

## JRC TECHNICAL REPORTS

# Revision of the EU Ecolabel criteria for Paper products

*Technical Report 3.0  
Draft criteria proposal*

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## Abstract

The current revised technical report (TR3.0) provides an update on the criteria revision, based on new information collected during the revision and provided by the involved parties (i.e. through stakeholders' discussion at the AHWG meetings, technical meeting for tissue paper and tissue paper products, further stakeholder inputs following the meetings, emission, energy, and chemical sub-groups co-operation followed by additional desk research).

*The most significant proposals and changes are:*

- *Following the recommendations given in Commission Communication COM(2017)355 product groups 'graphic paper', and tissue paper and tissue paper product' are proposed to be published under one common Commission Decision. The specific criteria of the two product groups are proposed to be displayed in two separate Annexes of this Commission Decision. The list of the complementary definitions has been extended under the common Act Emission limits and scoring system for Criterion 1(a) have been revised, specific values have been added for magnesite pulp;*
- *AOX emission limit has been revised - Criterion 1(b);*
- *CO2 emission criterion has been revised and reformulated following the feedback received. For tissue paper and tissue paper product, the addition of separated reference value for structural paper has been proposed. – Criterion 1 (c);*
- *An energy consumption criterion has been reformulated; it is proposed to refer to the sum up of energy consumed (total energy consumed in form of fuel and electricity). The energy consumption reference values have been updated. For tissue paper and tissue paper product, reference value for structural paper has been proposed - Criterion 2;*
- *Introduction of a common ambition level for fibre sourcing criterion for all three product types– Criterion 3;*
- *Harmonization of the chemical criterion according to recent findings of Chemical Task Force – Criterion 4.*
- *An update of fitness for use criterion for tissue paper and tissue paper product.*

For criteria that addresses emissions to water and air and energy use, the recently published BREF document for pulp, paper and board products has been taken as the main reference for the revision of reference values. Further data from the license holders were gathered via responses to the 2<sup>nd</sup> questionnaire circulated by DG JRC. The emission and energy consumption requirements were discussed with dedicated sub-groups.

Further findings and changes introduced after the 2 AHWG Meeting and additional technical meeting are inserted in [blue](#).

Each criterion is analysed within a separated chapter that includes the main discussion points after the 1<sup>st</sup> and the 2<sup>nd</sup> AHWG meetings, and incorporate the output of technical meeting for tissue paper and tissue paper products. The key aspects of further research, proposed changes and rationales for the revised proposal are included.

# **1. Introduction**

## **1.1 Brief background to the EU Ecolabel**

The EU Ecolabel (European Commission, 2009c) is a voluntary labelling scheme created in 1992 and a key voluntary policy instrument within the European Commission's Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan (European Commission, 2008a) and the Roadmap for a Resource-Efficient Europe. The Roadmap seeks to move the economy of Europe onto a more resource efficient path by 2020 in order to become more competitive and to create growth and employment.

The EU Ecolabel promotes the production and consumption of products with a reduced environmental impact along the life cycle and is awarded only to the best (environmental) performing products in the market.

The entire life cycle of the product is considered, from the extraction of raw material through to production, packaging, distribution, use and disposal. The EU Ecolabel may define criteria that target environmental impacts from any of these life cycle phases, with the aim being to preferentially target those areas of greatest impact. The criteria development process involves scientists, non-governmental organisations (NGOs), Member State representatives and industry stakeholders. The overall ambition level for criteria should aim to target the 10% to 20% most environmentally friendly products currently on the market. Because the life cycle of each product and service is different, the criteria are tailored to address the unique characteristics of each product type. They are revised typically every four years to reflect upon technical innovation such as alternative materials or production processes, reductions in emissions and market advances.

The EU Ecolabel also has links with other policy instruments, such as Green Public Procurement (GPP) (European Commission, 2015b), the Eco-Management and Audit Scheme (EMAS) (European Commission, 2015c), the Ecodesign Directive (European Commission, 2009b) and the Environmental Technologies Action Plan (ETAP) (European Commission, 2006).

The development and revision processes are carried out in accordance with the EU Ecolabel Regulation (EC) No 66/2010. An important part of the process for developing or revising EU Ecolabel criteria is the involvement of stakeholders through publication of and consultation on draft technical reports and criteria proposals. This is achieved by stakeholder involvement in working group meetings and written consultation processes managed via an online platform.

Article 7(2) and 11(2) make provisions to encourage alignment between criteria for the EU Ecolabel and other suitable ISO 14024 Type I ecolabels for similar products. However, care must be taken to ensure that any such alignments are based on scientifically sound rationale, do not create geographical distortions for potential applicants and ultimately, that the proposed criteria are acceptable to the majority of EU Ecolabelling Board (EUEB) members who must vote on the final proposed criteria prior to its adoption.

Other ecolabel schemes of relevance to the paper products that have been identified include: the Nordic Swan (Scandinavia) (Nordic Ecolabelling, 2015), the Blue Angel (Germany) (The Blue Angel, 2015), Umweltzeichen (Austria) (Umweltzeichen, 2015) and the United States Green Seal standards (United States Green Seal, 2015).

## 1.2 The criteria revision process

The typical standard approach that is taken for the revision of EU Ecolabel criteria is illustrated below. The current stage in the process is highlighted in the red box in Figure 1.

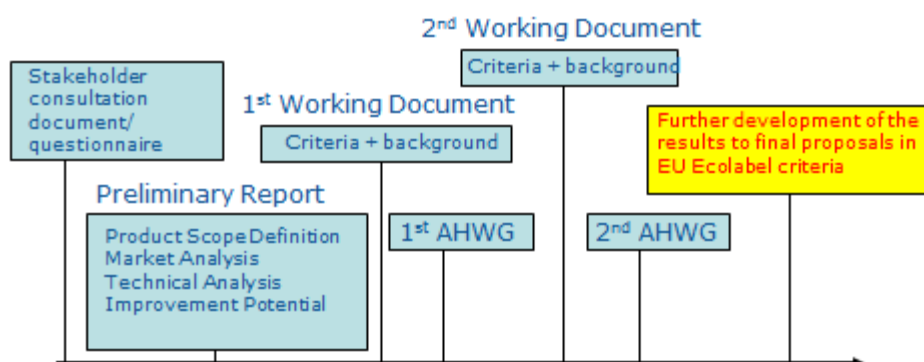


Figure 1. Overview of the typical EU Ecolabel revision process

A draft Preliminary Report (PR) has been published in parallel with Technical Report v.1 (both May 2016) ahead of the 1<sup>st</sup> AHWG meeting held in June 2016 in Seville. The PR examines the three paper product groups in the current legal, political market context. The technical aspects of pulp and paper production are presented and considered from an LCA perspective – attempting to identify the main hot-spots. The documents can be found at the project website: [http://susproc.jrc.ec.europa.eu/Paper\\_products/](http://susproc.jrc.ec.europa.eu/Paper_products/).

**This report (TR3.0) should be read having in consideration the information contained in the Preliminary Report and Technical Reports v.1.0, and v.2.0.** The TR v. 3.0 provides an update on the criteria revision, based on new information collected from the involved parties during the criteria revision process.

The criteria should attempt to target the top 10% to 20% of the most environmentally friendly products currently on the market otherwise the criteria run the risk of becoming meaningless as a basis for highlighting good performance. However, it is appreciated that this is not often possible to judge accurately where multiple criteria are set on a pass-fail basis as is the case with the EU Ecolabel approach.

## 2 Preliminary Report summary

This section summarises the main conclusions of the PR, which presents background research carried out for the EU Ecolabel for three paper product groups: copying and graphic paper (CGP), newsprint paper (NP) and tissue paper (TP).

The full preliminary report can be found on the BATIS platform for registered stakeholders and also at the project website:

[http://susproc.jrc.ec.europa.eu/Paper\\_products/](http://susproc.jrc.ec.europa.eu/Paper_products/) .

### 2.1. Key environmental aspects and relation with the criteria proposal

The life cycle analysis revealed that the key environmental impacts associated with the pulp and paper products are:

- Deforestation and potential loss of biodiversity from sourcing of raw materials (although this is not well captured by land use indicators, land classification factors or biodiversity indicators using current LCA methodology);
- Emissions to air during pulp and paper production (especially CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub>);
- Emissions to water during pulp and paper production (especially COD, AOX and P);
- Energy consumption during production (mainly fuel for pulp mills and electricity for paper mills);
- Water consumption during pulp and paper production
- Energy and ecotoxicity due to the production and uses of chemicals during pulp and paper production;

An illustration of the degree of importance of different normalised impacts for a representative graphic paper intermediate product is illustrated in Figure 2.

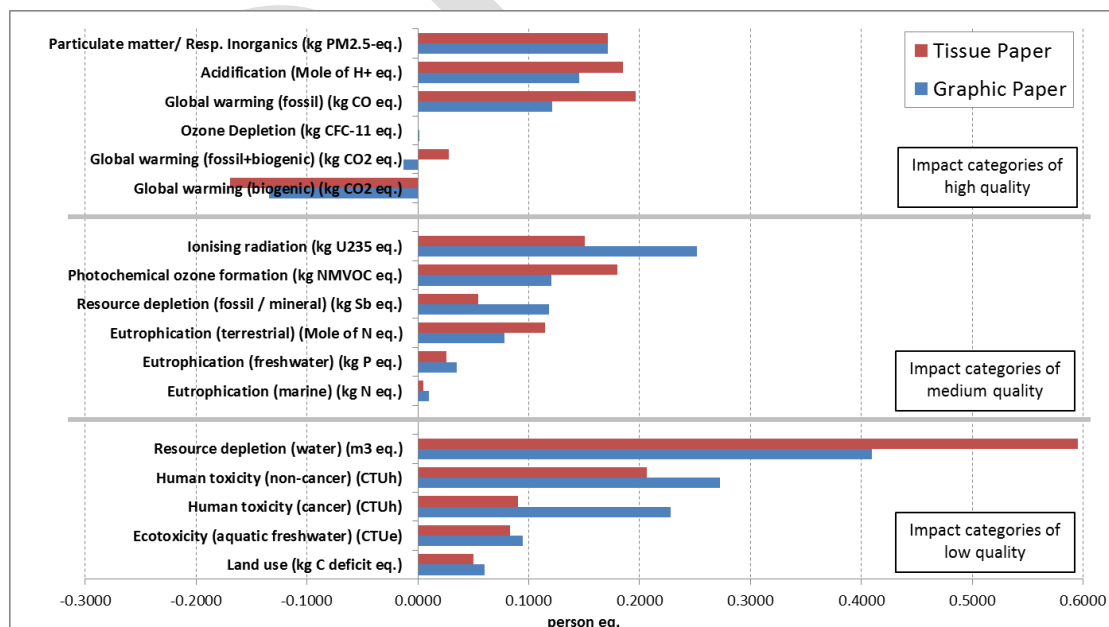


Figure 2: Identification of most relevant impact categories for a representative graphic paper intermediate product (source PEFCR screening study).



It should be noted that, due to the intermediate nature of the product, the data in Figure 2 does not include the use phase of End-of-Life (EoL). However, it is widely accepted that the use phase is negligible and that the EoL impacts are highly dependent on consumer behaviour and the local waste management infrastructure, which will influence whether paper ends up producing uncontrolled methane emissions in a landfill, is incinerated with or without energy recovery or is recycled.

Raw material acquisition was the dominant stage for global warming (biogenic), human toxicity and land use impact categories. This stage was also important for ozone depletion (mainly due to incomplete combustion of fossil fuels in chainsaws and logging machinery) and marine eutrophication (mainly due to nitrogen fertiliser production and application). All other impact categories were dominated by the pulping and/or papermaking stages.

The life-cycle analysis also looked in more detail at the hotspots identified to determine at which life cycle stage, at the level of specific processes, the largest contributions to each impact category occurred. It was found that:

- The dominant life-cycle stage for each impact category is either related to virgin pulp production or the papermaking process.
- The energy use and chemical additives in both the pulping and papermaking stages were the sources of most impacts.
- The sourcing of wood (impacts on climate change and land use) and water resource depletion (for the pulping and papermaking processes) were also identified as important.
- The most significant impacts were related to human toxicity (non-cancerous effects), climate change, acidification, photochemical ozone formation, particulate matter/respiratory inorganics and ionising radiation.

The links between the LCA and non-LCA impacts and the revised EU Ecolabel criteria are presented in Table 1.

The environmental analysis revealed that best practice in paper production is the result of using processes and technologies with lower environmental impacts, and producing products with improved quality. Combined with sustainable behaviours during the use phase, these can result in more eco-friendly products. The list of best practices by impact category is presented below.

1. Fibre sourcing: virgin, recycled and non-wood:

- Use of wood from sustainably managed sources; and
- Encourage the use of fibre from recycling;

2. Fuel and electricity consumption, CO<sub>2</sub> emissions and climate change:

- Substitute coal or fuel oil for natural gas, substitute natural gas for biomass
- Replace traditional boilers with Combine Heat and Power (CHP) units;
- Upgrade recovery boiler units to gasification combined cycle technology

3. Water consumption:

- Optimize the closure of water circuits; and
- Minimise water consumption, use of water savings techniques;

4. Emission to water:

- Use environmentally benign bleaching sequences;
- Minimize the use of poorly biodegradable organic substances;

- Optimise the dosing of N and P to wastewater treatment processes;
5. Emission to air:
- Reduce sources that contribute to acidification (sulphur); and
  - Modernise recovery boilers, replace with gasification combined cycle units;
6. Solid waste:
- Implement integrated waste management plan, minimise waste generation and maximise recycling and waste recovery;

The analysis of best practices undertaken in the preliminary report will be expanded further following the first AHWG meeting, to reflect input from the stakeholders.

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Table 1: Link between the hotspots identified (LCA and non-LCA impacts) and the revised EU Ecolabel criteria

Identified hotspots (LCA impacts)	Revised or new EU Ecolabel criteria	Comments on the related criteria
<b>Acidification</b>	Criterion 1 – Emissions to water and air Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It limits the emissions to air and water arising from the pulping process. It ensures a reduction in energy use, which is the main source of indirect emissions in the pulping and papermaking processes. It limits the hazardous substances and mixtures that can be included in paper, limiting environmental and health risks for consumers.
<b>Particulate Matter / Respiratory Inorganics</b>	Criterion 1 – Emissions to water and air Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It limits the emissions to air and water arising from the pulping process. It ensures a reduction in energy use, which is the main source of indirect emissions in the pulping and papermaking processes. It limits the hazardous substances and mixtures that can be included in paper, limiting environmental and health risks for consumers.
<b>Climate change (fossil/biogenic)</b>	Criterion 2 – Energy use Criterion 3 – Fibres Criterion 4 – Excluded / Limited Substances	It ensures a reduction in energy use, which is the main source of indirect emissions in the pulping and papermaking processes. Encourage the use of recycled fibres, thereby reducing the need to cut down trees which can contribute to resource depletion. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting environmental and health risks for consumers.
<b>Photochemical ozone formation</b>	Criterion 1 – Emissions to water and air Criterion 2 – Energy use Criterion 3 – Fibres Criterion 4 – Excluded / Limited Substances	It limits the emissions to air and water arising from the pulping process. It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking processes. Reduces use of virgin fibres and increases use of recycled/recovered fibres, thereby reducing the need to cut down trees which can contribute to ozone depletion. It limits the hazardous substances and mixtures that can be included in paper, limiting environmental and health risks for consumers.
<b>Human toxicity (non- cancer)</b>	Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances Paper mill infrastructure	It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking and pulping processes. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting environmental and health risks for consumers.
<b>Human toxicity (cancer)</b>	Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It ensures a reduction in energy use, which is the main source of indirect emissions in the pulping process. It limits the hazardous substances and mixtures that can be included in pulp, limiting environmental and health risks for consumers.
<b>Ionising radiation</b>	Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking and pulping processes. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting environmental and health risks for consumers.

Identified hotspots (LCA impacts)	Revised or new EU Ecolabel criteria	Comments on the related criteria
<b>Eutrophication (freshwater)</b>	Criterion 1 – Emissions to water and air Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It limits the emissions to air and water arising from the pulping process. It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking and pulping processes. It limits the hazardous substances and mixtures that can be included in paper, limiting eutrophication and thereby environmental and health risks for consumers.
<b>Ozone Depletion</b>	Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It ensures a reduction in energy use, which is the main source of indirect emissions in the pulping and papermaking processes. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting environmental and health risks for consumers.
<b>Land use</b>	Criterion 2 – Energy use Criterion 3 – Fibres	It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking process. Encourage the use of recycled fibres, thereby reducing the need to cut down trees which can contribute to land use changes.
<b>Resource depletion (fossil / mineral )</b>	Criterion 3 – Fibres Criterion 4 – Excluded / Limited Substances	Reduces use of virgin fibres and increases use of recycled/recovered fibres, thereby reducing the need to cut down trees which can contribute to resource depletion. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting environmental and health risks for consumers.
<b>Eutrophication (terrestrial)</b>	Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking process. It limits the hazardous substances and mixtures that can be included in paper, limiting eutrophication and thereby the environmental and health risks for consumers.
<b>Eutrophication (marine)</b>	Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It ensures a reduction in energy use, which is the main source of indirect emissions in the papermaking and pulping processes. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting eutrophication and thereby the environmental and health risks for consumers.
<b>Ecotoxicity (aquatic freshwater)</b>	Criterion 1 – Emissions to water and air Criterion 2 – Energy use Criterion 4 – Excluded / Limited Substances	It limits the emissions to air and water arising from the pulping process. It ensures a reduction in energy use, which is the main source of indirect emissions in the pulping process. It limits the hazardous substances and mixtures that can be included in paper and pulp, limiting the environmental and health risks for consumers.

### 3 Product group names, definitions and scopes proposal

The following section presents the proposed revisions to the existing names, definitions and scopes of the paper product groups considered in this report.

#### 3.1 Name, definition and scope of EU Ecolabel

Proposed scope
<p style="text-align: center;">Article 1</p> <p>The product group 'graphic paper products' shall comprise sheets or reels of not converted, unprinted blank or coloured paper made from cellulose pulp used for writing, printing, or conversion purposes.</p> <p>It shall not include:</p> <ul style="list-style-type: none"><li>• paper or board intended for conversion into packaging;</li><li>• packaging or wrapping paper;</li><li>• thermally sensitive paper;</li><li>• photographic or carbonless paper;</li><li>• fragranced paper.</li></ul> <p style="text-align: center;">Article 2</p> <p>The product group 'tissue paper and tissue paper products' shall comprise sheets or reels of tissue paper and tissue paper product made from cellulose pulp fit for use for personal hygiene, absorption of liquids and/or cleaning of soiled surfaces. Tissue paper is not converted paper while "tissue paper product" is "tissue paper that has been converted into a finished article for end-user purposes. It includes but is not limited to handkerchiefs, toilet tissue, facial tissue, kitchen/household towel, hand towels, table napkins, mats, industrial wipes and rolls.</p> <p>It shall not include:</p> <ul style="list-style-type: none"><li>• absorbent hygiene products as defined in Commission Decision 2014/763/EU<sup>1</sup> and other absorbent undergarments;</li><li>• tissue paper products containing cleaning agents designed for the cleaning of surfaces;</li><li>• coated tissue paper products or tissue paper products laminated with other materials than tissue paper;</li><li>• cosmetic products within the meaning of Regulation (EC) No 1223/2009 of the European Parliament and of the Council<sup>2</sup> including wet wipes;</li><li>• Fragranced and lotion treated products.</li></ul>
Complementary definitions

<sup>1</sup> OJ L 320, 6.11.2014, p. 46

<sup>2</sup> OJ L 342, 22.12.2009, p. 59

*Article 3*

For the purposes of this Decision, the following definitions shall apply:

- 1 'pulping' means the act of processing wood, other plant matter or waste paper to obtain pulp;
- 2 'pulp' means fibrous material in papermaking produced in a pulp mill, either mechanically, chemically, or by the combination of both;
- 3 'recycled fibre' means fibres diverted from the waste stream during a manufacturing process or generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for their intended purpose. Excluded is reutilisation of materials generated in a process and capable of being reclaimed within the same process that generated it (mill broke — own produced or purchased);
- 4 'mechanical woodpulp paper or board' means paper, board paper or board containing mechanical woodpulp as an essential constituent of its fibre composition;
- 5 'chemical pulp' means fibrous material obtained by removal from the raw material of a considerable part of non-cellulosic compounds that can be removed by chemical treatment (cooking, delignification, bleaching);
- 6 'CTMP' means chemithermomechanical pulp;
- 7 'ECF pulp' means elementary chlorine free bleached pulp;
- 8 'TCF pulp' means totally chlorine free bleached pulp;
- 9 'non-integrated production' means production of market pulp (for sale) in mills that do not operate paper machines, or production of paper/board using only pulp produced in other plants (market pulp);
- 10 'integrated production' means pulp and paper is produced at the same site. The pulp is not dried before paper manufacture. The production of paper/board is directly connected with the production of pulp;
- 11 'deinked pulps' means pulp made from paper for recycling from which inks and other contaminants have been removed;
- 12 'Air dry tonne' of pulp (ADt) meaning dry solids content of 90 %
- 13 'Mother reel' means large roll of tissue paper, wound upon the winding station, covering either the full width or part of the width of the tissue paper machine;
- 14 'packaging' means all products made of any material of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer..
- 15 'Metal-based pigment and dyes' means dyes and pigments containing more than 50% by weight of the relevant metal compound(s).
- 16 'Dyes' means intensely coloured or fluorescent organic substances only, which impart colour to a substrate by selective absorption of light. They are soluble and / or go through an application process which, at least temporarily, destroys any crystal structure by absorption, solution, and mechanical retention, or by ionic or covalent chemical bonds.
- 17 'Pigments' means coloured, black, white or fluorescent particulate organic or inorganic solids which usually are insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate in which they are incorporated. They alter appearance by selective absorption and/or by scattering of light. Pigments are usually dispersed in vehicles or substrates for application, as for instance in the manufacture of inks, paints, plastics or other polymeric materials. Pigments retain a crystal or particulate structure throughout the coloration process.
- 18 'Structured tissue paper' means paper characterized by high bulk and absorbance capacity obtained with significant local areas of high and low fibre density in the form of fibre pockets in the base sheet, generated by specific processes in the tissue paper machine.

### 3.2 Rationales for the revised proposal

The EU Ecolabel is part of a wider package of product policy instruments that contribute to the Circular Economy. The Fitness Check (evaluation study and stakeholder consultation) results show that the uptake of the schemes could be better and more efficient if applying a more focused approach to maximize impacts on the ground (European Commission, 2017).

In order to improve the performance of the EU Ecolabel Regulation scheme and make it more focused to ensure bigger cumulative impact a more targeted approach should be addressed. It should include bundling of closely related product groups where appropriate. Accordingly the product groups: graphic paper (that includes former copying paper and graphic paper, and newsprint paper product groups), and tissue paper and tissue paper product are proposed to be integrated under a common Commission Decision with two independent code numbers.

In this line, a single combined Act accommodates two separated Annexes for two product groups: graphic paper (Annex I), and tissue paper and tissue paper products (Annex II) . The fact that the same manufacturers are often operating in both sectors supports the intention of the proposal.

The previous proposal to establish the definition of the common product group "paper product" was accordingly withdrawn. Following the feedback received, additional definitions have been added.

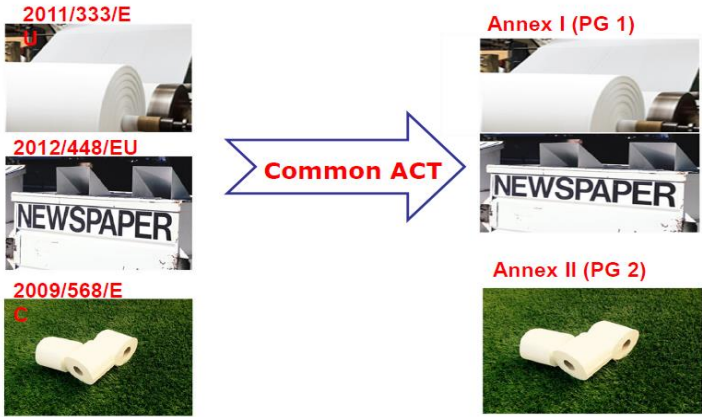


Figure 3 Proposed structure of the Commission Decision for paper product groups under revision

Regarding the definitions related to the product groups under revision Table 2 contains examples of paper related terminology included in ISO 4046 standards. (Note: the definitions provided are given as an example, the full list of definitions and terms is included in the ISO 4046)

Table 2. Examples of scope related terminology of interest included in ISO 4046 : Paper, board, pulps and related terms – Vocabulary

Terms	Definition
<b>Coated paper</b>	Paper that has undergone a coating process on one or both sides
<b>Copy paper</b>	Xerographic paper, photocopying paper, paper, usually uncoated, used for xerographic, ink-jet and other types of home and office copiers and printers

Terms	Definition
<b>Crepe paper</b>	Paper that has been subjected to crêping
<b>Embossed paper or board</b>	Paper or board on which a raised or depressed design has been produced, generally by pressure from an engraved roll or plate
<b>Folding boxboard carton board</b>	Board intended for the manufacture of cartons, and having good scoring and folding properties
<b>Kraft paper</b>	Paper made almost entirely from kraft pulp  NOTE: In some areas, the term "kraft paper" is also used to refer specifically to paper made essentially from unbleached softwood pulp produced by the kraft process. Such paper usually has higher mechanical strength than is obtainable by other known pulping processes from the same woods.
<b>Mechanical woodpulp paper or board</b>	wood-containing paper or board paper or board having mechanical woodpulp as an essential constituent of its fibre composition
<b>Multi-ply paper or board</b>	Multi-layer paper or board multiplex paper or board paper or board consisting of more than three furnish layers combined together during manufacture cf. two-ply paper or board, three-ply paper or board NOTE Two or more furnish layers may be of the same composition
<b>Newsprint</b>	Paper intended for the printing of newspapers
<b>Recovered paper</b>	Waste paper recovered for use, reuse, reprocessing or recycling
<b>Recyclable paper</b>	Recovered paper that can be manufactured into paper or board
<b>Recycled-content paper</b>	Recycled paper or board derived partially or totally from recyclable paper
<b>Tissue paper</b>	Crêped web or sheet of closed formation, made of cellulosic fibres and comprising one or more plies of lightweight paper  NOTE 1 Crêping is generally carried out before the paper is fully dried.  NOTE 2 In certain countries, the use of the word "cellulosic" in this context may lead to practical difficulties and there may be a danger of confusion with cotton wool or wadding, as cotton is also pure cellulose.
<b>Toilet paper</b>	Paper intended for sanitary use
<b>Woodfree paper or</b>	Freesheet paper or board, paper or board having, in principle, only



Terms	Definition
<b>board</b>	chemical pulp in its fibre composition NOTE In practice, it may contain a small amount of other pulps.

### 3.2.1 Copying, graphic paper and newsprint paper

The similarity between copying and graphic paper and newsprint paper product groups is well reflected in the current criteria sets. Specifically, the current definition of copying and graphic paper will also work for newsprint paper. In this sense, and following industry practice it is proposed to accommodate product groups newsprints, and copying and graphic paper under a common nomenclature: **graphic paper**.

The current scope for copying and graphic paper results in constraints as the weight-based restrictions (upper limit of 400 g/m<sup>2</sup>) is not related to the industry practice. The figure of 400g/m<sup>2</sup> appears to be related to the definition of 'board substrate' in Commission Decision 2014/256/EU on the EU Ecolabel for converted paper products (European Commission, 2014a). According to this Commission Decision, board substrate is: "*Paperboard, cardboard or board, unprinted and not converted, with a basis weight higher than 400 g/m<sup>2</sup>*" (European Commission, 2014a). None of the other ecolabels (e.g. Nordic Swan, Blue Angel, etc.) propose weight-based restrictions for copying and graphic or newsprint paper (although it should be noted that the scopes of these other labels are not always comparable).

### 3.2.2 Tissue paper

The stakeholder survey conducted by the IPTS, which is summarised in the Preliminary Report, indicated that only 38.2% of respondents are happy with the current definition and scope for tissue paper. This is in contrast to the definitions and scope for copying and graphic paper and newsprint paper, where the majority of respondents agreed that the current scope and definitions were sufficient.

The term "tissue" describes products and base papers made from lightweight, dry or wet creped and some "non-creped" papers. Tissue products can be made of one or several plies, each ply being of one or several layers, prepared as sheets or rolls, folded or unfolded, embossed or unembossed, with or without lamination, printed or not printed and possibly finished by post-treatment, e.g. lotion application. Products of such a kind derive from a single-ply, semi-finished, wet-laid tissue-base paper that is predominantly composed of natural fibres. The origin of fibres may be virgin or recycled, or a mixture of both. A typical grammage of single-ply tissue-base papers ranges from 10 g/m<sup>2</sup> to 50 g/m<sup>2</sup>.

Each tissue-making process produces a specific kind of tissue suitable for different applications, i.e. kitchen towel requires high strength and good absorption whereas softness is most relevant for facial tissue. The product range includes among others: toilet tissue, facial tissue, kitchen/household towels, hand towels, handkerchiefs, table napkins, and industrial wipes.

The properties of the tissue-base paper give to its resulting products the typical high capacity of tensile energy absorption together with a good textile-like flexibility, surface softness, comparatively low bulk density and high ability to absorb liquids. Disposable tissue products are commonly used for hygienic and industrial purposes. Nonwovens are not classified as tissue (ISO 12625).

Tissue-paper manufacturing technology has evolved and diverged from "ordinary" paper technology therefore the product group is addressed by the separated Annex to the

Commission Decision. Another aspect that should be taken into account for the product group are differences in terminology used. ***Tissue product means the final product obtained after converting operations*** that include processes between the dry end of the paper machine and storage and/or distribution of the finished product, i.e. winding procedures, calendering, embossing, laminating, lamination, perforating, cutting. Converting may include lotion treatment and printing. (Note: The specific definitions that apply to tissue paper and tissue paper product are addressed by Standard ISO 12625). The base tissue paper intended to manufacture tissue paper products is taken from the tissue machine as a single-ply web wound up on a roll/reel. Following stakeholders consultation it is considered appropriate to enable labelling of mother reels.

Following EN ISO 12625:2011: "*Tissue products form an important and growing market for single-use disposable hygiene, and industrial products. The current range of these familiar products includes, toilet tissue, facial tissue, kitchen/household towels (these three products can also be lotion treated), hand towels, handkerchiefs, table napkins, mats, industrial wipes and lotion treated products.*"

It is therefore proposed to base the definition of tissue paper product on the ISO 12625 Standard.

The scope set out in Commission Decision 2009/568/EC (European Commission, 2009a, p. 568) specifically excludes following products:

- (a) wet wipes and sanitary products;
- (b) tissue products laminated with other materials than tissue paper;
- (c) products as referred to in Directive 76/768/EEC.

Ad a) Stakeholders suggested that absorbent hygiene products or undergarments (e.g. disposable diapers, etc.), should be specifically excluded from the scope, in consideration to Commission Decision 2014/763/EU, which sets out EU Ecolabel criteria specifically for absorbent hygiene products, such as: "*baby diapers, feminine care pads, tampons and nursing pads (also known as breast pads), which are disposable and composed of a mix of natural fibres and polymers, with the fibre content lower than 90 % by weight (except for tampons)*"

. According to the Cambridge Dictionary a product can be described as 'sanitary' if it "...protects health by the removal of dirt and waste, especially human waste" or "...describes the things which are used by women during their period". Different eco-labelling schemes group different products into the category 'sanitary products' or sub-categories such as 'sanitary paper products' or 'absorbent hygiene products'. ISO 12625 specifies hygiene paper as *general term for tissue paper intended for personal hygiene use (also referred to as sanitary paper)*.

It is therefore proposed to exclude products that are included in the scope of EU Ecolabel for absorbent hygienic products (2014/763/EU), along with wet wipes, and absorbent undergarments such as disposable diapers. The specific exclusion of "wet wipes and sanitary products, including absorbent undergarments such as disposable diapers" is proposed to be withdrawn as the broad range of tissue product could be considered sanitary products.

Ad (c) During the AHWG Meeting for copying and graphic paper, the reasons for the exclusion of wet wipes from the scope were specifically discussed. No standardised definition has been found for wet wipes. English Oxford Dictionary defines 'wet wipe' as a small disposable cloth treated with a cleansing agent, used especially for personal hygiene. Collins English Dictionary specifies 'wet wipe' as a disposable moistened paper towel.

These two definitions in the combined form describe wet wipe as tissue, or tissue – alike product with leave-on liquid incorporated. The function of wet wipe i.e. surface cleaning, personal hygiene is mostly defined by the type of liquid that is incorporated into the paper base used as vehicle to fulfil intended use.

Following the prescription of Cosmetic Regulation N°1223/2009 in specific cases, some products such as i.e. a wipes, may be the “vehicle” to deliver a substance or mixture to the human skin. This substance or mixture, if it is intended to be placed in contact with the various external parts of the human body, with a view exclusively or mainly to cleaning these external parts, to perfume them, to change their appearance and/or to correct body odours and/or to protect them or keep them in good condition, falls within the scope of application of the Cosmetics Regulation N°1223/2009. Such substances or mixtures are primarily considered to be leave-on cosmetic products (European Commission, 2016a). In this line, following Nordic Swan, wet wipes may be labelled in accordance with the criteria for cosmetic products, which specify that the paper material must fulfil the Nordic Ecolabel or EU Ecolabel requirements on tissue paper. It is therefore proposed to maintain the exclusion of wet wipes from the scope for tissue paper and tissue paper products.

### **3.3. Outcomes from and after the 1<sup>st</sup> and 2<sup>nd</sup> AHWG meetings:**

Some stakeholders were in favour of merging the scope (and criteria) for copying and graphic paper (CGP) and newsprint paper. This would be in line with ISO 1446 and CEPI definitions, where newsprint is a subset of CGP. Other argued that the technical differences observed for the two types of papers would make complicate drafting the common criteria.

The 400 g/m<sup>2</sup> ‘grammage’ upper limit for CGP was assumed as being misleading and far from industry practice. The suggestion to base scope definition on the product intended use (i.e. graphic purposes) was welcomed by the majority.

Most of the stakeholders were not in favour of including “paperboard intended for packaging conversion” in the scope, mainly because of the different production processes. A significant proportion of stakeholders suggested to align the definition of tissue paper product with respective ISO Standard (ISO 12625), and to include similar products such as tablecloths, mats, napkins, etc., within the scope.

The majority of stakeholders are in favour of retaining printed tissue paper in the scope, given that printing inks meet relevant EU regulations on chemicals. By contrary fragranced tissue paper was considered as of limited functionality.

### **3.4. Further considerations and main changes**

The proposed common definition of paper products has been withdrawn. Each product group is proposed to be addressed by its respective definition. A product group name "copying and graphic paper" is proposed to be changed to "graphic paper". The wording of the revised scope has been accordingly adapted. The nomenclature used was clarified.

The moisture content for paper of 6% is proposed to be clarified in the user manual to serve as the base for the calculation. It was accordingly removed from the definitions. Additional definitions were added following CEPI terminology, and respective Standards: ISO 12625 (*Tissue paper and tissue products – Part 1: General guidance on terms*) and ISO 4046-4 (*Paper, board, pulps and related terms – Vocabulary*).

The groups are addressed by their functionality and end use. Printed, coated and converted paper products continue not to be included in the scope due to all the additional processes associated with these products.

The feedback received indicated that there is a need to update the current definition of tissue paper. It was revised in line with ISO 12625 on Tissue Paper and Tissue Products. The reference to EN ISO 12625:2011, and the list of products given is the most reliable and international reference to tissue definition. Considering that tissue product to a large extent substitutes the use of textile material, and that the list of products cannot be exhaustive under the standard, it should be cross checked if the additional functionality should be added to the definition.

*The conversion process of tissue paper into tissue paper product is proposed to be included in the scope only for the chemical and fitness for use requirements. Conversion process of tissue paper is proposed to be specifically excluded from the scope of Criterion 1 and Criterion 2.*

In reference to the pulp accreditation, competent bodies commented the importance of getting access to the lists of pulps and chemicals that have been approved by other competent bodies. A significant proportion of stakeholders are in favour of having a central database for 'Approved Pulps', which can help the paper producers to check if the pulps they want to use are listed as approved. This would also ease the verification work of competent bodies, as the evidence for each type of pulp will only need to be checked once for pulp from a given source, rather than for every applicant using pulp from that source. It would also be possible, for example, to calculate emission values simply by using the available data in the 'Approved Pulps' database. After the 2<sup>nd</sup> AHWG Meeting it was proposed to explore the feasibility to start a project that could deal with the approved pulps database.

It was also suggested that an appendix could potentially be added to the User Manual. Pulp producers could this way provide the necessary information / data for paper producers (applicant), and competent bodies. It was noted that in a list of Approved Pulps it must be clearly explained that it is a paper producer who is expected to make the calculations to show if paper meets the Ecolabel criteria. The calculation should therefore include the information on pulp and paper production.

In line with Nordic Swan criteria for tissue paper Non-woven (of which air-laid is one method) are primarily considered in terms of production techniques and are permitted if the products in question are based on cellulose and meet the requirements in regard to energy use, CO<sub>2</sub> emissions and so on. (I.e. the reference values for tissue paper shall be used).

## 4. Proposed framework for the revision of the EU Ecolabel criteria and main changes

Proposed criteria sets have been designed to cover the different life stages, addressing the hot spots and key parameters identified in the preliminary report.

For the first AHWG meeting some criteria were suggested to be revised in content but maintaining the structure. Moreover, some additional criteria were proposed in order to cover certain aspects not addressed through the current criteria and to be consistent with the revised scope. After the first AHWG consultation the criteria proposal was modified according to the stakeholder comments and further research. 2<sup>nd</sup> AHWG indicated the possible improvement areas for the criteria proposed.

The table below shows the proposed structure of Annex I and Annex II to the Commission Decision for paper products: graphic paper, and tissue paper and tissue paper products.

Table 3. Criteria structure for graphic paper (Annex I), and tissue paper and tissue paper products (Annex II).

Graphic paper (Annex I)	Tissue paper and tissue paper product (Annex II)
1. Emissions to water and air;	1. Emissions to water and air;
2. Energy use;	2. Energy use;
3. Fibres: conserving resources, sustainable forest management;	3. Fibres: conserving resources, sustainable forest management;
4. Excluded or limited substances and mixtures;	4. Restricted hazardous substances and mixtures;
5. Waste management;	5. Waste management;
6. Fitness for use;	6. Final product requirement;
7. Information on the packaging;	7. Information appearing on the EU Ecolabel Packaging;
8. Information appearing on the EU Ecolabel Packaging;	

## 5. Criteria proposal

The following section presents the revised criteria proposal for paper products under consideration. The differences in criterion formulation between Annex I and Annex are specified for each product group.

### 5.1. Criterion 1: Emissions to water and air

#### Rationales for the revised proposal

During the on-going revision process it was acknowledged by a large part of stakeholders that data contained in BREF for pulp and paper (JRC, 2015) continue to be representative for the European market, and could therefore be taken as the primary reference for the revision process, being contrasted with the data gathered from stakeholders (including license holders) during the 2<sup>nd</sup> questionnaire, and further consultation process.

The applicability of the emission data contained in BREF was analysed; BAT-AELs values have been contrasted with questionnaire results and further industry feedback. Proposed emission thresholds are expressed as specific emission load per tonne of product with defined moisture content where the weight of the pulp product is corrected to 10% water and 90% fibre content (kg/ADt), as defined in Article 3 of the proposed Act to the Commission Decision.

An air dry tonne of paper is proposed to be defined as paper with 6% water content in the final product. Following the feedback received, in order to establish common reference for an applicant, correction of the moisture content for paper product, is proposed to be removed from the legal text and introduced in the User Manual.

In many cases paper only contains one type of pulp together with fillers and coating. However, there are also cases where different types of pulps are mixed. To reflect the industry practice and to accommodate specificity of the different type of pulps the calculation of emission needs therefore to be weighted according to the weight content of each pulp in the final product.

#### Monitoring of emission parameters

The JRC Reference Report on Monitoring (ROM) of emissions to air and water from IED installations (revised final draft, June 2017)<sup>3</sup> addresses general principles and other relevant aspects concerning the monitoring of emissions and associated parameters that are the basis for deciding on the monitoring approach and frequency, as well as on the gathering, treatment and reporting of monitoring data. This document aims to promote the accuracy, reliability, representativeness and comparability of monitoring data from industrial installations. In particular, the document covers topics which are related to the monitoring of emissions in connection with Articles 14(1)(c) and 16 of the IED<sup>4</sup>. The list of standards and methods test that addresses emission into water and air indicated in ROM document are listed below.

The test methods' hierarchy established by the BAT conclusions recognises EN and ISO standards first. In the absence of such standards, national standards can be accepted. However, in cases where a national standard is used to monitor emissions instead of an existing EN or ISO standard, it would be necessary to have third party verification that the results from the national standard can be accurately correlated to results that would be obtained from analysing the same given sample under the relevant EN or ISO standard.

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<sup>3</sup> [http://eippcb.jrc.ec.europa.eu/reference/BREF/ROM/ROM\\_RFD\\_2017-06-05.pdf](http://eippcb.jrc.ec.europa.eu/reference/BREF/ROM/ROM_RFD_2017-06-05.pdf)

<sup>4</sup> Directive 2010/75/EU, OJL 334, 12 December 2010, pp. 17–119



Stakeholder feedback revealed that there are many different test methods used to monitor emissions, stemming directly from national permitting requirements, in some situations developing of correlation methodology was perceived as too complex. **Following industry feedback, acceptance of equivalent test methods should be considered by Competent Body.** Thereupon, the following text has been added into A&V: *the applicant shall provide detailed calculations and test data showing compliance with this criterion, together with related supporting documentation which shall include test reports using the following continuous or periodical monitoring standard test methods (or equivalent standard methods that that are accepted by the Competent Body as providing data of equivalent scientific quality): or equivalent standard methods that that are accepted by the Competent Body as providing data of equivalent scientific quality).*

Additionally, following the recommendations of BAT 10, there is a trend to replace COD by TOC for economic and ecological reasons. If TOC is already measured as a key process parameter, there should be no need to measure COD; however, a correlation between the two parameters should be established for the specific emission source and waste water treatment step. It is proposed to address additional clarification in the user manual.

BAT 9 indicates the frequency of monitoring of parameters that addresses air emission. The recommended monitoring frequency for NO<sub>x</sub> and S should be based on periodic or continuous measurements. BAT-AELs are reported as yearly average. Following feedback received further indications concerning data reporting has been added (based on boiler capacity).

Table 4. Standards and methods for the measurement of emissions to water and air

Analyte	EN or ISO Standard	Monitoring frequency	Monitoring method	Measurements range and measurements limits	Remarks
COD	ISO 15705:2002	Periodic	Oxidation with dichromate via small-scale sealedtube method followed by a) photometric detection or b) titrimetric detection	a) 6 mg/l (LoD) to 1 000 mg/l b) 15 mg/l (LoD) to 1 000 mg/l	No EN standard; several Member States use national standards for regulatory purposes e.g. NEN 6633 in NL, NF T 90 101 in FR, or DIN 38409-41 in DE)
	ISO 6060:1989	Periodic	Oxidation with dichromate via open reflux method followed by titration	30 mg/l to 700 mg/l	
Total P	EN ISO 6878:2004	Periodic	Spectrometry using ammonium molybdate after digestion with peroxodisulphate or nitric acid	0.005 mg/l to 0.8 mg/l	-
	EN ISO 15681-1:2004 EN ISO 15681-2:2004	Periodic	Flow analysis (FLA and CFA) after manual digestion with peroxodisulphate	0.1 mg/l to 10 mg/l	
	EN ISO 11885:2009	Periodic	Inductively coupled plasma optical emission spectrometry (ICP-OES)	LoQ: ~ 0.013 mg/l	
AOX	EN ISO 9562:2004	Periodic	Determination of organically bound chlorine, bromine and iodine (expressed as chloride) adsorbable on activated carbon	10 µg/l to 300 µg/l	-
Nitrogen oxides (NO <sub>x</sub> )	EN 21258:2010	Periodic	Extraction, filtration and conditioning followed by non-dispersive infrared spectrometry	Up to 1 300 mg/m <sup>3</sup> at large combustion plants; Up to 400 mg/m <sup>3</sup> at waste (co-)incineration plants	-

Analyte	EN or ISO Standard	Monitoring frequency	Monitoring method	Measurements range and measurements limits	Remarks
Sulphur oxides (SOx)	EN 14791:2005	Periodic	Extraction and filtration followed by absorption in aqueous H <sub>2</sub> O <sub>2</sub> solution with subsequent sulphate determination via ion chromatography or titration	<p>- Ion chromatography: 0.5 mg/m<sup>3</sup> to 2000 mg/m<sup>3</sup> (sampling duration 30 min) (3)</p> <p>(4); LoD: ≥ 0.1 mg/m<sup>3</sup> (flow rate of 1 l/min, 100 ml of absorption solution, sampling duration of 30 min)</p> <p>- Titration: 5 mg/m<sup>3</sup> to 2 000 mg/m<sup>3</sup> (sampling duration 30 min) (3) (4); LoD ≥ 2.2 mg/m<sup>3</sup></p> <p>(flow rate of 1 l/min, 100 ml of absorption solution, sampling duration of 30 min)</p>	-
Nitrogen oxides (NOx)	EN 14792:2005	Continuous,	Chemiluminescence, FTIR, NDIR, NDUV, DOAS.	<p>Lowest range: ≤ 1.6 mg/m<sup>3</sup> (LoQ req.) to 20 mg/m<sup>3</sup></p> <p>Highest range: to 7.5 g/m<sup>3</sup></p>	AMS <sup>5</sup> , SRM <sup>6</sup> ; Certification and calibration standards: EN15267-1:2009, EN15267-2:2009, EN15267-3:2007, and EN 14181:2014.
Sulphur oxides (SOx)	EN 14791:2005	Continuous,	FTIR, NDIR, NDUV, DOAS	<p>Lowest range: ≤ 0.8 mg/m<sup>3</sup> (LoQ req.) to 10 mg/m<sup>3</sup></p> <p>Highest range: to 8.0 g/m<sup>3</sup></p>	

<sup>5</sup> AMS - automated measuring systems (AMSs)

<sup>6</sup> Validation & calibration methods using Standard Reference Methods (SRMs), after the AMS has been installed.



### 5.1.1. Criterion 1a) Chemical Oxygen demand (COD), Phosphorus (P), Sulphur (S), Nitrogen oxides (NOx)

#### Graphic paper

The requirement is based on information on emissions in relation to a specified reference value. The ratio between actual emissions and the reference value translates into an emissions score.

The score for any individual emission parameter shall not exceed 1.3.

In all cases, the total number of points ( $P_{total} = P_{COD} + P_S + P_{NOx} + P_P$ ) shall not exceed 4,0.

In case of non-integrated production the applicant shall provide a calculation that includes pulp and paper production.

For pulp and paper making as a whole, the calculation of  $P_{COD}$  shall be made as follows (the calculations of  $P_S$ ,  $P_{NOx}$ ,  $P_P$  shall be made in exactly the same manner).

For each pulp 'i' used, the related measured COD emissions (COD pulp, i expressed in kg/air dried tonne — ADT), shall be weighted according to the proportion of each pulp used (pulp 'i' with respect to air dried tonne of pulp), and summed together. Air dried tonne assumes a 90% dry matter content for pulp, and 95% for paper.

The weighted COD<sub>emission</sub> for the pulps is then added to the measured COD<sub>emission</sub> from the paper production to give a total COD<sub>emission</sub>· COD<sub>total</sub>.

The weighted COD reference value for the pulp production shall be calculated in the same manner, as the sum of the weighted reference values for each pulp used and added to the reference value for the paper production to give a total COD reference value COD<sub>ref,total</sub>. The reference values for each pulp type used and for the paper production are given in the Table 1.

Finally, the total COD emission shall be divided by the total COD reference value as follows:

$$P_{COD} = \frac{COD_{total}}{COD_{ref,total}} = \frac{\sum_{i=1}^n [\text{pulp},i \times (COD_{\text{pulp},i})] + COD_{\text{papermachine}}}{\sum_{i=1}^n [\text{pulp},i \times (COD_{\text{ref pulp},i})] + COD_{\text{ref papermachine}}}$$

**Table 1. Reference values for emissions from different pulp types and from paper production**

Pulp Grade/Paper	Emissions (kg/ADT)			
	COD <sub>reference</sub>	P <sub>reference</sub>	S <sub>reference</sub>	NOx <sub>reference</sub>
Bleached Chemical pulp (others than sulphite)	16	0,025 0,09 <sup>(1)</sup>	0,35	1,6
Bleached Chemical pulp (sulphite)	24	0,04	0,75	1,6
Magnefite pulp	28	0,056	0,75	1,6
Unbleached chemical pulp	6,5	0,016	0,35	1,6
CTMP /CMP	16	0,008	0,2	0,25 / 0,7 <sup>(2)</sup>
TMP/groundwood pulp	3/5,4 <sup>(3)</sup>	0,008	0,2	0,25
Recycled fibre pulp without de-inking	1,1	0,006	0,2	0,25
Recycled fibre pulp with de-inking	2,4	0,008	0,2	0,25
Paper mill	1	0,008	0,3	0,7

<sup>(1)</sup>Reference value for Eucalyptus pulp.

<sup>(2)</sup>NOx emission value for non-integrated CTMP mills using flash-drying of pulp with biomass-based steam

<sup>(3)</sup> COD value for the highly bleached mechanical pulp (70 – 100 % of fibre in final paper)

In cases where co-generation of heat and electricity occur at the same plant, the emissions of S and NOx resulting from onsite electricity generation can be subtracted from the total amount. The following equation can be used to calculate the proportion of the emissions resulting from electricity generation:

$$2 \times (MWh(\text{electricity})) / [2 \times MWh(\text{electricity}) + MWh(\text{heat})]$$

The electricity in this calculation is the electricity produced at the co-generation plant. The heat in this calculation is the net heat delivered from the co-generation plant to the pulp/paper production.

### Tissue paper and tissue paper product

The requirement is based on information on emissions in relation to a specified reference value. The ratio between actual emissions and the reference value translates into an emissions score.

The score for any individual emission parameter shall not exceed 1.3.

In all cases, the total number of points ( $P_{total} = P_{COD} + P_S + P_{NOx} + P_P$ ) shall not exceed 4,0.

In case of non-integrated production the applicant shall provide a calculation that includes pulp and paper production.

For pulp and paper making as a whole, the calculation of  $P_{COD}$  shall be made as follows (the calculations of  $P_S$ ,  $P_{NOx}$ ,  $P_P$  shall be made in exactly the same manner).

For each pulp 'i' used, the related measured COD emissions (COD pulp, i expressed in kg/air dried tonne — ADT), shall be weighted according to the proportion of each pulp used (pulp 'i' with respect to air dried tonne of pulp), and summed together. Air dried tonne assumes a 90% dry matter content for pulp, and 95% for paper.

The weighted COD<sub>emission</sub> for the pulps is then added to the measured COD<sub>emission</sub> from the paper production to give a total COD<sub>emission</sub>, COD<sub>total</sub>.

The weighted COD reference value for the pulp production shall be calculated in the same manner, as the sum of the weighted reference values for each pulp used and added to the reference value for the paper production to give a total COD<sub>reference</sub> value COD<sub>reftotal</sub>. The reference values for each pulp type used and for the paper production are given in the Table 1.

Finally, the total COD emission shall be divided by the total COD reference value as follows:

$$P_{COD} = \frac{COD_{total}}{COD_{ref,total}} = \frac{\sum_{i=1}^n [\text{pulp},i \times (COD_{\text{pulp},i})] + COD_{\text{papermachine}}}{\sum_{i=1}^n [\text{pulp},i \times (COD_{\text{ref pulp},i})] + COD_{\text{ref papermachine}}}$$

**Table 1. Reference values for emissions from different pulp types and from paper production**

Pulp Grade/Paper	Emissions (kg/ADT)			
	COD <sub>reference</sub>	P <sub>reference</sub>	S <sub>reference</sub>	NOx <sub>reference</sub>
Bleached Chemical pulp (others than sulphite)	16	0,025 0,09 <sup>(1)</sup>	0,35	1,6
Bleached Chemical pulp (sulphite)	24	0.04	0,75	1,6
Magnefite pulp	28	0.056	0.75	1.6
Unbleached chemical pulp	6,5	0.016	0,35	1,6
CTMP /CMP	16	0.008	0.2	0,25 / 0.7 <sup>(2)</sup>
TMP/groundwood pulp	3/5.4 <sup>(3)</sup>	0.008	0.2	0.25
Recycled fibre pulp without de-inking	1.1	0.006	0.2	0.25
Recycled fibre pulp with de-inking	3.2	0.012	0.2	0.25
	Emission (kg/tonne)			
Tissue paper making	1,2	0,01	0,3	0,5
Structured tissue paper making	1,2	0.01	0.3	0.7

<sup>(1)</sup>Reference value for Eucalyptus pulp.

<sup>(2)</sup>NO<sub>x</sub> emission value for non-integrated CTMP mills using flash-drying of pulp with biomass-based steam

<sup>(3)</sup> COD value for the highly bleached mechanical pulp (70 – 100 % of fibre in final paper )

In cases where co-generation of heat and electricity occur at the same plant, the emissions of S and NO<sub>x</sub> resulting from onsite electricity generation can be subtracted from the total amount. The following equation can be used to calculate the proportion of the emissions resulting from electricity generation:

$$2 \times (MWh(\text{electricity})) / [2 \times MWh(\text{electricity}) + MWh(\text{heat})]$$

The electricity in this calculation is the electricity produced at the co-generation plant. The heat in this calculation is the net heat delivered from the co-generation plant to the pulp/paper production.

**Assessment and verification:** the applicant shall provide detailed calculations and test data showing compliance with this criterion, together with related supporting documentation which shall include test reports using the following continuous or periodical monitoring standard test methods (or equivalent standard methods that are accepted by the Competent Body as providing data of equivalent scientific quality): COD: ISO 15705 or ISO 6060; NO<sub>x</sub>: EN 14792 or ISO 11564; S(oxid.): EN 14791 or EPA no.8; S(red.): EPA no 15A,16A or 16B; S content in oil: ISO 8754; S content in coal: ISO 19579; S content in biomass: EN 15289; Total P: EN ISO 6878.

Rapid tests can also be used to monitor emissions so long as they are checked regularly (e.g. monthly) against the relevant aforementioned standards or suitable equivalents. In the case of COD emissions, continuous monitoring by the analysis of TOC (Total Organic Carbon) shall be accepted so long as a correlation between TOC and COD results has been established for the site in question.

The minimum measurement frequency shall be daily for COD emissions and weekly for Total P emissions. Emissions of S and NO<sub>x</sub> shall be taken on a continuous basis (for emissions from boilers of capacity exceeding 50MW) or a periodic basis (at least once per year for boilers and driers of capacity less than 50MW each).

Data shall be reported as annual averages except in cases where:

- the production campaign is for a limited time period only,
- the production plant is new or has been rebuilt, in which case the measurements shall be based on at least 45 days subsequent days of stable running of the plant.

In either case, data may only be accepted if it is representative of the respective campaign and that a sufficient number of measurements for each emission parameter have been made.

The supporting documentation shall include an indication of the measurement frequency and the calculation of the points for COD, Total P, S and NO<sub>x</sub>.

Emissions to air shall include all emissions of S and NO<sub>x</sub> which occur during the production of pulp and paper, including steam generated outside the production site, but subtracting any emissions allocated to the production of electricity. Measurements shall include recovery boilers, lime kilns, steam boilers and destructor furnaces for strong smelling gases. Diffuse emissions shall also be taken into account. Reported emission values for S to air shall include both oxidised and reduced S emissions. The S emissions related to the heat energy generation from oil, coal and other external fuels with known S content may be calculated instead of measured, and shall be taken into account.

Measurements of emissions to water shall be taken on unfiltered and unsettled samples at the effluent discharge point of the mills wastewater treatment plant. In cases where mill effluent is sent to a municipal or other third party wastewater treatment plant, unfiltered and unsettled samples from the mill effluent sewer discharge point shall be analysed and results multiplied by a standard removal efficiency factor for the municipal or third party wastewater treatment plant. The removal efficiency factor to apply shall be based on information provided by the operator of the municipal or other third party wastewater treatment plant.

For integrated mills, due to the difficulties in getting separate emission figures for pulp and paper, if only a combined figure for pulp and paper production is available, the emission values for pulp(s) shall be set to zero and the combined emissions shall be compared against the combined reference values for the relevant pulp and paper production.

#### **5.1.1.1. Rationales for the revised proposal**

The emission data was provided by 44 industrial pulp and paper mills, 26 out of which represented tissue production (Table 5). Three competent bodies informed about ranges of emissions provided by their current license holders. In general, data reported represented kraft pulp manufacturing, and covered tissue paper, graphic paper, and to the lesser extent newsprint paper. No specific (or conclusive) data on sulphite pulp, mechanical or recycled pulp (2 sites) was possible to be subtracted from the questionnaire. This is most probably due to the level of integration of mechanical and recycled pulp production (2 sites) from one site, and the limited number of sulphite pulp

mills from the other. More detailed information was provided to the members of the emission sub-group, and is also available for the stakeholders registered under BATIS System (preparatory documents and minutes from the meeting). Table 5 shows the summary of the information gathered during the consultation process.

During the emission sub-group calls it was debated whether the revised proposal should shape the criteria based on existing licenses or rather set the target for license holders (and potential applicants) to meet. In the latter case, the emissions criteria might oblige license holders to select other pulp suppliers. For integrated production there is however limited (if any) flexibility to change pulp sourcing without major costs and transport associated emissions (that is not addressed by EU Emission Limit (EUEL) criteria). Given the inherent environmental benefits of integrated production (i.e. minimal transport, energy savings, etc.), EU Emission Limit (EUEL) emission limits should be revised very much in consideration of the existing license holder data.

Table 5. Ranges of emission values for singular emission parameters addressed by the Criterion 1 and collected during stakeholders consultation

<i>Emission parameter</i>	<i>Min</i>	<i>Max</i>
	<i>kg/ADt</i>	<i>kg/ADt</i>
<b>COD</b>	0.318	27.97
<b>AOX</b>	0.463*10 <sup>-3</sup>	0.32
<b>P (total)</b>	0.001	0.44
<b>NO<sub>x</sub></b>	0.010	3.45
<b>SO<sub>2</sub></b>	0.024*10 <sup>-2</sup>	1.49
<b>CO<sub>2</sub> fossil</b>	13,00	1461,00

Following stakeholder's feedback the reference values for magnesite pulp has been added, and harmonised with BAT-AELs for COD and P emission. The NO<sub>x</sub> emission into air has been aligned with chemical pulp. The value for sulphur emission has been adapted to the best practice information found in BREF (JRC, 2015).

Following feedback received, additional derogation for COD emission has been added for highly bleached TMP/groundwood pulp.

After the consultation with registered stakeholders, the score for each reference value has been raised to 1,3 (comparing to previous proposal of 1.25), mainly to provide industry with additional flexibility and accommodate the large list of derogations/specific scenarios that have been considered under BAT-conclusions.

#### **5.1.1.1.1 Outcomes from and after the 1<sup>st</sup> AHWG Meeting**

Several stakeholders commented on the overall stringency of the proposed criteria and pointed out the difficulties to achieve the revised values. It was also noted that although the criteria ought to be demanding from an environmental perspective, other relevant factors (e.g. technical, environmental and economic aspects), and possible constraints should be considered. From the other side, it was commented by one stakeholder that BAT-AELs in the BREF documents represent the legal framework and can be achieved by 50-70% of the producers. Since the Ecolabel wants to reflect the top 20% of the market, the reference values should significantly be below the upper BAT-AELs. Some of the stakeholders commented on the time required to implement the proposed changes in the criteria. A few stakeholders expressed concerns that the criteria revision has not

accounted properly for the difference between papermaking using virgin fibres and using recycled fibres.

#### **5.1.1.1.2 Outcomes from and after the 2nd AHWG Meeting and technical Meeting**

Most stakeholders agreed with environmental benefits of using ISO 15705 instead of ISO 6060 for COD analysis and, even better, using TOC analysis as a proxy measure for COD.

Regarding the frequency of measurement for emissions of S and NO<sub>x</sub> to air, it was perceived as necessary to define a minimum number of measurements per year.

National standards for emissions testing, which are required already as per national permitting procedures should also be recognised by EU Ecolabel. Nevertheless, EU Ecolabel should define methods according to international standards only and if the national standards are equivalent.

With regards to the proposed reference values and ambition level of the criteria:

- 1) Additional flexibility of 1.5 for one parameter was perceived as too ambiguous, as any exemption should be clearly define;
- 2) The proposal to simplify the criterion and refer to the final score of 4 as the sum of all four individual emission values without establishing the barrier of 1.25 for each parameter was generally not accepted (based on the feedback received);
- 3) It was proposed to increase the score for each individual parameter from 1.25 to 1.3.

The proposed phosphorus value was perceived as challenging; the problem of the phosphorous presence in the incoming water was commented. The pulp and paper BREF does not cover all the NO<sub>x</sub> emissions that are happening at the pulp and paper mills, especially the pulp side. About 30% of the emission on average and up to 50 % emissions for high integrated mills stem from using high shares of biomass energy, so 50% of the NO<sub>x</sub> emissions are actually generated by biomass boilers.

#### **5.1.1.2. Further research and main changes**

##### **5.1.1.2.1. Methodology**

The proposed revision of EU Ecolabel emission reference values was performed according to the following methodology:

1. To establish the basic threshold for EU Ecolabel reference values at a level corresponding to 80% of the upper BAT-AELs values; in some cases this results in values that are already close to the existing EU Ecolabel reference values.
2. To maintain the scoring system and the current equation, but to reduce the maximum permitted score from 1.5 to 1.3, in order to prevent allowing emissions that would effectively exceed minimum legal requirements in the EU.
3. To perform individual analysis of each emission parameters contrasting information contained in BREF with the questionnaire feedback, and to analyse if there is a possible space for further improvement.
4. On-going consultation process with the dedicated emission sub-group, and industry stakeholders.

The proposal to allow one of the parameters to reach the score 1.5 as long as the final score does not exceed 4, and also an alternative proposal to report the final score of 4,

without considering scoring threshold for each individual parameter were during the posterior consultation process **not acknowledged by the majority** of stakeholders.

The decision to base the proposed revised values on the upper BAT-AELs stems from the comments received from several stakeholders, according to which: a mill performing with the lowest values in the BAT range for all parameters does not exist in reality. The emission parameters are linked and in many cases when one is abated, another tent to raise and an integrated approach was considered necessary. This is in line with BREF findings, i.e. increasing the DS content of the black liquor results in lower SO<sub>2</sub> emission and higher NO<sub>x</sub> emission. Due to this, a recovery boiler with low emission levels for SO<sub>2</sub>, may be on the higher end of the range for NO<sub>x</sub> and vice versa. Similar observation refers to data provided from industry stakeholders.

The holistic approach is therefore the most appropriate and feasible in setting the criteria stringency level, i.e. to reach the lowest overall environmental impact in an integrated approach. For the further analysis of the proposal presented it is important to look at criteria document in its entire form. EU Ecolabel is not intended to target the top 20% of European pulp and paper mills in terms of emissions (by Criterion 1) but instead the top 20% of paper products on the European market (represented by the scope of the revise criteria set). The emission criterion is not intended as a benchmarking exercise for mills but it is rather a part of a wider set of EU Ecolabel criteria, all of which must be complied with.

Furthermore, the 80% of the BREF upper values means that on average each individual parameter has to be at the level of 80% of BAT-AELs. If one emission parameter is at the upper level of BAT (i.e. 1.3x the EU Ecolabel reference value), then another emission parameter, must be lower (i.e. 0.70x the corresponding EU Ecolabel reference value), in order to balance the overall score. Each individual mill will have its own, site specific potential for further improvement. The current system is considered as a way of recognising this fact and allowing for flexibility at the mill level while incorporating a moderate but notable increase in ambition level beyond the platform set by work carried out in the BREF study.

It is also important to noticed that the revised proposal contains changes in the emission reference values from one side, and the reduction of maximum allowed score for individual emissions (from 1.5 to 1.3), from the other. When considered together, even moderate reductions in the EU Ecolabel reference values will be more challenging than they may first appear.

In case of integrated mills, due to the difficulties in getting separate emission figures for pulp and paper, if only a combined figure for pulp and paper production is available, the emission values for pulp(s) shall be set to zero and allocated to the paper mill. Thus the emission from paper production should include both pulp and paper production.

In many cases the produced paper contains only one type of pulp together with fillers and coating. A typical copying paper may include for instance 70% chemical pulp and 30% fillers. However, there are also cases where different types of pulps are mixed. In this case the calculation of final scoring should be weighed according to the pulp content (% of weight).

#### **5.1.1.2.2. CHEMICAL PULP**

Figure 4 illustrates the analysis of emission levels for parameters addressed by Criterion 1(a). The analysis addresses sulphate pulp.

For sulphur emission 54 mills are included in the calculation. 70,3% (38 in number) of included mills meet the proposed revised EU Ecolabel reference level (0.35 kg S/ADt).



Following EKONO study (Ekono, 2012) total sulphur emission (kg S/t) for kraft mills in 2011 in Europe varied between 0.02-0.84 (kg S/t)<sup>7</sup>. The median TRS emission was about 0,17 kg S in Sweden and 0,18 kg S/t in Finland. The US kraft mills average was about 0,6 kg S/t, whereas the Canadian 0.7 kg S/t. The study does not specify if S-emission related to heat and energy generation is included in the analysis (Ekono, 2012). The proposed revised emission level is based on the sum up of BAT-AELS emission thresholds for 4 sources: weak gases burners, recovery boiler, lime kiln and residual weak gases.

For NO<sub>x</sub> emission, analysis includes 53 mills out of which 66% (35 in number) meets the proposed current EU Ecolabel reference level (1.6 kg NO<sub>x</sub>/ADt).

The revised proposal maintained analogous scope for reporting on NO<sub>x</sub> and includes all emissions which occur during the production of pulp and paper, including steam generated outside the production site.

The upper BAT-AELs values set in Commission Implementing Decision 2014/687/EU establishing the best available techniques (BAT) conclusions for the production of pulp, paper and board are as follows:

- Recovery boiler: 1.7 kg NO<sub>x</sub>/ADT
- Lime kiln: 0.3 kg NO<sub>x</sub>/ADT
- TRS burner: 0.1 kg NO<sub>x</sub>/ADT

It is relevant to state that more ambitious emission limit for NO<sub>x</sub> is technically feasible considering that:

- In practice only primary NO<sub>x</sub>-reduction measures are applied, such as low NO<sub>x</sub> burners and staged combustion. It seems the full potential of primary measures is not being fully utilized. Information available at the 'Paper Environmental Footprint' website indicates that with more extensive staged combustion and integration of an OFA (over fire air) system NO<sub>x</sub> emissions reductions of 20% - 40% could be achieved.
- Use of selective catalytic reduction (SCR); Lahti Energy RDF gasification plant with ceramic filter for high temperature removal of condensed volatile salts at 400°C illustrated that the risk of catalyst deactivation can in theory be mitigated by installing high temperature filters. These filters can even be designed to be based on catalytic ceramic materials, acting as a SCR reactor.
- Another technical option for deep removal of NO<sub>x</sub> is wet scrubbing at low temperatures.
- New technological developments may allow application of secondary and tertiary measures such as SCR DeNO<sub>x</sub>, currently not yet applied because of technical risks.

The power boilers and especially the biomass boilers that generate NO<sub>x</sub> emissions are addressed by Large Combustion Plants BREF, and not by the Pulp and Paper BREF. Cross check with the current license holders and further industry consultation show that the level for NO<sub>x</sub> of 1.6 kg NO<sub>x</sub>/ADt is already challenging. Therefore it is proposed to maintain the current value.

COD emissions was analysed on the base of data from 42 mills, out of which 32 mills generate bleached kraft pulp. 50% of bleached pulp mills (16 mills) meet the proposed revised EU Ecolabel reference level (16 kg COD/ADt), whereas the compliance for unbleached kraft pulp (6,5 kg COD/ADt) is equal to 60% (10 mills) of analysed sites.

For phosphorous emission, data includes 42 mills out of which 54,7% (23 mills) meet the proposed revised EU Ecolabel reference level (0,025 and 0,016 kg P/ADt for

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<sup>7</sup> TRS (Total sulphur emission) comprise the sum of the SO<sub>2</sub> and TRS emission.

bleached and unbleached chemical pulp, respectively). Following the indication of BAT conclusions for kraft pulp processing, a specific reference value is granted to Eucalyptus pulp (0,09 kg P/ADt).

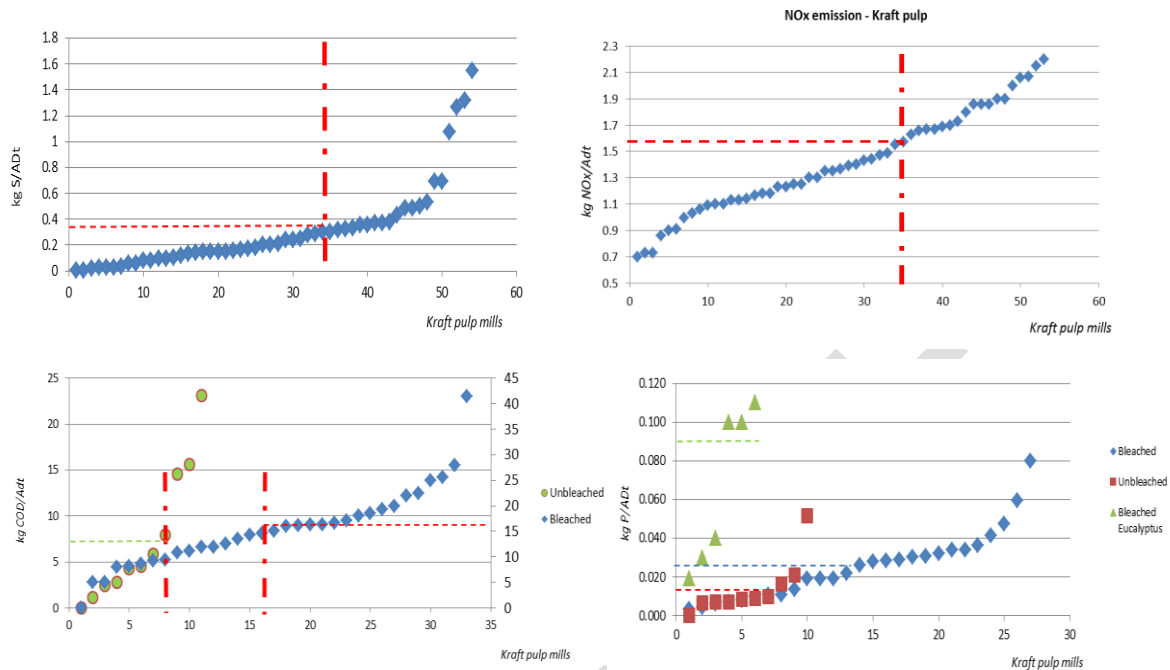
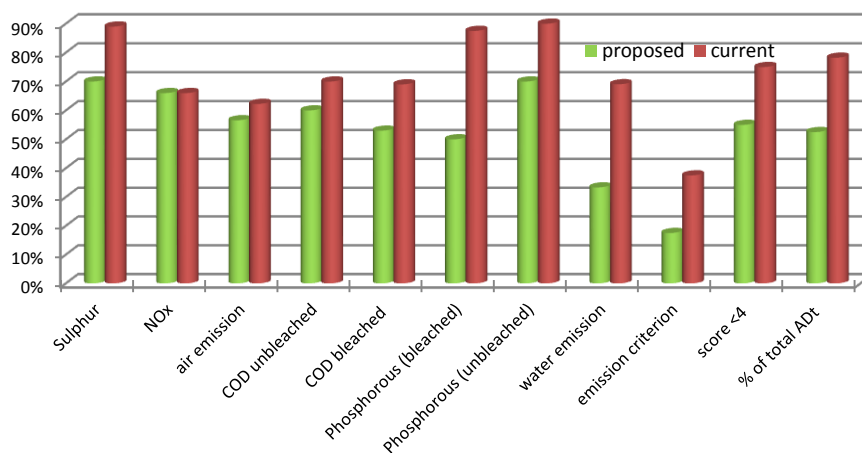


Figure 4 Analysis of emission parameters from kraft pulp mills (Source: BREF)<sup>8</sup>

Table 6 and

Figure 5 contain comparative analysis of the current and proposed, revised reference emission values for the criterion 1(a). Figure 4 compares the current and proposed ambition level for: (1) each parameter, (2) combination of air emission requirements, (3) combination of water emission requirements, and (4) emission criterion in its entire form including scoring system. Combined evaluation includes only those mills that specified all emissions parameters, and indicated production capacity. All in all, comparative analysis includes 40 kraft pulp mills manufacturing 18.095.765 ADt/year. In total, 55% of analysed mills, which roughly corresponds to approximately 40% of the kraft pulp market, comply with the proposed sub-criterion 1(a). The data analysis also proves the need to maintain a flexible approach of scoring system



<sup>8</sup> The air emission data exclude emissions from auxiliary boilers or other steam and power plants.



Figure 5 Change in the current and proposed ambition level of the criterion (% of compliant mills)

Table 6 Comparative analysis of the current and proposed emission reference values for the criterion 1(a)

<i>Parameter</i>	<i>Current threshold</i>	<i>Proposed threshold</i>	<i>Number of mills</i>	<i>Comply with the current threshold</i>	<i>Comply with the proposed threshold (% of mills)</i>	<i>Change (%)<sup>(1)</sup></i>
<i>Sulphur (kg/ADt)</i>	0.6	0.35	54	48	38 (70%)	-21%
<i>NOx (kg/ADt)</i>	1.6	1.6	53	35	35 (66%)	0%
<i>COD (bleached) (kg/ADt)</i>	18	16	32	22	17 (53%)	-23%
<i>COD (unbleached) (kg/ADt)</i>	10	6.5	10	7	6 (60%)	-14%
<i>P (bleached) (kg/ADt)</i>	0.045/(0.1) <sup>(2)</sup>	0.025 (0.09) <sup>(2)</sup>	32	28	16 (50%)	-43 %
<i>P (unbleached)(kg/ADt)</i>	0.04	0.016	10	9	7 (70%)	-22%
<i>Criterion 1(a)</i>	x	x	40	15	7 (17.5%)	-53%
<i>Criterion 1(a) score&lt;4</i>	x	x	40	30	22 (55%)	-27%
<i>Total production (ADt)</i>		18.095.765		14.424.634	7.553.776	-33%

<sup>(1)</sup>Referred to the ambition level of the current criteria

<sup>(2)</sup>Eucalyptus pulp

Emission of P and COD from sulphite pulp have been harmonised with the BREF reference values, in line with the general approach of 80% of upper BAT-AELs limit.

Following feedback received, sulphite processes might show higher than sulphate process variations in the levels of emission into air. Absorbing towers, digester/blow tank systems and the recovery furnace are the main sources of sulphur emission. In a magnesium sulphite mill the main source for sulphur oxide emissions is the recovery boiler.

Following BREF findings, sulphur emissions are in the range of 0.5 – 2.7 kg SO<sub>2</sub>/ADt<sup>9</sup>. In most sulphite pulp mills, two different operational conditions have to be distinguished: 'normal operating conditions' and periods of 'acid operation' (flushing and cleaning of the incrustation in the scrubbers and washer). During the cleaning cycles of the scrubber, the emissions increase as one of the scrubbers or the final washer is not operating and must be compensated by the residual scrubbers (around 96 hours per year). Examples of emission from recovery boilers in sulphite process are given in Table 7. The reference values for sulphite process are proposed to be incorporated into Criterion 1 a).

Table 7 Emission from example sulphite pulp recovery boilers (JRC, 2015)

<b>Sulphur dioxide (as SO<sub>2</sub>)</b>	<b>Yearly average</b>	<b>Daily average (min-max range) incl. explanatory remarks</b>
<b>Four-stage venturi-scrubber and washer</b>	144 mg SO <sub>2</sub> /Nm <sup>3</sup> 1.1 kg SO <sub>2</sub> /ADt	30 – 200 mg SO <sub>2</sub> /Nm <sup>3</sup> (normal operation); 200 – 550 mg SO <sub>2</sub> /Nm <sup>3</sup> (cleaning of the venturi scrubber) 500 – 1 000 SO <sub>2</sub> /Nm <sup>3</sup> (cleaning of last washer); 6 % O <sub>2</sub>

<sup>9</sup> 1 mg SO<sub>2</sub> = 0.5 mg S

Sulphur dioxide (as SO <sub>2</sub> )	Yearly average	Daily average (min-max range)	incl. explanatpory remarks
<b>Electrostatic precipitator and three-stage countercurrent washer</b>	No data provided 0.62 kg SO <sub>2</sub> /ADt	20 – 80 mg SO <sub>2</sub> /Nm <sup>3</sup> (normal operation); during the cleaning of the scrubber values increase to 250 – 300mg SO <sub>2</sub> /Nm <sup>3</sup> ; some ½ hr values reach 1 200 mg SO <sub>2</sub> /Nm <sup>3</sup> (cleaning of the last washer); 5 % O <sub>2</sub>	
<b>Electrostatic precipitator three venturi washers</b>	156 mg/Nm <sup>3</sup> 1.12 kg SO <sub>2</sub> /ADt	Acid washing of venturi washers-(8 hrs/month) are not included in the data (2.5 % O <sub>2</sub> )	

Examples from Austrian sulphite pulp mill shows that when applying BAT it is possible to reach the SO<sub>2</sub> removal efficiency during 'normal operation' of around 99.8% (0,42 kg SO<sub>2</sub>/ADt). The emissions from recovery boilers from sulphite pulp mills that have implemented dust abatement (ESPs or multicyclones) and multistage scrubbers or washers for the recovery of sulphur emission expressed as SO<sub>2</sub>-S range between 0,1 to 0,77 SO<sub>2</sub>-S/ADt (JRC, 2015).

Considering the data analysed, for sulphite pulp (including magnetite pulp) it is proposed to establish the reference value at the level of 0.75 kg S/ADt.

Following BAT 33 - Phosphorous emission for magnetite pulp ios equal to for 0,01 – 0,07, and and for bleached sulphite pulp to 0,01 – 0,05. The reference values are proposed to be adapted accordingly

#### **5.1.1.2.3. CHEMITERMOMECHANICAL (CTMP) AND CHEMIMECHANICAL PULP (CMP)**

Combustion of fuel for on-site energy generation might potentially be a source of emissions into air. It has been therefore assumed that the emission of S and NO<sub>x</sub> to air from semi-mechanical (also mechanical pulping) is closely related to the energy generation.

The proposal is based on following rationales:

- Process related emissions of S-compounds, including emissions of odorous compounds are negligible;
- There are no residues that have to be incinerated onsite, as with black liquor in sulphate pulping. The bark and other residues produced during wood preparation, pulping and waste water treatment need not be incinerated onsite. In fact, bark is frequently supplied to third parties as a fuel (JRC, 2015) or is utilized as an auxiliary in e.g. composting (SPIN, 1993). Pulp residues, rejects and sludge may also be supplied to external customers as a fuel. These may not always be pulp mills and paper mills, but also district heating plants or biomass fired power stations;
- Theoretically, heat demand for TMP pulping and chemithermomechanical pulping (CTMP) is compensated by the amount of heat that can be recovered in form of steam and/or hot water.

Furthermore, emission values (i.e. COD, P) for CTMP pulp reflect 80% of BAT-AELs values. This proposal was cross-checked with the information sent by the license holders and data contained in BREF (JRC, 2015).

EKONO study (Ekono, 2012) reported emission values from semi-chemical pulp and board mills vary between 0.05 – 3.1 kg/t for NO<sub>x</sub> emission (median 0.99 kg NO<sub>x</sub>/t), and 0.02-4.6 kg/t for sulphur emission (median 0.35 kg S/t). Finish mills reported the value between 0.03-0.79 kg S/t for sulphur, and 1.6-2.1 kg NO<sub>x</sub>/ADt.

The REFIT study advises to improve consistency and integration between the EU Ecolabel and existing national/regional labels (European Commission, 2017). Accordingly,

reference emission values for NO<sub>x</sub> and sulphur are proposed to be harmonised with the Nordic Swan requirement for pulp and paper basic module. However, according to information gathered from stakeholders a non-integrated CTMP mill with steam drying of pulp and a power plant using biofuels will be characterised by a specific NO<sub>x</sub>-emissions of about 0,4-0,6 kg/t with BAT technology. With advanced chemical recovery by combustion the NO<sub>x</sub>-level may be up to 0.8 kg/t. The number of mills that falls under the description is limited as most CTMP mills are integrated with pulp, paper or board mills, or are using different drying technique or fuel base.

To address a specific technological solution it NO<sub>x</sub> emission as of 0,7 kg/ADt was proposed for non-integrated CTMP mills using flash-drying of pulp with biomass-based steam and recovery of impregnation chemicals. The consultation process revealed that the higher NO<sub>x</sub> emission should broadly apply to biomass based steam, in general. The derogation is therefore proposed to be amplified.

#### 5.1.1.2.4. MECHANICAL PULP

Mechanical pulping generates emissions to the air that stem mainly from the energy generation by combustion of different types of fossil fuels or renewable wood residuals, among others. In a typical integrated paper mill that uses mechanical pulp high-pressure steam is generated in a power plant. The energy is partially transformed into electricity in a back pressure turbo generator and the rest is used in paper drying. The emission of sulphur dioxide is limited by using selected fuels. Depending on the local conditions there are paper mills using different amounts of energy from external supply (Bajpai, 2015a).

By using emission factors related to specific production data, i.e. fuel, energy, it is possible to estimate the emissions. Table 8 shows as example the emission factors for some combustion facilities. As example, the emission factor for natural gas is 20 x S where S is correlated to the sulphur content of fuel (in wt %), it follows that the combustion of 1 kg of natural gas yields 0.60 g of SO<sub>2</sub> (Van Velzen. D. Eds, 2012):

Combustion of fuels or waste from the pulp, paper and board industry is addressed by the BREF for Large Combustion Plants<sup>10</sup>. Following the prescription of BAT 5, initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee. Accordingly, it is understood that the information on fuel and possible emissions related is a common practice within the sector.

Table 8 Emission factors (g/kg) for the combustion of different fuels (S in%)

	Hard coal	lignite	Pressing lignite	Fuel oil	Natural gas
SO <sub>2</sub>	19xS	10xS	10xS	20xS	20xS
NO <sub>x</sub> (as NO <sub>2</sub> )	1.5-3.0	0.4-0.8	0.96	5.3	3.0-5.0

Following the EKONO study findings (Ekono, 2012), analysed Swedish and Finnish mills reported total sulphur emission below 0.18 kg S/t. The reference value for Nordic Swan is 0.2 kg S/t. It is proposed to harmonise the value with the Nordic Swan.

<sup>10</sup> Best Available Techniques (BAT) Reference Document for Large Combustion Plants. JRC. 2016. Final Draft

The median NO<sub>x</sub> emissions were 0.17 and 0.35 kg NO<sub>x</sub>/t in Sweden and Finland, respectively. Reference emission value for NO<sub>x</sub> is proposed to be harmonised with the Nordic Swan requirement for pulp and paper basic module.

Figure 6 contains analysis of COD and P emissions from mechanical pulping (groundwood and TMP). Table 9 analyses the level of compliance with the proposal.

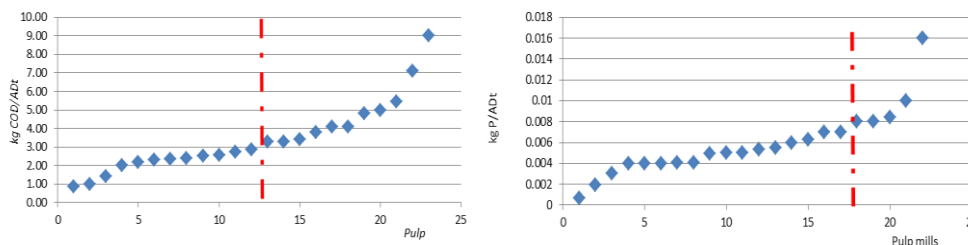


Figure 6 Analysis of emission parameters into water from groundwood and TMP pulp (Source: BREF)

Table 9 Analysis of the ambition level for the values proposed for mechanical pulp mills

	Current threshold	Proposed threshold	Number of mills	Comply with the current threshold	Comply with the proposed threshold	Change (%)*	Ambition level*
<b>COD</b>	3	3	23	12	12	0%	52%
<b>Phosphorous</b>	0.01	0.008	22	21	20	-0.5%	91%

During the consultation process, COD reference value for highly bleached TMP/groundwood pulp was proposed to be established at 5.4 kg COD/ADt. In fact, in line with BAT 40, for highly bleached mechanical pulp (70 – 100 % of fibre in final paper), emission levels of up to 8 kg/t may occur. Further cross check revealed that paper with the highest brightness cause higher COD loads than standard grades due to an alkaline peroxide bleaching stage. The yield loss in connection with peroxide bleaching is 15 – 30 kg/tonne corresponding to an additional load of approximately 10 – 30 kg O<sub>2</sub>/tonne measured as COD respectively. The values reported for mechanical mills cover the range of 0.87 kg/t to 7.13 kg/t, and up to 8 – 9 kg/t in the case of highly bleached mechanical pulp (JRC, 2015). TMP mills that are based on 80 – 100 % TMP, most of it hydrogen peroxide bleached, reported the highest COD emissions; with emissions varying between 4.5 kg/ADt and 9 kg/ADt. The achieved brightness level (% ISO) of the final product (MFC, LWC paper) corresponds to a certain extent to the discharged COD load. Consequently, in line with the proposal received, the reference value for highly bleached mechanical pulp has been updated to 5.4 kg COD/ADt.

Whiteness is the most common nomenclature, as defined by the CIE (Commission Internationale de l'Eclairage - International Commission on Illumination), to express the optical property of the product. Paper companies in Europe use the CIE whiteness scale (ISO Standard 11475<sup>11</sup>). In the US the most commonly used measure is Brightness as defined by the TAPPI T451 (Technical Association of the Pulp and Paper Industry). ISO Standard 2469 is popular mainly in Europe and South America. TAPPI and the ISO are not interchangeable, mainly because of differing instrumentation and methodology (diffuse vs directional) used to take measurements. TAPPI uses directional brightness measurement of parallel beams of light that illuminate the paper surface at an angle of

<sup>11</sup>ISO 11475:2017 should be read in conjunction with ISO 2469

45 degree. ISO brightness uses an integrating sphere to provide diffuse light and perpendicular observation geometry. The reflected light is viewed by a photocell positioned to view the sample in a perpendicular direction.

As to the product groups under revision, newsprint's brightness ranges from 55 to 75 ISO brightness. Standard office papers is usually in the range of 82 to 90 ISO, but could be as bright as 104 ISO. A brightness index of 90 ISO or above is commonly associated with high-quality papers.

### 5.1.1.2.5. RECYCLED FIBRE

In most cases, plants processing paper for recycling are integrated with paper production. The intensity of the recovery process, and the presence of some emissions pointed in Figure 7 in depends mainly on the paper grade and paper properties to be achieved and the type of energy supply.

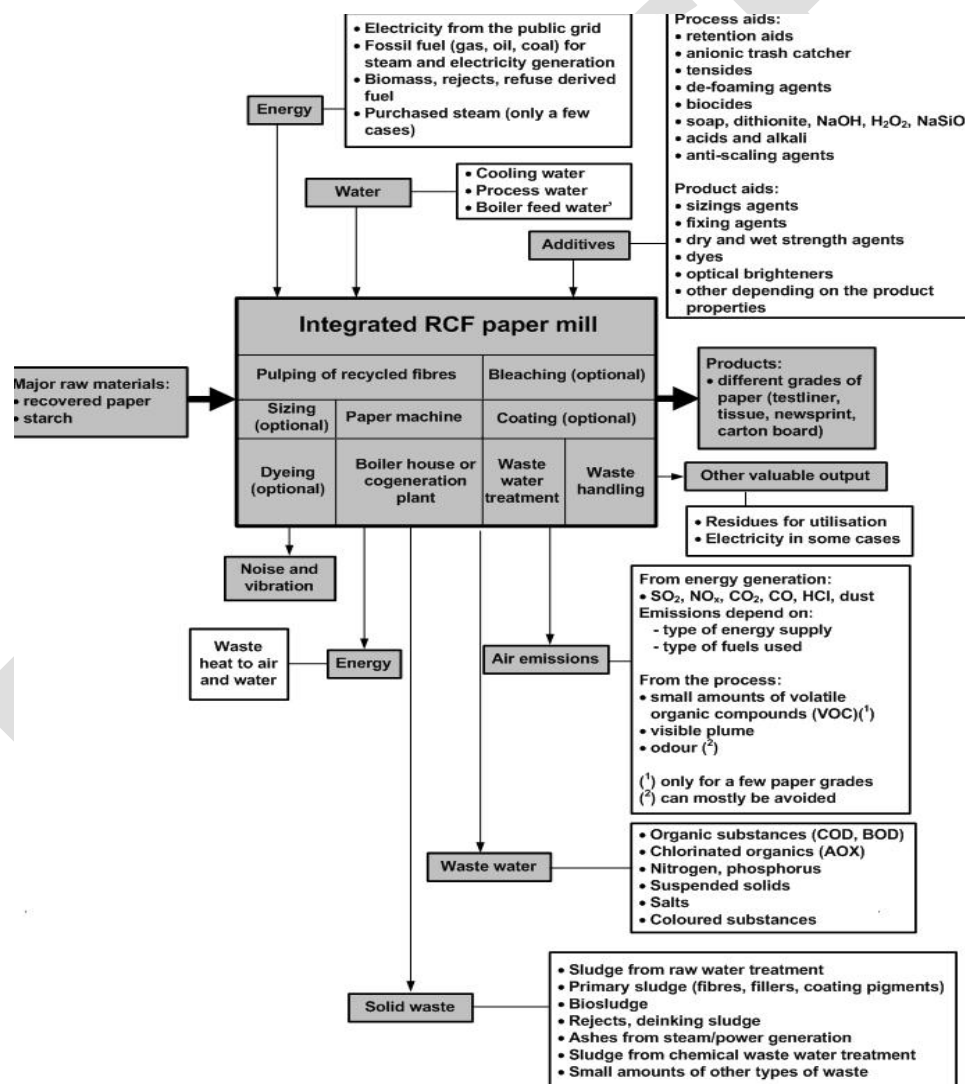


Figure 7 Mass stream overview of an integrated mill for processing paper for recycling (JRC, 2015)

In Europe, it is possible to find large differences in the composition of paper for recycling. The environmental impact of processing paper for recycling basically comprises emissions to water, solid waste generation and atmospheric emissions that

are mainly related to energy generation by combustion of fossil or other fuels in steam boilers or combined heat and power plants.

Figure 8 and Figure 9 contain analysis of the emission levels from RCF mills. The division between mills that operates with or without de-inking have been established under proposed criterion in line with BAT –AELs and BREF finding that reflect differences in the emission loads.

Table 10 contains comparative analysis of the prevalent and proposed, revised emission reference values for recycled fibre.

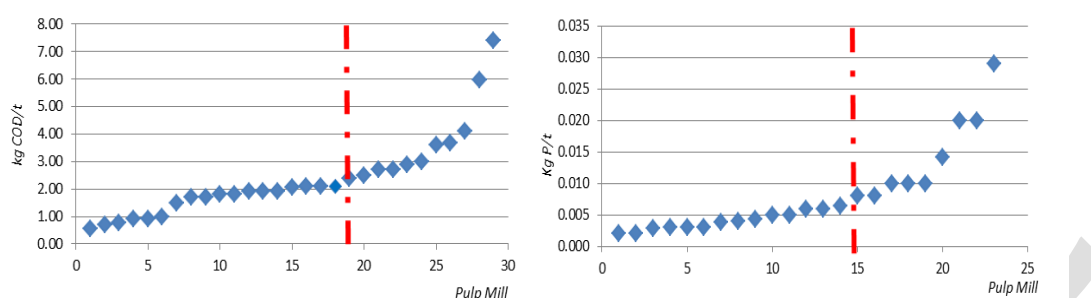


Figure 8. COD and phosphorous emissions from RCF mills with deinking

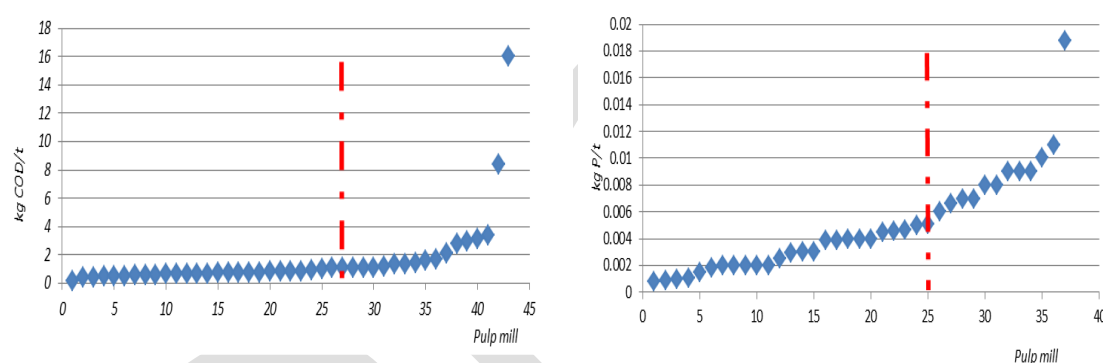


Figure 9. COD and phosphorous emissions from RCF mills without deinking

Table 10 Analysis of the ambition level for the values proposed for recycled pulp

	Current threshold	Proposed threshold	Number of mills	Comply with the current threshold	Comply with the proposed threshold	Change (%)*	Ambition level*
<b>Emission from RCF mills with deinking</b>							
<b>COD</b>	2.0	2.4	29	14	19	+36%	65,5%
<b>Phosphorus</b>	0.01	0.008	23	19	16	-16%	69,6%
<b>Emission from RCF mills without deinking</b>							
<b>COD</b>	2.0	1.1	43	36	30		69.8%
<b>Phosphorus</b>	0.01	0.006	37	30	20		54.1%

\*Assumed as the representativeness of absolute emission value for the number of mills analysed (score 1.25 is not taken into consideration)

Similarly to mechanical pulping, emissions to air from paper recycling originate mainly from energy generation (steam and electricity) and less from the manufacturing process itself.

Following the Econo study (Econo, 2012) that addressed mills producing secondary fibre with deinking, NOx emission from Swedish and Finnish mills ranged from 0.07 to 0.8 kg/t.

NOx and sulphur emission values for recycled fibre are proposed to be harmonised with the Nordic Swan requirement for pulp and paper basic module.

RCF fibre designated for the tissue paper manufacturing requires higher purity. Hence, following indication of BAT 45 for integrated RCF paper mills with deinking, COD and P emission reference values were adapted to the derogation specifically indicated for tissue paper (Table 11).

Table 11 Proposed reference values for emissions into water for RCF paper mills

<b>Parameter</b>	<b>BAT-AELs Yearly average kg/t</b>	<b>Proposed revised EU Ecolabel values value</b>	<b>EU reference reference</b>
<b>Chemical oxygen demand (COD)</b>	0,9 – 4,0		3,2
<b>Total phosphorus</b>	0,002 – 0,015		0,012

#### **5.1.1.2.6. PAPER PRODUCTION**

Independently from the paper grade manufactured, paper mill processes can be generally divided into key sections, characterized by a specific emissions as demonstrated on Figure 10.



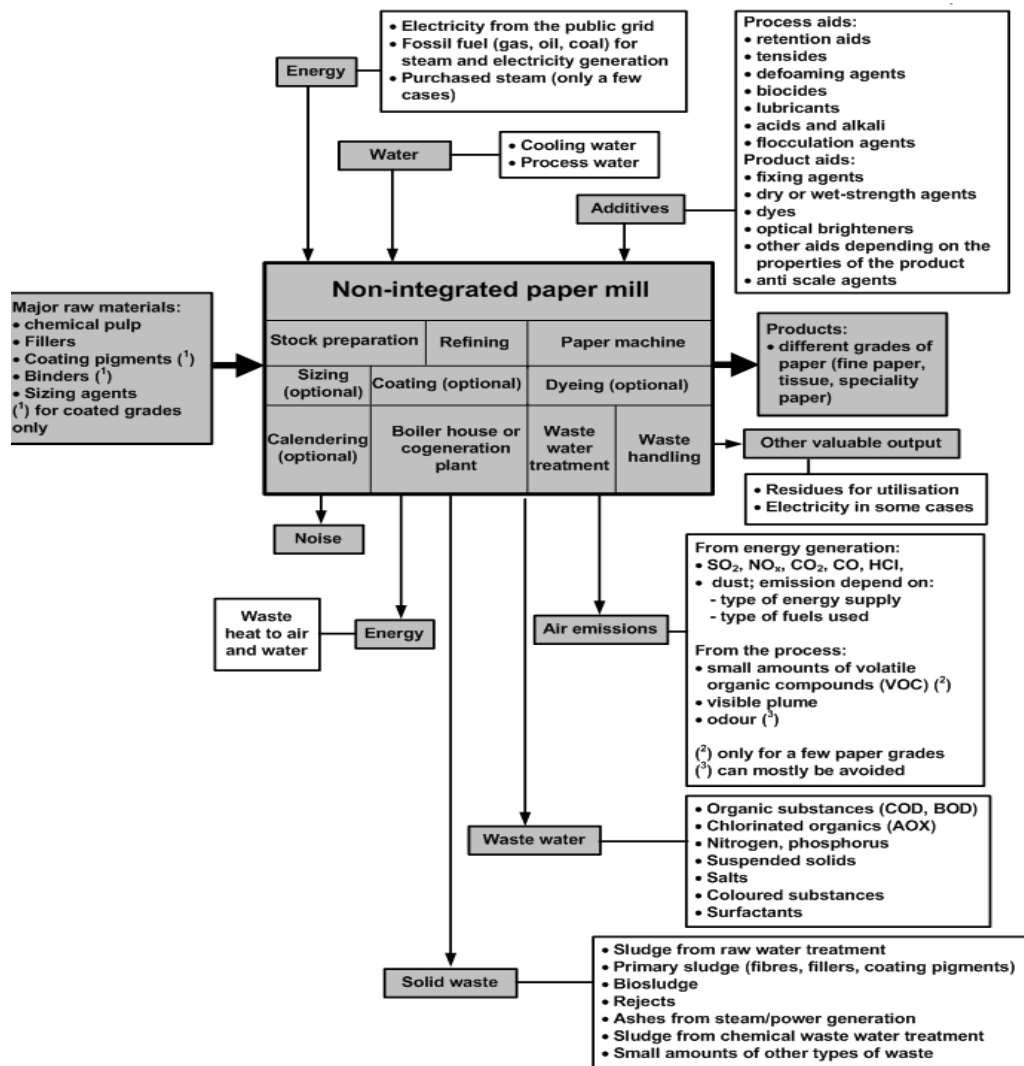


Figure 10 Mass stream overview of paper mill (JRC, 2015)

In non-integrated mills fuel for generation of the process heat required for stock preparation and paper machine constitutes the main source of emission into air. In paper mills utilizing recovered fibres or market pulp, heat demand for stock preparation and paper machine will need to be covered by fossil fuel or biomass fired boilers.

Heat demand for stock preparation and paper machine amounts to approximately 5±1 GJ/ADt of paper on average. In integrated plants producing chemical pulp, TMP pulp or CTMP pulp the heat demand can be (to a large extent) met with heat from recovery boiler/bark boiler and mechanical pulping respectively. For integrated paper mills, the specific pulping processes used and related emission levels should be taken into account.

Following Ekono study (2012) total sulphur emission from non-integrated paper production in 2011 in Europe varied between 0.00 and 0.5kg S/ADt, and for NOx emission between 0.06 and 0.64 kg NOx/ADt. Nordic Swan criteria establishes the threshold value at the level of 0,3 S ref/ADt, and of 0,7 NOx/ADt for paper machine (coated and uncoated paper), and 0,5 for paper machine for speciality paper. Figure 11 contain analysis of the emission levels from non-integrated paper mills. Table 12 contains comparative analysis of the prevalent and proposed, revised emission reference values for the criterion 1(a).



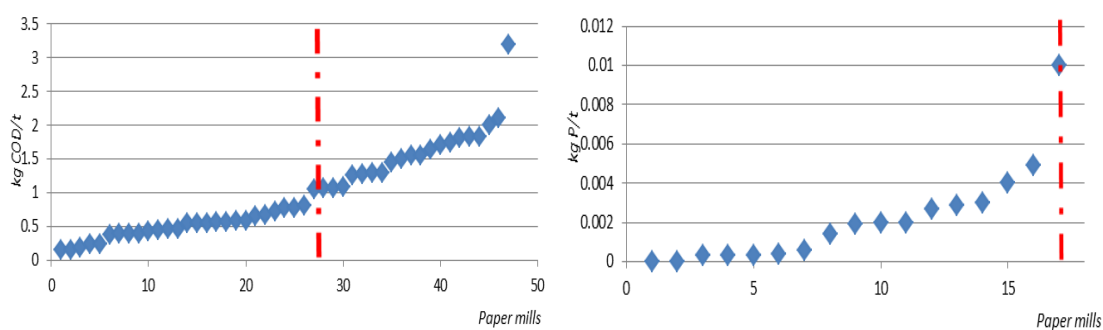


Figure 11. COD and phosphorous emission from non-integrated paper mill

Table 12 Analysis of the ambition level for the values proposed for non-integrated paper mills

	Current threshold	Proposed threshold	Number of mills	Comply with the current threshold	Comply with the proposed threshold	Change (%)*	Ambition level*
<b>COD</b>	1	1	47	26	26	0%	55%
<b>Phosphorous</b>	0.01	0.008	17	17	17	0%	100%

As to the tissue paper and tissue paper product, BAT 50 specifically addresses the COD and P emission ranges that should be met as BAT-AELs.

Table 13 Proposed reference values for emissions into water for tissue paper mills (BAT 50)

Parameter	BAT-AELs Yearly average kg/t	Proposed revised EU Ecolabel reference values reference value
<b>Chemical oxygen demand (COD)</b>	0.15 – 1.5	1,2
<b>Total phosphorus</b>	0.003 – 0.012	0,01

### 5.1.1.2.7. REFERENCE ANALYSIS METHODS

Some limitations of the wording of the criteria set out in Decisions 2011/332/EU and 2012/448/EU for Copying and Graphic Paper and Newsprint Paper respectively when referring to standard methods were:

- No specific allowance for *equivalent* standards made.
- No minimum monitoring *frequency* specified.

Stakeholders were asked to provide details of the actual standard methods used to assess emissions of COD, P, S and NO<sub>x</sub> from pulp and paper mills so that they could be compared with the actual methods listed in Decisions 2011/332/EU and 2012/448/EU for Copying and Graphic Paper and Newsprint Paper respectively. The recently published BAT Conclusions (Decision 2014/687/EU) for the production of pulp, paper and board were also cross-checked for recommended analytical methods.

With COD emissions, it was found that the standard ISO 6060 method uses significant quantities of hazardous chemicals such as potassium dichromate, mercury sulfate and silver sulfate. By changing the ISO 6060 reaction system from an open reflux to a closed reflux, the consumption of the aforementioned hazardous chemicals can be reduced by a factor of 10. The closed reflux system procedure is described in ISO 15705 and has been available since 2002. For this reason, ISO 15705 is now mentioned as the main standard method for monitoring COD.

The consumption of hazardous chemicals during COD analysis can be reduced even further by accepting Total Organic Carbon (TOC) measurements in lieu of COD data. This is specifically mentioned in the BAT Conclusions and is already being carried out by some license holders according to the Swedish CB. Nonetheless, even when TOC data is gathered on a daily basis, some intermittent analysis for COD will also be required because a correlation factor between COD and TOC needs to be established for every different mill. A typical correlation is around 3-4 units of COD for every unit of TOC. A new clause has therefore been inserted to make sure that applicants and Competent Bodies are aware that TOC data can be accepted in lieu of COD measurements. The minimum frequency of daily monitoring of COD (or TOC) is also specified, reflecting the BAT requirements.

With P emissions, it has to be considered that there are different types of P that may be present in a wastewater:

- Orthophosphate (will contribute to colour development and be detected).
- Polyphosphate (may or may not contribute to colour development and thus be detected).
- Organophosphate (will not contribute to colour development and will not be detected).

All standard methods for measuring P in wastewater have different sample preparations that can convert polyphosphate and organophosphate into orthophosphate. For clarity, the revised criteria now refer to Total P, which means that all three forms of phosphate should be measured. A minimum weekly measurement frequency should also be respected. This has now been stated in the criteria and also reflects the approach taken in the BAT Conclusions.

With respect to emissions of S and NO<sub>x</sub>, the BAT Conclusions state that measurements should be continuous in certain situations (i.e. recovery boiler) and periodic or continuous in others (e.g. lime kiln or dedicated TRS burner). Thus it is difficult to simply specify any defined measurement frequency in EU Ecolabel criteria, which will also account for different pulp technologies and paper mills.

Continuous measurement techniques have an advantage over periodic measurement techniques as they provide a larger amount of data that can facilitate statistical analysis and can highlight periods of different operating conditions. According to the IED, reporting to competent authorities should be carried out yearly.

It should be noted that the majority of combustion plants used by the pulp and paper industry falls under the scope of MCP Directive<sup>12</sup>. In this sense, medium combustion plants (MCP) are defined as rated thermal input equal to or greater than 1 MW and less than 50 MW irrespective of the type of fuel they use. Following the prescription of Annex III, Part 1(1), periodic measurements shall be required at least:

— *every three years for medium combustion plants with a rated thermal input equal to or greater than 1 MW and less than or equal to 20 MW,*

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<sup>12</sup> DIRECTIVE (EU) 2015/2193 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants, OJ L 313, 28.11.2015, p. 1-19

– every year for medium combustion plants with a rated thermal input greater than 20 MW In the case of continuous measurements, compliance with the emission limit values referred to in Article 6 shall be assessed as set out in point 1 of Part 4 of Annex V to Directive 2010/75/EU.

Annex V (Technical provisions relating to combustion plants), Part 3 of the IED specifies emission monitoring frequency for the large combustion plants. Accordingly, The concentrations of SO<sub>2</sub>, NO<sub>x</sub> in waste gases from each combustion plant with a total rated thermal input of 100 MW or more shall be measured continuously. The competent authority may decide not to require the continuous in the following cases:

- (a) for combustion plants with a life span of less than 10 000 operational hours;
- (b) for SO<sub>2</sub> and dust from combustion plants firing natural gas;
- (c) for SO<sub>2</sub> from combustion plants firing oil with known sulphur content in cases where there is no waste gas desulphurisation equipment;
- (d) for SO<sub>2</sub> from combustion plants firing biomass if the operator can prove that the SO<sub>2</sub> emissions can under no circumstances be higher than the prescribed emission limit values.

Where continuous measurements are not required, measurements of SO<sub>2</sub> and NO<sub>x</sub>, shall be required at least once every 6 months.

The standard method for analysis of S in coal has been updated to ISO 19579 since ISO 351 has now been withdrawn and now reference is made to analysing S in biomass as well. It was explained during a CB Forum meeting in June 2017 that when calculating S emissions simply by analysing the S content of the fuel (instead of measuring oxidised and reduced S in exhaust gases) it should be assumed that all of the S in the fuel is emitted to the atmosphere.

One other clarification that was received during the CB Forum meeting, which is related to the S and NO<sub>x</sub> emission calculation, was that the reason for multiplying onsite generated electricity by a factor of 2 in the equation is related to the concept of Primary Energy Saving (PES) that can be achieved when using cogeneration technology and when there is a use for the heat generated.

### 5.1.2. Criterion 1b) AOX

Graphic paper product
<p>This criterion refers to ECF pulp.</p> <p>The AOX emissions from the production of each pulp used in EU Ecolabel graphic paper shall not exceed 0,17 kg/ADT.</p>
<p><i>Assessment and verification: the applicant shall provide test reports using the AOX ISO 9562 test method or equivalent methods, accompanied by detailed calculations showing compliance with this criterion and any related supporting documentation.</i></p> <p><i>The applicant shall provide a declaration of compliance with this criterion, supported by a list of the different ECF pulps used in the pulp mix, their respective weightings and their individual amount of AOX emissions, expressed as kg AOX/ADt pulp.</i></p> <p><i>The supporting documentation shall include an indication of the measurement frequency. AOX shall only be measured in processes where chlorine compounds are used for the bleaching of the pulp. AOX need not be measured in the effluent from non-integrated paper production or in the effluents from pulp production without bleaching or where the bleaching is performed with chlorine-free substances.</i></p> <p><i>Measurements of AOX emissions to water shall be taken on unfiltered and unsettled samples at the effluent discharge point of the mills wastewater treatment plant. In cases where mill effluent is sent to a municipal or other third party wastewater treatment plant, unfiltered and unsettled samples from the mill effluent sewer discharge point shall be analysed and results multiplied by a standard removal efficiency factor for the municipal or third party wastewater treatment plant. The removal efficiency factor to apply shall be based on information provided by the operator of the municipal or other third party wastewater treatment plant.</i></p> <p><i>The information on the emission shall be expressed as the annual average from measurements done at least once every two months. In case of a new or a re-built production plant, the measurements shall be based on at least 45 subsequent days of stable running of the plant. The measurement shall be representative of the respective campaign.</i></p>
Tissue paper and tissue paper product
<p>The weighted average value of AOX released from the production of all pulps used in EU Ecolabel tissue paper shall not exceed 0,12 kg/ADT. The AOX emissions from the production of each pulp used shall not exceed 0,17 kg/ADT.</p>

**Assessment and verification:** the applicant shall provide test reports using the AOX ISO 9562 test method or equivalent methods, accompanied by detailed calculations showing compliance with this criterion and any related supporting documentation.

The applicant shall provide a declaration of compliance with this criterion, supported by a list of the different pulps used in the pulp mix, their respective weightings and their individual amount of AOX emissions, expressed as kg AOX/ADT pulp.

The supporting documentation shall include an indication of the measurement frequency. AOX shall only be measured in processes where chlorine compounds are used for the bleaching of the pulp. AOX need not be measured in the effluent from non-integrated paper production or in the effluents from pulp production without bleaching or where the bleaching is performed with chlorine-free substances.

Measurements of AOX emissions to water shall be taken on unfiltered and unsettled samples at the effluent discharge point of the mills wastewater treatment plant. In cases where mill effluent is sent to a municipal or other third party wastewater treatment plant, unfiltered and unsettled samples from the mill effluent sewer discharge point shall be analysed and results multiplied by a standard removal efficiency factor for the municipal or third party wastewater treatment plant. The removal efficiency factor to apply shall be based on information provided by the operator of the municipal or other third party wastewater treatment plant.

The information on the emission shall be expressed as the annual average from measurements done at least once every two months. In case of a new or a re-built production plant, the measurements shall be based on at least 45 subsequent days of stable running of the plant. The measurement shall be representative of the respective campaign.

In case the applicant uses only non-ECF pulp, a corresponding declaration to the Competent Body is sufficient

### **5.1.2.1. Rationales for the revised proposal**

The parameter "AOX" is a sum of all Absorbable Organic Halogens in the waste water. The AOX are generated in the pulp and paper industry during the bleaching process, being formed as a result of reaction between residual lignin from wood fibres and chlorine/chlorine compounds used for bleaching process. A reduction of AOX has been achieved, among others, thanks to the replacement of molecular chlorine by chlorine dioxide, and the use of chlorine free bleaching chemicals such as molecular oxygen, hydrogen peroxide, ozone or peracetic acid. Prevention of AOX formation could be achieved by application of bleaching sequences with reduced chlorine containing agents, or using TCF bleaching. It is then reasonable to assume that reporting AOX should primarily target ECF pulps.

The discussion conducted, and feedback gathered from various proposals presented by JRC during the revision process lead to the conclusion that **a compromise should be found** to establish a threshold which is both **realistic** (1. achievable by companies, 2. respects the differences between integrated and non-integrated production), and **ambitious** (1. reduction of environmental impact, 2. emission levels possible to be achieved with the use of best available techniques).

### **5.1.2.2. Outcomes from and after the 1<sup>st</sup> AHWG Meeting**

Some stakeholders considered the current limit for AOX is ambitious enough suggesting no further changes. It was proposed to maintain the upper limit value proposed for the 1<sup>st</sup> AHWG Meeting - 0.15 kg/ADT – mainly to demonstrate continuous improvement. Others argued that there is no reason why AOX should be treated separately as it is one of the emission parameters, and it was reduced by 35% during the last revision. Lowering the values without achieving any additional environmental gain or reduction of the impact was considered as not appropriate and resulting in the extremely low uptake.

It was also commented that some wood species require more severe bleaching conditions due to the high kappa number (indicates lignin content). Moreover, most integrated mills were assumed to use one type of pulp without the flexibility to use/adapt pulp mix to required emission levels. It was also argued that some of the low limit values for AOX emissions are at the analytical detection limits, measurements of which are often unreliable.

The AOX was assumed as not applicable to plants that provide evidence that no AOX is generated or added via chemical additives and raw materials emission as not relevant parameter, i.e. TCF bleaching. Some stakeholders proposed to exclude AOX criterion for recovered fibre pulp, as the possible emission stems from the feedstock used thus being difficult to control in production of paper from recycled fibres.

### **5.1.2.3. Outcomes from and after the 2nd AHWG Meeting**

There was a split view on the proposals observed during the meetings and the posterior consultation process. Some stakeholders expressed the opinion that AOX should not be included in the sum of the equation because the emission is a result of chemistry used in the process. It was stated that TCF process should be favoured. It was proposed to establish the criterion that refers to the weighted average (0.14 kg AOX/ADt was proposed).

An industry stakeholder added that having an average value for an integrated pulp and paper mill that is locally supplied by wood with high tannins content would not change anything, and the threshold 0.17 kg AOX/ADt is required. There is a correlation between AOX, kappa number and process yield. Integrated mills have limited capacity to change the wood supply.

It was also noted that excessive lowering of AOX value will exclude most of the European pulp mills and favour import of Eucalyptus pulp. It would also cause the risk that the entire regions that rely on high tanning content type of wood could potentially be excluded from the certification.

It was also admitted that AOX testing is performed on the daily bases, but sending samples to external 3rd party test laboratories shows big differences in results (up to 30%). Going lower on AOX emissions, increases uncertainty of the measurements for the same sample (0.1 vs 0.13 AOX/ADt). This justifies flexibility on the AOX parameter. It was also stated that lowering the AOX value below 0.25 does not bring any considerable environmental savings.

If we have integrated pulp and paper mill we should focus on the local wood supply not to increase transport intensity. The AOX criterion should be considered as a pass-fail limit that is only one part of a multiple requirements and the proposed AOX limit already cuts out 34% of ECF pulp market in the EU (according to data gathered during the BREF exercise).

#### 5.1.2.4. Further research and main changes

The feedback received indicates that AOX should not be incorporated into the equation under criterion 1 a). **It was noted that averaging the values could potentially cause unequal treatment between integrated and non-integrated pulp mills. The latter has the higher capacity to choose the kind of pulp used. The integrated pulp and paper mills that rely on wood from the local region have limited flexibility regarding raw material source and should not be punished given that they achieve significant energy savings when compared to non-integrated production. Additionally, referring to the weighted average would also allow the mathematical lowering of the value by pulp blending to reach indicated threshold. Nevertheless in case of tissue paper production, following the feedback received and considering that the system operates with the use of market pulp, it is proposed to refer to the weighted average.**

The vast majority of AOX emission comes from the first ClO<sub>2</sub> bleaching stage in the ECF process (Tuula et al. 2010). Following Zhu et al. (Zhu et al, 2016) more than 97% of the AOX is produced during the first 5 minutes of the bleaching sequence, and the reaction rate is primarily determined by the initial amount of lignin in the pulp and ClO<sub>2</sub> dosage. The upper BREF-BAT value is 0.20 kg AOX/ADT for chemical pulp.

The data collected from the industry shows that all EU Ecolabel licenses met the current limit of 0,17 kg AOX/ADt. The specific AOX emissions of bleached kraft pulp mills at the point of discharge, i.e. after waste water treatment vary between undetectable and 0.3 kg AOX/ADt of bleached pulp (Figure 12).

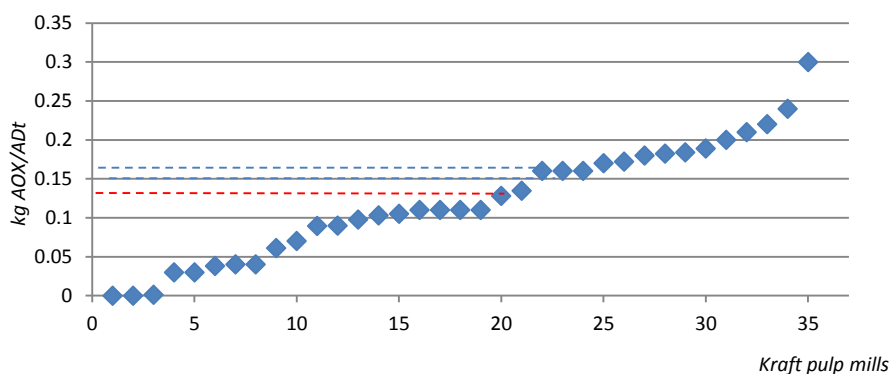


Figure 12 AOX emission levels for bleached Kraft pulp (JRC, 2015)



During the consultation process it was proposed to lower AOX reference value to the level of 0.1 kg AOX/ADt. In order to assess the ambition level of the sub-criterion 1(b), the emission level from the bleached kraft pulp was contrasted with the production capacity of analysed mills. Further analysis of data shows that AOX emission level that is equal or lower than 0.1 kg AOX/ADt corresponds to 38% of bleached kraft pulp production<sup>13</sup> (Figure 13). Data collected within the 2<sup>nd</sup> EU Ecolabel questionnaire is in line with information contained in the BREF for pulp and paper.

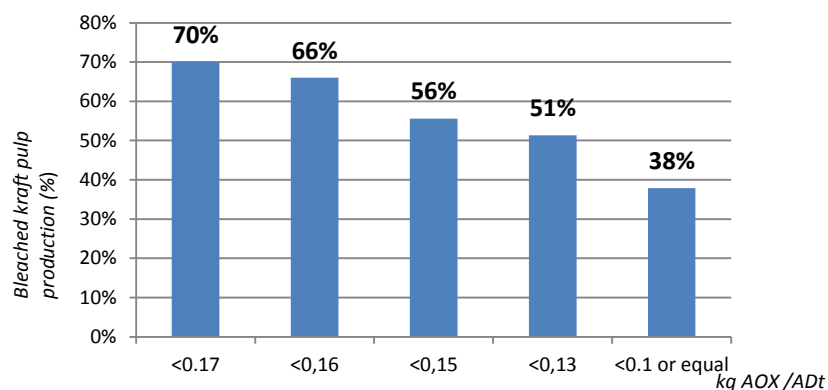


Figure 13 Production capacity of bleached kraft pulp vs AOX emission per tonne of bleached pulp

The AOX emission depends on the nature of the wood species related to the kappa number achieved before pulp bleaching, the chlorine dioxide charge applied in bleaching, the bleaching sequences including washing and water recirculation, and the effluent treatment

In a bleached kraft pulp mill, the most desirable goal is to reduce the lignin content in pulp (low kappa number) that enters the bleach plant and to preserve the pulp yield as high as possible. Low lignin content before bleaching implies the use of modest bleaching sequences that result in lower AOX emission. This is possible to be achieved to the large extend by in-process measures before the bleaching process, for example, increased delignification by extended or modified cooking and additional oxygen stages (pre-bleaching), spill collection systems, efficient washing, and stripping and reuse of condensates (Bajpai, 2010).

Following BREF analysis the discharge of residual lignin in kg COD/ADt assumes a discharge of approximately 2 kg COD per kappa unit and a pulp to be bleached to full brightness. However, where the kappa number is less than 10, the discharge of COD is closer to 1.5 kg per kappa unit.

Table 14 Examples of the interrelation between wood type, techniques and degree of delignification before the bleach plant and COD generated during bleaching

Cooking method	O <sub>2</sub> delignification/ ozone bleaching	Hardwood pulp		Softwood pulp	
		Kappa number into bleach plant	COD [kg/ADt]	Kappa number into bleach plant	COD [kg/ADt]
Conventional cooking	–	18	38	30	63
Conventional cooking	O <sub>2</sub> delignification	13	27	15	32
Modified cooking	–	16	34	20	42
Modified cooking	O <sub>2</sub> delignification	10	15	12	25

<sup>13</sup> Total amount of bleached kraft pulp 37 sources equals 15,222,762 ADt/year



Further modified cooking	-	13	26	15	30
Further modified cooking	O <sub>2</sub> delignification	10	15	10	15

It is not an intention of EU Ecolabel to require changes in the structure of wood supply at the regional level, neither to suggest the use of one type of wood over the other:

- a. Integrated mills are dependent on the local wood supply and the local biodiversity
- b. For some wood species, especially for species growing in Europe, further reducing the AOX emissions will lead to an increased wood consumption due to lower wood yield and/or to an increased chemical consumption at the pulp or paper production (for ex. optical brighteners), therefore creating negative impacts on the environment.
- c. Some wood species are difficult to bleach, for example the high tannin containing species (chestnut, oak, yew). At equivalent kappa numbers, high tannin containing wood species require more bleaching chemicals than other wood species even when BAT is in place. Reduction of AOX below certain level could potentially exclude the whole areas from the EU Ecolabel certification, i.e. in France, the only pulp mill producing pulp for copying and graphic papers and for tissue papers is located in a region where the most available wood species are chestnut and oak.

During the consultation process **risk of potential toxicity** was claimed as an argument for the further lowering of AOX emission threshold. In fact, library screening shows a split view of scientific community in assessing the **magnitude of toxicity related to AOX emission lower than certain reference level**. The processes of pulping and bleaching have gone through considerable changes in recent years, mainly with the objective of decreasing the discharge of chlorinated organic matter. Tarkpea et al. (1999)<sup>14</sup> concluded that in the acute Nitocra spinipes test of nine effluent samples, the conventional-softwood 8% ClO<sub>2</sub> and the ECF-softwood effluents before secondary treatment were the most toxic. It is however important to stress that the effluent with Toxic Equivalency Factor (TEF) of around 700 corresponds to the AOX emission value of 2,9 kg AOX/ADt that is 17 times higher than the proposed reference value of 0.17 kg AOX/ADt. The toxic emission factor of ECF Softwood pulp that generated the contamination load of 0,2 kg AOX/ADt was characterised with a TEF of 290 after secondary treatment. By contrast, more recent studies conclude on the non-accumulation of toxic chlorinated organic substances in fish and mussels (Pryke et al. 2006)<sup>15</sup>, and lack of the reproductive impacts on fish (Mower et al 2011). A laboratory study of effluents from Canadian mills showed that there was no correlation between acute or sublethal toxicity and AOX levels below about 2.5 kg/ton (O'Connor et al, 1994)<sup>16</sup>.

The possible dioxin formation was emphasized during the consultation process. The total organically bound chlorine in pulp (TOX as measured according to ISO 11480) typically varies between 100-200 mg Cl/kg of pulp (CEPI). The potential for dioxin (2,3,7,8 tetra chlorodibenzo-p-dioxin) and furan (2,3,7,8 tetra chlorodibenzofuran) formation has been reported to be drastically reduced when ClO<sub>2</sub> is used instead of Cl<sub>2</sub> as a first stage bleaching agent, **reaching non-detectable concentrations** at substitution levels over

<sup>14</sup> Tarkpea, M., Eklund, B., Linde M., Bengtsson, B-E. 1999. Toxicity of conventional, elemental chlorine-free, and totally chlorine-free kraft-pulp bleaching effluents assessed by shortterm lethal and sublethal bioassays. Environmental Toxicology and Chemistry

<sup>15</sup> Pryke D.C. & Barden M.T., 2006. "Environmental Performance of Maine's Bleached Kraft Pulp and Paper Mills". Proceedings from the 6th International Conference on Fate and Effects of Pulp and Paper Mill Effluents, Vitória, Brazil, April 9-12

<sup>16</sup> O'Connor, B.J., Kovacs, T.G., Voss, R.H., Martel, P.H. van Laerp, B. 1994. Pulp and Paper, Canada 95 (s)

50%<sup>17</sup>. Highly chlorine substituted phenolic compounds were not detected in ECF mills' final effluents (Pryke et al 2006, Takagi et al 2008). Nakamat and Ohi (2003)<sup>18</sup>, concluded that a main source of 1,3,6,8- and 1,3,7,9-tetrachlorodibenzo-p-dioxins in the process water from ECF pulp mill seemed to be agrochemical contamination in water supplied from a river.

By the end of 2004, there had been a 90% decrease in the number of dioxin precursors downstream of pulp and paper mills in 1990 (AET 2005)<sup>19</sup>. The figure below shows the reduction in chlorinated organic compounds (measured as the AOX) over time. To make further reductions beyond this, the bleach plant cannot be considered in isolation from the rest of the mill. Some of the approaches for further reducing the use of chlorine-based bleaching agents involve additional removal of lignin during pulping. Others involve using recovered bleach plant wastewaters (also called filtrates) for washing of unbleached pulps, an approach that sends organochlorine compounds to the mill's pulping liquor recovery process where they are burned (NCAS, 2013).

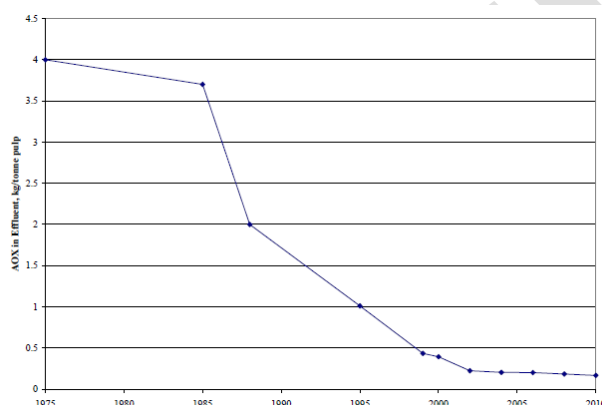


Figure 14. Reduction in chlorinated organic compounds (measured as the AOX) over time (AF&PA 2012<sup>20</sup>, NCAS 2013<sup>21</sup>)

*Considering information analysed and feedback received it is proposed as follows:*

#### **For graphic paper:**

Having in mind the split view on how the criterion should be addressed, and considering the feedback received that reflects different scenarios. **It is proposed to maintain the current criterion, and establish the fixed value of 0,17 kg AOX per ADt for ECF pulps.** The value refers to any individual pulp used in the pulp mix.

This way, no additional derogation are required for integrated pulp mills that rely on local wood supply i.e. with high tanning content such as chestnut

#### **For tissue paper:**

Tissue paper manufacturing is based mainly on market pulp, pulp integration is becoming more common in mature markets. Usually integrated pulp and paper mills use RCF fibre as the feedstock. Globally around 11 % of tissue capacity is integrated with a

<sup>17</sup>Gonzalez, P., Zaror, C. 2000. Effect of process modifications on AOX emissions from kraft pulp bleaching, using Chilean pine and eucalyptus, Journal of Cleaner Production 8 ( 3), pp. 233

<sup>18</sup> Nakamata, Keiichi & Ohi, Hiroshi. (2003). Examination of polychlorinated dibenzo- p-dioxins and polychlorinated dibenzofurans in process water of kraft pulp bleaching mill using chlorine dioxide from the aspect of environmental water quality. Journal of Wood Science. (49), pp 525

<sup>19</sup> Alliance for Environmental Technology (AET). 2005. Eco-System recovery: Lifting of fish consumption advisories for dioxin downstream of U.S. pulp mills – 2005 update.

<sup>20</sup> American Forest and Paper Association. 2012. AF&PA Sustainability Report. Washington.

<sup>21</sup> NCAS. National Council for Air and Stream Improvement. 2013. Environmental Footprint Comparison Tool. Effects of decreased release of chlorinated compounds.

chemical pulp mill (Papakostas, 2017). Respecting the way in which tissue paper manufacturing is organised it is proposed to refer to **the weighted average** of AOX emission from each pulp in a mix.

Draft

### 5.1.3. Criterion 1c) CO2

#### Copying and Graphic paper product

The emission of carbon dioxide from fossil fuels used for the production of process heat and electricity (whether on-site or off-site) must not exceed the following limit values:

- 1100 kg CO<sub>2</sub> /tonne paper for paper made from 100 % DIP/recycled pulp;
- 1000 kg CO<sub>2</sub> /tonne paper for paper made from 100 % chemical pulp;
- 1600 kg CO<sub>2</sub> /tonne paper for paper made from 100 % mechanical pulp;

For paper composed of any combination of chemical pulp, recycled fibre pulp and mechanical pulp, a weighted limit value shall be calculated, based on the proportion of each pulp type in the mixture. The actual emission value shall be calculated as the sum of the emissions from the pulp and paper production taking into account the mixture of pulps used.

*Assessment and verification: the applicant shall provide data and detailed calculations showing compliance with this criterion, together with related supporting documentation.*

*For each pulp used, a single CO<sub>2</sub> emission value shall be provided to the applicant by the pulp manufacturer, in units of kg CO<sub>2</sub>/ADT pulp. The applicant shall also provide a single CO<sub>2</sub> emission value for the relevant paper machine(s) used to produce EU Ecolabel graphic paper. For integrated mills, CO<sub>2</sub> emissions for pulp and paper production may be reported as a single value.*

*To define the maximum CO<sub>2</sub> emission allowed, the applicant shall define the pulp mix in terms of pulp type (i.e. chemical pulp, mechanical pulp and recycled pulp). To calculate the actual CO<sub>2</sub> emissions, the applicant shall define the pulp mix in terms of individual pulps supplied, calculate the weighted average CO<sub>2</sub> emission for pulp production and add this value to CO<sub>2</sub> emissions from the paper machine(s).*

*The CO<sub>2</sub> emission data shall include all sources of non-renewable fuels used during the production of pulp and paper, including the emissions from the production of electricity (whether on-site or off-site).*

*Emission factors for fuels shall be used according to Annex VI of Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions.<sup>22</sup>*

*For grid electricity, an emission calculation factor of 384 (kg CO<sub>2</sub>/MWh) shall be used.*

*The period for the calculations or mass balances shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least 45 subsequent days of stable running of the plant. The calculations shall be representative of the respective campaign.*

*For grid electricity, the value provided above (the European average) shall be used unless the applicant presents documentation establishing the average value for their suppliers of electricity*

<sup>22</sup> OJ L 181, 12.7.2012, p. 30–104

(contracting supplier), in which case the applicant may use this value instead of the value quoted in the table.

The amount of energy from renewable sources purchased and used for the production processes will not be considered in the calculation of the CO<sub>2</sub> emissions. Appropriate documentation that this kind of energy is actually used at the mill or is externally purchased shall be provided by the applicant.

### Tissue paper and tissue paper product

*Note: The criterion refers to the sum total of CO<sub>2</sub> emission from pulp and paper manufacturing processes. Conversion is not included.*

The emission of carbon dioxide from fossil fuels used for the production of process heat and electricity (whether on-site or off-site) must not exceed the following limit values:

- 1200 kg CO<sub>2</sub>/tonne of conventional tissue paper
- 1850 kg CO<sub>2</sub>/tonne of structured tissue paper

**Assessment and verification:** the applicant shall provide data and detailed calculations showing compliance with this criterion, together with related supporting documentation.

*For each pulp used, a single CO<sub>2</sub> emission value shall be provided to the applicant by the pulp manufacturer, in units of kg CO<sub>2</sub>/ADT pulp. The applicant shall also provide a single CO<sub>2</sub> emission value for the relevant paper machine(s) used to produce EU Ecolabel tissue paper. For integrated mills, CO<sub>2</sub> emissions for pulp and paper production may be reported as a single value.*

*The CO<sub>2</sub> emission data shall include all sources of non-renewable fuels used during the production of pulp and paper, including the emissions from the production of electricity (whether on-site or off-site).*

*Emission factors for fuels shall be used according to Annex VI of Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions.<sup>23</sup>*

*For grid electricity, an emission calculation factor of 384 (kg CO<sub>2</sub>/MWh) shall be used.*

*The period for the calculations or mass balances shall be based on the production during 12 months. In case of a new or a rebuilt production plant, the calculations shall be based on at least 45 subsequent days of stable running of the plant. The calculations shall be representative of the respective campaign.*

*For grid electricity, the value provided above (the European average) shall be used unless the applicant presents documentation establishing the average value for their suppliers of electricity (contracting supplier), in which case the applicant may use this value instead of the value quoted in the table.*

*The amount of energy from renewable sources purchased and used for the production processes will not be considered in the calculation of the CO<sub>2</sub> emissions. Appropriate documentation that this kind of energy is actually used at the mill or is externally purchased shall be provided by the applicant.*

<sup>23</sup> OJ L 181, 12.7.2012, p. 30–104

### 5.1.3.1. Rationale for the revised proposal

The European pulp and paper industry has a direct emission of about 37 million tonnes of CO<sub>2</sub> per year which accounts for 2% of the emissions under the EU ETS (European Trading Scheme) and less than 1% of the EU total emissions (CITL, 2008).

The CO<sub>2</sub> emissions are mainly caused by combustion processes: producing the electricity and heat needed for the processes. Indirect emissions are caused by purchased electricity (around 62% of the total electricity consumption). Non energy-related emission sources, includes by-product CO<sub>2</sub> emissions from the lime kiln chemical reactions and CO<sub>2</sub>/CH<sub>4</sub> emissions from wastewater treatment. Table 12 lists the stationary direct CO<sub>2</sub> (and other GHG) emission sources found in the pulp and paper manufacturing industry (US EPA, 2010).

Table 15 Stationary direct GHG emission sources in the pulp and paper manufacturing industry

Emission Source	Types of pulp and paper mill where emission source typically are located	Type of GHG emission
<b>Fossil fuel and/or biomass boiler</b>	All types of pulp and paper mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O biogenic CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
<b>Thermal oxidizers and regenerative thermal oxidizers (RTOs)</b>	Kraft pulp and semi-chemical pulp mill (for combustion unit control)	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O,
<b>Direct-fired dryers</b>	Gas-fired dryers at some pulp and paper mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
<b>Combustion turbines</b>	All types of pulp and paper mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
<b>Chemical recovery furnace - kraft&amp;soda</b>	Kraft and soda pulp mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O Biogenic CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
<b>Chemical recovery furnace - sulphite</b>	Sulfite pulp mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O Biogenic CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
<b>Chemical recovery combustion units - stand alone semi-chemical</b>	Stand alone semi-chemical pulp mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O Biogenic CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O
<b>Kraft and soda lime kilns</b>	Kraft and soda pulp mills	Fossil CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O Process biogenic CO <sub>2</sub>
<b>Makeup chemicals (CaCO<sub>3</sub>, Na<sub>2</sub>CO<sub>3</sub>)</b>	Kraft and soda pulp mills	Process CO <sub>2</sub>
<b>Flue gas desulfurization system</b>	Mills that operate coal-fired boilers required to limit SO <sub>2</sub> emission	Process CO <sub>2</sub>
<b>Anaerobic waste water treatment</b>	Chemical pulp mills (kraft mostly)	Biogenic CO <sub>2</sub> , CH <sub>4</sub>
<b>On-site landfills</b>	All types of pulp and paper mills	Biogenic CO <sub>2</sub> , CH <sub>4</sub>

In Europe, there is an observable trend within the industrial sector to reduce the use of coal and oil for the benefit of renewable energy forms (biomass and waste) and to a lesser extent electricity. The shift in fuel composition is driven by the mandatory emission reductions that industrial activities should achieve in the context of the Industrial Emissions Directive (IED), as well as because of national action for complying with the binding national targets of the Effort Sharing Decision (ESD) in the short-term (concerning the non-ETS industries) and the increasing ETS prices (concerning the ETS industries) mainly in the long-term (EU Energy, Transport and GHG Emissions Trends to 2050 Reference Scenario, 2013). Following European Environmental Agency (EEA, 2012), the trends indicate that additional policy measures will need to be implemented in order to meet the EU's longer-term emissions reduction targets, particularly for CO<sub>2</sub>.

Public heat and electricity production is the largest emission source category in the EU-28, as well as the main source of emissions from energy industries. Fossil fuels continued to dominate the electricity mix in 2013, being responsible for close to one half (45%) of all gross electricity generation in the EU-28. The electricity produced from renewable sources increased by 171% between 1990 and 2013 at an average annual

rate of 4.4%. Since 2005, the rate has been higher, at 7.5% per year. The acceleration observed since 2005 occurred in the context of national and EU renewable energy support policies and significant cost reductions achieved by certain renewable energy technologies. The total emissions of CO<sub>2</sub> from electricity and heat production depend on both the amount of electricity and heat produced as well as the CO<sub>2</sub> intensity per unit produced (which are also fuel specific). Therefore the policies and measures to reduce emissions need to address both demand (e.g. through improvements in the energy efficiency) to stem the rapid increase in electricity and heat production, as well as CO<sub>2</sub> intensity per unit of electricity and heat produced (e.g. by fuel switching, generation efficiency). The large use of biomass within a pulp and paper sector contributes to the reduction of its CO<sub>2</sub>- intensity. In 2011, about half (55 %) of the energy used by the industry came from biomass and most of the rest (36.2 %) from natural gas (EEA, 2015a, EEA 2015B, European Commission 2014c).

For the sites that rely on the energy supply from the grid, one critical area to establish CO<sub>2</sub> threshold and ensure a level playing field is the variation of local energy mix in the content of a possible CO<sub>2</sub> emission e.g share of coal used as a fuel in the energy mix. This situation is beyond the influence of pulp and paper manufacturer. *To follow differences in CO<sub>2</sub> emissions of electricity consumption across member States please see the link: <https://www.electricitymap.org/?wind=false&solar=false&page=map>*

Table 16 shows the International Energy Agency (IEA) composite electricity/heat factors (IEA, 2010)

Table 16. EU-28 fuel-based Electricity/Heat Emission Factors for CO<sub>2</sub>

Country	IEA composite electricity/heat factors (gCO <sub>2</sub> /kWh)	Country	IEA composite electricity/heat factors (gCO <sub>2</sub> /kWh)
Austria	182.756	Italy	398.464
Belgium	248.975	Latvia	162.236
Bulgaria	488.862	Lithuania	114.437
Croatia	341.416	Luxemburg	314.782
Cyprus	758.660	Malta	848.708
Czech Republic	543.894	Netherlands	392.079
Denmark	307.755	Poland	653.440
Estonia	751.861	Portugal	383.544
Finland	187.118	Romania	416.646
France	82.717	Slovakia	217.154
Germany	441.181	Spain	325.878
Greece	731.218	Sweden	39.939
Hungary	330.842	UK	486.949
Ireland	486.205	EU-28	379.900

### 5.1.3.2. Outcomes from and after the 1st AHWG meeting:

During and after the 1<sup>st</sup> AHWG Meeting it was possible to observe a clear division concerning the future of the sub-criterion. It was stated that CO<sub>2</sub> emission is far more difficult to calculate than energy consumption, and is covered by a large list of specific policy measures. Most of the paper industry operates under EUETs, with the emissions being annually externally verified. The Ecolabel calculation for CO<sub>2</sub> emissions is different to EUETs scheme. It was suggested that the EU ETS benchmark should not be used for setting the reference values for the criterion on CO<sub>2</sub> emissions, as the EU ETS benchmark has been designed for a different purpose, and the EU ETS does not take into



account the indirect CO<sub>2</sub> emissions avoided (due to heat and electricity production as a by-product).

Several stakeholders suggested removing the CO<sub>2</sub> emission criterion entirely, as it is already covered by the criterion on energy use.

There was also a disagreement among the stakeholders on which CO<sub>2</sub> emission factor to apply. Some stakeholders suggested on using the EU average due to the interconnection of the grid, whilst others maintained that specific country or specific fuel mix provider factors, or use supplier specific emission factors for the purchased grid electricity in addition to using the EU average emission factor, as this could improve flexibility of the criteria and create the motivation to purchase electricity with a lower CO<sub>2</sub> profile.

The idea of rewarding mills that invested in renewable energy through subtracting the CO<sub>2</sub> emissions attributed to renewable energy purchased or generated on site was supported. It was also stated that the intention with EU Ecolabel criteria in general should not effectively support nuclear energy, which is something that a low-CO<sub>2</sub> criteria would effectively do, supplied electricity should be split into renewable (granted a zero CO<sub>2</sub> factor), nuclear (granted the EU-grid average CO<sub>2</sub> factor) and fossil energy (granted the EU-grid average CO<sub>2</sub> factor).

In general it was accepted to relate CO<sub>2</sub> emission levels to the type of pulping process. It was suggested that integrated (RCF) mills need more energy than other types of integrated paper mills, because of deinking and other processes. It was also observed that mechanical pulping is more energy intensive, and in most cases the production relies on grid electricity. It was also noted that the CO<sub>2</sub> emissions for tissue paper will always be higher than CGP or newsprint paper because of the much lower base weight/density.

### **5.1.3.3. Outcomes from the 2nd AHWG Meeting**

For the 2<sup>nd</sup> AHWG Meeting two alternative options to address the CO<sub>2</sub> requirement were presented:

- 1) to withdraw the criterion on CO<sub>2</sub> as being redundant with the energy criterion
- 2) to align the criterion with Nordic Swan requirement that considers the energy intensity of different pulping processes. This means that the distinction between integrated and non-integrated production will be removed.

Stakeholders admitted that withdrawal of the CO<sub>2</sub> criterion would simplify the verification and so reduce cost to prepare the dossier and evaluation by the authorities given that CO<sub>2</sub> emission has a partial overlap with energy criterion. The viability of the proposal is not entirely in industry hands (e.g. permits for using waste, removing biomass depends on local authorities).

From the other side withdrawal of the criterion was considered as counterproductive and so lowering the credibility of the EU Ecolabel as the aspects of CO<sub>2</sub> emission are widely recognised by the consumer that expects EU Ecolabel to have climate change criterion. Many pulp and paper producers have invested into renewable processes and have the excellent possibilities to create and sell renewable energy, these companies should be therefore rewarded. Maintaining the CO<sub>2</sub> requirement was perceived as the way to promote the use of renewable energy. In this view, criterion 1c and criterion 2 were considered complementary. **The criterion was proposed to be maintained and harmonize with the Nordic Swan approach.**

900kg CO<sub>2</sub> per ton for chemical pulp for integrated and non-integrated paper mills was assumed as too restrictive for market pulp manufacturing. The reference level was proposed to be raised to 1000 and assessed as challenging in some regions. Equally the reference value for RCF pulp was proposed to be increased to 1,100 considering that recycled pulp mills are integrated and are struggling to meet the value of 1000.

#### **5.1.3.4. Further research and main changes**

The feedback received indicates that the withdrawal of the criterion might have an adverse effect on the consumer perception given that the criteria would not make any distinction between a paper made of i.e. 100% coal energy or 100% solar or hydro power.

##### **I. Graphic paper product:**

Following feedback received the reference values for graphic paper are proposed to be revised as follows:

- 1,100 kg CO<sub>2</sub> /tonne paper for paper made from 100 % DIP/recycled pulp;
- 1,000 kg CO<sub>2</sub> /tonne paper for paper made from 100 % chemical pulp;
- 1,600 kg CO<sub>2</sub> /tonne paper for paper made from 100 % mechanical pulp;

##### **II. Tissue paper and tissue paper product:**

Following the interaction with stakeholders, considering the structure of currently valid criterion 1c), as well as the fact that energy consumption during paper making process is significantly higher than during pulp manufacturing (allocation to tissue paper), it is proposed to develop singular value allocated to the final product. The reported value should represent combined CO<sub>2</sub> emissions from fuels used during production of paper and constituent pulps.

##### **III. Fuel CO<sub>2</sub> emission factors**

The methodology proposed to estimate CO<sub>2</sub> emission from fuel combustion follows the one used by IEA that is based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPPC, 2006). The computation follows the concept of conservation of carbon, from the fuel combusted into CO<sub>2</sub>. The IEA CO<sub>2</sub> emissions are calculated using the IPCC default values. Generally, the estimation of CO<sub>2</sub> emissions from fuel combustion for a given fuel can be summarised as follows (OECD/IEA 2006):

**CO<sub>2</sub> emissions from fuel combustion = Fuel consumption \* Emission factor**

*CO<sub>2</sub> emission should be allocated to the final product.*

As to the CO<sub>2</sub> emission from the grid electricity, Figure 15 shows reduction of CO<sub>2</sub> emissions from electricity generation across OECD Europe (1985-2105). The graph addresses four factors: CO<sub>2</sub> intensity of the fossil fuel mix, fossil share of electricity, thermal efficiency of fossil fired generation, and total electricity output.

The EU average carbon intensity of the electricity grid, according to MEERP methodology- 0.384 tCO<sub>2</sub>/MWh = 0.107 tCO<sub>2</sub>/GJ<sub>e</sub> (MEERP)<sup>24</sup>. It is therefore proposed to adapt accordingly the CO<sub>2</sub> emission reference value for electricity obtained from external suppliers.

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<sup>24</sup> Methodology for the Ecodesign of Energy-related Products (<http://www.meerp.eu/>)

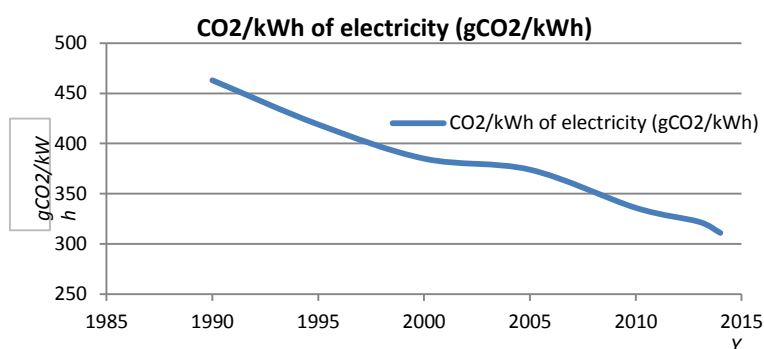


Figure 15 CO2 emission factor from electricity for OECD -Europe (1990-2014)

Fuel **emission factors** related to net calorific value (NCV) and net calorific values per mass of fuel are **proposed to be related to Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions** pursuant to Directive 2003/87/EC of the European Parliament and of the Council<sup>25</sup>. The main reason for the update proposed is **to expand the list of different fuels** that might be used. The values are mainly based on the IPCC indications.

Table 17 Fuel emission factors related to net calorific value (NCV) and net calorific values per mass of fuel

Fuel type description	Emission factor (t CO <sub>2</sub> /TJ)	Net calorific value (TJ/Gg)	Source
Crude oil	73,3	42,3	IPCC 2006 GL26
Orimulsion	77,0	27,5	IPCC 2006 GL
Natural gas Liquids	64,2	44,2	IPCC 2006 GL
Motor gasoline	69,3	44,3	IPCC 2006 GL
Kerosene (other than jet kerosene)	71,9	43,8	IPCC 2006 GL
Shale oil	73,3	38,1	IPCC 2006 GL
Gas/Diesel oil	74,1	43,0	IPCC 2006 GL
Residual fuel oil	77,4	40,4	IPCC 2006 GL
Liquefied petroleum gases	63,1	47,3	IPCC 2006 GL
Ethane	61,6	46,4	IPCC 2006 GL
Naphtha	73,3	44,5	IPCC 2006 GL
Bitumen	80,7	40,2	IPCC 2006 GL
Lubricants	73,3	40,2	IPCC 2006 GL
Petroleum coke	97,5	32,5	IPCC 2006 GL
Refinery feedstocks	73,3	43,0	IPCC 2006 GL
Refinery gas	57,6	49,5	IPCC 2006 GL
Paraffin waxes	73,3	40,2	IPCC 2006 GL
White spirit and SBP	73,3	40,2	IPCC 2006 GL
Other petroleum products	73,3	40,2	IPCC 2006 GL
Anthracite	98,3	26,7	IPCC 2006 GL

<sup>25</sup> OJ L 181, 12.7.2012, p. 30-104

<sup>26</sup> IPCC 2006 Guidelines for National Greenhouse Gas Inventories

Coking coal	94,6	28,2	IPCC 2006 GL
Other bituminous coal	94,6	25,8	IPCC 2006 GL
Sub-bituminous coal	96,1	18,9	IPCC 2006 GL
Lignite	101,0	11,9	IPCC 2006 GL
Oil shale and tar sands	107,0	8,9	IPCC 2006 GL
Patent fuel	97,5	20,7	IPCC 2006 GL
Coke oven coke and lignite coke	107,0	28,2	IPCC 2006 GL
Gas coke	107,0	28,2	IPCC 2006 GL
Coal tar	80,7	28,0	IPCC 2006 GL
Gas works gas	44,4	38,7	IPCC 2006 GL
Coke oven gas	44,4	38,7	IPCC 2006 GL
Blast furnace gas	260	2,47	IPCC 2006 GL
Oxygen steel furnace gas	182	7,06	IPCC 2006 GL
Natural gas	56,1	48,0	IPCC 2006 GL
Industrial wastes	143	n.a.	IPCC 2006 GL
Waste oils	73,3	40,2	IPCC 2006 GL
Peat	106,0	9,76	IPCC 2006 GL
Waste tyres	85,0	n.a.	WBCSD CSI
Carbon monoxide	155,2 (1)	10,1	J. Falbe and M. Regitz, Römpp Chemie Lexikon, Stuttgart, 1995
Methane	54,9 (2)		

## VI CO2 Calculation

The criterion addresses CO2 emission from fossil fuels used **for pulp and paper manufacturing**. The calculation is based on the fuel emission factors related to net calorific value (NCV) and net calorific values per mass of fuel. The CO2 emission should be translated to the mass content of each pulp in the pulp mix used to manufacture final product (tonne of paper).

The pulp and paper manufacturer shall specify the quantities of fossil fuel used for heat production and electricity generation. The CO2 emissions from fossil fuels used in pulp and paper manufacturing should be calculated using the values specified in Table 17. Information on CO2 emissions from purchased energy should be obtained from the heat supplier. CO2 emissions from purchased electricity are added to the CO2 emissions from fossil fuels consumed.

In case of non-integrated production, the pulp manufacturer shall send information to paper manufacturer on total CO2 emissions specified as kg per tonne of 90% pulp to the paper manufacturer.

*For graphic paper:*

A weighted threshold value for blends of different types of pulp is calculated upon the basis of the threshold values for chemical pulp, recycled fibre and mechanical pulp, i.e. the threshold value of paper made from 70% chemical pulp and 20% mechanical pulp, and 10% of recycled fibre should be calculated according to the formula  $0.7 \cdot 1000 + 0.2 \cdot 1600 + 0.1 \cdot 1100$  (1130 CO2/tonne of paper).

### 5.1.3.4.2. Data analysis

As with energy consumption, CO<sub>2</sub> emissions depend on the type of pulp used and the degree of integrated production. However, the current CO<sub>2</sub> requirement is set at the level of paper produced and does not distinguish between different pulp types. During the emission and energy sub-groups meetings, it was pointed out that the limit of 1100 kg CO<sub>2</sub>/ADt should remain for paper produced in non-integrated mills. It was also considered that the 1000 kg CO<sub>2</sub>/ADT for integrated production was reasonable because copying and graphic paper includes mechanical pulp that alike recycled pulp requires external energy supply. According to feedback received from 2 mills processing recycled fibre, 1000 kg CO<sub>2</sub>/ADT could be achieved.

The data collected within the 2<sup>nd</sup> questionnaire shows that reported CO<sub>2</sub> emission varies between 13 and 1372 kg CO<sub>2</sub>/ADt (Figure 16). Most data is based on kraft pulp production. Very little data was provided for papers based on >50% DIP (273–936 kg CO<sub>2</sub>/ADt). The carbon intensity of CTMP pulp was 552–886 kg CO<sub>2</sub>/ADt. *(It should be noted that data presented on Figure 16 does not distinguish between specific types of pulps used, and allocate the CO<sub>2</sub> intensity of the process to the final product. This reflects the approach of the current criterion that sets a specific value for integrated or non-integrated production).*

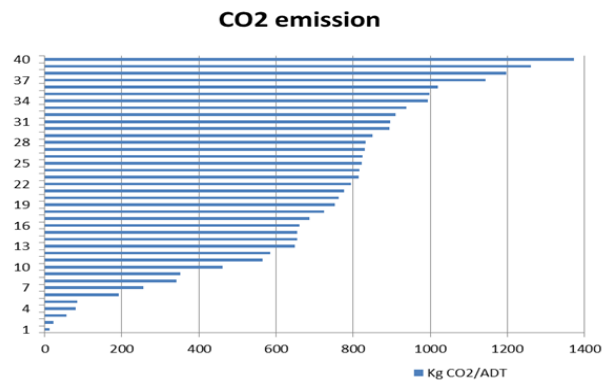


Figure 16 CO<sub>2</sub> emission data reported within the 2<sup>nd</sup> questionnaire

Further analysis of data collected (Figure 17) shows that when combining fuel and electricity into a single value for energy use, it is possible to directly correlate CO<sub>2</sub> emissions with energy use.

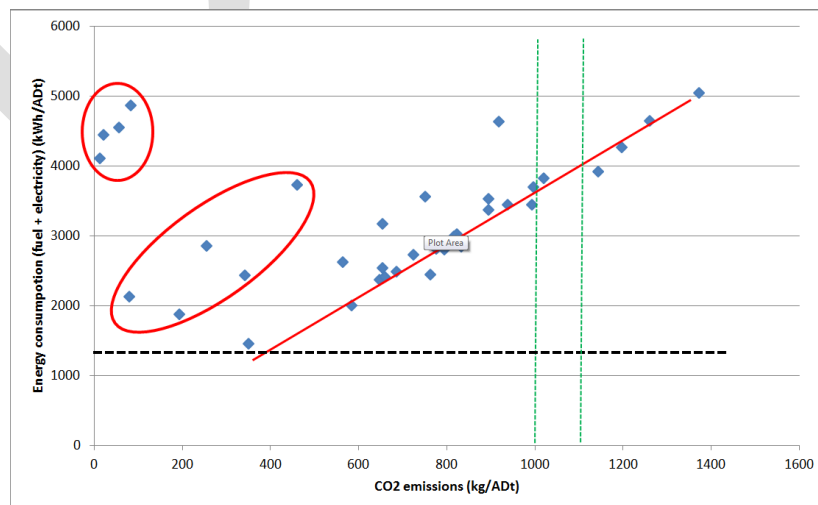


Figure 17. Relationship between energy consumption and CO<sub>2</sub> emission

It is also possible to observe that there is a minimum necessary energy consumption level (in this case it appears to be around 1500 kWh/ADt). However, due to the high

degree of use of biomass, there is no minimum limit for CO<sub>2</sub> emission – with 5 results below 100 kg CO<sub>2</sub>/ADt. Based on the data presented, it appears that an appropriate ambition level for CO<sub>2</sub> could lie between 750 and 1000 kg/CO<sub>2</sub>. Furthermore, the data collected can broadly be split into three categories:

- Those that respect a general correlation between energy use and CO<sub>2</sub> emissions (28 of 37 points);
- Those that are very low in CO<sub>2</sub> but relatively high in energy consumption (4 of 37 points);
- Those that are somewhere in between case 1 and 2 (5 of 37 points).

Based on Figure 15 it can be generally assumed that CO<sub>2</sub> criteria and energy use criteria are essentially measuring the same thing for most of the pulp and paper industry (i.e. a correlation) but also that there is a significant number of exceptions (i.e. very low CO<sub>2</sub> but high energy use). Those that are somewhere in between case 1 and 2 (5 of 37 points).

#### 5.1.3.4.2.1 Tissue paper and tissue paper product

Data presented in Figure 20 illustrates CO<sub>2</sub> emission from 38 paper mills, and 69 different type of pulp mills. The type of pulp used by tissue industry is mainly virgin kraft and CTMP pulp (both ECF and TCF) and RCF pulp. The CO<sub>2</sub> emission value from the conventional tissue paper making ranges from 283 to 1069 CO<sub>2</sub>/kg of paper, whereas from pulp production from 6 to 683 kg CO<sub>2</sub>/ADt. The CO<sub>2</sub> emission value for structural tissue paper making process varies from 1250 to 1650 CO<sub>2</sub>/kg of paper.

For paper mills, CO<sub>2</sub> input from the external electricity supply represented 55% of the total CO<sub>2</sub> emission.

Nordic Swan criteria for tissue paper specify that emissions of CO<sub>2</sub> from purchased electricity and from burning of fossil fuels for both heating and internal electricity generation must not exceed 1100 kg CO<sub>2</sub>/tonne paper. **CO<sub>2</sub> calculations include emissions from production of both paper and constituent pulps.**

Given that - (1) the energy intensity (hence, CO<sub>2</sub> emission) of tissue paper making process is higher than of pulping process, due to energy consumption in the drying section and the lower basis weight of the final product; (2) tissue paper is mainly manufactured from chemical pulp, RCF pulp, and to the lesser extend from CTMP pulp, whereas purely mechanical pulp of high energy demand is not used - It is proposed to establish a singular reference value for tissue paper and tissue paper product at the level of 1200 kWh/tonne of tissue paper. This approach represents the allocation of emission value to its main source - tissue making process.

During the consultation process, it was requested to add a specific value for structural paper as of 2000 kg CO<sub>2</sub>/tonne paper. Tissue that is manufactured with the use of TAD or hybrid process is denominated **structured tissue**, being characterized by **a high bulk and absorbance capacity**.

In the through-air drying (TAD) process, hot process air flows through the sheet past each individual fibre (Figure 1). This makes the process more efficient than conventional drying. However, when comparing to conventional system, as there is no wet pressing TAD machines need to remove about two times more water per unit of fibre by the means of thermal energy. Even though the drying process itself is more efficient, its energy intensity is higher. The higher energy needs are linked to the reduced pressing and multistep drying with TAD and Yankee dryers, while power use is higher due to the vacuum requirement and large airflows (fans) (JRC 2015, Laurijssen 2010 ).



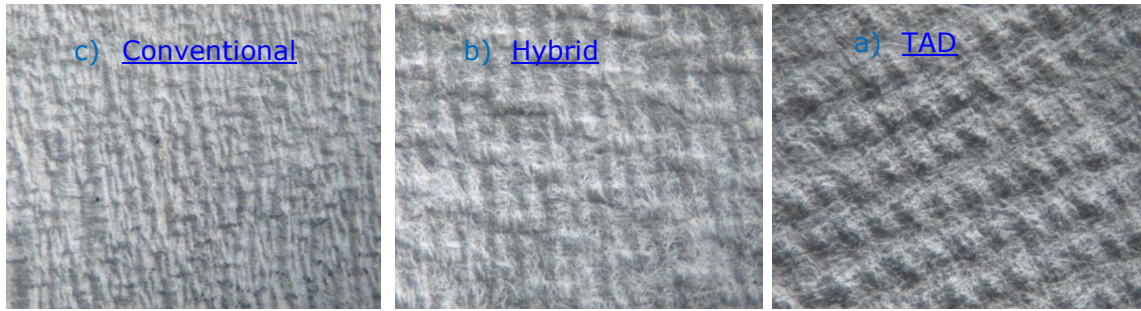


Figure 18 Microscopic image of fibre structure from a) conventional, b) hybrid, and c)TAD process.

As it is possible to see on Figure 18 the more open structure (b), and c)) results in less fibres per square meter and enables the higher absorption (capturing the water in-between the open fibre structure).

The TAD process is more energy-intensive than the traditional wet-pressing, but it delivers a very soft and bulky sheet that can absorb up to twice as much water as conventional tissue while utilising less fibre. This is due to structural differences obtained during the drying process, see Figure (*Note: hence denominated structural tissue*). Multi-ply sheet structure, TAD and advanced fibre technology play key roles in achieving higher tissue quality. In comparison to light dry crepe (LDC), the TAD produced tissue and towel have **twice the bulk and absorption capacity for the same basis weight**<sup>27</sup>. In fact, following the information gathered by JRC, when comparing conventional and TAD tissue product, the latter **offers about 50% extra absorption capacity for the given grammage** (Figure 19). This can be translated into **direct savings in the quantity of fibre used**. The main advantages of the technology are therefore: enhanced sheet properties such as softness, bulk and absorbance.

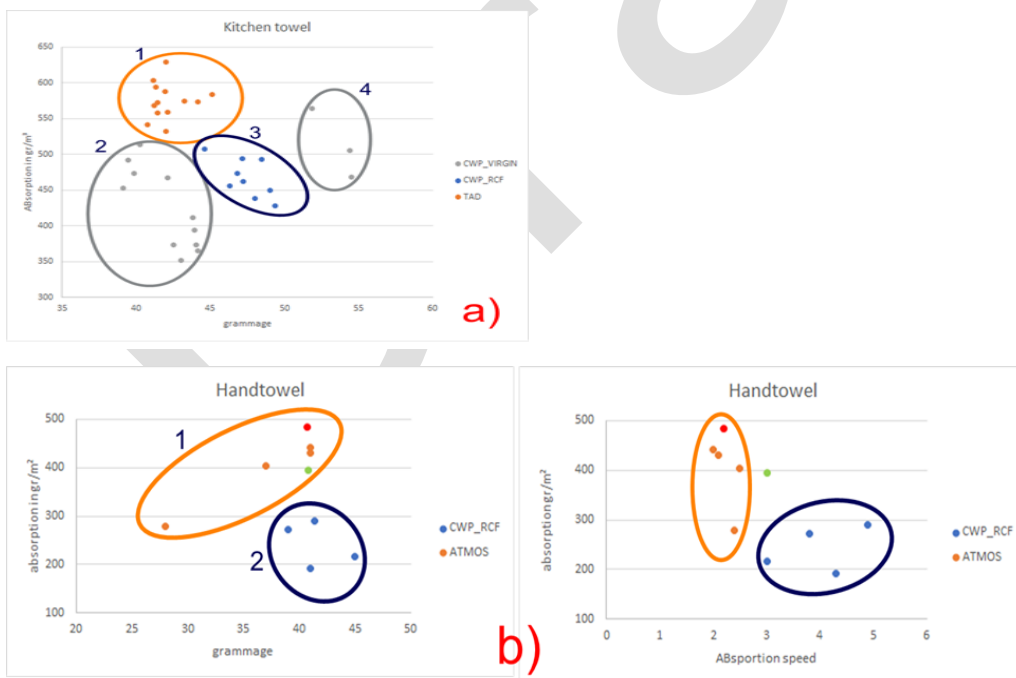


Figure 19 Comparison of grammage and absorption capacity for conventional and structured tissue

<sup>27</sup>What is TAD? 25 April 2016. Kadant Mills and Technologies. Paper Advance: available at: <http://www.paperadvance.com/mills-a-technologies/technologies/5389-what-is-tad.html>



Over the last years structured tissue become a second standard technology used for tissue paper manufacturing. In North America where energy costs are lower than in Europe, structured tissue is becoming a standard for rolled products such as bathroom tissue and towels.

New hybrid technologies enables small machines to produce a higher bulk tissue than conventional machines with a texture or structure similar to that produced in a TAD machine. In terms of energy consumption hybrid tissue technologies are somewhere in between conventional and TAD tissue.

In the current criteria, the energy consumption threshold is too low to accommodate TAD and hybrid technology. Considering, the growing presence of structured tissue on the market as well as an overall efficiency of the process it is proposed to establish the value at the level of 1850 kg CO<sub>2</sub>/tonne paper. This value allocates the higher energy demand required for paper drying and represents the sum up of the average CO<sub>2</sub> emission from structural tissue paper making process (1500 kg CO<sub>2</sub>/tonne) and the median CO<sub>2</sub> emission from pulping process (350 kg CO<sub>2</sub>/ADt)<sup>28</sup>. Still, consultation with industry shows that only the TAD of new generation will be able to meet the requirement.

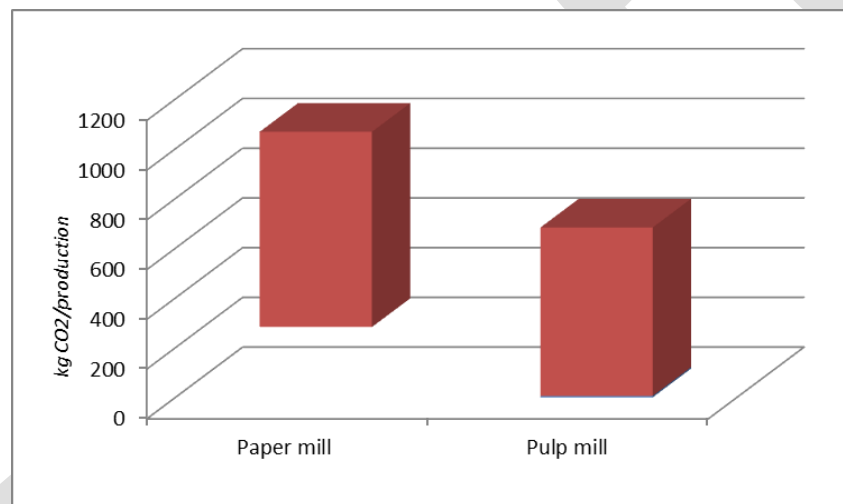


Figure 20 CO<sub>2</sub> emission from pulp mills and conventional tissue paper mills

<sup>28</sup> Based on emission data provided by industry stakeholders

## 5.2. Criterion 2: Energy use

### Graphic paper product

The requirement is based on information on actual energy use during pulp and paper production in relation to specific reference values. The energy consumption includes electricity and fuel consumption for heat production that shall be expressed in terms of points ( $P_{total}$ ) as detailed below. The total number of points ( $P_{total} = P_E + P_F$ ) shall not exceed 2.5.

The reference values for the energy consumption calculation are given in Table 3.

In case of mixtures of pulps, the reference value for electricity and fuel consumption for heat production shall be weighted according to the proportion of each pulp used (pulp 'i' with respect to air dried tonne of pulp), and summed together.

#### *Criterion 2(a) Electricity*

The electricity consumption related to pulp and paper production shall be expressed in terms of points ( $P_E$ ) as detailed below.

Calculation for pulp production: For each pulp i used, the related electricity consumption ( $E_{pulp,i}$  expressed in kWh/ADT) shall be calculated as follows:

$E_{pulp,i} =$  Internally produced electricity + purchased electricity – sold electricity

Calculation for paper production: Similarly, the electricity consumption related to the paper production ( $E_{paper}$ ) shall be calculated as follows:

$E_{paper} =$  Internally produced electricity + purchased electricity – sold electricity

Finally, the points for pulp and paper production shall be combined to give the overall number of points ( $P_E$ ) as follows:

$$P_E = \frac{\sum_{i=1}^n [pulp,i \times E_{pulp,i}] + E_{paper}}{\sum_{i=1}^n [pulp,i \times E_{ref pulp,i}] + E_{ref paper}}$$

In case of integrated mills, due to the difficulties in getting separate electricity figures for pulp and paper, if only a combined figure for pulp and paper production is available, the electricity values for pulp(s) shall be set to zero and the figure for the paper mill shall include both pulp and paper production.

#### *Criterion 2(b) Fuel consumption for heat production*

The fuel consumption related to the pulp and the paper production shall be expressed in terms of points ( $P_F$ ) as detailed below.

Calculation for pulp production: For each pulp i used, the related fuel consumption ( $F_{pulp,i}$  expressed in kWh/ADT) shall be calculated as follows:

$F_{pulp,i} =$  Internally produced fuel + purchased fuel – sold fuel – 1,25 × internally produced electricity

*Note:*

1.  $F_{pulp,i}$  (and its contribution to  $P_F$ , pulp) need not be calculated for mechanical pulp unless it is market air dried mechanical pulp containing at least 90 % dry matter.
2. The amount of fuel used to produce the sold heat shall be added to the term "sold fuel" in the equation above.

Calculation for paper production: similarly, the fuel consumption related to the paper production ( $F_{paper}$ , expressed in kWh/ADT), shall be calculated as follows:

$F_{paper} =$  Internally produced fuel + purchased fuel – sold fuel – 1,25 × internally produced electricity

Finally, the points for pulp and paper production shall be combined to give the overall number of points ( $P_F$ ) as follows:

$$P_F = \frac{\sum_{i=1}^n [\text{pulp},i \times F_{\text{pulp},i}] + F_{\text{paper}}}{\sum_{i=1}^n [\text{pulp},i \times F_{\text{ref pulp},i}] + F_{\text{ref paper}}}$$

**Table 3. Reference values for electricity and fuel**

Pulp grade	Fuel kWh/ADT Ereference		Electricity kWh/ADT Ereference	
	Non-admp	Admp	Non-admp	admp
Chemical pulp	3 650	4 650	750	750
Thermomechanical pulp (TMP)	0	900	2 200	2 200
Groundwood pulp (including Pressurised Groundwood)	0	900	2 000	2 000
Chemithermomechanical pulp (CTMP)	0	800	1 800	1 800
Recycled pulp	350	1350	600	600
Paper grade	kWh/tonne			
Uncoated fine paper, Magazine paper (SC), Newsprint paper	1 700		750	
Coated fine paper Coated magazine paper (LWC, MWC)	1 700		800	

Admp = air dried market pulp

**Assessment and verification (for both (a) and (b)):** the applicant shall provide detailed calculations showing compliance with this criterion, together with all related supporting documentation. Reported details shall therefore include the total electricity and fuel consumption.

The applicant shall calculate all energy inputs, divided into heat/fuels and electricity used during the production of pulp and paper, including the energy used in the de-inking of waste papers for the production of recycled pulp. Energy used in the transport of raw materials, as well as conversion and packaging, is not included in the energy consumption calculations.

Total heat energy includes all purchased fuels. It also includes heat energy recovered by incinerating liquors and wastes from on-site processes (e.g. wood waste, sawdust, liquors, waste paper, paper broke), as well as heat recovered from the internal generation of electricity — however, the applicant need only count 80 % of the heat energy from such sources when calculating the total heat energy.

Electric energy means net imported electricity coming from the grid and internal generation of electricity measured as electric power. Electricity used for wastewater treatment need not be included.

Where steam is generated using electricity as the heat source, the heat value of the steam shall be calculated, then divided by 0,8 and added to the total fuel consumption.

In case of integrated mills, due to the difficulties in getting separate fuel (heat) figures for pulp and paper, if only a combined figure for pulp and paper production is available, the fuel (heat) values for pulp(s) shall be set to zero and the figure for the paper mill shall include both pulp and paper production.

### Tissue paper and tissue paper product

The requirement is based on information on actual energy use during pulp and paper production in relation to specific reference values.

The energy consumption includes electricity and fuel consumption for heat production that shall be expressed in terms of points ( $P_{\text{total}}$ ) as detailed below.

The total number of points ( $P_{\text{total}} = P_E + P_F$ ) shall not exceed 2.5.

The reference values for the energy consumption calculation are given in Table 3.

In case of mixtures of pulps, the reference value for electricity and fuel consumption for heat production shall be weighted according to the proportion of each pulp used (pulp 'i' with respect to air dried tonne of pulp), and summed together.

**Criterion 2(a) Electricity**

The electricity consumption related to pulp and paper production shall be expressed in terms of points (P<sub>E</sub>) as detailed below.

Calculation for pulp production: For each pulp i used, the related electricity consumption (E<sub>pulp,i</sub> expressed in kWh/ADT) shall be calculated as follows:

$$E_{pulp,i} = \text{Internally produced electricity} + \text{purchased electricity} - \text{sold electricity}$$

Calculation for paper production: Similarly, the electricity consumption related to the paper production (E<sub>paper</sub>) shall be calculated as follows:

$$E_{paper} = \text{Internally produced electricity} + \text{purchased electricity} - \text{sold electricity}$$

Finally, the points for pulp and paper production shall be combined to give the overall number of points (P<sub>E</sub>) as follows:

$$P_E = \frac{\sum_{i=1}^n [\text{pulp},i \times E_{pulp,i}] + E_{paper}}{\sum_{i=1}^n [\text{pulp},i \times E_{ref pulp,i}] + E_{ref paper}}$$

In case of integrated mills, due to the difficulties in getting separate electricity figures for pulp and paper, if only a combined figure for pulp and paper production is available, the electricity values for pulp(s) shall be set to zero and the figure for the paper mill shall include both pulp and paper production.

**Criterion 2(b) Fuel consumption for heat production**

The fuel consumption related to the pulp and the paper production shall be expressed in terms of points (P<sub>F</sub>) as detailed below.

Calculation for pulp production: For each pulp i used, the related fuel consumption (F<sub>pulp,i</sub> expressed in kWh/ADT) shall be calculated as follows:

$$F_{pulp,i} = \text{Internally produced fuel} + \text{purchased fuel} - \text{sold fuel} - 1,25 \times \text{internally produced electricity}$$

Note:

1. F<sub>pulp,i</sub> (and its contribution to P<sub>F</sub>, pulp) need not be calculated for mechanical pulp unless it is market air dried mechanical pulp containing at least 90 % dry matter.
2. The amount of fuel used to produce the sold heat shall be added to the term "sold fuel" in the equation above.

Calculation for paper production: similarly, the fuel consumption related to the paper production (F<sub>paper</sub>, expressed in kWh/ADT), shall be calculated as follows:

$$F_{paper} = \text{Internally produced fuel} + \text{purchased fuel} - \text{sold fuel} - 1,25 \times \text{internally produced electricity}$$

Finally, the points for pulp and paper production shall be combined to give the overall number of points (P<sub>F</sub>) as follows:

$$P_F = \frac{\sum_{i=1}^n [\text{pulp},i \times F_{pulp,i}] + F_{paper}}{\sum_{i=1}^n [\text{pulp},i \times F_{ref pulp,i}] + F_{ref paper}}$$

Table 2. Reference values for electricity and fuel

Pulp grade	Fuel kWh/ADT		Electricity kWh/ADT	
	Reference		Reference	
	Non-admp	admp	Non-admp	admp
Chemical pulp	3 650	4 650	750	750

Thermomechanical pulp (TMP)	0	900	2 200	2 200
Groundwood pulp (including Pressurised Groundwood)	0	900	2 000	2 000
Chemithermomechanical pulp (CTMP)	0	800	1 800	1 800
Recycled pulp	350	1350	700	700
Paper grade	kWh/tonne			
Tissue paper	1950	950		
Structured tissue	3000	1500		
Admp = air dried market pulp				

**Assessment and Verification** (for both (a) and (b)): the applicant shall provide detailed calculations showing compliance with this criterion, together with all related supporting documentation. Reported details shall therefore include the total electricity and fuel consumption.

The applicant shall calculate all energy inputs, divided into heat/fuels and electricity used during the production of pulp and paper, including the energy used in the de-inking of waste papers for the production of recycled pulp. Energy used in the transport of raw materials, as well as packaging, is not included in the energy consumption calculations.

Total heat energy includes all purchased fuels. It also includes heat energy recovered by incinerating liquors and wastes from on-site processes (e.g. wood waste, sawdust, liquors, waste paper, paper broke), as well as heat recovered from the internal generation of electricity — however, the applicant need only count 80 % of the heat energy from such sources when calculating the total heat energy.

Electric energy means net imported electricity coming from the grid and internal generation of electricity measured as electric power. Electricity used for wastewater treatment need not be included.

Where steam is generated using electricity as the heat source, the heat value of the steam shall be calculated, then divided by 0,8 and added to the total fuel consumption.

In case of integrated mills, due to the difficulties in getting separate fuel (heat) figures for pulp and paper, if only a combined figure for pulp and paper production is available, the fuel (heat) values for pulp(s) shall be set to zero and the figure for the paper mill shall include both pulp and paper production.

### 5.2.1. Rationales for the revised proposal

The pulp and paper industry is the fourth largest industrial user of energy, consuming some 6.4 EJ worldwide in 2005 (OECD IEA, 2008). At the EU level, the pulp and paper industry accounts for approximately 12% of energy consumption but this can be much more significant in certain countries, such as Finland and Sweden, where it accounts for more than 50% of national energy consumption (ADEME, 2015). Of the total energy consumption, approximately two thirds are due to fuel use and one third due to electricity consumption (OECD IEA, 2008). Only 1.8 GJ/t of the total 13.3 GJ/t specific energy consumption was due to purchased electricity.

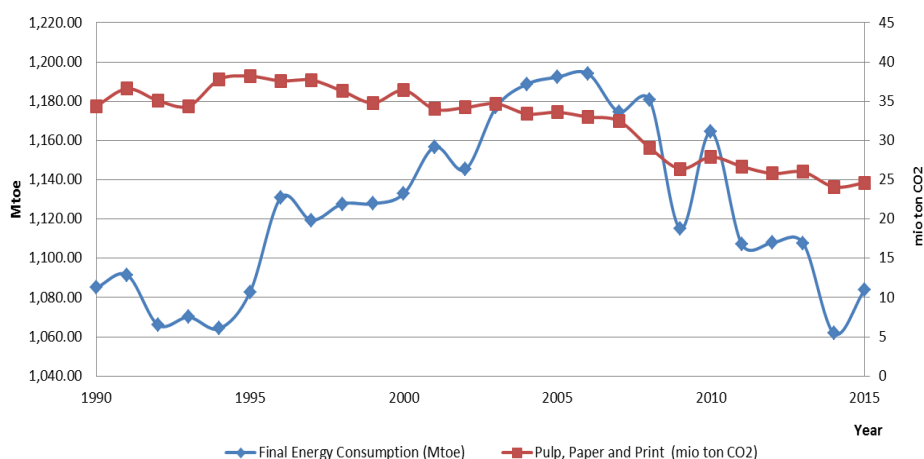


Figure 21. EU- 28 Energy Statistics- total energy consumption of paper, pulp , and print (Mtoe) related with CO2 emission (mio ton CO2) (DG Energy, 2017)

The pulp and paper industry has a large potential for creating energy savings (Chen et al, 2012). The use of heat recovery systems and recovery of residual biomass (i.e. bark, black liquor and, to a much lesser extent, wastewater sludge) plays an important role in the overall energy efficiency of the pulp and paper industry. In Europe, the industry produces about 51 % of the electricity it consumes, most (95,2 %) from combined heat and power installations (CHP). Overall, around 56% of the energy requirements for the industry (heat and electricity) are met using biomass ([CEPI, website](#)).

The ration between energy consumed/production suggests industry efforts to implement energy saving measures that are proportionally related to operational costs of a site. Energy costs represents a significant contribution to total production costs, so there is an inherent incentive for the pulp and paper sector to improve energy efficiency when beginning new investment cycles. Fleiter et al., (2012) estimated energy to account for around 13% of total pulp and paper production costs. The pulp and paper sector is characterised by large scale, capital intensive plants and long investment cycles. Boilers and recovery boilers can have expected lifetimes of 30-40 years. This means that any radical shifts to technologies that offer improved energy efficiency is unlikely to occur on an industry-wide scale overnight, and that incremental improvements via upgrades are more likely.

Between 1990 and 2005, overall specific heat consumption has improved towards a defined aggregate BAT level by a factor of approximately 10% (OECD/IEA, 2008). Specific electricity consumption (MWh/t) in CEPI countries has been reduced by 18.7% between 1990 and 2012 and by 8.6% between 2002 and 2012 (CEPI, 2013). Future trends for specific energy consumption in the pulp and paper industry are expected to show a continued decrease of between 0.5% and 1.0% each year until 2050 (DG ENER, 2013). One study estimated that it would be possible to reduce specific electricity consumption by 16% and specific fuel consumption by 21% in the German pulp and paper industry by 2035 (Fleiter et al., 2012).

Table 18. Assessment of subsystems with regard to their relevance for energy consumption

Process <sup>(1)</sup>	Integrated uncoated mechanical	Integrated coated mechanical	Non-integrated uncoated wood-free	Non-integrated coated wood-free	RCF without deinking	RCF-based graphic (with deinking)	RCF-based board (with deinking)	Non-integrated tissue	RCF-based tissue	Speciality wood-free
Wood handling			NA	NA	NA	NA	NA	NA	NA	NA
Refining										
Grinding			NA	NA	NA	NA	NA	NA	NA	NA
Screening										
HC cleaning										
Thickening			NA	NA				NA		NA
Deinking	NA	NA	NA	NA	NA			NA		NA
Bleaching			NA	NA	NA			NA		NA
Mixing										
Approach flow										
Forming										
Pressing										
Drying										
-Coating	NA		NA		NA	NA		NA	NA	
Calendering					NA		NA	NA	NA	
Finishing										
Central service										
	Very intensive (greatest consumer in the mill)									
	Considerable (major consumer)									
	Low (has only a minor impact on the energy situation of the mill)									
	Negligible									
NA	The process is not applied in the manufacturing of this grade									
	Varying because of differences in process and production within this grade									
<sup>(1)</sup> Chemical pulping is not included.										

Monitoring of energy used in the pulp and paper industry is complex. Different processes will use primary energy in the form of fuel or secondary energy in the form of electricity and steam. Within one paper grade there are differences in raw material composition, product properties and installed process equipment, among others, that influence the overall energy consumption per product. Additionally, when comparing energy consumption data one has to keep in mind that energy data recording and reporting is not yet uniform (Blum et al. 2007). When considering potential EU Ecolabel criteria for energy use, it is necessary to base justifications on energy data that are *technology - specific and up-to-date*. The first point of reference should therefore be the recently published BAT conclusions and the supporting BREF background document that were published in 2013-2014 for the production of pulp, paper and board. The reference level should be formed by energy consumption figures together with the technologies used.

Table 18 shows the assessment of subsystems with regard to their relevance for energy consumption. System borders and reference values of the subsystems are to be considered when assessing the energy balance (Blum et al., 2007).

### The general approach of BREF to energy management

The Best Available Techniques Reference report for pulp and paper industry does not contain explicit reference values for BAT energy consumption, but specifies instead "the best practice" reported or gives indicative ranges. Data is reported for different mill



types and in some cases the energy consumption is broken down into process stages (EC, 2015). Final BAT conclusions relating to energy have also been published as a binding Commission Decision 2014/687/EU. However, no specific energy consumption reference values are stated in the Decision. Instead, measures that must be taken to reduce specific energy consumption are described together with applicable situations. An overall approach to assessing the energy efficiency of a particular mill is described and split into three steps:

- i. **Assessment of the initial energy situation of the mill and benchmarking:** this should involve the gathering of electrical consumption and heat consumption (steam or fuel) data for the whole site as a function of product output and should be specific to different production lines where these involve different equipment and produce different pulp or paper grades.
- ii. **Detailed system analysis and improvement by optimisation:** this should provide the specific data necessary to identify and prioritise which parts of the plant could and should be invested in and what improvements are possible.
- iii. **Monitoring and sustainable safeguarding of achieved savings:** this should involve the development or continued implementation of an ongoing energy management system that will facilitate the input and storage of energy consumption data in a manner that makes it simpler to monitor the energy performance of the mill and defined production lines and unit processes.

The cross-cutting measures for energy use that can apply to all relevant installations are summarised in Table 19. The requirements in part A of Table 19 should ensure that all mills in the EU are collecting energy consumption data at the mill level and that this data is linked to production intensity. These requirements broadly align with those set out in EN ISO 50001.2011 for Energy Management Systems. The type of information gathered *should complement any reporting requirements that fall under EU Ecolabel criteria*.

Other major energy consuming stages that are specific to pulping are grinding (for mechanical pulp only) and refining (for both mechanical and chemical pulp).

In absolute terms, the energy intensity for producing pulp from Paper for Recycling (PfR) is much lower than producing mechanical pulp or chemical pulp from wood but there is also much less potential for energy recovery when processing PfR.

Table 19. BAT 6 of Decision 2014/687/EU for the production of pulp, paper and paperboard

Technique	Applicability
<b>A</b> Use an energy management system that includes all of the following features: (i) <u>Assessment of the mill's overall energy consumption and production</u> (ii) Locating, quantifying and optimising the potentials for energy recovery (iii) <u>Monitoring and safeguarding the optimised situation for energy consumption</u>	Generally applicable
<b>B</b> Recover energy by incinerating those wastes and residues from the production of pulp and paper that have high organic content and calorific value, taking into account BAT 12	Only applicable if the recycling or reuse of wastes and residues from the production of pulp and paper with a high organic content and high calorific value is not possible
<b>C</b> Cover the steam and power demand of the production processes as far as possible by the cogeneration of heat and power (CHP)	Applicable for all new plants and for major refurbishments of the energy plant. Applicability in existing plants may be limited due to the mill layout and available space
<b>D</b> Use excess heat for the drying of biomass and sludge, to heat boiler feedwater and process water, to heat buildings, etc.	Applicability of this technique may be limited in cases where the heat sources and locations are far apart

<b>E</b>	Use thermo compressors	Applicable to both new and existing plants for all grades of paper and for coating machines, as long as medium pressure steam is available
<b>F</b>	Insulate steam and condensate pipe fittings	Generally applicable
<b>G</b>	Use energy efficient vacuum systems for dewatering	Generally applicable
<b>H</b>	Use high efficiency electrical motors, pumps and agitators	Generally applicable
<b>I</b>	Use frequency inverters for fans, compressors and pumps	Generally applicable
<b>J</b>	Match steam pressure levels with actual pressure needs	Generally applicable

### 5.2.2. Outcomes from and after the 1<sup>st</sup> AHWG meeting

Although there were some concerns regarding the stringency of the proposed criterion on energy use, it was proposed to look for the further improvements to the criterion. Following stakeholders feedback on-site generation through renewable sources other than biomass (e.g. hydropower, wind, and photovoltaic) should be promoted, and electricity purchased in the market should be completely 'green'. A complete ban on the use of coal, and introduction of criteria for the sustainable origin of any biomass used was also proposed. Moreover, the provision of incentives for switching to biogas was also suggested.

It was suggested that this criterion should be developed in compliance with the work done by the dedicated Task force on energy.

It was noted that the recycled pulp for graphic paper and tissue paper needs more treatment than that used for newsprint paper. Moreover, the quality of paper collected for recycling has been showing a downward trend. Thus more cleaning and refining steps are required which is increasing the energy (electricity) consumption for recycled paper, especially for CGP and tissue paper production.

Regarding the requirement of different energy reference values for GWP (ground wood pulp) and TMP (thermal and mechanical pulp), it was suggested that there are few instances of GWP and TMP production in the market, and those particular cases should be evaluated on a case by case basis without specifying separate reference values.

Some stakeholders suggested that waste water treatment should be included in the calculation of energy consumption. However, other stakeholders informed that it should be excluded from the calculations because mills will not be comparable regarding waste water treatment capacity.

Stakeholders expressed an overall preference to keep the existing calculation method.

### 5.2.3. Outcomes from and after the 2nd AHWG Meeting

Stakeholders asked for clarification of the proposed reference values for recovered fibre as drying pulp always implies higher energy consumption for non-integrated sources. For non-integrated production value was proposed to be higher than 1000. There is a difference between integrated and non-integrated production, and the electricity values could be between the levels of 800 and 900 kWh. This split proposed was perceived as impossible to be achieved.

For non-integrated pulp mills producers were proposed to be able to send documentation directly to the CB, so the paper producers only send the documentation for their own production. The paper producers would report for the paper production.

This way pulp producer would report to the pulp CB and paper producer to CB where paper is produced. This proposal in fact could work with the list of approved pulps, in case it is decided to be integrated into user manual. Otherwise it might create lack of clarity for the paper producer if they don't have the actual data from the pulp suppliers.

Stakeholders asked for the specification that the conversion process is excluded from the scope of the criterion.

For tissue paper and tissue paper product the incorporation of structural paper into the criteria was broadly discussed in line with two proposals: (1) to define separate reference values for structural tissue paper machine and apply the same final score of 2.5. ; (2) to have no separate reference values but allow a higher score for structural tissue (e.g. 3.0 instead of 2.5). Following feedback received, structural tissue paper is proposed to be assigned a specific reference value.

#### 5.2.4. Further research and main changes

Reference values have been evaluated and revised for each type of pulping and paper making process that falls under the scope of the product groups. The magnitude of changes proposed depends on the degree of revision required when contrasting the actually valid reference values with best practice information found, and feedback collected during the revision process.

In this regard, the feedback received indicates that the electricity reference values for admp and non-admp recovered fibre pulp should be aligned as there's no reason for different values (referring to the proposal presented during the 2<sup>nd</sup> AHWG Meeting). In fact, the main difference between admp and non-admp relates to fuel consumption since additional fuel is required to dry the pulp. It should be clarified that the energy consumption is allocated to the paper product, and represents the sum of electricity and fuel used during pulp and paper making process (both separately indicated).

For tissue paper and tissue paper product, specific energy consumption reference value has been proposed to be added for structural tissue paper. The reference values for conventional tissue making process are proposed to be harmonised with the best practice indicated in BREF.

##### 5.2.4.1. Energy consumption data collection and analysis

Data for the further analysis of energy consumption was collected via responses to 2<sup>nd</sup> questionnaire circulated by DG JRC and supported by the information from several license holders. Overall, the ranges of energy consumption data provided are set in Table 20 and compared with the current reference values. Data reported addresses mainly chemical and chemithermomechanical pulp. Data lack hinders any possibility to present energy consumption ranges for other pulp types.

Table 20. Reported energy consumption during pulp and graphic grade paper making processes

	Reported values (kWh/t)		Current EU Ecolabel reference values (kwh/t)	
	Electricity min-max	Heat min-max	Electricity	Heat
Pulp production (chemical)	364-1056	1064-7636	800	4000
CTMP	1305-1960	473-1142	2000	1000

	Reported values (kWh/t)		Current EU Ecolabel reference values (kwh/t)	
Paper Production				
Uncoated woodfree fine paper, magazine paper (SC)	520-760	553-3904	600	1800
Coated woodfree fine paper, coated magazine paper (LWC, MWC)			800	1800

\*In some cases the energy consumption for integrated system is considered as a whole and allocated to papermaking

Table 21 contains information on specific power and heat consumption for different type of pulps (UBA, 2009). The specific consumption does only contain secondary energy (i.e. power and heat for the process and related secondary units). Any losses or own consumption etc. of the energy conversion plant are not contained in the consumption values stated.

The data collected confirms the complexity and dynamic nature of energy consumption within the sector, and so related difficulties to propose the singular values, even on a per pulp-type basis. The singular mills might produce different products and use different raw materials and technologies. Seeking for best practice is therefore not straightforward, and will require certain assumptions to accommodate a series of possible scenarios. In terms of product output, some mills only produce an intermediate pulp product, others only buy market pulp to produce paper (i.e. non-integrated production) while others produce both pulp and paper (integrated production) but may sell some of the excess pulp and purchase minor amounts of market pulp of other types to add as a furnish, allowing for the potential to adjust the technical properties of the paper they produce and/or to achieve a cost-optimal combination of ingoing and outgoing pulp.

Table 21 Typical specific consumption values for process energy in pulp paper mills (UBA, 2009)

Type of mill	Range of energy consumption	
	Power (kWh/t) (from – to)	Heat (kWh/t) (from – to)
<b>Non- integrated kraft pulpmill</b>	700-800	3800-5100
<b>Integrated uncoated mechanical paper</b>	1200-1400	1000-1600
<b>Integrated coated mechanical paper</b>	1200-2100	1300-1800
<b>Non-integrated uncoated wood free paper</b>	600-800	1300-2500
<b>Non-integrated coated wood – free paper</b>	600-1000	1200-2100
<b>RCF without deinking</b>	300-700	1100-1800
<b>RCF with deinking</b>	900-1400	1000-1600
<b>Non-integrated tissue (no TAD)</b>	900-1200	1900-2800

Type of mill	Range of energy consumption	
<i>RCF based tissue mills (no TAD)</i>	800-2000	1900-2800

Further consultation with energy sub-group confirmed that energy data contained in BREF (JRC, 2015) were sufficiently detailed to form a basis for EU Ecolabel reference values

#### 5.2.4.2. Comparison of energy criteria for the EUEL and Nordic Ecolabel

The current criteria for EU Ecolabel Copying and Graphic Paper (Decision 2011/332/EU) and the Basic Module for "Nordic Ecolabelling of Paper Products" (version 2.2, 2011-2019) make reference to fuel and electricity.

One potentially significant difference between the two schemes is that the EUEL criteria state that any electricity used to generate steam is to be divided by 0.8 (to account for a typical boiler efficiency) added to the fuel account. The Nordic criteria also address the situation of steam generated by electric boilers but they request that the electricity consumption be multiplied by 2.5 (to reflect the efficiency of fuel use to generate grid electricity) before it is moved to the fuel account. Another potential difference is that the Nordic criteria specifically exclude filler from their calculations.

Both the EUEL and Nordic criteria allow for any *solid heat* to be converted into an equivalent fuel by dividing by 0.8 (i.e. assuming an 80% efficient boiler). Both the EUEL and Nordic criteria also make allowance for fuel used to generate electricity to be subtracted from the fuel balance and added to the electricity account.

##### 5.2.4.2.1. Issues specific to scope and ambition level for pulp production

The key to the ambition level of the criteria is the reference values that are selected for each particular pulp and paper production process. A comparison of the reference values and conditions for compliance is shown in Table 22. Comparison of reference values for energy use criteria for EU Ecolabel and Nordic Ecolabel pulp and paper.

Table 22. Comparison of reference values for energy use criteria for EU Ecolabel and Nordic Ecolabel pulp and paper

EU Ecolabel			Nordic Ecolabel		
Pulp type / Paper grade	Fuel reference kWh/t (GJ/t)	Electricity reference kWh/t (GJ/t)	Pulp type / Paper grade	Fuel reference kWh/t (GJ/t)	Electricity reference kWh/t (GJ/t)
<i>Chemical pulp</i>	4000 (14.4)	800 (2.88)	<i>Bleached chemical pulp</i>	3750 (13.5)	750 (2.7)
<i>Dried chemical pulp</i>	5000 (18)	800 (2.88)	<i>Dried bleached chemical pulp</i>	4750 (17.1)	750 (2.7)
			<i>Unbleached chemical pulp</i>	3200 (11.52)	550 (1.98)
			<i>Dried unbleached chemical pulp</i>	4500 (16.2)	550 (1.98)
<i>CTMP</i>	1000 (3.6)*	2000 (7.2)	<i>CTMP</i>	n/a	2000 (7.2)
<i>Dried CTMP</i>	1000 (3.6)	2000 (7.2)	<i>Dried CTMP</i>	1000 (3.6)	2000 (7.2)
<i>Recycled fibre pulp***</i>	1800 (6.48)	800 (2.88)	<i>Deinked pulp (DIP)</i>	350 (1.26)	500 (1.8)
<i>Dried recycled fibre pulp</i>	2250 (8.1)	800 (2.88)	<i>Dried deinked pulp (DIP)</i>	1350 (4.86)	600 (2.16)
<i>Mechanical pulp**</i>	0 (0)	1900 (6.84)	<i>Thermomechanical pulp (TMP)</i>	n/a	2200 (7.92)
<i>Dried mechanical pulp**</i>	900 (3.24)	1900 (6.84)	<i>Dried thermomechanical</i>	1000 (3.6)	2200 (7.92)

EU Ecolabel			Nordic Ecolabel		
			<i>pulp (TMP)</i>		
<i>Groundwood pulp (GWP)**</i>	0 (0)	2000 (7.2)	<i>Groundwood pulp (GWP)</i>	n/a	2000 (7.2)
<i>Dried groundwood pulp (GWP)**</i>	900 (3.24)	2000 (7.2)	<i>Dried groundwood pulp (GWP)</i>	1000 (3.6)	2000 (7.2)
<i>Uncoated woodfree fine paper</i>	1800 (6.48)	600 (2.16)	<i>Uncoated fine paper</i>	1700 (6.12)	750 (2.7)
<i>Magazine paper (SC)</i>			SC	1700 (6.12)	750 (2.7)
<i>Coated woodfree fine paper</i>	1800 (6.48)	800 (2.88)	<i>Coated fine paper</i>	1700 (6.12)	750 (2.7)
<i>Coated magazine paper (LWC, MWC)</i>			LWC	1700 (6.12)	800 (2.88)
<i>Newsprint***</i>	1800 (6.48)	700 (2.52)	<i>News</i>	1700 (6.12)	750 (2.7)
			<i>Folding box board (FBB)</i>	1700 (6.12)	800 (2.88)
			<i>Solid bleached sulphate (SBS)</i>		
			<i>Solid bleached board (SBB)</i>		
			<i>Solid unbleached board (SUB)</i>		
			<i>White lined chipboard (WLC)</i>		

\*comparing Decision 2011/332./EU with Decision 2012/448/EU, it is apparent that this value should be 0.

\*\*energy reference values for mechanical pulp as set out in Decision 2011/332/EU for copying and graphic paper. The equivalent criteria published in Decision 2012/448/EU for Newsprint paper are different (slightly higher) and distinguish between TMP and GWP.

\*\*\*energy reference values set out in Decision 2012/448/EU for the same pulp type are much lower than those listed above, which were set out in Decision 2011/332/EU for copying and graphic paper.

The reference values typically indicate that drying of pulp to 10% moisture content has an energy cost of 1000 kWh/t of dried pulp. and that this is achieved by using additional fuel instead of electricity. The BREF findings (EC, 2015), showed that the energy for pulp drying (only market pulp) can be of the order of 3 GJ/ADt (or 833 kWh/ADt) of pulp or some 25 % of the total heat requirement for a kraft pulp mill and 15 – 20 % of the electrical energy.

### 5.2.4.3 Energy reference values – overview of available data

Reference values for energy consumption in pulp and paper production are to be reviewed within the context of the revision. To accomplish the above specified objective, the Nordic Swan reference values has been crosschecked and compared with the information contained in BREF (JRC, 2015) and other available sources (ÅF-Engineering AB, 2010, Ecofys 2009, Fleiter 2012; PAPRICAN 2008; Preiss et all 2007, UBA 2007; UBA 2009).

#### 5.2.4.3.1 Chemical pulp

The manufacturing of bleached kraft pulp consumes a large amounts of heat energy about 10 – 14 GJ/ADt (2778-3889 kWh/ADt), excluding steam for the production of electrical power. The model mills are very energy efficient and the black liquor alone produces enough steam to satisfy the process steam consumption in each of the mills. The lime kiln is fired with bark powder, or gasified bark, and the remaining bark from the woodyard and chip screening is burned in a power boiler. There is an excess of steam from the recovery and power boilers which is utilized in a condensing turbine to produce in green power which is sold.

The energy consumption for pulp drying is about 25 % of the heat energy and 15 – 20 % of the electrical energy. Over 50 % of the electrical energy consumption is used for



pumping. The energy for pulp drying (only market pulp) can be of the order of 3 GJ/ADt of pulp (833 kWh) or some 25 % of the total heat requirement for a kraft pulp mill and 15 – 20 % of the electrical energy. Considering available data, it is proposed to assume 1000 kWh/ADt of fuel consumption for pulp drying in non-integrated system.

The manufacturing of bleached sulphite pulp (Table 23) consumes about 7.5 – 16.5 GJ/ADt (2084 -4583 kWh/ADt) of heat energy (excluding steam for the production of electrical power). The lower levels are achieved when paper pulp is produced and the drying of pulp is not included (pumpable pulp). The consumption of electrical energy is 550 – 900 kWh/ADt. If ozone is used in bleaching, the total consumption of electrical energy may reach 990 kWh/ADt.

Table 23. Indicative energy consumption levels for gross process heat and power for different types of sulphite pulp mills

Type of sulphite pulp mill	Indicative consumption level for gross process heat in kWh/ADt	Indicative consumption level for electricity in kWh/ADt	Remarks
<i>Production of bleached sulphite or magnesite paper grade pulp (pumpable pulp)</i>	2 100 – 2 400	400 – 700	Levels refer to manufacturing of pumpable pulp; pulp drying would additionally consume approx. 780 – 840 kWh/ADt heat and 100 kWh/ADt power
<i>Production of bleached sulphite paper grade pulp (market pulp)</i>	2 900 – 3 200	500 – 800	Levels refer to air dry pulp, i.e. include pulp dryer; if steam-consuming processes for by-products are included, energy consumption may increase accordingly
<i>Production of bleached sulphite pulp for viscose</i>	3 200 – 3 500	700 – 800	Levels refer to air dry pulp (including dryers) and include an ozone bleaching stage

\*Note that 1 GJ = 277,78 kWh

The potential for electricity generation in the chemical process might generate net negative electricity consumption in the pulp mill. The EUEL and Nordic calculations specify that all electricity consumption (internally or externally sourced) is added and any sold electricity is to be subtracted. Consequently it will not be possible to reach a negative number for specific electricity consumption.

Comparative analysis of energy consumption values collected from different sources of information is presented in Table 24 Comparative energy consumption values for chemical pulp.

Table 24 Comparative energy consumption values for chemical pulp

Pulp types	BREF, best performance mentioned		Nordic Ecolabel		Swedish mills, 2007		PAPRICAN 2008 (Median)		EU Ecolabel	
	Non-admp (integrated)	admp (non integrated)	Non-admp (integrated)	admp (non integrated)	Non-admp (integrated)	admp (non integrated)	Non-admp (integrated)	admp (non integrated)	Non-admp (integrated)	admp (non integrated)
<b>Bleached kraft pulp</b>										
Heat (kWh/ADt)	3530	4400	3750	4750	3542	4960	4500	5436	4000	5000



Electricity (kWh/ADt)	700	550	750	750	700	800	550	667	800	800
<b>Bleached sulphite pulp</b>										
Heat (kWh/ADt)	2250	3050	3750	4750					4000	5000
Electricity (kWh/ADt)	550	650	750	750		800			800	800
<b>Unbleached chemical pulp</b>										
Heat (kWh/ADt)	2900	3800	3200	4500	2276	5195			4000	5000
Electricity (kWh/ADt)	620	470	550	550		800			800	800

### 5.2.4.3.2 Mechanical and thermomechanical (TMP), and chemithermomechanical pulp (CTMP)

Electricity is the main energy used in the pulping process, thus this technology may have high primary energy demand and CO<sub>2</sub> emissions. Groundwood pulp used for SC paper and newsprint production consumes in total about 2 200 kWh/t and 1 600 kWh/t respectively, whereas TMP consumes about 3 600 kWh/t and 2 500 kWh/t respectively. However, higher heat recovery in TMP may normally lead to lower overall energy consumption than GW pulping.

Table presents examples of energy consumption of German integrated mechanical plants (UBA, 2007). The total energy consumption for the analysed mills varies between 2400 and 3400 kWh/tonne. The specific electricity consumption accounted for 1197 to 2091 kWh/tonne, whereas process heat consumption for 1025 to 1775 kWh/tonne.

Following stakeholder's consultations, only CTMP mills in some cases ((approximately 10 mills in Europe) operate in a non-integrated manner, other mechanical pulp mills are integrated. *There is nevertheless, the need to establish reference values for market mechanical pulp to address the situations where minor amounts of mechanical pulp are added as furnish.*

Table 25. Specific energy consumption of German integrated mechanical pulp mills

Electric power (kWh/t)	Process heat (kWh/t)	Total energy (kWh/t)
2091	1306	3397
1217	1775	2992
1514	1626	3140
1375	1025	2400
n.a.	n.a.	2838
1197	1495	2695

For CTMP pulp, information received from license holders reveals the energy consumption levels from 1305 to 1960 kWh/tonne for the electricity and 473-1142 kWh/tonne for heat. Following information contained in BREF (JRC, 2105) Indicative energy consumption level for CTMP pulp accounts to 0-300 kWh/tonne for heat, and 2300 -3000 kWh/tonne for electricity. The energy consumption levels refer to the entire mill and consider both pulp and paper manufacturing process.

For TMP and CTMP recoverable energy fraction can amount to respectively 80% and 45% of power consumption and for TMP can exceed heat requirement for pulp drying or

paper making. The following is prescribed in BAT 41: “*Extensive recovery of secondary heat from TMP and CTMP refiners and reuse of recovered steam in paper or pulp drying*” is considered a technique that applied in order to reduce the consumption of thermal and electrical energy. Also, according to the BREF, heat recovery is “standard practice in all new and recently rebuilt plants” (only a few plants in Europe have not installed them).

Table 26. Energy balance for a non-integrated Finnish CTMP mill

<b>Department</b>	<b>Heat (kWh/tonne)</b>	<b>Electrical power (kWh/tonne)</b>
<b>Pulp mill</b>		
Recovered steam, only for process used	+750	
External supply	0	+1650
Consumption	0	-1600
Effluent treatment	0	-50
Excess energy from pulp mill	+750	0
<b>Pulp dryer</b>		
Consumption	-1556	-150
Steam boiler (wood residual and fuel oil)	+806	+150
Total external supply	806	1800

Table 26 shows an example of energy balance for energy consumption of a Finnish non-integrated CTMP mill (JRC, 2015).

The reference values for CTMP are proposed to represent the example given in Table 26. Energy balance for a non-integrated Finnish CTMP mill. However, it is proposed to increase the electricity consumption threshold by 100 kWh/ADt in order to reflect information received from license holders. Proposed change in the criterion verification that consist in setting a scoring threshold for the sum of energy used (heat and power), would give necessary flexibility to accommodate different scenarios, and also respond to the information received from license holders. The proposal also accommodates energy consumption data reported by current license holders.

Regarding the requirement of different energy reference values for mechanical pulps (GWP, and TMP), following the energy sub-group feedback there is a great variation in specific energy consumption amongst the handful of mechanical pulp mills in Europe (mainly in Sweden) and so it would be even more difficult to try to justify values for different types of mechanical pulp (due to the very low numbers of each type of mechanical pulp mill). It was suggested that considering the minor presence of GWP and TMP production in the market, the particular cases should be evaluated on a case by case basis. Nevertheless, following stakeholders consultation and specific values have been proposed to address the presence of mechanical pulp in the pulp mix.

Considering the energy consumption data analysed it is proposed to align the energy consumption for GW and TMP pulp with the values specified in EU Ecolabel for Newsprint Paper (2012/448/EU).

#### **5.2.4.3.3 Recycled pulp**

RCF mills require substantial amounts of steam for heating of water, pulp, air and chemical additives and for drying the paper. Nevertheless, RCF pulping requires comparatively less total energy for processing than is needed for virgin pulp, especially for mechanical pulping. In fact, it has been estimated that producing recycled Kraft pulp uses 33% less energy overall, on average, than mills making virgin chemical pulp (Kinsela, 2012).

Energy consumption in recovered fibre processing depends to a large extent on the design, type and amount of process steps involved to achieve a certain product quality (Table 23). Whereas standard deinked stock for newsprint consumes about 300 – 350

kWh/t electrical energy, high-grade deinked pulp with higher ISO brightness (e.g. graphic papers) requires 400 – 500 kWh/t.

Table 27. Energy consumption different RCF paper grades

	Packaging paper	Newsprint	LWC/SC paper	Tissue paper and market pulp
<i>Main paper for recycling (depends on availability and price of paper for recycling and quality of the end product)</i>	Mixed paper for recycling and boards, paper for recycling and packaging from stores and supermarkets	Deinkable paper for recycling (old newsprint and old magazines)	Deinkable paper for recycling (old newsprint and old magazines)	Deinkable paper for recycling (old newsprint + magazines); wood-free office paper for recycling
<b>Energy consumption</b> - Electricity - Thermal energy (e.g. steam)	150 – 250 kWh/t 0 MJ/t (if dispersing is applied heating is required)	300 – 420 kWh/t 450 – 900 MJ/t (=0.2 – 0.4 t <sub>steam</sub> /t)	400 – 600 kWh/t 650 – 1 200 MJ/t (=0.3 – 0.5 t <sub>steam</sub> /t)	400 – 500 kWh/t 650 – 1 100 MJ/t (=0.3 – 0.5 t <sub>steam</sub> /t)

Integrated RCF-based mills are often partially integrated, i.e. part of pulp is manufactured on site and the rest is purchased pulp. In Europe, nearly all RCF-based mills are integrated. In RCF paper mills, steam is normally produced on site by each company. Electricity can also be purchased from the public grid. Paper mills usually use a mixture of different fibre types. The total energy consumption is directly proportional to the share and type of mechanical pulp in the supplied pulp. Power consumption for RMP (refiner mechanical pulp) and GW (groundwood) is significantly higher than for RCF processing.

During the consultation process, industry stakeholder clarified that recycled fibre feedstock quality is a continually evolving phenomenon that depends directly on market features such as demand for different grades of paper for recycling, spot prices and wastepaper collection rates in different countries. The reduction in consumption of copying and graphic paper and the demand of external markets (mainly China) were mentioned as factors that strongly affect the market for secondary fibre. The pulp and paper sector has to constantly adapt to fluctuations in recycled fibre quality. Demand for the best quality recycled fibres is extremely high and when using lower grades of paper for recycling, it was confirmed that pulp yields were lower and energy demands higher. Accordingly, Nordic reference electricity values for DIP pulp were perceived as too low (600 kWh) to satisfy the energy demand of modern DIP installations.

The information subtracted from the German RCF plants (UBA 207, 2009) has been contrasted with data contained in BREF. For the UBA analysis of energy consumption levels, it was assumed that the selected mills represent technological solution able to achieve a high level of environmental protection (Table 28). The analysis included 20 RCF mills (13 without deinking and 7 with deinking) (UBA, 2007). The total energy consumption (heat and electricity) for the analysed mills varies between 1400 and 4170 kWh/tonne (electricity: 758-1430 kWh/tonne, heat: 1146-2793 kWh/tonne). Following the BREF, the indicative energy consumption levels for RCF pulps with deinking designated for copying and graphic paper and newsprints, varies from 1000 to 1800 kWh/tonne for process heat consumption, and from 900 to 1300 kWh/tonne for electricity consumption. The ranges include all process units related to RCF processing and papermaking.

Table 28 Specific energy consumption of German RCF mills with deinking

Electric power (kWh/t)	Process heat (kWh/t)	Total energy (kWh/t)
927	1146	2073

1285	1113	1400
1430	1400	2830
1000	1600	2600
1377	2793	4170
758	1942	2700
1158	2589	3747

As an example, for newsprint based on 100% recycled fibres, values are given in Table 29 for the specific energy consumption (SEC) and the energy balance

Table 29. Specific energy consumption in an integrated Swedish mill producing newsprints from deinked pulp

Process unit	Process heat (kWh/ADt)	Electrical power (kWh/ADt)
<b>Pulp mill</b>		
Deinking	56	175
Washing and screening	0	50
Bleaching	0	75
Total pulp mill	56	300
<b>Paper mill</b>		
Stock preparation	0	235
Paper machine	1472	350
Total paper mill	1528	585
Effluent treatment	0	32
<b>Total pulp and paper mill</b>	<b>1528</b>	<b>917</b>

The proposed reference value for electricity consumption for recovered fibre market pulp (350 kWh/ADt) was perceived as inconsistent with the proposed value for non-air dried pulp (1000 kWh/ADt) given that the main difference in energy intensity between admp and non-admp pulp stem from the fuel consumption required for pulp drying.

It was also suggested to increase the electricity consumption to 1000 kWh/ADt based on the information provided by two RCF market pulp manufacturers. Following BREF indication (2015) and data contained in UBA Report (2009) the total best-practice energy consumption for graphic paper grade made of de-inked RCF fibre requires approx. 3000 kWh/t. Considering the energy consumption (in form of heat electricity) for a paper mill it is proposed to update the reference values for RCF pulp manufacturing to 600 kWh/ADt for electricity consumption, and 350 kWh/ADt for fuel consumption (1350 kWh/ADt for admp pulp). The values proposed are harmonised with the Nordic Swan requirement.

### 5.2.4.3.3.1 RCF based tissue paper

For the integrated production the best practice energy consumption for RCF based tissue pulp and paper mill was reported by Worell (Worell, 2007)<sup>29</sup> as equal to 1944 kWh/ADt for fuel, and 1200 kWh/ADt for electricity. Some other indication shows the average energy consumption for a traditional tissue plant at the level of around 2800-2900 kWh/ton<sup>30</sup>. For Nordic Swan applications, where the tissue is produced out of recycled fibre fuel consumption is set at 500 kWh/tonne, and for electricity at 500 kWh/tonne. In case where dried recycled fibre is used fuel consumption is set at 1500 kWh/tonne, and for electricity at 700 kWh/tonne. Following Blum et al (2007) an example of best practice energy consumption for non-integrated tissue mill that manufactures handkerchiefs from 100% virgin fibre is 900 kWh/t for electricity, and 2000 kWh/t for heat.

Integrated RCF-based mills are often partially integrated, i.e. part of pulp is manufactured on site and the rest is purchased pulp. In RCF paper mills, steam is normally produced on site by each company. Electricity can also be purchased from the public grid. Paper mills usually use a mixture of different fibre types. For the production of RCF based graphic and tissue paper grade, high quality of recovered fibre is required. Following consultation with CEPI, companies producing recycled paper with deinking (integrated or market) are facing a reduction in the availability of RCF fibre that is suitable for standard deinking. This is due to the reduction in the graphic grades consumption. This requires the system to be adapted to accommodate broader variety of recycled fibre grades which re-pulping to graphic or tissue grade (product cleanliness, brightness, and yield). Hence the change in the feedstock quality is a driver of the higher energy consumption.

Table 30 Energy consumption during production of different RCF based paper grades

	Packaging, paper	Newsprint	LWC/SC paper	Tissue paper and market pulp
<b>Main paper for recycling</b> <i>(depends on availability and price of paper for recycling and quality of the end product)</i>	Mixed paper for recycling boards, paper for recycling packaging stores and supermarkets	Deinkable paper for recycling (old newsprint and old magazines)	Deinkable paper for recycling (old newsprint and old magazines)	Deinkable paper for recycling (old newsprint + magazines); wood-free office paper for recycling
<b>Energy consumption</b>	150 – 250 kWh/t	300 – 420 kWh/t	400 – 600 kWh/t	400 – 500 kWh/t
<b>- Electricity</b>	0 MJ/t (if dispersing is applied heating is required)	450 – 900 MJ/t	650 – 1 200 MJ/t	650 – 1 100 MJ/t
<b>- Thermal energy (e.g. steam)</b>		(=0.2 – 0.4 t <sub>steam</sub> /t)	(=0.3 – 0.5 t <sub>steam</sub> /t)	(=0.3 – 0.5 t <sub>steam</sub> /t)

The reference values for energy consumption for RCF pulp have been adapted and split between pulp and paper making process. Accordingly, the sum of the energy required for pulp and paper making process is in line with data that represents best practice of RCF based tissue mill (Table 21).

The energy consumption reference values for RCF based pulp are proposed to be separated following the paper grade that is going to be achieved. Tissue making process

<sup>29</sup>Worrell, E. L. (2007) World Best Practice Energy Intensity Values for Selected Industrial Sectors. Ernest Orlando Lawrence Berkeley National Laboratory.

<sup>30</sup>TOSCOTEC. Practical applications for energy consumption reduction. 2011. <http://www.toscotec.com/en/media/news/news-detail/article/practical-applications-for-energy-consumption-reduction/>

requires higher pulp purity, hence additional surplus of energy is proposed to be granted to RCF pulp designated for tissue paper and tissue paper product.

#### 5.2.4.3.4 Paper mill

The total electrical energy consumption at paper mills is summarised in Table 31. All electric power inside the paper mill building is included. i.e. all power usage inside the paper mill starting from the pulp storage towers (in integrated mills) and ending at the finishing operations is included. The values are based on 100 % efficiency at the reel to make paper machines comparable. An example of a non-integrated fine paper mill with on-line coating with a technical age of no more than five years shows the total consumption of process heat of 1795 (kWh/t) and electric power of 829 (kWh/t) (JRC, 2015). Considering information found, it is proposed to harmonise the reference values for the paper grades with the Nordic Swan requirements.

Table 31. Typical electrical energy consumption at modern paper mills based on the dimensioning capacity (= 100 % at reel) of the paper machine

<b>Paper grade</b>	<i>Power consumption in kWh/t (based on dimensioning capacity, Paper machine without stock preparation)</i>	<i>Power consumption in kWh/t (data refer to the whole paper mill)</i>
<i>Newsprint</i>	480 – 630	500 – 700
<i>LWC paper</i>	550 – 750	500 – 800
<i>SC paper</i>	600 – 700	450 – 700
<i>Fine paper (uncoated)</i>	450 – 650	450 – 650
<i>Fine paper (coated)</i>	600 – 850	600 – 750
<i>Multi-ply board</i>	~ 680	
<i>Sack paper</i>	~ 850	700 – 850
<i>Testliner</i>	~ 550	
<i>Tissue</i>	500 – 3 000 *	

The key differences in the design of paper making process are associated with the type of paper produced. By far the largest share of energy used in a non-integrated paper mill is allocated to the drying section. The thermomechanical principles of the heat and mass transfer that occurs in the drying section of pulp and paper making process have remained almost unchanged since its initial development (contact drying with steam heated cylinders is still the dominant method for drying). Thermal drying is often responsible for more than 80% of the total steam use (Laurijssena et al., 2010)<sup>31</sup>. The average consumption of primary energy per ton of paper produced and per ton of evaporated water is about 5800 MJ (about 1600 kW h) and 4000 MJ (about 1100 kW h), respectively (Culicchi, 2002)<sup>32</sup>.

##### 5.2.4.3.4.1. Tissue paper

The different drying systems used in tissue mills through-air drying or hybrid technologies have a significant effect on the energy consumption of the mill. Apart from the tissue-making process, there are additional processes that can significantly influence the energy consumption of a tissue mill:

<sup>31</sup>Laurijssena, J., De Grama, F.J., , Worrell, E. Faaij, A. 2010. Optimizing the energy efficiency of conventional multi-cylinder dryers in the paper industry. Energy 35 (9) p. 3738-3750

<sup>32</sup>Culicchi, P. 2002. L'industria cartaria italiana e il contest europeo [(The Italian paper industry and the european context)] Third workshop Comieco – MIAC, Lucca (Italy)



- Integrated deinking will require more energy;
- CHP/cogeneration will require more natural gas consumption;
- Electrical steam boilers will require more electricity;
- Biomass boilers will require less fossil fuel.

Nordic Swan set the reference values for the tissue paper machine's consumption of fuel at 1800 kWh/tonne, and for electricity at 1030 kWh/tonne. The same reference values shall be used for tissue paper products that are manufactured using non-woven or TAD technology. Where the tissue is produced out of recycled fibre fuel consumption is set at 500 kWh/tonne, and for electricity at 500 kWh/tonne. In case where dried recycled fibre is used fuel consumption is set at 1500 kWh/tonne, and for electricity at 700 kWh/tonne. BREF indicates that the heat consumption for non-integrated tissue with conventional drying system is at 1800-2100 kWh/tonne, and for electricity 900-1100 kWh/tonne.

Average specific energy consumption (SEC) per process in GJ/t for tissue paper is show on Figure 22.

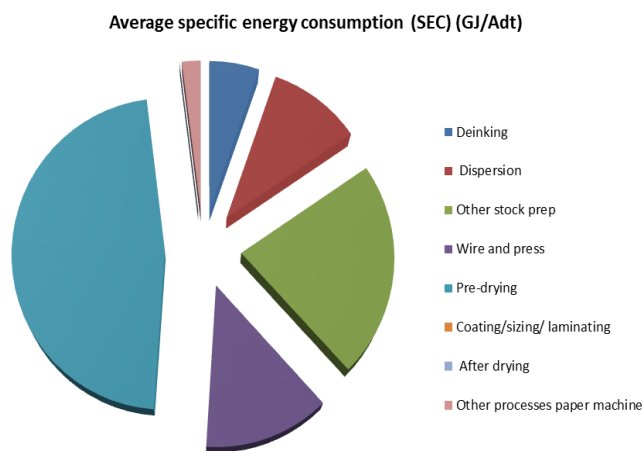


Figure 22 Average specific energy consumption for the tissue paper making process (SEC) (Laurijssen, 2013)

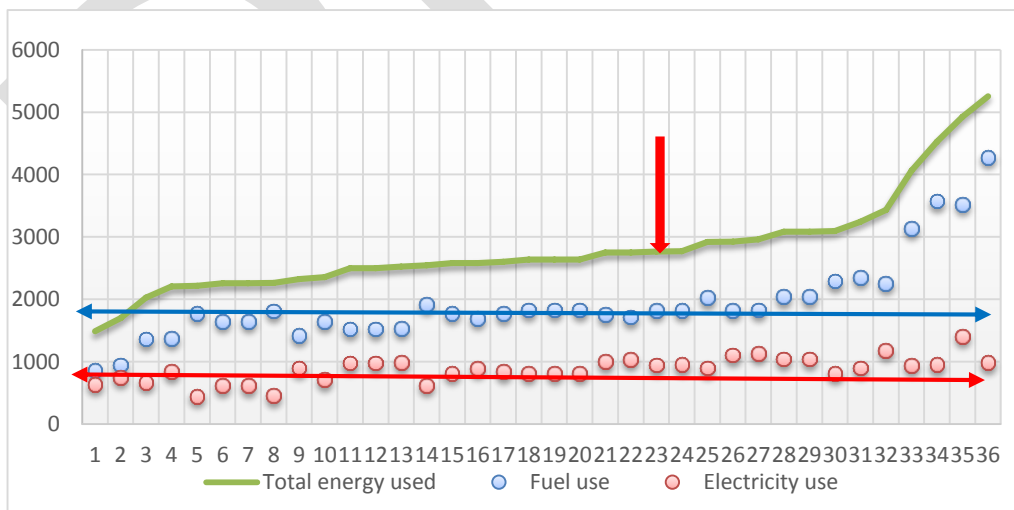


Figure 23 Energy consumption during manufacturing of tissue paper grade-conventional process (kWh/tonne of paper)

Analysed data represents 36 tissue paper mills across Europe. The total energy consumption for the conventional process varies between approx. 650 and 5300



kWh/tonne of paper. The electricity consumption ranges from 443 to 1406 kWh/tonne of paper (arithmetic mean 900 kWh/tonne), and fuel consumption between 851 and 4274 kWh/tonne (arithmetic mean 1950 kWh/tonne).

For the further analysis energy consumption data in 2016 reported from 38 sites were analysed (Figure 23 Energy consumption during manufacturing of tissue paper grade-conventional process (kWh/tonne of paper)Figure 23). It includes tissue production from virgin and recycled fibres. 3 out of 38 sites produce structured tissue. For the conventional tissue making process the energy consumption varied from 851 to 4274 kWh/ADt for fuel used, and from 443 to 2233 for electricity consumption (total energy consumption from 1486 to 5255 kWh/ADt). The total energy consumption for TAD technology varied from 4924 to 6175 kWh/ADt. When contrasting with Table 21, it is possible to observe that the average values reported represent the lowest range of the energy consumption for non-integrated tissue paper mill according to UBA (UBA, 2009). The reference values established by Nordic Swan for the tissue paper machine's are: fuel -1800 kWh/tonne, and electricity - 1030 kWh/tonne. Following Laurijssen et al. (Laurijssen, 2010)<sup>33</sup>, typical heat and electricity demand for tissue grade is 1300 kWh/tonne for power demand, and 5500 kWh/tonne for heat demand, maintaining heat-to-power ration at 1.2. Following Ecofys study (Ecofys, 2009)<sup>34</sup>, average specific fuel consumption is 1527-2083 KWh/tonne.

Following BREF findings, when applying energy-saving measures, the indicative energy consumption levels for the non-integrated tissue paper grade is 1800-2100 kWh/ADt for fuel, and 900-1000 kWh/ADt for electricity.

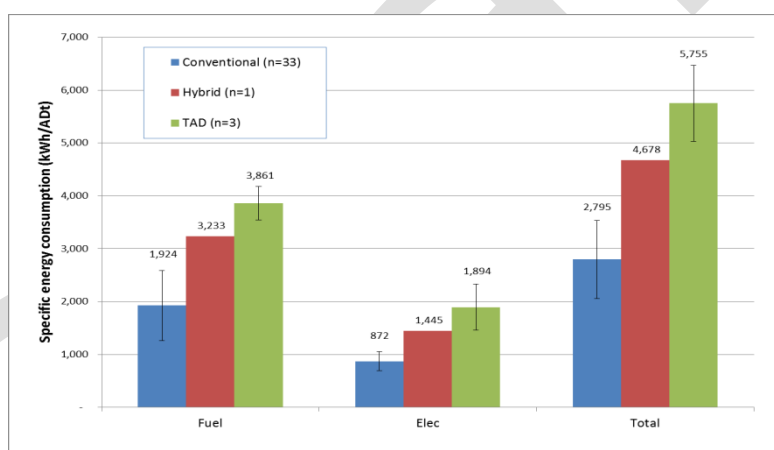


Figure 24 Energy consumption for different tissue making processes

Figure 24 shows the averaged values of energy consumption for different tissue making processes.

As previously mentioned structural fibre manufacturing requires more energy but provides a product of higher quality, when savings on the fibre use. As an example, the 50-80% increased bulk enable to maintain the roll diameter and roll firmness, but to have lower sheet count in the roll. The roll weight can thus be reduced by 20-25%. Furthermore, the high bulk can also be used to improve surface softness by calendaring if required, making this feature ideal for the best quality toilet and facial tissue<sup>35</sup>. Other

<sup>33</sup>Laurijssen, J., De Gram, F.J., Worrell, E. & Faaij, A.P.C. (2010). Optimizing the energy efficiency of conventional multi-cylinder dryers in the paper industry. *Energy*, 35, 3738-3750.

<sup>34</sup>Ecofys (2009) Methodology for the free allocation of emission allowances in the EU ETS post 2012, Sector report for the pulp and paper industry. Fraunhofer Institute for Systems and Innovation Research Öko-Institut By order of the European Commission.

<sup>35</sup>[http://www.kawano.co.jp/pdf/Advantage\\_NTT.pdf](http://www.kawano.co.jp/pdf/Advantage_NTT.pdf)

manufacturers reported fiber saving of 20-30 % when using TAD<sup>36</sup> or hybrid machines<sup>37</sup>. In fact some sample data provided to JRC shows that analysed TAD toilet paper and kitchen roll required approx.. 100% more energy (both for fuel and electricity) when providing approx.. 35% on fibre saving;

Considering the data analysed it is proposed to establish the following reference values:

1. Conventional tissue paper:

- 1950 kWh for fuel consumption;
- 950 kWh for electricity consumption

2. Structured tissue

- 3000 kWh for fuel consumption;
- 1500 kWh for electricity consumption

The split view was observed if, or if not EU Ecolabel should accommodate structural paper. Analysis of energy consumption data reported for TAD shows that highly demanding, and might be achieved by hybrid technology or a modern TAD process that select pulps of low energy consumption. Given the growing market share of structural paper, and high quality of the product obtained, supported by saving in quantity of fibre used, it is propose to incorporate structural paper into the EU Ecolabel scheme.

### 5.2.5. Summary of the reference sources for the proposed values

The summary of proposed revised reference values for the energy consumption, together with crossed -checked sources are summarized in Table 32.

Table 32 Proposed revised reference values for the energy consumption

Pulp grade	Fuel kWh/ADT $F_{reference}$		Electricity kWh/ADT $E_{reference}$		References
	Non-admp	admp	Non-admp	admp	
Chemical pulp	3650	4650	750	750	BREF, ÅF-Engineering AB, 2010, PAPRICAN 2008, data collected, Nordic Swan
Thermomechanical pulp (TMP)	n/a	900	2 200	2200	Nordic Swan, UBA, BREF
Groundwood pulp (including Pressurised Groundwood)	n/a	900	2 000	2 000	Nordic Swan, UBA, BREF
Chemithermomechanical pulp (CTMP)	n/a	800	1800	1800	Nordic Swan, BREF, data collected
RCF pulp (graphic)	350	1350	600	600	UBA, BREF, Nordic Swan
RCF pulp (tissue)	350	1350	700	700	UBA, BREF, Nordic Swan, data collected
Paper grade	Fuel kWh/tonne		Electricity kWh/tonne		
Uncoated woodfree fine paper, newsprint paper, Magazine paper (SC)	1700		750		Nordic Swan
Coated woodfree fine paper Coated magazine paper (LWC, MWC)	1700		800		Nordic Swan
Tissue paper conventional	1950		950		BREF, data collected,

<sup>36</sup> [http://www.valmet.com/globalassets/media/downloads/white-papers/tissue/wpt\\_advantagethru-air.pdf](http://www.valmet.com/globalassets/media/downloads/white-papers/tissue/wpt_advantagethru-air.pdf)

<sup>37</sup> [https://voith.com/corp-de/1375\\_e\\_2012-02-27\\_atmos-technology\\_low.pdf](https://voith.com/corp-de/1375_e_2012-02-27_atmos-technology_low.pdf)

			UBA
Tissue paper structural	3000	1500	Data collected, BREF
Admp	=	air dried market pulp.	

### 5.2.6. Methodology for reporting on energy consumption

In terms of energy consumption, there are three main sources of information that need to be considered:

- electricity consumption/production,
- steam consumption/production and
- fuel consumption.

The requirement is based on information on actual energy consumption in form of heat and power consumed to manufacture 1 tonne of product (sum of the energy from pulp and paper), in comparison to the reference values defined in the criteria. The ratio between actual energy consumption and the reference value translates to an energy score. The calculation includes energy scores for all pulps used and energy scores for the paper production. The overall final score then relates to the average of the pulp and paper scores shall be less than or equal to 2.5.

It can be argued that there is no need to report steam consumption (unless steam is purchased from an external source nearby) once best practice is well understood for a specific type of pulp or paper making process because any improvements in the efficiency of steam use and steam generation from fuel combustion or waste heat recovery would be reflected in a reduced net fuel consumption and/or net electricity consumption for a specific production volume of a particular pulp type or paper grade.

Further analysis of the specific data for energy consumption from German pulp and paper mills (UBA, 2007) shows the possible scenario of reaching adequate overall energy performance of the plant (sum total of fuel and power) with the low specific electricity consumption but fuel consumption higher than the reference values. On the other side, stakeholder's consultation revealed the existence of the current industry trends towards higher electricity and lower fuel consumption due to the impact of climate change policies.

The criterion refers to the calorific value of the fuel converted into heat - Fuel (heat) - and not of the steam produced from the fuel, therefore any purchased steam is to be converted back to fuel for the purposes of the EU Ecolabel calculation, using an assumed efficiency factor. To remove a possible misinterpretation the term "fuel" has been replaced by altered to "fuel consumption for heat production". That in practice means that any electricity generated from fuel in a CHP unit can and should be subtracted from the fuel consumption calculation.

The points model permits a higher level of energy consumption in order to allow the paper manufacturer an certain degree of flexibility. In this sense, addressing fuel and electricity consumption together (as a sum up) represents a holistic approach able to accommodate different scenarios. Consequently, the alternative methodology on reporting energy consumption is proposed, as follows:

$$\text{Total score } P(\text{fuel}) + P(\text{electricity}) \leq 2.5$$

This proposal was supported by the energy sub-group members and industry stakeholders, as scoring fuel and electricity together would address the current trends in energy management.

The calculation rule requires a reduced set of parameters considering key energy inputs and outputs. The formula considers onsite power generation. In this way the approach takes into account all aspects relevant for onsite optimisation of energy consumption; heat demand per process, heat integration and recovery of residual heat, conversion efficiencies (e.g. boiler efficiencies).

Energy used in the transport of raw materials, as well as conversion and packaging, is not included in the energy consumption calculations. Electricity used for waste-water treatment and air cleaning need not be included.

The consumption of electricity and fuel shall be based on bills and electricity meter readings. It should encompass the entire production process – both paper manufacturing and the constituent pulp.

In case of integrated mills, due to the difficulties in getting separate electricity figures for pulp and paper, if only a combined figure for pulp and paper production is available, the electricity values for pulp(s) shall be set to zero and the figure for the paper mill shall include both respective pulp and paper production. In this sense the energy consumption should be contrasted with the sum of respective reference values for pulp and paper manufacturing. The weighed content of each pulp in the pulp mix used in the final product should also be respected.

For non-integrated production, the calculated points should be passed on by the pulp manufacturer to the paper manufacturer that can perform a calculation of the total energy score for the finished paper. The calculation includes energy scores for all pulps used and energy scores for the paper production.

According to current Ecolabel criteria fuel(heat) consumption considering all contributions is to be calculated as:

**Consumption** = Internally produced fuel + 0,8 x bleed steam <sup>(a)</sup> + 0,8 x steam from electrode boilers <sup>(b)</sup> + purchased fuel – sold fuel – 1,25 x internally produced electricity <sup>(c)</sup> – sold heat <sup>(d)</sup>

<sup>(a)</sup> According to the 2011 Commission Decision on Ecolabel criteria for copying and graphic paper: 'Total heat energy includes .... as well as heat recovered from the internal generation of electricity – however, the applicant need only count 80 % of the heat energy from such sources when calculating the total heat energy.' This has been interpreted as referring to bleed steam from a back pressure steam turbine.

<sup>(b)</sup> 'Where steam is generated using electricity as the heat source, the heat value of the steam shall be calculated, then divided by 0,8 and added to the total fuel consumption'.

<sup>(c)</sup> The factor of 1.25 in the EU Ecolabel equation for internally produced electricity reflects efficiency (80%).

<sup>(d)</sup> As mentioned in the Commission Decision: 'The amount of fuel used to produce the sold heat shall be added to the term 'sold fuel' in the equation above'.

## 5.3 Criterion 3: Fibres – conserving resources, sustainable forest management

### 5.3.1 Criterion proposal – fibre sourcing

#### Fibres – conserving resources, sustainable forest management

(For Graphic and Tissue paper)

The fibre raw material may be recycled or virgin fibre.

Any virgin fibres shall not originate from GMO species.

All fibres shall be covered by valid chain of custody certificates issued by an independent third party certification scheme such as the Forest Stewardship Council (FSC), the Programme for the Endorsement of Forest Certification (PEFC) or equivalent or be covered by delivery invoices of Paper for Recycling according to EN 643.

At least 70% of the fibre material allocated to the product or production line shall originate from forests or areas managed according to Sustainable Forestry Management principles that meet the requirements set out by the relevant independent chain of custody scheme and/or originate from recycled materials covered by EN 643 compliant delivery notes.

Excluded from the calculation of recycled fibre content is the reutilisation of waste materials that are capable of being reclaimed within the same process that generated it (i.e. paper machine broke — own produced or purchased). However, inputs of broke from conversion operations (own or purchased) may be considered as contributing towards the recycled fibre content.

Any uncertified virgin material shall be covered by a verification system which ensures that it is legally sourced and meets any other requirement of the certification scheme with respect to uncertified material. The certification bodies issuing forest and/or chain of custody certificates shall be accredited or recognised by that certification scheme.

**Assessment and Verification:** the applicant shall provide to the Competent Body a declaration of compliance supported by a valid, independently certified chain of custody certificate of the manufacturer of EU Ecolabel **graphic/tissue** paper and for all virgin fibres used in the product or production line. FSC, PEFC or equivalent schemes shall be accepted as independent third party certification. Inputs of recycled materials from Paper for Recycling (PjR) may alternatively be covered by EN 643 delivery notes.

The applicant shall provide audited accounting documents that demonstrate that at least 70% of the materials allocated to the product or production line originate from forests or areas managed according to Sustainable Forestry Management principles that meet the requirements set out by the relevant independent chain of custody scheme and/or originate from recycled materials.

If the product or production line includes uncertified virgin material, proof shall be provided that the content of uncertified virgin material does not exceed 30% and is covered by a verification system which ensures that it is legally sourced and meets any other requirement of the certification scheme with respect to uncertified material.

In case the certification scheme does not specifically require that all virgin material is sourced from non-GMO species, additional evidence shall be provided to demonstrate this.

### 5.3.2 Rationale of proposed criterion text

The wording of the criterion text largely follows the same text that has been agreed upon in the last few years for other relevant EU Ecolabel product groups (e.g. Furniture criteria in Decision (EU) 2016/1332 and Wood-, cork- and bamboo-based floor coverings in Decision (EU) 2017/176). There are some specificities for this topic that are unique to the paper industry, such as the use of the term “fibre”, reference to the EN 643 for inputs of Paper for Recycling to the process and reference to “broke” materials. These terms were already used in the existing criteria for Newsprint paper (Decision 2012/448/EU) and Copying and Graphic Paper (Decision 2011/332/EU) and continue to be used in the proposal.

Some aspects of the criterion wording that is common to different product groups has been modified with the aim of improving the readability of the text. The most significant changes in this respect have been:

- Deletion of the text: "All virgin fibre shall be covered by valid sustainable forest management certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent". This effectively sets a 100% requirement for SFM certification for virgin fibre which then directly conflicts with the next sentence where it is said that "at least 70% of fibres shall be virgin and SFM certified and/or recycled fibres...".
- Deletion of the text: "Where a certification scheme allows the mixing of uncertified material with certified and/or recycled materials in a product or production line...". It is well understood that both FSC and PEFC allow for mixing of SFM certified and SFM uncertified material, and so would any other truly equivalent scheme. So it is considered that there is no real added value in this text.

On important point to highlight is that recycled fibres and sustainable virgin fibres are recognised as equivalent for the purposes of the EU Ecolabel criteria for both graphic paper and tissue paper. This represents a significant change from the existing Decision for Newsprint paper, where previously a mandatory minimum recycled fibre content of 70% was defined. The main justifications for removing the mandatory requirement for recycled fibre content (and not introducing one for tissue paper) are that the demand for recycled fibre already exceeds supply in Europe and that any mandatory minimum requirement would simply favour mills in regions close to densely populated areas (where large quantities of PFR are available) over mills in sparsely populated areas. A more detailed look at PFR statistics is included in the further research section.

Another important point is that the increase in the ambition level for "sustainable fibres" from 50% to 70% is significant for Copying and Graphic paper and for Tissue Paper, especially for existing license holders that do not have any recycled fibre inputs. The increase in ambition level was keenly contested by industry stakeholders and so further research on the appropriateness of the 70% ambition level was carried out and is included in the further research section. In summary, the results of the further research justified the appropriateness of the 70% ambition level for EU Ecolabel paper products.

Both the 70% ambition level and the equivalent recognition of recycled fibres and sustainable certified virgin fibres fits well with the FSC and PEFC certification schemes, as can be seen below.

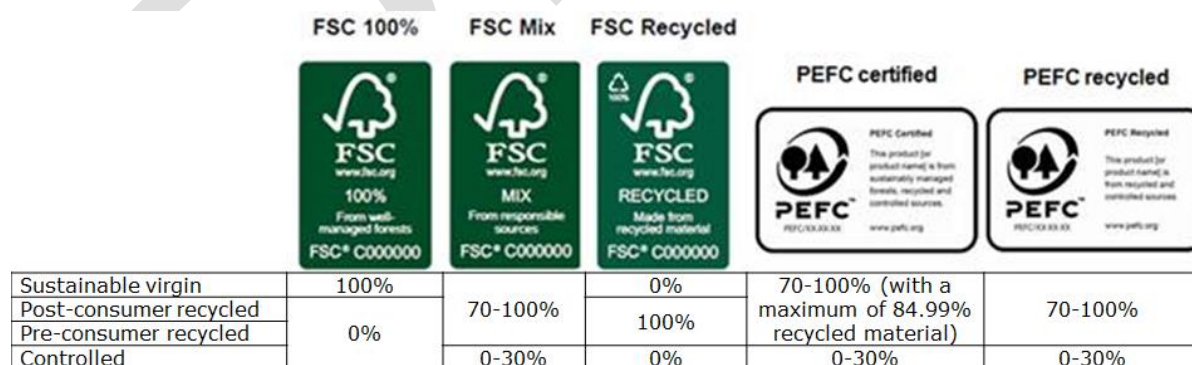


Figure 25. FSC and PEFC labels and related fibre input requirements for paper products

One clear benefit of the criteria proposal is that any product that qualifies for any of the FSC or PEFC labels can directly be considered as compliant with the fibre criterion for EU Ecolabel paper products.

Before presenting the main outcomes from the two AHWG meetings and the relevant further research conducted, some of the more fundamental rationale behind this criterion are listed in the next two sub-sections.



### The need for Sustainable Forest Management (SFM)

Sustainable forestry and widespread awareness of the adverse environmental impacts of deforestation originally came to the fore around 1990. Since then, a political commitment at the ministerial level in Europe to the definition, monitoring, understanding and promotion of sustainable forestry has become well established under the voluntary Forest Europe initiative, to which 46 European countries have now signed up and which defines sustainable forest management as:

*"The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems."*

The Forest Europe initiative has defined qualitative and quantitative indicators of sustainable forest management, initially in 1998, then again in 2003 and most recently in 2015. The most recent criteria cover 11 qualitative indicators and 34 quantitative indicators<sup>38</sup> (see Appendix I).

The environmental impact of wood harvesting from forests or plantations can vary significantly depending on how the whole process is carried out and how the forest or plantation is managed in the long term. In terms of LCA impact categories, the harvesting of wood has a strong influence on global warming potential and land use as well as impacts on biodiversity.

Positive impacts on climate change due to the sequestration of carbon in the wood biomass and in forest/plantation soil are obvious although these short term positive impacts are meaningless in the long term if the harvesting operation results in net deforestation or forest degradation.

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC, 2014) quotes forestry and land use as the second most important source of anthropogenic carbon dioxide (fossil fuel combustion being the first). These conclusions are supported by other independent scientific studies, e.g., the work carried out by van der Werf et al., (2009). The subject is sufficiently important to have been addressed specifically in an IPCC special report (IPCC, 2000) and the development of the "United Nations Reducing Emissions from Deforestation and forest Degradation" UN-REDD initiative.

Land use impacts are generally negative due to the need for building access roads and clearcutting operations but the latter impact can be minimised over the longer term when the harvested area is replanted and the forest or plantation is managed in a manner that maintains or enhances the overall levels of growing stock in the forest/plantation. Land use change relating to forestry operations can in some limited cases be positive (due to land reclamation or the conversion of intensive agricultural land to plantations) but can also be negative (due to the conversion of naturally regenerated or primary forests to plantations).

Threats to biodiversity caused by forestry activities are evident if care is not taken to maintain minimum levels of deadwood and a minimum spread of different tree species and ages in the forest unit.

### The need for Chain of Custody (CoC) certification and SFM auditing

The Forest Europe criteria are useful in terms of the periodic assessment of the "state of Europe's forests" reports in 2007, 2011 and 2015, but for the purposes of EU Ecolabel

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<sup>38</sup> Madrid Ministerial Declaration. 25 years together promoting Sustainable Forest Management in Europe, 7<sup>th</sup> Ministerial Conference, Madrid, 20-21 October 2015. Accessed [online](#) July 2017.



criteria, it is necessary for an applicant to be sure that the material delivered to their mills is indeed sourced from sustainably managed forests.

The best way to ensure this is to make sure that the virgin material only passes through suppliers and intermediaries that are covered by chain of custody certificates awarded by an independent 3<sup>rd</sup> party organisation and that the source forest or plantation is also certified as being sustainably managed – again according to periodical audits by an independent 3<sup>rd</sup> party organisation.

The market for such certification is dominated by the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). Both schemes are global in their reach and also allow for the supply chain certification of Paper for Recycling and for pre- and post-consumer recycled wood, wood chips and sawdust.

The paper industry has been very proactive in the promotion and uptake of independent SFM auditing. Indeed, one of the primary goals of the International Council of Forest and Paper Associations, when it was set up in 2002, was and is to “*support and advocate for sustainable forest management (SFM) and sustainable production of forest products*”.

### **5.3.3 Outcomes from and after the 1<sup>st</sup> AHWG meeting**

No criterion was proposed in the Technical Report (version 1.0) that was presented at the 1<sup>st</sup> AHWG meeting.

This was due to the desire of the Commission to broadly discuss during the 1<sup>st</sup> AHWG meeting how EU Ecolabel criteria should be formulated when referring to SFM.

Consequently, in TR 1.0 a placeholder was inserted instead of a criterion proposal. The placeholder mentioned that the intention of the criterion, once clarification on whether FSC and PEFC can be mentioned in the criterion or not was received, would be to require that at least 70% of all fibres used in Newsprint paper, Copying and Graphic paper or Tissue paper are virgin fibres from sustainably managed forests and/or recovered fibres.

There were four main talking points during the 1<sup>st</sup> AHWG and in the follow up commenting period:

- The replacement of direct reference to FSC and PEFC with basic SFM principles
- Mandatory minimum requirements for recovered fibres
- Increasing the ambition level of minimum sustainable virgin fibre and/or recovered fibre contents
- Allocation of fibres to EU Ecolabel products

#### *Replacing direct reference to FSC and PEFC with basic SFM principles - feedback*

An overwhelmingly negative response was received from stakeholders regarding this proposal. Industry stakeholders stated that they work exclusively with FSC and PEFC and that, while it is possible that there are some regional or national level programmes for forest management, there is no way that these could currently be considered as "equivalent" to FSC or PEFC.

Member State Competent Body (CB) representatives emphasised that directly embedding sustainable forest management principles in the criterion wording could result in serious consequences. It would open the door to applicants potentially submitting evidence of SFM directly to CBs, who would be required to assess and verify this by themselves, going well beyond their existing capacities and competencies. Such a situation would simply not be feasible under the current fee structure. Previous discussions and agreements reached at the EUEB level that led to the existing wording of "*FSC, PEFC or equivalent*" were referred to. It was claimed that if any CB was presented with an application that claimed to comply with the criteria by virtue of certification by another scheme that was not FSC or PEFC, then this would need to be discussed at the

EU Ecolabelling Board (EUEB) level and decided if it could be accepted as equivalent. So far no such equivalent scheme has been presented to the EUEB. It was emphasised that care should be taken not to confuse "equivalent schemes" with "equivalent SFM principles/evidence" – because there is an enormous difference between the two in terms of work required, evidence gathering and control.

One forest management expert stakeholder added that great care should be taken if trying to weave together a set of basic sustainable forest management principles from the existing principles, criteria and indicators set out under the FSC and PEFC schemes and the Forest Europe initiative. For a start, the Forest Europe initiative should not be confused with sustainable forest management as such. Forest Europe simply reports on the state of the forest at a particular point. The Commission continues to make efforts to define what sustainable forest management is, but it is facing difficulties with this, and several Member States have shown reluctance to allow the Commission to propose anything that could be interpreted as being normative. Any basic management principles would need to be equally applicable to the different forests across the world and the development of these principles would be a process which would require expert input and significant resources and time and still not guarantee any satisfactory outcome even after several years.

#### Minimum requirements for recovered fibre content - feedback

The use of recovered fibres in EU Ecolabel products was discussed at length, with split views apparent amongst stakeholders. Some stakeholders wanted to maintain or even increase the minimum recycled fibre content for Newsprint Paper (from 70% to 90%) - while others wanted no mandatory minimum recovered fibre content for any paper product group.

Arguments in favour of recovered fibre content were largely based on the general lower environmental impact associated with recovered fibres compared to virgin fibres, consumer perception and the alignment with a circular economy philosophy.

Arguments against mandatory minimum recovered fibre contents were largely based on the fact that recycled fibres cannot be recycled ad-infinitum (maximum 5-6 cycles), thus requiring a constant influx of virgin material in the broader paper loop. It was also stated that while minimum recovered fibre contents may be easy to achieve in regions like Germany (large population centres), it would be much more difficult in others like the Nordic countries (fewer and smaller population centres). It was added that recycling rates in Europe had improved considerably in the last 20 years but further increases were unlikely to be possible and that demand for recycled fibre already exceeds supply at the EU level. Consequently, any mandatory minimum requirement for recovered fibres in Copying and Graphic Paper would simply require the importing of Paper for Recycling (PFR) to licence holders in certain European countries instead of being used in mills closer to the source.

When considering the availability of recycled fibres, the need to distinguish between "white fibres" and "brown fibres" was mentioned. While both are suitable for recycling into packaging applications, only white fibres are generally suitable for recycling into graphic and tissue papers (with the possible exception of hand-towels). Consequently, any minimum requirements for recycled content may simply result in recycled fibres being diverted from packaging production to graphic or tissue paper production, with no overall environmental benefit but with potential technological challenges to existing license holders to maintain process parameters in the paper machine and final product quality.

#### Increasing the ambition level for SFM virgin fibres and/or recovered fibres - feedback

The principal reasons for raising the ambition level from 50% to 70% were to bring the criteria into line with other EU Ecolabel product groups and to ensure that the ambition level aligns with the labelling requirements set out by FSC and PEFC. It was explained the 70% minimum requirement could be met by either virgin fibres from sustainable

certified forests or recovered fibres or a combination of both. Stakeholders were generally in favour of considering sustainable virgin fibres and recycled fibres as equivalent under the EU Ecolabel criteria.

However, split views were expressed by stakeholders about raising the ambition level. Those against the increase stated that going from 50% to 70% effectively required the quantities of certified fibres coming in to increase by 40%, which would be a major challenge. They also added that the forest sector was facing increased competition from the energy sector, which was further increasing costs and that the growth in certified forests across Europe had slowed down.

Those in favour of the increase in certified fibre availability pointed to the 2015 report by the International Council of Forest & Paper Associations, which showed that, of the forests owned by its member companies, the percentage of certified forest area increased from 48% to 52% between 2010/2011 and 2012/2013 (*this figure has since increased further to 54% in 2014/2015*). In this context, the existing ambition level of 50% does not seem ambitious at all. It was reiterated that EU Ecolabel criteria ambition levels are not intended to apply to the entire market, but only to the best performing products on the market.

In response, the example of integrated mills in Portugal was provided, where certified fibre availability is limited due to the ownership structure of Portuguese forests (lots of inherited smallholdings owned by individuals or families that may not even be aware of this, let alone be interested in the additional costs of forest certification). Any increase in certified sustainable virgin fibre requirements would effectively require the import of market pulp from other countries (e.g. Brazil) instead of the use of locally sourced virgin wood.

It was countered that the forest certification system is not a one way process but that the market can respond to increased demand for certified fibres by seeing more forest owners looking to obtain certification. The Portuguese government was looking at a potential Regulation to resolve the problems with the forest ownership structures in Portugal although how long this would take to create conditions more amenable to achieving higher forest certification was unknown.

One stakeholder claimed that raising the ambition level to 70%, effectively aligning with the ambition level of FSC and PEFC, may encourage some companies to simply market their products as FSC or PEFC instead of EU Ecolabel because the fibre requirements are the same but there is no need to limit emissions to water and air, limit energy use or avoid the use of certain chemicals for the former labels. Others argued that this was precisely the added value of the EU Ecolabel, which looks at all relevant environmental impacts associated with the life cycle of the products, unlike labels such as FSC and PEFC, which are purely focussed on one, albeit very important, aspect of the product.

The debate continued by stating that the pressure of finding an extra 40% of certified fibre can be considerably reduced by allowing recycled fibres to also be accepted. However, this was disputed by one stakeholder who claimed that many paper plants are not set up to accept any recycled fibres and investment would be needed to accept any injection of recycled fibres into the process line.

#### Allocation issues in fibre accounting

With regards to the issue of demonstrating the appropriate allocation of sustainable certified virgin fibres or recycled fibres to the EU Ecolabel product, it was explained that in certain cases, CBs need to be given access to a full balance sheet that accounts for all the inputs and outputs of certified and non-certified materials and products and the % claims associated with them. Industry stakeholders claimed that they already operate with such accounting systems, which are set up in a manner analogous to a bank account with monthly updates to the balance. JRC asked for details of this to be shared with a view to setting up a common template that all EU Ecolabel applicants could use to ensure consistency between different applications and between different CBs.

### 5.3.4 Outcomes from and after the 2<sup>nd</sup> AHWG meeting

The fibre criterion proposals for Copying and Graphic paper and Newsprint paper in the Technical Report 2.0 published in September 2017 and the proposal for Tissue paper in the Annex published in November 2017 were significantly different and largely based on discussions with existing license holders in follow-ups from the 1<sup>st</sup> AHWG meeting. The reason for the delay in the criterion proposal for tissue paper was due to the fact that this project had been frozen for administrative purposes and not due to any obstacles related to stakeholder discussion. A simple comparison of the 3 proposals is provided below.

Table 33. Comparison of fibre criteria for different paper products

Copying and Graphic Paper	Newsprint Paper	Tissue Paper
At least 55% certified virgin and/or recycled fibres for integrated mills. At least 70% certified virgin and/or recycled fibres for non-integrated mills. Alternative A&V text independent of FSC and PEFC described for verification in cases when requirements are met by recycled fibre content alone.	At least 90% recycled fibres for integrated or non-integrated mills.  Alternative A&V text independent of FSC and PEFC described for verification in cases when requirements are met by recycled fibre content alone.	At least 70% certified virgin and/or recycled fibres for integrated or non-integrated mills.  No alternative A&V text independent of FSC and PEFC described for verification in cases when requirements are met by recycled fibre content alone.
<u>Main reasons:</u> Integrated mills have much less flexibility in sourcing raw materials and so would be penalised more than non-integrated mills, which actually have a significantly higher energy consumption due to the need to dry market pulp.	<u>Main reasons:</u> Market data showed that the sector average recycled fibre content for newsprint in CEPI countries is around 71%, so the existing criterion was unambitious.	<u>Main reasons:</u> The tissue paper sector is mostly non-integrated, so not considered necessary to distinguish between non-integrated and integrated mills for ambition levels. Alternative A&V text removed due to negative stakeholder feedback for the copying and graphic and newsprint paper proposals received one month earlier.

Feedback from stakeholders was mainly focussed on: opinions about mandatory minimum recycled fibre content, the increase in ambition level for “sustainable fibres”, specific criterion wording and guidance on fibre allocations.

#### Feedback about mandatory minimum recycled fibre contents

Arguments against mandatory minimum recycled contents focussed on the lower availabilities of Paper for Recycling of sufficient quality (which matches the decline in newspaper and magazine production and is also influenced by mixed collection schemes) and the claim that this criterion would not stimulate extra recycling of paper. A number of newsprint mills in Sweden and Finland were cited as having real difficulties (or practical impossibilities) in meeting the mandatory minimum content for recovered fibres. This was despite the fact that paper recycling rates in Finland are around 77% and almost all of that being sent to one big newsprint mill. It was added that the principal newsprint license holder in France would not be able to meet a 90% recovered fibre content.

Industry stakeholders requested that the fibre criterion makes a distinction between paper machine broke (which should not be considered as recycled material) and converting broke (which should be considered as recycled material when sent back to a paper machine). No stakeholders disputed this distinction at the meeting or during the commenting period. However, 3 weeks after the deadline for comments, one stakeholder questioned whether converting broke should be considered as recycled material, citing a court case in the regional Court of Berlin (reference number 15:o.669/07) and the

German standard DIN 6730. A closer look at the subject matter of the court case revealed that the definition of recycled material simply looked at "mill broke" in general without distinguishing between "paper machine broke" and "converting broke". It was confirmed that industry statistics and a significant number (around 40) of EN 643 codes for grades of PFR relate to wastes that can arise in the conversion line. When confronted with these details and facts, it was agreed that converting waste should continue to be considered as recycled material in the proposed criterion.

One Competent Body (CB) stakeholder added that at the European level, we still have not reached the maximum potential for paper recycling in these product groups (when considering the achievements of Germany). However, while the equivalence of sustainable virgin fibres and recycled fibres at the European level was understandable, they would like to see a greater mention of the environmental benefits of paper based on recovered fibres in the TR (e.g. lower energy consumption and emissions).

An industry stakeholder explained that having such a high requirement of recovered fibre content for newsprint paper would increase challenges with paper quality, especially considering that the dominant source of recovered fibre for newsprint production is old newspapers and magazines. Other feedback from CBs was that the one newsprint paper licence in France would be lost if increasing the requirement to 90% and that there were mills in Sweden that could meet all the criteria except for the minimum requirement for recycled fibre. Making distinctions between integrated and non-integrated mills was generally perceived as extra work and potential complication for CBs and therefore not desirable.

#### *Feedback about increasing the ambition level for "sustainable fibre" content*

Industry stakeholders opposed any increase in the ambition level for certified sustainable fibres and/or recovered fibres. It was stated that the increase in ambition level (10% in 2002 to 50% in 2011 and now proposed to go to 70% in 2018) simply does not match the increases in certified material on the market. They claimed that only 17% of forests in CEPI countries are FSC or PEFC certified. However, another stakeholder pointed out that if you only count "productive forests" in CEPI countries, the certification level is much higher, around 60%.

In terms of ambition level, the industry stakeholders stated that they would support an increase to 55% (as currently proposed for integrated mills for copying and graphic paper) but not the higher proposal of 70% for non-integrated production. If going to 70% (i.e. matching the FSC and PEFC labelling requirements) it was likely that a significant amount of production would simply go to these schemes and away from the EU Ecolabel.

One stakeholder representing various NGOs stated that they would not promote EU Ecolabel paper products if the ambition level was set to less than 70% for any situation. In the absence of mandatory content for recycled fibres, NGOs can only endorse the label for paper if fibres are either recovered or sustainable virgin. They would strongly support a requirement for virgin fibres to be 100% sustainable certified fibres, but can accept the 70% benchmark as a compromise. The origin of fibres is one of the important aspects for consumers seeking guidance on environmentally friendly paper: either they are recovered or from sustainable forests. It would be difficult to explain to a consumer why paper from integrated mills can use lower levels of certified/recycled fibres. In response to earlier comments suggesting that producers would simply shift from EU Ecolabel to FSC and PEFC if the ambition level is raised to 70%, it was stated that there is a need for the EU Ecolabel to not be perceived as inferior to FSC or PEFC, and indeed, to be considered as superior in the sense that it is a Type I Ecolabel and duly covers other environmental aspects as well. The need to align with other EU Ecolabel product groups, especially for converted paper, was highlighted.

One argument against increasing the ambition level to 70% was based on the recent example of the Nordic ecolabel criteria for paper. The current ambition level for certified

sustainable virgin fibres is just 30% and after much debate it is planned to raise this to 50% in 2019. However, a Danish stakeholder added that creating a criterion where the EU Ecolabel is not an assurance of a minimum of 70% “sustainable” fibre content would impede its potential success in Danish GPP criteria for paper procurement.

#### Feedback about specific wording for the fibre criterion

Several stakeholders requested that the same wording that was previously agreed for Wood Coverings to be used – adding that this repetitive work and discussion should be minimised as far as possible – as per the refit exercise findings. However, it was pointed out that there are number of terms and clauses that are unique to paper products and these must continue to be included.

One potential concern raised was that the existing criteria for paper products clearly place no CoC requirements on recycled fibre inputs whereas the wording for wooden floor coverings would place such a requirement. Recycled materials are far more important to the paper industry than the wooden floor cover industry and so care must be taken with this point. This is reflected by the development of EN 643 which has the purpose of classifying and tracking movements of Paper for Recycling (PfR).

It was asked how exactly the CoC certification works for the supply chain when dealing with PfR. One certification expert responded, saying that FSC simply places a requirement on the producer to ensure that their material is actually recycled. This is easy for PfR but not so easy for sawdust. Based on this feedback, the criterion text should be revised to ensure that no CoC requirements are placed on the supply chain for PfR if delivery invoices according to EN 643 are available but that any other recycled inputs should be CoC certified.

#### Feedback about guidance on fibre allocations

It was asked what was meant by “product or production line” since the data should be calculated based on the paper machine. JRC responded saying that “production line” would refer to allocation of fibres to all products coming off one paper machine while “product” could allow the allocation of fibres to be differentiated between different products coming off the same paper machine (either during the same time period or at different times during the same calendar year).

When calculating inputs of recycled fibres it was asked why the yield factor for PfR processing should be considered and what does it mean exactly. It was clarified that the EU Ecolabel criteria are based on fibres in the end product but that PfR always has significant yield losses before it is processed into recycled fibre pulp. The losses are due to non-fibre content in PfR, which are mainly be due to fillers, inks, adhesives and laminates which are removed during the process. To simply estimate the recycled fibre content of the paper product based on the tonnes of PfR fed to the mill and the tonnes of wood or virgin pulp sent to the mill could lead to the recycled fibre content being overestimated by 20% or more. Typical yield losses for the copying and graphic paper, newsprint paper and tissue paper have been considered in the further research section.

### **5.3.5 Further research**

Based on the comments received during and following the 1<sup>st</sup> and 2<sup>nd</sup> AHWG meetings, further research was conducted, focussing on the following aspects:

- Forest certification trends for FSC and PEFC in Europe
- Market trends for PfR in Europe.
- Investigation into the Portuguese forestry ownership situation and comparison to other countries.
- Balance sheets suitable for fibre allocation in cases where the product is not double labelled with FSC or PEFC and the EU Ecolabel.

### Forest certification at the global level

The data reported by the International Council of Forest and Paper Associations (ICFPA) are highly relevant since members account for around 90% of global pulp and paper production.

Table 34. SFM certified forest areas by ICFPA members<sup>39</sup>

	2000	2009	2011	2013	2015
Total productive forest area of members (Mha)	541	543	591	580	574
Total forest area SFM certified (Mha)	62	277	284	302	310
<b>% certified</b>	<b>11</b>	<b>51</b>	<b>48</b>	<b>52</b>	<b>54</b>

It is clear from the table above that the really significant increase in certified forest area occurred between the years 2000 and 2009. It is interesting to note that during the same time period the ambition level for SFM certified content in certain EU Ecolabel product groups raised from 10% to 50% - almost directly reflecting the ICFPA data. According to the ICFPA<sup>40</sup>, further increases in certified forest area have been limited due to the following factors:

- Existing uncertified wood supply is beyond the direct control of association members and is not certified due to the preferences of private forest owners, which may be based on economic or practical considerations.
- A lack of penetration of credible SFM certification schemes into developing countries.

### Forest certification at the European level

Certified forest levels in Europe are of even greater relevance to the ambition level for sustainable fibres in EU Ecolabel criteria, especially when considering the fact that the European paper industry consistently sources more than 80% of its virgin wood raw materials (industrial roundwood and chips) from Europe (**CEPI statistics 2010-2016**).

In order to have an idea of the forest certification levels, and also to estimate the percentage of certified material produced in Europe, forest area data and industrial roundwood production data from Eurostat has been gathered and compared to forest certification data provided by FSC and PEFC.

Table 35. Relevant data for estimating forest certification and certified raw material availability in European countries.

Country (in descending order of % forest certification)	Forest available for wood supply (Mha)	Total FSC or PEFC certified (Mha)	% potentially productive forest that is certified	Industrial roundwood production in 2014 (1000m <sup>3</sup> u.b)	% of total roundwood production in selected countries	Assumed certified roundwood production in 2014 (1000m <sup>3</sup> u.b)
Croatia	1740	2039	117.2%	3078	1.0%	3607
Norway	8259	7416	89.8%	9807	3.0%	8806
Austria	3339	2984.6	89.4%	12030	3.7%	10753
Poland	8234	7320	88.9%	35425	10.9%	31493
Finland	19465	16695	85.8%	49202	15.2%	42200
Sweden	19832	16610	83.8%	64200	19.8%	53770
Czech Republic	2301	1799	78.2%	13365	4.1%	10449
Estonia	1994	1535	77.0%	5769	1.8%	4441
Slovakia	1785	1286	72.0%	No data	0.0%	0
Ireland	632	447	70.7%	2625	0.8%	1857

<sup>39</sup> This data was based on the ICFPA sustainability reports in 2015 and 2017. The data up until 2013 was based on reporting by member associations representing the US (AF&PA), Europe (CEPI), Chile (CORMA), Canada (FPAC), Brazil (Iba), Japan (JPA) and South Africa (PAMSA) while the data for 2015 also included New Zealand (NZFOA).

<sup>40</sup> From the ICFPA 2017



Country (in descending order of % forest certification)	Forest available for wood supply (Mha)	Total FSC or PEFC certified (Mha)	% potentially productive forest that is certified	Industrial roundwood production in 2014 (1000m <sup>3</sup> u.b)	% of total roundwood production in selected countries	Assumed certified roundwood production in 2014 (1000m <sup>3</sup> u.b)
Germany	10888	7638	70.2%	43243	13.4%	30335
Latvia	3151	1848	58.6%	11298	3.5%	6626
Lithuania	1924	1090	56.7%	5035	1.6%	2852
Netherlands	301	170	56.5%	980	0.3%	553
Romania	4627	2597	56.1%	10484	3.2%	5884
United Kingdom	3144	1644	52.3%	9361	2.9%	4895
France	16018	8207	51.2%	24451	7.6%	12528
Luxembourg	86	42	48.8%	No data	0.0%	0
Bulgaria	2213	1079	48.8%	3036	0.9%	1480
Denmark	572	269	47.0%	1230	0.4%	578
Belgium	670	302	45.1%	No data	0.0%	0
Slovenia	1139	300	26.3%	3511	1.1%	925
Spain	14711	3611	24.5%	12476	3.9%	3062
Portugal	2088	382	18.3%	No data	0.0%	0
Hungary	1779	304	17.1%	3095	1.0%	529
Italy	8216	821	10.0%	No data	0.0%	0
Cyprus	41	0	0.0%	4	0.0%	0
Greece	3595	0	0.0%	No data	0.0%	0
<b>TOTAL</b>	<b>142744</b>	<b>88435.6</b>	<b>62.0%</b>	<b>323705</b>	<b>100.0%</b>	<b>237625</b>

It is important to note that the estimated areas of certified forests already discounts double counting for areas that are certified by both FSC and PEFC. This was possible thanks to the joint statement released by FSC and PEFC titled "*Double certification FSC and PEFC – estimation end 2016*". The FSC data used was from July 2017 and the PEFC data from March 2017.

The forest available for wood supply is always lower than the total forest and wooded areas reported in Eurostat. A comparison of these numbers is available in Table 6.1 (page 167) of the 2016 Edition of "*Agriculture, forestry and fishery statistics*" published by Eurostat.

The data for industrial roundwood production was also taken from the same Eurostat report (Table 6.2). It is understood that industrial roundwood may be used in the production of sawnwood, veneers and pulp and paper production. In order for an estimation of the availability of certified raw material produced in Europe that is used in pulp and paper production to be made, the following assumptions had to be made:

- That there is no preferential destination for certified industrial roundwood material between the sawnwood, veneer and pulp sectors.
- That certified and non-certified forests in a particular country are equally productive.
- That all certified forests are also productive forests.

From the data in Table 35, it is clear that there is a discrepancy in the reporting for Croatia, either an overestimation of certified forest or an underestimation of forest available for wood supply or a combination of both.

There is a clear difference in certification levels in different countries. However, it is important to consider certification levels in absolute terms, i.e. in terms of the total percentage of forests able to supply wood. Considering the total values, approximately **62.0%** of all productive forest area in Europe is FSC or PEFC certified.

If actual industrial roundwood is also factored into the calculation, the estimated certified industrial roundwood is **73.4%**. The reason for this value being higher than the 62.0% certified forest area is at least partly due to:

- The fact that the most productive countries have higher certified forest percentages than 62% (e.g. Sweden with 19.8% of production and 83.8% certification; Finland with 15.2% of production and 85.8% certification; Poland with 10.9% of production and 88.9% certification and Germany with 13.4% of production and 70.2% certification).
- The fact that countries with the lowest percentages of forest certification tended to not have significant roundwood production rates (Spain was the only country accounting for more than 1.1% of European roundwood production that had less than 50% of its productive forests certified).

The figures of 62.0% (certified forest area) and 73.4% (certified production estimation) are relatively close to the figure of 64.6% certified wood, chips and sawmilling by-products delivered to European mills that was quoted by CEPI in their 2013 Sustainability Report. These three figures, 62.0%, 64.6% and 73.4% should therefore be considered when discussing the potential ambition level for any requirements relating to sustainable certified virgin materials.

#### *Recycled fibres: the other type of sustainable fibre*

Paper recycling rates have improved dramatically all over the world in the last 20 years as the original technological challenges with deinking and paper machine optimisation have been overcome. Apart from the environmental benefits that have been attributed to paper made from recycled fibre (e.g. lower energy consumption, lower water consumption, less pressure on forest resources etc.<sup>41</sup>), paper recycling is an economically viable business in its own right.

It has been proposed to recognise recycled fibres as equivalent to sustainable certified virgin fibres for the purposes of the EU Ecolabel criterion. This reflects approaches already taken by the FSC and PEFC labelling rules and with recently voted Commission Decisions for other wood-based product groups.

Precisely because of this equivalent recognition, it is necessary to consider the availabilities of Paper for Recycling as well as the availability of certified virgin material when deciding on what is a reasonable ambition level to set for EU Ecolabel paper products.

#### *Statistics on Paper for Recycling (PFR) and recycled fibres*

In the CEPI 2013 Sustainability Report, a material flow for the European paper recycling loop shows that the input of virgin fibre was 46Mt while the input of PFR was 49Mt. However, it should be noted that this loop will also include paper grades that are not included in the scope for graphic or tissue paper but have typically high recycled fibre contents (e.g. packaging grades).

For a better understanding of the flows of PFR into graphic and tissue paper grades, it is useful to refer to the annually reported CEPI statistics. Overall trends in the recycling rate in Europe have been calculated by dividing the total quantities of PFR going into mills by the total quantities of paper and board coming out of those same mills.

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<sup>41</sup> Report by UBA (In German, 2012): Accessed online: <http://www.umweltbundesamt.de/en/press/pressinformation/brilliant-colours-sharp-print-definition>

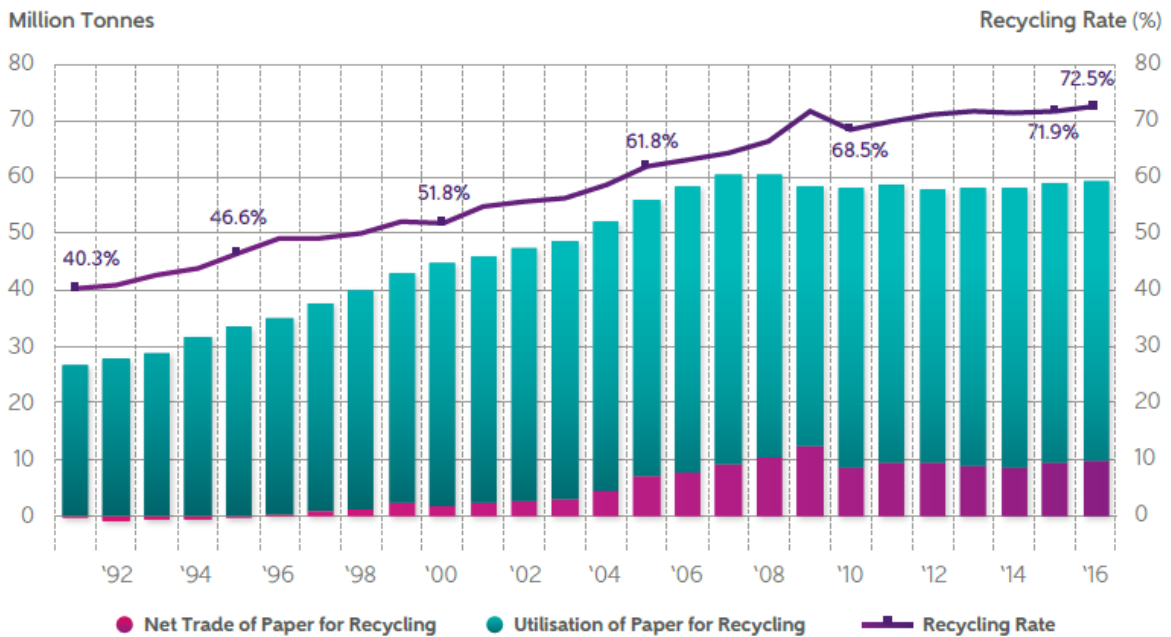


Figure 26. Trends in paper recycling rates in EU28 + Norway and Switzerland (CEPI).

The data in Figure 26 show that major progress has been made in the recycling rate of paper between the years 1991 and 2011. Since 2011, rates have plateaued at around 71-72%. It is also apparent that net exports of PFR (mainly to China) increased notably between 1999 and 2009 before stabilising at around 10 million tonnes per year (around 10% of annual paper and board consumption).

Significant further increases in recycling rates are not expected due to a combination of certain paper products being used in such a way that prevents their recycling (e.g. toilet paper) and limitations due to sub-optimal post-consumer collection and sorting of waste paper. However, a target of 74% has been set for 2020, which might only be achieved with the aid of other legislative measures such as the banning of the landfill disposal of paper and a shift away from the commingled collection of paper with other materials<sup>42</sup>.

The CEPI statistics also allow the PFR trades to be split between different paper sectors (e.g. newsprint, other graphic paper, carton board and sanitary and household paper) and different types of PFR input (i.e. mixed grades, corrugated and kraft, newspapers and magazines and other grades).

By knowing the total production of a particular paper sector and the total input of PFR to that sector, it is possible to express the PFR inputs as a sector average percentage of total production. However, in order to estimate the sector average recycled fibre content, it is necessary to account for any losses of PFR during processing. Yield losses vary from sector to sector and depend not only on the quality of PFR grades that go in, but also on quality requirements for the recycled pulp and the final paper product. The European Fibre Flow Model published by Meinel et al. (2016), suggests overall yield losses of 21%, 24% and 37% for the newsprint paper, other graphic paper and sanitary and hygiene paper sectors respectively.

A mass balance for these sectors can then be calculated based on CEPI statistics for a particular year, with the assumption that the difference between total production and recycled fibre inputs is predominantly bridged by virgin fibre inputs (filler content may be significant for the "other graphic paper" sector).

<sup>42</sup> European Paper Recycling Council press release, May 2017. Accessed [online](#), July 2017.

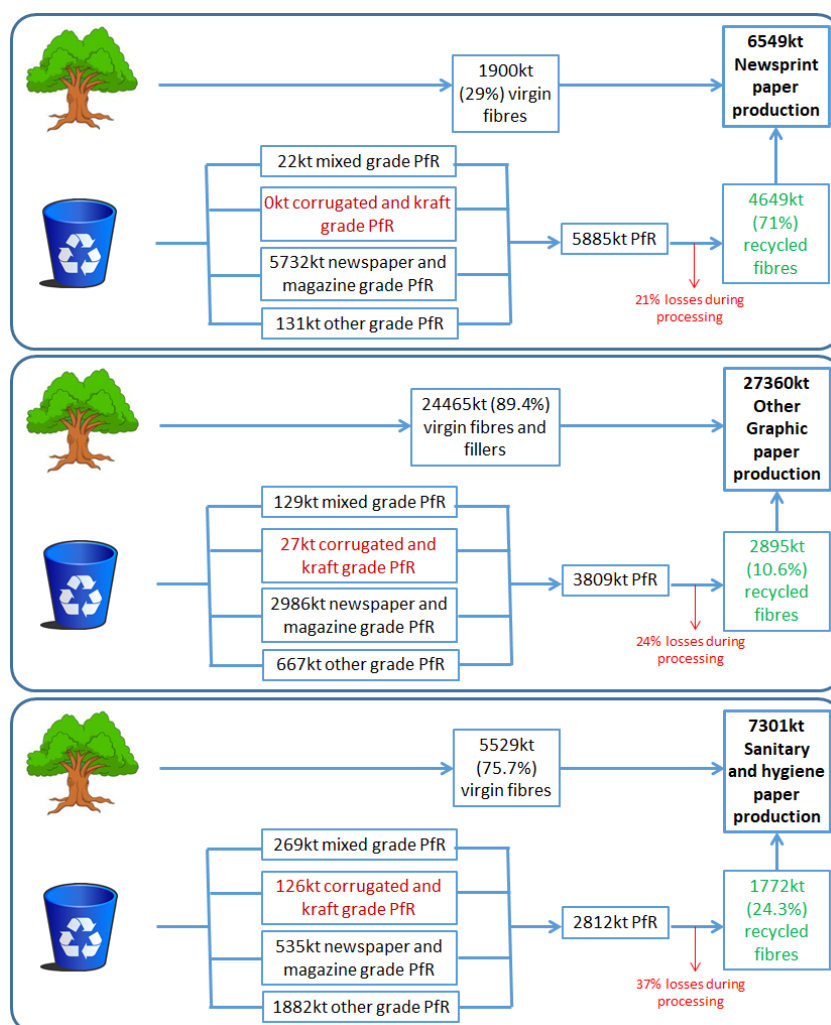


Figure 27. Estimates of sector average recycled fibre contents for newsprint paper (top), other graphic paper (middle) and sanitary and hygiene paper (bottom).

The main conclusions to draw from these simplified sector average mass balances is that the recycled fibre content is highly significant in the newsprint sector (71.0%), not very significant in the other graphic paper sector (10.6%) and more significant in sanitary and hygiene paper sector (24.3%).

### Investigation into problems with forest certification in Portugal

The previous comments about difficulties for integrated mills in Portugal meeting increased ambition levels for minimum sustainable fibre contents appear to be well founded based on the data presented in the previous sub-section. Only 18.3% of productive Portuguese forests are currently FSC or PEFC certified.

Considering other countries with EU Ecolabel licenses for Copying and Graphic Paper or Newsprint Paper, it is clear that any integrated mills in Slovenia (26.3% certified), Spain (24.5% certified) and Italy (10.0% certified) may also face challenges with sourcing sustainable virgin raw materials from the same country in which they operate.

The Eurostat data presented in Table 6.1 of the 2016 Edition of Agriculture, Forestry and Fishery statistics shows that while Portugal is quite clearly the Member State with the highest levels of private forest ownership (97%). However, it is worth noting that other Member States with high levels of private forest ownership have still managed to achieve high levels of forest certification. Examples are Norway (87.7% private and 89.8%

certified), Sweden (75.7% private and 83.8% certified) and Austria (74.2% private and 89.4% certified).

Across Europe, there is no clear correlation between public/private forest ownership and productive forest certification. The main obstacle in Portugal was claimed to be due to the fact that most of the available forest is privately owned by individuals or families who are not interested in either selling the land or paying for certification.

In a 2009 statement made by Portugal at the 67<sup>th</sup> UNECE/Timber Committee, it was revealed that the forest ownership structure in Portugal was split as follows:

- Public ownership: 1.5% of forest area
- Private ownership: 98.5% of forest area
  - of which owned by individuals: 88.9%
  - of which owned by private business entities and institutions: 5.3%
  - of which owned by local communities: 4.3%

The same statement identified the ownership regime as the single biggest barrier to increased uptake of forest certification. In particular, owners of the smallest forest holdings in the North and Central regions of Portugal were considered as being unaware of the importance of forest certification.

Overall, while the concerns raised by the Portuguese industry representative appear to be completely valid, distinctions cannot be made for individual Member State situations in EU Ecolabel criteria for fibre sourcing. In the proposals taken to the 2<sup>nd</sup> ADWG meeting, a lower ambition level of 55% was proposed for all integrated mills, which would have effectively addressed the Portuguese concerns, but this was not well received by EUEB members.

#### Balance sheets for sustainable fibre content

In cases where a) a product is double labelled with both EU Ecolabel and FSC or PEFC it is only necessary to provide a valid chain of custody certificate(s) and valid product label that can be cross-checked in the FSC or PEFC databases.

However, in cases where a) the product is not double-labelled or b) the EU Ecolabel product meets the requirements via a combination of FSC certified sustainable virgin material and PEFC certified sustainable virgin material, it will be necessary to provide a balance sheet to the Competent Body that captures all inputs and outputs of certified raw materials and fibres and outputs of certified materials at the site level and at a monthly time resolution. The reason for case b) is because FSC and PEFC fail to recognise SFM certified virgin material from each other as SFM certified virgin material, but instead only as controlled material.

The most simplified version of an example balance sheet that could be considered as acceptable is provided below. In mills that accept Paper for Recycling, a separate row would be needed which accounts for significantly different yields when converted, with or without deinking treatment, into recovered fibre pulp.

It may also be more helpful to see the volume of sales and average fibre contents reported together with a breakdown of the allocations of certified fibre contents – which would then be added together to calculate the total output of certified fibres.

Some basic rules should apply to the balance sheet. For example, that the monthly site balance (bottom row) should never fall below zero and that the overall yearly balance can be reported for a calendar year or for a rolling 12 month period that is linked to the original awarding of the EU Ecolabel licence. Any net credits from 24 months ago must be set to zero to prevent the balance sheet from becoming too long.

It is proposed to have a standard calculation spreadsheet that all Competent Bodies can use to ensure that compliance with this criterion, when FSC or PEFC double labelling is not the case or is not sufficient, is done in a consistent and transparent manner.

Table 36 Example of certified fibre balance sheet for a mill accepting Paper for Recycling and virgin fibre.

	<u>Units</u>	<u>Month 1</u>	<u>Month 2</u>	<u>Month 3</u>	<u>Month 4</u>	<u>Month 5</u>	<u>Month 6</u>	<u>Month 7</u>	<u>Month 8</u>	<u>Month 9</u>	<u>Month 10</u>	<u>Month 11</u>	<u>Month 12</u>
<b>Start Site Balance (A)</b>	Tonnes	0	1250	2515	3775	5040	6295	7550	8810	10460	12125	13780	15045
<b>Certified Virgin Fibre Purchases</b>	Tonnes	500	500	500	500	500	500	500	500	500	500	500	500
<b>Conversion Factor (Yield)</b>		0.90	0.93	0.92	0.93	0.91	0.91	0.92	0.90	0.93	0.91	0.93	0.93
<b>Credit Input from Virgin Fibre (B)</b>	Tonnes	450	465	460	465	455	455	460	450	465	455	465	465
<b>Certified Paper for Recycling Purchases</b>	Tonnes	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
<b>Conversion Factor (Yield)</b>		0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
<b>Credit Input from Paper for Recycling (C)</b>	Tonnes	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
<b>Total Credit Input (B+C)</b>	Tonnes	1650	1665	1660	1665	1655	1655	1660	1650	1665	1655	1665	1665
<b>Total Sales [D]</b>		400	400	400	400	400	400	400	0	0	0	400	400
<b>Site Balance (A+B+C-D)</b>		1250	2515	3775	5040	6295	7550	8810	10460	12125	13780	15045	16310

## 5.4. Criterion 4: Restricted hazardous substances and mixtures

Criterion 4 is split into 8 sub-criteria which relate to different types of restrictions that are placed on different chemicals that may be used in the pulp and paper manufacturing process. The 8 sub-criteria can be split into two groups as follows:

- Horizontal criteria that are linked to Articles 6(6) and 6(7) of the EU Ecolabel Regulation, which are based on hazard classifications rather than specific substances and which apply at the level of the final product (i.e. criteria 4a and 4b).
- Specific criteria that refer to individual substances or groups of chemicals which apply at the level of the purchased chemical (e.g. criteria 4c, 4d, 4e, 4f, etc.).

### 5.4.1 Horizontal hazardous substance and mixture restrictions

#### 5.4.1.1 Criteria proposal – 4a and 4b

Proposed Criterion 4: Restricted hazardous substances and mixtures
<p><i>(For both Graphic and Tissue paper):</i></p> <p><b>Preamble</b></p> <p>The basis for demonstrating compliance with each of the sub-criteria under criterion 4 shall be the applicant providing a list of all the relevant chemicals used together with appropriate documentation (Safety Data Sheet or a declaration from the chemical supplier).</p>
Criterion 4a) Substance of Very High Concern (SVHC) restrictions
<p><i>(For both Graphic and Tissue paper)</i></p> <p><i>Note: Screening of all process and functional chemicals used in the paper mill and when relevant, during the tissue paper conversion process, shall be required. This criterion does not apply to chemicals used for wastewater treatment unless the treated wastewater is recirculated back into the paper production process.</i></p> <p>The paper product shall not contain substances that have been identified according to the procedure described in Article 59(1) of Regulation (EC) No 1907/2006 and included in the Candidate List for Substances of Very High Concern (SVHCs) in concentrations greater than 0.10% (weight by weight). No derogation from this requirement shall be given.</p> <p><b>Assessment and verification:</b> <i>the applicant shall provide a declaration that the paper product does not contain any SVHC in concentrations greater than 0.10% (weight by weight). The declaration shall be supported by Safety Data Sheets (SDSs) or appropriate declarations from chemical suppliers of all process and functional chemicals used in the paper mill that show that none of the chemicals contain SVHCs in concentrations greater than 0.10% (weight by weight).</i></p> <p><i>The list of substances identified as SVHCs and included in the candidate list in accordance with Article 59 of Regulation (EC) No 1907/2006 can be found here:</i></p> <p><a href="http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp">http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp</a></p> <p><i>Reference to the list shall be made on the date of application.</i></p>
Criterion 4b) CLP restrictions
<p><i>(For both Graphic and Tissue paper)</i></p> <p><i>Note: Screening of all process and functional chemicals used in the paper mill and when relevant, during the tissue paper conversion process, shall be required. This criterion does not apply to chemicals used for wastewater treatment unless the treated wastewater is recirculated back into the paper production process.</i></p> <p>Unless specifically derogated in Table 3, the paper product shall not contain substances or mixtures in concentrations greater than 0.10% (weight by weight) that are classified with any of the following hazard statements in accordance with Regulation (EC) No 1272/2008:</p> <ul style="list-style-type: none"><li>• Group 1 hazards: Category 1A or 1B Carcinogenic, Mutagenic and/or Toxic for Reproduction (CMR): H340, H350, H350i, H360, H360F, H360D, H360FD, H360Fd, H360Df</li><li>• Group 2 hazards: Category 2 CMR: H341, H351, H361, H361f, H361d, H361fd, H362; Category 1 aquatic toxicity: H400, H410; Category 1 and 2 acute toxicity: H300, H310, H330; Category 1 aspiration toxicity: H304; Category 1 Specific Target Organ Toxicity (STOT): H370, H372, Category 1 Skin Sensitizer*: H317.</li><li>• Group 3 hazards: Category 2, 3 and 4 aquatic toxicity: H411, H412, H413; Category 3 acute toxicity: H301,</li></ul>



H311, H331; Category 2 STOT: H371, H373.

*\*H317 restrictions shall only apply to commercial dye formulations, surface finishing agents and coating materials applied to paper.*

*The use of substances or mixtures that are chemically modified during the paper production process (e.g. inorganic flocculating agents, cross-linking agents, inorganic oxidising and reducing agents etc.) so that any relevant restricted CLP hazard no longer applies shall be exempted from the above requirement.*

**Table 3. Derogations to the CLP hazard restrictions and applicable conditions**

Substance / mixture type	Applicability	Derogated classification(s)	Derogation conditions
Dyes and pigments	Used in wet end or surface application during the production of coloured (graphic or tissue) paper.	H411, H412, H413	The chemical supplier shall declare that a fixation rate of 98% can be achieved on the paper and provide instructions about how this can be ensured.
Basic dyes	Dyeing of (graphic) paper based mainly on mechanical pulp and/or unbleached chemical pulp.	H400, H410, H317	The paper producer shall provide a declaration of compliance with any relevant instructions.
Wet Strength Agents	Use as retention agents, to improve runnability or to impart wet strength to the (tissue paper) product.	H411, H412, H413	The combined residual monomer content of epichlorohydrin (ECH, CAS No 106-89-8) and its breakdown products 1,3-dichloro-2-propanol (DCP, CAS No 96-23-1) and 3-monochloro-1,2-propanediol (MCPD, CAS No 96-24-2) must not exceed 0.35% (w/w) of the active solids content of the formulation.
Cationic polymers (including polyethyleneimines, polyamides and polyamines)	Various uses possible which include use as retention aids; improve wet-web strength, dry strength and wet strength (of the graphic or tissue paper).	H411, H412, H413	The paper producer shall provide a declaration of compliance with any relevant instructions for safe handling and dosing specified in the Safety Data Sheet.

**Assessment and verification:** *the applicant shall provide a list of all relevant chemicals used together with the relevant Safety Data Sheet or supplier declarations.*

*Any chemicals containing substances or mixtures with restricted CLP classifications shall be highlighted. The approximate dosing rate of the chemical, together with the concentration of the restricted substance or mixture in that chemical (as provided in the Safety Data Sheet or supplier declaration) and an assumed retention factor of 100% shall be used to estimate the quantity of the restricted substance or mixture remaining in the final product.*

*Justifications for any deviation from a retention factor of 100% or for chemical modification of a restricted hazardous substance or mixture must be provided in writing to the Competent Body.*

*For any restricted substances or mixtures that exceed 0.10% (weight by weight) of the final paper product but are derogated, proof of compliance with the relevant derogation conditions shall be provided.*

#### 5.4.1.2 Rationale of proposed criterion text

The general structure of the horizontal hazardous substance criteria (preamble, horizontal CLP restrictions and horizontal SVHC restrictions) follows the general recommendations of the 1<sup>st</sup> EU Ecolabel Chemicals Task Force. The ongoing work of the 2<sup>nd</sup> EU Ecolabel Chemicals Task Force could result in a common text being agreed for all EU Ecolabel product groups but since this has not yet been presented or finalised, the wording for the horizontal criteria for Graphic and Tissue paper has been developed based on stakeholder input during the revision process.

There is no longer any reference to risk phases (e.g. R45, R50 etc.) when mentioning the classification of substances and mixtures because these were linked to the Dangerous Substances Directive (67/548/EEC) which was repealed by the CLP Regulation as of June 2015. Instead, reference is exclusively made to hazard statements and classes.

For criterion 4b), reference to "concentration limits defined in Article 10 of the CLP Regulation" has been removed. This is due to a mismatch in the applicability of these

concentration limits. While a general concentration limit of 0.10% (w/w) is set in criterion 4b) for the paper product, by referring to Article 10, a whole range of other concentrations potentially come into play, which are specifically linked to the classification of substances and mixtures, but not paper.

One major conclusion has been to decide to reinsert the general exemption clause for chemical modification. This decision was taken due to the inability to gather a sufficient number of SDSs relating to the large number of process and functional chemicals that are used in paper machines. However, the reinsertion of the exemption for chemical modification is based on the principle that a common understanding of what this term means in the context of EU Ecolabel Graphic and Tissue paper can be developed. Further research on this matter is presented in a later section.

Stemming from the further research on what can be considered as chemical modification, it was decided that dyes, pigments, cationic polymers and wet strength agents should be considered as not undergoing chemical modification. Even though this is only true to varying degrees for the aforementioned substance groups, it was decided that a clear signal needs to be sent to the industry about what hazards are acceptable and under what conditions (see derogations). This will also prevent the possibility of inconsistent approaches where one CB assumes that, for example, not all dyes are chemically modified whereas another CB is led to believe that all dyes are chemically modified.

The listing and grouping of the restricted CLP hazards follow the recommendations of the 1<sup>st</sup> Chemicals Task Force. The optional additional hazard restriction of H317 is considered relevant to both Graphic and Tissue paper. Reference for H317 restrictions is no longer made to chemicals considered as "*auxiliaries*" because no suitable definition of this term could be found that would be applicable to the pulp and paper industry. However, a series of EUH hazards (EUH059, EUH029, EUH031, EUH032 and EUH070), despite being published in Decision 2012/448/EU for Newsprint paper, were not considered relevant based on feedback from industry stakeholders. These hazards would only apply to a limited number of chemicals used in pulping, which is not within the scope of the horizontal criteria, and would be considered to undergo chemical modification in any case.

#### **5.4.1.3 Outcomes from and after 1st AHWG meeting**

One of the main talking points about the horizontal criteria for hazardous substances was the proposal to remove the following exemption clause:

*"Substances or mixtures which change their properties upon processing (e.g., become no longer bioavailable, undergo chemical modification) so that the identified hazard no longer applies are exempted from the above requirement."*

It was emphasised that the reason for proposing to remove the clause was that the text is too vague to be used in a legal text and is open to different interpretations and inconsistencies between different Competent Bodies. It was uncertain how much this clause was actually being used by EU Ecolabel licence holders but simply due to the fact that (i) the existing criteria have no derogation conditions and (ii) that the application of hazardous substance criteria has not been an issue affecting the uptake, suggest that the exemption clause has either been widely used or was not an issue in the first place.

It was explained that the idea of removing the exemption clause is not to create a major obstacle for existing licence holders but instead to force applicants and licence holders to reveal what hazardous substances are used in process and functional chemicals and consider if they will remain in the final paper product. If hazardous substances with restricted classifications can be considered to remain in the final product, then their use should not be permitted unless a derogation is granted.

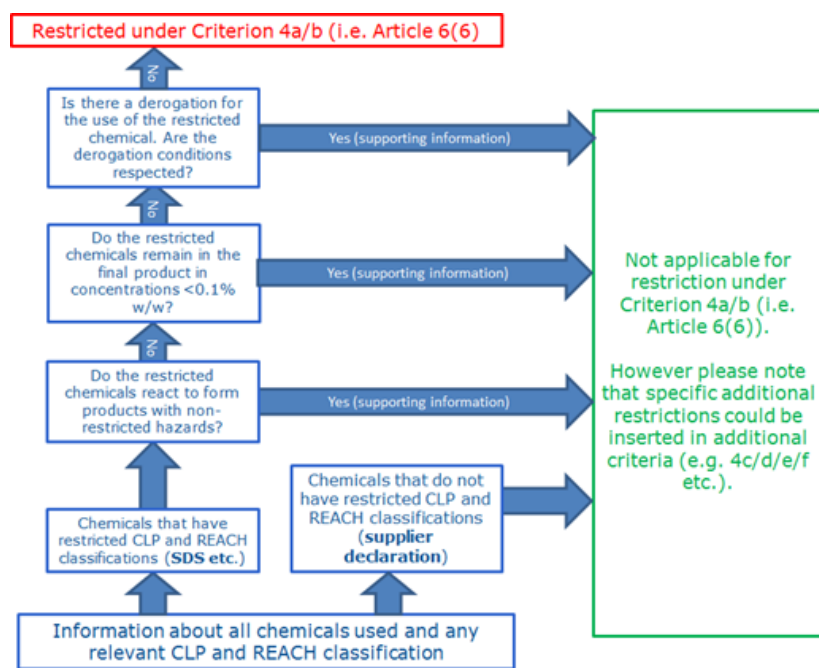


Figure 28. Illustration of the horizontal approach for hazardous substance and mixture criteria in EU Ecolabel paper products.

The general approach that should be followed for criterion 4b) is illustrated in Figure 28 above. The same approach applies for SVHCs but with the one difference that no derogations can be made for SVHCs.

The potential need to derogate for cationic polymers, de-foamers, cleaners, sizing agents, wet strength agents and dyes was raised. It was emphasised that justifications for the use of hazardous substances that may remain in the final product should be predominantly focussed on the environmental benefits that their use provides and any potential improved process efficiency, product quality or functionality compared to a situation when they are not used. Where relevant, the lack of any less hazardous alternatives on the market to achieve a similar function should be mentioned.

It is anticipated that most attention to potential derogations will need to be given to "*functional chemicals*" rather than "*process chemicals*". The main reason for this is that functional chemicals are deliberately intended to remain in the final product in order to impart some desirable function to the product. The most obvious examples of functional chemicals include: optical brightening agents, dyes, sizing agents, strength aids and coatings.

There was confusion about what level of information about hazard classifications is being requested. Some stakeholders claimed that suppliers will not provide declarations that their chemical products do not contain any substances with the classifications listed in criterion 4b). JRC explained that the basis for all information should be a REACH compliant Safety Data Sheet (SDS). If a hazardous substance is present in a supplied mixture above a certain trigger concentration that is related to the hazards it presents, it must be listed in Section 3 of the SDS.

If the SDS of a mixture reveals no restricted hazardous substances, then there are no restrictions placed by criterion 4a) and 4b) on the use of that mixture.

When the SDS reveals the presence of restricted hazardous substances, its use has to be quantified by estimating the total quantity of the substance added and dividing this by the total production volume of the EU Ecolabel product. This will provide a final product concentration that assumes that all the added substance remains in the final product and

none of it reacts to form different products. This initial assumption can then be multiplied by factors that account for degrees of chemical reaction and any losses due to washing out of substances or so on.

It was added that Substances of Very High Concern has not been an issue with chemicals used in the pulp and paper industry. However, the continued need to screen process chemicals at the level of SDSs will be needed as the SVHC Candidate List is periodically updated.

#### **5.4.1.4 Outcomes from and after 2nd AHWG meeting**

The horizontal criteria for hazardous substances and mixtures are completely new for Tissue paper and so, in order to ensure a smooth transition process, considerable dialogue was established with some existing license holders before the 2<sup>nd</sup> AHWG meeting and as soon as the Tissue product was restarted after a 9 month delay.

The presentation for horizontal hazardous substance restrictions was essentially the same as was presented at the 1st AHWG meeting. Consequently, only a broad overview of the chemicals used in pulp and paper production was provided, splitting them into two groups: (i) process chemicals used to optimise production processes and (ii) functional chemicals used to affect the properties of the paper product (see the further research section for more details).

The JRC proposed to narrow the scope of the horizontal criteria to only the paper machine (and in the case of tissue paper, to the paper machine and converting house). This means not carrying out a horizontal screening of the chemicals used in the pulp process in non-integrated or integrated mills. The main reason for this proposal is the fact that at the very beginning of the paper machine, pulp is present in a dilute suspension of approximately 99% water and 1% fibres. Consequently it was doubted if there are any hazardous chemicals used in the pulping processes that could ever end up remaining in the final paper product in concentrations higher than 0.1%.

Apart from the potential non-relevance of the horizontal hazardous substance screening in pulping chemicals, it greatly lightens the workload of applicants, existing license holders and CBs because one paper producer will tend to source pulp from multiple suppliers, who may vary with time as well. Feedback from CBs that currently have licenses confirmed that extending the scope to pulp chemicals had proven unworkable with the current Copying and Graphic and Newsprint paper product groups. Narrowing the scope of the horizontal hazardous substance criteria thus fits well with the recommendations from the REFIT exercise, which emphasised the need to develop a practical modus operandi for the implementation of Article 6(6) and 6(7).

Stakeholders generally wanted the scope of the horizontal criteria to be limited to "process chemicals" and "functional chemicals". In response to a prompt from JRC, it was stated that the need to restrict EUH hazard classes seemed unnecessary since it would only apply to commodity chemicals such as sodium bisulphite or sodium hypochlorite – that clearly do not remain in the final paper product.

Industry stakeholders asked why a limit of 0.1% was set for all restricted CLP hazards (i.e. Group 1, 2 and 3) instead of being lower for the more severe hazards and higher for the less severe hazards. In follow up discussions with some CBs, they also agreed that, in their experience, it was the 0.1% limit for Group 3 hazards that was creating the most work and potential obstacles. JRC acknowledged the point but clarified that the general 0.1% limit for products that are articles had been the conclusion of work carried out by the 1st Chemicals Task Force.

Despite the proposal to narrow the scope of the horizontal criteria to process and functional chemicals only, some complaints were expressed that removing the general exemption clause for substances that undergo chemical modification or become no longer bioavailable would make the criteria unworkable. Following the AHWG meeting,

further discussions with CBs, with the aim of explaining how they currently interpret the horizontal hazardous substance criteria for copying and graphic and newsprint paper products resulted in an agreement to reinsert the general exemption for chemical modification. It was also agreed to reword the horizontal criteria and to explain that estimations of hazardous substances should be based on concentrations stated in SDSs, dosing rates and retention factors. If substances are considered to undergo chemical modification, it should be up to the applicant to explain this to the CB, although the JRC agreed to provide some general guiding principles to understand what is meant by chemical modification in the context of paper production.

#### 5.4.1.5 Further research

##### Providing guidance for CBs on the scope and exemption for chemical modification

From the feedback received from stakeholders, it was clear that detailed discussions about the use of process and functional chemicals in paper production will be needed in order to decide what derogations could potentially be justifiable.

The use of chemicals and additives in the pulp and paper industry has generally increased over the last 20 years as the understanding of the role that such chemicals can play in reducing operating costs, reducing environmental impacts and improving paper quality has improved. Broadly speaking, the types of chemicals used can be split into 3 groups:

- **Commodity chemicals:** chemicals that are traded in large quantities worldwide that are highly relevant to the pulp and paper industry. Examples include chlorine dioxide, hydrogen peroxide, sodium salts, sulfuric acid, china clay and calcium carbonate.
- **Process chemicals:** chemicals that are used to optimise process conditions, such as improving the runnability and speed of paper machines, reducing fouling and reducing steam consumption. Examples include retention aids, defoamers, fixative agents and biocides.
- **Functional chemicals:** chemicals that directly influence certain physical qualities of the paper such as strength, brightness or water repellency and which will affect the printability of the paper. Examples of functional chemicals include dyes, coating pigments, binders, wet strength agents and sizing additives.

Commodity chemicals are considered to be out of the scope, even when used in the paper machine. The main justification for this exclusion is the fact that the chemicals are either non-hazardous or clearly undergo chemical modification to the extent that they do not remain in the final paper product. Some chemicals carry out more than one function and there is no concrete boundary between process chemicals and functional chemicals. However, in terms of scale, functional chemicals are much more significant than process chemicals (Bajpai, 2016).

In order to help applicants and CBs understand how the general exemption clause for chemical modification for chemicals used in EU Ecolabel Graphic paper and Tissue Paper should be applied, the following table has been produced.

Table 37. Identification and consideration of main process and functional additives<sup>43</sup>

<b>Process additives:</b> materials that improve the operation of the paper machine and that are primarily added at the wet end of the paper machine.	<b>Functional additives:</b> materials that enhance or alter specific properties of the paper product and that may be added internally or to the surface of the sheet
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<sup>43</sup> Content is based on information in the book chapter "Papermaking Additives" in ECT 3rd ed., Vol. 16, pp. 803–825, by S. T. Putnam, H. H. Espy, and G. G. Spence, Hercules Inc.; in ECT 4th ed., Vol. 18, pp. 35–60, by M. A. Dulany, G. L. Batten, Jr., M.C. Peck, and C. E. Farley, Georgia-Pacific Resins, Inc.

<p><b>Retention aids:</b> encourage co-flocculation by two mechanisms: they neutralize the negative charges on fillers, fibers, or fines so that van der Waals forces can hold them together, and they form molecular bridges between two particles to which they are adsorbed. Prevents the loss of fibres from the sheet and is effectively incorporating into the sheet.</p> <p><u>Examples:</u> aluminium sulphate, poly-aluminium chloride, cationic starch and high-molar mass synthetic polyelectrolytes (e.g. polyacrylamides and polyethylenimines).</p> <p><u>Chemically modified?:</u> If inorganic, yes, if organic, no.</p>	<p><b>Sizing agents:</b> improve the resistance of paper to wetting by the incorporation of particles with water repellent properties.</p> <p><u>Examples:</u> Rosin-based sizes, cellulose-reactive sizes, wax emulsions, fluorochemicals, AKD sizes.</p> <p><u>Chemically modified?:</u> Yes.</p>
<p><b>Formation aids:</b> prevent the flocculation of fibres that would result in an even fibre distribution in the sheet prior to immobilization of the wet fibre mat on the wire.</p> <p><u>Examples:</u> Polyacrylamide, polyethylene oxide, natural gums, locust bean gum, polyacrylates, lignin sulfonates and naphthalene sulfonates.</p> <p><u>Chemically modified?:</u> No.</p>	<p><b>Dry-Strength Additives:</b> help maintain a suitable dry-strength when weaker (i.e. recycled) fibres are used and allows for lower density papers to be manufactured.</p> <p><u>Examples:</u> cationic starches, amphoteric starches, cationic and anionic polyacrylamides, vegetable gums, sodium carboxymethylcellulose and PVF/PVAm resins.</p> <p><u>Chemically modified?:</u> No</p>
<p><b>Defoamers:</b> minimise entrainment of air bubbles in the sheet which can slow drainage, reduce machine speed and result in the formation of translucent spots on the finished sheet.</p> <p><u>Examples:</u> Water soluble and water insoluble defoamers possible. Insoluble examples include hydrocarbon/fatty acid/ester or wax blends, polysiloxanes, fluorocarbons, hydrophobic silica and organic micromax.</p> <p><u>Chemically modified?:</u> No, but retention factor may be less than 100%, especially for water soluble defoamers..</p>	<p><b>Wet Strength Additives:</b> reduces the extent to which the presence of water can disrupt hydrogen bonds between cellulose fibres in the paper sheet.</p> <p><u>Examples:</u> Urea-Formaldehyde and Melamine-Formaldehyde resins, aminopolyamide-epichlorohydrin resins, polymeric amine-epichlorohydrin resins, glyoxalated polyacrylamide resins, aldehyde-modified resins.</p> <p><u>Chemically modified?:</u> Although there is evidence that chemical modification occurs, for the purposes of the horizontal criterion for EU Ecolabel Graphic and Tissue paper, exemptions for chemical modification are not considered.</p>
<p><b>Wet-web strength aids:</b> minimise sheet breaks when transferring the wet sheet from the forming wire to the press section.</p> <p><u>Examples:</u> Anionic polyacrylamides, locust bean gum, guar gum, cationic aldehyde starches.</p> <p><u>Chemically modified?:</u> If inorganic, yes, if organic, not clear.</p>	<p><b>Fillers:</b> increase the surface area of the sheet, imparting more opacity to paper. Fillers are especially useful for low base weight paper for printing and writing that is based predominantly on chemical fibre pulp.</p> <p><u>Examples:</u> kaolin clay, titanium dioxide, calcium carbonate, silica, hydrated alumina and talc.</p> <p><u>Chemically modified?:</u> No</p>
<p><b>Pitch control agents:</b> prevent the formation of sticky deposits at the wet end of the paper machine that could later result in sheet breaks and the formation of off-colour spots.</p> <p><u>Examples:</u> Inorganic agents include clay, alum, talc and polyaluminium chloride. Organic agents include naphthalene sulfonates, ligninsulfonates and polyacrylates, starch-based cationic polymers.</p> <p><u>Chemically modified?:</u> If inorganic, yes, if organic, not clear.</p>	<p><b>Pigmented coatings:</b> are mixtures of pigments, binders and minor additives suspended in a slurry that is added to improve the smoothness and printability of the paper. Unlike paints, pigmented coatings have a much lower binder content (typically 5-30 parts per 100 parts of pigment). The minor additives are used to ensure suitable dispersion of the pigment and retain water during the coating operation.</p> <p><u>Examples:</u> pigments are generally the same chemicals as mentioned above for fillers although polystyrene-based pigments and satin-white can be combined with mineral pigments to improve gloss. Water soluble binders include unmodified or derivatised starches and casein. Synthetic binders are mainly latexes, especially styrene-butadiene copolymer latex, polyvinyl acetate and acrylate esters. The most important minor additives are polyphosphates and sodium polyacrylate and various water-soluble polymers. Minor additives for water retention include</p>
<p><b>Save-alls:</b> recover paper fines and fillers from the white water and greatly reducing the suspended solids load passing to the wastewater treatment plant.</p> <p><u>Examples:</u> Aluminium salts, iron salts, lime and organic polyelectrolytes.</p> <p><u>Chemically modified?:</u> If inorganic, yes, if organic, not clear.</p>	<p>carboxylmethylcellulose, hydroxyethylcellulose, guar gum, sodium alginate and lubricants include calcium stearate, fatty acid esters, sulfonated oils and wax emulsions.</p> <p><u>Chemically modified?:</u> Pigments – No. Binders – Yes. Minor additives – not clear, may vary.</p>
<p><b>Slimicides and biocides:</b> To prevent growth in of slime-forming bacteria and fungi.</p> <p><u>Examples:</u> organobromides, organosulfurs, isothiazolines, thiocyanates, thiocarbamates, metallics containing copper and tin, chlorinated phenols, and phenates. Formulations may also contain agents such as hydrogen peroxide, glutaraldehyde ozone and peracetic acid to enhance effectiveness.</p> <p><u>Chemically modified?:</u> Yes for any enhancing agents but no</p>	



for biocidal active substances. However, retention factor less than 100% justifiable.	
<p><b>Creping aids:</b> ensure the optimum adhesion of the tissue paper sheet to the roll before it is creped.</p> <p><b>Examples:</b> animal glues, starch, wet-strength resins, specialised polyamines, emulsified paraffin oil, silicone oils, polyethylene glycol.</p> <p><b>Chemically modified:</b> No.</p>	

While the information in the above table should not be taken as the final word about chemical modification exemptions, or if retention factors less than 100% are justifiable, any reasons for contradicting the guidance above must be well justified to the CB.

What should chemical modification be considered as?

Unfortunately, it is not possible to provide an exhaustive, all-encompassing definition of chemical modification. However, for the purposes of interpreting this exemption clause for the horizontal hazardous substance and mixture criteria for EU Ecolabel Graphic paper and Tissue paper products, the following points are recommended:

- That any inorganic substance that is water soluble and whose ions will react to form different salts, complexes and/or precipitates shall be considered as being chemically modified.
- Any inorganic or organic substance that breaks and/or forms covalent bonds should normally be considered as having been chemically modified.
- The formation or breaking of hydrogen bonds shall not be considered as chemical modification.
- Adsorption and ion-exchange at charged sites on organic molecules and polymers shall not be considered as chemical modification.
- For the purposes of consistent interpretation, dyes, pigments, cationic polymers and wet strength agents shall not be considered as eligible for exemption due to chemical modification.

When considering chemical modification of dyes, it is difficult to accept any arguments that chemical modification takes place because the dye colour is very much present in the final product and the way in which light is absorbed and reflected is precisely a matter of the chemical structure of the dye compound or complex. Despite this, discussions with one dye supplier revealed that direct dyes can form salt complexes with  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions in the process water and that fixatives may help form adsorption sites for the dye to bind efficiently to the fibre surfaces before they effectively intercalated into the paper sheet by mechanical actions in the paper machine.

With cationic polymers, the general mechanism is considered to be due to adsorption to fibre surfaces or simply forming sufficiently large solid particles so as to be physically retained in the sheet. Arguments for chemical modification could be based on the fact that these extremely long and complex polymers inevitably break into smaller fragments in the aggressive environments of the paper machine. The degree of adsorption to the paper sheet by polyacrylamide polymers is extremely strong, to the extent that is not possible to selectively remove the polyacrylamide from the sheet.

With wet-strength agents, particularly the most commonly used PAE (polymeric amine epichlorohydrin) resins, there is a strong case for chemical modification due to the fact that the polymer is capable of cross-linking with itself and of forming covalent bonds with cellulose fibres. However, due to the presence of other, more hazardous wet-strength agents available, it was considered more appropriate to not apply a general exemption based on chemical modification of wet-strength agents per se.



### Guidance about certainty of stated CLP hazards

To simplify the horizontal hazardous substance screening exercise, CBs and applicants simply have to look at section 3 of the SDS provided by suppliers whenever there is a CLP classified restricted substance present. It is assumed that the SDS is always correct and the liability for incorrect information is the responsibility of the chemical supplier.

The implementation of REACH and CLP is a massive exercise and can create the sensation of constantly moving goalposts. For those applicants and CBs who may wish to know more about the level of certainty of information provided in section 3 of the SDS, some quick guidance is provided here.

For example, let's assume that the applicant uses the 5 coating pigments defined below in their paper products. As explained above, these chemicals are not considered to be chemically modified and should be retained in the final product with a near 100% efficiency. Some examples of commonly used pigments, together with possible hazard classifications that may appear in SDSs are included below.

Table 38. Examples of hazard classifications of common coating pigments

Name (formula)	CAS Number	Classification entries in ECHA C&L inventory		
		Harmonised	Joint	Individual
<b>Zinc Oxide (ZnO)</b>	1314-13-2	H400 – Aquatic Acute 1 H410 – Aquatic Chronic 1	H400 – Aquatic Acute 1 H410 – Aquatic Chronic 1 H302: Acute Tox. 4 H332: Acute Tox. 4 H360: Repr. 1A H373: STOT RE 2	H400 – Aquatic Acute 1 H410 – Aquatic Chronic 1 H302: Acute Tox. 4 H332: Acute Tox. 4 H360: Repr. 1A H373: STOT RE 2 H315: Skin Irrit. 2 H319: Eye Irrit. 2 H335: STOT SE 3 H300: Acute Tox. 2 H330: Acute Tox. 2 H317: Skin Sens. 1 H318: Eye Dam. 1 H350: Carc. 1A H314: Skin Corr. 1B
<b>Barium Sulfate (BaSO<sub>4</sub>)</b>	7727-43-7	No harmonised classification	Joint entry says: Not classified	H302 – Acute Tox. 4 H332 – Acute Tox. 4 H371 – STOT SE 2 H319 – Eye Irrit. 2 H373 – STOT RE 2 H335 – STOT SE 3
<b>Barium Carbonate (BaCO<sub>3</sub>)</b>	513-77-9	H302 – Acute Tox. 4	H302 – Acute Tox. 4	H302: Acute Tox. 4 H332: Acute Tox. 4
<b>Calcium Carbonate (CaCO<sub>3</sub>)</b>	471-34-1, 7440-70-2	No harmonised classification	Joint entry says: Not classified	H315 – Skin Irrit.2 H318 – Eye Dam. 1 H319 – Eye Irrit. 2 H335 – STOT SE 3
<b>Titanium Dioxide (TiO<sub>2</sub>)</b>	13463-67-7	No harmonised classification	Joint entry says: Not classified	H351: Carc. 2 H332: Acute Tox. 4 H319: Eye Irrit.2 H335: STOT SE 3 H372: STOT RE 1 H350: Carc. 1B H302: Acute Tox. 4 H315: Skin Irrit. 2 H413: Aquatic Chronic 4 H336: STOT SE 3

The information provided above is publically available on the ECHA Classification and Labelling Inventory (C&L Inventory). The inventory registers all submissions that have been made to ECHA regarding the hazard classification of that particular substance. Initially, submissions are normally made by individual producers with a relatively small data set. By sharing data and agreeing on conclusions, larger numbers of producers and

other interested parties using the substance in question can submit a joint submission. When the data is considered mature, comprehensive and conclusive enough, a harmonised classification can be made.

From the examples above, the classifications H400 and H410 will always be provided for ZnO now because it is a harmonised classification. Even though there are some hazards claimed in individual submissions for BaSO<sub>4</sub>, CaCO<sub>3</sub> and TiO<sub>2</sub>, the fact that there are joint entries that claim these pigments are not classified suggests that there are suppliers on the market willing to submit SDSs with no listed CLP hazard for these chemicals.

However, there is always the possibility that new toxicological data becomes available that would result in the substance being reclassified. Despite the fact that there is a joint entry claiming that TiO<sub>2</sub> is not classified, France has submitted a proposal to reclassify Titanium Dioxide as a Cat. 2 carcinogen via the inhalation pathway for particles in the 1-4µm size range<sup>44,45</sup>.

#### Specific considerations relating to TiO<sub>2</sub>

It is unlikely that any final decision on the classification will be made before June 2018, when the EU Ecolabel criteria for Graphic paper and Tissue paper are expected to be voted. While it is not possible to propose any derogation in the draft legal text based on a classification that has not yet been finalised, it is possible to consult with stakeholders and gauge opinions about a potential derogation for TiO<sub>2</sub>.

Industry stakeholders confirmed that TiO<sub>2</sub> is not used in Tissue paper, which does not use many pigments in general anyway. With Graphic paper, the use of TiO<sub>2</sub> is exclusively for high quality printing papers with good brightness. The use of TiO<sub>2</sub> is considered necessary to reach the highest quality levels. High quality printing paper may actually be of more relevance to the Graphic paper that is used as a substrate for EU Ecolabel Printed paper. In order to avoid possible unintended limitations of the range of EU Ecolabel Printed paper products, it is recommended that a derogation for TiO<sub>2</sub> be permitted in the EU Ecolabel criteria for Graphic paper.

Discussions about possible derogation conditions led to the agreement that the use of TiO<sub>2</sub> should only be permitted in Graphic paper that is produced for high quality printing. However, precisely how high quality printing could be defined was not clarified – this may require input from stakeholders in the printing sector. It was also agreed that the derogation conditions should be linked to worker health and safety. The use of TiO<sub>2</sub> slurries effectively removes the inhalation hazard and the use of powders in closed dosing systems would also minimise the hazard. Conditions relating to maximum concentrations in the paper were questioned because this might discriminate against low base weight papers. The initial proposal for a TiO<sub>2</sub> derogation would provisionally be as follows:

Substance	Applicability	Derogated classification(s)	Derogation conditions
Titanium Dioxide	Use in the production of paper for high quality printing purposes	H351 (provisional)	<i>Avoid dust formation by organizational and/or technical means in order to fully comply with the applicable OEL and strictly respect and comply with the requirements as specified in the SDS.</i>

Given the timing of the reclassification issue, it is likely that the insertion of any derogation condition for TiO<sub>2</sub> will need to be introduced via an amendment procedure.

#### Further research related to dyes and pigments

<sup>44</sup> <https://chemicalwatch.com/43791/france-proposes-carcinogen-1b-classification-for-titanium-dioxide>

<sup>45</sup> <https://echa.europa.eu/-/titanium-dioxide-proposed-to-be-classified-as-suspected-of-causing-cancer-when-inhaled>

The market for dyes and pigments in the paper industry is well-established. A broad range of chemicals are used in the dye and pigment industry, which can broadly be split as follows:

- Dyes (which can be further split into reactive dyes, disperse dyes, sulfur dyes, VAT dyes, acid dyes, direct dyes and basic dyes).
- Organic pigments (e.g. azos, phthalocyanines etc.)
- Inorganic pigments (e.g. titanium dioxide, iron oxide etc.).

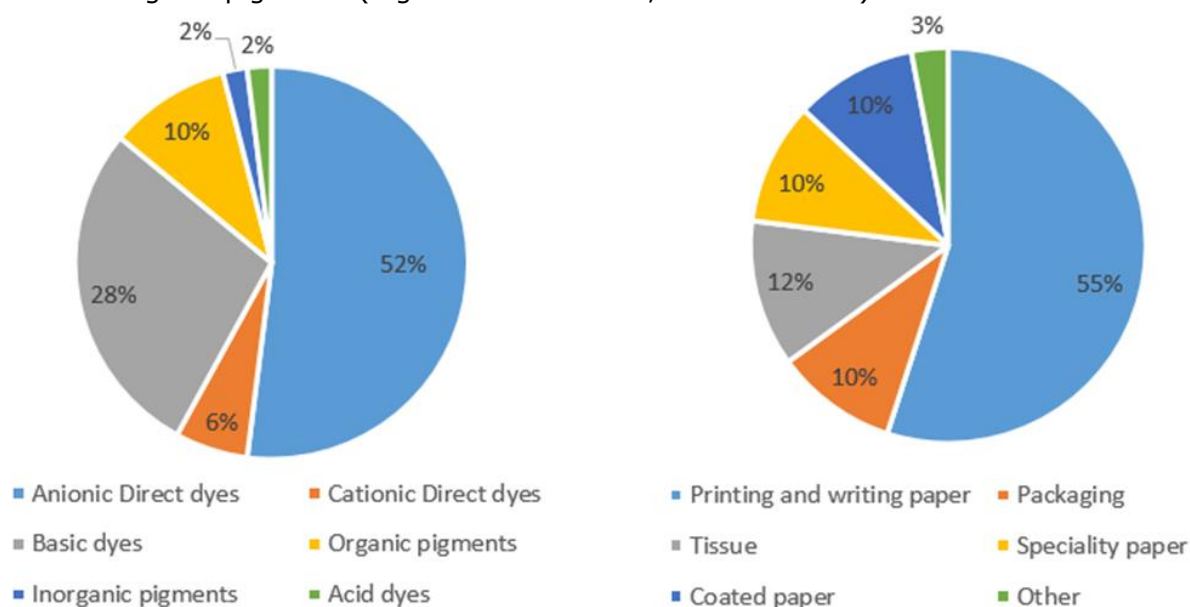


Figure 29. Market data for dyes and pigments in the paper sector as a function of chemical type (left) and as a function of paper grade (right). Source: Roick, 2003<sup>46</sup>.

From the data above, it is clear that dyes (88%) are much more commonly used than pigments (12%) for colouring paper. The most commonly used dyes are anionic direct dyes (52%) although basic dyes are also important (28%). The latter dyes are necessary in papers with significant quantities of lignin (i.e. unbleached and mechanical pulp).

Dyes and pigments are most commonly used in printing and writing paper (55%) but use in tissue paper was also significant (12%).

#### Cross-check of CLP hazards associated with dyes

Due to the fact that dyes and pigments are, for the purposes of interpreting the horizontal hazardous substance criteria for EU Ecolabel paper products at least, not considered to undergo chemical modification, it is necessary to review what type of CLP hazards are relevant. Once this information has been gathered, it will be possible to justify what derogation requirements are needed.

A review of the ECHA CLP inventory revealed a large number of entries for anionic dyes, cationic dyes and direct dyes.

Table 39. Dyes found in the ECHA CLP inventory

Anionic dyes	Cationic dyes	Direct dyes
Acid black 2, 77, 83, 107, 168, 173, 194, 210.	Basic violet 1, 3.	Direct black 38, 62, 112, 155, 179.
Acid orange 43, 78, 86, 89, 95,	Basic red 9, 18:1, 46.	Direct blue 6, 77, 200, 260, 273,
	Basic blue 1, 3.	

<sup>46</sup> Direktfarbstoffe am Beispiel Tissue-Papiere, Das Papier, 2003-T160, p.40-44.

116, 139, 142, 144, 154. Acid red 3, 37, 52, 62, 131, 226, 257, 276, 299, 315, 336, 343, 357, 359, 361, 362, 407, 425, 6796. Acid yellow 79, 110, 116, 166, 184, 194, 204, 219, 232. Acid violet 48, 54, 66, 74.		279, 293, 307. Direct orange 102. Direct red 9, 28, 83:1, 89, 224, 227, 239, 262. Direct yellow 28, 107, 137, 142, 169. Direct violet 99.
Restricted CLP hazards found: G2: H317, H410 G3: H373, H411, H412	Restricted CLP hazards found: G1: H350 G2: H351, H400, H410 G3: H301, H412	Restricted CLP hazards found: G1: H350 G2: H317, H361d G3: H373, H411, H412

Although many of the dyes listed in the table above had entries in the CLP Inventory that said "not classified", these entries always had very few notifiers (between 1 and 5) and normally only a single submission. Hazard classifications may eventually arise as more test evidence is compiled. There were very few harmonised classifications as well, except for the H350 and H361d classifications for azo dyes.

For these reasons, it is considered relevant to permit some derogation from the horizontal CLP restrictions should the presence of dyes in coloured paper be greater than 0.1% (w.w).

#### Cross-check of SDSs for some dye formulations currently used in paper industry

Information provided by a dye manufacturer for 13 different dye formulations supplied to the paper industry revealed that none of the solvents or carriers such as acetic acid, lactic acid, benzyl alcohol, 3,4,5-Trihydrobenzoic acid or 2-Dimethylaminoethanol had CLP classifications that would be restricted by the horizontal CLP criterion 4b). The main hazards associated with these substances were: H302, H312, H314, H315, H319, H332 and H335. However, hazards relating to the dye substances were always relevant to the horizontal CLP restriction.

Table 40. Cross-check of CLP hazards associated with dyes used in the paper industry

Substance	CAS / EC No	Max. Conc.	Hazards
Direct Blue 273 Trisodium salt	76359-37-0	<20%	H412
C.I. Basic Blue 154	159604-94-1	<15%	H317, H411
Blue HAS 2-192	430-200-7	<9%	H318, H412
Cartasol Red K-3BN liquid (notification presscake, dried)	455-600-9	<15%	H412
[N,N',N'',N'''-Tetrakis[3-(dimethylamino)propyl]-29H,31H-phthalocyaninetetrasulphonamidato(2-)-N29,N30,N31,N32]copper tetraacetate	82864-55-9	<25%	
Yellow JGW 235 R	431-440-5	<10%	H318, H411
Red LF 6339	443688-20-8	<15%	H318, H412
Yellow PE 3260/SF 158	778583-04-3	<25%	H412
Yellow HAS 2-1166/KL1-RW (notification presscake)	935-717-6, 700-312-3	<20%	H302, H317, H318, H411

Although information was not provided by the industry about dosing rates, it was confirmed that the dosing rates are high enough to result in the above substances consistently exceeding 0.1% by weight of the final paper product. Based on the hazards listed above, derogations could be requested for H317, H411 and H412. However, due to the way in which tissue paper is used, a derogation for H317 (category 1 skin sensitiser) is not recommended.

## 5.4.2 Specific hazardous substance restrictions

### 5.4.2.1 Criteria proposal – 4c, 4d, 4e, 4f, 4g, 4h, 4i and, for tissue only, 4j

#### Proposed Criterion 4c): Chlorine

(For Graphic and Tissue paper)

*Note:* This requirement shall apply to the pulp and paper producers. While this requirement also applies to the bleaching of recycled fibres, it is accepted that the fibres in their previous life-cycle may have been bleached with chlorine gas.

Chlorine gas shall not be used as a bleaching agent. This requirement does not apply to chlorine gas related to the production and use of chlorine dioxide.

**Assessment and verification:** the applicant shall provide a declaration that chlorine gas has not been used as a bleaching agent in the paper production process, together with declarations from any relevant pulp suppliers.

#### Proposed Criterion 4d) APEOs

(For Graphic and Tissue paper)

*Note:* This requirement shall apply to the pulp and paper producers.

Alkylphenol ethoxylates or other alkylphenol derivatives shall not be added to cleaning chemicals, de-inking chemicals, foam inhibitors or dispersants (also coatings for Graphic paper). Alkylphenol derivatives are defined as substances that upon degradation produce alkyl phenols.

**Assessment and verification:** the applicant shall provide a declaration(s) from their chemical supplier(s) that alkylphenol ethoxylates or other alkylphenol derivatives have not been added to these products.

#### Criterion 4e) Surfactants used in deinking

(For Graphic and Tissue paper)

*Note:* This requirement shall apply to the producer(s) of deinked pulp.

All surfactants used in deinking processes shall demonstrate ready or inherent ultimate biodegradability (see test methods and pass levels below). The only exemption to this requirement shall be the use of surfactants based on silicone derivatives upon the condition that paper sludge from the deinking process is incinerated.

**Assessment and verification:** the applicant shall provide a declaration of compliance with this criterion together with the relevant safety data sheets or test reports for each surfactant which shall indicate the test method, threshold and conclusion reached, using one of the following test methods and pass levels:

- For ready biodegradability: OECD No 301 A-F (or equivalent ISO standards) with a percentage degradation (including absorption) within 28 days of at least 70% for 301 A and E, and of at least 60% for 301 B, C, D and F.
- For inherent ultimate biodegradability: OECD 302 A-C (or equivalent ISO standards), with a percentage degradation (including adsorption) within 28 days of at least 70 % for 302 A and B, and of at least 60 % for 302 C.

*In cases where silicone-based surfactants are used, the applicant shall provide a Safety Data Sheet for the chemicals used and a declaration that paper sludge from the deinking process is incinerated, including details of the destination incineration facility or facilities.*

#### Criterion 4f) Biocidal product restrictions for slime control

(For Graphic and Tissue paper)

*Note:* This requirement shall apply to the paper producer.

The active substances in biocidal products used to counter slime-forming organisms in circulation water systems containing fibres shall have been approved for this purpose, or be under examination pending a decision on approval, under Regulation (EU) No 528/2012 and shall not be potentially bio-accumulative.

For the purposes of this criterion, the potential to bio-accumulate shall be characterised by log Kow (log octanol/water partition coefficient)  $\leq 3,0$  or an experimentally determined bioconcentration factor (BCF)  $\leq 100$ .

**Assessment and verification:** the applicant shall provide a declaration of compliance with this criterion together with the relevant material safety data sheet or test report which shall indicate the test method, threshold and conclusion reached,

using the following test methods: OECD 107, 117 or 305 A-E.

#### Criterion 4g) Azo dye restrictions

(For Graphic and Tissue paper)

Note: This requirement shall apply to the paper producer.

Azo dyes, which by reductive cleavage of one or more azo groups, may release one or more of the aromatic amines listed in Directive 2002/61/EC, or Regulation (EC) No 1907/2006 Annex XVII, Appendix 8, shall not be used in the production of EU Ecolabel **graphic/tissue** paper.

**Assessment and verification:** the applicant shall provide a declaration of compliance with this criterion from the supplier(s) of all colorants used in the production process for EU Ecolabel **graphic/tissue** paper products. The colourant supplier declaration should be supported by test reports according to the appropriate methods described Appendix 10 or Annex XVII or Regulation (EC) No 1907/2006 or equivalent methods.

#### Criterion 4h) Metal complex dye stuffs or pigments

(For Graphic paper)

Note: This requirement shall apply to the paper producer. See definition of metal complex dye stuffs in Article 3(15) of the Act for this Decision.

Dyes or pigments based on: aluminium\*, silver, arsenic, barium, cadmium, cobalt, chromium, **copper\***, mercury, manganese, nickel, lead, selenium, antimony, tin or zinc shall not be used.

\*The restriction for copper shall be exempted in the case of copper **phthalocyanine** and the restriction for aluminium shall not apply to aluminosilicates.

**Assessment and verification:** the applicant shall provide a declaration of compliance with the requirements of this criterion from the supplier(s) of all colourants used in the production process for EU Ecolabel paper products. The supplier declarations shall be supported by safety data sheets or other relevant documentation.

(For Tissue Paper)

Note: This requirement shall apply to the paper producer **or, where relevant, to the tissue paper converter**. See definition of metal complex dye stuffs in Article 3(15) of the Act for this Decision.

Dyes or pigments based on: aluminium\*, silver, arsenic, barium, cadmium, cobalt, chromium, mercury, manganese, nickel, lead, selenium, antimony, tin or zinc shall not be used.

\*The restriction for aluminium shall not apply to aluminosilicates.

**Assessment and verification:** the applicant shall provide a declaration of compliance with the requirements of this criterion from the supplier(s) of all colourants used in the production process for EU Ecolabel **tissue** paper products. The supplier declaration(s) shall be supported by safety data sheets or other relevant documentation.

#### Criterion 4i) Ionic impurities in dye stuffs

(For Graphic paper)

Note: This requirement shall apply to the paper producer.

The levels of ionic impurities in the dyestuffs used shall not exceed the following limits: Silver 100 ppm; Arsenic 50 ppm; Barium 100 ppm; Cadmium 20 ppm; Cobalt 500 ppm; Chromium 100 ppm; **Copper 250 ppm**; Mercury 4 ppm; Nickel 200 ppm; Lead 100 ppm; Selenium 20 ppm; Antimony 50 ppm; Tin 250 ppm; Zinc 1,500 ppm.

The restriction for copper impurities shall not apply to dye stuffs based on copper **phthalocyanine**.

**Assessment and verification:** the applicant shall provide a declaration of compliance with the requirements of this criterion from the supplier(s) of all colourants used in the production process for EU Ecolabel **graphic** paper. The supplier declaration(s) shall be supported by safety data sheets or other relevant documentation.

(For Tissue paper)

Note: This requirement shall apply to the paper producer **or, where relevant, to the tissue paper converter**.

The levels of ionic impurities in the dyestuffs used shall not exceed the following limits: Silver 100 ppm; Arsenic 50 ppm; Barium 100 ppm; Cadmium 20 ppm; Cobalt 500 ppm; Chromium 100 ppm; Mercury 4 ppm; Nickel 200 ppm; Lead 100 ppm; Selenium 20 ppm; Antimony 50 ppm; Tin 250 ppm; Zinc 1,500 ppm.

**Assessment and verification:** the applicant shall provide a declaration of compliance with the requirements of this criterion from the supplier(s) of all colourants used in the production process for EU Ecolabel **tissue** paper. The supplier declaration(s) shall be supported by safety data sheets or other relevant documentation.

#### Criterion 4j) Wet Strength Agents

(For Tissue paper)

Note: This requirement shall apply to the paper producer.

Wet strength agents that contain glyoxal must not be used in the production of EU Ecolabel tissue paper.



*Assessment and verification: the applicant shall provide a declaration from the relevant chemical supplier(s) that glyoxal has not been intentionally added to the chemical formulation for any wet strength agents that are used.*

#### **5.4.2.2 Rationale of proposed criteria**

##### Chlorine

The criterion for chlorine has remained unchanged during the entire revision process. The only comments relating to chlorine was a request to consider if it would be feasible to ask that any chlorine gas used to generate ClO<sub>2</sub> was not manufactured using the Mercury process. After some investigation (see further research section) it was decided that this would not be a particularly easy condition to verify and that the Mercury process had already being phased out to a large degree.

##### APEOs

The criterion for APEOs has remained unchanged during the entire revision process. The only change was to specify that screening for APEOs should not apply to coating chemicals for tissue paper because these type of chemicals are not used for that product group.

##### Acrylamide

The criterion for residual acrylamide monomer content in polyacrylamide chemicals was deleted in the end. After many requests to delete the criterion and no official comments requesting the criterion to be maintained, it was decided to delete. The main arguments to support the deletion were that acrylamide is water soluble, does not remain in the final product and is readily biodegraded in mill wastewater.

##### Surfactants

The surfactant criterion continues to only be applicable to surfactants used during deinking processes. Stakeholders did not provide sufficient input to determine if extending the biodegradability requirements to all surfactants used would have been overly burdensome. One major concern was if the criterion would apply to all surfactants in all process and functional chemicals or only to chemicals whose primary purpose is to act as a surfactant. In any case, the largest use of surfactants is associated with the deinking process. As per input during the 1<sup>st</sup> AHWG meeting and during follow-ups, the conditional allowances of high efficiency but less biodegradable silicone surfactants was permitted so long as the deinking sludge is incinerated. This follows the approach of the Nordic Ecolabel. This is effectively a slightly different requirement for tissue paper, which previously required surfactants to be readily biodegradable if the quantity used exceeded 100g/ADT return fibres.

##### Biocidal product restrictions for slime control

The criteria have simply been updated to cover the new Biocidal Products Regulation that came into force in 2012. The scope of the criterion is better reflected in the title. From a tissue paper perspective, there is now a clear definition of what should be considered as non-bioaccumulative.

##### Azo-dye restrictions

After some minor changes and some less minor changes, conclusive feedback from industry stakeholders has provided a wording that makes it clear that these chemicals should not be used in the first place and the onus is on the chemical supplier to demonstrate such compliance for the dyes they supply. One advantage of this wording is that the criterion text is simplified in the sense that there is no need to reproduce the list of restricted azo-dyes in an appendix.

##### Metal-complex dye restrictions



A definition has now been provided (in the Act) so that applicants, license holders, suppliers and CBs can clearly understand which chemicals this criterion applies to. As per stakeholder request, it has been clarified that Aluminium metal complexes are not to be confused with aluminosilicates. This criterion is new for tissue paper and it was requested that the restriction on copper be removed because there are a number of commercially accepted shades accepted by global tissue brands that need to use one or more different copper complexes.

#### *Ionic impurities in dye stuffs*

A definition has now been provided (in the Act) so that applicants, license holders, suppliers and CBs can clearly understand what is meant by the term "dye". As with the metal complex dye restrictions, this requirement is new for tissue and it was requested that the limit for copper be removed. Limits for Fe and Mn were also removed (for both graphic and tissue paper) since they are not considered as toxic heavy metals.

#### *Wet Strength Agents (WSAs, tissue only)*

Now that the PAE based WSAs are covered by the horizontal criterion and the maximum residual monomer content is there too as a derogation condition, the only requirement left here is for a non-use of glyoxal (a H362 classified substance) in formulations. It is worth noting that the residual monomer limit for PAE-based WSAs has been reduced from 0.7% to 0.35%. Industry stakeholders confirmed that this was possible to achieve.

#### *Softeners, lotions, fragrances and additives of natural origin (tissue only)*

Stakeholder discussion focussed almost exclusively on fragrances, to the detriment of gaining a better understanding of the other substances used in this group. It was considered that softeners could be covered by the horizontal hazardous substance criteria. The criteria from the 2009 Decision actually restrict the use of additives of natural origin and so it was also decided that these types of substances should simply be covered by the horizontal hazardous substance criterion. It was not possible to obtain a clear distinction between the use of lotions and fragrances in tissue products let alone obtain SDSs for unperfumed lotions used in tissue paper products. A number of EUEB stakeholders expressed reservations about the inclusion of fragrances in the scope for EUEL Tissue paper products, simply on the basis of consumer perception. Industry stakeholders wished to have perfumed tissue included in the scope and shared market data that confirmed the growing fraction of tissue product launches that were perfumed products at the European level and especially in Germany and Austria (see further research). An analysis of 4 SDSs for fragrance formulations used in tissue paper products was cross-checked against the horizontal hazardous substance criteria, the existing criterion in Decision 2009/568/EC for EU Ecolabel tissue paper and against the more recent fragrance criterion for EU Ecolabel Absorbent Hygiene Products (AHP). It was discovered that in mentholated tissue, the use of Eucalyptol (H317) was sufficiently high that it could exceed the horizontal 0.1% limit. Otherwise, the fragrances easily passed the horizontal CLP criterion. However, none of the fragrance formulations passed the existing tissue criterion nor the fragrance criterion for AHP. The main reason for this was that these criteria set zero limits for some hazard classifications that are very common in substances used in fragrance formulations (e.g. H411, H412, H317). If the 4 SDSs submitted by industry stakeholders are representative of the fragrance formulations used in tissue paper, then the way the fragrance criteria are worded for tissue (2009 Decision) and AHP (2014 Decision) would mean a de facto ban on the use of fragrances. Consequently, it was decided to make a criterion proposal that was more realistic and related to good practice already conducted in the tissue paper industry. However, this proposal is presented in the further work section of this report and not in the draft legal text because after later discussions with Commission colleagues, it was decided that fragrances would be banned in the scope. Now that fragrances are banned, it is uncertain what to do with lotions. Commission colleagues proposed to ban lotions as well although this should be cross-checked with industry stakeholders to make sure that banning lotions would not have any unintended consequences on existing licenses.

### **5.4.2.3. Outcomes from and after 1st AHWG meeting**

#### Chlorine

No changes had been proposed to the criterion that bans bleaching with chlorine gas but does not ban the use of chlorine dioxide. It was requested that the possible restriction of chlorine gas based on the manufacturing process used to make it be considered.

Stakeholders mentioned that ECF bleaching (which will use chlorine dioxide as a bleaching agent instead of chlorine gas) has improved a lot in recent years and that ambitious limits on AOX are an acceptable means of restricting the use of chlorine-based bleaching agents. There were no objections to the proposed criterion for chlorine.

#### APEOs

No comments were received or objections raised regarding the proposed criterion for alkylphenol ethoxylates (APEOs). As a consequence, no further research has been carried out.

#### Acrylamide (<700ppm) and other residual monomers (<100ppm)

Stakeholders overwhelmingly supported the removal of the restriction of residual monomers present in coatings, retention aids, strengthening agents, water repellents or chemicals used in internal and external water treatment at levels exceeding 100ppm. The main reasons for this were cited as a lack of clarity about how this could be possibly verified and the disproportionate level of restriction compared to other hazardous substance criteria. One stakeholder claimed that this approach was being successfully implemented in the Nordic ecolabel for paper. However, stakeholders representing Nordic countries that had actually awarded licences for the Newsprint Paper and Copying and Graphic Paper product groups were happy to remove the residual monomer requirement.

Split opinions were expressed regarding the issue of residual acrylamide in coatings, retention aids, strengtheners, water repellents or chemicals used in internal and external water treatment. Some stakeholders wanted the proposed 700ppm limit to remain, others wanted it raised to 1000ppm and others felt that there was no reason to single out acrylamide, considering the horizontal criteria 4a) and 4b) as sufficient.

#### Surfactants

After proposing to extend the minimum biodegradability requirement to all surfactants used in pulp and paper production (instead of just those used during deinking processes) the industry expressed doubts about this – requesting time to take a closer look at the actual situation in these other, non-deinking processes. Only if the use of surfactants is significant in other parts of the process would a broader application of the restriction be justifiable.

Other comments received suggested that anaerobic biodegradability should also be specified and there was some apparent confusion about what is meant exactly by the term "*inherent ultimate biodegradability*" – which is not to be confused with the less stringent "*inherent primary biodegradability*".

One point that was raised was a potential alignment with the Nordic criteria for surfactants, which include an exemption for silicone-based surfactants although supporting arguments would need to be presented.

#### Biocidal products

Stakeholders were supportive of a specific reference to the Biocidal Products Regulation (EC) No 528/2012 but also that it must be clear that the substances should "be approved or currently be under evaluation". The need for this added part is due to the fact that there is a backlog with updating the previously approved biocidal active substances under the Biocidal Product Directive 98/8/EC.

#### Dyes, dyestuffs and pigments

In response to a question about the importance of phthalates in dye, dyestuff and pigment formulations, one industry stakeholder clarified that no low molecular weight phthalates were used (e.g. DBP, DIBP, BBP and DEHP) due to the fact that no authorisation requests have been received prior to the sunset date for these substances in February 2015. For high molecular weight phthalates, the situation is less clear because these substances do not yet have harmonised classifications and their use to date only needs to be reported in toys and childcare articles.

There was a perceived need for clarity regarding the definition of terms such as "dye", "dyestuff" and "ink".

It was confirmed that the REACH restricted azo dyes are not used by the paper industry and that the restriction is not so relevant. This could be considered to already be controlled by criteria 4a) and 4b). Another option would be to restrict the use of those azo dyes that are known to be able to cleave into the restricted aromatic amines. Otherwise, it would be necessary to test for these amines in the paper product – for example using the methodology that one stakeholder was familiar with (EN 645, EN 647 and EN 15518) where water extracts are analysed by HPLC-MS.

In the TR 1.0, the three separate requirements for dyes, for dyestuffs and for pigments had been grouped together into a single criterion with three parts (instead of 3 criteria each with one part). This was not accepted by a highly relevant industry stakeholder who claimed that the members of their association would potentially be confused by this change. Consequently the criterion will once again be split into three parts.

The exemption that applies for Copper Phthalocyanine when looking at metal complexes in dyestuffs or pigments must also be repeated in the next sub-criterion that looks at ionic impurities in dye stuffs.

Another request for clarification was to ensure that aluminium restrictions are not intended to be applied to aluminosilicates, such as natural kaolin clay.

JRC asked for opinions about the possible exclusion of fragrances from the Tissue paper scope. No stakeholders were against and some were actively for the exclusion of fragrances, raising concerns about possible contact with food for certain tissue papers.

Regarding wet-strength agents, it was asked how wet-strength agents would be dealt with under the newly proposed criteria 4a and 4b as this could potentially affect up to 50% of existing licenses should wet-strength agents be excluded. JRC replied by saying

that although all chemicals must be screened under 4a and 4b, this is simply to ensure that none of the chemicals will remain in the final product. The criteria in 4i apply to concentrations in the chemical used, not the final product. Given that wet strength agents are very much intended to remain in the final product, how relevant 4a and 4b will apply will depend on the CLP classification of the wet-strength agent formulation used in the process. This was also flagged up as an obvious issue to discuss further in the sub-group for hazardous chemicals used in the pulp and paper industry.

An inconsistency with glyoxal was highlighted. Basically up to 0.015 mg/m<sup>2</sup> of glyoxal is allowed in paper containing recycled fibres but is completely prohibited in virgin paper was highlighted. JRC responded that the overall aim of the criteria was to not use glyoxal and that the inconsistency essentially lay in what applicants could directly control (i.e. chemicals used to make virgin paper) and what they cannot directly control (trace contaminants in recovered paper).

### Other chemicals

#### Optical Brightening Agents

Optical brightening agents (OBAs) are used in graphic papers and tissue to achieve higher levels of brightness than achievable in the wood-derived or deinked pulp and as an alternative to whitening fillers. To a degree there is a trade-off between the level of bleaching in the pulping process and the use of OBAs after bleaching, the latter sometimes being more cost-effective (Moreira Barbosa, Gomes, Colodette, Carvalho, & Manfredi, 2013).

Initial stakeholder input raised concerns about the hazardous properties of OBAs in general. Examples of OBAs based on stilbene and tetrasulfonic compounds were mentioned (albeit these were used in laundry detergents and their relevance to the paper sector was unclear).

A UNEP SIDS study (OECD, 2005) regarding disodium 4,4'-bis[(4-anilino-6-morpholino-1,3,5-triazin-2-yl)- amino-stilbene-2,2'disulphonate (Fluorescent Brightener FWA-1) found no human toxicity concerns but a hazard for the environment (chronic toxicity to daphnia in water). Examination of other SDSs for OBAs found hazards related to eye, skin and respiratory tract irritation as well as aquatic toxicity. Other hazards mentioned were H302 (Acute toxicity category 4, harmful if swallowed) and H314 (Skin corrosion Category 1B, causes burns). However, it was pointed out that these last two hazards are not specifically restricted by the horizontal EU Ecolabel criteria.

Blue Angel bans the use of OBAs entirely in some papers (essentially where brightness is not deemed essential) but allows the use of low hazard OBAs in 'white' papers:

*"The use of optical brighteners shall not be permitted. Notwithstanding this, SC, LWC, MWC and HWC papers (according to Appendix 1 to these Basic Award Criteria) may be produced using the optical brighteners C.I.220, benzenesulfonic acid, 2,2'-(1,2-ethendiyl) bis [5[4-[bis(2-hydroxyethyl) amino]-6-[(4-sulfophenyl)amino]- 1,3,5, triazin-2yl]amino]-, tetra sodium salt and C.I. 113 or C.I.28 disodium salt 4,4'-bis[6-anilino-4-[bis(2-hydroxyethyl)amino]-1,3,5-triazin-2-yl]amino]stilbene-2,2'-disulphonate."*

The Green Seal standard restricts OBAs in the following manner:

*"Optical brighteners may be used as a functional papermaking additive at a dosage not to exceed 200 parts per million (0.02%) by weight in the finished product. This level does not include any optical brighteners that may be present in the furnish through the use of recovered materials."*

However, feedback received from the European paper industry revealed that there are REACH registered OBAs available on the market that exhibit none of the restricted CLP hazards mentioned in criterion 4b). Any OBAs that do possess restricted CLP hazards should quite rightly be excluded from use in any EU Ecolabel paper product if resulting in their presence in levels exceeding 0.1% (w/w). Consequently it was decided that the horizontal criterion 4b) was sufficiently restrictive and no stand-alone criterion was

required for OBAs. This approach restricts the use of OBAs based on substances with any of a large number of hazards but at the same time allows producers to decide on how best to achieve the target brightness of their paper product (i.e. more bleaching or use more non-hazardous/less hazardous OBA). The overly prescriptive approach of the Blue Angel was criticised and it was questioned if the Green Seal requirement does not simply result in a shifting of the life cycle impact from savings on impacts related to OBA to increases in impacts due to extra bleaching.

### EDTA/DTPA

Currently there are 3 different approaches to EDTA in European Ecolabel schemes which are: (i) a ban on EDTA in the Blue Angel, (ii) conditional use requirements for EDTA in the Nordic Ecolabel and (iii) no criteria in the EU Ecolabel. The need for comprehensive background research was highlighted in order to justify which of these three approaches would be most justifiable in the criteria revision.

In chemical or mechanical pulp mills, complexing/chelating agents are used to protect oxygen-based bleaching chemicals against catalytic degradation prior to or during the bleaching stages (i.e. in TCF and, to a lesser extent, in ECF bleaching). The complexing agents are used in neutral, slightly acidic or slightly alkaline (depending on the formulation and the process requirements) washing and bleaching steps to eliminate transition metals (mainly Mn and Fe, and Cu). The most widely used chelating agents are EDTA (ethylenediaminetetraacetic acid) and DTPA (diethylenetriaminepentaacetic acid), in different product formulations.

BAT/BREF provisions and criteria in the Nordic Swan and Blue Angel eco-label schemes, prompts paper mills to look at alternatives to EDTA and DTPA. The Swedish Environmental Institute has written a report on complexing agents in relation to environmental labelling of paper products (Staffas et al, 2015)<sup>47</sup>. In this report it is claimed that no technically feasible alternatives to EDTA and DTPA are available today. The readily biodegradable chelates on the market today are less strong and efficient in sequestering Mn and Fe at the conditions used in the pulp mill.

The report explains that a reduction in use of EDTA and DTPA, with the current state of art, would be compensated with increased consumption of peroxides, chloride dioxide, sodium hydroxide, oxygen and sodium silicate and also more energy use, and could result in increasing emissions of AOX. For these reasons it is assessed in the same report that the economic consequence of a ban of DTPA above 0.05 kg/tonne is estimated to be between 0.5 and 1 billion SEK (approximately 50 - 100 million EUR) for the Swedish pulp and paper sector.

The main concern surrounding the use of complexing agents in the bleaching process is that they end up in the effluent of the bleaching process. A holistic approach to understanding the potential environmental impact of the presence of these chelating agents in the effluent of a specific paper mill must consider bio-degradation, waste treatment technology and environmental effect of any release to watercourses.

EDTA does not meet the criteria for ready biodegradability but can be classified as inherently biodegradable. The OECD defines inherent biodegradable as a classification of chemicals for which there is unequivocal evidence of biodegradation (primary or ultimate) in any test of biodegradability. The potential of EDTA to biodegrade has been demonstrated in numerous experiments reviewed comprehensively by (Buechli-Witschel and Egli, 2001<sup>48</sup>; Nortemann, 1999<sup>49</sup>). Microorganisms convert EDTA into biomass, carbon dioxide, water and ammonium (Bucheli-Witschel & Egli 2001, Nörtemann 1999).

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<sup>47</sup> L Staffas, E Petterson, H Norrström, T Ericsson, M Remberger and M Karlsson (2015) Komplexbildare och miljömärkning av pappersprodukter. Rapportnummer: B 2245. [www.ivl.se](http://www.ivl.se)

<sup>48</sup> M Bucheli-Witschel and T Egli (2001) Environmental fate and microbial degradation of aminopolycarboxylic acids. *FEMS Microbiol. Rev.* 5(1) 69-106.

<sup>49</sup> B Nortemann (1999) Biodegradation of EDTA. *Appl. Microbiol. Biotechnol.* 51 751-759.

In this bioconversion process only readily biodegradable intermediates are formed. As a consequence, EDTA can not only be classified as inherently, but also as ultimately (completely) biodegradable.

Bio-degradation is the result of the biodegradability (potential to biodegrade) of the substance in combination with the conditions in a certain system. Hence, a substance which is classified as inherently biodegradable may be biodegraded under favourable conditions, e.g. in well-operated biological wastewater treatment plants. Almost complete biodegradation of EDTA can be achieved in biological treatment systems operated at an SRT (sludge retention time) of >10 days and slightly alkaline conditions (van Ginkel et al 1997<sup>50</sup>). Several monitoring studies in full-scale treatment plants have shown that this technology is (economically) feasible for effluents from the dairy industry (van Ginkel et al, 1997; Xie et al, 2012<sup>51</sup>) and the P&P mills (van Ginkel et al, 1999<sup>52</sup>; Ek 1999<sup>53</sup>; Malmqvist et al, 2004<sup>54</sup>; Carlson et al, 2000<sup>55</sup>).

Ultimate biodegradation of DTPA has never been reported. Photodegradation was reported for Fe(III)DTPA and oxidation by Mn(II) in an abiotic process occurring in soils (Bucheli-Witschel & Egli 2001).

Several attempts have been made to develop techniques for EDTA and DTPA removal from wastewaters, principally using advanced oxidation and electrochemical processes often in combination with biological processes. Oxidation methods that have been explored are the following: Elimination based on H<sub>2</sub>O<sub>2</sub>/UV (Rodriquez et al 1999)<sup>56</sup>, radiolysis (Krapfenbauer and Getoff, 1999)<sup>57</sup>, photocatalysis (Babay et al, 2001)<sup>58</sup>, Fenton and photo-Fenton (Ghiselli, 2004) and solar-assisted oxidation (Emilio et al 2002)<sup>59</sup>. The combined electrochemical/biological treatment was able to achieve removal percentages as high as 90, 95, and 70% for carbon, DTPA and Ntotal, respectively (van Ginkel et al, 2002<sup>60</sup>). No full-scale studies of chemical treatment have been described most likely because of the costs involved.

In case chelating agents are not completely removed within the industrial setting, they are released to the environmental compartment, e.g. into surface water or sea water. The environmental effect will depend on the amount of chelating agent emitted as well as the specific conditions of the receiving eco-system. Readily biodegradable chelating agents such as GLDA and MGDA are expected to biodegrade in all receiving

<sup>50</sup> CG van Ginkel, KL Vandenbroucke and CA Stroo (1997) Biological removal of EDTA in conventional activated sludge plants operated under alkaline conditions. *Bioresource Technology* 59 151-155.

<sup>51</sup> CZ Xie, T Healy, P Robinson and K Stewart (2012) EDTA in dairy wastewater and removal efficiency, a case study. *Int. J. Environment and Sustainable Development* 11(2) 206-212.

<sup>52</sup> CG van Ginkel, J Virtapohja, JAG Steyaert and RJ Alen (1999) Treatment of EDTA containing pulp and paper mill wastewaters in activated sludge plants. *Tappi Journal* 82 138-142.

<sup>53</sup> M Ek, M Remberger, A-S Allard (1999) Kinetic studies on the degradation of EDTA; The effects of different pH, sludge age and load. *Nordic Pulp and Paper Research Journal* 14(4) 310-314.

<sup>54</sup> A Malmqvist, B Berggren, S Sjolln, T Welander, L Heuts, A Fransen and D Ling (2004) Full scale implementation of the nutrient limited BAS process at Sodra Cell Varo. *Water Sci. Technol.* 50(3) 123-130.

<sup>55</sup> BL Carlson, T Ericsson, R Loyblad, S Persson and O Simon (2000). The reconstruction of an aerated lagoon to a long-term aerated sludge (LAS) plant at Sodra cell, Monsteras kraft pulp mill. *Tappi International Environmental Conference and Exhibit, Denver, CO, vol. 1 Norcross, GA 30092, USA: Technical Association for Pulp and Paper Industry (TAPPI)* 363-371.

<sup>56</sup> J Rodriguez, A Mutis, MC Yeber, J Freer, HD Mansilla (1999) Chemical degradation of EDTA and DTPA in a Totally Chlorine Free (TCF) Effluent. *Water Sci. Technol.* 40 267.

<sup>57</sup> K Krapfenbauer and N Getoff (1999) Comparative studies of photo- and radiation-induced degradation of aqueous EDTA. Synergistic effects of oxygen, ozone and TiO<sub>2</sub> (acronym: CoPhoRaDe/EDTA). *Rad. Phys. Chem.* 55 385-393.B.

<sup>58</sup> PA Babay, CA Emilio, RA Ferreyra, EA Gautier, RT Gettar and MI Litter (2001) Kinetics and mechanisms of EDTA photocatalytic degradation with TiO<sub>2</sub> under different experimental conditions. *Int. J. Photoenergy* 3 193-199.

<sup>59</sup> CA Emilio, WF Jardim, MI Litter, HD Mansilla, (2002) EDTA destruction using the solar ferrioxalate advanced oxidation technology (AOT): Comparison with solar photo-Fenton treatment. *J. Photochem. Photobiol. A: Chem.* 151 (2002) 121-127.

<sup>60</sup> CG van Ginkel, BJW Tuin VG Aurich and W Maassen (2002) Coupling of electrochemical and biological treatment to remove DTPA from pulp and paper effluents. *Acta Hydrochimica et Hydrobiologica* 30 (2-3) 94-100.

environmental compartments. Biodegradation and photodegradation of EDTA will most likely occur in many environmental compartments (Bucheli-Witschel and Egli, 2001). An example of biodegradation of EDTA in an environmental compartment is the breakdown of EDTA in soils and sediments as demonstrated by Tiedje (1975<sup>61</sup>). This breakdown is slow, but ultimately all EDTA is mineralized (converted into CO<sub>2</sub>, water and ammonia).

The use of EDTA and DTPA in pulp and paper mills has been risk assessed under REACH and found to be safe use both from an environmental and human toxicity perspective. The ability of chelating agents to mobilize heavy metals often put forward is most likely negligible. Complexation of metals in surface waters is mainly determined by naturally occurring organic substances like humic and fulvic acids or amino acids (Kowalik and Einax 2000)<sup>62</sup>.

The EU eco-label regulation and guiding principles sets forth that criteria should be developed based on a holistic life-cycle perspective. The text above demonstrates a trade-off situation that calls for such an approach, in order to avoid unintended suboptimal consequences due to single criteria assessment. It is therefore recommended that the selection of chelating agents should also be based on an environmentally holistic perspective and risk based approach, using widely accepted assessment methods such as Life cycle assessments and REACH risk assessment methodology in combined assessments. Assessments should demonstrate that the selection of chelating agents does not pose an unreasonable risk to humans and the environment, and that there are no other economically and technically feasible alternatives which lead to a substantially reduced overall socio-economic impact. This should be well documented and proven for the paper to be awarded with the EU Ecolabel.

Based on the above considerations, it was decided not to impose any specific stand-alone criterion on EDTA or DTPA in the EU Ecolabel criteria for Graphic or Tissue paper.

#### **5.4.2.4 Outcomes from and after 2<sup>nd</sup> AHWG meeting**

The specific restrictions for other hazardous substances, covered by criteria 4c), 4d), 4e) etc. were mentioned, with the presentation only focussing on those criteria where meaningful changes had occurred since the 1st AHWG meeting. This narrowed the presentation down to "surfactants" and to "dyes, dyestuffs and pigments". The main changes can be summarised as:

- Specific mention of "*active solid content*" instead of "*solid content*" when calculating the concentration of acrylamide residues in polyacrylamide.
- The scope of surfactant restrictions has been narrowed back down to deinking chemicals only and will remain so unless stakeholders will be able to present evidence justifying the expansion of the scope. A conditional allowance has been made for silicone-derivative based surfactants too, mirroring the Nordic approach.
- It has been clarified that the biocidal product restrictions only apply to slime control agents. Biocidal products are not expected to be used anywhere else in the day to day process.
- The criteria for dyes, dyestuffs and pigments have been split up again into three, reflecting its original structure. Specific reference to the restricted azo dyes has now been included in Appendix II and also to non-restricted dyes that may cleave during processing to for these restricted dyes. Some testing conditions have been

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<sup>61</sup> JM Tiedje (1975) Microbial degradation of ethylenediamine tetraacetate in soils and sediments. Appl. Microbiol. 30(2) 327-329.

<sup>62</sup> C Kowalik and JW Einax (2000). Untersuchung des Komplexbildungsverhaltens von Metallionen in anthropogen belasteten Wässern mittels Ultrafiltration. Vom Wasser 94, 229-243.



provided in cases when these latter dyes are used. Some minor clarifications have been added in the 2<sup>nd</sup> and 3<sup>rd</sup> parts.

For Graphic paper, representatives from the printed paper sector raised a point that there was a criterion for printed paper, which they felt should perhaps be directly inserted in the graphic paper criteria.

*"Wet strength agents may be used only if the recyclability of the finished product can be proved."*

It was highlighted that no manufacturer of printed paper uses wet strength agents (WSAs). This would be something that is done by the manufacturer of the paper substrate (i.e. graphic paper). When asked if wet strength agents were used in graphic paper production, stakeholders claimed that they were not aware of this. Further follow-ups after the meeting confirmed that the use of WSAs was not commonplace for graphic paper.

One representative from the chemical sector appealed for the specific restriction of 700ppm acrylamide to be removed, citing that this was a victimisation against acrylamide above all other residual monomers, especially since it does not remain in the final product. No other stakeholders offered any public opinion on this matter, either in agreement or disagreement with the proposal to remove the acrylamide restriction.

For the biocides criterion, it was asked that what happens if one of the substances that is "currently under evaluation" is found to be unsafe. JRC responded that if this happens, the biocide would effectively be removed from the EU market, and so it shouldn't be an issue for the EU Ecolabel.

One final comment, received privately at the close of the meeting, was that the reference to the 2002/61/EC legislation for azo dyes was outdated and that a more recent reference could be provided.

#### **5.4.2.5. Further research**

##### Chlorine

Even though the use of chlorine gas as a bleaching agent is banned by the EU Ecolabel criteria, it can still be used onsite to manufacture the less stable but lower environmental impact chlorine dioxide bleaching agent in situ. Some stakeholders were interested in the EU Ecolabel criteria requiring that any chlorine gas used in the process, even if only used to manufacture Chlorine Dioxide at the mill site.

The manufacturing method for chlorine gas is one further step away from the applicant and it is uncertain if it would be realistic to implement this requirement. Nonetheless, the subject has been investigated here.

There are three main methods to produce chlorine:

- the diaphragm process, where a nearly saturated brine solution enters an electrolytic cell separated by a diaphragm, resulting in the production of chlorine gas, hydrogen gas and a cell liquor of 10-12% sodium hydroxide and 16% sodium chloride.
- the membrane process, where ultra-pure brine is fed to the anode of an electrolytic cell, producing chlorine gas and selectively letting water and cations (i.e. sodium ions) pass through the membrane to the cathode, where hydrogen gas and 30-35% sodium hydroxide (with <100ppm chloride impurity) is produced.
- the mercury process, where brine is fed into an electrolytic cell where mercury acts as a liquid cathode along the bottom of the cell and anodes are suspended a

few millimetres above. Chlorine gas is generated at the anode and sodium dissolves in the mercury, forming an amalgam that, once treated with deionised water, will produce a 50% sodium hydroxide solution and a mercury metal that can be recirculated.

The market share of chlorine production capacity using the mercury process has been gradually decreasing due to regulatory pressure both at the EU level and, via the UNEP Mercury Global Partnership, at the global level.

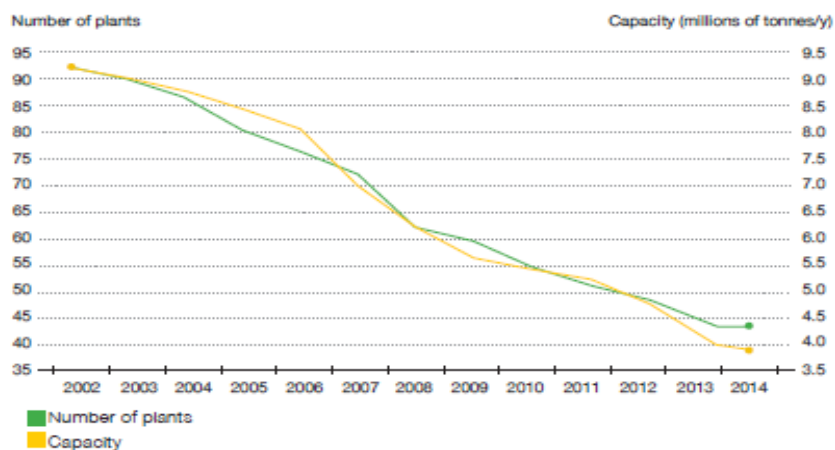


Figure 30. Number of plants and capacity of mercury electrolysis units in USA, Canada, Mexico, Europe, Russia, India, Brazil, Argentina and Uruguay.

According to Figure 30, during the years 2002 to 2014, both the number of mercury process plants and their production capacity has decreased by more than 50%. Perhaps, importantly, the data did not include China, which is the single largest producer of chlorine in terms of installed capacity.

Nonetheless, it has been estimated that less than 5% of global chlorine production capacity is based on the mercury process and that the pulp and paper industry accounts for around 5% of total chlorine consumption (CEPS, 2014).

Focussing on Europe, as of the beginning of 2016, around 20% of the chlor-alkali plants were based on the Mercury process (with 64% being due to the membrane process and around 14% due to the diaphragm process)<sup>63</sup>.

Following the publication of the BAT conclusions for the chlor-alkali industry (Decision 2010/732/EU) it will no longer be permitted to use the mercury process in the EU as of December 2017. This would reduce the total share of mercury-based global production to less than 2%, assuming that no other mercury-based process units were closed down outside of Europe.

Based on the above considerations, it is uncertain what additional benefit the banning of using chlorine produced using the mercury process would have on current practice in the chlor-alkali industry.

### Acrylamide

<sup>63</sup> Chlor-Alkali Industry Review 2015-2016. Accessed [online](#), July 2017.

Stakeholders representing the chemicals industry were requested to provide evidence of the net environmental benefits of using polyacrylamide in the pulp and paper industry as well as considerations of the environmental fate of residual acrylamide – for example does it remain in the final product or end up in wastewater effluent or wastewater sludge.

Using polyacrylamides in the paper machine allows for higher production rates and capacities due to improved machine speeds and wire widths. This is possible specifically due to the following polyacrylamide-induced effects:

- Increased retention of paper pulp on the paper machine, reducing the waste of fillers, fibres and other additives and increasing paper quality.
- Improved wet and dry strength.
- Improved drainage of water, resulting in significant reductions in drying energy requirements.

Concerns about occupational exposure in the paper mill can be minimised by using water in oil emulsions that are automatically dosed and prevent any contact with the chemical. In the worst case scenario, assuming the use of one 700kg super sack of granular polyacrylamide, exposure time is less than 10 minutes and there is practically no respirable dust if deliveries are emptied by vacuum in an enclosed environment. Up to 1000ppm of acrylamide impurities are permitted in polyacrylamide used to make food contact paper materials<sup>64</sup>.

In terms of environmental fate, testing of paper products carried out as part of the BfR 36<sup>th</sup> Recommendation and FDA Regulation 2 CFR 176.170 found that acrylamide was not detectable (detection limit of 0.5ppb). Any residual acrylamide that makes it to white water will be susceptible to reaction with oxidants and sulfites. It is considered as a readily biodegradable substance and therefore unlikely to pass through any wastewater treatment plant with secondary biological treatment.

### Surfactants

The results of the industry cross-check about the scale of use of surfactants in other pulp and paper processes will be provided in this section when ready.

One proposal was made to permit the use of silicones as surfactants despite the fact that they are less biodegradable than the fatty acids and soaps that have traditionally been used in deinking.

The main argument in favour of silicones is that they are more efficient and can be used in total quantities that are 15-20 times lower than fatty acids to provide a given effect. However, due to their poorer biodegradability, their use should only be permitted in cases where the resulting paper sludge is incinerated.

### Fragrances

Split opinions were expressed which were not strongly based on scientific evidence but rather on consumer perception and market trend considerations. Although the original criterion referred to softeners, lotions, fragrances and additives of natural origin,

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<sup>64</sup> According to both the German BfR (Bundesinstitut für Risikobewertung) and the US FDA.

stakeholders only really expressed opinions about fragrances. For this reason, further research has predominantly focussed on fragrances.

Opinions against the use of fragrances were focussed on the point that these chemicals are not essential to the basic functions of tissue paper and should also be avoided due to their possible contribution to allergies. Opinions in favour of the inclusion of fragrances in the scope focussed on the fact that no-one will buy a fragranced tissue paper product if they do not like them and that this is the fastest growing tissue paper sector in Europe. The question of:

*"Should fragrances be included in the scope of EU Ecolabel tissue paper products?"*

was turned around to say:

*"Should consumers who want to buy fragranced tissue products be able to have the choice of an environmentally excellent fragranced product?"*

If fragranced products are to be included in the scope for tissue paper, then it will be necessary to assess what are the hazard profiles of currently used fragrances, what quantities they are used in and what potential criteria could be applied for EU Ecolabel fragranced tissue paper.

#### Market Analysis of tissue product launches

In order to assess product trends and innovation in the tissue sector, the Mintel Global New Products Database (GNPD) was accessed in September 2017 to look at consumer tissue product launches since 2015, when the database started. Consumer tissue included the following categories:

- BRT (bathroom tissue, mainly toilet paper)
- HaFa (hankies and facial tissues)
- HHT (household towel, such as kitchen roll and also including napkins)

Products were classified as either "Fragranced", "Fragrance Unavailable", "Not Specified" or "Unfragranced/Plain". In the analysis, the last 3 classifications were all considered as unfragranced product launches.

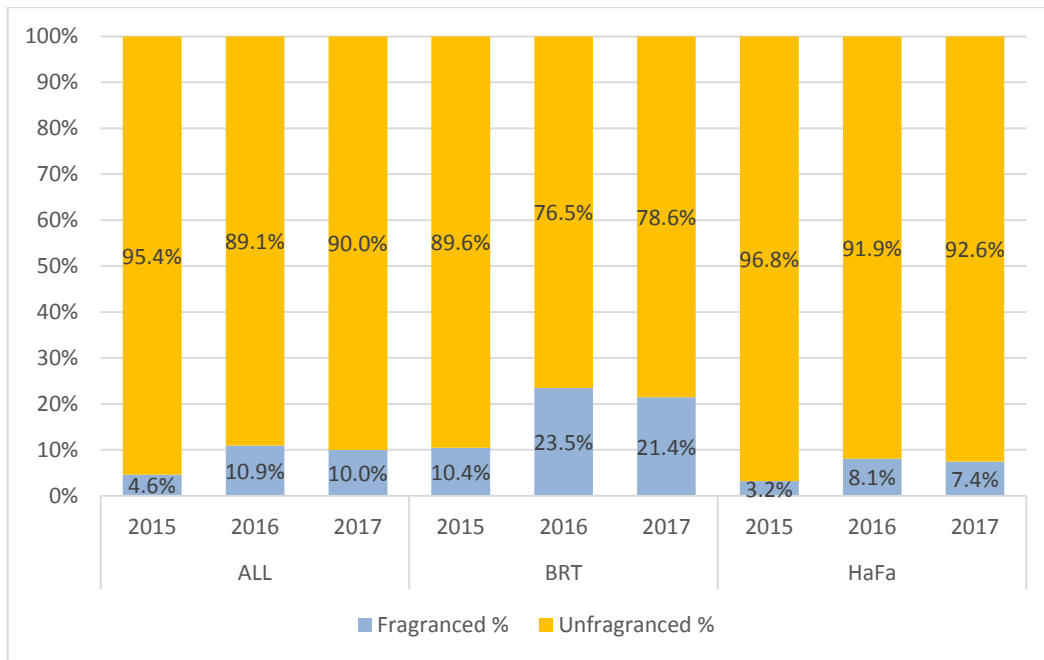


Figure 31. Evolution in fragranced tissue paper products for all consumer tissue product categories (ALL), for bathroom tissue (BRT) and for hankies and facial tissues (HaFa) in Europe, Turkey and Russia combined.

From the data in Figure 31, it is clear that there has been a more than doubling in the percentage of launched products that are fragranced across the entire consumer tissue sector between 2015 and 2016 and that the new higher percentage of product launches has remained into 2017. In terms of total percentage, fragranced products are most significant in the bathroom tissue paper product category (BRT), reaching over 20%.

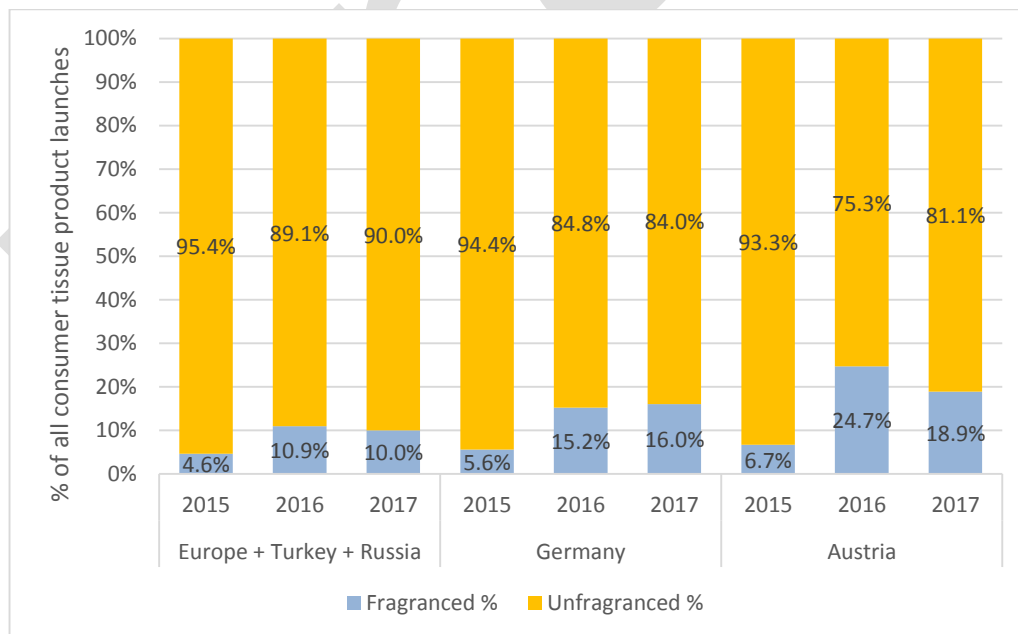


Figure 32. Comparison of the evolution of fragranced product launches as a percentage of total consumer tissue paper product launches during the period 2015-2017 for Europe (left), Germany (middle) and Austria (right).

From the data in Figure 32, it is clear that the increase in launches of fragranced products is even more significant in Germany and Austria.

Although there are a number of pitfalls with interpreting such market data, for example the fact that product launches do not directly equate to product volume on the market and the fact that less than 3 years history is available, it cannot be denied that consumer tissue product producers are innovating and bringing to the market many more fragranced products than before.

Given that many of the existing EU Ecolabel tissue products are for commercial purposes, allowing fragrances to be included in the scope would present an opportunity to improve the visibility of the EU Ecolabel to customers since the market data presented focuses only on consumer tissue paper products.

#### Hazard screening of fragrance formulations used

Industry stakeholders kindly provided 4 confidential Safety Data Sheets (SDSs) for fragrance formulations actually used in the tissue paper industry. A compilation of the different substances found in the four SDSs is provided in the table below, together with their concentration ranges.

Table 41. Assessment of substances used in 4 commercial fragrance formulations that are relevant to the tissue paper industry.

Substance name	Conc.	Aspiration, Acute toxicity	Aquatic Toxicity	Skin irritation
Menthol	25-50%			H315,H317,H319
Eucalyptol	25-50%			
Oxydipropanol	10-25%	?	?	?
Iso E Super	10-25%		H411	H315,H317
ethylene brassylate	10-25%		H411	
d-limonene	2.5-10%	H304	H400,H410	H315,H317
Ethylene brassylate	2.5-10%		H411	
4--tert-butylcyclohexyl acetate	2.5-10%		H411	
Ethylene brassylate	2.5-10%		H411	
2,3-dihydrodicyclopentadien-2/3-yl acetate	2.5-10%		H412	
2-phenylethanol	2.5-10%	H302		H319
ethyl linalool	2.5-10%			H315,H319
benzyl acetate	2.5-10%		H412	
gamma terpinene	<2.5%	H304		
D,L-alpha-Pinen	<2.5%	H304	H400,H410	H315,H317
Beta pinene	<2.5%	H304	H400,H410	H315,H317
Tetrahydrolinalol	<2.5%			H315
2,6-dimethyloct-7-en-2-ol	<2.5%			H319
Habanolide	<2.5%		H410	
2-cyclohexylidene-2-phenylacetone	<2.5%	H302	H411	
2-acetonaphthone	<2.5%		H411	
hexyl acetate	<2.5%		H411	
beta Ionone	<2.5%		H411	
cis-3-hexenyl salicylate	<2.5%		H400,H410	H317
alpha-methyl-1,3-benzodioxole-5-propionaldehyde	<2.5%		H411	H317
Triplal	<2.5%		H412	H315,H317,H319

Karanal	<2.5%	H373	H400,H410	
Linalyl acetate	<2.5%			H315, H319
acetate de terpenyle	<2.5%		H411	
Methyl ester of rosin, partially hydrogenated	<2.5%		H412	
citronellyl acetate	<2.5%		H411	H315
isobornyl acetate	<2.5%		H411	H315
Florocyclene	<2.5%		H411	
2,6-dimethyloct-7-en-2-ol	<2.5%			H319
Terpenyl acetate	<2.5%		H411	H319
Benzophenone	<2.5%	H373	H411	
Verdox	<2.5%		H411	
Methyl 2-naphthyl ether	<2.5%	H302	H411	
Isoamyl salicylate	<2.5%		H411	
Frutalone	<2.5%		H411	H315
B-methyl-3-(1-methylethyl)-benzenepropanol	<2.5%		H411	
Octine carbonate de methyle	<2.5%	H302		H317

The substances in the table have been listed in order of the concentration that they have been used in the 4 SDSs provided, although different concentrations of these same substances could easily occur in different fragrance formulation formulations. Each substance is colour coded based on the nature of the CLP hazards it exhibits:

- Green colours means none of the restricted CLP classifications listed in criterion 4b) are exhibited.
- Orange means that at least one Group 3 restricted CLP classifications listed in criterion 4b) is exhibited.
- Red means that at least one Group 2 restricted CLP classifications listed in criterion 4b) are exhibited.

From the table above, it was clear that no substances with Group 1 hazards were present but that a significant number (12 of 42) exhibited at least one Group 2 hazard. None of the four fragrance formulations was completely free of Group 2 hazard substances although for one of them, the only Group 2 hazard was a single H317 substance at <2.5%. More than three quarters of the substances with restricted CLP hazards (27 of 35) were present in concentrations <2.5%.

#### Presence of hazardous substances in the final product

The presence of hazardous substances in the fragrance formulation is only part of the picture. The real risk posed by any hazardous substance depends on its exposure to the target and the exposure is clearly influenced by the quantity of hazardous substance involved.

Consequently, it is also necessary to consider the dosing rate in order to determine the quantities involved in the final fragranced tissue paper product. Industry stakeholders kindly provided the dosing rates of 15 different fragrance formulations (including 3 of the 4 fragrance formulations for which SDSs were provided) that are used in tissue paper products that are currently on the market.

For confidentiality reasons, the actual dosing rates of each fragrance formulation cannot be revealed but the range of dosing rates varied by more than a factor of 5 (from 0.16 to 1.00% w/w). The average and median values were 0.36% (w/w) and 0.30% (w/w) respectively. It can be understood that in some cases the dosing rate will be influenced



by the concentration of the fragrance formulation that is dosed, with more concentrated fragrance formulations requiring lower dosing rates for a given imparted fragrance on the tissue paper. For this reason, it is recommended that any EU Ecolabel criteria relating to fragrances should target concentration limits of hazardous substances on the final product and not necessarily the CLP classification of fragrance formulations used.

Cross-check of the 4 fragrance formulations against existing EU Ecolabel criteria for tissue paper

The appropriateness of the existing criterion for fragrances in EU Ecolabel tissue paper that are set out in Decision 2009/568/EC can be evaluated by checking how the four fragrances for which SDSs have been provided would be treated. For convenience, the fragrance criterion text from Decision 2009/568/EC is repeated below:

**(f) Softeners, lotions, fragrances and additives of natural origin**

*None of the constituent substances or preparations/mixtures in the softeners, lotions, fragrances and additives of natural origin must meet the classification as hazardous to the environment, sensitising, carcinogenic or mutagenic with risk phrases R42, R43, R45, R46, R50, R51, R52 or R53 (or and combination thereof) in accordance with Council Directive 67/548/EEC or Directive 1999/45/EC of the European Parliament and of the Council and its amendments. Any substances/fragrances that in accordance with Directive 2003/15/EC of the European Parliament and of the Council (7th amendment to Directive 76/768/EEC, Annex III, part I), requires the fragrance to be labelled on a product/packaging, shall not be used in the eco-labelled product (concentration limit 0,01 %).*

*Any ingredient added to the product as a fragrance must have been manufactured, handled and applied in accordance with the code of practice of the International Fragrance Association.*

**Assessment and verification:** *The applicant shall provide a list of softeners, lotions and additives of natural origin that have been added to the tissue product together with a declaration for each added preparation that the criterion is met.*

*A declaration of compliance with each part of this criterion shall be provided to the Competent Body by the fragrance manufacturer.*

It is first necessary to update the risk phrases into hazard classifications which are as follows: R43→H317; R42→H334; R45→H350; R46→H340; R50, R51, R52, R53 and combinations thereof → H400, H410, H411, H412 and H413.

The existing criteria effectively bans any "constituent substance" to be present in the fragrance formulation that are classified as H317, H334, H340, H350, H400, H410, H411, H412 or H413. It is assumed that the term "constituent substance" is synonymous with "intentionally added substances or mixtures". So the criterion, in an indirect way, is asking for the SDS of the fragrance formulation to be checked for the hazards of the ingredients therein.

One objective criticism of the existing criteria would be to ask why substances with a Category 4 aquatic toxicity classification (H413) are excluded in fragrances while substances with a Category 2 carcinogenic classification (H351) are not excluded at all.

Table 42. Results of cross-check of fragrance formulation SDSs with 2009 fragrance criterion

Restricted CLP hazard	SDS 1	SDS 2	SDS 3	SDS 4
H317	<65% (4 subs)	<7.5% (3 subs)	<25% (1 sub)	<2.5% (1 sub)
H334	0%	0%	0%	0%

H340	0%	0%	0%	0%
H350	0%	0%	0%	0%
H400	<15% (3 subs)	<5% (2 subs)	0%	0%
H410	<15% (3 subs)	<7.5% (3 subs)	0%	0%
H411	0%	<32.5% (7 subs)	<52.5% (3 subs)	<35% (11 subs)
H412	0%	<2.5% (1 sub)	0%	<22.5% (3 subs)
H413	0%	0%	0%	0%

The cross-check with the existing criterion in Decision 2009/568/EC revealed a number of interesting points, which are summarised below:

- None of the four commercially available fragrance formulations screened appear to meet the existing EU Ecolabel criteria for Tissue Paper set out in the 2009 Decision
- The most serious Group 1 hazards (H340 and H350) were not an issue at all
- No respiratory sensitisers (H334) were used at all, but skin sensitisers (H317) were present in varying concentrations in all 4 fragrance formulations.
- All fragrance formulations had at least 3 substances that were classified as either Group 2 (H400, H410) and/or Group 3 (H411, H412) hazards for aquatic toxicity.

To conclude, it is doubted whether there is any commercially used fragrance formulations that would meet the existing criterion set out in Decision 2009/568/EC. A review of more SDSs of fragrance formulations would help verify how accurate this conclusion might be.

#### Cross-check of the fragrance formulations against the horizontal CLP criterion

Considering the dosing rates of fragrance formulations 1 to 4 (not published here for confidentiality reasons), the percentage of each classified substance that could potentially remain in the final product was estimated. This involved the conservative assumptions that 100% of the substance dosed remains in the tissue paper product and that if the concentration range of e.g. 25-50% or <2.5% is communicated in the SDS, that the highest possible concentration is assumed.

One substance was actually dosed in high enough quantities to exceed the 0.1% threshold for the horizontal CLP criterion (Eucalyptol, H317 classified and with a maximum of 0.175% w/w of the tissue paper). Consequently, if fragranced tissue is to be included in the scope and mentholated tissue is to be included too, it may be necessary to allow derogation for eucalyptol in the horizontal CLP criterion.

#### Cross-check of the 4 fragrance formulations against existing EU Ecolabel criteria for AHP

The existing criterion for tissue paper was published in 2009. It was considered useful to check the fragrance formulations SDSs against criteria for fragrances in a more recently published product group, namely Absorbent Hygiene Products (AHP), which was published in Decision 2014/763/EU.

The AHP criteria have separate requirements for fragrances and lotions, which are reproduced below for convenience.

#### 6.3. Fragrances

(a) Products marketed as designed and intended for children as well tampons and nursing pads shall be fragrance-free.

(b) Any ingoing substance or mixture added to the product as a fragrance shall be manufactured and handled following the code of practice of the International Fragrance Association (IFRA). The code can be found on IFRA website: <http://www.ifraorg.org>. The recommendations of the IFRA Standards concerning prohibition, restricted use and specified purity criteria for materials shall be followed by the manufacturer.

(c) Any fragrance used shall also comply with Criterion 7 on excluded or limited substances or mixtures regardless of the concentration in the final product.

(d) Fragrances and ingredients of the fragrance mixtures that are identified as established contact allergens of special concern by the Scientific Committee on Consumer Safety as well as the fragrances whose presence, in accordance with Annex III to Regulation (EC) No 1223/2009 of the European Parliament and of the Council, is required to be indicated in the list of ingredients shall not be used. Further the use of nitromusks and polycyclic musks is not allowed.

(e) The use of fragrances shall be indicated on the product packaging. Further, fragrances and/or ingredients of the fragrance mixtures that are identified as established contact allergens in humans by the Scientific Committee on Consumer and are not restricted by Criterion 6.3 (c) and (d) shall additionally be named.

**Assessment and verification:** *The applicant shall provide a declaration of compliance for all the requirements laid down in points (a) to (e), supported by a declaration of the fragrance manufacturer, if appropriate. The list of fragrances used and visual evidence that information has been added to the packaging shall be also provided, when fragrances are used.*

The criteria set out in parts b), c), d) and e) are potentially relevant to any proposals made for tissue paper. Since wet wipes (i.e. including baby wipes) are excluded from the scope, part a) is not considered relevant. The IFRA code of practice and restrictions on substances are highly relevant and should be included in any criterion proposal (i.e. as per 6b). Specific reference to the Cosmetics Regulation should also be made in any criterion proposal for EU Ecolabel tissue paper products (i.e. as per 6d).

The most critical part of the fragrance criterion is actually 6c), specifically where it says "regardless of the concentration in the final product". This text basically means that the fragrance formulation should not contain any substances with Group 1, Group 2 or Group 3 restricted CLP hazards at any concentration. The AHP criterion restricts the same hazards that are defined in Decision 2009/568/EC for fragrances plus many more. So the same conclusion can be reached in that the fragrance criteria could effectively be considered as a de-facto ban on the use of fragrances. The main difference is simply that there is greater certainty that the AHP criteria represents such a de-facto ban due to the greater number of restricted CLP hazards.

#### 6.4. Lotions

(a) Lotions shall not be used in feminine care pads, tampons and nursing pads. The use of lotions in other products shall be indicated on the packaging.

(b) Any lotion used in products other than feminine care pads, tampons and nursing pads shall comply with Criterion 6.3 on fragrances and Criterion 7 on excluded or limited substances or mixtures regardless of their concentration in the final product.

(c) The following substances shall not be used: triclosan, parabens, formaldehyde and formaldehyde releasers.

**Assessment and verification:** *The applicant shall provide a declaration of compliance supported by a declaration of the lotion manufacturer, if appropriate. Visual evidence that information has been added to the packaging shall be also provided, when lotions are used.*

In a similar manner to the fragrance criterion for AHP, criterion a) would not apply to EU Ecolabel tissue paper since baby wipes would be out of the scope, together with all wet wipes in general. Part b is extremely strict and could have the consequence of banning

all lotions used by industry (further information needed about actual SDSs of lotion formulations to conclude on this point). Part c offers some practical restrictions that industry and the supply chain can react to and declare about.

#### Consideration of industry good practice

When attempting to formulate a criterion proposal for fragrances, examples of good practice by industry were requested in order to better understand what type of requirements could be set that screen out and restrict the more hazardous fragrance substances but can actually permit the use of fragrances in the final product.

Some basic good industry practice was stated as requiring that all fragrance formulations supplied are compliant with the Cosmetics Regulation (EC) No 1223/2009 and the IFRA standards for restricted substances.

Specific bans extend to all CMR substances, SVHCs, to nitro musk and polycyclic musk, to lylal, lial and oakmoss extracts and to all substances listed in Annex II of the Cosmetics Regulation. Some requests to suppliers have also specified that the classification of the fragrance formulation itself should not be H317, H334, H400 or H410.

However, with Annex III allergens, instead of a complete ban on their presence, it has instead been requested that they are not present above a sum total 0.3% in the fragrance mixture or a sum total 0.001% in the fragranced tissue product.

No intentional addition of DEP, Estragol, Methyleugenol, halogen organic components,  $\alpha/\beta$ -Asarone, Safrole, Isosafrole, dihydrosafrole and Geranyl nitrile have also been requested from fragrance formulation suppliers.

#### JRC criterion proposal for fragrances and lotions (conditional on fragrances and lotions being included in the scope)

Subject to fragrances being included in the scope for EU Ecolabel, the JRC would propose the following criterion for fragrances.

#### **4k) Fragrance and lotion restrictions**

Any ingoing substance or mixture added to the product as a fragrance shall be manufactured and handled following the code of practice of the International Fragrance Association (IFRA). The code can be found on IFRA website: <http://www.ifraorg.org>. The recommendations of the IFRA Standards concerning prohibition, restricted use and specified purity criteria for materials shall be followed by the fragrance manufacturer.

No fragrance or lotion used shall be dosed in quantities that result in any individual substances with the CLP restricted classifications listed in criterion 4b) being present in quantities exceeding 0.01% (w/w) of the final tissue product. The sum of substances with any particular restricted CLP classifications shall not exceed 0.07% (w/w) of the tissue paper product. The only exception to this restriction shall be the use of Eucalyptol in fragranced tissue, which shall only be permitted in concentrations up to 0.10% (w/w) of the product and not be counted towards the sum of H317 hazardous substances.

No CMR substances or substances that have been identified according to the procedure described in Article 59(1) of Regulation (EC) No 1907/2006 and included in the Candidate List for Substances of Very High Concern shall be added to fragrance or lotion formulations.

In fragrance formulations, no nitro musk, polycyclic musk, lylal, lial and oakmoss extracts, estragol, methyleugenol,  $\alpha/\beta$ -Asarone, Safrole, Isosafrole, dihydrosafrole, geranyl nitrile or substances listed in Annex II to Regulation (EC) No 1223/2009 of the European Parliament and of the Council shall be added.

In lotion formulations, no triclosan, parabens, formaldehyde or formaldehyde releasers shall be added.

Fragrances and ingredients of the fragrance mixtures that are identified as established contact allergens of special concern by the Scientific Committee on Consumer Safety as well as the fragrances whose presence, in accordance with Annex III to Regulation (EC) No 1223/2009 of the European Parliament and of the Council, is restricted, is required to be indicated in the list of ingredients shall not be used.

The use of fragrances shall be indicated on the product packaging. Further, fragrances and/or ingredients of the fragrance mixtures that are identified as established contact allergens in humans by the Scientific Committee on Consumer and are not restricted by Criterion 4b 6.3 (c) and (d) shall additionally be named.

**Assessment and verification:** *the applicant shall provide a list of relevant fragrances and lotions used in the production of EU Ecolabel tissue paper product(s) together with declarations of compliance from the respective suppliers of the fragrance and lotion formulations, relevant Safety Data Sheets and calculations based on dosing rates used by the applicant and showing the estimated concentrations of each individual CLP restricted hazardous substance remaining in the final EU Ecolabel tissue paper product.*

Draft

## 5.5. Criterion 5: Waste Management

Graphic paper/Tissue paper and tissue paper product
<p>All pulp and paper production sites shall have a system in place for the handling of waste arising from the production process and a waste management and minimisation plan that describes the production process and includes information on the following aspects:</p> <ul style="list-style-type: none"> <li>• Procedures in place for waste prevention;</li> <li>• Procedures in place for waste separation, reuse, and recycling;</li> <li>• Procedures in place for the safe handling of hazardous waste;</li> <li>• Continuous improvement objectives and targets relating to the reduction of waste generation and the increase of reuse and recycling rates.</li> </ul> <p><b>Assessment and verification:</b> <i>the applicant shall provide a waste minimisation and management plan for each of the sites concerned and a declaration of compliance with the criterion.</i></p> <p><i>Applicants registered with EMAS and/or certified according to ISO 14001 shall be considered as having fulfilled this criterion if:</i></p> <ul style="list-style-type: none"> <li>- <i>the inclusion of waste management is documented in the EMAS environmental statement for the production site(s), or</i></li> <li>- <i>the inclusion of waste management is sufficiently addressed by the ISO 14001 certification for the production site(s).</i></li> </ul>

Waste Framework Directive (2008/98/EC) provides guidance in planning implementation of a comprehensive waste management scheme. The majority of residues generated during pulp and paper process could be reused, recycled or recovered. Stakeholders were inquired about the feasibility of quantitative requirements for the waste dispose was further discussed with stakeholders.

The BAT 12 specifies (Commission Implementing Decision 2014/687/EU) ways in which solid waste could be minimised by using additional processes and/or making them available to other industries (Table 43).

Table 43: Waste Management BAT (JRC, 2015)

Technique	Description
<b>Pre-treatment of process residues before reuse or recycling</b>	<p><i>Pre-treatment comprises techniques such as:</i></p> <ul style="list-style-type: none"> <li>• dewatering e.g. of sludge, bark or rejects and in some cases drying to enhance reusability before utilisation (e.g. increase calorific value before incineration); or</li> <li>• dewatering to reduce weight and volume for transport. For dewatering belt presses, screw presses, decanter centrifuges or chamber filter presses are used;</li> <li>• crushing/shredding of rejects e.g. from RCF processes and removal of metallic parts, to enhance combustion characteristics before incineration;</li> <li>• biological stabilisation before dewatering, in case agricultural utilisation is foreseen</li> </ul>
<b>Material recovery and recycling of process residues on site</b>	<p><i>Processes for material recovery comprise techniques such as:</i></p> <ul style="list-style-type: none"> <li>• separation of fibres from water streams and recirculation into feed stock;</li> <li>• recovery of chemical additives, coating pigments, etc.;</li> <li>• recovery of cooking chemicals by means of recovery boilers, causticising, etc.</li> </ul>
<b>Energy recovery on- or off-site from wastes with high organic content</b>	<p>Residues from debarking, chipping, screening etc. like bark, fibre sludge or other mainly organic residues are burnt due to their calorific value in incinerators or biomass power plants for energy recovery</p>
<b>External material utilisation</b>	<p><i>Material utilisation of suitable waste from pulp and paper production can be done in other industrial sectors, e.g. by:</i></p> <ul style="list-style-type: none"> <li>• firing in the kilns or mixing with feedstock in cement, ceramics or bricks production (includes also energy recovery);</li> </ul>

Technique	Description
	<ul style="list-style-type: none"> <li>composting paper sludge or land spreading suitable waste fractions in agriculture;</li> <li>use of inorganic waste fractions (sand, stones, grits, ashes, lime) for construction, such as paving, roads, covering layers etc.</li> </ul> <p>The suitability of waste fractions for off-site utilisation is determined by the composition of the waste (e.g. inorganic/mineral content) and the evidence that the foreseen recycling operation does not cause harm to the environment or health</p>
<b>Pre-treatment of waste fraction before disposal</b>	Pre-treatment of waste before disposal comprises measures(dewatering, drying etc.) reducing the weight and volume for transport or disposal

### 5.5.1. Outcomes from and after the 1st AHWG meeting

Generally stakeholders were not in favour of setting a limit on maximum amount of waste disposal. It was observed that the limit would be difficult to administer as the legal definition of waste as well as the availability of disposal and recovery facilities varies depending on the country/region in question. Moreover, one of the main drivers for waste production is wastewater treatment, and a limit on waste generation is therefore in conflict with the need for waste water treatment. Another stakeholder commented that the waste management in the paper industry is already comprehensive due to other criteria, and an additional limit on waste generation will not be beneficial. For example, it was suggested that an environmental management system (EMS) or an ISO standard could be used achieve the same environmental improvements instead of a criterion on waste minimisation, and it would be easier for the CBs to assess and verify. In support of this, one stakeholder suggested that it would be sufficient to implement an on-site waste management system with evidence of continuous improvement but without any limit value.

In regards to setting a higher limit for RCF pulp production, it was noted that integrated RCF mills normally produce more waste that has to be disposed of outside the mill (e.g. deinking sludge, non-fibrous materials, metal, sand, etc.). It was also suggested that residues from production should be recycled as much as possible, which requires thorough separation and usage of non-toxic print. Also, waste streams sent to incineration or agricultural use should be minimized.

### 5.5.2. Outcomes from and after the 2nd AHWG meeting

EMAS or ISO 14001 certifications were proposed to be used as proof of compliance with this criterion since these certification schemes have similar requirements and are audited by third parties.

### 5.5.3. Further research and main changes

There is limited data availability to assess the total amount of waste generated at pulp and paper mills. Most pulp and paper mills already implemented internal rejects handling procedures. In accordance with the Waste Framework Directive (2008/98/EC) term re-use refers only to products or components that are not waste. For example, mill brokes are directly recirculated into the process being considered as fully valuable substrate; on-site incinerated bark residues and sludge remains in form of ashes, etc. Often the flow of internally treated material is not registered quantitatively, and this is one of the reasons of limited data availability to assess the total amount of waste generated at pulp and paper mills (including process rejects, and on – site treatment).



A waste management system is a valuable tool that ensures control over the material flow, and drives to waste prevention, and preparing for reuse, recovery, recycling, and safe disposal.

Key prevention activities are highlighted as;

- minimising the amount of fibre rejects having to be removed from the process;
- suitable handling and recovery to avoid having to discard coating chemicals;
- using good quality make-up chemicals to reduce the amount of material having to be bled out from a kraft or sulphite recovery system; and
- preventing fibre losses and fibre rejects from entering the effluent.

Some of the recovery options for paper mill residues are as follows;

- **Industrial** - bricks, cement, roads, mining, iron and steel;
- **Agricultural** – land spreading; and
- **Composting.**

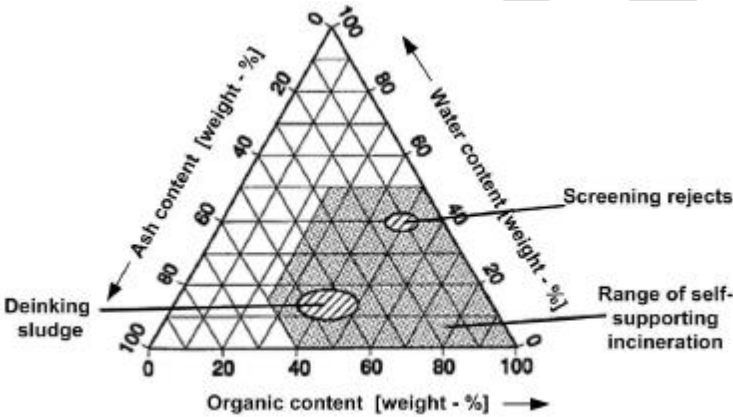


Figure 33. Fuel triangle for waste and residues from the paper industry (JRC, 2015)

As demonstrated in Figure 33 incineration can be self-supporting (with no additional energy input) for high calorific value rejects and deinking sludge with a high ash content. Effluent sludge can also be incinerated, but unless it has been dried to >40% dry solids, the net energy production may be negative.

Table 44. Example Solid Waste from European Paper Mills

Plant	Ortviken, Sweden (SCA, 2016)	Skogn, Norway (Norske Skog, 2015)	Golbey, France (Norske Skog, 2015)	Saugbrugs, Norway (Norske Skog, 2015)	Hylte, Sweden (Stora Enso, 2015b)	Nymolla, Sweden (Stora Enso, 2013)	Chapelle Darblay, France (UPM, 2014b)
<b>Pulp Process</b>	Integrated thermos-mechanical	Mechanical pulp, DNP	Mechanical pulp, recovered fibre	Mechanical pulp	De-inked pulp	Integrated sulphite	De-inked pulp
<b>Paper Type</b>	Newsprint, LWC	Newsprint	Newsprint	Super Calendared	Newspaper	Copy Paper	Newspaper
<b>Production (ktons)</b>	843	450	537	429	480	429	380
<b>Solid Waste to landfill (kg/t)</b>	0.7	16.85	2.4	19.56	82.9	0.31	20

Example data on generation of waste from a few of the larger European pulp and paper mills, namely UPM, SCA, Norske Skog, Stora Enso, are presented in Table 44. These figures show the vast differences, often up to ten times, even between mills that use the same pulp process.

One of the limiting factors to implement a comprehensive waste management strategy within pulp and paper mill is the availability of possible routes for waste treatment either internally or externally. Although it is possible to achieve a zero waste to landfill target, this requires access to end markets which should be developed over time and will vary depending on local infrastructure and demand. Therefore no specific waste treatment routes are required under revised criterion proposal. The wording of the criterion was adapted to reflect the main objective which is to ensure the implementation of a long-term waste management strategy.

The feedback received suggested **not to strengthen the requirement** with an introduction of quantitative threshold for waste. For recycled fibre, the resulting waste during the process of stock preparation of recycled fibres is mainly depending on the waste paper grades and the contamination. The rejects in integrated RCF-mills is normally waste, that has to be deposited outside the mill (deinking sludge, non-fibrous materials (plastic, metal, sand)). The amount varies depending on the used grade of waste paper. It was considered that the implementation of a waste management system would be sufficient.

During the development of the EU Ecolabel criteria, questions arose about the potential overlap between the EU Ecolabel criteria and the Eco-management Audit Scheme (EMAS).

EMAS allows organisations to evaluate, report, and improve their environmental performance. The companies that wish to participate in EMAS should develop an environmental management system (EMAS) and commit to continuously improving their environmental performance. They also must regularly publish an environmental statement highlighting their progress. EMAS registration ensures that the EMAS implemented by an organisation is verified by a third party, and focusses on the actions under the direct control of the company as well as actions on which it has a considerable influence. EMAS does not set targets or benchmarks for environmental goals; however, Sectoral Reference Documents are available or under development for certain economic sectors, e.g. tourism, which can be used as general guidelines. These documents contain the description of best practices for improving environmental performance, as well as indicators and benchmarks to monitor the progress achieved. They aim to provide guidance and inspiration to companies on how to improve their environmental performance. EMAS-registered organisations from the sectors where Sectoral Reference Documents are available must take these documents into account, but there is no obligation to follow the best practices or achieve any benchmark.

EMAS registration proves that a company is committed to manage and improve its environmental performance by using a structured framework for considering its most relevant environmental impacts, monitoring, reporting publicly and continuously improving its environmental performance, and, potentially, achieving the best performance thanks to the voluntary implementation of best practices.

EU Ecolabel and EMAS when used together are complementary: using the EU Ecolabel as a tool to communicate to the market that a certain service or product achieves a very high environmental performance and EMAS as a process to further improve environmental performance at an organisational level. ISO 14001 certification could also be used as equivalent to achieve objectives set by EMAS.

The present proposal for the Criterion 5 (Waste management) is an example of how the two voluntary frameworks can counterpart each other. Additional specification has been added under criterion assessment and verification in order to ensure that the subject matter of Criterion 5 is address by the EMAS.

## 5.6. Criterion 6: Fitness for use (graphic paper)

To simplify the criterion and reduce the administrative burdens, the reference to the large list of possible test methods is proposed to be withdrawn. The technical specifications need to accommodate product final destination, thus should apply considering each case individually. The manufacturer instead is expected to demonstrate the product conformity with normative requirements. No further changes are proposed for graphic paper product group.

Proposed Criteria
The paper product shall be suitable for its purpose.
<i>Assessment and verification: the applicant shall provide appropriate documentation demonstrating compliance with the scope of the criteria. The product shall fulfil the requirements for permanence in accordance with applicable standards. The producers shall guarantee the fitness for use of their products providing appropriate documentation demonstrating the paper quality, in accordance with the standard EN ISO/IEC 17050-1:2004, which provides general criteria for suppliers' declaration of conformity with normative documents.</i>

### 5.6.1. Rationales for the revised proposal

Paper products are subject to a series of technical requirements that vary as a function of their intended purpose and quality level. A few of the main technical/quality features are described below:

- Paper surface: A quality parameter which affects subsequent performance characteristics. Each paper is double-sided, i.e. the side which during production was in contact with the wire is called the wire side (bottom side). This side also bears the wire mark and is slightly more uneven. In the case of coloured papers, this side tends to be darker as pigments are deposited on the bottom. The upper side is called the felt side or the right side, as it is the first to come into contact with the felt. It is smoother and generally brighter as fibres can be freely arranged on this side. It also contains more fillers.

Surface smoothness (roughness) - both obtained in the machine and during glazing - a parameter that is relevant is for printing quality. The roughness of paper or board is assessed by measuring the flow of air which passes between the edge of a measuring head and the surface of the material under specified conditions

- Clarity, opacity, and transparency: Clarity indicates if the paper is coarsely ground or finely ground. Opacity is related to paper thickness and for a given thickness, a high filler content has a direct effect on this characteristic. Transparency is an undesirable characteristic for many paper qualities, with the notable exception of tracing paper or paper for detailed drawings.
- Sizing is especially important for writing and drawing papers, but also for other paper grades. The role of paper sizing is to bind fibres and filling agents. It must be uniform and dosed so that when ink or drawing ink is applied, the lines are clean and there is no bleed. Insufficient, poor sizing can be recognized by visible jagged lines often bleeding through to other side of paper or by picking (loose fibres on the paper surface).
- Strength: Mechanical properties of paper are defined by a series of parameters such as: breaking length, tensile strength, elongation, tearing index, folding resistance and stiffness.
- Grammage and thickness: Grammage is defined as the weight per square meter and expressed in gsm ( $\text{g/m}^2$ ). Paper thickness, measured in microns, defines if the paper is a compact paper with a lot of fillers or a high volume paper.

- Ageing of paper (yellowing): Resistance to ageing of different paper grades depends primarily on the quality of raw materials. In the case of products with a short life cycle, such as newsprint, packaging etc., this property is not very important.
- Brightness: Measures the visual parameters of a paper sheet: the amount of reflectance of a specific wavelength of blue light. Paper brightness affects the images printed on the paper, especially the vibrancy of the colours.

Paper products are essentially single use in nature. Paper quality requirements are directly related to the final product fitness for use requirements. It is therefore very complex to fix any common set of technical requirements in EU Ecolabel criteria that in the market reality are dynamic, reflecting the multiple different uses for paper products and related consumer expectations that is currently the case.

Considering the existing markets for Copying and Graphic Paper and for Newsprint Paper and the standard practice that is already prevalent in them, it is considered of little added value to specify fitness for use requirements in EU Ecolabel criteria.

Tissue Paper is a different case because there is a hygiene issue which can result in some products being treated with biocidal products to impart a final disinfective effect to the product. In order to avoid this occurring in EU Ecolabel Tissue Paper, there is a requirement for testing of the Tissue Product in accordance with EN 1104.

Again with Tissue Paper, there is a risk exposure issue for dyes and optical brighteners (where these are used) when paper is used in applications where it will come into contact with food. For this reason, compliance with EN 646/648 is required.

It should be noted that these requirements for Tissue Paper were already set out in the existing criteria but have simply been moved to a different criterion.

### **5.6.2. Outcomes from and after the 1<sup>st</sup> AHWG meeting**

Stakeholders in general opposed the inclusion of EN 12281 and EN 12858 standards in the criterion on fitness for use, being perceived as of minor relevance. Additionally, a large number of paper types that can be Ecolabelled under copying and graphic papers are currently not covered by the scope of the standards (e.g. coated papers, offset papers, preprint papers, inkjet papers, etc.). It was commented that a clear distinction should be made between the "product definition and characteristics" and "fitness for use". The assessment of "fitness for use" and the quality of the product varies from one market to other, and the quality and fitness for use of paper would be controlled by the consumer and therefore the market itself. A stakeholder noted that this can be assessed independently of the specific technical specifications of a product (e.g. strength, absorption, etc.).

Some stakeholders agreed that EN 646, 648 and 1104 can be considered under this criterion, but these should be clearly marked as "safe use requirement" criterion under the "fitness for use" criterion. However, another stakeholder argued that EN 646/648 are only applicable to papers that could have food and skin contact, and should not be included in this criterion, as these would already be covered by other specific food and safety regulations outside the EU Ecolabel.

One stakeholder commented that, almost all paper producers have internal procedures to manage complaints regarding their products under their ISO 9001 Quality Management System, which can substitute the requirements of this criterion, or be used as the assessment and verification mechanism.

### **5.6.3. Outcomes from and after the 2nd AHWG meeting**

Following stakeholders' feedback, there are a number of possible standards that could be used but some will be relevant for one type of paper product and others more relevant

for another paper product. A concrete list of standard was therefore proposed not to be mentioned in the criteria text.

#### **5.6.4. Further research and main changes**

ISO/IEC 17050-1:2004 specifies general requirements for a supplier's declaration of conformity in cases where it is desirable, or necessary, that conformity of an object to the specified requirements be attested, irrespective of the sector involved.

The assessment of "fitness for use" and common quality of the product differs along markets. Fitness for use is definitely not linked with specific technical criteria (strength, absorption...) but with market conditions, regulated by specific quality specifications (internal) and/or by general technical specifications which are the core of the contract between producers and distributors. The verification for this criterion is made by controlling the compliance to internal quality controls, to external (tender/technical/...) specifications, and checking the grounds for claim.

A paper that is not fit to be used will not be chosen by consumers and anticipating product applications that might not occur is not feasible. Moreover almost all paper producers have internal procedures to manage the complaints on their products under their ISO 9001 Quality Management System.

Following stakeholder's feedback there is no further specification needed.

## 5.7. Criterion 6: Final product requirements (tissue paper and tissue paper product)

Tissue paper and tissue paper product
<p><b>Criterion 6(a) Dyes and optical brighteners</b></p> <p>For dyed tissue paper, good fastness (level 4 or higher) shall be demonstrated according to the short procedure defined in EN 646.</p> <p>For tissue paper treated with optical brightening agents, good fastness (level 4 or higher) shall be demonstrated according to the short procedure defined in EN 648.</p> <p><i>Assessment and verification:</i> The applicant shall provide a declaration stating if dyes or optical brightening agents have been used. Compliance with these requirements shall be supported by relevant test reports in accordance with standards EN 646 and/or EN 648, as appropriate.</p>
<p><b>Criterion 6(b) Slimicides and antimicrobial substances</b></p> <p>Samples of the final tissue paper product shall not result in the growth inhibition of micro-organisms according to EN 1104.</p> <p><i>Assessment and verification:</i> The applicant shall provide a declaration of compliance, supported by relevant test reports in accordance with EN 1104.</p>
<p><b>Criterion 6(c) Product safety</b></p> <p>Any final tissue paper product that contains recycled fibre shall not contain any of the following hazardous substances above the specified limits and according to the specified test standards:</p> <ul style="list-style-type: none"><li>• Formaldehyde: 1 mg/dm<sup>2</sup> according to EN 1541 (cold water extraction).</li><li>• Glyoxal: 1.5 mg/dm<sup>2</sup> according to DIN 54603.</li><li>• PCP: 2 mg/kg according to EN ISO 15320 (cold water extraction).</li></ul> <p><i>Assessment and verification:</i> The applicant shall provide a declaration of compliance, supported by relevant test reports in accordance with the respective standards.</p>
<p><b>Criterion 6(d) Fitness for use</b></p> <p>The EU Ecolabel tissue paper product needs to meet all respective requirements of the country where it is placed on the market. For structured tissue paper the absorbency of the individual base sheet of tissue paper before conversion shall be equal to or higher than 10.0 g water/g tissue paper.</p> <p><i>Assessment and verification:</i> the applicant shall provide appropriate documentation demonstrating compliance with the criteria.</p> <p><i>The producers shall guarantee the fitness for use of their products providing appropriate documentation demonstrating the paper quality, in accordance with the standard EN ISO/IEC 17050-1:2004, which provides general criteria for suppliers' declaration of conformity with normative documents.</i></p> <p><i>For structured tissue paper the applicant shall provide a declaration of compliance with the requirement, supported by relevant test report in accordance with EN ISO 12625-8:2010.</i></p>

### 5.7.1. Outcomes from and after the technical meeting

The frequency of EN 1104, EN 646 and EN 648 was indicated to be required once per licensed product – unless there was a change in the production process. The testing for residual formaldehyde, PCP and Glyoxal was specified to be required when recycled paper is used in the process.

The removal of the quite meaningless criterion that stated "The product shall be fit for use", was supported. Stakeholders were still not sure about the requirement for structural tissue and repeated their request for this to be inserted into the list of definitions instead.



## 5.7.2. Further research and main changes

There is a wide range of products that are made from tissue paper, including toilet paper, wipes, kitchen towels, handkerchiefs, facial tissues, household towels, napkins, products for industrial use, etc. These commodities must be suitable for their intended purpose ensured by its functionality and safety.

Performance tests include: absorbency, mechanical resistance, breathability, elasticity, integrity, adhesivity, colourfastness, fibre loss, seal testing, etc. Setting an exhaustive list of technical requirements that are related to the product type and functionality is hardly feasible.

Nevertheless, one of the key aspects that should be addressed under fitness for use requirements is product safety. This is understood to form part of the manufacturers' good practice. In fact, following the prescription of BfR (Bundesinstitute fue Risikobewertung), based on responsible manufacturing practices and their duty of care, manufacturers and those responsible for bringing these commodities onto the market take full responsibility for ensuring that they are not harmful to health<sup>65</sup>. Multi-purpose use products that are not specifically intended for contact with foodstuffs (but might be used for this purpose), and characterised by the absence of significant migration, and the low exposure of the consumers are covered by the specific policy statement for 'Tissue paper kitchen towels and napkins'<sup>66</sup>.

The guideline recommends specifications that tissue paper kitchen towels and napkins should comply with in order to achieve safety of use for the consumer, in light of the general principles of the General Product Safety Directive 2001/95/EC. This assumes that tissue is only occasionally used in contact with food, and when it occurs it is only for a short time. There is also no significant migration of substances from the tissue into the food, as the main purpose of tissue is absorption.

The "Tissue Guideline" is not mandatory and therefore not legally binding, but it can be used as a reference document by those countries that do not have a national legislation for paper. Skin safety shall be considered for tissue that comes into direct contact with the body i.e. handkerchief or toilet paper. There is no European legislation or recommendation for sanitary papers<sup>67</sup>.

Directly or indirectly, tissue and hygiene products are subject to national and international standards, institutional guidelines or industry standards. It is understood that a part of best practice is to be equipped with management systems that comply with existing international standards regarding product quality, safety and legality (i.e. Consumer Products standard). In this sense, in Germany, the BfR has published "Guidelines for Evaluating Sanitary Papers. The guidelines include a list of raw materials and a number of criteria for the finished product (limit values and test methods).

ISO 12625 is considered when analysing fitness for use for tissue paper and tissue paper product. The Standard consists of the following parts:

- Part 1: General guidance on terms;
- Part 3: Determination of thickness, bulking thickness, apparent bulk density and bulk
- Part 4: Determination of tensile strength, stretch at break and tensile energy absorption;
- Part 5: Determination of wet tensile strength;
- Part 6: Determination of grammage;

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<sup>65</sup>Bundesgesundheitsbl. 39 (1996) 123, which supersedes "Criteria for Evaluating Sanitary papers"

<sup>66</sup>Policy statement concerning tissue paper kitchen towels and napkins version 1 –22.09.2004. Committee of experts on materials coming into contact with food.

<sup>67</sup>Charlotte Walldal, Ch. Product safety for tissue products: the European perspective. PERINI Journal,29 Available at: <http://www.perinijournal.it/Items/en-US/Articoli/PJL-29/Product-safety-for-tissue-products-the-European-perspective>



- Part 7: Determination of optical properties — Measurement of brightness and colour with D65/10° (outdoor daylight);
- Part 8: Water-absorption time and water-absorption capacity; basket-immersion test method;
- Part 9: Determination of ball burst strength;
- Part 11: Determination of wet ball burst strength;
- Part 12: Determination of tensile strength of perforated lines — Calculation of perforation efficiency;
- Part 15 Determination of optical properties — Measurement of brightness and colour with C/2° (indoor daylight) illuminant;
- Part 16 Determination of optical properties — Opacity (paper backing) — Diffuse reflectance method

ISO 12625 makes reference to ISO 15755 as standard recommended for the detection of impurities and contraries in tissue paper and tissue products.

The title of criterion is proposed to be change from Fitness for use to Final product requirements that accurately reflects the intention of the criterion.

### **5.7.2.1 Product safety**

The requirements stated in former criterion 5 (Product safety) are proposed to be integrated under criterion 6 – more specifically as criteria 6a), 6b) and 6c). The continued relevance of these requirements is due to the fact that some multifunctional tissue paper products e.g. kitchen towels and napkins may be put in contact with food by end users. Even considering limited migration capacity of certain functional chemical additives from tissue into food<sup>68</sup>, it is considered crucial to ensure that the EU Ecolabel product is fulfilling the safety requirements.

#### Fastness of dyes and optical brighteners (EN 646 and EN 648)

One of the final product quality requirements is related to colour fastness for dyed papers as measured according to EN 646. The current standard was published in 2006 and is currently under revision. The aim of the text in this section is to provide some additional insight into the details of the standard in order to justify why a more specific text has been introduced in the revised EU Ecolabel criteria proposals and to serve as a basis for some informed stakeholder discussion.

Looking more closely at the 2006 version of the EN 646 standard, two procedures are defined:

- Procedure A for long duration contact (e.g. food packaging).
- Procedure B for short duration contact (e.g. napkins and kitchen towel).

The main difference between the procedures is the length of contact time with the liquid (i.e. 24 hours or 10 minutes). Considering the scope of the Tissue Paper products, it is clear that only procedure B is relevant. However, regardless of whether procedure A or B is followed, the standard specifies 5 different test fluids that can be used:

1. Distilled or deionised water
2. Aqueous acetic acid (3.0% m/v)
3. Saliva simulant (5g/l – with a defined salt composition and pH)
4. Iso-octane (2,2,4-trimethylpentane)
5. Rectified olive oil (with defined characteristics such as iodine value, acidity etc.).

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<sup>68</sup>Migration studies on tissues in contact with food”, committee of experts on materials coming into contact with food, RD 6.3D/1-39#1; and “Test report on presence of fluorescent whitening agents in two samples”, Committee of experts on materials coming into contact with food, RD 6.3D/2-39#1.

After completion of the test, the sample papers can either be:

Compared against a blank paper to give a yes/no result for bleeding, or

Compared against a 5-grade grey scale based on EN 20105 A03 (same as ISO 105-A03) where results of 1 (poor fastness) to 5 (good fastness) can be reported.

For food packaging, it is only necessary for the results for the inner side of the paper to be reported but for tissue paper, results should be reported for both sides (if different).

For tissue paper treated with optical brightening agents, good fastness (level 4 or higher) shall be demonstrated according to the short procedure defined in EN 648.

Table 45 Indications from the latest version of the draft EN 646:2017 reveal that some potentially significant changes as summarised in red in the table below:

Parameter	EN 646:2006	prEN 646:2017
Test fluids	Distilled or deionised water Aqueous acetic acid (3.0% m/v) Saliva simulant Iso-octane Rectified olive oil	Distilled or deionised water Aqueous acetic acid (3.0% m/v) Alkaline salt solution Iso-octane Vegetable oil
Procedures	A: 24h at 23°C (long duration) C: 10min at 23°C (short duration)	A: 24h at 23°C (long duration) B: 4h at 23°C (medium duration) C: 10min at 23°C (short duration) D.1: 30min at 120°C in oil (hot contact-fatty food) D.2: 30min at 90°C in water (hot contact-moist food)

The only other major change is the introduction of an annex explaining how to deal with possible migration of dyes from papers where one side is dyed and the other not. However, this should be most relevant to food packaging.

The situation with EN 648 is analogous to that of EN 646. Both standards can generate results in terms of fastness grading (1 to 5) although the comparative method of assessing fastness is different. In EN 646 a grey-scale based on ISO 105-A03 is used while in EN 648, comparison is made under a UV lamp with control samples stained with a standard solution of fluorescent whitening agent.

#### Slimicides and antimicrobial substances (EN 1104)

The aim of this standard is to determine if the paper releases any anti-microbial substances. This test can guarantee against the deliberate or accidental impregnation of the paper substrate with anti-microbial substances. Basically samples of paper are placed in a petri dish and incubated with a defined bacterial colony. The positive control sample is a piece of similar paper that has previously been impregnated with penicillin and the negative control is a petri dish with no paper sample at all. All results are considered in the context of the control samples and no clear definition of what an anti-microbial effect actually is (in terms of inhibition zones) is defined.

The new draft standard (prEN 1104.2017) attempts to better define minimum requirements for an inhibition zone to be considered as a sufficient anti-microbial effect (i.e. >2mm in at least 2 of 9 replicate samples). The Annex also helpfully describes, with images, the cases where results reflect: (i) modified microbial growth at the edge of the test piece; (ii) absence of an inhibition zone at the edge of the test piece due to a microbial contaminant; (iii) presence of an inhibition zone at the edge of the test piece due to a microbial contaminant and other cases.

Product safety (EN 1541, DIN 54603 and EN ISO 15320)

The aim of these requirements is to provide control of the potential occurrence of certain hazardous substances that can be found in tissue paper products. The requirement refers to any tissue paper product that contains recycled fibre.

EN 1541 - Formaldehyde

The most recent version of EN 1541 was published in 2001. The actual detection limit of the method is reported as mg/kg (1mg/kg to be precise). When translated into units of mg/dm<sup>2</sup>, the detection limit would be 0.001 mg/dm<sup>2</sup> if the grammage of the paper was 100 g/m<sup>2</sup>. As the grammage of the paper goes down, the detection limit (on a per dm<sup>2</sup> basis) goes up. The standard quite clearly states in the scope that the hot water extraction method (i.e. EN 647) is only intended for paper and board materials intended for boiling and hot filtering purposes.

EN 15320 - PCP

The most recent version of the EN ISO 15320 standard was published in 2011. The detection limit is 0.05 mg PCP/kg. The test method was originally intended only for food contact paper and board but is not widely applied to other types of paper and board. The cold extraction involves 24 hours at 23°C while the hot extraction requires 2 hours at 80°C. In Annex A, results of 2 samples that were subjected to both the hot and the cold extraction produced similar mean results.

Structured tissue paper minimum water absorbance

Stakeholders from the tissue industry have made a case for the inclusion of tissue paper that is produced using higher specific energy consumption TAD (Through Air Drying) or hybrid airlaid technology.

These processes consume more energy because a significant part of the water is removed by passing hot air through a sheet on a dryer instead of simply by pressing the sheet during dewatering operations. However, because compression has been avoided, the tissue paper formed has a greater bulk and water absorbance because the fibres are more loosely packed.

Better absorbance products are especially important for kitchen towel and hand towels in public toilets where both the absorbance capacity and speed will influence how much tissue paper is actually consumed by the user for a single use.

The absorbance capacity can be expressed as g/m<sup>2</sup> or g/g. In particular the latter metric is a use example of the "efficiency of fibre use" for a given performance. Since it is possible to alter the grammage (g/m<sup>2</sup>) of tissue paper products by combining identical or different plies, a fairer way to examine performance is to assess the performance of the individual ply or base-sheet.

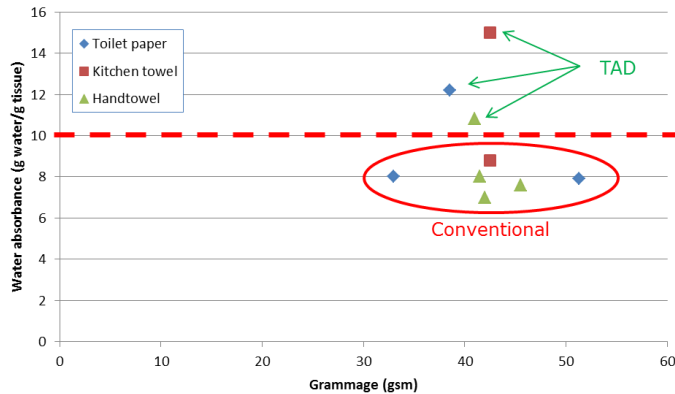


Figure 34 Illustration of why 10g/g is a reasonable performance distinction between TAD and conventional tissue base-sheets.

Based on some limited data kindly provided by industry stakeholders, it is clear to see that there does seem to be maximum achievable water absorbance with conventional technology of around 9 g/g whereas TAD can comfortably exceed 10g/g. Consequently a performance require of a minimum of 10g/g water absorbance could be a useful prerequisite for any labelling of tissue products that are allowed a higher specific energy consumption because they use TAD technology.

Draft

## 5.8 Criterion 7: Information on the packaging (graphic paper)

Graphic paper
The following information shall appear on the product packaging: "Please print double sided" (applicable for paper for office printing purposes) "Please collect used paper for recycling"
<i>Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, supported by an image of the product packaging bearing the information required.</i>

### Rationales for the revised proposal

The consumers should be encouraged to follow the waste hierarchy and to maximise the benefits of paper recycling.

### Outcomes from and after the 1<sup>st</sup> and 2<sup>nd</sup> AHWG meeting

Most of the stakeholders were not in favour of any change in the existing criterion. It was argued that the proposed text is too long and there is no space for the text in the packaging as the packaging features on average 7 languages; sometimes up to 13 languages. For this reason the optional text 'Please print double sided' is proposed for graphic paper designated for office printing purposes.

It was also argued that the language of the English text needs to be simple enough for non-English speakers to understand, as this message is often not translated into other languages.

## 5.9 Criterion 7 / Criterion 8: Information appearing on the EU Ecolabel

Graphic paper (Criterion 8)/ Tissue paper and tissue paper product (Criterion 7)
The applicant shall follow the instructions on how to properly use the EU Ecolabel logo provided in the EU Ecolabel Logo Guidelines: <a href="http://ec.europa.eu/environment/ecolabel/documents/logo_guidelines.pdf">http://ec.europa.eu/environment/ecolabel/documents/logo_guidelines.pdf</a> If the optional label with text box is used, it shall contain the 3 following statements: — Low emissions to air and water during production — Low energy use during production — Sustainably sourced fibres / xx% recycled fibres (as appropriate)
<i>Assessment and verification: the applicant shall provide a declaration of compliance with this criterion, supported by an image of the product packaging that clearly shows the label, the registration/license number and, as relevant, the statements that can be displayed together with the label.</i>

### Rationales for the revised proposal

The rationale is that this provides a more accurate reflection of the key issues addressed in line with the extended range of technical criteria proposed.

The key change introduced is to harmonise the requirement between tissue paper and tissue paper product and graphic paper. It should be clearly stated that because of the limited space available the use of label with text box is optional.

### **Outcomes from and after the 1<sup>st</sup> and 2<sup>nd</sup> AHWG meeting**

The stakeholders were generally not in favour of the proposed changes, and wanted the criteria to remain optional, mainly due to the space constraints in the product packaging. One stakeholder remarked that licence holders rarely use the text-box to provide this information. It was suggested that for readability and credibility, a maximum of 2 to 3 general claims could be provided. The purpose of this information should be to highlight the specific environmental performance of the Ecolabelled product, rather than to provide a list of what the product can generally achieve.

Regarding the choice of which of the three statements to keep, one stakeholder suggested the following statements:

- Low emissions to air and water during production
- Low energy use during production
- Sustainably sourced fibres / xx% recycled fibres (as appropriate)

Furthermore, to distinguish EU Ecolabel products from the other products on the market, it could be indicated that banned or limited substances have been excluded/reduced. It was also commented that the statement indicating the minimum percentage of recycled fibres and certified fibres is not feasible, as the proposed statement would not be in accordance with the FSC and PEFC certifications standards when the products are also PEFC/FSC certified, because they measure slightly different criteria. Moreover, for the non-certified products, consumers might misinterpret the statement as a forest certification claim.

Several stakeholders wanted it to be stated the two statements stated in the criterion 6 would be on an "and/or" basis instead of an "and" basis. The requirement to send a sample of packaging to Competent Bodies was requested to be modified to simply providing an appropriate image or images of the packaging in electronic format. An exemption for certain information requirements in B2B products was requested because of the very limited spaces available for written information.

Regarding the list of statements that could be used with the label, one stakeholder felt that the use of terms "sustainable fibres" and "virgin fibres" could potentially confuse customers. A split opinion was noted about any possible reference to recycled fibres when relevant.

Finally, regarding the criteria validity period, 6 years was generally considered as the minimum acceptable period. Some preference for the validity to align with the BREF process was expressed, although this would mean going to 8 years or beyond.

## 6. Impact of changes to criteria

The majority of the existing criteria are still relevant and they are proposed to be kept with minor or major corrections, such as adjusted thresholds that better highlight the best performers on the market. Additionally, some criteria are proposed to be deleted, added or restructured in order to harmonize the different product group criteria.

The main changes proposed compared to the existing criteria are:

### 1. Changes in the name of the product group, scope and definitions.

- Product groups under revision are proposed to be addressed under a common Commission Decision with two Annexes that address corresponding product groups. The product group graphic paper accommodates merging of copying and graphic paper and newsprint paper. The type of products covered by the merged criteria is not intended to change significantly.
- The existing distinction between copying and graphic paper and newsprint paper (based on grammage only) is proposed to be removed – creating a single definition for these two product groups that is harmonised with industry practice that links to functionality of the paper.
- For tissue paper, following the feedback received the definition of product group has been modified to align with the ISO 12625 standard. Structural paper is proposed to be clearly included in the scope (definition added).
  - The list of definitions has been amplified for the document clarity (Article 3)

### 2. Changes in the reference values and criterion formulation under criterion 1.

- For Criterion 1(a), the revised proposal contains changes in the emission reference values from one side, and the reduction of the maximum allowed score for individual emissions (from 1.5 to 1.3), from the other. When the compound effects of moderate reductions to individual emission reference values are considered, they are always greater. For example for kraft pulp mill, following data analysed the number of mills that complies with the proposed criterion 1(a) is reduced approximately by 27%. In total, the production of mills that comply with the criterion 1(a) was reduced by 33%.
- For Criterion 1(b) the reference value have been updated and reduced. The AOX emission level equal to or lower than proposed 0.17 kg AOX/ADt corresponds to approx. 70 % of bleached kraft pulp produced. For tissue paper, respecting the way in which tissue paper manufacturing is organised it is proposed to refer to the weighted average of AOX emission from each pulp in a mix.
- For Criterion 1(c) the reference values for CO<sub>2</sub> emission are harmonised with the irregular energy intensity of different pulping processes. For tissue paper it is propose to refer to the final product, considering that the industry relies mainly on market pulp and paper manufacturing is the main source of CO<sub>2</sub> emission. Specific CO<sub>2</sub> emission reference value has been added for structural paper.

### 3. Changes in the reporting of energy consumption (Criterion 2), and changes in reference values

The alternative methodology on reporting the final score for criterion 2 (energy consumption) was proposed. Addressing score for fuel and electricity consumption together (as a sum up) would maintain flexibility in the scoring system and could accommodate different scenarios. The ambition level of the criterion is increased by reducing the final score flexibility by 25%. Reference values have been updated.



Additionally for tissue paper product manufacturing, specific reference values for structural paper have been added.

#### 4. Criterion 3: Fibres – conserving resources, sustainable forest management

Different approaches to fibre sourcing criteria have previously been set out for copying and graphic paper, tissue paper and newsprint paper in Decisions 2011/332/EU, 2009/568/EC and 2012/448/EU respectively. The major difference was between newsprint paper (minimum recycled fibre content of 70%) and copying and graphic paper and in tissue paper (minimum 50% of virgin fibre content as sustainable certified material).

It is proposed to have a single approach for graphic (i.e. newsprint and copying and graphic paper) and tissue paper. The common approach sets and ambition level of 70% for any particular combination of sustainable certified virgin fibre and recycled fibre. This approach also aligns with the ambition level of other EU Ecolabel products like furniture and wooden-, cork- and bamboo-based floor coverings and also with current labelling rules for FSC and PEFC.

For copying and graphic paper and tissue paper products, the increase from 50% to 70% means that, for products with no recycled content at least, there is a need to allocate up to 40% more certified sustainable virgin fibres than previously. The input of all materials to the process must be covered by suitable Chain of Custody certificates although inputs of Paper for Recycling may alternatively be covered only by EN 643 compliant delivery notes. This increased ambition level should not be an issue for non-integrated paper producers or even integrated paper producers based in countries with high coverage of certified forest areas, but could be a real challenge for integrated producers in southern European countries, especially Portugal and Spain.

#### 5. Criterion 4: Restricted hazardous substances and mixtures.

The horizontal hazardous substance criteria relating to the REACH Candidate List and CLP classifications have been reworked for graphic paper based on input from stakeholders from the chemicals industry and CBs with experience trying to implement the chemical criteria. It was considered necessary to narrow the scope of the horizontal criterion to only process and functional chemicals used in the paper machine (also during conversion in the case of tissue paper products). The narrowing of the scope was justified because the chemicals used during pulp production are either going to be exempted due to undergoing chemical modification or not remaining in the final product in concentrations exceeding 0.1% (w/w) of the paper. It was also confirmed that extending the scope to pulp production for newsprint and copying and graphic paper created excessive workloads and paperwork for both applicants and CBs. The need for derogations for dyes, pigments, cationic polymers and wet strength agents was considered necessary. For simplicity, these chemicals are not considered to be exempt due to chemical modification. This way, a clear signal can be sent to the supply chain and CBs will interpret the criterion in a more consistent way.

Only relatively minor changes (if any) have been proposed to the remaining specific hazardous substance criteria. For example, an update in reference to relevant legislation for biocidal products, clarifications relating to dye stuff and pigment criteria and the proposed allowance of silicone-based surfactants under certain conditions in line with Nordic Ecolabel experience. The requirement for restricting residual acrylamide monomers has been removed due to pressure from industry, the fact that it does not present a risk to the wider environment when used (is biodegradable) and the fact that nobody has opposed its proposed deletion.

5 Following feedback received no milestone changes have been proposed for the revision of Criterion 5 to 8.

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## List of abbreviations and definitions

ADt	Specific chemical and energy consumption, costs and emissions are expressed as 'per 90 % air dry pulp
Air dry	Air dry tonne of pulp (ADt) meaning dry solids content of 90 %; in case of paper, air dry means paper with 6 % moisture content
BAT-AELs	The range of emission levels obtained under normal operating conditions using a best available technique or a combination of best available techniques, as described in BAT conclusions, expressed as an average over a given period of time, under specified reference conditions (Art 3.12. of Directive 2010/75/EU)
CTMP	Chemithermomechanical pulp
DIP	Deinked pulp – pulp produced from recovered printing paper, e.g. newsprint, through deinking process
ECF	Elemental Chlorine Free. Bleach sequence containing chlorine dioxide but not elementary chlorine gas
GW	Groundwood pulp
Hardwood	Group of wood species including aspen, beech, birch and eucalyptus. The term hardwood is used as opposition to softwood
Kappa number	Measures the amount of residual lignin content in unbleached pulp, determined after pulping and prior to bleaching. The lower the Kappa number, the less associated lignin. The kappa number is dimensionless
Kraft pulp	Chemical pulp which is manufactured using sodium sulphide as the main cooking chemical. Wood chips are digested in an alkaline cooking liquor, an aqueous solution of sodium hydroxide and sodium sulphide (white liquor)
Lime kiln	Unit in the kraft recovery cycle. In this lime kiln, the lime mud is reburnt to lime: $\text{CaCO}_3(s) + \text{heat} \rightarrow \text{CaO}(s) + \text{CO}_2$
LWC	Light-weight coated paper
Mechanical pulp	Papermaking pulp made entirely by mechanical means from various raw materials, i.e. by grinding wood against an abrasive surface (groundwood pulp) or by processing wood chips or sawdust through a refiner (refiner mechanical pulp). Mechanical pulp contains a considerable amount of non-cellulosic compounds
MWC	Medium-weight coated paper
Pulping	Process of converting raw fibre (e.g. wood) or recycled fibre to a pulp usable in papermaking
RCF	Recycled fibre; pulp obtained from processing paper for recycling
SC	Supercalendered paper
SGW	Stone groundwood (pulp)
Softwood	Wood from conifers including pine and spruce. The term softwood is used as opposition to hardwood
Sulphite pulp	Chemical pulp where various sulphites or bisulphites are used as the main cooking chemical
TCF	Totally Chlorine Free. Bleaching of pulp without using chlorine compound chemicals
TMP	Thermomechanical pulp
TOC	Total Organic Carbon; alternative measurement for COD. Analytical method used to determine the content of organics in a sampling of waste water
Yield	Amount of useful fibre after pulping and/or bleaching or deinking, expressed as a percentage of the useable fibre in relation to the raw material input.

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## Appendices

### Appendix I. Forest Europe criteria and indicators (2015)

Criteria	No.	Indicator	Full text
<b>Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles</b>	<b>C.1</b>	<b>Policies, institutions and instruments to maintain and appropriately enhance forest resources and their contribution to global carbon cycles</b>	
	1.1	Forest area	Area of forest and other wooded land, classified by forest type and by availability for wood supply, and share of forest and other wooded land in total land area
	1.2	Growing stock	Growing stock on forest and other wooded land, classified by forest type and by availability for wood supply
	1.3	Age structure and/or diameter distribution	Age structure and/or diameter distribution of forest and other wooded land, classified by availability for wood supply
	1.4	Forest carbon	Carbon stock and carbon stock changes in forest biomass, forest soils and in harvested wood products
<b>Criterion 2: Maintenance of Forest Ecosystem Health and Vitality</b>	<b>C.2</b>	<b>Policies, institutions and instruments to maintain forest ecosystem health and vitality</b>	
	2.1	Deposition and concentration of air pollutants	Deposition and concentration of air pollutants on forest and other wooded land
	2.2	Soil condition	Chemical soil properties (pH, CEC, C/N, organic C, base saturation) on forest and other wooded land related to soil acidity and eutrophication, classified by main soil types
	2.3	Defoliation	Defoliation of one or more main tree species on forest and other wooded land in each of the defoliation classes
	2.4	Forest damage	Forest and other wooded land with damage, classified by primary damaging agent (abiotic, biotic and human induced)
	2.5	Forest land degradation	Trends in forest land degradation
<b>Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)</b>	<b>C.3</b>	<b>Policies, institutions and instruments to maintain and encourage the productive functions of forests</b>	
	3.1	Increment and fellings	Balance between net annual increment and annual fellings of wood on forest available for wood supply
	3.2	Roundwood	Quantity and market value of roundwood
	3.3	Non-wood goods	Quantity and market value of non-wood goods from forest and other wooded land
	3.4	Services	Value of marketed services on forest and other wooded land
<b>Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems</b>	<b>C.4</b>	<b>Policies, institutions and instruments to maintain, conserve and appropriately enhance the biological diversity in forest ecosystem</b>	
	4.1	Diversity of tree species	Area of forest and other wooded land, classified by number of tree species occurring
	4.2	Regeneration	Total forest area by stand origin and area of annual forest regeneration and expansion
	4.3	Naturalness	Area of forest and other wooded land by class of naturalness
	4.4	Introduced tree species	Area of forest and other wooded land dominated by introduced tree species
	4.5	Deadwood	Volume of standing deadwood and of lying deadwood on forest and other wooded land
	4.6	Genetic resources	Area managed for conservation and utilisation of forest tree genetic resources (in situ and ex situ genetic conservation) and area managed for seed production

	4.7	Forest fragmentation	Area of continuous forest and of patches of forest separated by non-forest lands
	4.8	Threatened forest species	Number of threatened forest species, classified according to IUCN Red List categories in relation to total number of forest species
	4.9	Protected forests	Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE categories
	4.10	Common forest bird species	Occurrence of common breeding bird species related to forest ecosystems
<b>Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)</b>	<b>C.5</b>	<b>Policies, institutions and instruments to maintain and appropriately enhance of the protective functions in forest management</b>	
	5.1	Protective forests – soil, water and other ecosystem functions – infrastructure and managed natural resources	Area of forest and other wooded land designated to prevent soil erosion, preserve water resources, maintain other protective functions, protect infrastructure and managed natural resources against natural hazards
<b>Criterion 6: Maintenance of other socioeconomic functions and conditions</b>	<b>C.6</b>	<b>Policies, institutions and instruments to maintain other socioeconomic functions and conditions</b>	
	6.1	Forest holdings	Number of forest holdings, classified by ownership categories and size classes
	6.2	Contribution of forest sector to GDP	Contribution of forestry and manufacturing of wood and paper products to gross domestic product
	6.3	Net revenue	Net revenue of forest enterprises
	6.4	Investments in forests and forestry	Total public and private investments in forests and forestry
	6.5	Forest sector workforce	Number of persons employed and labour input in the forest sector, classified by gender and age group, education and job characteristics
	6.6	Occupational health and safety	Frequency of occupational accidents and occupational diseases in forestry
	6.7	Wood consumption	Consumption per head of wood and products derived from wood
	6.8	Trade in wood	Imports and exports of wood and products derived from wood
	6.9	Wood energy	Share of wood energy in total primary energy supply, classified by origin of wood
	6.10	Recreation in forests	The use of forests and other wooded land for recreation in terms of right of access, provision of facilities and intensity of use

## Appendix II Guarantees of origin certification across Member States

Table below provides a summary of key information on each of the Member States' GOs. Where information is available and accessible it provides the following information:

- The **competent body** for delivering the GO system and the associated link to the page where information on the scheme and who to contact can be found.
- The **coverage** of the GO in place, i.e. whether it includes renewable energy sources only or with high efficient cogeneration (CHP), both of which could be consumed by paper mills.
- The **transferability** of GOs across Member States, in terms of import and export.
- Whether or not the Member State is an **EECS member**, meaning their GOs are registered to an electronic system which allows the electronic transfer of certificates, enabling Member States to import and export certificates in line with EECS rules.
- **AIB link** to national datasheets of GOs and disclosure for each Member State. Within these datasheets the respective national systems for GOs and disclosure is described, as well as information on for example, renewable electricity support schemes.<sup>69</sup>
- A **conclusion** on the respective Member State's national system for GOs.

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<sup>69</sup> See: <https://www.aib-net.org/national-datasheets-on-gos-and-disclosure>

Table 46 Summary of Member States Guarantees of Origin

Country	Competent Body	Coverage	Transferability	EECS Member	AIB Link	Conclusion
<b>Austria</b>	<a href="#">Energie-Control Austria</a>	Electricity	Yes	Yes	<a href="#">Link</a>	Austria issues GOs for electricity only, is an EECS member and their GOs are transferable. Their system is advanced and well-functioning.
<b>Belgium (Brussels)</b>	<a href="#">CWAPE</a>	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	Belgium (Brussels) issues GOs for electricity and CHP, is an EECS member and their GOs are transferable.
<b>Belgium (Flanders)</b>	<a href="#">VREG</a>	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	Belgium (Flanders) issues GOs for electricity and CHP, is an EECS member and their GOs are transferable.
<b>Belgium (Wallonia)</b>	BRUEGEL (can't find specific webpage)	Electricity and CHP	Yes	Yes	Not available	Belgium (Wallonia) issues GOs for electricity and CHP, is an EECS member and their GOs are transferable.
<b>Bulgaria</b>	Sustainable Energy Development Agency (can't find specific webpage)	Electricity and CHP	Yes	No	<a href="#">Link</a>	Bulgaria issues GOs for electricity and CHP, the country is not an EECS member but their GOs are still transferable. There is currently no disclosure system implemented, GOs are mainly used to determine eligibility for feed-in-tariffs.
<b>Croatia</b>	<a href="#">HROTE</a>	Electricity and CHP (to be implemented)	Not yet	Planned	<a href="#">Link</a>	Croatia currently issues GOs for electricity, CHP is soon to be implemented. The country has limited disclosure; GOs are used as a tracking instrument and are not yet transferable. Croatia is not an EECS member although this is planned. Disclosure is limited to electricity origin and does not address environmental concerns.

<b>Cyprus</b>	Cyprus Energy Regulatory Authority (can't find specific webpage)	Electricity and CHP	Yes	No	<a href="#">Link</a>	Cyprus issues GOs for electricity and CHP. The country is not an EECS member but their GOs are transferable. Disclosure system not yet fully implemented.
<b>Czech Republic</b>	OTE (can't find specific webpage)	Electricity	Only imports. Exports not allowed until full disclosure system is implemented	Yes	<a href="#">Link</a>	The Czech Republic issues GOs for electricity only. The country is not an EECS member and only trades imports. There is not a full disclosure system and only once this is in place will exports be traded.
<b>Denmark</b>	<a href="#">Energinet.dk</a>	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	Denmark issues GOs for electricity and CHP, is an EECS member and their GOs are transferable. Denmark has issued a standard for green electricity and the country asks for an especially comprehensive list of attributes to be tracked for disclosure.
<b>Estonia</b>	<a href="#">Elering AS</a>	Electricity and CHP	Yes	Soon	<a href="#">Link</a>	Estonia issues GOs for electricity and CHP. The country has is soon to be an EECS member and their GOs are transferable.
<b>Finland</b>	<a href="#">Fingrid</a>	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	Finland issues GOs for electricity and CHP, is an EECS member and their GOs are transferable.
<b>France</b>	<a href="#">Povernext</a>	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	France issues GOs for electricity and CHP, is an EECS member and their GOs are transferable.
<b>Germany</b>	<a href="#">German Federal Environment Agency (UBA)</a>	Electricity	Yes	No	<a href="#">Link</a>	Germany issues GOs only for electricity and their GOs are transferable. Their system has been implemented in line with EECs rules but they are not a member.
<b>Greece</b>	<a href="#">Hellenic Electricity Market Operator (LAGIE)</a>	Not Available	No	No	<a href="#">Link</a>	There is limited information available for GOs in Greece. It is likely that there is currently no disclosure system in place and that the country is not trading GOs.



<b>Hungary</b>	<a href="#">MEKH</a>	Electricity, heating and cooling	Yes	No	<a href="#">Link</a>	Hungary issues GOs for electricity and heating and cooling. The country is not an EECS member but their GOs are transferable.
<b>Ireland</b>	<a href="#">SEMO</a>	Electricity	Yes	No	<a href="#">Link</a>	Ireland issues GOs for electricity only. The country is not an EECS member but their GOs are transferable.
<b>Italy</b>	<a href="#">GSE</a>	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	Italy issues GOs for electricity and CHP, is an EECS member and their GOs are transferable.
<b>Latvia</b>	<a href="#">Ministry of Economics</a>	Electricity and CHP	Yes	No	<a href="#">Link</a>	Latvia issues GOs for electricity and CHP. The country is not an EECS member. Their GOs are transferable.
<b>Lithuania</b>	<a href="#">AB Litgrid</a>	Electricity, heating and cooling	Yes	No	<a href="#">Link</a>	Lithuania issues GOs for electricity and heating and cooling. The country is not an EECS member but their GOs are transferable.
<b>Luxemburg</b>	Luxemburg Institute of Regulation (ILR) (can't find specific webpage)	Electricity and CHP	Yes	Yes	<a href="#">Link</a>	Luxemburg issues GOs for electricity and CHP. The country is an EECS member and their GOs are transferable.
<b>Malta</b>	<a href="#">Malta Resources Authority</a>	Electricity and CHP	Yes	No	<a href="#">Link</a>	Malta issues GOs for electricity and CHP. The country is not an EECS member but their GOs are transferable.
<b>Netherlands</b>	<a href="#">CertiQ</a>	Electricity, heating and cooling	Yes	Yes	<a href="#">Link</a>	The Netherlands issues GOs for electricity and heating and cooling. The country is an EECS member and their GOs are transferable.
<b>Poland</b>	Energy Regulatory Office/ The Polish Power Exchange/ ministry of economy (can't find specific webpage)	Electricity	Yes	No	<a href="#">Link</a>	Poland issues GOs for electricity only. The country is not an EECS member but their GOs are transferable.
<b>Portugal</b>	EN is no longer the Portuguese competent body	Electricity, heating and	Yes	Yes	<a href="#">Link</a>	Portugal issues GOs for electricity and heating and cooling. The country is an

	for guarantees of origin: this role has been inherited by the Directorate-General for Energy and Geology and the AIB Secretariat has already made contact with DGEK to discuss membership (can't find specific webpage).	cooling				EECS member and their GOs are transferable.
<b>Romania</b>	National Regulation Authority for Energy - ANRE has the responsibility to operate the electronic registry (can't find specific webpage).	Electricity	Yes	No	<a href="#">Link</a>	Romania issues GOs for electricity only. The country is not an EECS member but their GOs are transferable.
<b>Slovakia</b>	<a href="#">Office for the Regulation of Network Industries</a>	Electricity	Yes	Not Available	<a href="#">Link</a>	Slovakia issues GOs for electricity only. It is unclear whether the country is a member of EECS, their GOs are transferable.
<b>Slovenia</b>	<a href="#">Javna agencija RS za energija (AGEN-RG)</a>	Electricity	Yes	Yes	<a href="#">Link</a>	Slovenia issues GOs for electricity only. The country is an EECS member and their GOs are transferable.
<b>Spain</b>	<a href="#">National Energy Commission</a> Since 2007, the Spanish National Regulatory Authority (National Commission on Markets and Competition - CNMC) is the official Issuing Body for guarantees of origin of electricity from renewable energy sources and high-efficiency cogeneration in Spain	Electricity & CHP	Not Available	Yes	<a href="#">Link (empty doc)</a>	Spain issues GOs for Electricity and CHP. The country is an EECS member, there is no information as to whether their GOs are transferable.
<b>Sweden</b>	<a href="#">The Swedish Energy Agency</a> is preparing to take over the role as issuing body for EECS guarantees of origin from June 1st 2017, provided that the AIB approves the Swedish Energy Agency as	Electricity & CHP	Yes	No (but there is a separate EECS issuing body, Grexel)	<a href="#">Link</a>	Sweden issues GOs for Electricity and CHP. The country is not a member of Grexel, a separate EECS issuing body. Their GOs are transferable.

	member on June 9th 2017. EECS guarantees of origin will thereafter be issued in the Swedish Energy Agency's registry Cesar (new link blank).					
<b>UK</b>	<a href="#">Ofgem</a>	Electricity & CHP (but no electronic register for the latter)	Yes	No	<a href="#">Link</a>	The UK issues GOs for electricity and CHP. The country is not an EECS member but their GOs are transferable.

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