site-specific fraction for elimination of chemical on-site sewage treatment.

Appendix 4

Workshop Varese 2013 (2nd EU Leaching Workshop on Wood Preservatives)

The aims of this workshop were to compile the experiences of industry and authorities and to discuss problematic issues. Therefore, background documents had been provided before the beginning of the workshop. Open points should be decided, if possible, so that a harmonised approach could be established for environmental risk assessment in the future. The conclusions from this workshop have been summarised in a document (ECHA/UBA, 2013) circulated amongst the participants for commenting. So far, no final document has been endorsed. Therefore, the main topics are summarised in the following:

1. Request of leaching studies

- a) A leaching test is only required if 100% leaching would result in unacceptable risk for the environment for the active substance(s) as well as for substance(s) of concern (please refer to point 4.b)
- b) Laboratory tests are acceptable; however, semi field tests are preferred to assess the long-term leaching behaviour. The following test methods are proposed for the leaching tests:

Laboratory leaching tests:

Use Class 3:

- ▶ OECD Series on Testing and Assessment No. 107 "OECD Guidance on the Estimation of Emissions from Wood Preservative-Treated Wood to the Environment: for Wood held in Storage after Treatment and for Wooden Commodities that are not covered and are not in Contact with Ground" (2009)
- ▶ CEN/TS 15119-1

Use Classes 4 and 5:

- ▶ OECD Guidelines for testing of chemicals, Test No. 313 "Estimation of Emissions from Preservative - Treated Wood to the Environment: Laboratory Method for Wooden Commodities that are not Covered and are in Contact with Fresh Water or Seawater" (2007)
- ▶ CEN/TS 15119-2

Field leaching tests:

- ▶ NT Build Method 509: Nordic Innovation Centre (2005), NT Method "Leaching of active ingredients from preservative-treated timber - semi field testing)

2. Evaluation of leaching studies and data processing

- a) The leaching rate calculation can be performed in a stepwise approach:

Step 1: based on a FLUX curve

Step 2: based on a first order decay curve (previously logarithmic curve)

Step 3: based on the cumulative quantity leached out

Step 4: based on 100 % leaching for Time 2, if no leaching data are available; the percentage for Time 1 was controversially discussed without finding a conclusion agreed by all MSs. Therefore, this point is still open.

- b) An assessment factor of 5 (can be lowered to 2) should be used for scenarios with wood in horizontal orientation if laboratory studies are evaluated.

3. Top coat as risk mitigation measure and request for studies

- a) No assessment factor (AF) needs to be applied for Time 1 for wood preservatives with topcoat. An AF of 2 has to be applied for Time 2, if the service-life is equal to or lower than 5 years. For a service-life higher than 5 years the AF is set to 5.
- b) A topcoat as risk mitigation measure is also applicable for amateur use. However, the discussion of this point on the TMIII (2013) resulted in a follow up action for the industry (EWPM/CEPE), which proposed to supply mean reduction factors for the leaching rates.

4. How to deal with environmental risks identified during product authorisation?

- a) The mixture toxicity as a part of the cumulative risk assessment needs to be considered for wood preservatives. The PEC/PNEC-values of all active substances in one product and of the substance of concern should be summed up in a tier 1 assessment.
The guidance document "Transitional Guidance on mixture toxicity assessment for biocidal products for the environment" (ECHA, 2014) for assessing the mixture toxicity has recently become available while the guidance document for the aggregated environmental exposure assessment is still under discussion. Please refer to Section 0.
- b) For the Annex 1 inclusion under the BPD a $PEC/PNEC > 1$ was accepted for Time 1 during service life. For product authorisation there are currently three options under discussion:
- ▶ Time 1 is not considered in the risk assessment.
 - ▶ A $PEC/PNEC$ of up to 10 is accepted.
 - ▶ For a 30 day period a $PEC/PNEC > 1$ is accepted. However, the $PEC/PNEC$ should be < 1 at an additional time point (e.g. 180 days).

Furthermore, it was proposed that the protection goal for PT8 should be discussed at CA meeting: should the area around the treated commodities be considered as a technosphere?

- c) The in-situ application according to the OECD ESD no. 2 (2013) should also be considered during product authorisation. The environmental risk assessment

should be performed for brush and/or spray applications. If covering of the soil during application is necessary for safe use, this should be reflected in the CAR/PAR and also stated on the product label.

5. Further open points

- a) The revised OECD ESD no. 2 (2013) can be used for the environmental exposure assessment during product authorisation starting from now (i.e. after TM III 2013).
- b) The environmental exposure assessment of temporary wood preservatives against blue stain fungi can be performed according the following tiered approach:

Tier 1: ERA for storage as worst-case for service life: if risk identified, Tier 2 follows

Tier 2: qualitative approach – assessment of the further life cycle of the treated wood: if distinct exposure cannot be excluded, Tier 3 follows

Tier 3: choose an appropriate scenario from the OECD ESD no. 2 (2013) or develop a new scenario

6. Point for future work

- a) A minimum of requirements for leaching tests should be defined (according to ECHA/UBA (2013) the lead is open)
- b) More detailed guidance for the evaluation of leaching test and the data processing (e.g. determination of the leaching rate, see point 2a) is required (according to ECHA/UBA (2013) the lead is open)
- c) Read across of leaching tests from one BP to another one in PT8
- d) Classification and specification of topcoats according to EN 927 as RMM
- e) Definition of reduction factors for leaching results based on the quality of the topcoat

General remark to the conclusion of the PT8 workshop in Varese:

The outcome of the Varese workshop 2013 has not been considered in MOTA v.6 (2013) so far. However, it needs to be taken into account that the calculated leached amount for the longer assessment period should not exceed the applied amount of active substance. This might be relevant if e.g. for laboratory studies an assessment factor has to be considered.

Although the work-shop was only related to wood –preservatives, the results may also be relevant for PT6 products used as an in-can preservative for paints and coatings.

Workshop Berlin 2014 (“Leaching behaviour of biocides from preservatives”)

The main topic of the workshop was to present and discuss the results of the UBA project “Emission of material preservatives – Environmental risk assessment close to reality due to improved characterisation of the leaching of biocides from treated

materials under outdoor conditions" (UFO-Plan FKZ 3711 63 411) running at BAM (Federal Institute for Materials Research and Testing) since 2011.

The workshop was also used by the participants as a platform for discussion and sharing their experiences with laboratory and field tests. In preparation of this workshop two draft guidelines had been sent out for commenting:

1. Schoknecht, U. (2014-04-30): DRAFT Guidance on a laboratory leaching test method for materials that are treated with biocides to fulfil requirements of the European Biocidal Products Regulation. Berlin
2. Schoknecht, U. (2014-04-30): DRAFT Guidance on a semi-field test method for materials that are treated with biocides to fulfil requirements of the European Biocidal Products Regulation. Berlin

In addition, the workshop was served to discuss the comments and open points regarding the draft guidelines. Reached agreements were included in the draft documents. The revised guidelines were forwarded again to the participants, who got the possibility for a final check. The deadline for the second commenting period was the 12.09.2014.

Appendix 5

Items subject for future revision:

In the course of the preparation of the ESC the following items have been identified subject for future revision:

- Scenario for the application phase of the PT 6.5 Fuels requires development.
- Figures for F_{drift} and F_{runoff} for paints and coatings provided in Table 17: Emission scenario for calculating the releases from a façade treated by sprayer (according to the OECD ESD for PT 8 (2013)) may not be realistic. These figures were originally derived for the application of algicides on facades by spraying of aqueous solutions. Their revision may be needed.
- Default values for F_{pen} need to be adjusted as soon as the recommendation on F_{pen} (under preparation when this ESD was finalised) is available.

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