J R C   T E C H N I C A L   R E P O R T S

Revision of European Ecolabel Criteria for Soil Improvers and Growing Media

Preliminary Report

September 2013

Institute for Prospective Technological Studies
Joint Research Centre
RICARDO-AEA

European Commission

Joint Research Centre

Institute for Prospective Technological Studies. Edificio EXPO-C/ Inca Garcilaso, 3-E 41092 Seville

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Acronyms

ABP	Animal By-Products
ABPR	Animal By-Products Regulations
ABPR	Animal By-Product Regulations
AD	Anaerobic Digestion
AOX	Adsorbable Organic Halogen
BSI	British Standards Institute
CEN	Comité Européen de Normalisation (European Committee for Standardisation)
CEN TC	European Committee for Standardization (Comité Européen de Normalisation) Technical Committee
CLP	Classification, Labelling and Packaging (refers to Regulation on Classification, Labelling and Packaging of Substances and Mixtures)
DDT	DichloroDiphenylTrichloroethane
DG	Directorate General
EC	European Community
ECHA	European Chemicals Agency
EEC	European Economic Community
EoW	End of Waste
EPA	Environmental Protection Agency
EU	European Union
GM	Growing Media
GPP	Green Public Procurement
IPTS	Institute for Prospective Technological Studies
JRC	Joint Research Centre
LCA	Life Cycle Assessment

MBT	Mechanical-Biological Treatment
MS	Member State
MSW	Municipal Solid Waste
OJ	Official Journal
PAH	Polycyclic Aromatic Hydrocarbon
PAS	Publically Available Standard
PBDE	PolyBrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzodioxin
PCDD	PolyChlorinated Dibenzo-p-Dioxin
PCDF	Polychlorinated Dibenzofuran
PFC	PerFluorinated Compounds
PFNA	PerFluoroNonanoic Acid
PFOA	PerFluoroOctanoic Acid
PFOS	PerFluoroOctane Sulfonate
POP	Persistent Organic Pollutant
PTE	Potentially Toxic Element
QAS	Quality Assurance System
REACH	Registration, Evaluation, Authorisation and restriction of Chemicals
rWFD	Revised Waste Framework Directive
SI	Soil Improvers
TA	Technical Annex
TC	Technical Committee
TCDD	TetraChloroDibenzo-para-Dioxin

TEQ	Toxic EQuivalent
TS	Technical Standard
UK	United Kingdom
US	United States
VAT	Value Added Tax
WFD	Waste Framework Directive
WRAP	Waste and Resources Action Programme

1 Executive Summary

1.1 Introduction

The revision process of the current EU Ecolabel criteria for Soil improvers (Decision 2006/799/EC) and Growing media (Decision 2007/64/EC) is under development. In order to prepare the ground for this revision process, a study has been carried out by the Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS) with technical support from Ricardo-AEA. The work is being developed for the European Commission's Directorate General for the Environment.

The Preliminary Report summarises all the work done in preparation for the First Ad-Hoc Working Group meeting, at which the revised and new criteria will be discussed with stakeholders.

Currently, separate sets of EU Ecolabel criteria exist for Soil improvers (Decision 2006/799/EC) and Growing media (Decision 2007/64/EC). The revision process spans both product groups; thus common criteria for both Soil improvers and Growing media are developed, only distinguishing between technical product characteristics where necessary.

Another objective of this revision is addressing the possibility to broaden the current scope to the product *mulch*, as it has been identified as a potentially differentiated product.

The main issues addressed in the revision process have taken into account the Commission Statement issued in April 2006:

Issues to be addressed	Growing Media	Soil Improvers
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

The revision process has been conducted considering the new legislative framework that will apply to the product group: End of waste criteria for biodegradable waste that is currently under development and the Fertilizers Regulation that is currently being revised and will include soil improvers and growing media in its scope.

Additionally, the EU Ecolabel Regulation 66/2010 has introduced new requirements by mean of Article 6.6 and 6.7., whose application in the product groups "soil improver", "growing medium" and "mulch" has been studied.

1.2 Project Scope and Definition

The **Scope and Definition** section includes the proposed definitions of SI and GM for the purposes of this study. It also gives an analysis of the project scope and discusses the possibility of extending it to include mulch as a separate product stream for which EU Ecolabel criteria can be set. Its conclusions are that mulch should be considered as a separate product worthy of its own EU Ecolabel, and that the definitions of the three products should be as follows:

Soil improver	Material added to soil in situ primarily to maintain or improve its physical properties, and which may improve its chemical and/or biological properties or activity.
Growing media	Material, other than soils in situ, in which plants are grown.
Mulch	A protective covering placed around plants to prevent the loss of moisture, control weed growth, and reduce soil erosion.

1.3 Legal Review

The **Legal Review** is an overview of both existing and imminent EU legislation that is likely to affect the criteria revision. The aim is to ensure that the proposed criteria are consistent with EU-wide Directives and Regulations, as these are a key driver for the process. National legislation and respective standards in each Member State will also be reviewed at a later stage and conclusions will be presented in a relevant project report. The principal conclusions of the review are presented in Table 1-1.

Table 1-1: Impact of existing legislation on the review of the EU Ecolabel criteria

	Ecolabel Regulations	End of Waste Criteria	Fertilisers Regulation	CLP	REACH	GPP	Water Framework Directive	ABPR	CEN TC 400 Standards
Current Status	**Existing**	**Imminent**	**Imminent**	**Existing**	**Existing**	**Existing**	**Existing**	**Existing**	**Imminent**
PTE limits	✓	✓	✓	✓	✓	✓	✓		
Mineral wool	✓			✓	✓	✓			
Peat	✓					✓			
Organic pollutants	✓	✓	✓	✓	✓	✓	✓		
Microbial pathogens limits	✓	✓	✓			✓		✓	
Test methods (esp. pathogens)		✓						✓	✓
Conclusion	**Article 6.6 regarding CLP and REACH should be implemented**	**EU Ecolabel limits should not be more relaxed than limits for EoW**	**EU Ecolabel limits should not be more relaxed than in the Fertilisers Regulation**	**Constituents of SI, GM and mulches cannot contain substances from Annexes I and IV**	**Constituents of SI, GM and mulches cannot contain substances from Article 57 of REACH**	**GPP revision must follow the EU Ecolabel revision to avoid discrepancies**	**Limits for priority substances must be checked**	**Compost and digestate must be sanitised and tested for pathogens as required by ABPR**	**CEN TC 400 standards should be used for EU Ecolabel sampling and testing**

1.4 Literature Review

A **Review of Scientific Literature** around SI, GM and Mulch constituents and their environmental profile, as well as literature on the environmental performance of each product, comprises the third section of this report. This forms the scientific basis upon which each criterion was assessed.

Our conclusion from the review is that there is enough evidence published on the environmental performance of compost and digestate. There are also a satisfactory number of studies around peat and the emissions resulting from its extraction and use.

However, there seems to be a considerable lack of data around most hazards, namely organic pollutants, toxic elements, microbial pathogens and physical contaminants across all constituents. Knowledge gaps were also identified in LCA for several constituents. For data that do not already exist, the project team have made precautionary assumptions based on studies for compost and digestates.

The colour-coded table below uses a traffic light rating system to provide an indication of the areas where enough data is available and the ones where there is a lack of information.

Table 1-2: Summary of Data Availability for the Different Constituents and Criteria Examined

Criteria examined	Peat	Compost	Coir	Bark, wood waste	Rice husks	Perlite, vermiculite	Mineral wool
Sources and extraction	Green	Green	Amber	Red	Amber	Amber	Amber
Physical form	Green	Green	Amber	Amber	Amber	Amber	Amber
Dry & organic matter content	Green	Green	Green	Amber	Red	Amber	Red
Nutrient content	Green	Green	Green	Green	Amber	Red	Red
Toxic elements (PTEs)	Green	Green	Amber	Amber	Green	Red	Red
Organic pollutants	Amber	Green	Amber	Amber	Red	Red	Red
Microbial pathogens	Red	Green	Red	Red	Red	Red	Red
Physical contaminants	Red	Amber	Red	Red	Red	Red	Red
Other parameters	Red	Green	Red	Green	Red	Amber	Red
Environmental & health concerns	Green	Green	Red	Red	Red	Red	Green
LCA studies	Green	Green	Amber	Amber	Amber	Amber	Green
Overall	Green	Green	Amber	Amber	Amber	Amber	Amber

Key: **Green**: Enough information available. **Amber**: Limited information available. **Red**: No information.

1.5 Stakeholder Questionnaire

A **consultation/survey** to invite stakeholders' input to the process has also been conducted. The consultation invited comments on the proposed definitions, current state of the market and each individual criterion that is going to be reviewed and potentially revised. The questionnaire used for this purpose is reproduced in Annex B. The **Stakeholder Feedback** received is summarised below.

Table 1-3: Analysis of Information from Questionnaire

Section	Count	Summary of responses
Scope and definition	27/28	85% of respondents agreed with the proposed definitions while the remaining 15% suggested minor amendments, mainly around the definition of mulch. They also advised the harmonization with the ongoing revision of the Fertilizer Regulation
Market data and product costs	17/28	Responses received from a number of Member States, namely UK, Germany, Latvia, Denmark, Netherlands, France, Italy and Belgium. The majority of responses covered estimated quantities of SI, GM and mulch consumed in each country. Only a small amount of specific data was provided for all other market related questions. Some respondents provided references to publications and surveys containing market data that will be analysed to extract any useful information. Very little data was received on product costs.
Peat	26/28	Approximately 35% of respondents answered that they agree with the complete exclusion of peat from the EU Ecolabel, while 62% suggested that the inclusion of a certain percentage of peat would make sense, as a certain percentage of peat is reported to have a positive impact on the properties and performance of GM. Stakeholders also welcomed a potential restriction on the sources of peat allowed, to ensure that only sustainable sources are used.
Mineral wool	17/28	47% of respondents suggested that no mineral wool should be allowed in Si or GM for the purposed of the EU Ecolabel as it is a material that can potentially be classified as carcinogenic, while it is also hard to recycle. 29% suggested that there should be no limitation to the use of mineral wool, especially for GM (not so important for SI as SIs are mainly organic products and mineral wool does not have an organic content). It has also been reported by a few stakeholders that recycling of mineral wool is only feasible to a certain extend.
Hazardous substances	24/28	There was a mixed response to existing hazardous substance limits. Majority of respondents who disagree are suggesting more relaxed limits.

Section	Count	Summary of responses
Organic pollutants	19/28	A mix of responses on whether limits for organic pollutants are necessary. These limits are relevant to certain products depending on their constituents but not as relevant to others.
Micro-biological testing	23/28	35% of respondents answered that they agree with existing microbiological testing *E.Coli, H.Ova* and *Salmonella*). 26% disagreed with existing tests, suggesting that testing for *H.Ova* is not necessary. Approximately half of the respondents suggested that microbiological testing should be carried out on each constituent while the other half believes that it is best to test the final product. No respondents suggested there is a need for additional tests.
Life cycle analysis (LCA)	18/28	Very little data received on this section, with the majority of respondents pointing to the EPAGMA report for information. Some information was provided on countries of origin for different constituents that can be used when estimating transport emissions.

1.6 Market Analysis

The **market analysis** section of the report aims to analyse the European market for GM, SI and mulches. The intention is to determine the overall size of the market, and its split by Member State, as well as the imports from and exports to outside the EU. Understanding these details will be important to determine the potential benefit of moving the market towards products that meet the revised EU Ecolabel criteria. It is also useful to understand the market segmentation, and the key producers involved.

The initial assessment of the EU market for these products used PRODCOM and Eurostats data on production and trade. The final figures from this analysis are summarised in Table 1-4.

Table 1-4: Final EU Market Statistics (Value in 000s Euros, Volume in 000s tonnes)

	PRODCOM Data		Eurostats Data			
Product	All Values	All Sold Volume	Export outside the EU	Export within the EU	Import from within the EU	Import from outside the EU
Mulch	3,228,262	47,032,378	120,129	727,645	851,873	720,852
GM	479,565	2,729,281	114,643	126,834	154,622	14,482
SI	1,125,152	3,377,631	135,508	170,695	209,007	16,321
Total	**4,832,979**	**53,139,291**	**370,280**	**1,025,173**	**1,215,502**	**751,654**

Ricardo-AEA's assessment of these figures was that, whilst the tonnage for mulch looks reasonable, the figures for both GM and SI look somewhat low. In order to check this concern, a series of additional calculations were undertaken, to derive the tonnages by alternative means.

Three alternative calculations were performed, using results from the Ricardo-AEA Stakeholder Survey, the 2008 EPAGMA Study and a *de novo* calculation from EU Compost Data. The results of the calculations are summarised in Table 1-5. The country-by-country estimations for the three products and via the different methods are presented in Table 1-6.

Table 1-5: Summary of Results (market size in thousands of tonnes)

Product	PRODCOM & Eurostats	Project Questionnaire	EPAGMA 2008 Study	Calculation from Compost
Growing Media	2,729	3,615	10,853	52,508
Soil Improvers	3,378	4,338	1,292	26,230
Mulch	47,032	1,073		

The immediate conclusion from these results is that there is little consensus from the various sources about the size of the EU market for GM, SI and Mulch. In the light of the differences, we have revisited our calculations (in Section 6.3.3), but feel that both our underlying assumptions and the resulting totals feel reasonable.

Given these large variations, Ricardo-AEA performed some benchmarking against which the analysis could be compared. Our opinion is that the larger values calculated from compost arisings seem realistic, especially as they mostly exclude digestate (which, for instance, is established for use in agriculture in Germany).

1.6.1 *General Market Trends*

Little stakeholder information was gathered on general market trends, so Ricardo-AEA performed some analysis using PRODCOM data. Our best estimate of the future volumes of GM sales forecasts a steady growth to an index of 120 (versus 2012) by 2030, which represents an average annual growth rate over the next 18 years of 1.03%, with EU sales rising to about 3500 Mt by 2030. Equivalent projections for SI and mulches lead to sales estimations of around 4100 Mt and 50,000 Mt by 2030 respectively.

The demand for ecolabelled GM and SI products is reasonable in Europe. In total 12 companies sell 63 ecolabel GM products while 17 companies sell 33 products.

1.6.2 *Market Share*

In 2011, circa 44,500 thousand tonnes of green compost was produced across the EU27. This figure is expected to grow as European countries fulfil their Landfill Directive targets, suggesting the market will expand, potentially attracting new players.

No comprehensive breakdown of the European market was available, but a literature review identified some of the top producers of GM, SI and Mulch producers, as shown in Table 1-7 below.

Table 1-6: Summary of Results by Different Estimation Techniques (market size in thousands of tonnes)

		Growing Media				Soil Improvers				Mulch	
Country	**Split**	**P'COM**	**Quest.**	**EPAGMA**	**Compost**	**P'COM**	**Quest.**	**EPAGMA**	**Compost**	**P'COM**	**Quest.**
Belgium	2.88%	104	264	312	1,250	104	175	37	624	340	138
Bulgaria	0.29%	8	20	32	128	8	25	4	64	41	9
Czech Republic	1.18%	31	82	128	514	40	102	15	257	1,230	37
Denmark	1.91%	10	148	207	829	10	165	25	414	145	60
Germany	20.36%	580	1,417	2,210	8,850	658	1,765	263	4,421	6,520	640
Estonia	0.12%	0	8	13	51	0	10	2	26	2,097	4
Ireland	1.27%	245	88	138	552	245	110	16	276	638	40
Greece	1.88%	51	131	204	815	76	163	24	407	23	59
Spain	8.66%	324	603	940	3,763	365	751	112	1,880	701	272
France	15.75%	286	792	1,709	6,846	590	1,225	203	3,420	3,323	495
Italy	12.62%	415	720	1,370	5,486	454	1,200	163	2,740	125	55
Cyprus	0.14%	0	10	15	62	0	12	2	31	0	4
Latvia	0.15%	4	21	16	64	5	618	2	32	2,381	5
Lithuania	0.22%	0	16	24	97	36	19	3	48	796	7
Luxembourg	0.34%	0	24	37	147	0	29	4	74	0	11
Hungary	0.80%	22	56	87	349	29	70	10	174	495	25
Malta	0.05%	0	4	6	22	0	4	1	11	0	2
The Netherlands	4.82%	135	960	523	2,095	173	175	62	1,046	80	110
Austria	2.32%	39	161	252	1,007	57	201	30	503	3,647	73
Poland	2.89%	122	201	313	1,255	145	250	37	627	1,073	91
Portugal	1.41%	94	98	153	612	105	122	18	306	606	44
Romania	0.99%	0	69	108	432	8	86	13	216	69	31
Slovenia	0.29%	8	20	32	127	11	25	4	64	66	9
Slovakia	0.54%	15	37	58	233	19	47	7	117	274	17
Finland	1.47%	17	102	159	638	17	127	19	319	2,986	46
Sweden	2.83%	79	197	307	1,228	79	245	36	613	12,958	89
United Kingdom	13.83%	141	710	1,500	6,009	145	945	179	3,002	6,419	770
Total		**2,729**	**6,959**	**10,853**	**43,461**	**3,378**	**8,669**	**1,292**	**21,711**	**47,032**	**3,141**

Table 1-7: Example European GM, SI and Mulch producers and turnover (€ millions)

Company	Turnover (€ millions)
Metsa Group	5000
Les Jardins D'Aquitaine	4780
Cocus Planka	1700
Veolis Proprete	180
Klasmann Deilmann	150
ECN	144
Westland Horticulture	68
Florentaise	30
Tourbieres De France	1.2

1.7 Technical Analysis

Recommendations for the new criteria for the EU Ecolabels for GM, SI and mulches are reported in the **Technical Analysis** section of this report, which itself is a summary of the **Technical Annex**, in which detailed assessments are provided of each of the seven criteria categories. The recommendations are summarised in Table 1-9, with the key points as follows:

- For several of the criteria below, revised testing methods and schedules are proposed, to align methods where possible and to ensure ongoing compliance.
- Our recommendation is to exclude peat from EU Ecolabel for SI and mulches, mainly because peat is rarely used in these products. For GM, we offer the option to retain the current complete prohibition, or to allow the inclusion of a certain percentage of peat in GM under certain conditions.
- As with peat, we see little value in the inclusion of mineral wool in SI and mulches, so these uses are prohibited. Furthermore, given the risk from dusts from handling GM by amateur gardeners, we propose that mineral wool is not generally allowed as a constituent in GM. However, we acknowledge its use in commercial horticultural applications (closed-cycle recirculating hydroponic systems) as 100% mineral wool GM, and so this is permitted, under certain conditions of safe and sustainable management and sources.
- Concerning mineral extraction for GM and SI, we concluded that limits and specific restrictions on types of minerals were unnecessary, but we do retain the requirements concerning the provenance of such minerals.
- For Potentially Toxic Elements, we propose to adopt the current EU Ecolabel limits for GM, SI and mulches, although, accepting that some composts can achieve lower levels, tighter limits are also offered for discussion.
- For pathogens, the current limits for E. coli and Salmonella spp are retained, but the Helminth ova test is dropped.
- New limits are proposed for a series of organic pollutants (PAH_{16}, PCB_7, PCDD/F and Pesticides)
- Minor modifications are made to a few of the "Other Criteria".

- Both the current EU Ecolabel for SI and GM include a requirement to state several parameters and provide information within “Information provided with the product”. The proposed requirements are described in Table 1-8 below. New or amended proposals are highlighted in underlined red.

Table 1-8: Information required with the EU Ecolabel product

	GM	SI	Mulch
a	the name and address of the body responsible for marketing		
b	a descriptor identifying the product by type, including the wording		
c	a batch identification code		
d	the quantity (in volume and weight)		
e	the main input materials (those over 5% by volume and by weight) from which the product has been manufactured		
f	the recommended conditions of storage and the recommended ‘use by’ date;		
g	guidelines for safe handling and use (especially with respect to microbial risks)		
h	a description of the purpose for which the product is intended and any limitations on use. This should include a statement about the suitability of the product for particular plant groups (e.g. calcifuges or calcicoles)		
i	pH (Method		
j	Organic C content [EN 15936], total N content [EN16168] and inorganic N [CEN/TS 16177] content and C/N ratio (Method from horizontal)		
k	a statement about the stability of organic matter (stable or very stable) by national or international standard		
l	a statement on recommended methods of use		
m	SI and mulch only	in hobby applications: recommended rate of application expressed in kilograms or litres of product per unit surface (m^2) per annum	
n	Moisture content		
o	For mineral growing media the following declaration should be required: - For all substantial professional markets (i.e. where the applicant’s annual sales in any one country in the professional market exceed 30,000 m³ [or an agreed lower threshold volume]), the applicant shall fully inform the user about available options for the removal and processing of growing media after use. This information shall be integrated in the accompanying fact sheets. - The applicant shall demonstrate that at least 50% [or an agreed higher percentage]) by volume of the growing media waste generated in EU-25 is recycled after use. The applicant should inform the Competent Body, in an annual recycling report, about the option(s) on offer and the response to these options, in particular: - a description of collection, processing and destinations. At any time, plastics should be separated from minerals/organics and processed separately; - an annual overview of the volume of growing media collected (input) and processed (by destination).		

Table 1-9: Summary of All Criteria Proposals

Criterion	Growing Media	Soil Improver	Mulch
Organic ingredients	Either: Peat is not allowed and organic matter content is derived from the processing and/or re-use of waste Or: Peat is allowed under the below conditions and other organic matter content is derived from the processing and/or re-use of waste	Peat is not allowed and organic matter content is derived from the processing and/or re-use of waste	Peat is not allowed and organic matter content is derived from the processing and/or re-use of waste
Peat	***Either*** **No**	No	No
	Or **Yes**, (under provisions set out below): A. Only for GM where the peat is no more than 20% of the GM on a dry matter basis; and B. The peat is sourced from a responsibly managed peat production source that is neither a pristine peat habitat nor a designated Natura 2000 site, Special Area of Conservation (SACs) or Site of Special Scientific Interest (SSSIs).		
Mineral Wool	**Yes**, under provisions set out below.	No	No
	A, Only for GM composed of 100% mineral wool used in commercial horticultural applications. B, The mineral wool is sourced from recycled mineral wool or from a manufacturing process that uses at least 60% waste as feedstock and that any raw minerals used in the manufacturing process are not sourced from a specially protected habitat site C, Mineral wool is not classified as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction according to Annex VI of CLP Regulation D, After use as a GM, the mineral wool is recycled as per existing [or modified] requirements of the current EU Ecolabel GM Criterion 6b.		

<table>
<tr><th>Criterion</th><th>Growing Media</th><th>Soil Improver</th><th>Mulch</th></tr>
<tr><td>Mineral Extraction</td><td colspan="2">Extracted minerals can be used provided that they are not extracted from:
- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,
- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.</td><td>No</td></tr>
<tr><td>Potentially Toxic Elements</td><td colspan="3">
<table>
<tr><th></th><th>Zn</th><th>Cu</th><th>Ni</th><th>Cd</th><th>Pb</th><th>Hg</th><th>Cr</th><th>Mo</th><th>Se</th><th>As</th><th>F</th></tr>
<tr><td>Proposal</td><td>300</td><td>100</td><td>50</td><td>1.0</td><td>100</td><td>1.0</td><td>100</td><td>2.0</td><td>1.5</td><td>10</td><td>200</td></tr>
<tr><td>Stretch</td><td>250</td><td>80</td><td>50</td><td>0.8</td><td>75</td><td>0.75</td><td>75</td><td>2.0</td><td>1.5</td><td>10</td><td>200</td></tr>
</table>
</td></tr>
<tr><td>Pathogens</td><td colspan="3">E. Coli: limit of 1000 CFU/g fw
Salmonella spp: absent in 25g fw</td></tr>
</table>

<table>
<tr><th>Criterion</th><th>Growing Media</th><th>Soil Improver</th><th>Mulch</th></tr>
<tr><td>Organic Pollutants</td><td colspan="3"><table>
<tr><th></th><th>PAH_{16}</th><th>PCB_7</th><th>PCDD/F</th><th>Pesticides</th></tr>
<tr><td>Limits</td><td>6 mg/kg dry matter</td><td>0.2 mg/kg dry matter</td><td>30 ng I-TEQ/kg</td><td>Limits as indicated by test method</td></tr>
</table></td></tr>
<tr><td>Viable seeds and weeds</td><td colspan="3">In the final product, the content of weed seeds and the vegetative reproductive parts of aggressive weeds shall not exceed two units per litre</td></tr>
<tr><td>Electrical conductivity</td><td>1.5 dS/m or
150 mS/m</td><td>No limit</td><td>No limit</td></tr>
<tr><td>Dry matter</td><td>No less than 25% (*)</td><td>No limit but required for information</td><td>No less than 25%</td></tr>
<tr><td>Organic matter</td><td>No less than X% (*)</td><td>No less than 20%</td><td>No less than 20%</td></tr>
<tr><td>Physical contaminants</td><td colspan="3">Sum of: glass (>2mm), plastics (>2mm), metals (>2mm) and stones (>5mm)
No more than 0.5%</td></tr>
<tr><td>Total N
(% FW)</td><td>Information – no limit</td><td>Information – no limit</td><td>No more than 3%</td></tr>
</table>

Criterion	Growing Media	Soil Improver	Mulch
Inorganic N (% of total N)	Information – no limit	Information – no limit	No more than 20%

(*) except for 100% mineral GM used in closed-cycle recirculating hydroponic systems.

1.8 Improvement Potential

It is not appropriate to use the EcoReport tool to assess the life-cycle environment impacts of products conforming to the proposed criteria, because EcoReport is not designed to analyse these types of products, nor could it easily be modified. This means that it is more difficult to assess the **potential improvement** that might be delivered by adopting the new criteria. Under these circumstances, we have attempted to perform some illustrative calculations, to indicate the possible benefits of the new criteria.

In our view, permitting a low level of peat in GM might provide a positive overall benefit, as the limit of 20% is lower than the amount of peat currently used in many GM. Therefore, we would consider that taking this option would provide an incentive for producers to reduce their overall peat consumption in GM through attaining EU Ecolabel status for their products. Our estimations are that a 20% uptake of the EU Ecolabel in GM with a 20% peat allowance could reduce total peat usage in such products by over 4 Mm^3.

2 Project Scope and Definition

2.1 Objective

Currently, separate sets of EU Ecolabel criteria exist for soil improvers and growing media. The revision process will span both product groups; thus common criteria for both soil improvers and growing media will be developed, which are only distinguishing between technical product characteristics where necessary.

Another objective of this revision is addressing the possibility to broaden the current scope to mulch, as it has been identified as a potentially differentiated product, but a further study is needed in order to clarify whether the differences between *mulch* and *soil improver* are enough to build a new product definition.

This draft proposal outlines recommendations for the definition of the Soil Improver and Growing Media products to be used in the revision of the EU Ecolabel criteria for these products, and also analyses the definition of *mulch* as potential new product to include in the scope of the EU Ecolabel Criteria for Soil Improvers and Growing Media.

2.2 Existing definitions for Soil Improvers and Growing Media

2.2.1 *Current definitions from the European Ecolabel*

The European Ecolabel currently has two sets of criteria documents[1], for Soil Improvers and for Growing Media:

<u>Soil Improver</u>

Decision 2006/799/EC which sets the EU Ecolabel criteria for Soil Improvers and the document *User Manual European Eco-label Soil Improvers (Part 2.1 Introduction) include* the following definition of Soil Improver in section*:*

> *"Materials to be added to the soil in situ primarily to maintain or improve its physical properties, and which may improve its chemical and/or biological properties or activity."*

Additionally the "*User Manual European Eco-label Soil Improvers"* provides an extended definition in the section Part 2.2 Terms and Definitions:

> *"can loosely be used to describe any material which improves the physical, chemical and/or biological properties of soil. However, the more usual interpretation relates to materials which are added to soils to enhance their physical properties. Such materials include bulky organic manures, and various types of composted materials which may or may not also provide some useful quantities of plant nutrients. They can be subdivided in soil conditioner, planting materials or mulches."*

<u>Growing Media</u>

Decision 2007/64/EC which sets the EU Ecolabel criteria for Growing Media and the document *User Manual European Eco-label Growing Media (*Part 2.1 Introduction) includes the following definition of Soil:

[1] Decision 2006/799/EC establishing revised ecological criteria and the related assessment and verification requirements for the award of the Community eco-label to soil improvers sets the following definition of soil improver and Decision 2007/64/EC establishing revised ecological criteria and the related assessment and verification requirements for the award of the Community eco-label to soil improvers sets the following definition of growing media

"Material, other than soils in situ, in which plants are grown."

This same definition for Growing Media also appears in the section Part 2.2 Terms and Definitions of the "*User Manual European Eco-label Growing Media",* that also provides a definition of soil improvers that fits in the definition given by "*User Manual European Eco-label Soil Improvers".*

2.2.2 *Definitions of CEN/TC223*

The CEN/TC223 Committee for Soil Improvers and Growing Media applies the following definitions for Soil Improvers and Growing Media in most if not all Standards they develop associated with these products. These definitions are described in the 1999 CEN report *CR13456 Soil improvers and growing media - Labeling, specifications and product schedules*:

<u>Soil Improvers</u>

"*Material added to soil in situ primarily to maintain or improve its physical properties, and which may improve its chemical and/or biological properties or activity."*

<u>Growing media</u>

"*Material, other than soils in situ, in which plants are grown."*

According to Regulation (EC) No 889/2008 down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control 'Hydroponic production' is the method of growing plants with their roots in a mineral nutrient solution only or in an inert medium, such as perlite, gravel or mineral wool to which a nutrient solution is added;

Considering these definitions, it is concluded that there is no specific definition of hydroponic production within CEN/TC223. Where hydroponic production applies a solid medium to help support plant roots that are then bathed in a mineral nutrient medium, then this solid medium is assumed to be a growing medium. Some of the solid materials typically used in this case are constituents that can be found in conventional solid growing media, such as rice husks, coconut fibre and perlite. Where hydroponic production applies solely a mineral nutrient medium, then this mineral nutrient medium is also assumed to be included within the CEN definition of growing medium.

There is no specific definition of mulches applied within CEN/TC223, but the definitions provided allow deriving that mulches are considered by CEN/TC223 as soil improvers on the grounds that, although they are applied as a surface layer on soil, they ultimately get incorporated into the soil.

2.2.3 *Other definitions for Soil Improvers, Growing Media and Mulches*

Several other documents include definitions for these products, and tend to be more descriptive than those used by CEN/TC223. As an example, the *UK Defra report (Defra 2005) "Monitoring of peat and alternative products for growing media and soil improvers in the UK"* includes the following definitions:

<u>Soil improvers</u>

"For the purposes of this project the term "soil improver" incorporates true soil improvers, tree planting composts, surface mulches and specialist products such as turf dressings. True soil improvers are materials that are added to improve a soil's organic matter level and physical condition, either by improving structure and/or increasing water-holding capacity. They should therefore have a high organic matter content, pH and nutrient content are less important. They

should be largely free of weeds and physical hazards such as glass and metal. There should normally be a wide range of particle sizes up to about 25 mm.

Tree planting composts are a specialist form of soil improver. Again the main component is organic matter but a significant nutrient content is also desirable and particle size should be slightly smaller. Turf dressings are similar in properties to tree planting composts, but a lower organic matter content can be tolerated. The most stringent requirements are fine particle size and absence of sharps such a stones, glass, metal and sharp plastic.

Surface mulches have two main functions: firstly to suppress weed growth and secondly to conserve soil moisture. For both purposes the product must be of coarse particle size, typically over 20 mm, to allow water to infiltrate and the surface to dry quickly, hence preventing weed establishment. The colour should ideally be dark brown or black since this is more aesthetically pleasing. A low nutrient content is desirable to discourage weed establishment."

Growing Media

"A growing medium consists of a bulky physical medium with an appropriate and safe nutrient content to sustain plant growth for a period in a container. Since plants are grown in isolated containers it must be free of phytotoxic chemicals or excessive nutrient levels. It must be sufficiently well drained to allow good air porosity but at the same time hold enough moisture to avoid the need for frequent watering. The pH should ideally be between 5.0 and 7.0, depending on species grown and the buffering capacity of the medium, in order to maximise the availability of nutrients to plants. A growing medium should be physically and biologically stable and with little variability, physically and nutritionally, between batches.

This is particularly important for professional growers who are required to produce batches of uniform plants to schedules. The shelf-life of growing media sold via retail outlets to amateur gardeners is important as such products may be manufactured at least 6 months before they will be used."

These definitions reflect the focus of the study subject, and the description includes some characteristics of mulches that differentiate "mulches" from "true soil improvers". In particular:

Mulches

"*typically over 20 mm, to allow water to infiltrate and the surface to dry quickly, hence preventing weed establishment. A low nutrient content is desirable to discourage weed establishment"*

True soil improvers

"*There should normally be a wide range of particle sizes up to about 25 mm".*

The current *User Manual European Eco-label Growing Media* also includes a definition for mulches within the definition of *Bark and Composted Bark* as:

"mulch (mulching: materials which applied to the surface of the soil reduce the loss of moisture, control weed growth, reduce the erosion and the evaporation)".

This definition may match with the concept of *mulching* given by the French standard *NF U52-001 Matériaux biodégradables pour l'agriculture et l'horticulture - Produits de paillage - Exigences et méthodes d'essai* that sets requirements of biodegradability of mulching films made of organic materials used in agriculture and

horticulture. This standard is focused on films made of bioplastics, textiles, natural fibers, etc, used to cover the soil, whose end-of-life stage is the biodegradation within the soil.

2.2.4 *Definitions within the standards on compost*

There is a wide range of standards that set specifications and requirements on the quality of the compost, which contain definitions of *mulch*. Some examples of these standards are the following:

PAS 110:2010 Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source-segregated biodegradable materials and *PAS 100:2011. Specification for composted materials* provide the following definition of mulch:

> *"Mulch: material spread and allowed to remain on the soil surface to conserve soil moisture, suppress weeds and shield soil particles from the erosive forces of raindrops and runoff'*

This definition is indicated in these documents as being derived from PD CR 13456:1999, but it was impossible to find this definition of mulch in PD CR 13456:1999.

European Compost Network ECN/ORBIT provides a definition of mulch within the classification of compost:

> *"Mulch compost: Compost of generally coarse structure (higher portions of wood chips with a maximum particle size > up to ca. 35 mm) and with less demands regarding maturity"*

German standard Quality Assurance RAL GZ "Compost and digestate products" classifies the different types of compost depending on the type of application:

> *"Mulchkompost (Mulch compost): Low portion of fine particles for soil coverage"*

2.2.5 *Definitions within the ongoing revision of the Fertilizer Regulation*

The Fertilisers Regulation (Regulation (EC) No 2003/2003 of the European Parliament and of the Council of 13 October 2003 Relating to Fertilisers) was introduced to harmonise existing provisions and ensure that mineral fertilisers which meet certain legislative requirements can be freely circulated within the internal EU market. Several minor revisions have been made to these regulations since 2003. A more comprehensive review is currently being undertaken by the European Commission with a view to fully harmonising the internal market for fertilisers and extending the scope of the Regulation to include organic materials that may be considered as fertilisers, such as SIs and GMs.

The on-going revision of the Regulation of the European Parliament and of the Council relating to fertilizers, liming materials, soil improvers, growing media and plant biostimulant and repealing Regulation (EC) No 2003/2003, considers the following definitions

- ***Soil improver*** *means a material added to soil in situ whose main function is to maintain or improve its physical and/or chemical and/or biological properties, with the exception of liming materials*
- ***Organic soil improver*** *means a soil improver containing materials of biological origin and whose main function is to increase soil organic matter content*
- ***Other soil improver*** *means a soil improver that maintains or improves soil physical properties or decrease soil pH without addition of organic matter*
- ***Growing medium*** *means a material other than soil in situ, in which plants are grown and which is used independently from soil in situ*

It is important to highlight that the there is a wide agreement among the stakeholders involved in the revision process regarding on excluding the liming materials from the definition of soil improvers and setting a separate category for these materials. The definition of liming materials is the following:

- ***Liming materials*** *are mineral substances and mixtures whose main function is to correct soil acidity containing either calcium and/or magnesium under the forms of oxides, hydroxides, carbonates or silicates.*

EU Ecolabel definitions shall be aligned to the definitions within the next Fertilizer Regulation, in order to ensure the consistency among the European product policies. Thus, the development of this regulation will be followed during the revision of the EU Ecolabel Decision and its product definitions will be harmonized with the ones within the last version of the Fertilizer Regulation.

2.3 Constituents

The approach of defining ingredients is a sensible way for establishing one of the criteria for differentiating EU Ecolabel Growing media, Soil Improvers and potentially Mulches.

Hence, although yet to be proved through the technical evaluation of the project, the initial view is that the environmental risks of each product depend on its function and way of application, which may lead to different criteria and limit values and also to different sets of constituents allowed. For instance, small particle sized biowaste composts if used as mulches might present a greater environmental risk from run off into surface waters than larger low nutrient bark. Therefore, biowaste compost might be excluded from EU Ecolabel Mulch but included in EU Ecolabel Soil Improver. This is noticed for illustration purposes only.

2.3.1 *CEN/TC 223 Constituents*

The CEN 1999 report CR13456 includes a table for constituents of Growing Media and Soil Improvers. The listed ingredients are many and include several that are common to both growing media and soil improvers, as follows:

Table 2-1: CEN/TEC 223 Constituents of Growing Media and Soil Improvers

Material	Description
Raised bog peat	Organic material obtained from raised bogs and mainly consisting of Sphagnum species
Fen peat	Organic material obtained from mires and mainly consisting of sedge, reed or swamp-forest peat, or mixtures hereof
Composted green material	Product obtained by thermophilic aerobic processing, including anaerobically pre-treated organic matter such as green cut, garden and park waste and forest biomass.
Composted biomaterial	Product obtained by thermophilic aerobic processing, including anaerobically pretreated organic matter such as separately collected biogenic waste and aquatic biomass

Material	Description
Composted material with animal excreted matter including paunch contents	Product obtained by thermophilic aerobic processing, including anaerobically pretreated organic matter such as plant material, animal excrement and paunch contents
Spent mushroom compost	Product obtained as a residue of mushroom production, with or without cover soil
Bark	Bark from one or more type of tree or tree species
Composted bark	Composted bark from one or more types of tree or tree species
Wood fibre	Product obtained by fraying (rasping) of untreated wood
Wood chips	Wood chips produced by a mechanical process from untreated wood
Coir	Fibre and/or pith from coconut husks
Straw	Straw obtained by harvesting and cutting ripened crop residues
Aquatic plant biomass	Product obtained from naturally occurring aquatic plants
Lignite	A naturally occurring organic material derived from compressed, decomposed plant matter
Sawdust	Product obtained as a residue of untreated wood from the timber industry
Conifer needle litter	Product obtained from coniferous forestry
Rice hulls	Product obtained as a residue in the rice manufacturing industry and mainly consisting of rice paleae
Jute fibre	Product obtained from the jute industry
Clay	Mineral material obtained from natural deposits
Solid manure	Product consisting of the faeces and absorbed urine of farm animals — with or without bedding — that can be stacked
Semi-liquid manure	Product consisting of a semi-liquid mixture of faeces and urine of farm animals — with or without bedding and with or without spilled drinking water, washing-down water and/or rainwater from livestock buildings — that can be pumped
Pumice	Naturally expanded volcanic material

Material	Description
Broken lava/porous volcanic rock	Product obtained from naturally expanded volcanic material
Broken lava	Product obtained from naturally expanded volcanic material
Composted plant material	Product obtained by thermophilic aerobic processing of organic matter made only with plant material like leaves, stems, barks, etc
Spent coffee grounds	Product obtained from coffee seeds after toasting and extraction of soluble fraction
Sand	Mineral material obtained from natural deposits
Soil	Mineral particles of clay, silt and sand naturally occurring with or without organic matter
Composted grape marc	Product obtained by pressing grapes after extraction of its juice, to make wine, which have been subjected to an aerobic composting process
Anaerobically digested material	Product obtained by anaerobically digesting organic material such as plant material, which may include aquatic biomass, biogenic waste, bark, sewage sludge, wood waste and animal manure
Biosolids	Product obtained from sewage plants treating domestic and urban wastewaters and other sewage plants treating wastewaters of a composition similar to domestic and urban wastewaters

Additionally there are other constituents listed that are limited to growing media as follows:

Table 2-2: CEN/TEC 223 Further Constituents of Growing Media

Material	Description
Polyurethane foam granules	Product obtained by polymerisation of two or polyfunctional hydroxy groups, containing compounds with di- or polyisocyanates, to a synthetic organic material, in granules
Polyurethane foam (rigid non-granular)	Product obtained by polymerisation of two or polyfunctional hydroxy groups, containing compounds with di- or polyisocyanates, to a synthetic organic material, non-granular
Polyphenol foam granules	Product obtained by polymerisation of two or polyfunctional hydroxy groups, containing compounds with di- or polyphenols, to a synthetic organic material, in granules

Material	Description
Polyphenol foam (rigid non-granular)	Product obtained by polymerisation of two or polyfunctional hydroxy groups, containing compounds with di- or polyphenols, to a synthetic organic material, non-granular
Mineral wool granules	Product obtained by spinning and granulation of mineral wool
Mineral wool (rigid non-granular)	Product obtained by spinning of mineral wool
Exfoliated vermiculite	Granular material manufactured from naturally occurring hydrated micaceous mineral, expanded/exfoliated by heat to form a laminar structure
Expanded perlite	Granular material manufactured from naturally occurring hydrated volcanic rock, expanded by heat to form a cellular structure
Expanded clay/slate	Product obtained by heating up and expansion of clay particles
Coal mine spoil	Mineral particles, mainly slates, coming from coal extraction, in its natural state or combusted at 1 100 °C, once ground and classified.
Blast furnace gravel	Product obtained as the coarse fraction from water cooling (granulated product) or air cooling (crystallized product) of cast slag originating from cast iron obtained in a blast furnace

There are also caveats that these are not an exhaustive list of ingredients and that other ingredients may in future be used in such products.

> *"Future products. In the future new products will be developed that will be sold as, and perform the functions of, growing media [/soil improvers]. They shall be labelled in accordance with the principles and structure of this report."*

2.3.2 *EU Ecolabel constituents*

The current EU Ecolabel criteria include descriptions of the ingredients that are permitted in EU Ecolabel Growing Media and Soil Improvers. For example:

Ingredients (criterion 1.1 as defined in Council Directive 75/442/EEC on waste and in Annex I of the said Directive):

> *"A product shall only be considered for the award of the European Eco-label if it does not contain peat and its organic matter content is derived from the processing and/or re-use of waste"*

Processing is, for example, biological treatment like composting and anaerobic digestion. 'Re-use of waste materials' is, for example, the use of organic waste from primary manufacture, which can be employed as Soil Improver, or as an ingredient in such products, due to its physiochemical characteristics. Examples of

such are: bark remaining from timber mechanical manufacturing; rice hulls; coconut fibre and residuals from the food industry (such as specified under criterion 1.2, see paragraph 2.4.3). Minerals can be added to improve product characteristics (such as specified under criterion 1.3, see paragraph 2.4.4)

Sludges (criterion 1.2 as defined by Commission Decision 2001/118/EC amending Decision 2000/532/EC6): 02 03 05 / 02 04 03 / 02 05 02 / 02 06 03 / 02 07 05

> *"Products shall not contain sewage sludge. (Non-sewage) sludges are allowed only if they meet the following criteria:*
>
> *Sludges are identified as one of the following wastes according the European list of wastes*
>
> - 02 03 05 - *sludges from on-site effluent treatment in the preparation and processing of fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco; conserve production; yeast and yeast extract production, molasses preparation and fermentation.*
> - 02 04 03 - *sludges from on-site effluent treatment in sugar processing.*
> - 02 05 02 - *sludges from on-site effluent treatment in the dairy products industry.*
> - 02 06 03 - *sludges from on-site effluent treatment in the baking and confectionery industry.*
> - 02 07 05 - *sludges from on-site effluent treatment in the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa).*
>
> *Sludges are single source separated, meaning that there has been no mixing with effluents or sludges outside the specific production process. Single source sludges from a number of sources may be applied.*
>
> *Maximum concentrations of heavy metals in the waste before treatment (mg/kg dry weight) meet the requirements of criterion 2. A Declaration of conformity must be added for every single source sludge applied.*
>
> *Sludges shall meet all other European Eco-label criteria specified in section 2.4, in which case they are considered to be sufficiently stabilized and sanitized."*

Minerals (criterion 1.3)

Minerals shall not be extracted from:

- *Notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,*
- *Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.*

Minerals applied as or in soil improvers are for example sand, clay, and pumice (as far as allowed by National legislation). The criteria also apply to minerals imported from non EU countries, in which case the provisions of the United Nations' Conventions on Biological Diversity are guiding.

2.4 Conclusions

2.4.1 *Findings*

The analysis of existing definitions has revealed the following findings:

- The current EU Ecolabel definition for Growing Media is consistently applied in the current EU Ecolabel documents and is consistent with the definition of Growing Media used in CEN Standards.
- The EU Ecolabel definition for Growing Media is a simple statement that provides an open playing field for commercial interests.
- The EU Ecolabel for Growing Media would contain aspects of hydroponic production. The definitions given by CEN/TC 223 derive that hydroponic production are not considered separately. However whilst some forms of hydroponic production involve growing plants in a wholly mineral nutrient water based medium, other methods include growing the plants in medium containing solid supports through which the mineral nutrient solution is passed.
- The current EU Ecolabel definition for soil improvers provides some inconsistency, as two different definitions appear in the EU Ecolabel User Manual. One of these is a simple definition that closely matches the definition applied by CEN apart from a few word changes, i.e. changing the first part of the definition from *Material added to soil* to *Materials to be added to the soil* . The definition given by the User Manual is more complex; so it may lead to confusion, as it is not helpful to include the phrases "*can loosely be used", "include bulky organic manures" and "can be subdivided in soil conditioner, planting materials or mulches."*.
- Mulch is applied as a surface layer to soil, is not incorporated into the soil and typically has different characteristics than true soil improvers. Therefore, the initial of view mulch is that mulch is a product that can be differentiated from soil improvers on the basis of its function and application as a layer on top of the soil. Whilst this may be considered as insufficient differentiation by many, the differences could lead to different hazards and risks associated with mulches compared with soil improvers. It is likely that different criteria might need to be developed for mulches and for soil improvers that reflect differences in risks.
- The next Fertilizer Regulation will cover the products soil improver and growing medium, and it will contain definitions of both products

2.4.2 *Recommendations on definitions*

Based on the findings above, the recommendations on definitions are the following:

- The definitions of Soil Improvers and Growing Media are consistently applied and match those typically applied in CEN developed Standards for these products.
- Nevertheless, EU Ecolabel definitions shall be aligned to the definitions within the next Fertilizer Regulation, in order to ensure the consistency among the European product policies. Thus, the development of this regulation will be followed during the revision of the EU Ecolabel Decision and its product definitions will be harmonized with the ones within the last version of the Fertilizer Regulation. Meanwhile, CEN Standards definitions will be used since they are the most relevant references currently available;
- That a separate product "Mulch" is considered for which EU Ecolabel criteria are developed.

The revised EU Ecolabel criteria would then potentially include the three EU Ecolabel products (Growing Media, Soil Improvers, Mulch) with criteria values tabulated for each product. Some of these may be common to all products and some may have differences for the products.

An example of how the tables might be represented in a single revised EU Ecolabel document is illustrated below.

Criterion heavy metal limit	Growing media	Soil Improver	Mulch
Metal 1 mg/kg	A	A	A
Metal 2 mg/kg	B	B	C

2.4.3 *Proposed definitions*

Based on the recommendations above the following set of definitions is proposed:

a) ***'Soil improver'***
Material added to soil in situ primarily to maintain or improve its physical properties, and which may improve its chemical and/or biological properties or activity.

b) ***'Growing media'***
Material, other than soils in situ, in which plants are grown.

c) 'Mulch'
A protective covering placed around plants to prevent the loss of moisture, control weed growth, and reduce soil erosion.

2.5 References

CEN 1999 report CR 13456 Soil improvers and growing media —Labelling, specifications and product schedules.

PD CR 13456:1999. Soil improvers and growing media —Labelling, specifications and product schedules.

Defra 2005, Monitoring of peat and alternative products for growing media and soil improvers in the UK 2005.

PAS100:2011. Specification for composted materials

PAS110:2010. Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source-segregated biodegradable materials.

Compost production and use in the EU. Final Report (2008). ORBIT e.V. / European Compost Network ECN

3 Legal Review

3.1 Introduction

Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel (the EU Ecolabel Regulation) requires all revisions of the EU Ecolabel criteria to take into consideration existing legislation and ensure consistency between different regimes. This section examines current and upcoming legislation that might have an impact on this revision of the EU Ecolabel criteria for soil improvers and growing media, and for the potential new EU Ecolabel product mulches.

3.2 Regulations

3.2.1 *EU Ecolabel Regulations*

<u>Regulation (EC) No 66/2010 on the EU Ecolabel (the EU Ecolabel Regulation)</u>

The EU Ecolabel award is an EU-wide voluntary scheme introduced in 1992 to promote products that demonstrate a low environmental impact across their lifecycle. The EU Ecolabel Regulation is applicable across the EU and defines the main considerations when setting up EU Ecolabel criteria for different product groups.

The Regulation requires that EU Ecolabel criteria are based on the environmental performance of products. The criteria should promote, among other things, the substitution of hazardous substances by safer substances and the durability and reusability of products. Moreover, they should take into account any criteria established for other similar environmental labels, particularly officially recognized ones, such as EN ISO 14024 type I environmental labels, as well as any criteria developed in specific Member States.

Of particular importance to this review is Article 6.6 of the EU Ecolabel Regulation. The current EU Ecolabel criteria for soil improvers (SI) and growing media (GM) were established before the publication of the revised Regulation in 2010 that introduced Article 6.6. As a result, this Article did not apply to the previous revision that developed the current EU Ecolabel SI and GM criteria, but it will be taken into account during this study. Article 6.6 states that the EU Ecolabel should not be awarded to products containing substances or mixtures that could be classed as toxic, hazardous to the environment, mutagenic, carcinogenic or toxic for reproduction according to the CLP Regulations (see section 2.5). Products also cannot contain substances listed in Article 57 of REACH Regulations (see section 2.6). Constituents will be checked to ensure that any substances listed in the CLP and REACH Regulations are prohibited if they are above the specified cut-off value.

According to Article 6.7 of the EU Ecolabel Regulation, the Commission may grant derogations from Article 6.6 if it is not technically feasible to substitute prohibited substances or if the product has *"a significantly higher overall environmental performance compared with other goods of the same category"*.

The Regulation also requires that, during any revision, critical and controversial issues must be reported in detail. They must also be evaluated, and the revision must take into consideration the net balance between the environmental benefits and burdens. Additionally, health and safety and other social aspects should be considered, including any international conventions and agreements, International Labour Organisation standards and codes of conduct.

Annex I requires that a technical report should accompany each revision of the criteria. The report should provide justification for each criterion as well as a quantitative indication of the overall environmental

performance that the criteria are expected to achieve, compared to that of the average products on the market. Regarding testing, the technical report should include the relevant test methods for assessment of each criterion and an estimation of testing costs.

Annex III lists the minimum and maximum application fees that a competent body may charge producers for obtaining an EU Ecolabel for their product, as well as the annual fees for the use of the label. Application fees can range from 200 - 1,200€, while the maximum annual fee for usage is 1,500€. There are also provisions for small and medium businesses as the Commission aims to keep the scheme affordable for smaller producers.

Commission Decision (2006/799/EC) on Soil Improvers and (2007/64/EC) on Growing Media

Commission Decision (2006/799/EC) replaced Commission Decision 2001/688/EC in 2006. It set the current European ecolabel criteria specifically for SI. This was followed by Commission Decision (2007/64/EC) which set the criteria for GM as a separate product stream. Both sets of criteria were initially valid for a period of four years', however Commission Decision (2011/740/EU) prolonged their validity until 31st December 2013.

3.2.2 *Green Public Procurement*

Green Public Procurement (GPP) has been increasingly recognised at an international level as a potentially effective policy measure to promote the use of environmentally friendly products and services by public body example. In the EU, Member States have been encouraged to adopt national action plans for GPP since 2003. A Commission Communication, published in 2008 (COM (2008) 400 Final) as part of the Action Plan on Sustainable Consumption and Production and Sustainable Industrial Policy, suggested the development and use of a single set of GPP criteria across the whole of the EU. This would reduce the administrative burden on public bodies, as well as businesses that provide goods and services that meet the GPP criteria to public bodies of different Member States.

The EU GPP Criteria for Gardening Products and Services were established in 2012 (EU GPP 2012). The criteria include purchasing and green tender specifications for public authorities and cover soil improvers and mulches, as well as growing media when they are used as soil improvers. They consist of 'core' criteria that are easily verified and are aimed at reducing the main environmental impacts of products, and 'comprehensive' criteria that require a more complicated verification process and address additional impacts. For SI, the EU Ecolabel criteria were used as a basis when setting up the relevant GPP criteria. The core criteria require the use of compost from separately collected waste and the exclusion of peat and sewage sludge from SI. The comprehensive criteria include the entire set of EU Ecolabel criteria for SI.

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3.2.3 *Revised Waste Framework Directive and End of Waste Criteria*

The Revised Waste Framework Directive 2008/98/EC (rWFD) committed the European Commission to set end of waste criteria that specify when a waste ceases to be waste. Article 22 (titled Bio-waste) of the directive includes the following commitment:

"The Commission shall carry out an assessment on the management of bio-waste with a view to submitting a proposal if appropriate. The assessment shall examine the opportunity of setting minimum requirements for bio-waste management and criteria for compost and digestate from bio-waste, in order to guarantee a high level of protection for human health and the environment".

A JRC-IPTS working group is currently in the process of developing End of Waste (EoW) Criteria on Biodegradable Waste, including compost and digestate. The timetable for completion of this work is not known at present, but although it is understood to be imminent, it may not be available for the EU Ecolabel SI and GM revision.

The EoW criteria proposals include limit values for potentially toxic elements (PTEs), organic pollutants and pathogens and specify what might be permitted as feedstock to EoW composts and digestates. Limits for organic pollutants do not exist in the current EU Ecolabel criteria for SI and GM, but consideration for their inclusion in the revised criteria forms part of this study. The most recent reports published by the working group on biowaste EoW criteria are the Draft Final Report for End-of-Waste Criteria on Biodegradable Waste subject to Biological Treatment (IPTS 2013). Sewage sludge and biowaste from residual municipal waste are not permitted in composting and anaerobic digestion processes and thereby will not be able to obtain EoW status. This is consistent with current EU Ecolabel criteria for GM and SI. Additionally, more emphasis may be given to Member State defined criteria for bio-waste EoW status rather than an EU-wide standard. If this is the case, this would need to be incorporated into the EU Ecolabel criteria for GM, SI and mulches.

It is essential to ensure that revised EU Ecolabel limits are consistent and compatible with EoW limits and, in particular, are not any more relaxed. Less stringent limits in the EU Ecolabel could lead to waste-derived material that does not meet EoW being used in ecolabelled products. Furthermore, it should not be permitted to dilute materials that do not meet EoW or EU Ecolabel limits with other materials so that the final product complies with the criteria. Future changes in EoW criteria must also be accommodated in the revision of the EU Ecolabel on SI and GM criteria.

Article 5 of the Waste Framework Directive 2008/98/EU (WFD) clarifies when a material is deemed to be a by-product rather than a waste. This is important, as a number of the constituents used in SI, GM and mulches can be classed as by-products (e.g. rice husks and coconut fibre).

"A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste but as being a by-product only if the following conditions are met:

(a) further use of the substance or object is certain;

(b) the substance or object can be used directly without any further processing other than normal industrial practice;

(c) the substance or object is produced as an integral part of a production process; and

(d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts."

At the moment, the proposed biowaste EoW criteria for PTEs (see Annex 12 of the *IPTS 3rd Working Document for EoW Criteria on Biodegradable Waste*) are less stringent than the current EU Ecolabel limits (Table 3-1).

Table 3-1: Comparison of Limits (mg/kg) on compost (*) in EoW and EU Ecolabel Criteria

Element	EoW Limit 3rd Working document (2012)	EoW Limit Latest (2013)	EU Ecolabel Criteria
Zn	400	600	300
Cu	100	200	100
Ni	50	50	50
Cd	1.5	1.5	1
Pb	120	120	100
Hg	1	1	1
Cr	100	100	100

(*) Compost after the composting phase and prior to mixing with other materials
Source: IPTS 2012. 3rd Working Document for EoW Criteria on Biodegradable Waste, Draft Final Report for EoW Criteria on Biodegradable Waste subject (IPTS 2013).

If this revision of the EU Ecolabel results in setting less strict PTE limits, it must be ensured that the new limits are still equal to or no less strict than EoW limits. Limits for organic pollutants have been proposed for biowaste EoW criteria and, if limits for EU Ecolabel criteria are proposed, the same principles will apply to those.

3.2.4 *Fertilisers Regulation*

The Fertilisers Regulation (*Regulation (EC) No 2003/2003 of the European Parliament and of the Council of 13 October 2003 Relating to Fertilisers*) was introduced to harmonise existing provisions and ensure that mineral fertilisers which meet certain legislative requirements can be freely circulated within the internal EU market. Several minor revisions have been made to these regulations since 2003. A more comprehensive review is currently being undertaken by the European Commission with a view to fully harmonising the internal market for fertilisers and extending the scope of the Regulation to include organic materials that may be considered as fertilisers, such as SIs and GMs.

The revision is based on an evaluation report released in 2010, entitled *Evaluation of Regulation (EC) 2003/2003 Relating to Fertilisers* (CSES 2010). The report highlighted the views of several Member States suggesting that the absence of provisions for PTEs in the Fertilisers Regulation weakens the level of environmental and public health protection provided by national regulations. As a result, it has been decided that appropriate limits for PTEs will be set in this review of the Fertilisers Regulation. A consultation was carried out in 2011 to gather information on national standards for fertilisers across Member States.

In January 2012, the Commission published an impact assessment of the different policy options considered (DGEI 2012). The two best performing options proposed to include limit values for contaminants such as PTEs, organic pollutants and pathogens. The Commission has also confirmed the intention to include organic fertilisers, organo-mineral fertilisers, soil improvers and growing media in the revised regulations.

There are no specific limits proposed at this stage of the review, although the PTEs considered and indicative upper limit values were presented in the January 2012 publication. It is possible that the revised Fertilisers Regulation will be published after the completion of the EU Ecolabel review and that limits may not be consistent with other on-going initiatives such as the development of EoW criteria for composts and digestates. This study should ensure that the proposed limits set in the revised EU Ecolabel criteria are consistent with those set or likely to be set in the Fertilisers Regulation.

3.2.5 *Classification, Labelling and Packaging (CLP) Regulation*

According to the EU Ecolabel Regulations, Regulation (EC) No 1272/2008 (CLP) (unofficial consolidated version published in 2011) on Classification, Labelling and Packaging of substances and mixtures, contains provisions for substances that should not be used for the purposes of the EU Ecolabel. Article 61 of CLP provides a transitional period to allow a gradual transition from previous systems. The transitional period ran to 1 December 2010 for substances, and continues until 1 June 2015 for mixtures (preparations).

Constituents of SI and GM should be assessed to ensure they do not contain any classified substances. This includes any substances that are toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction according to Annexes I and IV of CLP above the cut-off value. Any constituents that do not comply with this part of CLP will be excluded, unless they are deemed to be critical, or their environmental profile is found to be significantly better than that of substitutes.

3.2.6 *Regulation (EC) No 1907/2006 (REACH)*

REACH refers to the registration, evaluation, authorisation and restriction of chemicals. REACH is not applicable to substances or materials classified as waste but covers by-products and materials that achieve EoW status. Article 6.6 of the EU Ecolabel Regulation requires that no materials that include substances listed in Article 57 of REACH are allowed in products bearing the EU Ecolabel. This includes organo-metals classed as persistent, bioaccumulative and toxic according to Annex XIII of REACH.

REACH requires chemical substances that are manufactured or imported into the EU to be registered with the European Chemicals Agency (ECHA). Annex V, which was amended in 2008, includes a list of exemptions from Titles II (registration), V (downstream users) and VI (evaluation). Paragraph 12 of Annex V specifically lists compost as exempt from the registration and evaluation process. Moreover, Guidance for Annex V - Exemptions from the obligation to register (ECHA 2012), confirms that digestate is also exempt from REACH regulations.

Other exemptions included in Annex V are substances that result from a chemical reaction that occurs when another substance is exposed to air, moisture, microbial organisms or sunlight, stored or as a result of the initial substance's end use. Minerals and other substances occurring naturally are also exempt if they are not chemically modified. Synthetic minerals are not covered by this exemption.

As a result, constituents such as peat, rice husks, coir, perlite and vermiculite can be exempt from registration and evaluation under REACH, provided that they are not chemically modified before they are used in soil improvers and growing media. All constituents and especially mineral wool will be checked to ensure they do not contain any substances listed in Article 57.

3.2.7 *EU Water Framework Directive*

The Water Framework Directive (Directive 2000/60/EC) sets out the framework for water policy in the EU. Annex X of the Directive (as amended by Directive 2008/105/EC) provides a list of priority substances that can present significant risks to the aquatic environment. Discharge or emission of those substances to the aquatic environment is being phased out across the EU and any pollutant limits set under the EU Ecolabel should take those substances into account. The application of materials to soil is a route for contamination of surface and ground waters via surface run-off and leaching.

Many persistent organic pollutants (POPs) such as PCBs, PAHs, dioxins, PCDDs and PCDFs as well as certain PTEs such as mercury, cadmium and lead are included in the list of priority substances. Maximum limits are provided for the concentration of each substance in surface waters. Limits for POPs and PTEs set in the Water Framework Directive must be taken into account during this revision.

3.2.8 *Animal By-Product Regulation (ABPR)*

Regulation (EC) No 1069/2009 sets out the health rules for animal by-products (ABP) and derived products not intended for human consumption. It is of critical importance to the EU Ecolabel revision as it applies to compost and digestate produced in plants that treat animal by-products or catering waste and is a pre-requisite for achieving EoW status for such ABP biowaste. Regulation EU No 142/2011 provides further details on implementing EC 1069/2009, particularly in Annex V's requirements for composting and digestate sanitation.

The ABPR restricts the types of ABP that may be treated in composting and anaerobic digestion plants, and describes the requirements allowing ABP-derived composts and digestates to be placed on the market and used as organic fertilisers or soil improvers. The (EU 142/2011) Regulation's Annex V include provisions for the sanitation process that should be followed, as well as sampling requirements during and after processing and storage, to ensure low levels of pathogens (a key concern with ABP) as follows:

"Standards for digestion residues and compost

1. (a) Representative samples of the digestion residues or compost taken during or immediately after transformation at the biogas plant or composting at the composting plant in order to monitor the process must comply with the following standards:

Escherichia coli: n = 5, c = 1, m = 1 000, M = 5 000 in 1 g;

or

Enterococcaceae: n = 5, c = 1, m = 1 000, M = 5 000 in 1 g;

and

(b) Representative samples of the digestion residues or compost taken during or on withdrawal from storage must comply with the following standards:

Salmonella: absence in 25 g: n = 5; c = 0; m = 0; M = 0

Where in the case of point (a) or (b):

n = number of samples to be tested;

m = threshold value for the number of bacteria; the result is considered satisfactory if the number of bacteria in all samples does not exceed m;

M = maximum value for the number of bacteria; the result is considered unsatisfactory if the number of bacteria in one or more samples is M or more; and

c = number of samples the bacterial count of which may be between m and M, the sample still being considered acceptable if the bacterial count of the other samples is m or less.

2. Digestion residues or compost, which do not comply with the requirements set out in this Section, shall be resubmitted to transformation or composting, and in the case of Salmonella handled or disposed of in accordance with the instructions of the competent authority."

This recent regulation places more emphasis for the test for Salmonella on stored product. This is assumed to be due to recognition of the potential for growth during storage. The primary responsibility for carrying out operations in accordance with ABPR rests with plant operators. Compost and digestate derived from ABP that has reached EoW status will be compliant with these regulations.

3.3 Standards and test methods

3.3.1 *Project Horizontal – CEN TC 400*

Project HORIZONTAL started in 2002 with a view to develop horizontal and harmonised European standards for sampling and testing of organic materials, such as sludge, soil, and treated biowaste. The standards cover hygienic and biological parameters as well as organic and inorganic parameters. On the majority of areas, the final consultation and validation of draft standards took place in 2007. This work is currently being finalised by a Technical Committee (CEN TC 400[2]) and when these standards are formally adopted they will aim to be applied to any related certification schemes, including EoW. The EU Ecolabel criteria for SI, GM and mulches should then apply the same horizontal programme derived standards where available in preference to other methods.

Standards that have been approved and published so far determine the testing methods for levels of PTEs, nutrients, certain POPs and methods for sampling pretreatment. Standards under development will address testing methods for PAHs, electrical conductivity, viable seeds and propagules, impurities and *E.Coli*. All standards are applicable to sludge, treated biowaste and soil.

3.3.2 *CEN TC 223*

Standard methods for growing media and soil improvers set by CEN TC 223[3] should be used where Horizontal methods are not yet available.

3.4 National Standards and Regulations

A number of standards and regulations around compost and digestate exist at a national level in different Member States of the European Union. A separate technical report is being developed for each criterion of the EU Ecolabel, so the national standards listed below will be examined and a detailed analysis will be included in the respective technical reports.

[2] http://www.cen.eu/cen/Sectors/TechnicalCommitteesWorkshops/CENTechnicalCommittees/Pages/default.aspx?param=736375&title=Project%20Committee%20-%20Horizontal%20standards%20in%20the%20fields%20of%20sludge,%20biowaste%20and%20soil

[3] http://www.cen.eu/cen/Sectors/TechnicalCommitteesWorkshops/CENTechnicalCommittees/Pages/default.aspx?param=6204&title=CEN/TC%20223

Table 3-2: National standards and regulations on compost and digestate in EU-27 Member States

Member State	National QAS and Regulations for Compost and Digestate
Austria (AT)	Compost Ordinance QAS based on ONORM S2206
Belgium (BE)	Royal Decree 07.01.1998 QAS operated by VLACO vzw
Bulgaria (BG)	No specified standards
Cyprus (CY)	No specified standards
Czech Republic (CZ)	Fertilizer law 156/1998, ordinance 474/2000 (amended) Draft Biowaste Ordinance
Germany (DE)	Biowaste Ordinance Fertilisers Ordinance QAS RAL GZ 245/246 of BGK
Denmark (DK)	Statutory Order Nr.1650
Estonia (EE)	Env. Ministry Re. (2002.30.12; m° 87) Sludge regulation
Greece (EL)	KYA 114218, Hellenic Government Gazette, 1016/B/17- 11-97 [Specifications framework and general programmes for solid waste management]
Spain (ES)	Real decree 824/2005 on fertilisers
Finland (FI)	Decree of the Ministry of Agriculture and Forestry on Fertiliser Products 12/07
France (FR)	NFU 44 051
Hungary (HU)	Statutory rule 36/2006 (V.18)
Ireland (IE)	Licencing for compost plants Voluntary Irish Standard 441:2011 for compost
Italy (IT)	Law on fertilisers (L 748/84; and: 03/98 and 217/06) for BWC/GC/SSC QAS for compost operated by the Italian Compost Association CIC
Lithuania (LT)	Regulation on sewage sludge Category I (LAND 20/2005)
Luxembourg (LU)	Licencing for compost plants

Member State	National QAS and Regulations for Compost and Digestate
Latvia (LV)	Regulation on licensing of waste treatment plants (n° 413/23.5.2006) – no specific compost regulation
Malta (MT)	No specified standards
Netherlands (NL)	Amended National Fertiliser Act from 2008 RHP quality mark
Poland (PL)	Organic fertilisers
Portugal (PT)	No specified standards
Romania (RO)	No specified standards
Sweden (SE)	SPCR 120 and SPCR 152 Compost and digestate QAS operated by the Swedish Waste Management Association Avfall Sverige
Slovenia (SI)	Decree on the treatment of biodegradable waste (Official Gazette of the Republic of Slovenia, 62/08)
Slovakia (SK)	Industrial Standard STN 46 5735
United Kingdom (UK)	BSI PAS100 – Compost BSI PAS110 - Digestate

3.5 Conclusions

The identified impact of existing and upcoming legislation on the review of the EU Ecolabel criteria is summarised in the table below. The proposed revised EU Ecolabel criteria will be in line with European legislation. Specific areas relevant to different EU Ecolabel criteria for SI, GM and mulches will be discussed in detail in the final technical reports for each criterion.

Table 3-3: Impact of existing legislation on the review of the EU Ecolabel criteria

	Ecolabel Regulations	End of Waste Criteria	Fertilisers Regulation	CLP	REACH	GPP	Water Framework Directive	ABPR	CEN TC 400 Standards
Current Status	Existing	Imminent	Imminent	Existing	Existing	Existing	Existing	Existing	Imminent
PTE limits	✓	✓	✓	✓	✓	✓	✓		
Mineral wool	✓			✓	✓	✓			
Peat	✓					✓			
Organic pollutants	✓	✓	✓	✓	✓	✓	✓		
Microbial pathogens limits	✓	✓	✓			✓		✓	
Test methods (esp. pathogens)		✓						✓	✓
Conclusion	**Article 6.6 regarding CLP and REACH should be implemented**	**EU Ecolabel limits should not be more relaxed than limits for EoW**	**EU Ecolabel limits should not be more relaxed than in the Fertilisers Regulation**	**Constituents of SI, GM and mulches cannot contain substances from Annexes I and IV**	**Constituents of SI, GM and mulches cannot contain substances from Article 57 of REACH**	**GPP revision must follow the EU Ecolabel revision to avoid discrepancies**	**Limits for priority substances must be checked**	**Compost and digestate must be sanitised and tested for pathogens as required by ABPR**	**CEN TC 400 standards should be used for EU Ecolabel sampling and testing**

3.6 References

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Commission Decision (2001/688/EC) of 28 August 2001 establishing ecological criteria for the award of the Community eco-label to soil improvers and growing media [2001] OJ L 242/17.

Commission Decision (2006/799/EC) of 3 November 2006 establishing revised ecological criteria and the related assessment and verification requirements for the award of the Community eco-label to soil improvers [2006] OJ L 325/28.

Commission Decision (2007/64/EC) of 15 December 2006 establishing revised ecological criteria and the related assessment and verification requirements for the award of the Community eco-label to growing media [2007] OJ L 32/137.

Commission Decision (2011/740/EU) of 14 November 2011 amending Decisions 2006/799/EC, 2007/64/EC, 2007/506/EC, 2007/742/EC, 2009/543/EC and 2009/544/EC in order to prolong the validity of the ecological criteria for the award of the EU Ecolabel to certain products [2011] OJ L 297/64.

Commission Regulation (EC) No 987/2008 of 8 October 2008 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction [2008] OJ L 268/14.

Commission Regulation (EU) No 142/2011. Implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at the border under that Directive [2011] OJ L 54/1.

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Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC andamending Directive 2000/60/EC of the European Parliament and of the Council [2008] OJ L 348/84.

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IPTS, Ricardo – AEA, 2013. Revision of European Ecolabel Criteria for Soil Improvers and Growing Media Inception report.

Regulation (EC) No 2003/2003 of the European Parliament and of the Council of 13 October 2003 relating to fertilisers [2003] OJ L 304.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006

concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC [2006] OJ L 396/1.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 [2008] OJ L 353.

Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 – Consolidated version [2011] 2008R1272 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2008R1272:20110419:EN:PDF.

Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009

laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation) [2009] OJ L 300/1.Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel [2010] OJ L 27/1

4 Literature Review

4.1 Objective

The EU Ecolabel Criteria for soil improvers and growing media are currently being revised. Issues identified in the Commission Statement on 6th April 2006 will be considered in this revision, while it is possible that the scope of the updated criteria will be extended to include mulch.

As part of the work, a review of existing literature has been initiated. The review to date has identified sources of information and data on the environmental performance of soil improvers, growing media and their various constituents. An initial evaluation of the information collected has been carried out to determine whether sufficient information is available or whether additional research studies need to be initiated to fill knowledge gaps. This initial assessment is required as additional research would impact and extend the timetable for execution of the EU Ecolabel revision. The project team will also evaluate the literature in detail to determine whether a further life cycle analysis will be required for the purposes of this project.

4.2 Literature review

Each of the main constituents of soil improvers and growing media has been examined as a separate material and the relevant literature found is listed below. A table summarizing the level of coverage for each of the constituents and each of the criteria is presented in Section 4.3.

4.2.1 *Peat*

There is a satisfactory amount of information on the environmental impact of peat, especially with regards to peat extraction. Dry and organic matter content, as well as nutrient content, are some of the areas where enough information was identified. There appears to be a lack of information on toxic elements, organic pollutants and pathogens.

Sources and extraction

Peat is a highly organic material consisting of decaying vegetative matter. Peat extraction from peatlands across the world has been found to generate greenhouse gas (GHG) emissions, especially when a change of land use is required. Cleary, Roulet & Moore (2005) reported GHG emissions from Canadian peat extraction between 1990 and 2000. Tomlinson (2010) has looked at the extraction of peat in Northern Ireland and the carbon emissions for a period of 18 years, from 1990 until 2008.

Further life cycle assessment (LCA) studies looking at the environmental impact of peat extraction and comparing it with the impact of other constituents are available from Boldrin, Hartling, Laugen and Christensen (2010) and EPAGMA (2012). Boldrin et al. (2010) calculated the emissions of undisturbed peatlands and those of excavated peatlands to assess the impact of the extraction phase. EPAGMA (2012) did a comparative analysis of different growing media constituents and their environmental impact.

<u>Physical form</u>

The physical properties of peat usually depend on the environment where it was formed. According to Andriesse (1988), high moor peat is a heterogeneous mix with a high hydrophilic humic material content (humic acids and hemicellulose). Low moor peat appears to have a smaller content of hydrophilic materials. Its bulk density ranges from 50 kg/m3 in very fibric, undecomposed materials to less than 500 kg/m3 in well decomposed materials.

Dry matter and organic matter contents

A breakdown of carbon content in dry matter for peat and other constituents can be found in the Defra (2008) study. Cleary et al. (2005) also give an indication of dry matter content.

Nutrient content

Five studies that give information on the nutrient content of peat were identified. The key ones are Defra (2008), Boldrin et al. (2010) and Murayama, Asakawa and Ohno (1990). These state concentration levels of nitrogen, phosphorus, potassium and sulphur in peat.

Cleary et al. (2005) and Verhagen and Boon (2008) also cover nutrient content.

Toxic elements PTEs

Boldrin et al. (2010) reported heavy metals in the leachate composition of peat. Some information on toxic elements was included in a few other studies, such as Verhagen and Boon (2008) and Pakarinen and Tolonen (1976).

Organic pollutants

Verhagen and Boon's (2008) analysis gives an overview of the impact of organic pollutants from peat. However, there seems to be a lack of information on organic pollutants for the majority of constituents, including peat.

Microbial pathogens

No studies were found to address the presence of pathogenic microorganisms in peat.

Physical contaminants – glass, metals plastics

No studies found.

Other parameters – plant growth tests, electrical conductivity

No studies found.

Environmental and health concerns

Environmental concerns due to the high GHG emissions from peat extraction were addressed in a number of LCA studies, all of which are listed below.

LCA studies

Cleary et al. (2005), Defra (2008), EPAGMA (2012) and Boldrin et al. (2010) looked at the GHG emissions from the entire lifecycle of peat, including extraction, transport and decomposing in land as end use. The emissions of peat were compared to those of peat substitutes. All of the peat substitutes mentioned in these studies have been further analysed during this literature review.

Tomlinson (2010) looks at extraction emissions only, while Verhagen et al. (2008) and Butler and Hooper (2010) look at other LCA parameters as well, such as acidification, eutrophication and human toxicity.

4.2.2 *Compost*

For the purposes of the EU Ecolabel, both green waste compost and household waste compost will be studied. Green waste compost covers compost produced from organic waste from agriculture, forestry and

green wastes from the food processing industry and landscaping. Household waste compost is obtained by composting the organic fraction of household solid waste (food scraps and 'green' waste), obtained by separated source waste collection.4

A large amount of studies exist for compost. These cover all areas of interest, namely LCA, pathogens, nutrient content, toxic elements and organic pollutants. Therefore, it is concluded that compost is a material that is adequately covered by existing literature.

Sources and preparation

A few studies looked at the sources and preparation of compost. A study by Zmora-Nahum, Hadar and Chen (2007) reported differences in physico-chemical properties, dry matter content, disease suppression and pollutants' absorption properties of different composts, depending on their source materials and country of origin.

Physical form

Compost is a humified material produced from highly heterogeneous organic matter (Zmora-Nahum et al. 2007). Density changes depending on the compost material and can range from 200 kg/m3 to 420 kg/m3 for green waste compost, or higher for food waste compost (Stoffella and Kahn 2001). Defra (2008) reported a bulk density range of 400 – 772 kg/m3.

Dry matter and organic matter contents

Seven studies gave details on the dry and organic matter content of compost. The reports are Defra (2008), Boldrin et al. (2010), Zmora-Nahum et al. (2007), Razza, Zaccheo, Cavanna and Innocenti (2011), Boulter-Bitzer, Trevors and Boland (2006), Tang, Inoue, Yasuta, Yoshida and Katayama (2003) and Zaccheo, Ricca and Crippa (2002).

Nutrient content

A large number of studies refer to the nutrient content of compost. Four of the studies identified addressed this area in more depth. These are Razza et al. (2011), Boulter-Blitzer et al. (2006), Tang et al. (2003) and Zaccheo et al. (2002).

Toxic elements PTEs

The toxic elements found in compost were discussed extensively in a report written in 2004 by the Working Group on Compost (WG Compost) of the Consulting & Development Technical Office for Agriculture. The report looked at potentially toxic elements and a number of different organic pollutants from organic waste used in agriculture as fertilisers.

Seven more reports have also addressed this matter, namely Boldrin et al. (2010), Boulter-Blitzer et al. (2006), Zmora-Nahum et al. (2007), Tang et al. (2003), Jintai Su (2009), Smith (2009) and Andersen, Boldrin, Christensen and Scheutz (2011).

[4] http://ec.europa.eu/environment/ecolabel/documents/si_criteria2.pdf

Organic pollutants

Organic pollutants such as PCBs, PAHs and phthalates in green compost and their rate of degradation is analysed in detail in the WG Compost (2004) report. A large number of reports looked at specific organic pollutants in different types of compost. These are Tang et al. (2003), Zmora-Nahum et al. (2007), Boulter-Blitzer et al. (2006), Zaccheo et al. (2002), Verhagen et al. (2008), EPAGMA (2012), Brandli (2006), Brandli et al. (2007a and 2007b), Kupper et al. (2006) and Ng, Chan and Ma (2008).

Microbial pathogens

Six references with a satisfactory amount of data on microbial pathogens were identified for compost, namely Boulter-Blitzer et al. (2006), Zmora-Nahum et al. (2007), Tang et al. (2003), WRAP (2003), WRAP (2009) and Suarez-Estrellaa, Vargas-Garciaa, Lopeza, Capelb and Morenoa (2007).

Physical contaminants – glass, metals plastics.

At this stage of the literature review, only two studies looking at physical contaminants were found for compost. Unmar and Mohee (2008) looked at the effect of plastic contaminants in green waste and Razza et al. (2011) investigated the effect of contaminants on compost production.

Other parameters

Phytotoxicity was addressed in one of the reports found (Aslam, VanderGheynst and Rumsey, 2008) while electrical conductivity and physical properties were included in four studies (Boulter-Blitzer 2006, Tang 2003, Zmora-Nahum 2007 and Andersen 2011).

Environmental and health concerns

The 3rd working document on End of Waste Criteria for biodegradable waste (IPTS 2012), states various environmental and health concerns on compost and digestates. These include emissions to air, water and soil, hygiene issues and injury risks.

Emissions to air from the composting process can be greenhouse gases such as CO_2, CH_4 and N_2O, as well as other emissions such as VOCs, NH_3, bioaerosols and particulates. Land emissions include contaminants passed to soils, while emissions to water occur mostly via treatment at sewage works. Other studies addressing emissions are available from Defra (2004), Komilis and Ham (2006), Recycled Organics Unit (2007), Environment Agency (2009) and WRAP (2002).

Hygiene issues are discussed in Defra (2002) and in the epidemiological study section of Defra (2004).

LCA studies

A large number of LCA studies are available on compost, nine of which were found to be more relevant to this project. The main LCA studies on compost are those of EPAGMA (2012), Verhagen et al. (2008), Razza et al. (2011), Defra (2008), Boldrin et al. (2010), Butler and Hooper (2010), Andersen et al. (2011), Recycled Organics Unit (2007) and JRC (2008).

4.2.3 *Coconut fibre (coir)*

Two in-depth LCA studies addressed coir (EPAGMA 2012 and Defra 2008) however, there is not adequate information on other areas of interest to this project, such as pathogens and pollutants.

Sources and preparation

Coconut fibre is extracted from the fibrous husk (mesocarp) of the coconut. It has a number of applications in product manufacturing, while it can also be used as a growing medium constituent in horticulture. No specific studies detailing the preparation process were identified.

Physical form

Coir is a fibrous material, high in lignin and low in cellulose. Particle size ranges from 0.68 - 2.18 mm (Viswanathan and Gothandapani 1999), while bulk density ranges from 80 – 600 kg/m3 (Defra 2008).

Dry matter and organic matter contents

Evans, Konduru and Stamps (1996) studied the physical and chemical properties of coir from different sources and found that physical properties tend to change depending on the source used. Chemical properties, such as the concentration of certain nutrients (Ca, Na, NO3-N) also changed across different coir sources.

Abad, Noguera, Puchades, Maquieira and Noguera (2002) reported physical and chemical properties of coir when this was used as a peat substitute. Physical properties examined were pH and electrical conductivity, while chemical properties included nutrient concentrations and organic matter content.

Verhagen and Boon (2008) reported the dry and organic matter of coir as part of their study.

Nutrient content

Evans et al. (1996), Abad et al. (2002) and Verhagen and Boon (2008) all included information on nutrient content in their studies.

Toxic elements PTEs

Data on heavy metals and other PTE concentrations can be found in Evans et al. (1996) and Verhagen and Boon (2008). However, no other sources of information addressing toxic elements were found.

Organic pollutants

There is a relatively small amount on data on organic pollutants content in coir. Some information is reported in EPAGMA (2012), as well as in Verhagen and Boon (2008) as part of their LCA studies.

Microbial pathogens

There is no information on pathogenic microorganisms in coir. However, Waller, Thornton, Farley and Groenhof (2008) conducted a study on testing techniques for human and plant pathogens in growing media constituents, including coir.

Physical contaminants – glass, metals plastics.

No studies found.

Other parameters.

No studies found.

Environmental and health concerns

No studies found.

LCA studies

A small number of LCA studies looked at the environmental impact of coir as a growing medium. EPAGMA (2012) and Defra (2008) are the key ones and they provide a comparison of the environmental impacts of coir and other growing media constituents.

4.2.4 *Bark and wood waste*

Limited information exists on bark and wood waste, especially with regards to pollutants and pathogens.

<u>Sources and preparation</u>

Bark and wood waste usually originate from forestry operations, but there were not studies identified on the production/preparation stage of those wastes.

<u>Physical form</u>

Bark comprises the outer part of woody stems and branches (USDA, 1971). Typical bulk density ranges from 250 – 450 kg/m3 (Defra 2008). Wood waste may contain both treated and untreated wood. Specific properties vary greatly, depending on the type of wood and its source. Bulk density is usually between 95 – 120 kg/m3 for wood fibre (Defra 2008).

<u>Dry matter and organic matter contents</u>

The carbon content of bark and wood fibre is given in Defra (2008) and Verhagen and Boon (2008).

<u>Nutrient content</u>

A satisfactory number of studies on nutrient content of bark and other wood wastes were identified. Four of these studies also give details on physical properties such as pH and electrical conductivity, namely Defra (2008), Verhagen and Boon (2008), Buamcha, Atland, Sullivan, Horneck and Cassidy (2007) and Ahmed, Asha, Urooj and Bhat (2009).

<u>Toxic elements PTEs</u>

A lack of information about toxic elements was observed for bark and wood waste. WRAP (2006) carried out a detailed analysis of chemical contamination in wood wastes and heavy metals were one category of pollutants found mainly in treated wood waste.

<u>Organic pollutants</u>

There is a lack of information on organic pollutants for the majority of constituents, including bark and wood waste. However, Loser, Holm and Heinz (2004) reported the degradation of PAHs in wood waste after composting, while WRAP (2006) addressed organic pollutants in different types of wood waste.

<u>Microbial pathogens</u>

No studies found.

<u>Physical contaminants – glass, metals, plastics</u>

No studies found.

<u>Other parameters</u>

Electrical conductivity was studied in a number of composition analyses, mentioned in the nutrient content section above. No studies were found on plant growth at this stage of the review.

Environmental and health concerns

The environmental impact of forestry operations was addressed in a report from IPCC published in 2000.

LCA studies

Defra (2008) and EPAGMA (2012) are the main LCA studies on bark and wood waste.

4.2.5 *Rice husks*

A large amount of data exists on LCA for rice husk ash and energy production uses, but data is very limited on rice husks and their use in agriculture.

Sources and preparation

Rice husks are a by-product of rice milling. A life cycle assessment of rice by Blengini and Busto (2009) provided information on the preparation of rice husks.

Physical form

Rice husk is the outermost layer of the paddy grain and has a low bulk density of 70 - 110 kg/m3.[5]

Dry matter and organic matter contents

No studies found.

Nutrient content

The nutrient content of rice husk is examined in Liou (2004).

Toxic elements PTEs

A few studies referred to the use of rice husks to absorb heavy metals. The most comprehensive ones are by Foo and Hameed (2009), Souza, Hencklein, Angelis, Goncalves and Fontanetti (2009), Tarley and Arruda (2004), Verhagen and Boon (2008) and Tanpaiboonkula, Asavapisita and Sungwornpatansakul (2010).

Organic pollutants

No studies found.

Microbial pathogens

No studies found.

Physical contaminants – glass, metals, plastics

No studies found.

Other parameters

No studies found.

Environmental and health concerns

No studies found.

5 http://www.knowledgebank.irri.org/rkb/rice-milling/byproducts-and-their-utilization/rice-husk.html

LCA studies

A couple of LCA studies, namely EPAGMA (2012) and Verhagen (2008), took into consideration the use of rice husks in horticulture.

4.2.6 *Perlite, vermiculite*

Existing information on environmental performance of perlite and vermiculite was found to be rather limited.

Sources and preparation

Both minerals are sourced through surface extraction. In addition to the main LCA studies used for this project, a report by USEPA (undated) gives background information on assessing emissions from perlite processing.

Physical form

Perlite is a glassy volcanic rock with a rhyolitic composition and does not contain any carbon. Its bulk density ranges from 45 – 180 kg/m3 (Defra 2008). Vermiculite has a similar composition to perlite and its density is 60 -120 kg/m3 (Defra 2008).

Dry matter and organic matter contents

Defra (2008) reported contents of dry and organic matter in perlite and vermiculite.

Nutrient content

Silber et al. (2010) reported release rates of different nutrients for perlite-based growing media.

Toxic elements PTEs

No studies found.

Organic pollutants

No studies found.

Microbial pathogens

No studies found.

Physical contaminants – glass, metals plastics

No studies found.

Other parameters

Plant growth and pH were studied for perlite-based growing media by Silber et al. (2010)

Environmental and health concerns

No studies found.

LCA studies

Defra (2008) and EPAGMA (2012) are the two main studies addressing environmental impacts of perlite and vermiculite.

4.2.7 *Mineral wool*

A number of studies addressing the human toxicity of mineral wool are available. A limited amount of information exists in all other areas.

Sources and preparation

A very limited amount of information exists in terms of sources and preparation of mineral wool. Some information can be derived from LCAs looking at different insulation materials, including mineral wool.

Physical form

Mineral wool often is a fibrous glassy substance made from minerals (basalt or diabase) or mineral products such as slag and glass. Its bulk density is typically 40 – 120 kg/m3 (NNFCC, 2008).

Dry matter and organic matter contents

No studies found.

Nutrient content

No studies found.

Toxic elements PTEs

No studies found.

Organic pollutants

No studies found.

Microbial pathogens

No studies found.

Physical contaminants – glass, metals plastics

No studies found.

Other parameters

No studies found.

Environmental and health concerns

A number of studies looked at the human toxicity of mineral wool. The main ones are WHO (2005), Wilson, Langer and Nolan (1999) and Fayerweather, Bender, Hadley and Eastes (1997).

LCA studies

The EPAGMA study (2012) was the only one to assess the lifecycle impact of growing media containing mineral wool. Four other LCA studies (NNFCC 2008, Schmidt, Jensen, Clausen, Kamstrup and Postlethwaite 2004, EPA 1980 and ESU-services 2012) looked at mineral wool as an insulation material. These can be used to identify the environmental impact of the production/preparation and possibly the transport phase of the mineral wool lifecycle.

4.3 Areas of uncertainty and recommendations

Following this preliminary assessment of existing literature, we conclude that there is enough evidence published on the environmental performance of compost and digestate. There are also a satisfactory number of studies around peat and the emissions resulting from its extraction and use.

However, there seems to be a considerable lack of data around most hazards, namely organic pollutants, toxic elements, microbial pathogens and physical contaminants across all constituents. Knowledge gaps were also identified in LCA for several constituents.

The colour-coded table below uses a traffic light rating system to provide an indication of the areas where enough data is available and the ones where there is a lack of information.

Table 4-1: Summary of Data Availability for the Different Constituents and Criteria Examined

Criteria examined	Peat	Compost	Coir	Bark, wood waste	Rice husks	Perlite, vermiculite	Mineral wool
Sources and extraction	Green	Green	Amber	Red	Amber	Amber	Amber
Physical form	Green	Green	Amber	Amber	Amber	Amber	Amber
Dry & organic matter content	Green	Green	Green	Amber	Red	Amber	Red
Nutrient content	Green	Green	Green	Green	Amber	Red	Red
Toxic elements (PTEs)	Green	Green	Amber	Amber	Green	Red	Red
Organic pollutants	Amber	Green	Amber	Amber	Red	Red	Red
Microbial pathogens	Red	Green	Red	Red	Red	Red	Red
Physical contaminants	Red	Amber	Red	Red	Red	Red	Red
Other parameters	Red	Green	Red	Green	Red	Amber	Red
Environmental & health concerns	Green	Green	Red	Red	Red	Red	Green
LCA studies	Green	Green	Amber	Amber	Amber	Amber	Green
Overall	Green	Green	Amber	Amber	Amber	Amber	Amber

Key: **Green**: Enough information available. **Amber**: Limited information available. **Red**: No information.

At this stage, it is recommended that additional data is collected, especially for constituents that are deemed important to this revision and for which there are notable information gaps. Alternatively, for data that do not already exist, the project team can make precautionary assumptions based on studies for compost and digestates.

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5 Questionnaire analysis

Table 5-1: Analysis of Information from Questionnaire

Section	No. of responses	Summary of responses
Scope and definition	27/28	85% of respondents agreed with the proposed definitions while the rest 15% suggested minor amendments, mainly around the definition of mulch. They also advised the harmonization with the ongoing revision of the Fertilizer Regulation
Market data and product costs	17/28	Responses received from a number of Member States, namely UK, Germany, Latvia, Denmark, Netherlands, France, Italy and Belgium. The majority of responses covered estimated quantities of SI, GM and mulch consumed in each country. Only a small amount of specific data was provided for all other market related questions. Some respondents provided references to publications and surveys containing market data that will be analysed to extract any useful information. Very little data was received on product costs.
Peat	26/28	Approximately 35% of respondents answered that they agree with the complete exclusion of peat from the EU Ecolabel, while 62% suggested that the inclusion of a certain percentage of peat would make sense, as a certain percentage of peat is reported to have a positive impact on the properties and performance of GM. Stakeholders also welcomed a potential restriction on the sources of peat allowed, to ensure that only sustainable sources are used.
Mineral wool	17/28	47% of respondents suggested that no mineral wool should be allowed in Si or GM for the purposed of the EU Ecolabel as it is a material that can potentially be classified as carcinogenic, while it is also hard to recycle. 29% suggested that there should be no limitation to the use of mineral wool, especially for GM (not so important for SI as SIs are mainly organic products and mineral wool does not have an organic content). It has also been reported by a few stakeholders that recycling of mineral wool is only feasible to a certain extend.
Hazardous substances	24/28	There was a mixed response to existing hazardous substance limits. Majority of respondents who disagree are suggesting more relaxed limits.

Organic pollutants	19/28	A mix of responses on whether limits for organic pollutants are necessary. These limits are relevant to certain products depending on their constituents but not as relevant to others.
Microbiological testing	23/28	35% of respondents answered that they agree with existing microbiological testing *E.Coli, H.Ova* and *Salmonella*). 26% disagreed with existing tests, suggesting that testing for *H.Ova* is not necessary. Approximately half of the respondents suggested that microbiological testing should be carried out on each constituent while the other half believes that it is best to test the final product. No respondents suggested there is a need for additional tests.
Life cycle analysis (LCA)	18/28	Very little data received on this section, with the majority of respondents pointing to the EPAGMA report for information. Some information was provided on countries of origin for different constituents that can be used when estimating transport emissions.

6 Market Analysis

6.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Growing Media (GM) and Soil Improvers (SI). The scope of this project also includes the potential development of an EU Ecolabel for mulches. Following an Inception Phase, during which the scope of work and the proposed implementation plan were agreed, Task 1 has now been completed, and comprised the following four stages:

- Scope and Definition
- Legal Review
- Literature Review
- Stakeholder Survey

The work that was been carried out in each stage, along with the respective findings, can be reviewed in the Task 1 Report, reproduced in the sections above.

The second phase of this project aims to analyse the European market for GM, SI and mulches. The intention is to determine the overall size of the market, and its split by Member State, as well as the imports from and exports to outside the EU. Understanding these details will be important to determine the potential benefit of moving the market towards products that meet the revised EU Ecolabel criteria. It is also useful to understand the market segmentation, and the key producers involved.

6.2 European Market Statistics

A first approach to estimate the product market sales in EU27 is to compute its apparent consumption in EU27. Indeed, estimates of production, exports and imports in the EU27 can be combined to arrive at an estimate of apparent EU consumption from the EU statistics on production and trade, using the following formula:

Apparent consumption in EU27	=	Production sold in EU27	–	Export to countries outside the EU27	+	Imports from countries outside the EU27

For production statistics, the PRODCOM categorisation was used, while for statistics on exports and imports, the study relies on the Combined Nomenclature (CN) codes. As a consequence of the collection methods and confidentiality preferences of many EU countries, these data are not immediately available, so a number of assumptions and calculations were required, and these are discussed in the appropriate sections below.

6.2.1 *PRODCOM*

PRODCOM is a system for the collection and dissemination of statistics on the production of manufacturing goods. The title comes from the French “PRODuction COMmunautaire” (Community Production) and aims to enable national statistics to be compared and where possible give a picture of an industry or product in the

European context. PRODCOM data are collected and reported by all Member States (MSs) including the EFTA[6] (European Free Trade Association) countries Norway and Iceland. Each manufacturing product is classified by an 8-digit code and all together aggregated in a database that is updated on an annual basis. For those products that are manufactured within a MS's territory, a MS should report on:

(1) the value of production in Euros;

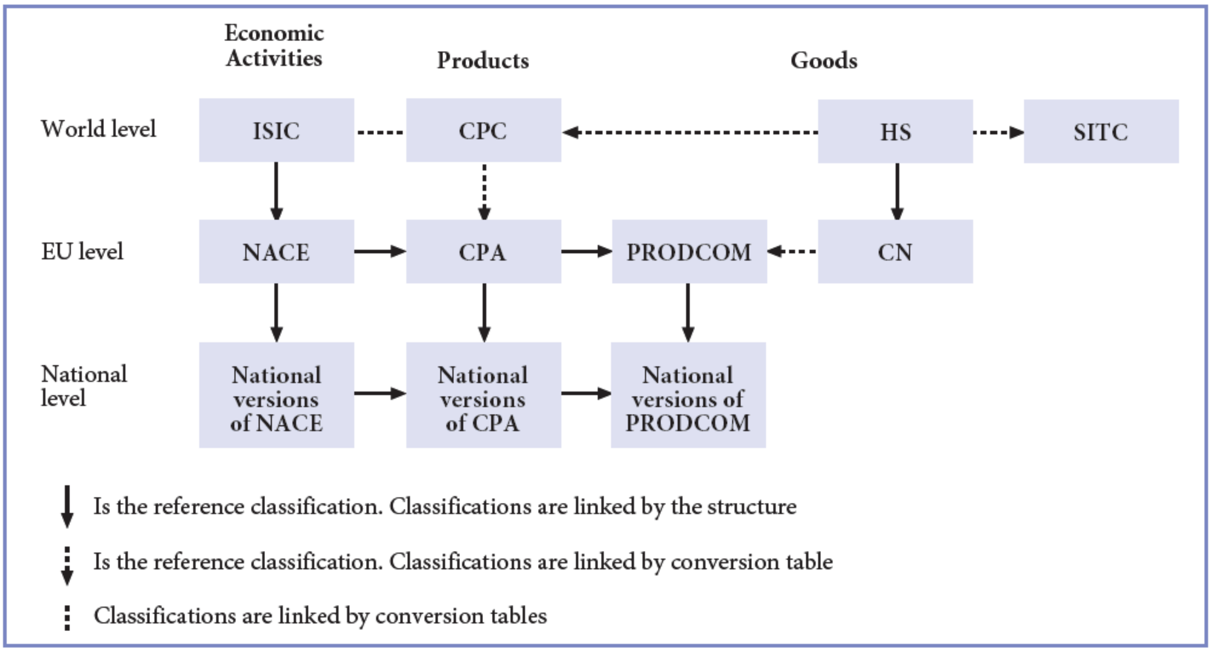
(2) the volume sold in thousands of units;and

(3) the total weight in thousands of kilograms.

It should be noted that National Statistical Institutes in each MS are not required to survey businesses with less than 20 employees. It is therefore impossible to know the actual percentage of production that has been reported.

PRODCOM production statistics are based on the CPA (Classification of Products by Activity) and the European Standard Classification of Productive Economic Activities NACE Rev. 1.1 (NACE Rev 2 as from 2008). From a European perspective, this system can be represented as shown in Figure 6-1. A number of revisions to NACE have been made over the years. PRODCOM data for 2005, 2006 & 2007 have been reported under NACE Rev. 1. However, data for 2008 and onwards are now reported under NACE Rev. 2.

Figure 6-1: International System of Classifications[6]



Key:

- ISIC is the United Nations' International Standard Industrial Classification of all Economic Activities.
- CPC is the United Nations' Central Product Classification.
- HS is the Harmonized Commodity Description and Coding System, managed by the World Customs Organisation.
- NACE is the European Standard Classification of Productive Economic Activities.

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6 http://epp.eurostat.ec.europa.eu/portal/pls/portal/!PORTAL.wwpob_page.show?_docname=30168.PDF

- CPA is the European Classification of Products by Activity.
- CN is the Combined Nomenclature.
- SITC Is the Standard International Trade Classification

6.2.2 *Combined Nomenclature*

The Combined Nomenclature (CN) is the classification used within the European Union for collecting and processing foreign trade data. Most PRODCOM headings correspond to one or more CN codes. The CN is comprised of the Harmonized System (HS) nomenclature with further Community subdivisions. The HS is run by the World Customs Organisation (WCO). This systematic list of commodities forms the basis for international trade negotiations, and is applied by most trading nations. The CN also include preliminary provisions, additional sections or chapter notes and footnotes relating to CN subdivisions. Products are classified by an eight-digit code and data are displayed on the value (Euro) of trades (internal and external) as well as on the quantity (kg) traded.[7]

Eurostat reports inter-country trade value (in Euros) for each CN2011 product code, breaking results down into:

- Export EU Intra   export to other countries within the EU
- Export EU Extra   export to countries outside the EU
- Import EU Extra   import from countries outside the EU
- Import EU Intra   import from countries within the EU

It might be expected that the EU27 total for exports to countries within the EU would match the EU27 total for imports from within the EU, but this is not the case. We assume that the difference is associated with movements that are reported by the participating MSs in different years, and by misalignments between countries in the allocation to the different product codes.

PRODCOM statistics have to be comparable with external trade statistic (CN). For that reason, Eurostat publishes a list on an annual basis with the CN codes and the corresponding PRODCOM codes, to define the relationship between the two nomenclatures. For each PRODCOM code, one or more CN code corresponds.

6.2.3 *This project*

For this project on GM, SI and mulches, we initially identified 13 codes within PRODCOM that might include some GM/SI/Mulch materials. Using code-mapping data from Eurostat, we identified that these 13 PRODCOM codes map to 65 CN2011 codes. The codes and their descriptions were examined in detail and assigned a red/orange/green rating, respectively reflecting not/potentially/definitely relevant to the study. The likely percentage split for each of the 65 codes between GM, SI and Mulch was also estimated (so, for example, CN44012100, which maps to PRODCOM 16102303, is "Coniferous wood in chips or particles", so

[7] http://ec.europa.eu/taxation_customs/customs/customs_duties/tariff_aspects/combined_nomenclature/index_en.htm

that is expected to be 100% mulch). The full list of codes and our assessment is reproduced in Table 6-15. Grouping the results by PRODCOM category, the final shortlist of nine categories is presented in Table 6-1.

Table 6-1: Summary of PRODCOM categories used in the Study

PRODCOM 2011	PRODCOM Description	Units	Mulch	GM	SI	to tonnes
1610 1039	Softwood sawn/chipped lengthwise, sliced/peeled and thickness > 6 mm including pencil slats - wood length <= 125cm, thickness <12.5 mm excluding end-jointed - planed/sanded, spruce/pine	m3 (000s)	50%	0%	0%	240
1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	m3 (000s)	21%	0%	0%	240
1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	m3 (000s)	14%	0%	0%	240
1610 2303	Coniferous wood in chips or particles	kg (000s)	100%	0%	0%	1
1610 2305	Non-coniferous wood in chips or particles	kg (000s)	100%	0%	0%	1
2015 3990	Mineral or chemical fertilizers, nitrogenous, n.e.c.	kg N (000s)	0%	0%	50%	1
2015 7930	Fertilizers in tablets or similar forms or in packages of a gross weight of <= 10 kg)	kg (000s)	0%	25%	25%	1
2015 7980	Other fertilizers, n.e.c.	kg (000s)	0%	17%	17%	1
2015 8000	Animal or vegetable fertilizers	kg (000s)	0%	50%	50%	1
	Density (tonnes/m3) (†):		**0.24**	**0.35**	**0.55**	

(†) Note: the densities used were sourced from:
Mulch: http://www.concrush.com.au/site/forest-mulch
SI: http://www.rolawn.co.uk/soil-improver.html
GM: http://www.fao.org/docrep/x5872e/x5872e0b.htm

Within PRODCOM and Eurostat, some confidential country data is protected, though the EU27 total is provided. By taking the difference between the sum of the country data provided and the EU27 total, it is possible to determine the sum of the protected data. This can be assigned to the withholding countries on a number of different bases, with options in the developed model allowing the user to select one of the following:

- Population
- GDP
- Households
- Eurostat AD Compost Data

In the analysis that follows, GDP has been chosen to drive these extrapolations. In reality, the various distributions are not very different, so this is not considered to be a critical factor.

6.2.4 *Market Results*

The production results for GM, SI and mulches are presented in Table 6-2, with more detailed figures, including the imports and exports, shown in Table 6-16 and Figure 6-2 (GM), Table 6-17 and Figure 6-3 (SI) and Table 6-18 and Figure 6-4 (mulches).

Table 6-2: PRODCOM Production data (Value in 000s Euros, Volume in tonnes)

	Mulch		GM		SI	
Country	**Value**	**Volume**	**Value**	**Volume**	**Value**	**Volume**
Belgium	40,410	340,224	21,580	104,152	21,580	104,152
Bulgaria	5,911	40,938	496	8,221	496	8,221
Czech Republic	68,474	1,230,024	8,258	30,710	24,395	39,991
Denmark	32,643	144,872	1,559	9,703	1,560	9,703
Germany	543,447	6,520,087	40,344	579,715	130,095	657,804
Estonia	61,151	2,097,309	72	139	72	139
Ireland	37,020	638,455	21,641	244,554	21,641	244,554
Greece	2,019	22,562	4,534	50,824	30,141	75,881
Spain	52,748	700,957	74,141	323,523	89,442	364,849
France	335,164	3,322,662	96,873	285,566	190,981	590,020
Italy	76,027	124,575	136,045	415,195	154,666	453,843
Cyprus	0	0	0	0	0	0
Latvia	170,021	2,381,434	247	4,100	2,247	5,250
Lithuania	51,639	795,547	50	126	3,438	36,036
Luxembourg	0	0	0	0	0	0
Hungary	25,521	494,856	1,511	22,487	12,463	28,786
Malta	0	0	0	0	0	0
The Netherlands	26,598	79,951	9,080	135,107	74,883	172,953
Austria	307,679	3,646,773	5,804	38,748	37,445	56,945
Poland	76,105	1,072,963	4,505	121,992	43,923	144,662
Portugal	33,718	605,884	10,259	94,000	29,472	105,051
Romania	37,966	68,967	0	0	13,566	7,802
Slovenia	6,349	66,244	552	8,217	4,554	10,519
Slovakia	15,162	273,917	907	15,036	8,239	19,253
Finland	268,118	2,986,098	5,399	16,694	5,399	16,694
Sweden	672,402	12,958,370	4,770	79,092	4,770	79,092
The United Kingdom	281,969	6,418,710	30,937	141,381	219,684	145,432
Total	**3,228,262**	**47,032,378**	**479,565**	**2,729,281**	**1,125,152**	**3,377,631**

Figure 6-2: Schematic Diagram of EU-Wide Trade for Growing Media (000s €)

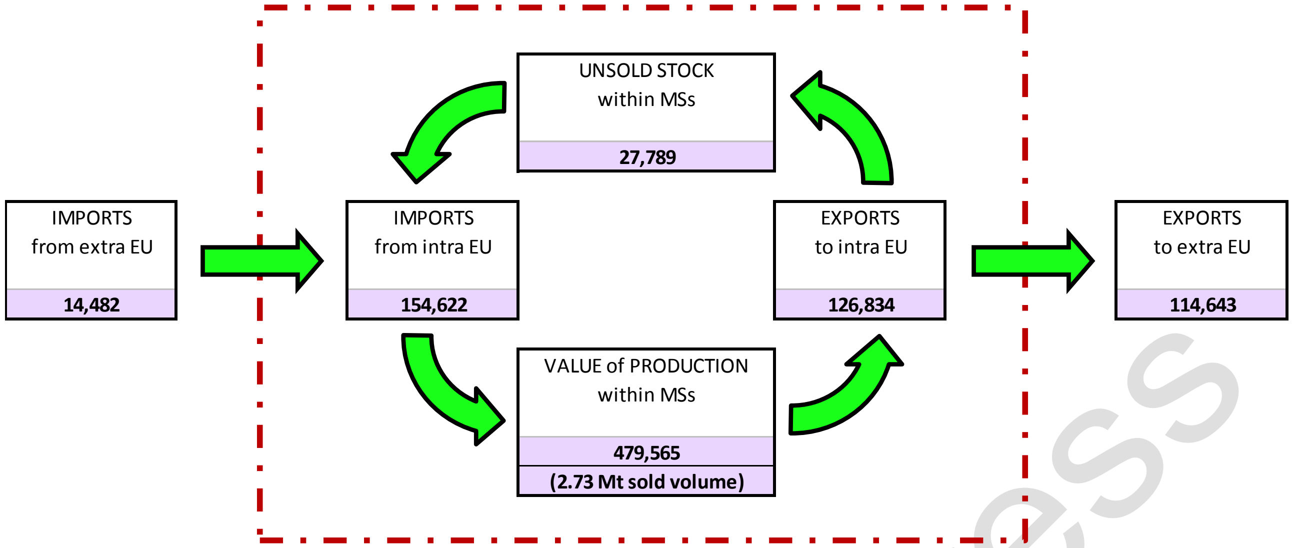


Figure 6-3: Schematic Diagram of EU-Wide Trade for Soil Improvers (000s €)

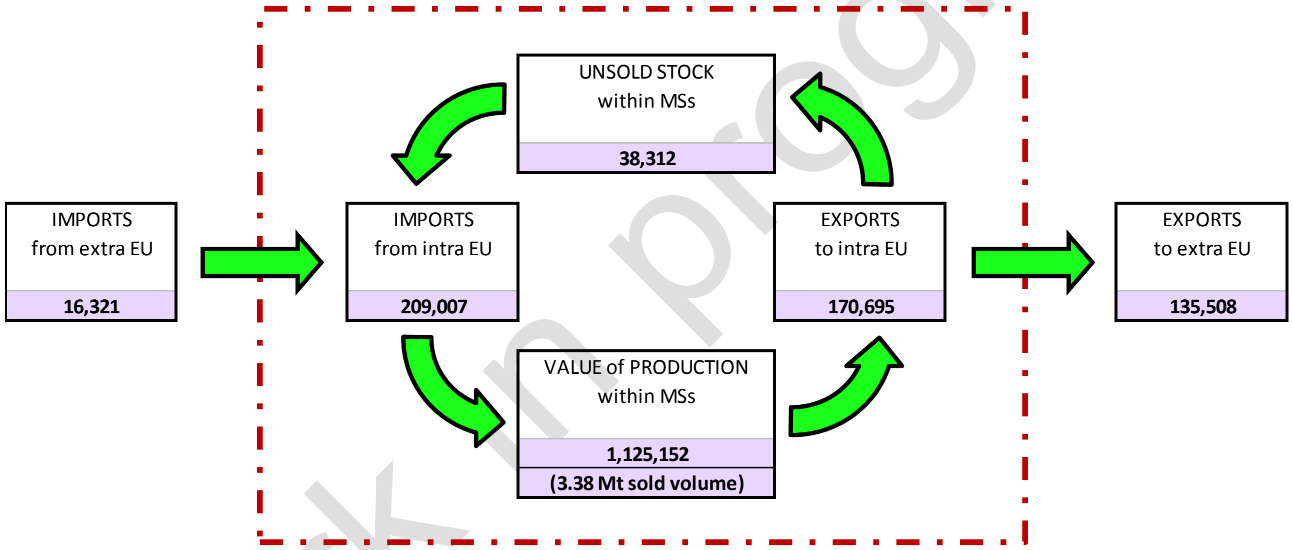
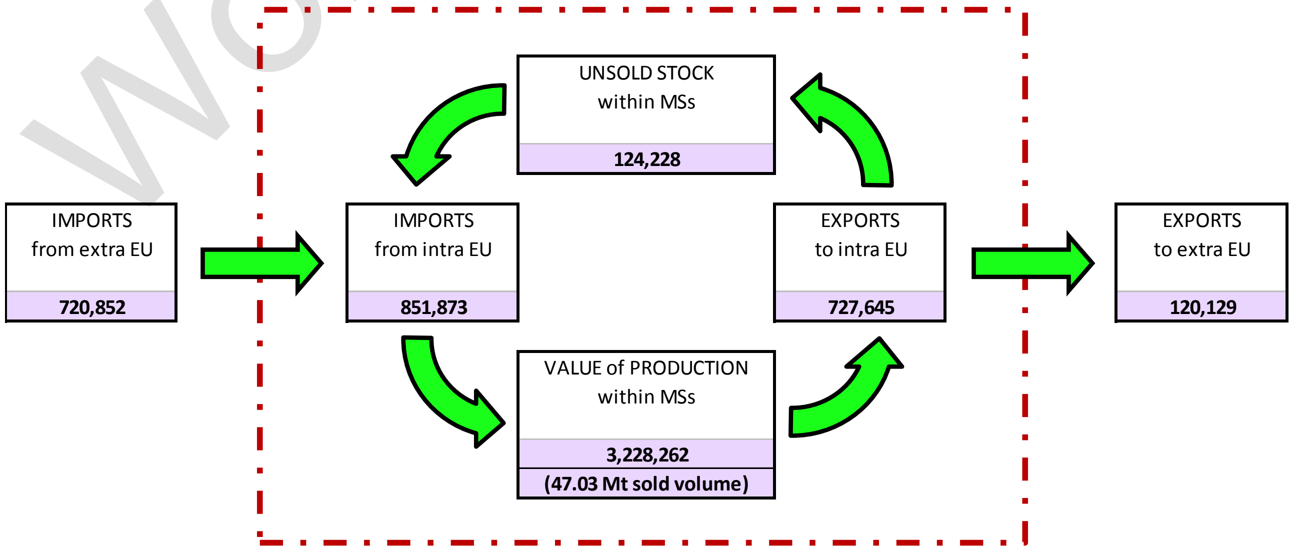


Figure 6-4: Schematic Diagram of EU-Wide Trade for Mulches (000s €)



The final figures are summarised in Table 6-3.

Table 6-3: Final EU Market Statistics (Value in 000s Euros, Volume in tonnes)

Product	PRODCOM Data		Eurostats Data			
	All Values	All Sold Volume	Export outside the EU	Export within the EU	Import from within the EU	Import from outside the EU
Mulch	3,228,262	47,032,378	120,129	727,645	851,873	720,852
GM	479,565	2,729,281	114,643	126,834	154,622	14,482
SI	1,125,152	3,377,631	135,508	170,695	209,007	16,321
Total	**4,832,979**	**53,139,291**	**370,280**	**1,025,173**	**1,215,502**	**751,654**

Ricardo-AEA's assessment of these figures was that, whilst the tonnage for mulch looks reasonable, the figures for both GM and SI look somewhat low. In order to check this concern, a series of additional calculations were undertaken, to derive the tonnages by alternative means.

6.3 Alternative Calculation Routes

6.3.1 *Ricardo-AEA Stakeholder Survey*

As part of this project, Ricardo-AEA prepared a questionnaire and invited stakeholders to respond, providing data about, amongst other things, their estimations of the size of the markets for the target products. As might be expected, it was not possible to get market estimations for every EU country. However, these could be obtained by adopting the same extrapolation process used to estimate missing data in PRODCOM.

In Table 6-4, statistics provided by stakeholders are in bold, with remaining data, extrapolated on the basis of GDP, in normal font.

Table 6-4: Annual Tonnages of Products Arisings, Extrapolated from Questionnaire

Country / Region	GDP Share	Growing Media	Soil Improvers	Mulch
Belgium	2.88%	**264,000**	**175,000**	**137,500**
Bulgaria	0.29%	20,435	25,456	9,224
Czech Republic	1.18%	82,258	102,472	37,129
Denmark	1.91%	**147,768**	165,316	59,900
Germany	20.36%	1,417,075	1,765,310	639,637
Estonia	0.12%	8,223	10,244	3,712
Ireland	1.27%	88,464	110,203	39,931
Greece	1.88%	130,532	162,609	58,919
Spain	8.66%	602,598	750,681	272,000
France	15.75%	**792,000**	**1,225,000**	494,754
Italy	12.62%	**720,000**	**1,200,000**	**55,000**
Cyprus	0.14%	9,904	12,338	4,471
Latvia	0.15%	**20,880**	**618,100**	4,600
Lithuania	0.22%	15,544	19,364	7,016
Luxembourg	0.34%	23,590	29,387	10,648
Hungary	0.80%	55,829	69,548	25,200
Malta	0.05%	3,535	4,404	1,596
The Netherlands	4.82%	**960,000**	**175,000**	**110,000**
Austria	2.32%	161,290	200,925	72,803
Poland	2.89%	200,933	250,311	90,697

Country / Region	GDP Share	Growing Media	Soil Improvers	Mulch
Portugal	1.41%	97,938	122,006	44,207
Romania	0.99%	69,153	86,147	31,214
Slovenia	0.29%	20,401	25,414	9,208
Slovakia	0.54%	37,375	46,560	16,870
Finland	1.47%	102,222	127,342	46,141
Sweden	2.83%	196,596	244,908	88,739
The United Kingdom	13.83%	**710,400**	**945,000**	**770,000**
GDP Subtotal	100.00%	51.95%	50.04%	34.14%
Totals		**6,958,943**	**8,669,046**	**3,141,116**

6.3.2 *2008 EPAGMA Study*

In September 2008, the European Peat and Growing Media Association (EPAGMA) published a report entitled, “Socio-economic impact of the peat and growing media industry on horticulture in the EU”, which included an analysis of the size of the European market for peat. A simple pie-chart (reproduced below) estimates the total size of the market and its share for GM and SI.

Figure 6-5: Peat Usage Data from EPAGMA

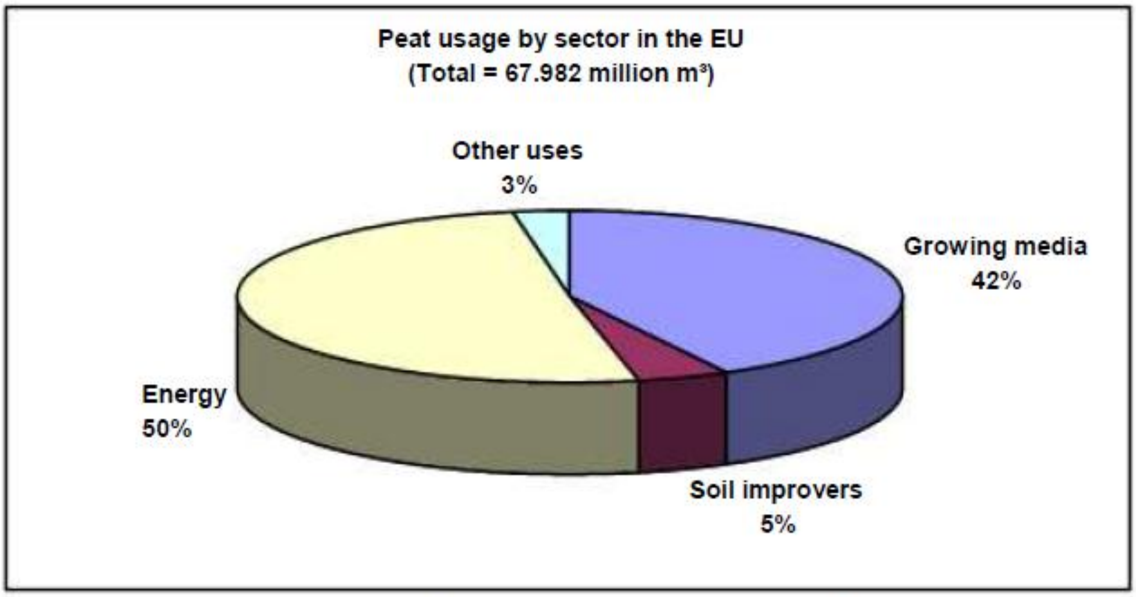


Figure 17: Peat usage in the EU based on data obtained from main producer and consumer countries. The reported total use of peat was 67.982 million m³ in 2005.

From this starting point, the inferred total EU27 market size for the two products can be calculated. Furthermore, by applying the same extrapolation technique once again, figures for individual countries can be estimated, as presented in Table 6-5.

Table 6-5: Annual Tonnages of Products Arisings, Extrapolated from EPAGMA Study

Country	GDP Share	GM	SI
Belgium	2.88%	312,142	37,160
Bulgaria	0.29%	31,868	3,794
Czech Republic	1.18%	128,282	15,272
Denmark	1.91%	206,955	24,638
Germany	20.36%	2,209,949	263,089
Estonia	0.12%	12,825	1,527
Ireland	1.27%	137,960	16,424
Greece	1.88%	203,566	24,234
Spain	8.66%	939,760	111,876
France	15.75%	1,709,377	203,497
Italy	12.62%	1,369,779	163,069
Cyprus	0.14%	15,446	1,839
Latvia	0.15%	15,893	1,892
Lithuania	0.22%	24,242	2,886
Luxembourg	0.34%	36,789	4,380
Hungary	0.80%	87,066	10,365
Malta	0.05%	5,513	656
The Netherlands	4.82%	523,105	62,274
Austria	2.32%	251,533	29,944
Poland	2.89%	313,358	37,305
Portugal	1.41%	152,736	18,183
Romania	0.99%	107,845	12,839
Slovenia	0.29%	31,815	3,788
Slovakia	0.54%	58,287	6,939
Finland	1.47%	159,416	18,978
Sweden	2.83%	306,594	36,499
The United Kingdom	13.83%	1,500,465	178,627
Total	**100.00%**	**10,852,568**	**1,291,972**

6.3.3 *Calculation from Compost Data*

Ricardo-AEA also performed a calculation starting from the total amount of municipal compost and digestate in the EU. The starting basis was the July 2013 "End-of-waste criteria for Biodegradable waste subjected to biological treatment – draft final report" from IPTS (which itself quoted a March 2010 Eurostat[8] release) estimating 44.5 million tonnes of MSW being composted. This was combined with the estimated split of the market (from ECN 2008 Survey, reported in 2012 Fertiliser report). The first assumptions applied are:

- Suitable fraction of the EU municipal compost and digestate (**60%**); and
- Split of each market fraction between GM and SI (see Table 6-6 below).

[8] http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/8-19032010-AP/EN/8-19032010-AP-EN.PDF

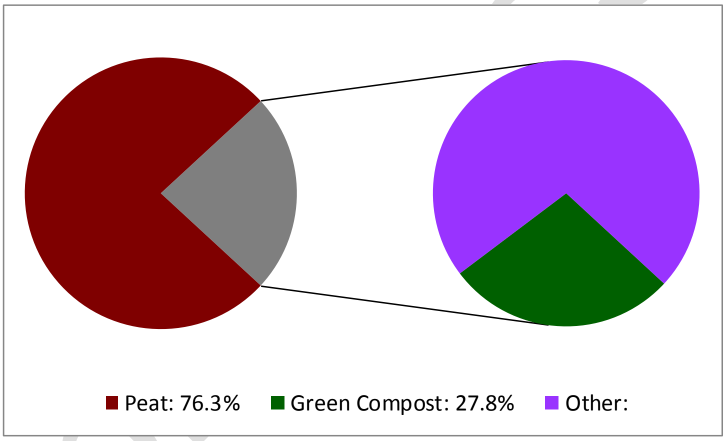
Table 6-6: Split of market for compost and digestate

Fate	Market Share (%)	GM	SI
Agriculture	50%	0%	100%
Landscaping	15%	0%	100%
Growing media and manufactured soil	20%	50%	50%
Private consumer market	15%	20%	80%
Total share	**100%**	**13%**	**87%**

For GM, the following additional assumptions are applied:

- fraction of non-peat GM that is green compost (**27.8%**, from questionnaire);
- average amount of GMs that contain peat (**76.3%**, from questionnaire).

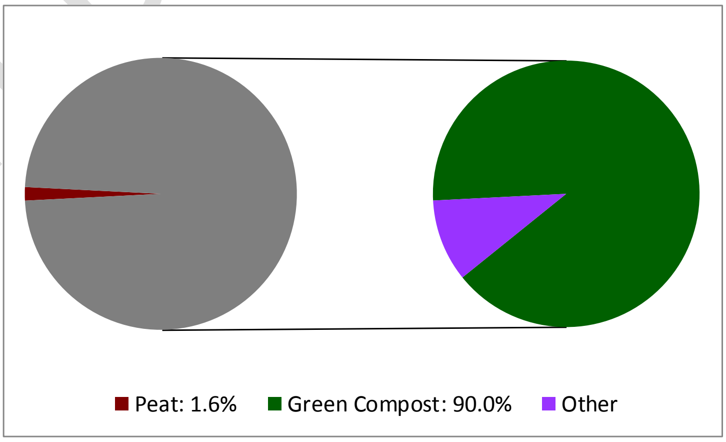
Total GM = 44.5 x 60% x 13% / [27.8% x (100%-76.3%)] = 52.5 Mt



For SI, the following additional assumptions are then applied:

- fraction of non-peat SI that is green compost (**90%**); and
- average amount of SIs that contain peat (**1.6%**, from questionnaire).

Total SI = 44.5 x 60% x 87% / [90% x (100%-1.6%)] = 26.2 Mt



The same GDP split is then used to distribute the total EU tonnages between MSs – see Table 6-7.

Table 6-7: Total Production (in tonnes) of GM and SI, from Green Waste Data

Country	Split	GM	SI
Belgium	2.88%	1,510	754
Bulgaria	0.29%	154	77
Czech Republic	1.18%	621	310
Denmark	1.91%	1,001	500
Germany	20.36%	10,692	5,341
Estonia	0.12%	62	31
Ireland	1.27%	667	333
Greece	1.88%	985	492
Spain	8.66%	4,547	2,271
France	15.75%	8,270	4,131
Italy	12.62%	6,627	3,311
Cyprus	0.14%	75	37
Latvia	0.15%	77	38
Lithuania	0.22%	117	59
Luxembourg	0.34%	178	89
Hungary	0.80%	421	210
Malta	0.05%	27	13
The Netherlands	4.82%	2,531	1,264
Austria	2.32%	1,217	608
Poland	2.89%	1,516	757
Portugal	1.41%	739	369
Romania	0.99%	522	261
Slovenia	0.29%	154	77
Slovakia	0.54%	282	141
Finland	1.47%	771	385
Sweden	2.83%	1,483	741
The United Kingdom	13.83%	7,260	3,626
Total	**100.00%**	**52,508**	**26,230**

6.4 Analysis and Comparison of Results

The above sections provide four different methods by which the size of the EU GM, SI and mulch markets might be estimated. The results of the calculations are summarised in Table 6-8. The country-by-country estimations for the three products and via the different methods are presented in Table 6-9.

Table 6-8: Summary of Results (market size in thousands of tonnes)

Product	PRODCOM & Eurostats	Project Questionnaire	EPAGMA 2008 Study	Calculation from Compost
Growing Media	2,729	3,615	10,853	52,508
Soil Improvers	3,378	4,338	1,292	26,230
Mulch	47,032	1,073		

The immediate conclusion from these results is that there is little consensus from the various sources about the size of the EU market for GM, SI and Mulch. In the light of the differences, we have revisited our calculations (in Section 6.3.3), but feel that both our underlying assumptions and the resulting totals feel reasonable.

Given these large variations, the next step in this work is to seek some benchmark figures against which the analysis can be compared. Ricardo-AEA is already aware of certain relevant data in the public domain:

- an early WRAP study in 2003 indicated the UK growing media market was 3.6 million m^3 (about 1.3 Mt);
- in 2010, WRAP's UK composting industry study indicated about 1.3 Mt of compost used as soil improver;
- ECN in 2005 estimated the green-waste compost in the EU to be 10.5 Mt, with no estimate from the digestate (and composting has grown a lot since); and
- the JRC End of Waste 2nd document used old data but indicated compost production was about 14 Mt in the EU, again excluding digestate.

Our opinion is that, taking these values into account and considering how they might be reproduced across the whole EU, the larger values calculated from compost arisings seem realistic, especially as they mostly exclude digestate (which, for instance, is established for use in agriculture in Germany).

We would welcome any further data from stakeholders, which will provide some spot-checks for the different countries, from which we hope to reach a consensus on reasonable market estimations.

Table 6-9: Summary of Results by Different Estimation Techniques (market size in thousands of tonnes)

		Growing Media				Soil Improvers				Mulch	
Country	**Split**	**P'COM**	**Quest.**	**EPAGMA**	**Compost**	**P'COM**	**Quest.**	**EPAGMA**	**Compost**	**P'COM**	**Quest.**
Belgium	2.88%	104	264	312	1,250	104	175	37	624	340	138
Bulgaria	0.29%	8	20	32	128	8	25	4	64	41	9
Czech Republic	1.18%	31	82	128	514	40	102	15	257	1,230	37
Denmark	1.91%	10	148	207	829	10	165	25	414	145	60
Germany	20.36%	580	1,417	2,210	8,850	658	1,765	263	4,421	6,520	640
Estonia	0.12%	0	8	13	51	0	10	2	26	2,097	4
Ireland	1.27%	245	88	138	552	245	110	16	276	638	40
Greece	1.88%	51	131	204	815	76	163	24	407	23	59
Spain	8.66%	324	603	940	3,763	365	751	112	1,880	701	272
France	15.75%	286	792	1,709	6,846	590	1,225	203	3,420	3,323	495
Italy	12.62%	415	720	1,370	5,486	454	1,200	163	2,740	125	55
Cyprus	0.14%	0	10	15	62	0	12	2	31	0	4
Latvia	0.15%	4	21	16	64	5	618	2	32	2,381	5
Lithuania	0.22%	0	16	24	97	36	19	3	48	796	7
Luxembourg	0.34%	0	24	37	147	0	29	4	74	0	11
Hungary	0.80%	22	56	87	349	29	70	10	174	495	25
Malta	0.05%	0	4	6	22	0	4	1	11	0	2
The Netherlands	4.82%	135	960	523	2,095	173	175	62	1,046	80	110
Austria	2.32%	39	161	252	1,007	57	201	30	503	3,647	73
Poland	2.89%	122	201	313	1,255	145	250	37	627	1,073	91
Portugal	1.41%	94	98	153	612	105	122	18	306	606	44
Romania	0.99%	0	69	108	432	8	86	13	216	69	31
Slovenia	0.29%	8	20	32	127	11	25	4	64	66	9
Slovakia	0.54%	15	37	58	233	19	47	7	117	274	17
Finland	1.47%	17	102	159	638	17	127	19	319	2,986	46
Sweden	2.83%	79	197	307	1,228	79	245	36	613	12,958	89
United Kingdom	13.83%	141	710	1,500	6,009	145	945	179	3,002	6,419	770
Total		**2,729**	**6,959**	**10,853**	**43,461**	**3,378**	**8,669**	**1,292**	**21,711**	**47,032**	**3,141**

6.5 Market Assessment

6.5.1 *General Market Trends*

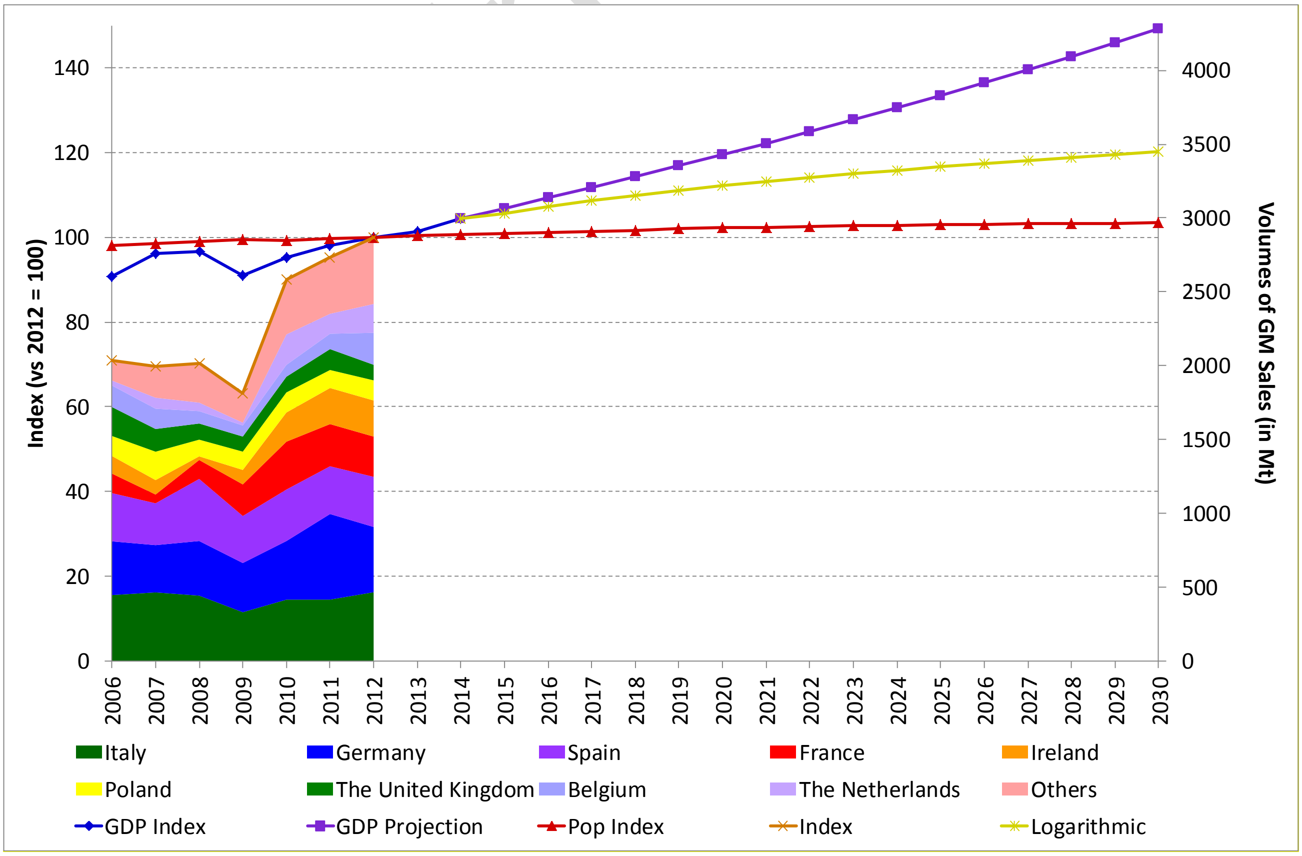
Little stakeholder information was gathered on general market trends, so the following analysis is derived from PRODCOM data. Despite the uncertainties mentioned above, PRODCOM data are still useful statistics for trend analysis, looking at how the market has moved in recent years and predicting from that what might happen in the future.

Figure 6-6 presents EU sales of GM products between 2006 and 2012, by country for the eight countries that exceed 100Mt, and aggregated for the others. The value for 2012 is set as the benchmark (index = 100) against which to compare historical and future projections of GDP and EU population. The historical data is all taken from Eurostat, as is the population projection. Eurostat also projects GDP out to 2014, after which a standard ongoing growth rate of 2.25% is assumed, in line with the figures between 2012 and 2014.

The plot shows that the volumes of GM sold broadly follow the *direction* of the historical index for GDP, but with a larger magnitude. We might therefore infer that the future projection for GM volumes should also exceed the future GDP growth predictions. However, we consider this to be a relatively unlikely, and that even a growth rate in line with the indicated GDP projection is ambitious.

Our lower boundary of possible future volumes is marked by the EU projection of population. This is a very flat projection, and we anticipate that GM sales will exceed this. Our best estimate of the future volumes of GM sales is given by a logarithmic projection through the historical data from years 2009-2012. This projection forecasts a growth to an index of 120 by 2030, which represents an average annual growth rate over the next 18 years of 1.03%, with EU sales rising to about 3500 Mt by 2030.

Figure 6-6: GM PRODCOM Sales Volume (in Mt) 2006-12, with Projections



Equivalent projections are provided for SI (Figure 6-7) and mulches (Figure 6-8).

Figure 6-7: SI PRODCOM Sales Volume (in Mt) 2006-12, with Projections

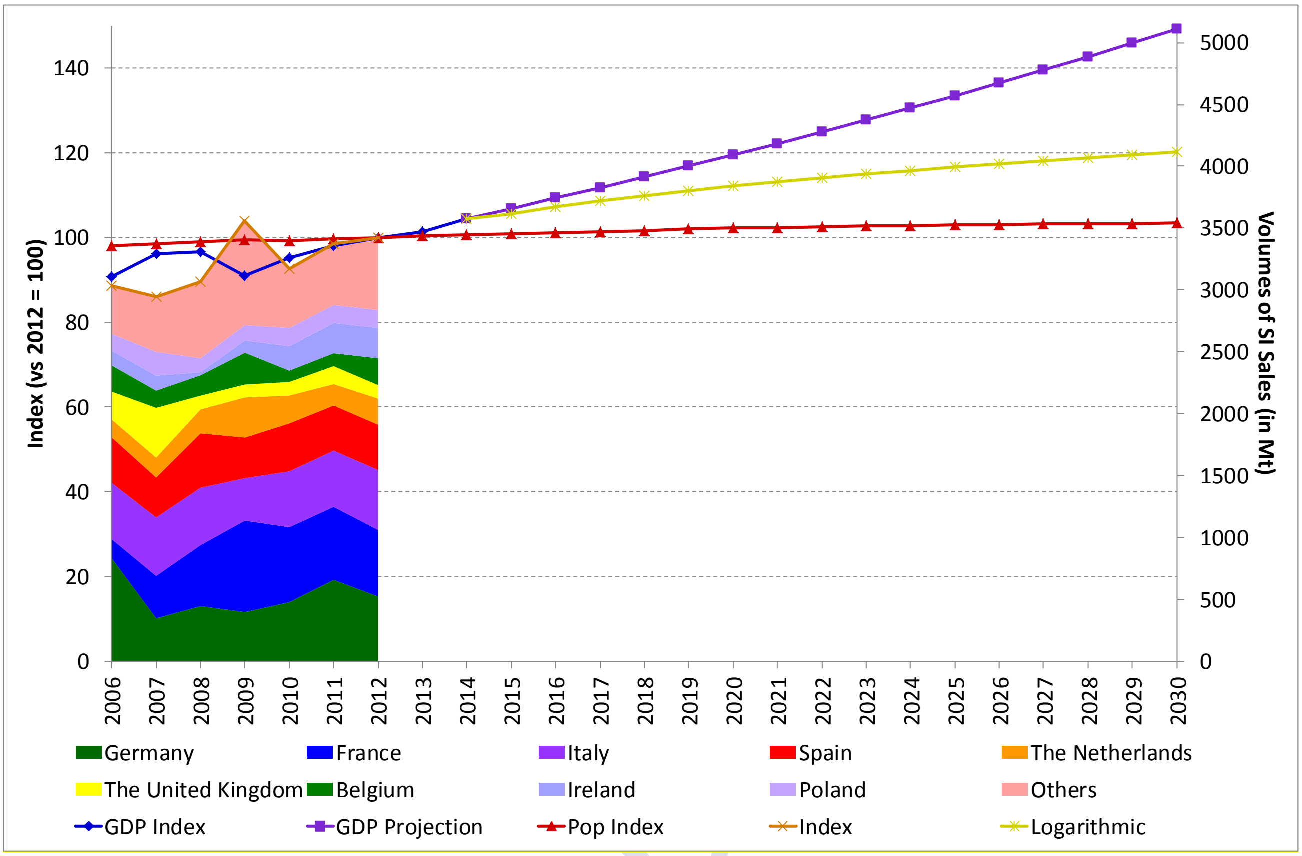
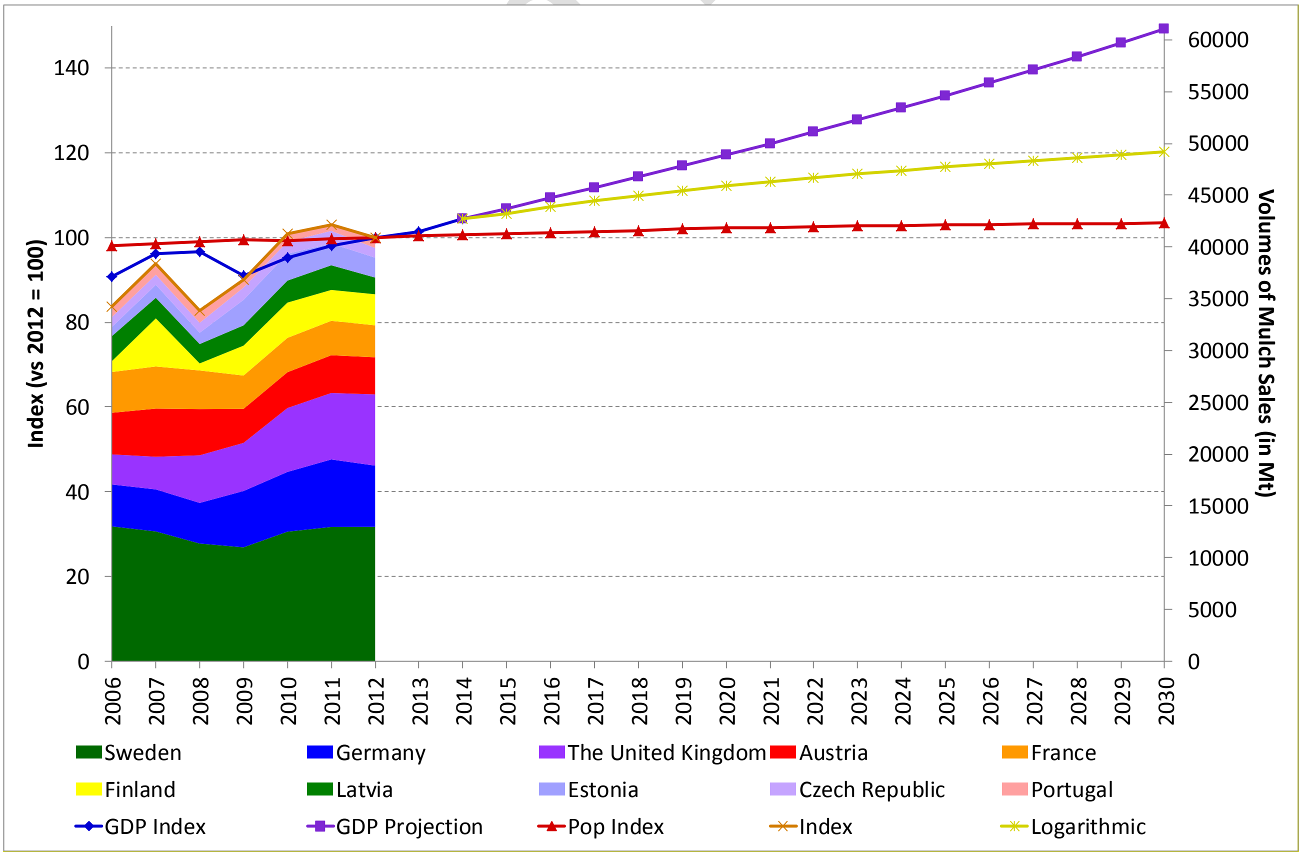


Figure 6-8: Mulches PRODCOM Sales Volume (in Mt) 2006-12, with Projections



6.5.2 *Other Information Sources*

A study conducted by the European Peat and Growing Media Association reveals that the peat and growing media industry for horticulture purposes accounted for a turnover of €1.3 billion and 11,000 jobs across 15 European countries listed below[9]. According to this study, 37 million m³ of GM were produced in the EU countries surveyed, with almost 19 million m^3 being used for professional horticulture and the rest for hobby gardening. This report is the most comprehensive study of the GM market across Europe which is publically available to date.

Table 6-10: Comparison of ex works market values for growing media, soil improvers (millions of € - 2005)

Producer Countries	Growing Media	Soil Improvers
Denmark	17.6	0.6
Estonia	-	-
Finland	28.4	16.1
France	173.8	7.5
Germany	239	45.4
Ireland	25.2	0.8
Latvia	18.3	0
Lithuania	31.4	0
Poland	-	-
Sweden	37.1	6.2
United Kingdom	121.9	66.3
Consumer countries		
Austria	6.8	1.7
Belgium	55.7	4.9
Italy	263.7	9
Netherlands	146.5	31
Spain	97.2	20
Total	1262.6	209.5

In landscape horticulture, GM are used to plant shrubs, trees, bedding plants, etc. in the ground. However, as peat is one of the main constituents for the large majority of GM products sold across the EU, the data available for peat use in horticulture is a good indication of the market, including the main countries producing peat for use in GM.

Data on peat production globally was sourced from the Mundi Index from 2006 up to 2010[10]. This data shows peat production for both fuel and horticulture use (i.e. within GM). The data relevant to the EU and horticulture market was extracted and is included within Table 6-11 below.

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9 http://www.epagma.eu/_SiteNote/WWW/GetFile.aspx?uri=%2Fdefault%2Fhome%2Fnews-publications%2Fpublications%2FFiles.Off%2FMainBloc%2FSocio_Economic_Study1_9864371f-20be-4d6b-9182-7e6a84816468.pdf

10 http://www.indexmundi.com/en/commodities/minerals/peat/peat_t9.html

Table 6-11: EU horticulture peat production (thousand tonnes)

Country	2006	2007	2008	2009	2010
Denmark	262	213	128	128	128
Estonia	1,207	964	705	110	361
Finland	6,919	8,671	6,933	5,576	5,580
France	200	200	200	200	200
Germany	218	85	119	119	119
Hungary,	77	90	90	90	107
Ireland	500	500	500	500	500
Latvia	931	1,000	1,000	1,164	1,119
Lithuania	471	307	521	543	327
Norway	69	140	438	440	440
Poland	577	641	632	594	672
Spain	60	60	60	60	60
Sweden	1,511	1,500	1,130	1,230	1,230
United Kingdom	1	1	1	1	1
Total	**13,003**	**14,372**	**12,457**	**10,755**	**10,844**

These countries represent the major peat producing countries extracting peat specifically for the horticulture/GM market. Finland dominates peat production across the EU and produces the highest tonnages of peat for horticulture use in the EU. Sweden and Latvia produce the second and third largest tonnages of peat destined for the horticulture market. Although Ireland is the second largest producer of peat across the EU, a large proportion is used for energy production. Excluding peat used for energy production, in 2010 Ireland was the fifth largest producer of peat for the horticulture market across the EU.

Generally, this data suggests the trend for peat production for use within GM has been relatively stable in recent years, suggesting the demand for GM products across the EU has remained strong. However, a small number of countries do show some large variances. For example, Estonia and Lithuania's production of peat for horticulture use has noticeably varied from year to year. One of the most likely reasons for such strong variations is the weather. As identified in the EPAGMA study (2008), all peat production techniques are weather dependent. If a particular year suffers a wet summer, drying of peat is not optimal. Similarly, if the winters are without sufficiently long period of below zero temperatures, the freeze-treatment of strongly decomposed peat might be too short to obtain peat of the highest quality. Such conditions directly impact the quality and amount of peat produced for horticulture use and hence the amount of available GM product for final sale.

Not all countries within the EU have peat resources and, as a result, demand for peat imports for use in GM is high for a number of European countries. The EPAGMA study published in 2008 provides data on the tonnes of finished products containing peat (i.e. GM) consumed per country. This is shown in Table 6-12 and is compared with the tonnages of peat produced. Of the GM consuming countries, Spain had the highest demand, followed by Belgium. A number of countries, despite producing large quantities of peat for GM products, still need to import large quantities (for example, Spain). A number of countries (such as Finland,

Estonia, Ireland and Latvia) produce large quantities of peat for GM products. These do not appear to import GM products containing peat, suggesting their market is satisfied by indigenous sources.

Table 6-12: Imported finished products containing peat (GM) and peat production in the EU

Producing Countries	Imported Finished Products containing GM – 2005 (000's Tonnes)*	Production of Peat for horticulture use – 2010 (000's Tonnes)**
Denmark	220	128
Estonia	0	361
Finland	0	5580
France	1012	200
Germany	198	119
Hungary	0	107
Ireland	0	500
Latvia	0	1119
Lithuania	0	327
Norway	0	440
Poland	n/a	672
Sweden	31	1230
United Kingdom	660	1
Consuming Countries		
Austria	267	-
Belgium	381	-
Italy	132	-
Netherland	220	-
Spain	944	60

*EPAGMA Study 2008; ** Index Mundi Data

It is not clear how the tough economic conditions across Europe have impacted the GM, SI and Mulches market. The horticulture market provides a good indication of demand across the EU. The European Nursery Stock Association (ENA) held its first international roundtable for the horticulture industry in June 2013. Horticulture industry leaders from around the world gathered in Italy to discuss national and global challenges facing the industry. As reported in the meeting, the state of the market varied considerably across Europe. In Germany and Holland markets were doing well, so the export market was not dramatically higher than usual. In contrast, the home markets for Italy, Spain and Portugal have just about collapsed[11]. The UK market has also proved challenging in recent times, although GM as a product category has sustained volume growth of 2.5 per cent per annum for more than a decade, partly due to the ageing population fuelling the popularity of gardening. The Royal Horticulture Society recently presented a report "Horticulture

[11] http://www.hortweek.com/news/1118173/Analysis-Tim-Edwards-reflects-state-trade-Europe-following-ENA-members-meeting-Essen/?DCMP=ILC-SEARCH

Matters” to the Government, calling for government action to urgently address the skills gap in the horticultural industry. A survey of 200 horticultural businesses conducted by the Society has demonstrated that more than 70% of horticultural businesses cannot fill skilled vacancies, nearly 20% are forced to recruit from overseas and almost 70% claim that career entrants are inadequately prepared for work[12].

Alternative materials to peat may be used in GM, but market research suggests the uptake trend across Europe varies. Alternatives are either other organic, composted or mineral materials, such as composted biodegradable waste, wood fibres, bark products, foam and coir, or mineral materials like rock wool, perlite and pumice, which are used as slabs or in bulk as pure products for certain crops[13]. In the UK, the Government established the Growing Media Task Force in 2011 to advise on how best to overcome the barriers to reducing peat use in horticulture in the UK. The task force has set target including zero peat in government and public sector contracts by 2015, zero peat in amateur products by 2020 and zero peat used by professional growers by 2030[14]. As reported within the UK Task Force Report, the phase out of peat tends to be a UK-centric drive and the issue is not as publicised across Europe. However, the recent poor harvest of peat all over Europe demonstrates its over reliance[15]. Industry reports that coir is making strong head way across Europe as a viable alternative to peat, and is likely to gain strength. The demand for quality coir pith from Europe is rapidly growing and takes the majority of that produced by India and Sri Lanka. In terms of export revenue, Europe and the US account for 72% of India’s coir product exports – Europe is currently the largest[16]. According to a report by Horticulture Week, coir is proving very popular for the professional market producing fresh produce. For example, coir is being used successfully to grow tomatoes, cucumbers and soft fruit such as strawberries. However, this again may vary by country or even supplier. In Holland, stone wool is still a predominant component of GM. However, coir is still a developing medium and caution still exists in the market.

The horticulture industry is under increasing pressure from the Government and NGOs to eliminate the use of peat in GM for environmental reasons. Consequently, a large number of the big retailers involved with gardening have within their corporate responsibility statements a commitment to reduce or eliminate the use of peat in their growing media in the short or medium term.

6.5.3 *Market Share*

In 2011, circa 44,500 thousand tonnes of green compost was produced across the EU27. This figure is expected to grow as European countries fulfil their Landfill Directive targets, suggesting the market will expand, potentially attracting new players. Across Europe, the majority of composts are used as soil improvers in either agriculture or landscaping. Between 50% and 75% of compost produced is used in the Agriculture market, while over 20% is used for landscaping across Europe. Typically, a low proportion is used within higher value markets, such as the production of high quality topsoil or as a constituent in GM. It

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12 http://www.rhs.org.uk/Media/PDFs/News/1016-RHS-Hort-Careers-Brochure-AW-low-res-spreads

13 http://ec.europa.eu/enterprise/sectors/chemicals/files/fertilizers/annexes_16jan2012_en.pdf

14 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221019/pb13867-towards-sustainable-growing-media.pdf

15 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221026/pb13834-sustainable-growing-media.pdf

16 http://newleafpractice.co.uk/pdf/Coir%20sustainability%20assessment%20sp.pdf

is estimated that around 20% of compost is used within the Hobby market[17]. The producer market is extremely, large consisting of thousands of SMEs across Europe. The European Compost network (ECN) represents more than 1500 bio-waste treatment plants across 24 European countries.

GM have two principal applications within the professional market or the hobby market, and also within the private sector landscaping market and Local Authority grounds maintenance. As for the SI market, the large of number of producers that exist across Europe vary in size and turnover. No comprehensive breakdown of the European market was available, but a literature review identified some of the top producers of GM, SI and Mulch producers, as shown in Table 6-13 below. In the UK, the supply of GM, SI and Mulch products to the hobby market is dominated by large retailers such as the Garden Centre Group, Tesco, Asda, Morrisons, Homebase and Wilkinson. Own brand labels account for 47% of the market, receiving supplies from numerous smaller producers. Three large players (Scotts, Westland and Sinclair) cater for circa 50% of the market, while the remaining small producers account for 3% of the market share[18].

Table 6-13: Example European GM, SI and Mulch producers and turnover (€ millions)

Company	Turnover (€ millions)
Metsa Group	5000
Les Jardins D'Aquitaine	4780
Cocus Planka	1700
Veolis Proprete	180
Klasmann Deilmann	150
ECN	144
Westland Horticulture	68
Florentaise	30
Tourbieres De France	1.2

The demand for ecolabelled GM and SI products is reasonable in Europe. In total 12 companies sell 63 ecolabel GM products while 17 companies sell 33 products. See table below.

Table 6-14: European manufacturers of Ecolabel GM and SI

Country	SI or GM	Company	Number of Ecolabel Products
Spain	GM	AGROVIVER, S.L.	**1**
Italy	GM	Fertil S.p.a.	**3**
Italy	GM	Collini Valentino & Mario s.n.c	**1**
Netherlands	GM	Rockwool B.V. - Grodan	**3**
Netherlands	GM	Pull B.V.	**1**
Netherlands	GM	Cocos-Lanka Holland B.V	**5**
France	GM	BIOLANDES PIN DECOR	**3**

[17] http://compost.it/biblio/2010_beacon_conference_perugia/2nd_day/5.c%20-%20Barth.pdf

[18] http://www.hortweek.com/news/1112526/Growing-media---Peat-free-preparations/?DCMP=ILC-SEARCH

Country	SI or GM	Company	Number of Ecolabel Products
France	GM	TERREAU FLORE BLEUE	**1**
France	GM	LES JARDINS D'AQUITAINE	**1**
France	GM	AQUILAND	**5**
France	GM	BIOLANDES PIN DECOR	**17**
France	GM	FLORENTAISE	**21**
Belgium	SI	Norland s.a	**1**
Belgium	SI	Desarrollo Agrícola y Minero, SA (Daymsa)	**2**
Spain	SI	Companía para la gestión de residuos en Asturias, SA	**1**
Hungary	SI	Szelektív Hulladékhasznosító és Környezetvédelmi Kft	**1**
Italy	SI	Vigorplant S.r.l	**3**
France	SI	LINIERE DE BOSC NOUVEL	**2**
France	SI	COMMUNAUTE d'AGGLOMERATION de la ROCHELLE	**2**
France	SI	BIOLANDES PIN DECOR	**11**
France	SI	VALNOR	**1**
France	SI	CEL Environnement	**1**
France	SI	VEOLIA PROPRETE	**1**
France	SI	RONAVAL ONYX	**1**
France	SI	GEVAL ONYX	**1**
France	SI	VEOLIA PROPRETE (NORD NORMANDIE)	**1**
France	SI	CHARIER DV	**1**
France	SI	AWT	**1**
France	SI	TOURBIERES DE France	**1**

6.6 Supporting Tables for Market Analysis

Table 6-15: Full List of 65 Potential CN2011 groups, the PRODCOM Equivalents, Ricardo-AEA's Assessment of Relevant and Market Split

CN 2011	CN Description	PROD COM 2011	PRODCOM Description	Comments	Mulch	GM	SI
3101 00 00	(CN tab - row 21) Animal or vegetable fertilisers, whether or not mixed together or chemically treated; fertilisers produced by the mixing or chemical treatment of animal or vegetable products (excl. those in pellet or similar forms, or in packages with a gross weight of <= 10 kg)	2015 8000	Animal or vegetable fertilizers	May include GM and SI as it contains vegetable feritlisers (i.e. the organic sources)	0%	50%	50%
3102 90 00	Description: - Other, including mixtures not specified in the foregoing subheadings Self-explanatory texts in English: Mineral or chemical nitrogen fertilisers (excl. urea; ammonium sulphate; ammonium nitrate; sodium nitrate; double salts and mixtures of ammonium nitrate with ammonium sulphate or calcium; mixtures of urea and ammonium nitrate in aqueous or ammoniacal solution; mixtures of ammonium nitrate and calcium carbonate or other non-fertilising inorganic elements; in tablets or similar in packages <= 10 kg)	2015 3990	Mineral or chemical fertilizers, nitrogenous, n.e.c.	Potentially include digestate with a high nutrient content - therefore may include SI. Not considered to include GM this is not a fertiliser	0%	0%	100%
3105 10 00	Description: - Goods of this chapter in tablets or similar forms or in packages of a gross weight not exceeding 10 kg Self-explanatory texts in English: Mineral or chemical fertilisers of animal or vegetable origin, in tablets or similar forms, or in packages with a gross weight of <= 10 kg	2015 7930	Fertilizers in tablets or similar forms or in packages of a gross weight of <= 10 kg)	May refer to organic materials which are generally very rich and used directly as fertilisers e.g. guano, bone meal, seaweed. May contain producted derived from digestates (dried digestate in pellets)	0%	50%	50%
3105 20 00	Description: - Mineral or chemical fertilisers containing the three fertilising elements nitrogen, phosphorus and potassium Self-explanatory texts in English: Mineral or chemical fertilisers containing the three fertilising elements nitrogen, phosphorus and potassium (excl. those in tablets or similar forms, or in packages with a gross weight of <= 10 kg)	2015 7100	Mineral or chemical fertilisers containing the three fertilising elements nitrogen, phosphorus and potassium (excl. those in tablets or similar forms, or in packages with a gross weight of <= 10 kg)	This is likely to be chemical fertilisers only	0%	0%	0%
3105 51 00	Description: -- Containing nitrates and phosphates Self-explanatory texts in English: Mineral or chemical fertilisers containing nitrates and phosphates (excl. ammonium dihydrogenorthophosphate "Monoammonium phosphate", diammonium hydrogenorthophosphate "Diammonium phosphate", and those in tablets or similar forms, or in packages with a gross weight of <= 10 kg)	2015 7400	Other mineral or chemical fertilisers containing the two fertilising elements nitrogen and phosphorus	Both chemcial fertilisers - not organics. No mention of organic fertilisers - salts metioned are typical of chemical fertilisers	0%	0%	0%

CN 2011	CN Description	PRODCOM 2011	PRODCOM Description	Comments	Mulch	GM	SI
3105 59 00	Description: -- Other Self-explanatory texts in English: Mineral or chemical fertilisers containing the two fertilising elements nitrogen (excl. nitrate) and phosphorus but not nitrates (excl. ammonium dihydrogenorthophosphate "monoammonium phosphate", diammonium hydrogenorthophosphate "diammonium phosphate" in tablets or similar forms, or in packages with a gross weight of <= 10 kg)	2015 7400	Other mineral or chemical fertilisers containing the two fertilising elements nitrogen and phosphorus	Both chemcial fertilisers - not organics. No mention of organic fertilisers - salts metioned are typical of chemical fertilisers	0%	0%	0%
3105 60 00	Description: - Mineral or chemical fertilisers containing the two fertilising elements phosphorus and potassium Self-explanatory texts in English: Mineral or chemical fertilisers containing the two fertilising elements phosphorus and potassium (excl. those in tablets or similar forms, or in packages with a gross weight of <= 10 kg)	2015 7500	Mineral or chemical fertilisers containing the two fertilising elements phosphorus and potassium	Both chemcial fertilisers - not organics. No mention of organic fertilisers - salts metioned are typical of chemical fertilisers	0%	0%	0%
3105 90 10	Code: 3105 90 10 Description: -- Natural potassic sodium nitrate, consisting of a natural mixture of sodium nitrate and potassium nitrate (the proportion of potassium nitrate may be as high as 44 %), of a total nitrogen content not exceeding 16,3 % by weight on the dry anhydrous product	2015 7980	Other fertilizers, n.e.c.	Assumed to be naturally occuring.	0%	0%	0%
3105 90 91	Description: --- With a nitrogen content exceeding 10 % by weight on the dry anhydrous product Self-explanatory texts in English: Mineral or chemical fertilisers containing the two fertilising elements nitrogen and potassium, or one principal fertilising substance only, incl. mixtures of animal or vegetable fertilisers with chemical or mineral fertilisers, containing > 10% nitrogen by weight (excl. potassium sodium nitrate of subheading 3105.90.10 and those in tablets or similar forms, or in packages with a gross weight of <= 10 kg)	2015 7980	Other fertilizers, n.e.c.	Its described having a mixture of animal and vegetable products which could be within the scope of this project. GM/SI are unlikely to have a N content greater than 3%. This category is unlikely to include SI or GM	0%	50%	50%
3105 90 99	Description: --- Other Self-explanatory texts in English: Mineral or chemical fertilisers containing the two fertilising elements nitrogen and potassium, or one main fertilising element, incl. mixtures of animal or vegetable fertilisers with chemical or mineral fertilisers, not containing nitrogen or with a nitrogen content, by weight, of <= 10% (excl. potassic sodium nitrate in subheading 3105.90.10, or in tablets or similar forms or in packages of a gross weight of <= 10 kg)	2015 7980	Other fertilizers, n.e.c.	GMSI tend to have a N content by weight at circa 3%. Therefore this category is likely to contain SI and GM	0%	50%	50%
4401 21 00	Description: -- Coniferous Self-explanatory texts in English: Coniferous wood in chips or particles (excl. those of a kind used principally for dying or tanning purposes)	1610 2303	Coniferous wood in chips or particles	Very likely to include mulch products	100%	0%	0%

CN 2011	CN Description	PRODCOM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4401 22 00	Description: -- Non-coniferous Self-explanatory texts in English: Wood in chips or particles (excl. those of a kind used principally for dying or tanning purposes, and coniferous wood)	1610 2305	Non-coniferous wood in chips or particles	Very likely to include mulch products	100%	0%	0%
4407 10 15	Description: -- Sanded; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Coniferous wood sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded, or end-jointed, whether or not planed or sanded	1610 1033	Coniferous wood; sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm, end-jointed, sanded or planed	Appears to be highly processed good - therefore unlikely to inlcude mulch materials	0%	0%	0%
4407 10 31	Description: ---- Spruce of the species ‘Picea abies Karst.’ or silver fir (Abies alba Mill.) Self-explanatory texts in English: Spruce of the species "Picea abies Karst." or silver fir "Abies alba Mill.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1033	Coniferous wood; sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm, end-jointed, sanded or planed		0%	0%	0%
4407 10 33	Description: ---- Pine of the species ‘Pinus sylvestris L.’ Self-explanatory texts in English: Pine of the species "Pinus sylvestris L.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1033	Coniferous wood; sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm, end-jointed, sanded or planed		0%	0%	0%
4407 10 38	Description: ---- Other Self-explanatory texts in English: Coniferous wood sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed, spruce of the species "Picea abies Karst.", silver fir "Abies alba Mill." and pine of the species "Pinus sylvestris L.")	1610 1033	Coniferous wood; sawn or chipped lengthwise, sliced or peeled, of a thickness > 6 mm, end-jointed, sanded or planed		0%	0%	0%
4407 10 98	Description: ---- Other Self-explanatory texts in English: Coniferous wood sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed or sanded, and spruce "Picea abies Karst.", silver fir "Abies alba Mill." and pine "Pinus sylvestris L.")	1610 1039	Softwood sawn/chipped lengthwise, sliced/peeled and thickness > 6 mm including pencil slats - wood length <= 125cm, thickness <12.5 mm excluding end-jointed - planed/sanded, spruce/pine	Potentially could contain mulch like material	100%	0%	0%
4407 21 10	Description: --- Sanded; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Mahogany "Swietenia spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded, or end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 21 91	Description: ---- Planed Self-explanatory texts in English: Mahogany "Swietenia spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%

CN 2011	CN Description	PROD COM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 21 99	Description: ---- Other Self-explanatory texts in English: Mahogany "Swietenia spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%
4407 22 10	Description: --- Sanded; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Virola, imbuia and balsa, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded, or end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 22 91	Description: ---- Planed Self-explanatory texts in English: Virola, imbuia and balsa, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 22 99	Description: ---- Other Self-explanatory texts in English: Virola, imbuia and balsa, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%
4407 25 10	Description: --- End-jointed, whether or not planed or sanded Self-explanatory texts in English: Dark red meranti, light red meranti and meranti bakau, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 25 30	escription: ---- Planed Self-explanatory texts in English: Dark red meranti, light red meranti and meranti bakau, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 25 50	scription: ---- Sanded Self-explanatory texts in English: Dark red meranti, light red meranti and meranti bakau, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 25 90	Description: ---- Other Self-explanatory texts in English: Dark red meranti, light red meranti and meranti bakau, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. such products planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%
4407 26 10	Description: --- End-jointed, whether or not planed or sanded Self-explanatory texts in English: White lauan, white meranti, white seraya, yellow meranti and alan, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%

CN 2011	CN Description	PRODCOM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 26 30	Description: ---- Planed Self-explanatory texts in English: White lauan, white meranti, white seraya, yellow meranti and alan, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 26 50	Description: ---- Sanded Self-explanatory texts in English: White lauan, white meranti, white seraya, yellow meranti and alan, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 26 90	Description: ---- Other Self-explanatory texts in English: White lauan, white meranti, white seraya, yellow meranti and alan, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%
4407 27 10	Description: --- Sanded; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Sapelli, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded, or end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 27 91	Description: ---- Planed Self-explanatory texts in English: Sapelli, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 27 99	Description: ---- Other Self-explanatory texts in English: Sapelli, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%
4407 28 10	Description: --- Sanded; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Iroko, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded, or end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 28 91	Description: ---- Planed Self-explanatory texts in English: Iroko, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 28 99	Description: ---- Other Self-explanatory texts in English: Iroko, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%

CN 2011	CN Description	PROD COM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 29 15	Description: --- End-jointed, whether or not planed or sanded Self-explanatory texts in English: Keruing, ramin, kapur, teak, jongkong, merbau, jelutong, kempas, okoumé, obeche, sipo, acajou d'Afrique, makoré, tiama, mansonia, ilomba, dibétou, limba, azobé, palissandre de Rio, palissandre de Para, palissandre de rose, abura, afrormosia, ako, andiroba, aningré, avodiré, balau, bossé clair, bossé foncé, cativo, cedro, dabema, doussié, framiré, freijo, fromager, fuma, geronggang, ipé, jaboty, jequitiba, kosipo, kotibé, koto, louro, maçaranduba, mahogany (excl. "Swietenia spp."), mandioqueira, mengkulang, merawan, merpauh, mersawa, moabi, niangon, nyatoh, onzabili, orey, ovengkol, ozigo, padauk, paldao, palissandre de Guatemala, pau Amarelo, pau marfim, pulai, punah, quaruba, saqui-saqui, sepetir, sucupira, suren, tauari and tola, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, end-jointed, whether or not planed or sanded	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 29 20	Description: ------ Palissandre de Para, palissandre de Rio and palissandre de Rose Self-explanatory texts in English: Palissandre de Rio, palissandre de Para and palissandre de rose, sawn or chipped lengthwise, sliced or peeled, planed, of a thickness of > 6 mm (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 29 25	Description: ------ Other Self-explanatory texts in English: Keruing, ramin, kapur, teak, jongkong, merbau, jelutong, kempas, okoumé, obeche, sipo, acajou d'Afrique, makoré, tiama, mansonia, ilomba, dibétou, limba and azobé, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 29 45	Description: ----- Sanded Self-explanatory texts in English: Keruing, ramin, kapur, teak, jongkong, merbau, jelutong, kempas, okoumé, obeche, sipo, acajou d'Afrique, makoré, tiama, mansonia, ilomba, dibétou, limba, azobé, palissandre de Rio, palissandre de Para and palissandre de rose, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 29 61	Used 60 - 61 is not included Description: ----- Other Self-explanatory texts in English: Keruing, ramin, kapur, teak, jongkong, merbau, jelutong, kempas, okoumé, obeche, sipo, acajou d'Afrique, makoré, tiama, mansonia, ilomba, dibétou, limba, azobé, palissandre de Rio, palissandre de Para and palissandre de rose, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. such products planed, sanded or end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%

CN 2011	CN Description	PROD COM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 29 68	Not found	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm		0%	0%	0%
4407 29 83	Description: ----- Planed Self-explanatory texts in English: Abura, afrormosia, ako, andiroba, aningré, avodiré, balau, bossé clair, bossé foncé, cativo, cedro, dabema, doussié, framiré, freijo, fromager, fuma, geronggang, ipé, jaboty, jequitiba, kosipo, kotibé, koto, louro, maçaranduba, mahogany (excl. "Swietenia spp."), mandioqueira, mengkulang, merawan, merpauh, mersawa, moabi, niangon, nyatoh, onzabili, orey, ovengkol, ozigo, padauk, paldao, palissandre de Guatemala, pau Amarelo, pau marfim, pulai, punah, quaruba, saqui-saqui, sepetir, sucupira, suren, tauari and tola, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 29 85	Description: ----- Sanded Self-explanatory texts in English: Abura, afrormosia, ako, andiroba, aningré, avodiré, balau, bossé clair, bossé foncé, cativo, cedro, dabema, doussié, framiré, freijo, fromager, fuma, geronggang, ipé, jaboty, jequitiba, kosipo, kotibé, koto, louro, maçaranduba, mahogany (excl. "Swietenia spp."), mandioqueira, mengkulang, merawan, merpauh, mersawa, moabi, niangon, nyatoh, onzabili, orey, ovengkol, ozigo, padauk, paldao, palissandre de Guatemala, pau Amarelo, pau marfim, pulai, punah, quaruba, saqui-saqui, sepetir, sucupira, suren, tauari and tola, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Processed goods	0%	0%	0%
4407 29 95	Description: ----- Other Self-explanatory texts in English: Abura, afrormosia, ako, andiroba, aningré, avodiré, balau, bossé clair, bossé foncé, cativo, cedro, dabema, doussié, framiré, freijo, fromager, fuma, geronggang, ipé, jaboty, jequitiba, kosipo, kotibé, koto, louro, maçaranduba, mahogany (excl. "Swietenia spp."), mandioqueira, mengkulang, merawan, merpauh, mersawa, moabi, niangon, nyatoh, onzabili, orey, ovengkol, ozigo, padauk, paldao, palissandre de Guatemala, pau Amarelo, pau marfim, pulai, punah, quaruba, saqui-saqui, sepetir, sucupira, suren, tauari and tola, **sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. end-jointed, planed or sanded)**	1610 1071	Tropical wood, sawn or chipped lengthwise, sliced or peeled, end-jointed or planed/sanded, of a thickness > 6mm	Potentially could contain mulch like material	100%	0%	0%

CN 2011	CN Description	PROD COM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 91 15	Description: --- Sanded; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Oak "Quercus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded, or end-jointed, whether or not planed or sanded	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 91 39	Description: ----- Other Self-explanatory texts in English: Oak "Quercus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed (excl. end-jointed and blocks, strips and friezes for parquet or wood block flooring)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 91 90	Description: ---- Other Self-explanatory texts in English: Oak "Quercus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 92 00	Description: -- Of beech (Fagus spp.) Self-explanatory texts in English: Beech "Fagus spp.", sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness of > 6 mm	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 93 10	Description: --- Planed; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Maple "Acer spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed, or end-jointed, whether or not planed or sanded	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 93 91	Description: ---- Sanded Self-explanatory texts in English: Maple "Acer spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 93 99	Description: ---- Other Self-explanatory texts in English: Maple "Acer spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 94 10	Description: --- Planed; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Cherry "Prunus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed, or end-jointed, whether or not planed or sanded	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%

CN 2011	CN Description	PRODCOM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 94 91	Description: ---- Sanded Self-explanatory texts in English: Cherry "Prunus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 94 99	Description: ---- Other Self-explanatory texts in English: Cherry "Prunus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 95 10	Description: --- Planed; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Ash "Fraxinus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, planed, or end-jointed, whether or not planed or sanded	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 95 91	Description: ---- Sanded Self-explanatory texts in English: Ash "Fraxinus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm, sanded (excl. end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 95 99	Description: ---- Other Self-explanatory texts in English: Ash "Fraxinus spp.", sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 99 20	Description: -- Other Self-explanatory texts in English: Wood, sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness of > 6 mm (excl. tropical wood specified in Subheading Note 1 to this chapter, coniferous wood, oak "Quercus spp.", beech "Fagus spp.", maple "Acer spp.", cherry "Prunus spp." and ash "Fraxinus spp.")	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 99 25	The code is 27 not 25? There was no 25 Description: --- Planed; end-jointed, whether or not planed or sanded Self-explanatory texts in English: Wood sawn or cut lengthwise, sliced or peeled, of a thickness of > 6 mm, planed, or end-jointed, whether or not planed or sanded (excl. tropical wood specified in Subheading Note 2 to this chapter, coniferous wood, oak "Quercus spp.", beech "Fagus spp.", maple "Acer spp.", cherry "Prunus spp." and ash "Fraxinus spp.")	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%

CN 2011	CN Description	PROD COM 2011	PRODCOM Description	Comments	Mulch	GM	SI
4407 99 40	Description: ---- Sanded Self-explanatory texts in English: Wood sawn or cut lengthwise, sliced or peeled, sanded, of a thickness of > 6 mm (excl. end-jointed; tropical wood specified in Subheading Note 2 to this chapter, coniferous wood, oak "Quercus spp.", beech "Fagus spp.", maple "Acer spp.", cherry "Prunus spp." and ash "Fraxinus spp.")	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Processed goods	0%	0%	0%
4407 99 91	Description: ----- Of poplar Self-explanatory texts in English: Poplar, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 99 96	Description: ----- Of tropical wood Self-explanatory texts in English: Tropical wood, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed, and tropical wood specified in Subheading Note 2 to this chapter)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%
4407 99 98	Description: ----- Other Self-explanatory texts in English: Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness of > 6 mm (excl. planed, sanded or end-jointed, and tropical wood, coniferous wood, oak "Quercus spp.", beech "Fagus spp.", maple "Acer spp.", cherry "Prunus spp.", ash "Fraxinus spp." and poplar)	1610 1050	Wood, sawn or chipped lengthwise, sliced or peeled, of a thickness > 6mm (excluding coniferous and tropical woods and oak blocks, strips and friezes)	Potentially could contain mulch like material	100%	0%	0%

CN Source: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=CN_2013&StrLanguageCode=EN&IntPcKey=29551272&StrLayoutCode=HIERARCHIC

PRODCOM Source: http://www.cbec.gov.in/excise/cxt2012-13/chap31-32.pdf

Table 6-16: European Market Data for Growing Media (all figures are in 000s Euros, except "Sold Volume", in tonnes)

Growing Media Country	All Values	All Sold Volume	Export outside the EU	Export within the EU	Import within the EU	Import from outside the EU
Belgium	21,580	104,152	2,017	25,817	8,545	273
Bulgaria	496	8,221	11	251	2,884	364
Czech Republic	8,258	30,710	254	834	1,454	34
Denmark	1,559	9,703	1,728	1,484	1,150	371
Germany	40,344	579,715	5,529	15,732	9,337	1,147
Estonia	72	139	84	1,135	653	5
Ireland	21,641	244,554	573	4,048	4,093	178
Greece	4,534	50,824	232	299	2,264	97
Spain	74,141	323,523	22,466	12,847	11,590	1,461
France	96,873	285,566	3,947	4,854	22,868	414
Italy	136,045	415,195	58,577	10,609	18,615	7,333
Cyprus	0	0	12	7	286	9
Latvia	247	4,100	7	47	450	8
Lithuania	50	126	170	125	1,879	48
Luxembourg	0	0	0	205	622	0
Hungary	1,511	22,487	191	1,983	3,226	111
Malta	0	0	0	0	157	0
The Netherlands	9,080	135,107	10,564	34,038	13,179	931
Austria	5,804	38,748	965	6,650	9,809	82
Poland	4,505	121,992	1,099	1,144	3,542	103
Portugal	10,259	94,000	712	246	10,302	32
Romania	0	0	12	11	3,346	37
Slovenia	552	8,217	1,389	134	957	30
Slovakia	907	15,036	213	185	709	12
Finland	5,399	16,694	84	576	373	11
Sweden	4,770	79,092	1,099	445	2,072	47
The United Kingdom	30,937	141,381	2,709	3,130	20,263	1,344
EU27	**479,565**	**2,729,281**	**114,643**	**126,834**	**154,622**	**14,482**

Table 6-17: European Market Data for Soil Improvers (all figures are in 000s Euros, except "Sold Volume", in tonnes)

Soil Improvers Country	All Values	All Sold Volume	Export Outside the EU	Export within the EU	Import from within the EU	Import from outside the EU
Belgium	21,580	104,152	2,283	26,753	10,561	275
Bulgaria	496	8,221	11	397	3,337	364
Czech Republic	24,395	39,991	262	5,824	3,072	38
Denmark	1,560	9,703	1,737	5,080	2,879	372
Germany	130,095	657,804	11,146	26,863	19,416	1,653
Estonia	72	139	84	1,149	758	5
Ireland	21,641	244,554	573	4,070	5,053	178
Greece	30,141	75,881	232	410	2,765	642
Spain	89,442	364,849	22,974	14,161	17,758	1,735
France	190,981	590,020	4,775	5,343	27,707	446
Italy	154,666	453,843	61,337	16,555	23,473	7,565
Cyprus	0	0	12	7	312	10
Latvia	2,247	5,250	7	53	734	8
Lithuania	3,438	36,036	170	160	1,987	48
Luxembourg	0	0	0	235	656	0
Hungary	12,463	28,786	539	2,165	4,242	113
Malta	0	0	0	0	160	0
The Netherlands	74,883	172,953	15,708	39,270	14,912	1,012
Austria	37,445	56,945	965	6,650	11,591	82
Poland	43,923	144,662	1,494	9,124	5,702	108
Portugal	29,472	105,051	1,865	608	13,983	35
Romania	13,566	7,802	12	172	7,316	37
Slovenia	4,554	10,519	1,431	134	1,040	30
Slovakia	8,239	19,253	213	301	990	12
Finland	5,399	16,694	84	589	767	11
Sweden	4,770	79,092	1,167	445	4,509	60
The United Kingdom	219,684	145,432	6,427	4,180	23,329	1,484
EU27	**1,125,152**	**3,377,631**	**135,508**	**170,695**	**209,007**	**16,321**

Table 6-18: European Market Data for Mulch (all figures are in 000s Euros, except "Sold Volume", in tonnes)

Mulch Country	All Values	All Sold Volume	Export Outside the EU	Export within the EU	Import from within the EU	Import from outside the EU
Belgium	40,410	340,224	3,269	78,251	65,831	53,076
Bulgaria	5,911	40,938	6,453	3,285	756	377
Czech Republic	68,474	1,230,024	691	25,940	18,421	2,965
Denmark	32,643	144,872	4,241	4,566	56,403	9,239
Germany	543,447	6,520,087	19,514	161,670	71,306	73,585
Estonia	61,151	2,097,309	946	30,316	7,057	4,225
Ireland	37,020	638,455	468	10,388	3,232	2,572
Greece	2,019	22,562	493	193	5,494	3,484
Spain	52,748	700,957	2,531	9,487	21,256	82,792
France	335,164	3,322,662	16,527	50,627	93,199	35,325
Italy	76,027	124,575	4,374	18,461	101,124	70,658
Cyprus	0	0	0	0	2,503	442
Latvia	170,021	2,381,434	7,956	112,710	1,607	1,151
Lithuania	51,639	795,547	743	19,175	8,552	11,761
Luxembourg	0	0	0	8,417	9,826	5
Hungary	25,521	494,856	1,248	15,705	8,654	5,161
Malta	0	0	0	0	325	482
The Netherlands	26,598	79,951	2,973	21,861	30,737	38,088
Austria	307,679	3,646,773	9,094	51,865	113,611	10,782
Poland	76,105	1,072,963	973	15,584	17,654	12,747
Portugal	33,718	605,884	6,546	5,541	9,141	96,986
Romania	37,966	68,967	11,079	10,003	1,361	1,198
Slovenia	6,349	66,244	811	13,481	3,657	11,830
Slovakia	15,162	273,917	269	28,051	7,608	490
Finland	268,118	2,986,098	679	14,237	57,141	105,194
Sweden	672,402	12,958,370	13,399	5,662	71,359	24,304
The United Kingdom	281,969	6,418,710	4,851	12,170	64,056	61,932
EU27	**3,228,262**	**47,032,378**	**120,129**	**727,645**	**851,873**	**720,852**

7 Technical Analysis

7.1 Introduction

In this part of the report, we present the findings of the technical analysis of the criteria. These criteria are discussed in detail in the Technical Annex (see Annex A: Technical Annex), which assesses the evidence available and draws conclusions about whether or not conditions should be placed on each criterion in the EU Ecolabels, and if so, what the conditions should be. The criteria are analysed in seven separate sections of the Technical Annex (TA Section AX), as follows:

- the inclusion of Peat (see TA Section A1);
- the inclusion of Mineral Wool (see TA Section A3);
- consideration of Mineral Extraction (see TA Section A4);
- acceptable limits for Potentially Toxic Elements (PTEs) (see TA Section A5);
- acceptable limits for Pathogens (see TA Section A6);
- acceptable limits for Organic Pollutants (see TA Section A2); and
- other Criteria (see TA Section A7).

Each of the recommendations is presented in turn below, together (where relevant) with the current EU Ecolabel criteria and a brief justification for the recommendations. However, the reader is strongly advised to consult the annex for the detailed reasoning. At the end of this section, there is a single table, bringing together all the criteria.

7.2 Inclusion of Peat (see TA Section A1)

7.2.1 *Summary of investigation*

The potential inclusion of peat in the EU Ecolabel is a particularly contentious area and the scientific evidence available is not robust enough to allow for a final conclusion to be made. It is clear from stakeholder feedback that peat is an important element in producing reliable and good quality high performing GM. The current prohibition of peat in EU Ecolabel for GM and SI is thought (by ourselves and many stakeholders) to be a key factor in the current low uptake of this Ecolabel product stream by commercial GM and SI producers.

The LCA evidence suggests that, from this perspective, the inclusion of peat in GM as a minor constituent is unlikely to be significantly worse compared with GM that is peat free. However, the extraction of peat is not a sustainable operation due to the slow natural rate of peat formation.

Some proposal options are therefore included in this section, but it must be emphasised that these are preliminary proposals only. In our view, the peat issue for EU Ecolabel GM, SI and mulches will need further debate by stakeholders at the AHWG meeting and thereafter. These proposals, along with the evidence and discussions in this report, are therefore given to guide this further debate.

Our recommendation is to exclude peat from EU Ecolabel for SI and mulches. This is based mainly on the fact that peat is rarely used in these products in the first instance and prohibition would therefore have little impact on the production and markets for these products.

For growing media, there are two options to consider, which are either a similar retention of the complete prohibition of peat, or to allow the inclusion of a certain percentage of peat in GM under certain conditions. In this context, we would not propose to make any differentiation between black and white peat as, in practice, there is a spectrum of degrees of peat decomposition from weakly through to strongly decomposed, rather than distinct peat types. Whilst the prohibition would adhere strictly to the EU Ecolabel principles. it is also thought likely in our and some stakeholders' opinion that this would maintain the status quo of a low uptake of EU Ecolabel for these products in the market place. If it is decided to allow a certain percentage of peat in GM, this should have a defined limit, which we proposes should not exceed 20% on a dry matter basis. This proposed limit is suggested on the basis of the LCA studies which indicate that such a peat content results in environmental impacts similar to many peat free GM. Moreover, peat used for the purposes of EU Ecolabel should then only be allowed from responsibly managed peatlands that are neither pristine peat habitats nor designated Natura 2000 sites, Special Areas of Conservation (SACs) or Sites of Special Scientific Interest (SSSIs). In that respect, acceptable sources and conditions to ensure responsible peat extraction should be clearly defined in the final EU Ecolabel criteria.

Table 7-1: Summary of Criteria Proposals - Inclusion of Peat

	Growing Media	**Soil Improver**	**Mulch**
Current	Not allowed. The organic matter content shall be derived from the processing and/or re-use of waste		
Proposal	***Either*** **Not allowed** ***Or* Yes**, (under provisions set out below): A. Only for GM where the peat is no more than 20% of the GM on a dry matter basis; and B. The peat is sourced from a responsibly managed peat production source that is neither a pristine peat habitat nor a designated Natura 2000 site, Special Area of Conservation (SACs) or Site of Special Scientific Interest (SSSIs).	The organic matter content shall be derived from the processing and/or re-use of waste	

7.3 Inclusion of Mineral Wool (see TA Section A3)

The use of mineral wool as **mulch** or as a constituent of mulch does not seem an appropriate use for this material. Our proposal would be that mineral wool is not permitted in EU Ecolabel mulch.

Although mineral wool is currently permitted in EU Ecolabel **soil improvers**, its inclusion would be a rare occurrence and any specific advantage of a soil improver having mineral wool as a constituent is not immediately apparent. Most soil improvers would be largely based on single constituent composts or digestates or other organic matter. On this basis, our proposal is that mineral wool should not be permitted in EU Ecolabel soil improvers.

In the case of granulates made from waste mineral wool, more information is needed to assess the suitability of this constituent in soil improvers awarded the EU Ecolabel.

7.3.1 *Mineral Wool in Growing Media*

The inclusion of mineral wool in growing media is considered a possibility. However, given the uncontrolled nature of the risk from dusts from handling growing media by amateur gardeners, we propose that mineral wool is not allowed as a constituent in general GM that would be used in pots and tubs, but is restricted to its use in commercial horticultural applications (closed-cycle recirculating hydroponic systems) as 100% mineral wool GM. Under these conditions, the risks from inhalation of fibre may be controlled and the spent GM may be recycled for the same application or alternatively disposed of by some other route.

7.3.2 *Management of used mineral wool growing media*

Mineral wool as growing media for non-professional uses

The management of spent GM raises further concerns that suggest the exclusion of mineral wool from GM. Spent GM may be re-used by the amateur gardener or placed in household waste, which may in turn hinder the recycling process, leading to disposal of the waste mineral wool in landfill.

It is our view that it would be impractical to arrange and manage a totally separate recycling route for mineral wool containing GM, so that the used GM could undergo a processing step that removed the mineral wool. We foresee that the volumes collected from amateur users would be low and very variable.

Mineral wool as growing media for commercial applications

Arisings of spent GM composed of 100% mineral wool in commercial hydroponic applications would be on a sufficient scale that the used GM could be collected and effectively cleaned and recycled. We understand from the stakeholder consultation that the re-use of this GM is not practised due to the difficulty of cleaning and mitigating risks from spreading plant pathogens. However, such issues are not insurmountable, and might be considered, together with recycling into other mineral wool applications. Disposal of used mineral wool to landfill would not represent a significant health risk due to the general inert nature and containment of landfill but would represent a loss of potential resources.

The current EU Ecolabel GM criteria recognise this and provide in Criterion 6b requirements for the after use of mineral GM. In our view, these provisions should be retained, but discussions should be conducted with respect to revising some of the requirements – for example, decreasing the threshold from 30,000 m^3 and increasing the volume of used GM to be recycled to a value greater than 50%.

7.3.3 *Sources of mineral wool*

There are a limited number of LCA studies assessing the environmental impact of mineral wool as an insulation material and in GM. The context and underlying assumptions in the LCAs are not clear from the reports.

On the basis of the limited LCA data and the consultation feedback, we would recommend that mineral wool for EU Ecolabel purposes is only acceptable if sourced from a manufacturing process that uses at least 60% waste material as input. Where any manufacturing process uses raw extracted minerals in the production of mineral wool, this should be only be sourced from sites that are not special protected sites as in the current EU Ecolabel criteria.

7.3.4 *Mineral wool and CLP Regulation*

Mineral wool is included in CLP Regulation as a substance that may be classified as Carcinogen category 2 if it does not fall under the conditions of exception. The exceptions are included in the Notes Q and R within the CLP Regulation, meaning that if the mineral wool is under the scope of one of these notes, the classification of carcinogen cat 2 does not apply to it:

- Note Q:

The classification as a carcinogen need not apply if it can be shown that the substance fulfils one of the following conditions:

  - a short term biopersistence test by inhalation has shown that fibres longer than 20 μm have a weighted half-life less than 10 days; or
  - a short term biopersistence test by intratracheal instillation has shown that fibres longer than 20 μm have a weighted half-life less than 40 days; or
  - an appropriate intra-peritoneal test has shown no evidence of excess carcinogenicity; or
  - absence of relevant pathogenicity or neoplastic changes in a suitable long term inhalation test.

- Note R :

The classification as a carcinogen need not apply to fibres with a length weighted geometric mean diameter less two standard geometric errors greater than 6 μm.

Table 7-2: Summary of Criteria Proposals - Inclusion of Mineral Wool

	Growing Media	Soil Improver	Mulch
Current	*Minerals can be applied as well, provided the applied material meets criterion 1.3.* "*Minerals shall not be extracted from:* *- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora7,* *- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity."*		
	Minerals applied as or in growing media are for example sand, clay, perlite, and mineral wool. The criteria also apply to minerals imported from non EU-countries in which case the provisions of the United Nations' Conventions on Biological Diversity are guiding." *"Applicable to mineral growing media only:* *- For all substantial professional markets (i.e. where the applicant's annual sales in any one country in the professional market exceed 30,000 m³), the applicant shall fully inform the user about available options for the removal and processing of growing media after use. This information shall be integrated in the accompanying fact sheets.* *- The applicant shall demonstrate that at least 50% by volume of the growing media waste generated in EU-25 is recycled after use.* *The applicant informs the Competent Body, in an annual recycling report, about the option(s) on offer and the response to these options, in particular:* *- a description of collection, processing and destinations. At any time, plastics should be separated from minerals/organics and processed separately;* *- an annual overview of the volume of growing media collected (input) and processed (by destination)."*	*"Minerals applied as or in soil improvers are for example sand, clay, perlite, and mineral wool (as far as allowed by National legislation). The criteria also apply to minerals imported from non EU countries in which case the provisions of the United Nations' Conventions on Biological Diversity are guiding.*	

	Growing Media	Soil Improver	Mulch
Proposal	**Yes**, under provisions set out below. A, Only for GM composed of 100% mineral wool used in commercial horticultural applications. B, The mineral wool is sourced from recycled mineral wool or from a manufacturing process that uses at least 60% waste as feedstock and that any raw minerals used in the manufacturing process are not sourced from a specially protected habitat site C, Mineral wool and substances present in it are not classified as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction according to Annex VI of CLP Regulation D, After use as a GM, the mineral wool is recycled as per existing [or modified] requirements of the current EU Ecolabel GM Criterion 6b.	No	No

7.4 Consideration of Mineral Extraction (see TA Section A4)

Criterion 1.3 (for both SI and GM) in the current EU Ecolabel criteria indicates that minerals extracted from natural resources can be used as a constituent, provided they are not sourced from protected sites.

Mulch is usually considered to consist of large particles of materials such as wood chips and bark applied on the surface of soil. Soil coverings with stone chips or pebbles may occur as a semi-permanent covering and, although this would suppress weeds and retain moisture, it is not in our view mulch, as it has a decorative function. Therefore, we propose that inorganic materials and especially extracted minerals are not permitted in EU Ecolabel mulch.

Soil improvers are generally organic materials, added to provide additional soil organic carbon. We consider that it is unlikely to be a soil improving activity to include substantial amounts of inorganic materials to soil. However, the addition of a mineral such as sand to soil of very poor quality with high clay content might be considered as soil improving, by increasing soil drainage. Adding lime to increase the soil pH in acid soils is also a common practice and might be considered as soil improvement. Furthermore, limed sludge can be used on acid soils to provide both fertiliser and soil pH adjustment.

Growing media are products that are generated for specific applications and, for some of those, the inclusion of inorganic constituents may be beneficial and provide the quality for the GM. The inclusion of inorganic constituents derived from natural sources in growing media therefore seems a reasonable proposition to consider. Additionally, for some applications such as in commercial horticulture, growing plants in hydroponics involves the use of a wholly mineral growing medium.

We conclude from the above analysis that it could be reasonable for both GM and SI to contain minerals, so the next consideration is whether any limits should be. The current EU Ecolabel criteria for SI and GM do not describe any limits for the mineral constituents, only that they are declared and are not from notified sites. Our view is that SI can potentially contain mineral materials, but the requirement of an organic matter content of at least 20% (see Section A7.5 under “Other Criteria”) means that there is already an implicit limit. This also applies for GM, except for GM used in closed-cycle recirculating hydroponic systems, where 100% mineral material is proposed to be permitted. For these reasons, we do not see a need to set a limit for mineral content.

Whenever mineral materials are used, a key question is whether there should be any restriction on source.

Another consideration was which minerals might and might not be permitted. The specific instance of mineral wool is addressed under its own criterion in Section 7.3. The technical annex details research into other constituents, from which we concluded that, having considered the relative merits of vermiculite and perlite, we could see no significant improvement if Ecolabel prohibited the use of vermiculite and promoted the use of perlite as substitute. No such restrictions on constituent are therefore included, beyond the requirement to source the minerals appropriately.

Table 7-3: Summary of Criteria Proposals – Consideration of Mineral Extraction

<table>
<tr><th></th><th>Growing Media</th><th>Soil Improver</th><th>Mulch</th></tr>
<tr><td>Current</td><td colspan="2">Criterion 1.3 for both SI and GM clearly indicates that minerals extracted from natural resources can be used as a constituent, provided they are not sourced from protected sites.

“Minerals shall not be extracted from:

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.

Minerals applied as or in soil improvers/growing media are for example sand, clay, perlite, and mineral wool (as far as allowed by National legislation). The criteria also apply to minerals imported from non EU countries in which case the provisions of the United Nations’ Conventions on Biological Diversity are guiding.</td><td></td></tr>
<tr><td>Proposal</td><td colspan="2">Extracted minerals can be used provided that they are not extracted from:

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.</td><td>No</td></tr>
</table>

7.5 Acceptable Limits for Potentially Toxic Elements (PTEs) (see TA Section A5)

Our recommendation is that the PTEs that should be limited in EU Ecolabel GM, SI and mulches are those that are currently limited, i.e. Zn, Cu, Ni, Cd, Cr, Pb, Hg, Mo, Se, As and F. We do not propose that Cr(VI) should be included as a parameter within the EU Ecolabel criteria, although it is included in some national standards and has been proposed by one stakeholder respondent. A comprehensive evaluation of the need for a development of appropriate limits for Cr(VI) is beyond the scope of this study. The risks from Cr(VI) associated with SI, GM and mulches should be monitored and considered in the next EU Ecolabel revision of these products.

Our recommended proposed limits are therefore the same as the current EU Ecolabel values for SI and GM. The limits for some parameters are more stringent than those currently being proposed for the EoW criteria

for biodegradable waste, in particular for Cd (1.5 mg/kg DM), Pb (120 mg/kg DM), Cu (200 mg/kg DM) and Zn (600 mg/kg DM). However, we also recognise that the Draft Final Report on EoW Criteria for Biodegradable Waste (IPTS 2013) indicates that composts can be produced that readily attain lower values than these limits. Therefore, there is also the option to decrease limits further and if this option was considered, we would propose that lower limits might be applied to GM, SI and mulches as indicated by the values in the bottom row, labelled “stretch”.

Table 7-4: Summary of Criteria Proposals – Acceptable Limits for Potentially Toxic Elements

	Growing Media, Soil improver and Mulch										
	Zn	**Cu**	**Ni**	**Cd**	**Pb**	**Hg**	**Cr**	**Mo**	**Se**	**As**	**F**
Current	300	100	50	1.0	100	1.0	100	2.0	1.5	10	200
Proposal	300	100	50	1.0	100	1.0	100	2.0	1.5	10	200
Stretch	250	80	50	0.8	75	0.75	75	2.0	1.5	10	200

7.6 Acceptable limits for Pathogens (see TA Section A6)

We consider that the current EU Ecolabel is not completely clear. The limits refer only to the compost component, so it is not immediately clear what testing and declaration would apply if the product did not contain compost. Additionally, there might be some \discussion on whether a compost product is or is not exclusively derived from green, garden or park waste, as these may contain contamination not necessarily classed as these.

In considering what limits should be applied, the technical annex details assessments of relevant hazard and risk factors, monitoring principles and the pathogens of possible concern – prions, legionella, aspergillus, clostridia, plant and animal pathogens, salmonella, Helminth ova and E. coli, as well as sporulating bacteria, viruses and fungi. Our conclusion is that monitoring should include *E. coli* and *Salmonella* spp on EU Ecolabel SI, GM and mulches as an absolute requirement. We also conclude that some measures should be considered that might entail additional testing for providing assurance against fungi, viruses and sporulating clostridia.

Some amendments to the sampling regime are proposed, to improve ongoing monitoring that no contamination is occurring.

Table 7-5: Summary of Criteria Proposals – Acceptable Limits for Pathogens

	Growing Media	Soil Improver	Mulch
Current	E. Coli: limit of 1000 MPN/g (ISO 11866-3) Salmonella spp: absent in 25g fw (ISO 6579) Helminth ova: absent in 1.5g (prXP X33-017)		
Proposal	For growing media, soil improver and mulch: E. Coli: limit of 1000 CFU/g fw (CEN/TR 16193) Salmonella spp: absent in 25g fw (ISO 6579) Sampling regime: Pre-certification – Product as manufactured: 4 samples from separate batches in 6 months Pre-certification – Product storage trial (testing after 3 months storage): Same batches as for Product certification stored for 3 months Post-certification monitoring: 1 sample every 2,000 tonnes (dry matter) up to 12 per year (3 per quarter)		

Key: MPN = most probable number; CFU = colony-forming units; fw = fresh weight

7.7 Acceptable Limits for Organic Pollutants (see TA Section A2)

The current EU Ecolabel criteria for GM and SI do not include any limits for organic pollutants, although they do require a plant growth bioassay, which might show problems with organic pollutants such as herbicides. In our opinion, retaining an appropriate bioassay test would be an acceptable and suitable approach.

In addition, and to be in line with other initiatives, we would propose that some specific POPs limits should be introduced for PAHs, PCBs, PFC and PCDD/F. Although most of the responses from the stakeholder consultation would like to have no or limited monitoring, there have also been occurrences of poor quality products contaminated with organic pollutants.

The control of organic pollutants, particularly POPs that do not degrade during composting and AD, is largely by elimination of input materials containing such pollutants. The FATE study by IPTS published in the 3rd Working document for EoW criteria for biodegradable waste (IPTS, 2012) indicated, however, that there is likely to be some measurable and variable level of POPs in all potential waste streams. Elimination of known materials as constituents with a high risk of high concentrations is feasible, but in our view, such measures are unlikely to be fully effective and eliminate the risk of the composts and digestates being contaminated. Assurance of quality through appropriate product testing is therefore recommended.

The frequency of testing is a key parameter, as testing is a cost but greater assurance on product quality is provided by more frequent monitoring. The stakeholder responses are clearly (if understandably) influenced by the financial cost of monitoring for organic pollutants, so an appropriate balance has been sought. It is

also suggested that testing has to be carried out by laboratories accredited for that purpose, through an accreditation standard and accreditation organisation accepted at EU level or by the Member State competent authority.

Table 7-6: Summary of Criteria Proposals - Acceptable Limits for Organic Pollutants

	Growing Media	**Soil Improver**	**Mulch**
Current	No specific limits, but a plant growth bioassay test is applied to monitor product performance under Criterion 3.	No specific limits, but a plant growth bioassay test is applied to monitor plant emergence and growth under Criterion 5b.	
Proposal	Limits as indicated below for Growing Media, Soil Improver and Mulches. Testing frequency to be: 4 samples in 3 months prior to certification; post certification for the first year, 1 sample every 2,000 tonnes of product up to a maximum of 16 samples per year; and then, for subsequent years, 2 samples per year if average of first year is less than half the limit and no limit exceeded by a single sample.		

Pollutant	**Test method (and cost)**	**Limit**
PAH_{16}	prCEN/TS 16181 when available (€ 149)	6 mg/kg dry matter
PCB_7	EN 16167:2012 (€ 201)	0.2 mg/kg dry matter
PCDD/F	CEN/TS 16190:2012 (€ 481)	30 ng I-TEQ/kg
Pesticides	Plant growth bioassay EN 16086-1:2011 (variable but comparable with above)	Limits as indicated by test method

Notes:

PAH_{16} = sum of naphthalene, acenaphtylene, acenaphtene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene and benzo[ghi]perylene

PCB_7 = sum of PCBs 28, 52, 101, 118, 138, 153 and 180

7.8 Other Criteria (see TA Section A7)

There are a number of additional criteria that are addressed in the last technical annex under the general title of "Other Criteria". Each of these is discussed in turn below.

7.8.1 *Viable seeds and weeds*

A good GM, SI or mulch should be largely free of viable seeds and weeds. The current EU Ecolabel criteria for GM and SI contain a requirement that, *"in the final product, the content of weed seeds and the vegetative*

reproductive parts of aggressive weeds shall not exceed two units per litre." This requirement is retained for all three products.

7.8.2 *Electrical conductivity*

Electrical conductivity is an indirect measurement of salinity, and therefore an important parameter to be checked for products coming into direct contact with plant roots. However, it is not particularly applicable for SI or mulches, which are added to or spread on soil, where the soluble elements that constitute the electrical conductivity would quickly dissipate.

The current EU Ecolabel criteria for GM states that, *"the electrical conductivity of the products shall not exceed 1.5 m or 150 mS/m."* This limit is maintained.

7.8.3 *Dry matter and organic matter content*

For GM, dry matter and organic matter content are not a specific criteria in the current Ecolabel, but organic matter content is required as part of the information required to be supplied with Criterion 6 – Information provided with the product (see Section 7.8.8). For SI, there are limits: *"products shall be supplied in a solid form and contain not less than 25 % dry matter by weight and not less than 20 % organic matter by dry weight (measured by loss on ignition).*

We propose that these limits be retained for GM (except in the special instance of 100% mineral GM used in closed-cycle recirculating hydroponic systems) and extended to mulches. For SI, the limit for organic matter is again relevant, but the dry matter limit is not relevant (as some SIs are liquid), so only a reporting requirement is set.

7.8.4 *Physical Contaminants*

The current EU Ecolabel for SI contains limits for the content of physical contaminants, thus: *"in the final product (with mesh size 2 mm), the content of glass, metal and plastic shall be lower than 0.5% as measured in terms of dry weight.* However, there is no requirement for this in the EU Ecolabel for GM, which seems inappropriate, owing to the risk from injury through handling GM. We propose that this limit be applied to all three products.

7.8.5 *Nitrogen*

A high level of organic N ensures that N is released only slowly after application. The current EU Ecolabel for SI has limits for nitrogen content: *"the concentration of nitrogen in the product shall not exceed 3 % total N (by weight) and inorganic N must not exceed 20% total N (or organic N ≥ 80%).*

For GM, there is no specific criterion for N, although the information provisions (see Section 7.8.8) include C/N ratio, which then requires total N determination.

In our opinion, SI application rates vary, and therefore it is the loading of N to the soil that is the key parameter. This is related to both the N content of the SI and the loading rate of SI to the soil. In our view, limits on the N content of the SI would not provide sufficient information for minimising environmental risks from excessive N applications, so the criterion should be limited to one of reporting.

With mulch, the addition of readily available N is not considered appropriate, as the material functions to suppress weed growth and not as a soil improver through fertilization of the soil. In this context, N limits for mulch seem appropriate.

Considering GM, many digestates would not meet the current EU Ecolabel criteria for nitrogen in SI. We would therefore consider that the N content of GM should be measured but have no limits. We would assume that responsible GM producers would not place on the market GM with excessive N contents, as this could cause inhibition and poor performance of the growing medium.

Table 7-7: Proposed nitrogen limits

Parameter	**SI**	**GM**	**Mulch**
Total N (% FW)	Information – no limit	Information – no limit	No more than 3%
Inorganic N (% of total N)	Information – no limit	Information – no limit	No more than 20%

7.8.6 *Biostability*

The current EU Ecolabels for SI and GM requires the provision of *"a statement about the stability of organic matter (stable or very stable) by national or international standard".* The question of method is important, but it is beyond the scope of this study to evaluate and propose a standard method for the EU Ecolabel. **However, we do recommend that this is considered in the next EU Ecolabel revision of SI, GM and mulches.**

We have proposed that, as part of the microbial criteria (Section A6), product storage trials are undertaken as part of the EU Ecolabel pre-certification tests. This would provide some protection against the risk of microbial pathogens growing in stored un-biostabilised products. Therefore, for this revision, we propose that the information statement is retained regarding the stability of organic matter (stable or very stable) by national or international standards (as currently required to accompany EU Ecolabel SI and GM products).

7.8.7 *Summary of Other Criteria Proposals*

The proposals for the criteria discussed above are summarised in Table 7-8.

Table 7-8: Proposals on limits and testing methods for different parameters

Parameter	SI	GM	Mulch	Method
Viable seeds and weeds	In the final product, the content of weed seeds and the vegetative reproductive parts of aggressive weeds shall not exceed two units per litre			Method: CEN/TS 16201 Sludge, treated biowaste and soil - Determination of viable plant seeds and propagules
Electrical conductivity	No limit	1.5 dS/m or 150 mS/m	No limit	CEN/TS 15937 Sludge, treated biowaste and soil - Determination of specific electrical conductivity
Dry matter (% FW)	No limit but required for information	No less than 25% (*)	No less than 25%	EN 15934 - Sludge, treated biowaste, soil and waste - Calculation of dry matter fraction after determination of dry residue or water content
Organic matter as Loss on Ignition (%DM)	No less than 20%	No less than 20% (*)	No less than 20%	EN 15935 - Sludge, treated biowaste, soil and waste - Determination of loss on ignition
Physical contaminants	Sum of: glass (>2mm), plastics (>2mm), metals (>2mm) and stones (>5mm) No more than 0.5%			CEN/TS 16202 Sludge, treated biowaste and soil - Determination of impurities and stones
Total N (% FW)	Information – no limit	Information – no limit	No more than 3%	EN 16168 - Sludge, treated biowaste and soil - Determination of total nitrogen using dry combustion method
Inorganic N (% of total N)	Information – no limit	Information – no limit	No more than 20%	CEN/TS 16177 - Sludge, treated biowaste and soil - Extraction for the determination of extractable ammonia, nitrate and nitrite

(*) except for 100% mineral GM used in closed-cycle recirculating hydroponic systems.

7.8.8 *Provision of Information*

Both the current EU Ecolabel for SI and GM include a requirement to state several parameters and provide information within “Information provided with the product”. Some of these have been discussed above. We propose that these should be updated for SI, GM and mulches taking into account the proposals above and our other proposals, and the use of horizontal standard methods.

The proposed requirements are described in Table 7-9 below. New or amended proposals are highlighted in underlined red.

Table 7-9: Information required with the EU Ecolabel product

	GM	SI	Mulch
a	the name and address of the body responsible for marketing		
b	a descriptor identifying the product by type, including the wording		
c	a batch identification code		
d	the quantity (in volume and weight)		
e	the main input materials (those over 5% by volume and by weight) from which the product has been manufactured		
f	the recommended conditions of storage and the recommended ‘use by’ date;		
g	guidelines for safe handling and use (especially with respect to microbial risks)		
h	a description of the purpose for which the product is intended and any limitations on use. This should include a statement about the suitability of the product for particular plant groups (e.g. calcifuges or calcicoles)		
i	pH (Method		
j	Organic C content [EN 15936], total N content [EN16168] and inorganic N [CEN/TS 16177] content and C/N ratio (Method from horizontal)		
k	a statement about the stability of organic matter (stable or very stable) by national or international standard		
l	a statement on recommended methods of use		
m	SI and mulch only	in hobby applications: recommended rate of application expressed in kilograms or litres of product per unit surface (m^2) per annum	
n	Moisture content		

	GM	SI	Mulch
o	For mineral growing media the following declaration should be required: - For all substantial professional markets (i.e. where the applicant's annual sales in any one country in the professional market exceed 30,000 m³ [or an agreed lower threshold volume]), the applicant shall fully inform the user about available options for the removal and processing of growing media after use. This information shall be integrated in the accompanying fact sheets. - The applicant shall demonstrate that at least 50% [or an agreed higher percentage]) by volume of the growing media waste generated in EU-25 is recycled after use. The applicant should inform the Competent Body, in an annual recycling report, about the option(s) on offer and the response to these options, in particular: - a description of collection, processing and destinations. At any time, plastics should be separated from minerals/organics and processed separately; - an annual overview of the volume of growing media collected (input) and processed (by destination).		

7.9 Hazardous substances

7.9.1 *Organic constituents*

The organic constituents currently allowed by the EU Ecolabel Decisions of SI and GM shall derived from the processing and/or re-use of waste. In the case of compost, it is covered by Article 2(7)(b) of the Regulation (EC) No 1907/2006 (REACH), which sets out criteria for exempting substances within Annex V of this Regulation from the registration, downstream user and evaluation requirements. According the Guidance provided by ECHA:

This exemption covers compost when it is potentially subject to registration, i.e. when it is no longer a waste, and is understood as being applicable to substances consisting of solid particulate material that has been sanitised and stabilised through the action of micro-organisms and that result from the composting of any bio waste capable of undergoing aerobic decomposition in its entirety.

This explanation is without prejudice to discussions and decisions to be taken under Community waste legislation on the status, nature, characteristics and potential definition of compost, and may need to be updated in the future.

In the case of digestates, it is not clear whether the same exemption applies.

Other wastes not covered by End of waste criteria are out of the scope of the REACH Regulation.

Regarding the substances that might be classified as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction (CMR), in accordance with Regulation (EC) No 1272/2008, compost and digestates might contain heavy metals, and other potential toxic elements (PTE) and organic pollutants that come from the wastes and sludges which are the inputs of the composting/digestate process. These pollutants are classified as *hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction* if the concentration is above the cut-off values defined in each case. In the case of PTE, the current EU Ecolabel criteria for SI and GM allow concentrations that are below the cut-off values set by the CLP Regulation to trigger the classification. In the case of organic pollutants, there are no criteria related to them

in the current Eco-label Decisions, because in the previous revision, it was considered that these limit values were irrelevant since these substances didn't occur in sludges produced by the list of industries allowed (food and beverage industries). However, the results of the JRC Sampling and Analysis Campaign (included in 4th *Working Document of End-of-waste criteria on Biodegradable waste subject to biological treatment July 2013)* show the presence of POPs in some samples of compost made of source separated bio-waste and green waste. The concentrations of these substances in compost and digestate are also are under the cut-off values set by the Reg (EC) No 1272/2008 CLP to trigger the classification.

7.9.2 *Peat*

According REACH Regulation, naturally occurring substances, if they are not chemically modified, are also exempted. This group of substances is characterized by the definitions given in Article 3(39) and 3(40):

The Article 3(39) defines a ‘substances which occur in nature’ as ‘a naturally occurring substance as such, unprocessed or processed only by manual, mechanical or gravitational means, by dissolution in water, by flotation, by extraction with water, by steam distillation or by heating solely to remove water, or which is extracted from air by any means

To our understanding, peat is covered by this exemption.

7.9.3 *Mineral constituents*

Mineral wool might be classified as carcinogenic according CLP Regulation, with some exemptions. This case is further studied in Annex A3 Mineral wool.

Other mineral constituents are covered by the exemption provided by Article 2(7)(b) of the REACH Regulation. The ECHA Guidance clarifies this point as follows:

Minerals which occur in nature are covered by the exemption if they are not chemically modified. This applies to naturally occurring minerals, which have undergone a chemical process or treatment, or a physical mineralogical transformation, for instance to remove impurities, provided that none of the constituents of the final isolated substance has been chemically modified’

7.10 Summary of Proposals

The table overleaf summarises the proposals for the next update of the EU Ecolabels for GM and SI, and for the new EU Ecolabel for mulches. It is stressed again that these are our recommendations, and it is fully expected that the details presented in the technical annex will be debated during the First Ad-Hoc Working Group meeting, in October 2013.

Table 7-10: Summary of All Criteria Proposals

<table>
<tr><th>Criterion</th><th>Growing Media</th><th>Soil Improver</th><th>Mulch</th></tr>
<tr><td>Organic ingredients</td><td>Either: Peat is not allowed and organic matter content is derived from the processing and/or re-use of waste

Or: Peat is allowed under the below conditions and other organic matter content is derived from the processing and/or re-use of waste</td><td>Peat is not allowed and organic matter content is derived from the processing and/or re-use of waste</td><td>Peat is not allowed and organic matter content is derived from the processing and/or re-use of waste</td></tr>
<tr><td rowspan="2">Peat</td><td>Either No</td><td>No</td><td>No</td></tr>
<tr><td colspan="3">Or Yes, (under provisions set out below):

A. Only for GM where the peat is no more than 20% of the GM on a dry matter basis; and

B. The peat is sourced from a responsibly managed peat production source that is neither a pristine peat habitat nor a designated Natura 2000 site, Special Area of Conservation (SACs) or Site of Special Scientific Interest (SSSIs).</td></tr>
<tr><td rowspan="2">Mineral Wool</td><td>Yes, under provisions set out below.</td><td>No</td><td>No</td></tr>
<tr><td colspan="3">A, Only for GM composed of 100% mineral wool used in commercial horticultural applications.

B, The mineral wool is sourced from recycled mineral wool or from a manufacturing process that uses at least 60% waste as feedstock and that any raw minerals used in the manufacturing process are not sourced from a specially protected habitat site

C, Mineral wool and substances present in it are not classified as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction according to Annex VI of CLP Regulation

D, After use as a GM, the mineral wool is recycled as per existing [or modified] requirements of the current EU Ecolabel GM Criterion 6b.</td></tr>
</table>

<table>
<tr><th>Criterion</th><th>Growing Media</th><th>Soil Improver</th><th>Mulch</th></tr>
<tr><td>Mineral Extraction</td><td colspan="2">Extracted minerals can be used provided that they are not extracted from:

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.</td><td>No</td></tr>
<tr><td>Potentially Toxic Elements</td><td colspan="3">
<table>
<tr><th></th><th>Zn</th><th>Cu</th><th>Ni</th><th>Cd</th><th>Pb</th><th>Hg</th><th>Cr</th><th>Mo</th><th>Se</th><th>As</th><th>F</th></tr>
<tr><td>Proposal</td><td>300</td><td>100</td><td>50</td><td>1.0</td><td>100</td><td>1.0</td><td>100</td><td>2.0</td><td>1.5</td><td>10</td><td>200</td></tr>
<tr><td>Stretch</td><td>250</td><td>80</td><td>50</td><td>0.8</td><td>75</td><td>0.75</td><td>75</td><td>2.0</td><td>1.5</td><td>10</td><td>200</td></tr>
</table>
</td></tr>
<tr><td>Pathogens</td><td colspan="3">E. Coli: limit of 1000 CFU/g fw
Salmonella spp: absent in 25g fw</td></tr>
<tr><td>Organic Pollutants</td><td colspan="3">
<table>
<tr><th></th><th>PAH$_{16}$</th><th>PCB$_7$</th><th>PCDD/F</th><th>Pesticides</th></tr>
<tr><td>Limits</td><td>6 mg/kg dry matter</td><td>0.2 mg/kg dry matter</td><td>30 ng I-TEQ/kg</td><td>Limits as indicated by test method</td></tr>
</table>
</td></tr>
<tr><td>Viable seeds and weeds</td><td colspan="3">In the final product, the content of weed seeds and the vegetative reproductive parts of aggressive weeds shall not exceed two units per litre</td></tr>
</table>

Criterion	Growing Media	Soil Improver	Mulch
Electrical conductivity	1.5 dS/m or 150 mS/m	No limit	No limit
Dry matter	No less than 25% (*)	No limit but required for information	No less than 25%
Organic matter	No less than 20% (*)	No less than 20%	No less than 20%
Physical contaminants	Sum of: glass (>2mm), plastics (>2mm), metals (>2mm) and stones (>5mm) No more than 0.5%		
Total N (% FW)	Information – no limit	Information – no limit	No more than 3%
Inorganic N (% of total N)	Information – no limit	Information – no limit	No more than 20%

(*) except for 100% mineral GM used in closed-cycle recirculating hydroponic systems.

8 Improvement Potential

This section of the report considers what levels of improvement might be possible if the revised EU Ecolabel for GM, SI and mulches are adopted. Unlike previous studies Ricardo-AEA has conducted for JRC/IPTS, it is not appropriate to use the EcoReport tool to assess the life-cycle environment impacts of products conforming to the proposed criteria, and compare with current products, because EcoReport is not designed to analyse these types of products, nor could it easily be modified. This means that it is more difficult to assess the potential improvement that might be delivered by adopting the new criteria. Under these circumstances, we have attempted to perform some illustrative calculations, to indicate the possible benefits of the new criteria.

8.1 Inclusion of Peat

On first assessment, it would appear that moving from an absolute ban on the inclusion of peat to a situation where a certain percentage of peat is permitted under the EU Ecolabel can only lead to an increase in the use of peat.

However, in our view, permitting a low level of peat in GM might provide a positive overall benefit, as the limit of 20% is lower than the amount of peat currently used in many GM. Therefore, we would consider that taking this option would provide an incentive for producers to reduce their overall peat consumption in GM through attaining EU Ecolabel status for their products. The proposed 20% peat limit might then be revised in future revisions to provide further incentives for further peat use reduction by the industry.

To give an indication of the possible figures involved, our market study suggests roughly 70% peat in all GM. If 20% of products achieved the EU Ecolabel with less that 20% peat, the average peat content would fall below (20% x 20% + 80% x 70% =) 60%, representing a notable drop.

To put some volumes on those figures, the EPAGMA study estimates that about half of all the peat extracted is used in GM and SI, amounting to 28.6 Mm^3 of peat in GM. Again, if we assume there is an average of 70% peat used in GM by volume, then the total GM market is 40.8 Mm^3. If 20% of this volume moved to an EU Ecolabel with 20% peat by volume, this would use 1.6 Mm^3 peat (and, on average, the figure would almost certainly be lower than 20% peat by volume). The remaining 80% of GM would still comprise 70% peat on average, amounting to 22.8 Mm^3 of peat. Therefore, the new total of peat used in GM would be 1.6 + 22.8 = 24.4 Mm^3 peat. Compared with the original 28.6 Mm^3, that's a reduction of over 4 Mm^3 of peat extracted.

If these rough estimates are close, then permitting peat in the GM EU Ecolabel could have a substantial benefit on peat extraction. Furthermore, this could then be improved further during the next revision of the criteria, if the peat limit is reduced further.

8.2 Organics Improvement

Our starting assessment is that it is uncertain whether the organic matter limits in the EU Ecolabel criteria would in itself influence and encourage the inclusion of recycled waste organic matter (such as composts) into growing media. This is because most compost is likely to be applied to land as a soil improver as a sole component product. We suspect that significant uptake of compost into EU Ecolabel GM will only come if there is also a premium from having EU Ecolabel status, and this probably applies to the inclusion of peat at the proposed Ecolabel limit, as well. However, we can make some preliminary calculations.

In 2010, about 13 Mt of compost produced, and it is estimated that about 35-40 Mt could be produced from all EU organic wastes (EoW criteria development reports). Currently, the vast majority of this goes to low value bulk outlets (agriculture as SI).

It is reasonable to expect tonnages to increase as diversion to composting increases across the EU. If the tonnage produced doubled (which is less than the EoW assumption), then around 26 Mt of compost would be produced (equivalent to 52 m^3 based on bulk density of 0.5). There is no reason to assume anything other than that most of this would still go to agriculture, without any impact from the EU Ecolabel.

If we assume that around 15% of this would go to GM without any influence from the EU Ecolabel, but that, on the back of the premium position of the Ecolabel status, this could grow to 20%, then we can estimate the improvement potential against peat saving.

Once again, if we assume the GM market is around 40.8 Mm^3, then there is currently about 3.9 Mm^3 compost used in GM. If compost production doubles and the same percentage of compost production is used in GM, this increases to 7.8 Mm^3 of compost. However, if uptake of the EU Ecolabel results in increased use overall to 20%, the use of organics in GM products would rise to 10.4 Mm^3 of compost. This would make a possible saving on peat of (10.4 – 7.8 =) 2.6 Mm^3.

This is based on an increase in compost production and a premium for Ecolabel use of compost in GM that encourages an increased use of compost in high value GM rather than putting to land as bulk SI. Putting to land as bulk SI would not impact peat as peat not used in SI.

European Commission

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Revision of European Ecolabel Criteria for Soil Improvers and Growing Media

Annex A

Technical Annex

September 2013

Institute for Prospective Technological Studies

Joint Research Centre

RICARDO-AEA

Annex A: Technical Annex

A1. Inclusion of Peat

A1.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included the potential revision of the position regarding the inclusion of peat within SIs and GMs. The scope of this project also includes development of an EU Ecolabel for mulches for which the inclusion of peat as an ingredient is also considered here.

Recommendations for the revised parameters are included in the main report. This Annex provides the justification for the revised position regarding peat.

A1.2 Background

A1.2.1 *Requirement to revise EU Ecolabel peat criteria for Soil Improvers and Growing Media*

JRC/IPTS are currently developing proposals for a revision of the EU Ecolabel criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-1) that should be taken into consideration at the next revision, which included the criterion for the inclusion of peat. At present, peat is not permitted as an ingredient to SI and GM. However, the production of high quality peat-free GM is difficult and might be a factor in the current low uptake of EU Ecolabel by the market.

Table 0-1: Issues to be addressed in revision of Soil Improver and Growing Media EU Ecolabel criteria

Issues to be addressed	**Growing Media**	**Soil Improvers**
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

In this section, we have considered the proposed inclusion of peat in EU Ecolabel growing media, soil improvers and mulches in the context of the sustainability of peat resources. Other criteria that encompass the characteristics of peat, such as PTE, organic pollutant and microbial hazards, are considered separately in the relevant Annexes.

A1.2.2 *Current EU Ecolabel peat criteria for GM and SI*

In the current EU Ecolabel criterion 1.1 for both SI and GM, it is clearly stated that peat is not permitted as a constituent.

"A product shall only be considered for the award of the European Eco-label if it does not contain peat and its organic matter content is derived from the processing and/or re-use of waste (as defined in Council Directive 75/442/EEC on waste and in Annex I to the said Directive)."

<u>Proposed revision scope</u>

In this revision, we have considered several factors that we think should inform our proposals regarding the inclusion of peat. These factors are:

- What products might allow peat as a constituent
- If allowed, what level of peat would be acceptable
- What sources of peat might be considered acceptable
- What reporting/declarations should be required

Each of the factors is considered in turn below.

Several of the studies reviewed differentiate between white and black peat, with the distinction being that black peat is strongly humified, whereas white peat is weakly or moderately humified.

A1.3 What products might allow peat as a constituent

GM, SI and Mulch products might all contain peat as a constituent. However, for EU Ecolabel, consideration is first given to which of these products might be permitted to contain peat.

A1.3.1 *General position*

Mulch is usually considered to consist of large particles of materials such as wood chips and bark applied on the surface of soil. This would be considered relatively resistant to being washed away. As peat is typically of very small particle size, it is likely to be more mobile and more easily washed away or lost by wind. For this reason, we would consider the use of peat would be inappropriate in mulches.

Soil improvers are most typically derived from composted biowaste applied to soils. Blends with various components are rare. We consider that peat itself is a valuable resource and its use in soil improvers would be an inappropriate use of such a resource and would provide no additional benefit over and above using simple compost.

In contrast, growing media are products that are generated for specific applications, and, for some of these, the inclusion of peat may be beneficial and provide the quality for the GM that might be difficult to achieve with other materials. A number of studies report beneficial aspects of peat in growing media and discuss the difficulties in substituting peat with other materials.

Lappalainen (2009) and Waldron *et al.* (2005) reported that peat demonstrates a number of beneficial chemical, physical and biological properties as a GM. The most significant ones are its porous and durable structure, high water and air holding capacity, low pH and nutrient content (which allow peat-based GM to be

easily amended to meet plant needs), and the absence of harmful chemical compounds, pests and weed seeds. According to Lappalainen, peat also has active microorganisms that can act as a buffer against seed-borne diseases and demonstrates stabilised low electrical conductivity, i.e. low salt content.

The inclusion of peat in growing media therefore seems a reasonable proposition to consider.

A1.3.2 *Consultation feedback*

This section assesses the feedback received from the consultation with stakeholders (http://susproc.jrc.ec.europa.eu/soilimprovers/). We received 28 responses in total, and all of the responses provided have been carefully considered during the criteria development process. Discussed below are what we consider to be the most pertinent points and comments received, and our conclusions of the prevalent stakeholder opinion, based on the feedback received.

In the consultation with stakeholders, specific feedback was requested concerning the use of peat and its possible inclusion in EU Ecolabel GM, SI and mulches. Two thirds of respondents were in favour of allowing a certain percentage of peat in GM, as it was reported to have a positive impact on the properties and performance of GM. Moreover, peat was considered safer in use for hobby gardeners and beginners than other materials such as mineral wool. It has been reported (see Section 5.4) that some voluntary and/or national certification schemes in Member States allow a certain percentage of or responsibly produced peat in GM (e.g. the Grünstempel in Germany, an organic farming certification which is licensed by the German Federal Office for Agriculture and Food). 60% of respondents who asked for an inclusion of peat in the EU Ecolabel for GM felt that peat is not necessary in SI or mulch, although a few mentioned they would agree with using spent peat in SI. A small number of stakeholders from Belgium and the Netherlands specified that a minimum of 50% peat should be allowed in the EU Ecolabel for GM in order to produce a GM of satisfactory quality.

Approximately one third of respondents answered that they support the exclusion of peat from the EU Ecolabel, because it is a non-renewable material. It was reported that peat is not generally regarded as a renewable resource, because its extraction rate in industrialised countries far exceeds its slow regrowth rate of 1 mm per year, and because peat regrowth takes place only in 30-40% of peatlands. Because of its specific characteristics, peat provides a habitat for distinctive fauna and flora. Peat extraction can destroy the habitat of these species and result in high levels of GHG emissions.

A number of stakeholders recognised that the inclusion of peat in the EU Ecolabel for GM may increase participation in the scheme. Moreover, the majority of stakeholders supporting the inclusion of peat, welcomed a potential restriction on the sources of peat allowed, to ensure that only responsibly selected and managed sources are used.

A1.3.3 *Selected responses*

The following responses illustrate the above summary of the consultation.

"Peat is an excellent quality and cheap product which is of pivotal importance in food production in particular in horticulture"

"We did research for a sustainable potting soil produced with as much as possible locally produced secondary constituents. To produce a growing media with a good quality, about 50% of peat is necessary."

“Peat is still the most important constituent for growing media, suitable substitutes are not available in sufficient quantities for restrictions at certain markets. The increasing competition to the energetic use and thermal utilisation of peat substitutes leads to growing shortage.”

“The amount of peat free products on the market is very low. There are different reasons: For the most mixtures with a good quality you need a certain amount of peat. The amount of alternative constituents is not high enough to replace peat.”

“It is clear that we do not currently have sufficient scientific evidence to be able to state with confidence that any one growing media constituent is more sustainable (in terms of reducing the negative impact of consumption and production on the environment, health, climate and natural resources) than another growing media constituent. As a result, it is not possible to single peat out as an unsustainable component of growing media.”

“Main point is that a final product should be judged according to the latest available LCA studies, not only judging raw material, but the final mix. Some raw materials together will deliver a balanced decreased environmental impact or foot print. We cannot exclude one raw material”

“In an Ecolabel there should be no room for including peat because of the sustainability issue.”

“It is possible, technically and economically, to replace the peat by diverse organic products in particular plant and ligneous composted waste (barks and wood fibres, compost of green waste) that is so possible to value. Ecolabelled products without peat already exist. Therefore the EU Ecolabel has to continue to promote products without peat in order to reduce the impact of the peat extraction on our wet areas.”

“Peat is a non renewable resource whose exploitation has high implications in soil quality and climate change. Besides it can be substituted by other materials such as compost. Therefore, in order to preserve this natural resource it should be excluded from SI and GM.”

<u>Conclusions to the consultation</u>

Peat is not regarded as essential to SI and mulch products, however, it is considered essential to GM by the majority of respondents. A certain percentage of peat (around 50%) is reported to be a key factor in the quality of GM. The restriction of peat to certain uses such as the professional market is not considered of relevance. Use of responsible peat sources is welcomed by the majority of respondents who support the inclusion of peat in EU Ecolabel for GM.

One third of respondents disagreed with the inclusion of peat in EU Ecolabel, due to the slow rate at which peatlands can be restored, making peat a non-renewable material.

A1.3.4 *Proposed position for EU Ecolabel*

On the basis that the consultation feedback confirms that very little virgin peat is directly used in SI and mulch, we propose that virgin peat is not permitted in EU Ecolabel for SI and mulch. Virgin peat is considered valuable in GM, and the remainder of this document then considers the use of virgin peat in growing media only.

A1.4 If allowed, what level of peat would be acceptable

On the assumption that peat were to be permitted as a constituent of GM, a proposal is required to define what limit might apply to the percentage of peat in GM.

A1.4.1 *Units*

The units used to describe growing media and peat are often expressed by either volume or by wet mass. Given the likelihood that different constituents would have different and variable moisture contents and different bulk densities, it would be inappropriate to express the percentage in terms of volume or wet weight, as this would not provide a definitive limit and could lead to significant inconsistency. Some of the LCA studies presented below use volume while other use weight as the reporting unit. Our preference is that it should be expressed as a percentage on a dry matter basis which would be a precise measurement and provide a consistent limit.

A1.4.2 *LCA studies*

Several LCA studies have examined the environmental impact of growing media containing peat compared with other constituents. These are discussed below.

<u>EPAGMA (2012)</u>

Scope: The study carried out by Quantis on behalf of EPAGMA in 2012 was a comparative LCA of growing media only. Five different applications were considered, namely fruity vegetables, pot plants, young plant production using loose-filled trays, tree nursery stock and hobby market. Mixes for the same application were compared with each other. Examined components were black (strongly humidified and decomposed) and white (weakly to moderately humidified and decomposed) peat, bark, perlite, green compost, wood fibres, coir pith, mineral wool and rice hulls.

Environmental indicators: Four environmental indicators were used in this study:

1. <u>Climate change</u>. This refers to the impact on global warming and is measured in kg CO_2 eq/m^3.

2. <u>Resources.</u> The two categories contributing to this indicator are mineral extraction and primary non-renewable energy consumption. Impact is measured in MJ/m^3.

3. <u>Human health</u>. Human toxicity (carcinogenic and non-carcinogenic effects), respiratory effects (inorganics and organics), ionizing radiation and ozone layer depletion are the categories looked into when assessing the impact to human health. The damage is measured in DALY/m^3, where DALY stands for Disability Adjusted Life Years.

4. <u>Ecosystem quality.</u> This indicator quantifies the impact on the natural development and occurrence of species within their habitats and consists of aquatic ecotoxicity, terrestrial ecotoxicity, acidification, eutrophication, terrestrial acidification/nitrification and land occupation. Impact is measured in PDF/m^2/y/m^3, where PDF stands for Potentially Disappeared Fraction of species.

System boundaries: The LCA includes all processes from raw material extraction to the end-of-life stage of all product constituents. The product system is divided into six principal life cycle stages: production, delivery, processing, distribution, use and end of life.

Mixes used and scores: The mixes used for the study were based on volume/volume mixes and their respective ranking for each environmental indicator (with 1 (green) being the best performer (lowest impact) and 3 or 4 (red) being the worst performer (highest impact)) are presented in Table 0-2 below.

Table 0-2: EPAGMA study – Growing media mixes and ranking against environmental indicator area

Application 1 – GM for fruity vegetables		Climate Change	Resources	Human Health	Ecosystem Quality
Mix 1.1	100% white peat	3	3	1	2
Mix 1.2	100% mineral wool	2	2	3	1
Mix 1.3	100% compressed coir pith	1	1	2	3
Application 2 – GM for pot plants		**Climate Change**	**Resources**	**Human Health**	**Ecosystem Quality**
Mix 2.1	50% white peat, 50% black peat	4	4	2	2
Mix 2.2	80% white peat, 20% perlite	1	2	1	1
Mix 2.3	50% white peat, 30% green compost, 20% coir pith	3	3	4	4
Mix 2.4	30% black peat, 20% bark, 10% green compost, 10% rice hulls, 30% wood fibres	2	1	3	3
Application 3 – GM for young plant production using loose-filled trays		**Climate Change**	**Resources**	**Human Health**	**Ecosystem Quality**
Mix 3.1	75% white peat, 25% black peat	4	4	2	2
Mix 3.2	30% white peat, 50% coir pith, 20% wood fibres	1	1	4	4
Mix 3.3	50% white peat, 30% coir pith, 20% wood fibres	2	2	3	3
Mix 3.4	80% white peat, 20% perlite	3	3	1	1
Application 4 – GM for tree nursery stock		**Climate Change**	**Resources**	**Human Health**	**Ecosystem Quality**
Mix 4.1	50% white peat, 30% green compost, 20% rice hulls	3	3	4	3
Mix 4.2	50% white peat, 30% bark, 20% wood fibres	1	1	1	1
Mix 4.3	60% white peat, 20% green compost, 20% wood fibres	2	2	2	1
Mix 4.4	40% white peat , 40% black peat, 20% bark	4	4	3	2
Application 5 – GM for hobby market		**Climate Change**	**Resources**	**Human Health**	**Ecosystem Quality**
Mix 5.1	60% white peat , 40% green compost	2	2	3	3
Mix 5.2	80% black peat , 20% bark	4	4	2	2

Mix 5.3	60% black peat, 40% white peat	3	3	1	1
Mix 5.4	10% bark, 30% coir pith, 30% green compost, 10% rice hulls, 20% wood fibres	1	1	4	4

Note that the rankings in Table 0-2 need to be considered with caution, as the mixes were described by volume and the assumed bulk density and moisture contents of the components varied considerably (Table 0-3).

Table 0-3: Assumed bulk density and moisture contents of EPAGMA (2012) LCA study

Constituent	**Bulk density (kg/m^3)**		**Moisture content (%m/m)**	**C content (%m/m dry matter)**	**kg dry matter/ m^3**
	Wet	**Dry**			
Bark	280	196	30	50	196
Coir pith	350	70	80	46	70
Green compost	600	330	45	29	330
Mineral wool	70	70	negligible	negligible	70
Black peat	400	100	75	55	100
White peat	180	72	60	50	72
Perlite	105	105	negligible	negligible	105
Rice hulls	110	100	9	47	91
Wood fibres	120	66	45	50	66

Assumptions: Total emissions for peat production = (harvesting stage + after-use stage) – reference scenario. The values for emissions and carbon sequestration that were assumed for the reference scenarios were mostly taken from one study (Hagberg and Holmgren, 2008).

Limitations: Only extraction of peat by milling was considered. Sod peat extraction was excluded as it was reported by EPAGMA members that this is not as common in Europe and this makes the study more comparable to Cleary et al. (2005).

Validity: The study has been commissioned by the European Peat and Growing Media Association (EPAGMA) and the majority of data used was supplied by members of the Association or obtained through EPAGMA's LCA database. However, scientific papers, data from other suppliers and Ecoinvent were also used to address any missing data. The report has been certified by 3rd party reviewers and obtained ISO

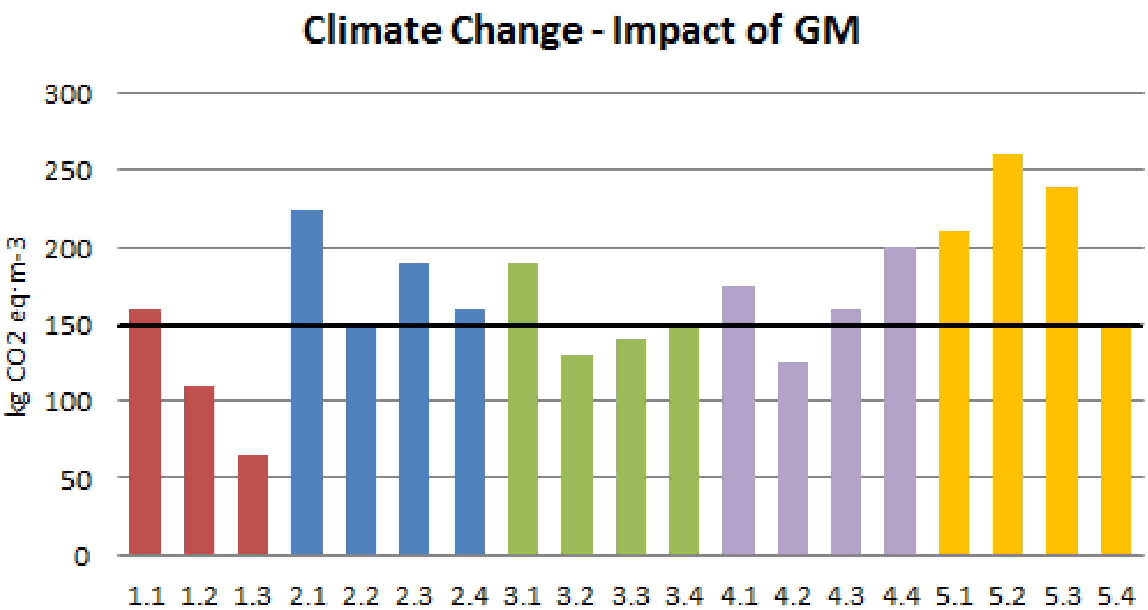
14040 and ISO 14044. The findings can be used to assess the environmental impact of peat as a GM, provided that findings of similar studies are also been taken into consideration.

Results: For all five applications, the worst performers in the areas of Climate Change and Resources were peat containing mixes. For each of the applications 1 to 4, the mix with the highest content in peat in each category was the one with the highest impact on climate change and resource depletion. For application 5 (hobby market), Mix 5.2 (80% black peat, 20% bark) had a higher impact than Mix 5.3 (60% black peat, 40% white peat). This can be an indication that black peat results in a higher environmental impact than white peat. Table 1 of the study suggests that the main constituent of GM in Europe is white peat, although there is no indication of the percentage of black peat used.

Moreover, the impact of a mix on climate change and resources was not found to be directly related to the percentage of peat in the mix. More specifically, Mix 2.2 (80% white peat, 20% perlite) has a lower impact on climate change than Mix 2.3 (50% white peat, 30% green compost, 20% coir pith) and Mix 2.4 (30% black peat, 20% bark, 10% green compost, 10% rice hulls, 30% wood fibres). Applying the dry matter contents per volume from Table 0-3 for the components it can be calculated that the peat represents 73%, 24% and 23% of the dry matter content for the mixes 2.2, 2.3 and 2.4 respectively. This suggests that it may be difficult to differentiate the impact of peat inclusion when mixed with other components.

The impact of each of the mixes studied on climate change is presented in the following graph. Although the study does not recommend comparing mixes used for different applications, the following graph is used to give an overview of the impact of peat and non-peat GM. The non-peat mix with the highest climate change impact was Mix 5.4 (10% bark, 30% coir pith, 30% green compost, 10% rice hulls and 20% wood fibres) and was used to set a baseline at 150 kg CO_2 eq/m^3.

Figure 0-1: Climate change impact of different GM mixes (EPAGMA 2012)



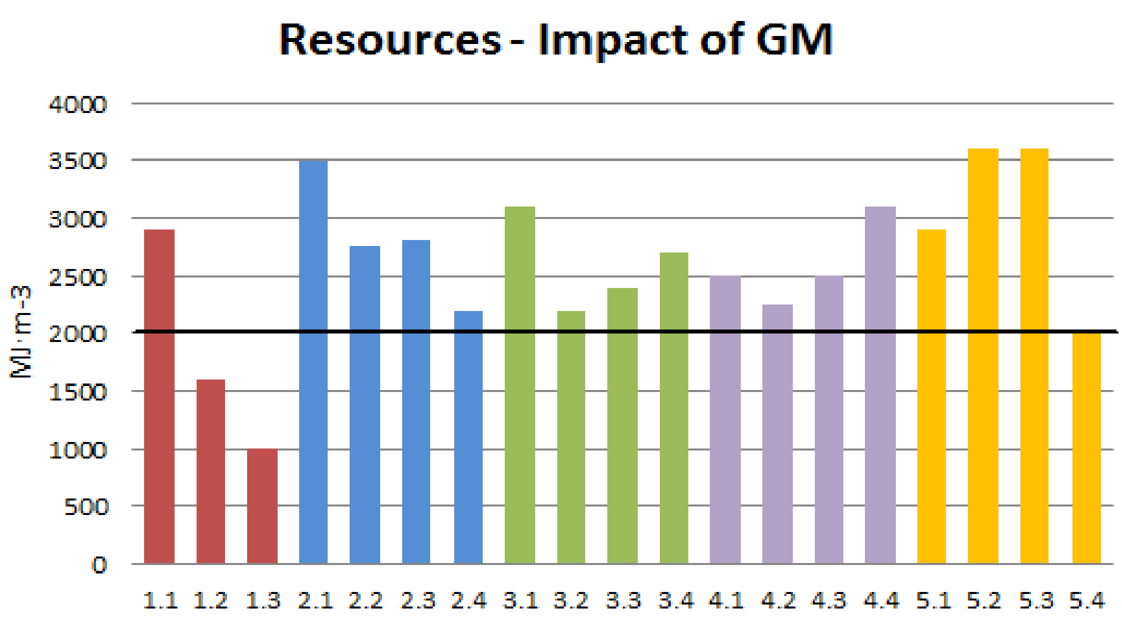
For key to mix codes along the x-axis, see Table 0-2.

A number of mixes containing peat fall below the baseline, which shows that it is possible for a GM containing a percentage of peat to have a similar or lower impact on climate change than a GM that does not

contain peat. Mixes falling below the baseline contained between 30% and 50% white peat but did not contain any black peat.

The impact of each of the mixes studied on resources is presented in the next graph. As per above, the EPAGMA study does not recommend comparing mixes used for different applications, however, the graph gives an overview of the impact of peat and non-peat GM. The non-peat mix with the highest impact on resources was also Mix 5.4 (10% bark, 30% coir pith, 30% green compost, 10% rice hulls and 20% wood fibres) and was used to set a baseline at 2000 MJ/m^3.

Figure 0-2: Resources impact of different GM mixes (EPAGMA 2012)

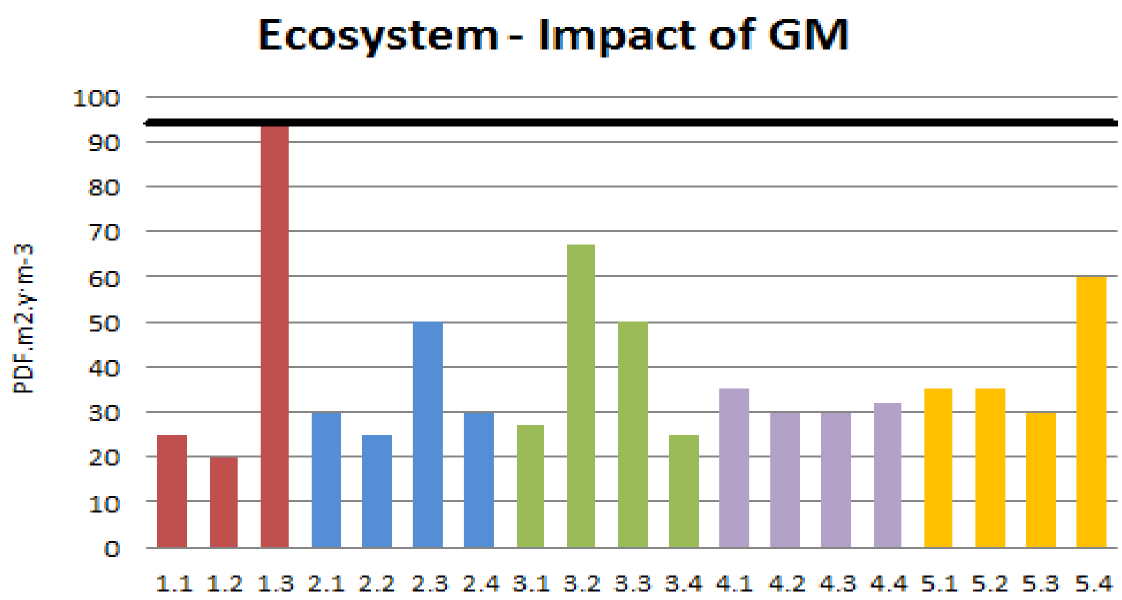


For key to mix codes along the x-axis, see Table 0-2.

As shown in the above graph (Figure 0-2), all of the mixes containing peat had a higher impact on resources than the non-peat mixes, regardless of the percentage used.

Another environmental indicator examined was the impact on ecosystem quality. The mix with the highest impact was Mix 1.3 (100% coir). As this was a non-peat mix, the baseline was set at approximately 95 PDF·m^2·y/m^3 which was the calculated impact of Mix 1.3 on ecosystem quality. The impact of each mix is presented in Figure 0-3 below.

Figure 0-3: Ecosystem quality impact of different GM mixes (EPAGMA 2012)



For key to mix codes along the x-axis, see Table 0-2.

As per the graph above, all peat mixes were below the baseline, which means that peat has a very much lower impact to ecosystem quality when compared to other mixes.

The EPAGMA study concluded that peat mixes tend to have a higher impact on climate change and resources than non-peat mixes. The extraction stage was found to have the highest impact on resources. Peat oxidation in situ causes a loss of the peat resource. Additionally, for black peat, distribution has a higher contribution than white peat, possibly due to the fact that black peat has a higher density than white peat and transportation work is expressed in kg/km, so the higher the density of the constituent transported, the higher the impacts will be. For climate change, the most impacting stage is the end-of-life. It is reported that peat decomposition takes approximately 200 years, with the majority of the emissions taking place during the first 100 years. Black peat end-of-life impacts are higher than the impacts for white peat because black peat has a higher carbon content and density than white peat.

Cleary et al. (2005)

Scope: The study examined the net GHG emissions of the Canadian peat industry between 1990 and 2000. GHG exchange was estimated for land-use change, peat extraction and processing, transport to market and in situ decomposition of extracted peat. The indicator used for this study was GHG emissions, namely carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

System boundaries: Land-use change, peat extraction and processing, transport to market, and the in situ decomposition of extracted peat were considered.

Results: Emissions from the extraction of Canadian peat increased between 1990 and 2000. The study found that peat decomposition associated with end use was the largest source of GHGs during the lifecycle, comprising 71% of total emissions during the study period. Land use change contributed 15% due to a switch of the peatlands from a GHG sink to a source. Peat transportation contributed 10% of total GHG

emissions and extraction and processing contributed 4%. It was estimated that approximately 2000 years would be needed to restore a carbon pool to its original size, provided that peatland restoration is successful and the peatland becomes a net carbon sink again.

Boldrin et al. (2010)

Scope: The lifecycle inventories (LCIs) of compost and peat in growing media were compared using LCA modelling. Leaching during the use of growing media made of compost and peat was assessed through batch leaching tests and the toxicity of leachate was calculated for each constituent. Four environmental indicators were used for this study, namely global warming potential, photochemical ozone formation, nutrient enrichment (eutrophication) and acidification.

Environmental indicators: Four environmental indicators were used in this study.

1. Climate change: This refers to the impact on global warming and is measured in kg CO2eq·m-3.
2. Resources: The two categories contributing to this indicator are mineral extraction and primary non-renewable energy consumption. Impact is measured in MJ·m-3.
3. Human health: Human toxicity (carcinogenic and non-carcinogenic effects), respiratory effects (inorganics and organics), ionising radiation and ozone layer depletion are the categories looked into when assessing the impact to human health. The damage is measured in DALY·m-3, where DALY stands for Disability Adjusted Life Years.
4. Ecosystem quality: This indicator quantifies the impact on the natural development and occurrence of species within their habitats and consists of aquatic ecotoxicity, terrestrial ecotoxicity, acidification, eutrophication, terrestrial acidification/nitrification and land occupation. Impact is measured in PDF·m2·y·m-3, where PDF stands for Potentially Disappeared Fraction of species.

Functional unit: The chosen functional unit is the following: "To provide 1 m3 (EN 12580) of growing media for each of the following five areas of application: fruity vegetables, pot plants, young plant production using loose-filled trays, tree nursery stock, and hobby market."

System boundaries: For compost, the composting process, growth media use and offsetting of mineral fertilisers were considered. For peat, peatland preparation, excavation, transportation and GM use were considered.

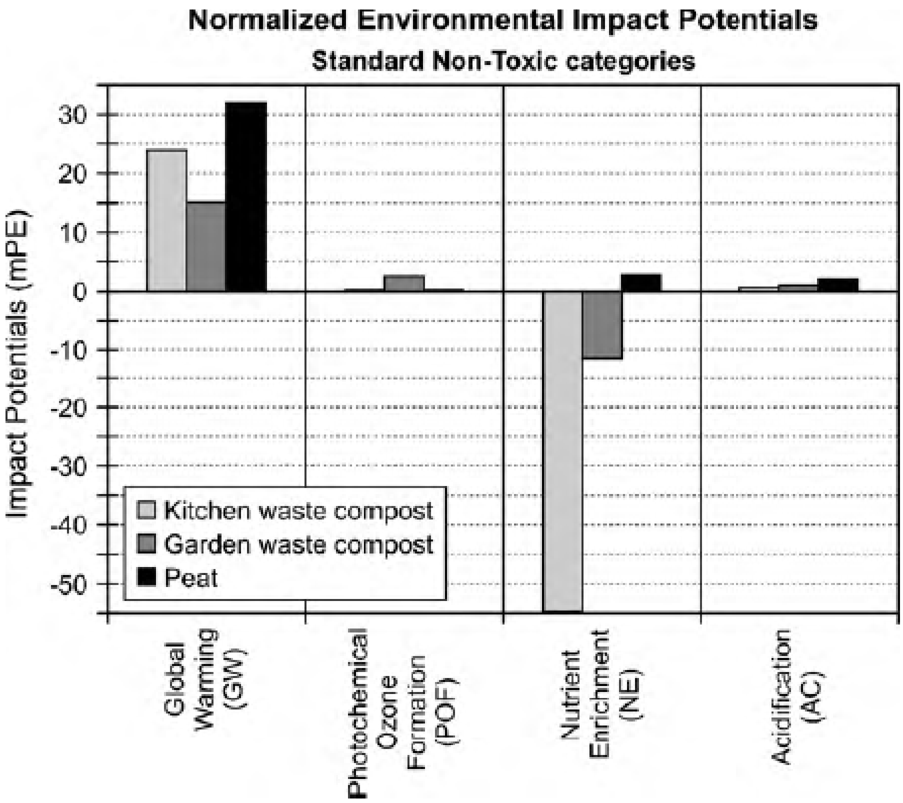
Assumptions: A 100-year period and a volumetric substitution ratio of 1:1 were assumed. It was also assumed that for compost 14% of the initial carbon was left in the soil after 100 years, while all carbon in peat was mineralised. Biogenic CO2 from the biowaste degradation generated during the compost production is considered neutral (GWP= 0) with respect to global warming.

Method used: With respect to GHG emissions, the method used considered carbon left in the soil (sequestered) a saving, while CO_2 from mineralised carbon was considered an emission, as peat in a peatland is considered stored biogenic carbon according to the study.

Results: Leaching during the use of GM was assessed. The compost was found to have leached 3–20 times more heavy metals and other compounds than peat. The LCA showed that compost performs better regarding global warming and nutrient enrichment, while peat performs better in some toxic categories, because of the lower content in heavy metals.

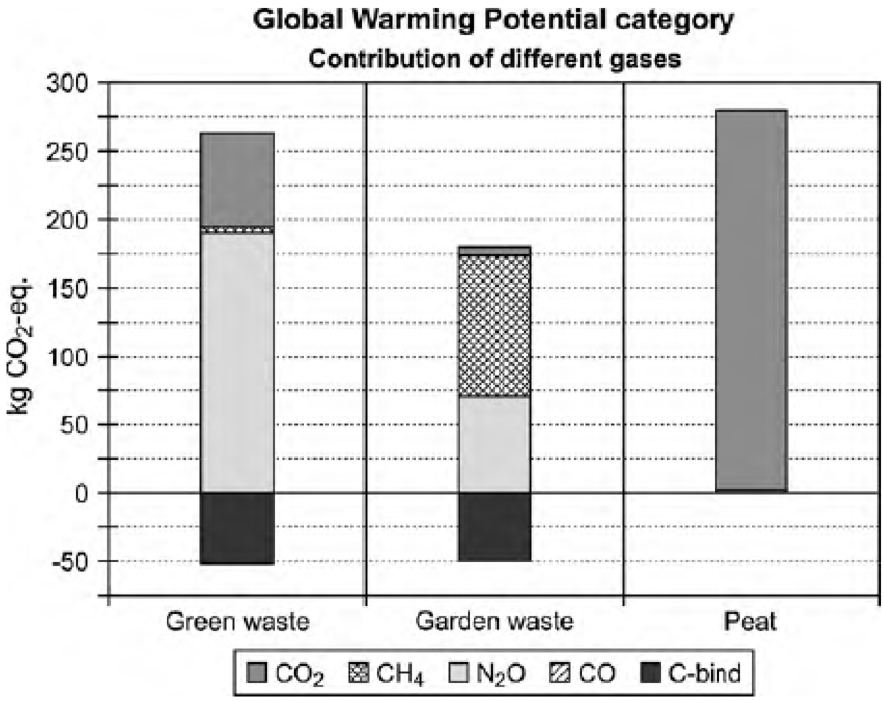
More specifically, when assessing the environmental impact potential of green compost, garden compost and peat, peat was found to have a higher global warming potential, as well as higher nutrient enrichment (eutrophication) potential, than the two types of compost examined. Peat also had slightly higher acidification impact, though garden waste compost was the most impactful on photochemical ozone formation. The results are presented in Figure 0-4 below.

Figure 0-4: Potential non-toxic impacts from use of compost (1 t) and peat (285 kg) as bulking materials in growth media preparation. (Boldrin et al. 2010)



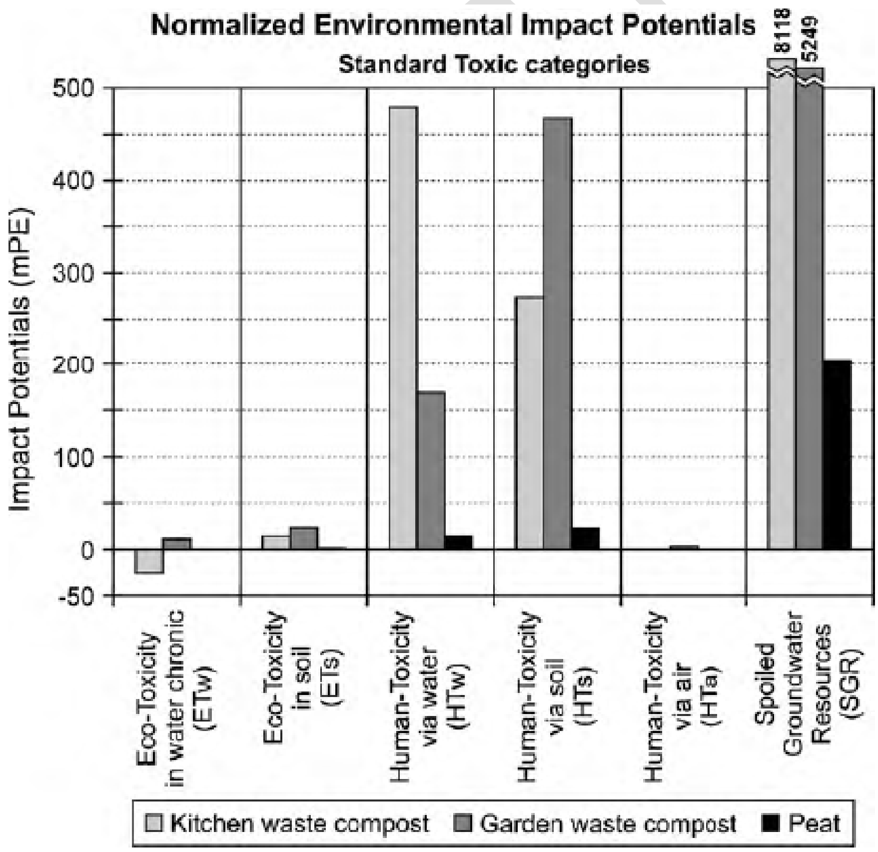
The study also took into account the N_2O emissions that occur during the composting process and carbon savings from the use of compost instead of peat were estimated to be 69 kg CO_2 eq/tonne for green waste and 148 kg CO_2 eq/tonne for garden waste. A more detailed analysis of the contribution of different gases to the global warming potential of each product is presented in Figure 0-5, in which the comparison between peat and compost is done on a 1:1 volume basis :

Figure 0-5: Contribution of different gases to global warming potential from use of compost (1 t) and peat (285 kg) as bulking materials in growth media preparation. (Boldrin *et al.* 2010)



In toxic categories, composts were found to have significantly higher impact than peat, as shown in Figure 0-6.

Figure 0-6: Potential toxic impacts from use of compost (1 t) and peat (285 kg) as bulking materials in growth media preparation. (Boldrin et al. 2010)



Defra (2008)

Scope: The study assessed the carbon footprint of selected GM constituents, comparing GHG emissions (CO_2, CH_4 and N_2O) from their production, processing, transport and use phase. The study also recognised the problem of comparing data based on volume and hence the functional unit used in this report is the metric tonne (t), at end-use stage of the life cycle.

Environmental indicators: GHG emissions were used as an environmental indicator for this study and they are expressed in kg of CO_2 equivalent.

Functional unit: The functional unit used throughout this report is the metric tonne (t), meaning 1000 kg, at end-use stage of the life cycle.

System boundaries: The life cycle stages examined are: changes in land use (where applicable), extraction and harvesting, processing, transport and end use. The system boundary, as specified in PAS 2050, excludes all the GHG emissions associated with capital goods. The temporal boundary of this study is the IPCC's 100 year time horizon.

Assumptions: The report assumes that organic materials added to the soil decompose at the end of their life cycle, while mineral materials remain in the soil. For organic materials, it is assumed that 80% of the carbon decomposes within the IPCC 100 year time horizon and is emitted as CO_2 while the rest 20% is sequestered into the soil carbon store. As a result, the CO_2 emitted within the 'end use' stage dominates the results. This study uses average moisture contents for peat, composts, forestry materials and coir but perlite and vermiculite are reported on a dry weight basis.

Limitations: This is a preliminary study, only looking at the use of GM within the UK and there are a number of methodological and interpretation issues which require further research. It is recommended that the results should be used with caution. Due to a lack of primary data, secondary data was used for a number of the calculations. Moreover, there seems to be some confusion between treatment of biogenic CO_2 as neutral in climate change indicators according some standards as PAS 2050, and the concept of carbon offsetting, which is called "offset approach" along the paper.

Method used: This study reports the 'LCA' carbon footprint where all emissions are included in the final total and also an 'offset' carbon footprint which excludes emissions of carbon dioxide from biogenic materials and deducts emissions associated with stored carbon.

Results: In terms of total GHG emissions, the 'LCA' approach supports the use of UK and Irish peat and coir in this study. However, when the 'offset' carbon footprint method is used, compost, timber products and coir are the preferred materials.

Table 0-4: Results of the study for each method and reporting unit

	LCA carbon footprint by weight	Offset carbon footprint by weight	LCA carbon footprint by volume	Offset carbon footprint by volume
< 100 kg CO2e t^{-1}		Green compost, bark, wood fibre	Wood fibre, perlite, vermiculite	Green compost, coir, bark, wood fibre, perlite, vermiculite
100 - 500 kg CO2e t^{-1}	Coir	Coir	Peat (UK, Ireland), peat (Finland), green compost, coir, bark	Peat (UK, Ireland), peat (Finland)
500 – 750 kg CO2e t^{-1}	Peat (UK and Ireland), perlite	Peat (UK and Ireland), perlite		
> 750 kg CO2e t^{-1}	Peat (Finland), green compost, bark, wood fibre, vermiculite	Peat (Finland), vermiculite		

The conclusions suggest that the method, as well as the reporting unit used can significantly affect the results of the study. There are clear difficulties involved in calculating and interpreting GHG emissions from growing media. Determining whether peat is a fossil or biogenic carbon source, when all other organic growing media are treated as biogenic carbon, is key to how the results are perceived and interpreted.

However, it was found that all GM constituents in the study had emissions associated with land use change during their production. This is especially apparent for surface mining of perlite and vermiculite. It was hence concluded that the reason for avoiding the use of peat in GM should be its 'non-renewability' and potential for long-term in-situ carbon storage rather than its emissions of GHGs.

Verhagen and Boon (2008)

Scope: RHP is a European knowledge centre for potting soil and substrates (growing media) for professional horticulture and consumers. RHP has developed a classification system demonstrating the environmental performance of different GM. The aim of the system was to offer producers and professional users transparency about the environmental quality of a particular substrate.

Environmental indicators: The environmental indicators used in this study were eutrophication, ozone depletion, ecotoxicity, GHG emissions, acidification, human toxicity, summer smog and energy use.**Functional unit:** The functional unit for the different LCAs used in this study is not specified.

Method used: Depending on their environmental profile, growing media were awarded an A, B or C classification. An A-classification indicated that the product has a considerably better environmental profile than the market average (standard Dutch substrate). The score-system was set up so that the reference product has a score B (50 points out of 100) and the scoring is as follows:

- Classification A > 50 points out of 100
- Classification B 30 to 50 points out of 100
- Classification C < 30 points out of 100

Results: According to the study, the environmental profile of white peat and black peat after production and transport to the end-user showed that black peat has considerably higher GHG emissions than white peat. This conclusion is consistent with the findings of the EPAGMA study, which showed a higher impact on climate change and resources from GM mixes that contained black peat compared to those containing only white peat.

The example used in this study was a mix containing 40% black peat, 40% white peat and 20% bark (France). The report stated that with 'wise use of peat', environmental care and use of environmental friendlier components, this mix scored an A (70 points out of 100). This scoring means the mix is considered an above average performer. The same mix was used in the EPAGMA study and was found to be the worst performer on climate change and resources out of the four mixes assessed for that application. This is an indication that the method used when assessing the environmental profile of a GM greatly impacts the result and points out the difficulty in developing a sufficiently robust LCA study.

Conclusions from LCA studies

The differences in results of the LCA studies discussed above make it apparent that the method and reporting unit used in an LCA study has a great impact on the results of the study. The EPAGMA study, when comparing different mixes of GM used for the same application, concluded that mixes containing peat demonstrate a higher impact on climate change and resources. For most applications, the mix with the highest content in peat in each category had the highest impact on climate change and resource depletion, however the impact of a mix on climate change and resources was not found to be directly related to the percentage of peat in that mix.

When presenting the results of the EPAGMA study on the same graph and establishing a baseline for the peat-free mix with the highest climate change impact, it was found that a number of mixes containing peat fall below the baseline. As a result, it is concluded that it is possible for a GM containing a certain percentage of peat to have a similar or lower impact on climate change than a GM that does not contain peat. Mixes falling below the baseline contained between 30% and 50% white peat but did not contain any black peat. However, all mixes containing peat were found to have a higher impact on resources than the non-peat mixes, regardless of the percentage used. Boldrin *et al.* (2010) reported that compost performs better regarding global warming and nutrient enrichment, while peat performs better in some toxic categories, because of the lower content of heavy metals.

The results of the EPAGMA study also suggest that black peat results in a higher environmental impact than white peat. This is mainly due to black peat end-of-life having a higher impact than white peat because black peat has a higher carbon content and density. This difference in impact between the two types of peat is also highlighted by Verhagen and Boon (2008), who looked at the environmental profile of white and black peat after production and transport to the end-user.

Despite the fact that peat containing GM tend to have a higher environmental impact than non-peat ones, Defra (2010) found that all GM constituents in the study (e.g. perlite, vermiculite) had emissions associated

with land use change during their production. As a result, it was concluded that the main reason for restricting the use of peat in GM should be its 'non-renewability' and potential for long-term in-situ carbon storage rather than its emissions of GHGs. Cleary et al. (2005) estimated that approximately 2000 years would be needed to restore a carbon pool to its original size, if peatland restoration was successful and the peatland became a net carbon sink again, which would mean that peat extraction cannot be a renewable activity.

Overall, we conclude that, because GM constituents may vary considerably in terms of types of materials and their percentage in the product, it is difficult to provide a definitive answer when considering peat. We conclude from the LCA studies that, whilst virgin peat as a major constituent of GM is unfavourable, the position is not clear when peat is a minor component of the GM. The limited LCA evidence suggests that its use as a minor component in a GM composed of a mixture of constituents is unlikely to represent a significant environmental impact compared with other mixtures of constituents that do not include peat. On this basis, our view is that, if peat were permitted in EU Ecolabel GM, it should be limited to being a minor constituent of the GM.

Defining such a limit for peat is not possible based on the LCA studies and so unless an extensive focused and comprehensive study was undertaken a pragmatic precautionary approach would be recommended unless. Therefore if a limit were considered we consequently would propose a limit of 20% on a dry matter basis for the amount of peat that might be permitted in EU Ecolabel GM. However, it must be emphasised that this is a preliminary proposal and it is subject to further debate at the AHWG meeting and thereafter.

A1.5 What sources of peat might be considered acceptable

A1.5.1 *Peat sources and extraction*

Peat is currently produced in significant quantities as a fuel and for horticulture by several EU countries. According to statistics published by EPAGMA in 2007, approximately 64 million m^3 are produced in the EU each year. A small amount of peat is also imported from outside the EU, resulting in total use of peat being 68 million m^3. Table 0-5, Table 0-6 and Table 0-7 present a breakdown of the use of peat in the EU.

Table 0-5: Peat usage within the EU by sector.

Sector	**Percentage of peat used**
Energy	50%
GM	42%
SI	5%
Other uses	3%

Table 0-6: Peat usage for production of professional growing media by segment

Application	Percentage of peat used
Floriculture	48%
Vegetable growing	27%
Nursery stock	17%
Mushroom growing	3%
Fruit growing	1%
Other uses	4%

Table 0-7: Peatland areas and peat production in EU divided between countries

Country	Peatland areas (% of total EU)	Peat production for all usages (% of total EU)
Sweden	38%	5%
Finland	32%	41%
UK	6%	2%
Germany	5%	13%
Estonia	4%	6%
Ireland	4%	21%
Poland	4%	3%
Lithuania	3%	3%
Latvia	2%	6%
Netherlands	1%	0%
Denmark	1%	0%

These tables indicate that there are a few major peat producing countries (Finland, Germany and Ireland) that account for 75% of EU production. However, there are many other countries with small areas of peat that are also extracting peat. Therefore, in very few countries (possibly Denmark and the Netherlands) is peat extraction so low that the peatlands are protected.

Many peat habitats are special sites with protected status under European legislation (eg. Natura 2000, EU Habitats and Birds Directives and EU Water Framework Directive) and international conventions (eg. Ramsar convention).

A1.5.2 *Sustainability of peat production*

There is some debate on the sustainability of peat production. As mentioned earlier in this report, a peatland would need approximately 2000 years to be restored and become a net carbon sink. In the UK, based on a growth rate of 1mm per year, it was estimated that only 10 to 20 m^3 of peat could be harvested sustainably for every hectare of active, peat-forming raised bog, which would be less than 2% of the UK's current annual peat use for horticulture. During the consultation, it was reported that peat's extraction rate in industrialised countries is far exceeding its slow regrowth rate of 1 mm per year and peat regrowth takes place only in 30-40% of peatlands. It is thus evident that sustainable sourcing of peat cannot easily be achieved. As a result, the rest of this Annex will focus on responsible sourcing of peat that is intended to minimise the environmental impact as far as possible.

A1.5.3 *Other studies and initiatives*

In 2010, the UK Government launched a consultation on proposals to phase out the horticultural use of peat by amateur gardeners in England by 2020 and professional gardeners by 2030, by switching to more sustainable, peat-free alternatives. This was followed by a Natural Environment White Paper that highlighted these targets. A report published by Defra in 2011 estimated that the UK uses 2.4 million cubic metres of peat per annum for horticulture. 69% is used by amateur gardeners and 30% by professional growers. The report also estimated that, based on a growth rate of 1 mm per year, only around 10 to 20 cubic metres of peat could be sustainably harvested for every hectare of active, peat-forming raised bog, suggesting that active English lowland raised bogs could, theoretically, supply less than 2% of the UK's current annual peat use for horticulture on a sustainable basis. It also suggested that, globally, more peat is being lost as CO_2 than what is being formed. During the EU Ecolabel consultation, it was reported that it is proving to be very difficult to meet the peat phase out targets. The past decade has seen a significant reduction in peat use in the horticulture industry, but the market in the UK is still far from being peat free.

A1.5.4 *Stakeholder consultation feedback on sustainable peat extraction*

As explained in Section 3.2, all of the stakeholder responses provided have been carefully considered during the criteria development process. The issue of peat is recognised as a sensitive topic. Peat was reported by some stakeholders and in literature to be essential for the production of high quality GM. In their opinion, it is important that GM bearing the EU Ecolabel are of a high quality, as a GM that results in failure of the crop would mean wasting all the resources used for the crop's cultivation, and cause a significant adverse impact on the reputation of EU Ecolabel. That is to say, they argue that, whilst being fully environmentally acceptable, a poorly performing product would not be suitable for the intended markets. It is possible that the current prohibition for the use of peat has been a factor in the current low uptake of the EU Ecolabel for GM and SI. On the contrary, many other stakeholders support the peat-free criterion, since there are substitutes as barks, wood fibres, compost of green waste that can feature a good level of quality in growing media.,

Discussed below are stakeholder comments received with respect to the extraction of peat. A number of respondents indicated support for the use of responsible resources for peat and reported that there are national initiatives across the EU that aim to ensure the responsible extraction of peat. Other stakeholders

pointed out the environmental issues associated to peat extraction (unsustainable resource, GHG emissions, biodiversity, etc):

The following Member State initiatives were highlighted during the consultation:

- Code of Practice (CoP) for Responsible Peatland Management by EPAGMA
- Strategy for Responsible Peatland Management by the International Peat Society - http://www.peatsociety.org/sites/default/files/files/srpmwebversion.pdf
- Certification scheme for Responsibly Produced Peat - http://www.responsiblyproducedpeat.org/
- UK Sustainable Growing Media Task Force (http://www.defra.gov.uk/peat-taskforce/about-us/), which has set criteria for the responsible sourcing of peat
- University of Greifswald is currently working on peat moss cultivation (Sphagnum farming) projects with a view to develop a substitute of virgin peat for growing media (http://sphagnumfarming.uni-greifswald.de/en/index.php)

A1.5.5 *Policy and initiatives promoting the responsible use of peat*

As stated in Table 0-7 above, Finland, Ireland and Germany are the main peat producing countries in the EU. A policy framework exists in all three of these countries to promote responsible peat production, while a number of relevant initiatives exist in Germany and other Member States.

Finland

The Finnish Ministry of Agriculture and Forestry published a National Strategy for Mires and Peatlands in February 2011. The strategy aimed to address issues such as after-use of drained unproductive peatlands, preferable sources of peat production and further peatland protection needs. Moreover, environmental licences for the operation of peat production sites are issued by appropriate authorities in Finland, helping to ensure that a site complies with minimum standards set by the authority. More specifically, all peat extraction in an area larger than 10 hectares requires an environmental licence, which is valid for ten years. If the planned peat production site is larger than 150 hectares or if the area has special environmental values, the peat producer must conduct an EIA before applying for an environmental licence. The Finnish peat industry has also committed to develop alternative options for the after-use or re-use of the cut-away peat production areas.

Ireland

Ireland's Environmental Protection Agency (EPA) published a research paper titled Bogland: Sustainable management of peatlands in Ireland (STRIVE Report no. 75) in 2011 (EPA, 2011), which provided recommendations for the development of a national peatland strategy. Targets set within the document included:

- *Areas of priority habitat peatlands (active and degraded raised bogs and blanket bogs) should be declared as Special Areas of Conservation (SACs) and more peatland sites (including fens) should be designated under adequate legal protection. Attention should be paid to maintaining the integrity of these peatland habitats to ensure the survival of the unique biodiversity that they sustain.*

- *Designated peatland sites should be appropriately managed and restored to increase the total area of near-intact peatlands. A range of key peatland sites representing all types of peatlands should be identified for positive management to achieve biodiversity targets at different levels: genetic, species, habitat and ecosystem.*
- *Consideration for the protection and conservation of peatland biodiversity should be integrated into other government policies, such as climate change policy, renewable energy policy, strategy for invasive species and the Water Framework Directive.*
- *Good practice guidance for Environmental Impact Assessment (EIA) involving peatlands should be developed. The EIA Directive specifies that thresholds do not preclude sensitive areas and as such peatlands are to be considered sensitive areas for any development and thus require an EIA.*
- *The present management of state-owned peatlands should be evaluated and alternative management options aimed at increasing the natural functions of peatlands should be implemented*

Moreover, the European Commission requested in June 2011 that Ireland ceased extraction of peat from protected Natura 2000 sites to avoid breaches of the Habitats Directive (92/43/EC) and the EIA Directive (85/337/EEC). Peat extraction sites in Ireland now require development consent, to enable planners to minimise negative impacts of peat extraction to the environment. More specifically, under the new Planning and Development Regulations 2001 to 2005, planning permission and EIA are required for peat extraction in a new or extended area of 30 hectares or more.

Germany

In Germany, peat extraction is only permitted from degenerated raised bog areas that have been drained for a long time and are generally used as meadows and pastures or as arable land (Concept, 2008). The Bog Protection Programme of Lower Saxony, an area where 95% of all bogs in the Atlantic area are located, has helped establish a network of Natura 2000 raised bog sites in the area and restore a number of those sites. Since 1981, only degenerated and drained bogs with agricultural pre-use are granted extraction permits in the area, under the condition of rewetting and restoration of the bog after extraction. Peat extraction is prohibited in pristine bogland. Moreover, under German law, an EIA is required for peat extraction covering an area greater than 10 hectares.

UK

Following the publication of the Natural Environment White Paper, the Natural Choice, in June 2011, which required the complete phase-out of peat in UK horticulture by 2030, a Sustainable Growing Media Task Force was established. The Task Force published a report titled ‘Towards Sustainable Growing Media’ in July 2012, which included a draft roadmap setting out the actions needed in order to achieve a transition to sustainable growing media. The report stated that no peat used in horticulture should be sourced from pristine or high quality peat habitats, such as peat habitats which are designated as Sites of Special Scientific Interest (SSSIs) or Special Areas of Conservation (SACs) in England. It also set out a goal to establish a responsible sourcing and manufacturing standard for GM and SI that will ensure only raw materials that are environmentally and socially responsibly sourced and manufactured are used.

In response to the report, the UK Government (Defra, 2013) agreed that peat extraction from pristine or high quality bogs should be avoided, but suggested that further work is required before a specific policy framework for sustainable growing media can be set.

EU-wide initiatives

EPAGMA Code of Practice for Responsible Peatland Management

This voluntary Code of Practice for EPAGMA members aims to monitor industrial peat production chains and to gradually increase the quality of growing media constituents. Regarding the selection of an extraction site, the Code requires participating companies to:

- *Establish new production sites, where possible, on peatlands that are already ditched or in other ways affected by man.*
- *Support the conservation of peatland types recognised as biologically valuable by national legislation.*
- *Not apply for licences to open new production sites on peatlands belonging to the Natura 2000 Network at the time of application, if extraction would have a significant effect on the site´s conservation objectives.*

The Code also includes provisions for management and after-use of the site.

International Peat Society (IPS) Strategy for Responsible Peatland Management

The Strategy states that use of peatlands should avoid damaging peatlands of high conservation value, pristine mires and intact peatlands, and prioritise the ones that have been degraded by human intervention. Moreover, it requires planned after-use, including some form of restoration or rehabilitation and rewetting to raise water tables.

Responsibly Produced Peat

Responsibly Produced Peat is a certification scheme developed by EPAGMA, IPS and the Dutch Growing Media Producers Organisation (VPN) and the specially formed Foundation Responsibly Produced Peat. It is expected to become available in 2013 and will include requirements from site-selection through to after-use. Companies will be able to apply for certification once the scheme is launched.

A1.5.6 *Potential EU Ecolabel peat sources*

Peat is a fossil material that takes very many years to replace naturally and that extraction would exceed the rate of replacement. Therefore, in our view it is unlikely that peat extraction could carry the label of sustainability. We would assume that the label of responsible peat extraction would be based on sound science and principles that minimised the adverse impact of peat extraction, whose conformity would be assessed by a third party verification system. Therefore, if peat were to be permitted in EU Ecolabel GM, we would propose that peat should only be supplied from sources recognised for responsible peat production by national government and industry codes of practice and regulations. Additionally we would propose that peat supplied for EU Ecolabel GM should not come from the following types of habitats:

- Pristine habitats, not previously used

- High quality habitats, designated as Natura 2000 sites, Special Areas of Conservation (SACs) or Sites of Special Scientific Interest (SSSIs).

A1.6 What reporting/declarations should be required

If peat were to be included in EU Ecolabel GM, our recommendation would be that the amount of virgin peat, determined by its percentage on a dry matter basis and the source of the peat is declared. The declaration should be that the peat is sourced from a recognised responsible peat source and is not from a protected special site. The declaration should be granted by third party verification.

A1.7 Proposed Criteria

The potential inclusion of peat in the EU Ecolabel is a particularly contentious area and the scientific evidence available is not robust enough to allow for a final conclusion to be made. It is clear from stakeholder feedback that peat is an important element in producing reliable and good quality high performing GM. The current prohibition of peat in EU Ecolabel for GM and SI is thought (by ourselves and many stakeholders) to be a key factor in the current low uptake of this Ecolabel product stream by commercial GM and SI producers.

The LCA evidence suggests that, from this perspective, the inclusion of peat in GM as a minor constituent is unlikely to be significantly worse compared with GM that is peat free. However, the extraction of peat is not a sustainable operation due to the slow natural rate of peat formation.

Some proposal options are therefore included in this section, but it must be emphasised that these are preliminary proposals only. In our view, the peat issue for EU Ecolabel GM, SI and mulches will need further debate by stakeholders at the AHWG meeting and thereafter. These proposals, along with the evidence and discussions in this report, are therefore given to guide this further debate.

Our recommendation is to exclude peat from EU Ecolabel for SI and mulches. This is based mainly on the fact that peat is rarely used in these products in the first instance and prohibition would therefore have little impact on the production and markets for these products.

For growing media, there are two options to consider, which are either a similar retention of the complete prohibition of peat, or to allow the inclusion of a certain percentage of peat in GM under certain conditions. In this context, we would not propose to make any differentiation between black and white peat as, in practice, there is a spectrum of degrees of peat decomposition from weakly through to strongly decomposed, rather than distinct peat types. Whilst the prohibition would adhere strictly to the EU Ecolabel principles. it is also thought likely in our and some stakeholders' opinion that this would maintain the status quo of a low uptake of EU Ecolabel for these products in the market place. If it is decided to allow a certain percentage of peat in GM, this should have a defined limit, which we proposes should not exceed 20% on a dry matter basis. This proposed limit is suggested on the basis of the LCA studies which indicate that such a peat content results in environmental impacts similar to many peat free GM. Moreover, peat used for the purposes of EU Ecolabel should then only be allowed from responsibly managed peatlands that are neither pristine peat habitats nor designated Natura 2000 sites, Special Areas of Conservation (SACs) or Sites of Special Scientific Interest (SSSIs). In that respect, acceptable sources and conditions to ensure responsible peat extraction should be clearly defined in the final EU Ecolabel criteria.

As an additional factor to the debate, permitting this low level of peat in GM might, in our view, provide a positive overall benefit, as the limit of 20% is lower than the amount of peat currently used in many GM. Therefore, we would consider that taking this option would provide an incentive for producers to reduce their overall peat consumption in GM through attaining EU Ecolabel status for their products. The proposed 20% peat limit might then be revised in future revisions to provide further incentives for further peat use reduction by the industry.

To give an indication of the possible figures involved, our market study suggests roughly 70% peat in all GM. If 20% of products achieved the EU Ecolabel with less that 20% peat, the average peat content would fall below (20% x 20% + 80% x 70% =) 60%.

Table 0-8: Proposed EU Ecolabel Criteria

Parameter	Growing Media	Soil Improver	Mulch
Inclusion of peat	**Either** **No (maintaining current EU Ecolabel position)** **Or Yes, (under provisions set out below):** **A. Only for GM where the peat is no more than 20% of the GM on a dry matter basis; and** **B. The peat is sourced from a responsibly managed peat production source that is neither a pristine peat habitat nor a designated Natura 2000 site, Special Area of Conservation (SACs) or Site of Special Scientific Interest (SSSIs).**	**No**	**No**

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A2. Organic Pollutants

A2.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included the potential revision of the organic pollutant limits for SIs and GMs. The scope of this project also includes development of an EU Ecolabel for mulches for which the inclusion of organic pollutant limits is also considered here.

Recommendations for the revised parameters are included in the main report. This Annex provides the justification for the revised proposed limits for organic pollutants.

A2.2 Background

A2.2.1 *Requirement to revise EU Ecolabel organic pollutant criteria for Soil Improvers and Growing Media*

JRC/IPTS are currently developing proposals for a revision of the EU Ecolabel criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-9) that should be taken into consideration at the next revision, and this included organic pollutants. At present, there are no criteria limiting organic pollutants in the Ecolabel SI and GM criteria. However, both contain plant growth tests as a bioassay, which would detect the presence of plant growth inhibition, which would include herbicides if the test plants were sensitive.

Table 0-9: Issues to be addressed in revision of Soil Improver and Growing Media EU Ecolabel criteria

Issues to be addressed	Growing Media	Soil Improvers
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

In this study we have considered the proposed revision for relevant organic pollutants limits for growing media, soil improvers and mulches.

A2.2.2 *Current EU Ecolabel organic pollutant criteria for GM and SI*

There are no specific organic pollutant tests in the current EU Ecolabel criteria for SI and GM.

The EU Ecolabel for SI does however include a plant growth bioassay test in Section 2.4.9 (2.4.9 Plant emergence and growth - Criterion 5b). The same method is also applied in the EU Ecolabel criteria for GM in Section 2.4.6 (2.4.6 Product performance - Criterion 3). However, the test method is not clearly described in the EU Ecolabel guidance documents.

"Products shall not adversely affect plant emergence or subsequent growth. The applicant shall provide, together with the European Eco-label application, results from a vegetative trial (germination test, phytotoxicity test, growing-on test, etc.) attesting benefits of the product regarding plant development.

Analytical tests shall be made on a representative standard that has been compiled as part of Project Horizontal. Ref.: Baumgarten, A., and Spiegel, H., Phytotoxicity (Plant tolerance), Horizontal-8, Agency for Health and Food Safety, Vienna, Austria, April 2004, the report can be downloaded from http://www.ecn.nl/horizontal/downloads/finaldeskstudies/."

A2.2.3 *Proposed revision scope*

In this revision, we have considered several factors that we think could be revised and have developed justifications for our proposed revisions. These factors are:

- What are the organic pollutant criteria that would be limited
- Whether limits are applied to constituents and/or final products
- What minimum monitoring frequency should be applied
- What limits for the organic pollutant criteria should be applied
- What test method should be applied
- What reporting/declarations should be required

A2.3 Factors considered in proposed revised organic pollutant limits

A2.3.1 *Hazard and risk considerations*

Exposure to hazards

Setting suitable limits should consider the hazard and the risk of harm from exposure to the hazard. For soil improvers, the principle exposure pathways when applied to agricultural land or in the home garden include:

- Ingestion, inhalation and through injuries during handling.
- Contamination of plants and animals (including crops) from the contamination added to soils.
- Consumption of contaminated food grown in contaminated soil.
- Contamination of other local environments such as neighbouring terrestrial habitats and water courses by wind, surface run off and transport by animals.

For growing media, which may be used by the householder for growing crops directly, there is the risk from handling the growing media and the hazard is taken up when the food crop is consumed.

Limits should be applied that reflect an acceptable level of risk through any exposure pathway.

Organic pollutant hazards of concern

Organic pollutant hazards come in many different forms due to the wide variety of different organic chemicals and their sources. Hazardous chemicals may cause acute and chronic toxicity, carcinogenicity, mutagenic and physiological disruption.

Pesticides

Many organic pollutants, such as pesticides and endocrine disrupting chemicals, are biologically active at very low concentrations. Others are resistant to microbial, chemical and physical decomposition and so may persist and accumulate in the environment, and may become concentrated in natural food chains and affect organisms where this accumulation occurs. They may be soluble in water or volatile and therefore relatively mobile. Alternatively, they may be insoluble and adsorb tightly to particles and solid materials. Some organic pollutants may degrade well under aerobic and/or anaerobic conditions and therefore may be removed during composting and/or anaerobic digestion. However, there are cases where specific pollutants have passed through composting and have impacted product quality.

For example, a particular problem has been with certain herbicides (picloram, clopyralid and aminopyralid) that may enter the biodegradable waste stream following their application to grass that is then cut as garden waste (WRAP 2010). These herbicides are available to professional and amateur gardeners, and do not degrade well during composting (and are stable under anaerobic conditions). They have been present in compost products, causing inhibition of sensitive crops such as peas, beans, lettuce, spinach, tomatoes and potatoes.

Persistent organic pollutants (POPs)

POPs are chemical substances that persist in the environment, bio-accumulate through the food chain and pose a risk of causing adverse effects to human health and the environment. POPs consist of pesticides (discussed above), industrial chemicals and unintentional by-products of industrial processes such as polychlorinated biphenyls (PCBs), dioxins and polyaromatic hydrocarbons (PAHs).

PAHs can be found in nature but they can also be a by-product of industrial processes. They are created as a result of the incomplete combustion of hydrocarbons (such as oil and coal) and organic matter. The EPA has classified seven PAH compounds as probable human carcinogens (JRC, 2010):

- Benz[a]anthracene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[k]fluoranthene
- Chrysene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene

Dioxins (polychlorinated dibenzo-p-dioxins - PCDDs and polychlorinated dibenzofurans - PCDFs) are also by-products of various industrial processes, such as combustion, metal processing, paper pulp bleaching and the production of chlorophenols and chlorophenoxy herbicides. They are highly toxic compounds, the

most toxic being 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD). PCBs are odourless, clear to pale yellow, viscous liquids, used as dielectric and coolant fluids. They often demonstrate characteristics similar to dioxins and can be characterized as dioxin-like compounds.

Other chemicals regarded as POPs are brominated flame retardants (BFRs) such as polybrominated diphenyl ethers (PBDE), perfluorinated compounds (PFC) such as perfluorooctane sulfonate (PFOS), polycyclic musk and a number of compounds used as insecticides (such as dichlorodiphenyltrichloroethane – DDT).

Endocrine disrupting chemicals (EDCs)

Endocrine disruption chemicals are highly biologically active compounds, especially in the aquatic environment. They are derived from drugs and other chemicals and are mostly associated with release into the aquatic environment via sewage treatment. Specific organic pollutants with known endocrine disruptive effects include PFOS, perfluorooctanoic acid (PFOA) and perfluorononanoic acid (PFNA). Moreover, possible microbial breakdown products from biodegradable waste can also form EDCs.

A2.3.2 *Monitoring organic pollutants*

There is a very large number of POPs and monitoring via chemical analysis is costly and very specific for individual or related chemical groups. This means that, in general, monitoring has not been widely applied in the organic waste, composting and AD industry. However, this is beginning to change and the consideration of specific organic pollutant monitoring is becoming more common. For example, the proposed end of waste criteria for biodegradable waste. Biodegradable waste include monitoring for PAHs (see Section A2.4.1) and some national compost and digestate specifications include some specific chemical analysis for organic pollutants (see Section A2.4.5).

As an alternative to chemical analysis, reliance for a proxy organic pollutant monitoring is often placed on plant growth tests (bioassays), on the assumption that poor growth would indicate that the product may contains inhibitory materials. However, such tests only detect acute plant inhibition, and do not indicate what the pollutant might be, as they cannot differentiate inhibition from other causes such as high conductivity and extremes of pH. Furthermore, pollutants at low concentrations may show no acute effects and be undetected, but if persistent, may accumulate in the environment. Plant growth tests are also relatively costly, comprising for example about 50% of the cost for the obligatory tests for the PAS100 (BSI 2011) compost specification.

Plant species have different sensitivities to different herbicides. The presence of specific persistent herbicides of concern in composts and digestates might be detected using plant growth tests that use plant species particularly sensitive to the specific herbicide. This would, however, mean multiple test species and tests to cover all possible herbicides. On the other hand, using a single plant growth test might not provide sufficient coverage of all possible herbicides. Therefore, a compromise is required in test selection to apply tests that gives the widest possible (but probably incomplete) coverage.

A2.4 Organic pollutant limits in existing and proposed legislation

A2.4.1 *End of Waste Criteria for Biodegradable waste*

The European Commission has committed to establish End of Waste (EoW) Criteria for biodegradable waste as required by the Revised Waste Framework Directive 2008/98/EC (rWFD). As part of this work, the Draft Final Report on End of Waste Criteria for Biodegradable Waste Subjected to Biological Treatment (IPTS

2013) included a proposal to monitor and limit organic pollutants in compost and digestate. Previous proposals regarding the monitoring of several groups of organic pollutants have been the subject of debate amongst stakeholders. As a result, the Draft Final Report included a proposal for monitoring of only PAH_{16} in compost and digestate. This is the sum of 16 PAHs, namely naphthalene, acenaphtylene, acenaphtene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene and benzo[ghi]perylene. The previous draft (3rd Working Document) contained proposals for monitoring PCBs, PCDD/Fs and PFC as well as PAHs. The substances in the PAH group have a higher occurrence in compost and digestate, their source can be linked to undesired input materials and the measurement cost is relatively low, compared to PCB, PCDD/F and PFC.

The limit introduced was 6 mg/kg dry matter for the sum of PAH_{16}.

These substances are also monitored in many national specifications for biodegradable waste and similar materials (see Section A2.4.5). Existing legislation in Member States has also been used as the basis when determining appropriate limit values for this compound group.

The working group stated that this limit has been set at a level that would ensure environmental and human health protection but would also allow sufficient materials to enter the market. Requirements on sampling frequency are also included and these are discussed in Section A2.8.1.

A2.4.2 *Fertilisers Regulation*

The Fertilisers Regulation (*Regulation (EC) No 2003/2003 of the European Parliament and of the Council of 13 October 2003 Relating to Fertilisers*) was introduced to harmonise existing provisions and ensure that mineral fertilisers that meet certain legislative requirements can be freely circulated within the internal EU market. A comprehensive review is currently being undertaken by the European Commission with a view to fully harmonising the internal market for fertilisers and extending the scope of the Regulation to include organic materials that may be considered as fertilisers, such as SIs and GM. The proposed revised version includes limits for a number of potentially toxic elements (PTEs) and organic pollutants. The proposed limits for organic pollutants in organic fertilisers are the same as the ones proposed for EoW Criteria in the 3rd Working Document (IPTS 2012).

It was proposed that the same limits should apply to SI, but no proposals have yet been put forward for GM. As the list of authorised ingredients will be limited to source separated materials (e.g. biodegradable and green waste) for the manufacture of compost and digestate, the Technical working group on contaminants set up by the Commission in 2012 agreed that PCBs should be determined as an indicator of contamination. When results are positive, manufacturers would be required to analyse their products to measure the potential presence of the other contaminants. Specific monitoring frequencies have not yet been proposed but it was stated that frequency could be reduced if producers can demonstrate that a significant number of representative samples are not exceeding the limit values proposed above over an initial period of time.

A2.4.3 *EU Water Framework Directive*

Annex X of the Water Framework Directive (Directive 2000/60/EC as amended by Directive 2008/105/EC) provides a list of priority substances that can present significant risks to the aquatic environment. Discharge or emission of those substances to the aquatic environment is being phased out across the EU and, since the application of materials to soil can be a route for contamination of surface and ground waters, any

pollutant limits set under the EU Ecolabel should take those substances into account. A number of pesticides and POPs, such as PCBs and PAHs, as well as certain PTEs are included in the list of priority substances. Maximum limits are provided for the concentration of each substance in surface waters and these are presented in Section A2.10. As the limits are applicable to surface waters rather than the soil that receives the SI, it is not possible to translate them into specific limits for SI and GM, as this needs to understand fully the complex (and site specific) pathways from the GM/SI to the surface water. However, the compounds presented in Section A2.10 are treated as compounds of interest during the EU Ecolabel review.

A2.4.4 *Persistent Organic Pollutants Regulation*

Council Regulation (EC) No 1195/2006 of 18 July 2006 amending Annex IV to Regulation (EC) No 850/2004 (POPs Regulation) prescribes general maximum concentration limit values in waste for PCBs (50 mg/kg) and PCDD/F (15µg/kg). If these limits are exceeded, the waste must be treated in such a way as to ensure that the POP content is destroyed or irreversibly transformed.

This indicates that PCBs and PCDD/Fs in waste are a factor in how waste is managed. It seems reasonable that this should be taken into account in waste derived products.

A2.4.5 *National legislation*

An overview of legally binding limits and guide values for organic pollutants in compost/digestate in different European countries is presented in Table 0-10.

This table only lists limits from specific organic pollutant legislation for compost and/or digestate or comparable materials intended for use on (agricultural) land. Some Member States have specific legislation for compost/digestate, which may exclude specific organic pollutants, in the case that the compost or digestate fulfils certain conditions. More specifically, Austria and Germany have no organic pollutant limits for compost and digestate from source separated materials listed on a positive list. In the Netherlands, certain exemption rules from measurement of organic pollutants apply to composts and digestates from source separated materials listed on a positive list.

In several Member States, other legislation, such as sewage sludge legislation, may affect the maximum limits for organic pollutants in compost/digestate. For example, the German Sewage Sludge Regulation prescribes the following limits for sewage sludge products, including sewage sludge based composts: 0.2 mg/kg dry matter (d.m.) for each of the PCB_6 congeners and 100 ng I-TEQ/kg d.m. for the 17 PCDD/Fs. However, sewage sludge is not permitted in existing EU Ecolabel Criteria for SI and GM, as per Criterion 1.2 (DG Env 2006a and 200b), nor is there a proposal to include it in this revision.

Finally, according to the Draft Final Report on EoW for Biodegradable waste, several Member States are in the process of setting compost/digestate organic pollutant limit values or revising them.

Table 0-10: Overview of organic pollutant limit values for compost/digestate and similar materials in EU, EoW Criteria for Biodegradable Waste Draft Final Report (IPTS, 2013)

	AT (a)	BE (Fl) (b)	BE (Wal; digestate) (c)	DE (d)	DK (e)	FR (compost) (f)	LU (g)	SI (h)	CH (i)
PAH (mg/kg dm)	**6** (sum for 6 congeners**)	Individual limits for 10 congeners	**5** (PAH_{16})		**3** (sum for 11 congeners***)	Individual limits for 3 congeners	**10*** (PAH_{16})	**3**	**4*** (PAH_{16})
PCB (mg/kg dm)	**0.2** (PCB_6)	**0.8** (PCB_7)	**0.15** (PCB_7)		**0.08*** (PCB_7)	**0.8** (PCB_7; only for sewage sludge compost)	**0.1*** (PCB_6)	**0.4** (1st class) **1** (2nd class) (PCB_6)	
PCDD/F (ng I-TEQ /kg dm)	**20**		**100**				**20***		**20***
PFC (mg/kg dm)	**0.1**			**0.1**					
AOX (mg/kg dm)	**500**		**250**						
LAS (mg/kg dm)			**1500***		**1300**				
NPE (mg/kg dm)			**25***		**10**				
DEHP (mg/kg dm)			**50***		**50**				

a) Düngemittelverordnung; b) VLAREA Regulation c) AGW du 14/06/2001 favorisant la valorisation de certains déchets d) Düngemittelverordnung e) Slambekendtgørelsen f) NFU 44-051 and NFU 44-095 g) Guidance value h) Official Gazette of the Republic of Slovenia, no. 62/08 i) Guidance value

*= guide value; **=sum of benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, fluoranthene and indeno[1,2,3-cd]pyrene; ***=sum of acenaphthene, phenanthrene, fluorene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, benzo[ghi]perylene and indeno[1,2,3-cd]pyrene; PAH_{16}= sum of US EPA 16 priority listed polycyclic aromatic hydrocarbons; PCB_6= sum of PCBs 28, 52, 101, 138, 153 and 180; PCB_7= sum of PCBs 28, 52, 101, 118, 138, 153 and 180; PCDD/F= sum of 17 polychlorinated dibenzo-p-dioxins/furans expressed in International Toxicity Equivalents; PFC= perfluorinated compounds (sum of PFOS and PFOA); AOX= adsorbable organic halogens; LAS linear alkylbenzene sulphonates, NPE= nonylphenol and –ethoxylates; DEHP= di(2-ethylhexyl)phtalates

A2.5 Organic pollutant content of GM and SI constituents

Several studies have been carried out to investigate the organic pollutant content of GM, and SI constituents.

A2.5.1 *End of Waste Criteria for Biodegradable waste*

As part of the work taking place on setting EoW criteria for biodegradable waste, a sampling and analysis study was carried out across the EU. The JRC sampling and analysis campaign (JSAC) looked at concentrations of organic pollutants and other chemicals in compost and digestate samples from different Member States (IPTS 2013). The methods used for the analysis of each substance are presented in Table 0-11.

Table 0-11: Targeted parameters for measurement on compost and digestate samples (IPTS, 2013)

Compounds class	*Method principle*
Perflurorinated surfactants (including PFOS, PFOA)	LC MS
Heavy metals (including Ag, Al, As, Ba, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Ti, Tl, V, Zn)	ICP-OES
Mercury	CV AAS
PCBs	GC-MS
PCDD/Fs	GC-MS
PAHs	GC-MS
Siloxanes	LC-MS
Polycyclic Musks	LC-MS
Nonylphenol and -ethoxylates	LC-MS
PBDE	LC-MS
Veterinary drugs, pharmaceuticals	Various
Estrogene activitiy (bio-asssay)	CALUX

The samples analysed included green compost, sewage sludge compost, compost derived from Mechanical Biological Treatment of Municipal Solid Waste, digestates from manure, source separated biodegradable wastes and energy crops, digestate from Mechanical Biological Treatment of Municipal Solid Waste and other minor categories (including bark compost). As no proposals had been made for limit concentrations for organic pollutants in the initial stages of this study, a clear reference point was lacking for discussion of the analytical results.

The analytical results, presented in detail in Section A2.11, lead to the following conclusions:

- All types of composts and digestates contain PAH compounds, generally between trace amount levels and a few mg/kg d.m. Exceedings of existing national PAH limit or guidance values for similar materials appear to occur and generally represent a few percent to more than a quarter of the sample population, depending on the reference limit value and the type of material.
- The PCB analysis results indicate that none of the compost or digestate samples exceed any of the existing national limit or guide values.
- All types of composts and digestates contain PCB and PCDD/F compounds, at least at trace level. In general, concentration ranges appear well below existing national limit or guidance values for similar materials.
- All types of composts and digestates contain PFC compounds. The scarcely available data show that most composts and digestates only contain trace levels well below any existing national limit or guidance value. However, the JSAC measurements suggest that sewage sludge compost materials may have generally higher overall PFC concentrations, which may exceed the currently existing national limit or guidance values for similar materials.
- No single technology provides an absolute barrier against the presence of inorganic or organic pollutants, making regular testing of certain pollutants recommended for all types of materials.
- The use of source separated bio-waste and green waste materials tends to lead to better results for heavy metal concentrations than when mixed municipal waste or sewage sludge is used as input material.

- MBT composts tend to have very high physical impurities levels at present and the existing data show that a large majority of the MBT composts would fail the currently proposed end-of-waste physical impurities criteria.
- On average, all materials (except the category "Other") have comparable organic pollutant concentrations, with the exception of sewage sludge compost, which tends to have higher PFC levels.

It was thus recommended that end-of-waste criteria should include limit values and testing requirements for certain organic pollutants, especially for PAH (for all possible compost/digestate materials) and PFC (only if sewage sludge derived materials were to be allowed), as no technology or input material type provides a full safeguard against the presence of organic pollutants.

A2.5.2 *DG ENV study (2004)*

A study published by DG ENV in 2004 looked at the presence of heavy metals and organic pollutants in wastes used as organic fertilisers (DG ENV 2004). The study considered several organic pollutants such as PCB, PAH, PCDD/F, chlorinated pesticides, Adsorbable Organic Halogen (AOX) and others. The materials analysed included green waste and biodegradable waste compost and bark. Results regarding the concentration of organic pollutants found in these materials are presented in Section A2.12. These also indicate that such pollutants can be detected in variable amounts in all materials tested.

A2.5.3 *WRAP (2006)*

A report by WRAP titled 'Identification and assessment of types and levels of chemical contamination in wood waste' looked at the PCB content of wood waste used in mulches and compost. The mulches studied mainly consisted of packaging waste and coarse waste wood and their average PCB concentration was 3.8 mg/kg, while the composts studied were mainly derived from low grade waste wood and their average PCB concentration was 4.36 mg/kg.

A2.5.4 *Conclusions to organic pollutant contamination in SI and GM constituents*

In our view, it not possible through selection of ingredients to eliminate the possibility of organic pollutants being present in the products. Therefore a precautionary approach is taken.

A2.6 Consultation feedback

When asked about the possibility of setting a limit for organic pollutants in the EU Ecolabel, the majority of stakeholders (85%) responded that such limits are not necessary, as there are no significant levels of POPs in peat, bark, wood fibre or mineral wool, while, for biodegradable waste constituents, these substances should be monitored in input materials. The evidence from analysis of organic materials and composts suggests that levels of contamination may vary, hence it may not be appropriate to generalise.

It was also suggested that, for biodegradable waste constituents, limits should be the same as those defined in the End of Waste criteria, while it is more important to make products for SI, GM and mulch from source segregated input materials.

The remaining 15% or respondents agreed that setting such limits would be acceptable and the substances for which testing was suggested were PAHs, PCBs, PCDD/F and PFOA/PFOS.

Moreover, 21% of respondents highlighted that the introduction of such limits would increase the costs associated with the EU Ecolabel, as testing for organic pollutants incurs a significant cost.

A2.6.1 *Selected responses*

The following responses illustrate the above summary of the consultation.

"The need to test for / limit inclusion of POPs should be driven by the materials from which GM and SI are derived. We would argue that, for source-segregated biodegradable waste inputs, there should be no need to test for POPs. This may differ [if] mixed biodegradable waste inputs or non-biodegradable waste inputs are allowed. One exception could be herbicide residues (particularly those known to be relatively persistent, such as some synthetic auxin herbicides). Since the presence of these is likely to be limited to certain biodegradable waste inputs, and occur sporadically, a limit on specific compounds might not be so appropriate as a general bioassay to demonstrate that the GM / SI is fit for purpose".

"In the first place, it is more important to make products for SI or GM from clean input materials (e.g. greenwaste, vfg-waste, separately collected organic waste). In this case, analysis of organic pollutants are not necessary. If limits for organic pollutants are set, they must be the same as those defined in the end of waste criteria."

"For some sources, it doesn't make sense to control organic pollutants. For others, such as compost, manure or sludges, the acceptance of only End-of-waste materials would make unnecessary to measure organic pollutants as these are controlled under the End-of-waste criteria. Besides, the measurement of organic materials would remarkably increase the cost of acquiring the EU Ecolabel."

"There is no evidence that organic pollutants occur in relevant amounts in compost based on source separated input materials. The analytical and sampling costs of organic pollutants (PAH, PCB, PCDD/F and PFC) in compost for mandatory measurement are not justifiable in relation to the environmental risk. They would be prohibitively expensive and would adversely affect the competitiveness of Europe's compost market."

A2.6.2 *Summary of stakeholder consultation*

In our view, the stakeholder consultation reflects the high cost of organic pollutant monitoring, as most of the responses would like to have no or limited monitoring. There is little quantitative data to back this up, as most studies indicate that pollutants can be detected in all materials likely to be used in compost and AD feedstocks. There have also been occurrences of poor quality products contaminated with organic pollutants. Stakeholders would accept limits in line with any End of Waste criteria for biodegradable waste. In our view a precautionary approach should be taken.

A2.7 Proposals for EU Ecolabel Organic Pollutant Criteria

Annex I of the Ecolabel Regulation (Regulation (EC) No 66/2010) requires that a technical report should accompany each revision of the criteria. As regards to testing, it is stated that the technical report should include the relevant test methods for assessment of each criterion and an estimation of testing costs.

A2.7.1 *What are the organic pollutants that should be limited*

The current EU Ecolabel criteria for GM and SI do not include any limits for organic pollutants, although they do require a plant growth bioassay, which might show problems with organic pollutants such as herbicides.

In our opinion, retaining an appropriate bioassay test would be an acceptable and suitable approach.

In addition and to be in line with other initiatives we would propose that some specific POPs limits should be introduced for PAHs, PCBs, PFC and PCDD/F.

Conclusions to selection of specific organic pollutants

The specific organic pollutants selected to be monitored in SI, GM and Mulches as part of the EU Ecolabel are the following:

- PAH_{16} (sum of naphthalene, acenaphtylene, acenaphtene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene and benzo[ghi]perylene)
- PCB_7 (sum of PCBs 28, 52, 101, 118, 138, 153 and 180)
- PCDD/F
- PFC (sum of PFOA and PFOS)

These are in addition to a plant growth bioassay test.

A2.7.2 *Costs associated with the selected organic pollutants*

According to the Draft Final Report on EoW Criteria for Biodegradable Waste (IPTS, 2013), average measurement costs for organic pollutants are:

- 149 Euro for PAH16
- 201 Euro for PCB
- 481 Euro for PCDD/F
- 150 Euro for PFC.

Moreover, for testing the final product, the following costs have been estimated as part of the Fertiliser regulation revision (Table 0-12).

Table 0-12: Average costs of analysis of organic pollutants in fertilising products (VAT not included)

	PAHs (16 congeners)	PCBs (7 congeners)	PCDD/Fs (7 PCDDs and 10 PCDFs)	PFC
Fertiliser Regulation	EUR 150	EUR 210	EUR 440	-
EoW Criteria	EUR 149	EUR 201	EUR 481	EUR 150

The cost of plant growth bioassay tests vary depending on the test method but are thought to be in the same range as for the specific organic pollutants test methods above.

A2.7.3 *Limits applied to constituents and/or final product*

In the current EU Ecolabel criteria for GM and SI there is no specific monitoring of organic pollutants. The plant growth bioassay is currently applied to the product for EU Ecolabel certification.

"Analytical tests shall be made on a representative sample from a product batch and at least one further representative sample from a different product batch, each of which was produced in the three months before the application date".

In our view, testing should be carried out on the product. Where the product is a direct composting and AD product that has undergone the same testing and to the same frequency as proposed here in order to achieve end of waste status, further testing may not be required, as there is unlikely to be any change nor, in particular, any increase in levels of organic pollutants during product storage.

A2.8 Test methods and limits proposed

Project HORIZONTAL started in 2002 with a view to develop horizontal and harmonised European standards for sampling and testing organic materials, such as sludge, soil, and treated biodegradable waste. The standards cover hygienic and biological parameters as well as organic and inorganic parameters. This work is currently being finalised by a Project Committee (CEN TC 400) and, when these standards are formally adopted, they will aim to be applied to any related certification schemes, including EoW. The EU Ecolabel criteria for SI, GM and mulches should then apply the same horizontal programme derived standards, where available, in preference to other methods. Standard methods for GM and SI set by CEN TC 223 should be used where Horizontal methods are not yet available.

CEN TC 400 organic pollutant methods

The method (Table 0-13) developed or under development by CEN TC400 covers many but not all of the parameters that would be required for the proposed monitoring for the EU Ecolabel for SI, GM and mulches. Therefore, additional non CEN TC400 developed methods would be required; in particular, a method for PFC.

Table 0-13: Published and currently developed Horizontal standards for organic pollutants in the fields of sludge, biodegradable waste and soil

Project Ref.	Title	Current Status
FprCEN/TS 16181	Determination of polycyclic aromatic hydrocarbons (PAH) by gas chromatography and high performance liquid chromatography	Under Approval
CEN/TS 16182:2012	Determination of nonylphenols and nonylphenol-mono- and diethoxylates using gas chromatography with mass selective detection	Published

Project Ref.	Title	Current Status
CEN/TS 16183:2012	Determination of selected phthalates using capillary gas chromatography with mass spectrometric detection	Published
CEN/TS 16189:2012	Determination of linear alkylbenzene sulfonates by high-performance liquid chromatography with fluorescence detection or mass selective detection	Published
CEN/TS 16190:2012	Determination of dioxins and furans and dioxin-like polychlorinated biphenyls by gas chromatography with high resolution mass selective detection	Published
EN 16166:2012	Determination of adsorbable organically bound halogens	Published
EN 16167:2012	Determination of polychlorinated biphenyls (PCB) by gas chromatography with mass selective detection and gas chromatography with electron-capture detection	Published

Proposed limits for organic pollutants

The proposed test methods and limits for organic pollutants in SI, GM and Mulch for the purposes of EU Ecolabel are presented in Table 0-14.

Table 0-14: Test methods and limits proposed for EU Ecolabel

Pollutant	Test method	Limit
PAH_{16} (sum of naphthalene, acenaphtylene, acenaphtene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene and benzo[ghi]perylene)	prCEN/TS 16181 when available	(sum of 16 PAHs) 6 mg/kg dry matter
PCB_7 (sum of PCBs 28, 52, 101, 118, 138, 153 and 180)	EN 16167:2012	(sum of 7 PCBs) 0.2 mg/kg dry matter

Pollutant	Test method	Limit
PCDD/F	CEN/TS 16190:2012	30 ng I-TEQ/kg

It is also suggested that testing has to be carried out by laboratories accredited for that purpose, through an accreditation standard and accreditation organisation accepted at EU level or by the Member State competent authority.

Plant bioassay method

A plant growth bioassay test should also be carried out in the final product to detect levels of pesticides. Test limits would be as indicated by the test method.

The CEN TC/400 test CEN/TS 160201 – (Sludge Treated Biodegradable waste and Soil – Determination of viable plant seeds and propagules) determines the number of plants that grow when the SI or GM is incubated. It therefore measures the number of seeds/plant propagules that are present in the product. It is not appropriate as a bioassay for toxicity as a negative response (i.e. no propagules present) could mean either that the product is highly toxic to plants or that the product is completely free of weed seeds and propagules.

We would therefore recommend that a plant growth assay that has been developed by the CEN TC/223 committee is applied, i.e. a test that includes the addition of plant seeds and for which the germination frequency and growth of the seedlings is monitored. The recommended test is EN 16086-1:2011.Soil improvers and growing media – determination of plant response – Part 1: Pot growth test with Chinese cabbage.

A2.8.1 *Frequency of testing*

The frequency of testing is a key parameter, as testing is a cost but greater assurance on product quality is provided by more frequent monitoring. The stakeholder responses are clearly (if understandably) influenced by the financial cost of monitoring for organic pollutants.

Proposed Biodegradable waste End of Waste sampling frequency

The sampling frequency proposed for composting and AD plants for each of the four organic pollutant groups was as follows:

- The default sampling and analysis frequency is given by the formula: number of analyses per year = amount of annual input material (in tonnes)/10000 tonne + 1;
- A minimum measurement frequency is proposed for the recognition year: 4 samples or more (except for the smallest plants), as well as for the following years: 2 samples or more (except for the smallest plants);
- The smallest plants should be able to benefit from reduced sampling requirements: one sample for every 1000 tonnes input material, rounded to the next integer, is required in the recognition year for plants up to 3000 tonne annual input and only one yearly measurement is required for plants with an annual input up to 1000 tonne in subsequent years;

- All mandatory measurement frequencies are capped at 12 measurements per year.

National standards

Details of frequency of testing in some national standards are presented in Table 0-15.

Table 0-15: Frequency of testing for organic pollutants in some national standards.

Austria (Austrian Compost Ordinance BGBI II 292)	**France** (Norme NFU 44051)		**Germany** (Quality and Test Regulations for secondary raw material fertilisers and soil improvers RAL-GZ 256)		**UK** (PAS 100 and PAS110)
Frequency depends on compost tonnage and with some required to be analysed by external laboratories: e.g. plant >4000 m3: 1 sample every 4,000 m3 but with a minimum of 3 and maximum of 12 per year of which 2 should be externally analysed	**Plant output (tonnes per annum)**	**Monitoring frequency**	**Approval procedure**	**Monitoring procedure**	No limits for organic pollutants
	0 – 350	1 per annum	one analysis for every full or partial batch of 1500 tons plant input, at least 4 tests max. 12 analyses per year	one analysis for every full or partial batch of 2000 tons plant input, at least 4 tests max. 12 analyses per year	
	350 – 3,500	1 per annum			
	3,500 – 7,000	1 per annum			
	> 7,000	2 per annum			

A2.8.2 *Control of organic pollutants in growing media, soil improvers and mulches*

The control of organic pollutants, particularly POPs that do not degrade during composting and AD, is largely by elimination of input materials containing such pollutants. The FATE study by IPTS published in the 3rd Working document for EoW criteria for biodegradable waste (IPTS, 2012) indicated, however, that there is likely to be some measurable and variable level of POPs in all potential waste streams. Elimination of known materials as constituents with a high risk of high concentrations is feasible but would not eliminate the risk of contamination. These constituent limitations would also need to apply to the feedstocks to composting and AD plants producing composts and digestates as constituents of GM and SI. WRAP (2010) for example, suggest that composters might address the risk of herbicide contamination by not accepting grass clippings as feedstocks. This would need some education of the waste producers.

In our view, such measures are unlikely to be fully effective and eliminate the risk of the composts and digestates being contaminated. Assurance of quality through appropriate product testing is therefore recommended.

Proposed EU Ecolabel monitoring requirements

Testing, in our view, should also be applied prior to and post certification, especially as events of peak contamination may occur randomly. Increasing the frequency of testing would enhance the chance of detecting a high failing product but at a financial cost in terms of testing costs. Monitoring by the plant bioassay was advised potentially at a higher frequency than the minimum required to achieve PAS 100 compliance (WRAP 2010). As the input of herbicides in compost feedstocks is likely to vary, it is still likely that contaminated product might not be detected unless every batch is tested.

Our proposal would be for a minimum of four samples in three months prior to certification. Post certification, we recommend one sample every 2,000 tonnes on a dry matter basis of product, up to maximum of 16 samples per year (four samples per quarter) for the first year post certification. For subsequent years, we propose that the sampling frequency can be reduced, dependent on the historical results and no change in constituents used in the GM, SI or mulches. We would propose that monitoring after the first year is reduced to twice per year if the first year results are satisfactory. "Satisfactory" in this case is proposed as the average level being half the limit and no sample having exceeded the limit.

This monitoring frequency should be the same frequency for SI, GM and mulches.

In our view, the proposed monitoring frequencies are in line with the most frequent monitoring requirements currently applied in some of the EU national standards.

A2.8.3 *Reporting/declarations required*

Our recommendation is that producers should declare sampling frequency, method followed and levels of $PAH_{16,}$ PCB_7 and PFC in mg/kg on a dry matter basis and PCDD/F in ng I-TEQ/kg, as well as plant growth bioassay method used and respective results in the final product.

A2.8.4 *Summary Proposed Criteria*

Our recommendation is to introduce a requirement for testing for the substances presented in Table 0-16 and would be applied to SI, GM and mulches.

Table 0-16: Proposed Criteria

Pollutant	Test method	Limit	Frequency (all tests)
PAH_{16} (sum of naphthalene, acenaphtylene, acenaphtene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene and benzo[ghi]perylene)	prCEN/TS 16181 when available	6 mg/kg dry matter	Certification: 4 samples in 3 months prior to certification Post certification: First year - 1 sample every 2,000 tonnes of product up to a maximum of 16 samples per year. Subsequent years: 2 samples per year if average of first year is less than half the limit and no limit exceeded by a single sample.
PCB_7 (sum of PCBs 28, 52, 101, 118, 138, 153 and 180)	EN 16167:2012	0.2 mg/kg dry matter	
PCDD/F	CEN/TS 16190:2012	30 ng I-TEQ/kg	
Pesticides	Plant growth bioassay EN 16086-1:2011	Limits as indicated by test method	

A2.9 References

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A2.10 Further Information: Priority Substances in Water Framework Directive

Annex X of the Water Framework Directive (Directive 2000/60/EC as amended by Directive 2008/105/EC) provides a list of priority substances that can present significant risks to the aquatic environment. The list of substances, along with the respective limits, is presented below.

Table 0-17: Environmental quality standards for priority quality standards for priority substances and certain other pollutants

ENVIRONMENTAL QUALITY STANDARDS FOR PRIORITY SUBSTANCES AND CERTAIN OTHER POLLUTANTS

PART A: ENVIRONMENTAL QUALITY STANDARDS (EQS)

AA: annual average;

MAC: maximum allowable concentration.

Unit: [μg/l]

(1)	(2)	(3)	(4)	(5)	(6)	(7)
No	Name of substance	CAS number [1]	AA-EQS [2] Inland surface waters [3]	AA-EQS [2] Other surface waters	MAC-EQS [4] Inland surface waters [3]	MAC-EQS [4] Other surface waters
(1)	Alachlor	15972-60-8	0,3	0,3	0,7	0,7
(2)	Anthracene	120-12-7	0,1	0,1	0,4	0,4
(3)	Atrazine	1912-24-9	0,6	0,6	2,0	2,0
(4)	Benzene	71-43-2	10	8	50	50
(5)	Brominated diphenylether [5]	32534-81-9	0,0005	0,0002	not applicable	not applicable
(6)	Cadmium and its compounds (depending on water hardness classes) [6]	7440-43-9	≤ 0,08 (Class 1) 0,08 (Class 2) 0,09 (Class 3) 0,15 (Class 4) 0,25 (Class 5)	0,2	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)
(6a)	Carbon-tetrachloride [7]	56-23-5	12	12	not applicable	not applicable
(7)	C10-13 Chloroalkanes	85535-84-8	0,4	0,4	1,4	1,4
(8)	Chlorfenvinphos	470-90-6	0,1	0,1	0,3	0,3
(9)	Chlorpyrifos (Chlorpyrifos-ethyl)	2921-88-2	0,03	0,03	0,1	0,1

(9a)	Cyclodiene pesticides: Aldrin (7) Dieldrin (7) Endrin (7) Isodrin (7)	 309-00-2 60-57-1 72-20-8 465-73-6	Σ = 0,01	Σ = 0,005	not applicable	not applicable
(9b)	DDT total (7) (8)	not applicable	0,025	0,025	not applicable	not applicable
	para-para-DDT (7)	50-29-3	0,01	0,01	not applicable	not applicable
(10)	1,2-Dichloroethane	107-06-2	10	10	not applicable	not applicable
(11)	Dichloromethane	75-09-2	20	20	not applicable	not applicable
(12)	Di(2-ethylhexyl)-phthalate (DEHP)	117-81-7	1,3	1,3	not applicable	not applicable
(13)	Diuron	330-54-1	0,2	0,2	1,8	1,8
(14)	Endosulfan	115-29-7	0,005	0,0005	0,01	0,004
(15)	Fluoranthene	206-44-0	0,1	0,1	1	1
(16)	Hexachloro-benzene	118-74-1	0,01 (9)	0,01 (9)	0,05	0,05
(17)	Hexachloro-butadiene	87-68-3	0,1 (9)	0,1 (9)	0,6	0,6
(18)	Hexachloro-cyclohexane	608-73-1	0,02	0,002	0,04	0,02

No	Name of substance	CAS number (1)	AA-EQS (2) Inland surface waters (3)	AA-EQS (2) Other surface waters	MAC-EQS (4) Inland surface waters (3)	MAC-EQS (4) Other surface waters
(19)	Isoproturon	34123-59-6	0,3	0,3	1,0	1,0
(20)	Lead and its compounds	7439-92-1	7,2	7,2	not applicable	not applicable
(21)	Mercury and its compounds	7439-97-6	0,05 (9)	0,05 (9)	0,07	0,07
(22)	Naphthalene	91-20-3	2,4	1,2	not applicable	not applicable
(23)	Nickel and its compounds	7440-02-0	20	20	not applicable	not applicable
(24)	Nonylphenol (4-Nonylphenol)	104-40-5	0,3	0,3	2,0	2,0
(25)	Octylphenol ((4-(1,1′,3,3′-tetramethylbutyl)-phenol))	140-66-9	0,1	0,01	not applicable	not applicable
(26)	Pentachloro-benzene	608-93-5	0,007	0,0007	not applicable	not applicable
(27)	Pentachloro-phenol	87-86-5	0,4	0,4	1	1
(28)	Polyaromatic hydrocarbons (PAH) (10)	not applicable	not applicable	not applicable	not applicable	not applicable
	Benzo(a)pyrene	50-32-8	0,05	0,05	0,1	0,1
	Benzo(b)fluor-anthene	205-99-2	Σ = 0,03	Σ = 0,03	not applicable	not applicable
	Benzo(k)fluor-anthene	207-08-9				
	Benzo(g,h,i)-perylene	191-24-2	Σ = 0,002	Σ = 0,002	not applicable	not applicable
	Indeno(1,2,3-cd)-pyrene	193-39-5				

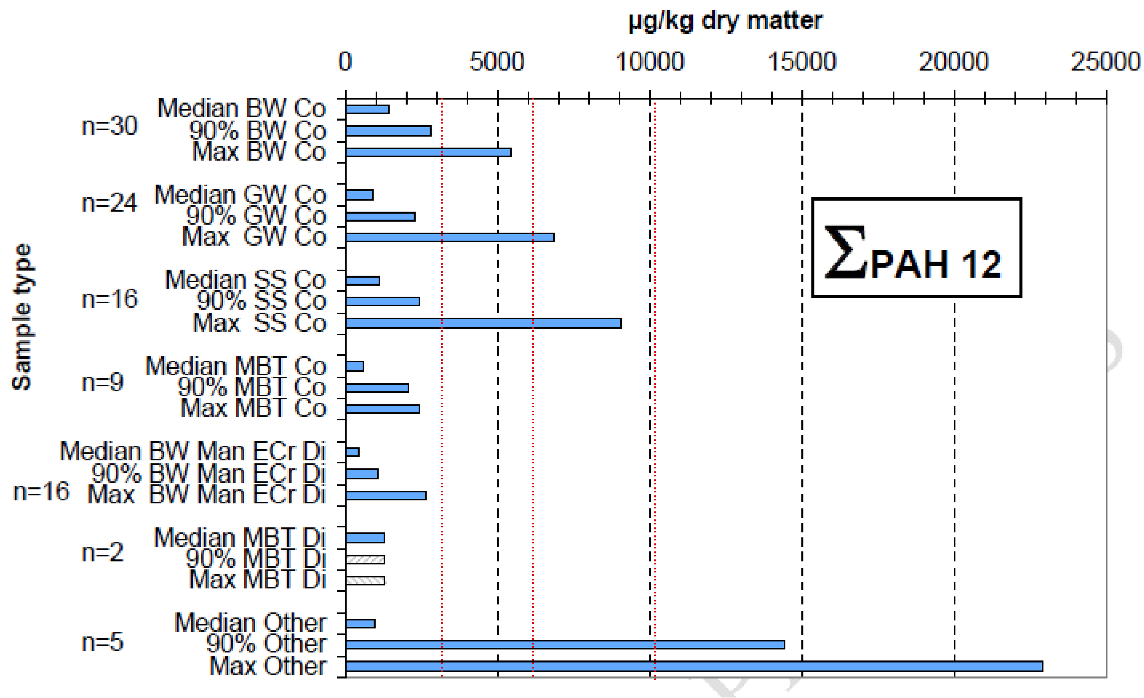
(29)	Simazine	122-34-9	1	1	4	4
(29a)	Tetrachloro-ethylene (7)	127-18-4	10	10	not applicable	not applicable
(29b)	Trichloro-ethylene (7)	79-01-6	10	10	not applicable	not applicable
(30)	Tributyltin compounds (Tributhyltin-cation)	36643-28-4	0,0002	0,0002	0,0015	0,0015
(31)	Trichloro-benzenes	12002-48-1	0,4	0,4	not applicable	not applicable
(32)	Trichloro-methane	67-66-3	2,5	2,5	not applicable	not applicable
(33)	Trifluralin	1582-09-8	0,03	0,03	not applicable	not applicable

(1) CAS: Chemical Abstracts Service.
(2) This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified, it applies to the total concentration of all isomers.
(3) Inland surface waters encompass rivers and lakes and related artificial or heavily modified water bodies.
(4) This parameter is the EQS expressed as a maximum allowable concentration (MAC-EQS). Where the MAC-EQS are marked as 'not applicable', the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges since they are significantly lower than the values derived on the basis of acute toxicity.
(5) For the group of priority substances covered by brominated diphenylethers (No 5) listed in Decision No 2455/2001/EC, an EQS is established only for congener numbers 28, 47, 99, 100, 153 and 154.
(6) For cadmium and its compounds (No 6) the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg $CaCO_3$/l, Class 2: 40 to < 50 mg $CaCO_3$/l, Class 3: 50 to < 100 mg $CaCO_3$/l, Class 4: 100 to < 200 mg $CaCO_3$/l and Class 5: ≥ 200 mg $CaCO_3$/l).
(7) This substance is not a priority substance but one of the other pollutants for which the EQS are identical to those laid down in the legislation that applied prior to 13 January 2009.
(8) DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU number 212-332-5); 1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU number 200-783-0).
(9) If Member States do not apply EQS for biota they shall introduce stricter EQS for water in order to achieve the same level of protection as the EQS for biota set out in Article 3(2) of this Directive. They shall notify the Commission and other Member States, through the Committee referred to in Article 21 of Directive 2000/60/EC, of the reasons and basis for using this approach, the alternative EQS for water established, including the data and the methodology by which the alternative EQS were derived, and the categories of surface water to which they would apply.
(10) For the group of priority substances of polyaromatic hydrocarbons (PAH) (No 28), each individual EQS is applicable, i.e. the EQS for Benzo(a)pyrene, the EQS for the sum of Benzo(b)fluoranthene and Benzo(k)fluoranthene and the EQS for the sum of Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene must be met.

A2.11 Further Information: Results of JRC Sampling and Analysis Campaign

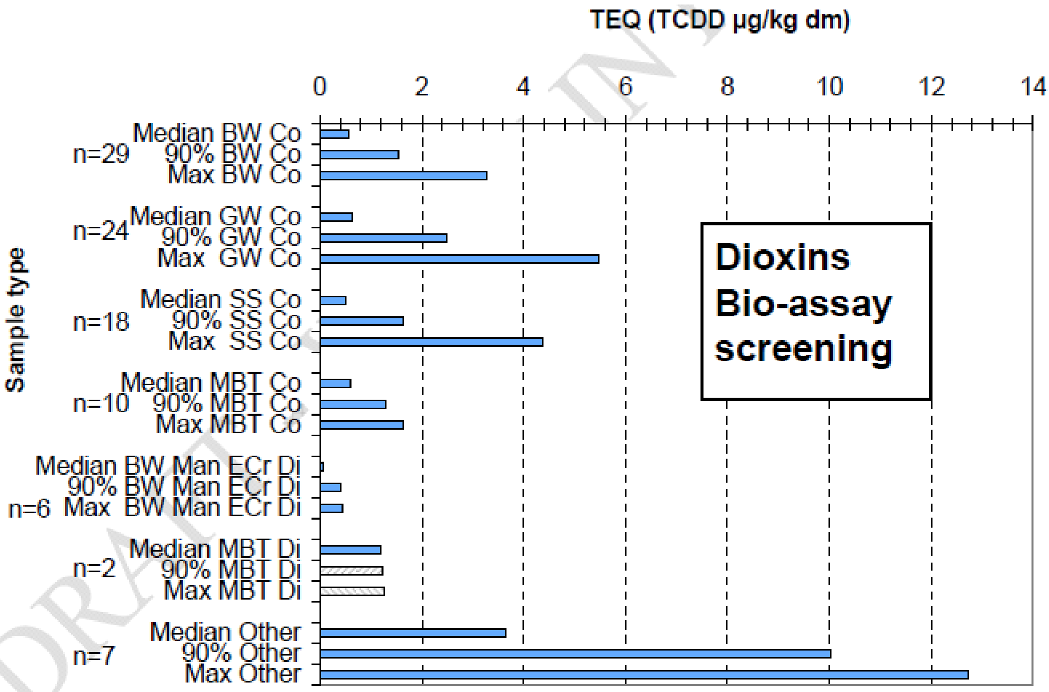
The JSAC study (IPTS 2013) carried out as part of establishing End of Waste Criteria for Biodegradable Waste showed the following organic pollutants concentrations in tested compost and digestate samples.

Figure 0-7: Sum of 12 US EPA priority list PAH compounds in compost and digestate samples



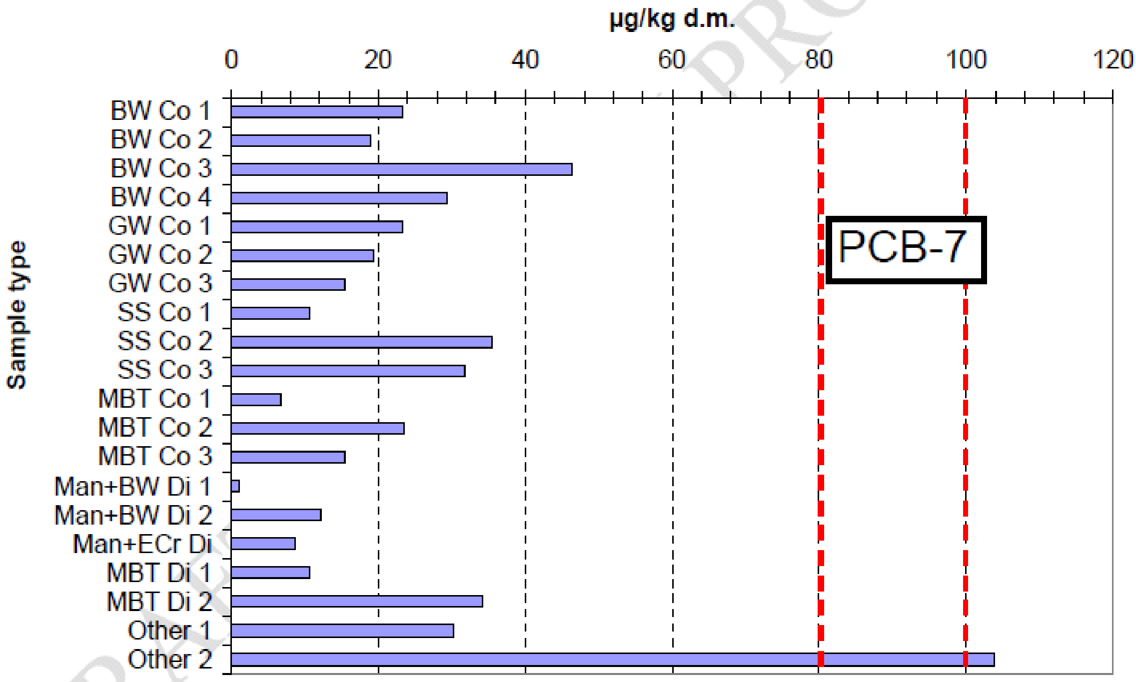
The values in Figure 0-7 represent median, calculated 90 percentile and maximum value per sample type. The red bars represent existing limit values in different European countries (n= sample number per category; Co=compost; Di=digestate; BW=source separated biodegradable waste & green waste; GW= source separated green waste; SS=sewage sludge; MBT=mechanical biological treatment; Man=manure; ECr=energy crops)

Figure 0-8: Dioxin (expressed in TCDD toxicity equivalents) in compost and digestate samples



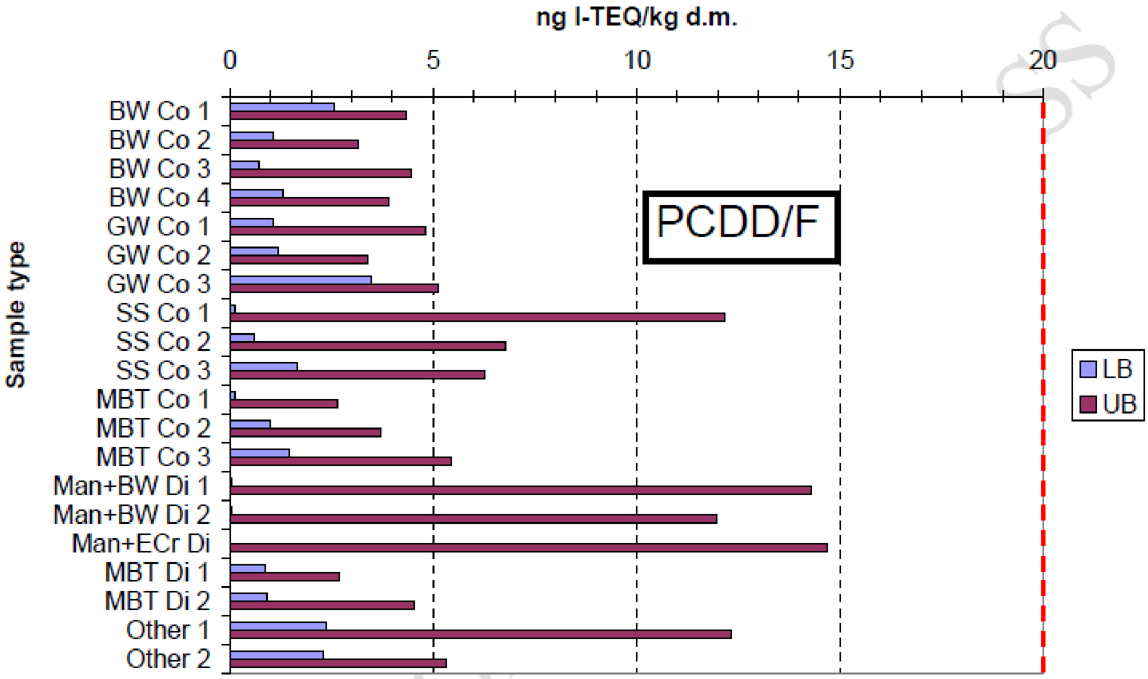
The values in Figure 0-8 represent median, calculated 90 percentile and maximum value per sample type (n= sample number per category; Co=compost; Di=digestate; BW=source separated biodegradable waste & green waste; GW= source separated green waste; SS=sewage sludge; MBT=mechanical biological treatment; Man=manure; ECr=energy crops)

Figure 0-9: Sum of 7 PCB (PCBs 28, 52, 101, 118, 138, 153 and 180) compounds in compost and digestate samples



In Figure 0-9 the red bars represent existing limit values in different European countries (Co=compost; Di=digestate; BW=source separated biodegradable waste & green waste; GW= source separated green waste; SS=sewage sludge; MBT=mechanical biological treatment; Man=manure; ECr=energy crops)

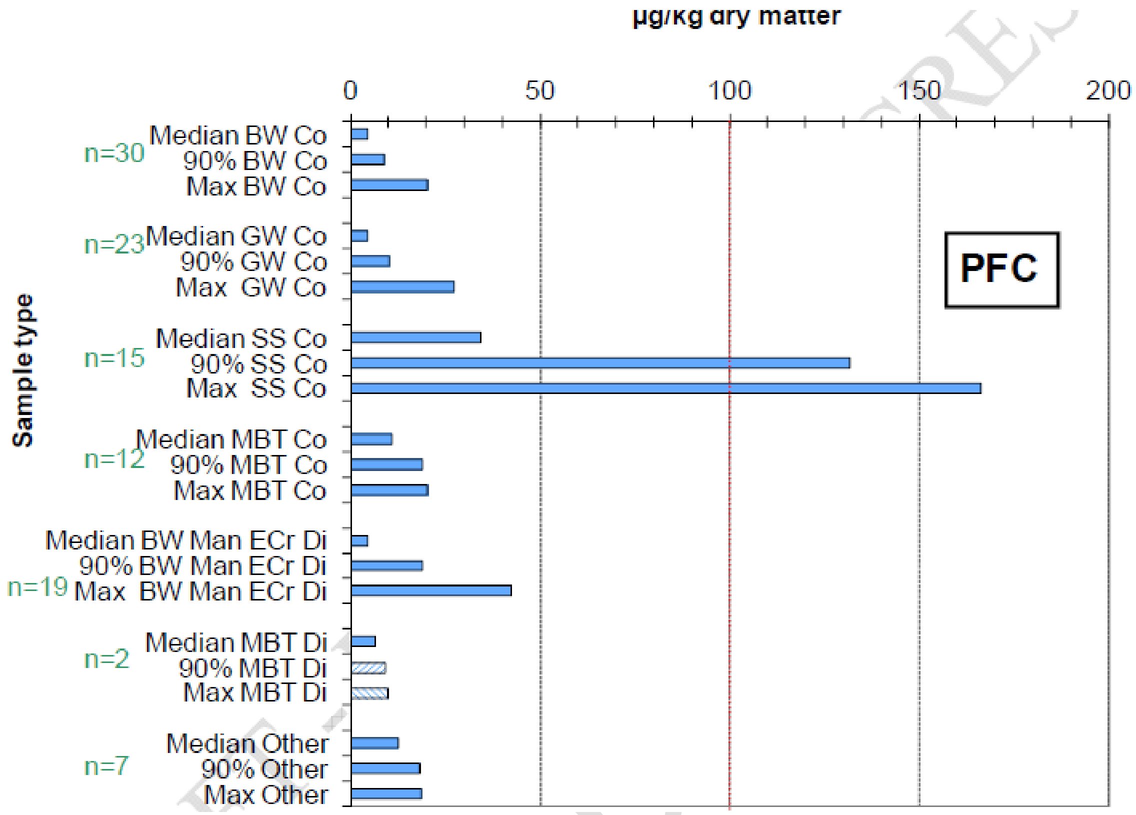
Figure 0-10: International toxicity equivalents (I-TEQ) of 17 PCDD/F compounds in compost and digestate samples



Data in Figure 0-10 represent lower bound (LB) and upper bound (UB) values. The red bar represents an existing limit value in different European countries (Co=compost; Di=digestate; BW=source separated

biodegradable waste & green waste; GW= source separated green waste; SS=sewage sludge; MBT=mechanical biological treatment; Man=manure; ECr=energy crops)

Figure 0-11: Perfluorinated compounds (sum of PFOA and PFOS) in compost and digestate samples



Values in Figure 0-11 represent median, calculated 90 percentile and maximum value per sample type. The red bar represents existing limit values for fertilisers in AT and DE (n= sample number per category; Co=compost; Di=digestate; BW=source separated biodegradable waste & green waste; GW= source separated green waste; SS=sewage sludge; MBT=mechanical biological treatment; Man=manure; ECr=energy crops)

A2.12 Further Information: Results of DG ENV Study on Concentrations of Organic Pollutants

The following tables are taken from DG ENV (2004) and show the level of PCB and PCDD/F in different compost input materials. Different average concentrations are listed in the tables for samples with a different organic matter (OM) content.

Table 0-18: PCBs in different source materials and soils (DG ENV 2004)

PCB in different source materials and soils [mg kg^{-1}d.m.] median or range min-max

Materials	n	OM	Sum PCB PCB 28 –180 mg kg^{-1}d.m.	Materials	n	OM	Sum PCB PCB 28 –180 mg kg^{-1}d.m.
leaves [2]	26	86.4 30	0.0366 0.1790	**wood** [2]	2-8	98.7-99.5 30	0.0025-0.0219 0.1566-1.1806
foliage [4]			0.081-0.194	**bush/tree shredder** [3]			0.086-0.098
grass [2]	32	87.3 30	0.0102 0.0558	**bark. woodchips. straw** [2]	6-8	90.4-98.8 30	0.0027-0.0119 0.0307-0.6960
grass [1]			0.037-0.052	**street sweepings. dust** [2]	8	2.0-18.6 30	0.0205-0.4103 0.0143-0.2872
yard waste [1]	31	90.6 30	0.0089 0.0790				
kitchen refuse [2]	15	84.0 30	0.0134 0.0511	**soil - arable land** [5]			n.n. –0.0151
biowaste [3]			0.082-0.148	**soil - arable land** [3]			0-0.0586 mean: 11.9
waste paper. pulp. diapers [2]	11-15	72.5-99.6 30	0.0043-0.0395 0.0317-1.4563	**soil – pasture** [5]			0.0003-0.0133

Sources: 1 (Krauß et al.. 1995a) . 2 (Krauss et al.. 1995b) . 3 (Kummer. V.. 1993). 4 (Rieß et al.. 1993). 5 (Anonymous. 1993)

Table 0-19: PCDD/Fs in different source materials and soils (DG ENV 2004)

PCDD/F in source materials and soils [ng TE kg^{-1}d.m.] median or range min-max

Materials	n	OM	PCDD/F [ng TE kg^{-1} d.m.]	Materials	n	OM	PCDD/F [ng TE kg^{-1} d.m.]
leaves [1]			24-33	straw [4]			1.4 - 5.3
leaves [2]	26	86.4 30	3.7 19.3	straw [6]		70–80 30	0.2-0.4 0.5-1.4
leaves from roadsides [1]			42	crop residues [4]			0.5 - 24.0
leaves from residential gardens [1]			58	crop waste [6] (high dust content)		90 30	0.5-2 3.5- 14
foliage [3]			1.4 - 20.4	wood [2]	2-8	98.7-99.5 30	0.2-10.1 1.8-775
foliage [5]			2.2[2] - 9.5[2] mean: 3.7	caffed wood [7]		30	5 11
foliage [6]		85 30	2 – 5 9.3 - 23	bush/tree shredder [3]			4.0 - 6.0
oak foliage [4]			7.0 - 20.0	bark, woodchips, straw [2]	6-8	90.4-98.8 30	0.0-1.1 0.1-13.6
needels /conifers [4]			1.4 - 2.6	bark [1,7]		30	3 16
grass [1]			4-5	newspaper [1]			0.2-2
grass [2]	32	87.3 30	0.7 3.5	newspapers [5]			1.0 - 1.6 1.3
grass [3]			4.0 - 5.0	paper [3]			3.0 - 5.0
grass [4]			0.5 – 5.0	waste paper [1]			5
grass [5]			0.1 - 4.7 mean: 0.7	recycled paper [1]			6-17
grass [6]		65 30	1-4 2-8	waste paper mix (Municipal Collection) [6]		85 30	15- 18 70-84
mowed material (roadside) [6]		85 30	5 23	waste paper, pulp, diapers [2]	11-15	72.5-99.6 30	0.0-11.7 0.1-431
yard waste [1]	31	90.6 30	0.4 4.7	street sweepings, dust [2]	8	2.0-18.6 30	1.5-24.1 1.1-20.7
yard waste [4]			0.2 - 4.1 0.4	street gully (soil, foliage, grass etc.) [6]		25 30	12- 15 11-14
green waste (municipal collection, autumn) [6]		90 30	18-22 126- 154	sewage sludge [3]			40 - 60
beet leaves [6]	%	70 30	2-4 4.6-9.3	slurry [3]			1.4 - 4.0
cabbage [6]		75–80 30	0.2 0.5-0.7	soil - arable land [5]	40		1.0
kale [6]		75 30	0.1-0.4 0.3 - 1.2	soil - arable land [3]			0.7 - 2.3 mean: 1.4
kitchen refuse [2]	15	84 30	0.5 2.6	soil – pasture [5]	39		0.4
kitchen refuse [4]			0.3 - 0.6 0.4	soil – forest [3]			mean: 18.7
biowaste [3]			5.0 - 26.0	populated at an average [5]	30		0.5
paunch content [6]		85 30	3 – 5 14-23	densely popul. [5]	27		5

Sources: 1 (Hagenmaier et al., 1990, Jager, 1991, Fricke et al., 1991 all cit. in Fricke and Vogtmann, 1993) , 2 (Krauss et al., 1995b), 3 (Kummer, V., 1993), 4 (Rieß et al., 1993), 5 (Krauß et al., 1995a), 6 (Sihler et al., 1993), 7 Einzmann , 1992

A3. Mineral Wool

A3.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included consideration of the inclusion or not of mineral wool as an ingredient of EU Ecolabel SIs and GMs and if so whether there should be limits on the content and source of the mineral wool. The scope of this project also includes development of an EU Ecolabel for mulches for which the inclusion of mineral wool as an ingredient is also considered here.

Recommendations for the revised parameters are included in the main report. This Annex provides the justification for the proposals for the mineral wool limits.

A3.2 Background

Requirement to revise EU Ecolabel mineral wool criteria for Soil Improvers and Growing Media

JRC/IPTS are currently developing proposals for a revision of the Ecolabel and GPP criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-20) that should be taken into consideration at the next revision which included reducing the use of mineral wool, e.g. by setting limits and the use of recycled/reused mineral wool. At present mineral wool is permitted in EU Ecolabel GM and SI if it meets certain criteria (see Section A3.2.1).

Table 0-20: Issues to be addressed in revision of Soil Improver and Growing Media EU Ecolabel criteria

Issues to be addressed	Growing Media	Soil Improvers
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

In this study we have considered the proposed revision for limits on mineral wool sources and content in growing media, soil improvers and mulches.

A3.2.1 *Current EU Ecolabel mineral wool criteria for GM and SI*

The current EU Ecolabel criteria for GM and SI include several provisions for the inclusion of mineral wool in both products. The User Manual EU Ecolabel SI (DG Env 2006a) and User Manual EU Ecolabel GM (DG

Env 2006b) set out the provisions presented below. These are the same for both product groups except where indicated.

Ingredients (Section 2.4.2 – criterion 1.1) (both SI and GM)

"Minerals can be applied as well, provided the applied material meets criterion 1.3 (see paragraph 2.4.4)".

Minerals (Section 2.4.2 - criterion 1.3) (both SI and GM)

"*Minerals shall not be extracted from:*

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora7,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity."

GM only

"Minerals applied as or in growing media are for example sand, clay, perlite, and mineral wool. The criteria also apply to minerals imported from non EU-countries in which case the provisions of the United Nations' Conventions on Biological Diversity are guiding."

SI only

"Minerals applied as or in soil improvers are for example sand, clay, perlite, and mineral wool (as far as allowed by National legislation). The criteria also apply to minerals imported from non EU countries in which case the provisions of the United Nations' Conventions on Biological Diversity are guiding."

Mineral growing media after use (criterion 6b)

"Applicable to mineral growing media only:

- For all substantial professional markets (i.e. where the applicant's annual sales in any one country in the professional market exceed 30,000 m³), the applicant shall fully inform the user about available options for the removal and processing of growing media after use. This information shall be integrated in the accompanying fact sheets.

- The applicant shall demonstrate that at least 50% by volume of the growing media waste generated in EU-25 is recycled after use.

The applicant informs the Competent Body, in an annual recycling report, about the option(s) on offer and the response to these options, in particular:

- a description of collection, processing and destinations. At any time, plastics should be separated from minerals/organics and processed separately;

- an annual overview of the volume of growing media collected (input) and processed (by destination)."

In summary, this indicates that in the current EU Ecolabel SI and GM that mineral wool is permitted if derived from waste mineral wool or from natural sources that are not notified community sites or Natura 2000 network sites. In addition, for spent mineral growing media, there are provisions to recycle the spent GM, although it is not specified what a mineral growing media is, e.g. how much must be mineral to define a growing medium as a mineral growing medium.

Proposed revision scope

In this revision, we have considered several factors that we think should be revised and have developed justifications for our proposed revisions. These factors are:

- What are the hazards associated with mineral wool and how Article 6.6 of EU Ecolabel Regulations applies to it?
- Should the sources of mineral wool be limited in any way?
- What should be the limits on the percentage of mineral in SI, GM and mulches?
- What requirements should be in place for spent growing media containing mineral wool?
- What reporting/declarations should be required?

Current use of mineral wool

In the consultation exercise (see details in Section 4), a number of stakeholders reported that mineral wool is mainly used as a GM in closed-cycle recirculating hydroponic systems, where the substrate is 100% mineral wool rather than a mix of different constituents. EPAGMA (2008) also reported that mineral wool slabs are commonly used in specific growing systems, mainly by professional growers, but cannot be applied to pot or container growing systems. The stakeholder consultation indicated there is no significant use of mineral wool in typical growing media used in pots, soil improvers and mulches.

Therefore, in our view, the use of mineral wool as a solid support in closed-cycle recirculating hydroponic systems is a significant use of mineral wool. Our proposed definition of growing media *“Material, other than soils in situ, in which plants are grown”* does not exclude the use of mineral wool in such closed-cycle recirculating hydroponic systems. For our purposes, we describe growing media composed of 100% mineral wool as “mineral growing media”.

A3.3 Mineral wool and Article 6.6 of EU Ecolabel Regulation

A3.3.1 *CLP Regulation*

Mineral wool is typically a fibrous glass-like substance made from extracted minerals (basalt or diabase) or mineral wastes such as slag and glass. Mineral wool made from natural rocks may also be described as rock wool and stone wool, and it is produced by melting basalt and limestone in a furnace after addition of coke at 1500-1600^{o}C, followed by spinning and granulation. Additives such as binders and wetting agents are also added.

Mineral wool presents a health hazard if small fibre fragments are inhaled into the lungs with the potential to cause cancer with a high risk for biopersistent fibres (WHO 2005). Biopersistence may be defined as the ability of a material (fibre) to persist in the lung in spite of the lung’s physiological clearance mechanisms and environmental conditions. On this basis, mineral wool fibres would be considered as a hazardous material.

Article 6.6 of the Regulation EC No 66/2010 excludes substances that are classified as carcinogenic, mutagenic, toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction according the CLP regulation. CLP Regulation (Regulation (EC) No 1272/2008) is the European regulation that applies in the classification and labeling of hazardous substances, and regarding carcinogenicity hazards, the following categories are considered:

- CATEGORY 1: Known or presumed human carcinogens. A substance is classified in Category 1 for carcinogenicity on the basis of epidemiological and/or animal data. A substance may be further distinguished as:
  - Category 1A: Category 1A, known to have carcinogenic potential for humans, classification is largely based on human evidence, or
  - Category 1B: Category 1B, presumed to have carcinogenic potential for humans, classification is largely based on animal evidence.

  The classification in Category 1A and 1B is based on strength of evidence together with additional considerations (see section 3.6.2.2). Such evidence may be derived from:
  - human studies that establish a causal relationship between human exposure to a substance and the development of cancer (known human carcinogen); or
  - animal experiments for which there is sufficient evidence to demonstrate animal carcinogenicity (presumed human carcinogen).

  In addition, on a case-by-case basis, scientific judgement may warrant a decision of presumed human carcinogenicity derived from studies showing limited evidence of carcinogenicity in humans together with limited evidence of carcinogenicity in experimental animals.
- CATEGORY 2: Suspected human carcinogens

  The placing of a substance in Category 2 is done on the basis of evidence obtained from human and/or animal studies, but which is not sufficiently convincing to place the substance in Category 1A or 1B, based on strength of evidence together with additional considerations. Such evidence may be derived either from limited evidence of carcinogenicity in human studies or from limited evidence of carcinogenicity in animal studies.

Mineral wool is included in CLP Regulation as a substance that may be classified as Carcinogen category 2 if it does not fall under the conditions of exception. The exceptions are included in the Notes Q and R within the CLP Regulation, meaning that if the mineral wool is under the scope of one of these notes, the classification of carcinogen cat 2 does not apply to it:

- Note Q:

  The classification as a carcinogen need not apply if it can be shown that the substance fulfils one of the following conditions:
  - a short term biopersistence test by inhalation has shown that fibres longer than 20 μm have a weighted half-life less than 10 days; or

- a short term biopersistence test by intratracheal instillation has shown that fibres longer than 20 μm have a weighted half-life less than 40 days; or
- an appropriate intra-peritoneal test has shown no evidence of excess carcinogenicity; or
- absence of relevant pathogenicity or neoplastic changes in a suitable long term inhalation test.

- Note R :

The classification as a carcinogen need not apply to fibres with a length weighted geometric mean diameter less two standard geometric errors greater than 6 μm.

A3.3.2 *Exposure to hazards*

Setting suitable limits should consider the hazard and the risk of harm from exposure to the hazard. For soil improvers and growing media, the principle exposure pathway when applied to agricultural land or in the home garden would be inhalation from fibres and dusts through handling. Inhalation of dust from handling GM and SI is a known exposure route, although dust generation is linked to the moisture content, with the risk of dust generation being greater the drier the material. The National Institute for Occupational Safety and Health (NIOSH) (United States) has set an exposure limit of 5 mg/m^3 (total dust) for mineral wool. A GM consisting entirely of mineral wool is likely to lack moisture, generating a high amount of wool fibres when handled as a result, although risks within a mixed GM or SI are likely to be lower.

In SI and GM where mineral wool is used as a constituent, some consideration should be given to whether its presence results in an increase of the risks associated with exposure to the product. IARC (1998) evaluated the carcinogenic risks of man-made vitreous fibres (MMVF) or synthetic vitreous fibres (SVFs), namely insulation glass wool, refractory ceramic fibres and mineral wool. These were classified as Group 2B "Possibly carcinogenic to humans". In 2001, an IARC working group re-assessed those risks and the overall evaluations were changed from Group 2B to Group 3 –"Not classifiable as to its carcinogenicity to humans" (IARC, 2002). The reason for this change was an alteration in the evidence for cancer in humans and experimental animals. However, Wardenbach *et al.* (2005) argues that the explanations of the IARC working group for preferring the newer inhalation studies are not sufficiently supported by published data.

According to WHO (2005), the hazards associated with the respirable fibres contained in mineral wool are determined by biopersistence, fibre dimensions and their chemical/physical properties. Based on a number of inhalation exposure studies, intraperitoneal injection studies and biopersistence studies, the report concluded that the carcinogenic hazard associated with mineral wool could vary from high to low, with high for biopersistent fibres and low for non-biopersistent fibres.

Another study by Wilson *et al.* (1999) reported that SVFs have been studied for their carcinogenic potential and there is considerable evidence that differences exist among fibres in their potency to produce a carcinogenic response. The study compared the risk associated with exposure to chrysotile asbestos with that of exposure to glass wool fibres. It concluded that, for a given fibre count, glass wool is five to ten times less risky than asbestos, with a risk of six lung cancer incidents in a million of workers per year. It also reported that neither the epidemiological studies of human exposure nor the animal studies have shown a marked hazardous effect from glass wool, concluding that any effect that might exist is small. Considering

the high health risks associated with exposure to asbestos though, a risk that is five to ten times lower is not necessarily considered negligible.

A3.3.3 *Binders*

It has been found that mineral wool insulation manufacture process uses urea-extended phenol formaldehyde resins as binder. The concern related to this type of binders is that they may emmit formaldehyde which is classified as carcinogen Cat. 2 (H351) and Acute toxic (H331, 311 and 301)

According to the mineral wool insulation industry (Roxul Safety Data Sheet), *Primary combustion products of the cured urea extended phenolic formaldehyde binder, when heated above 200 C, are carbon monoxide, carbon dioxide, ammonia, water and trace amounts of formaldehyde. Other undetermined compounds could be released in trace quantities. Emission usually only occurs during the first heating.* In this regard, the industry reported that formaldehyde in mineral wool insulation is eliminated in the production process through high temperatures.

A3.4 Consultation feedback

A3.4.1 *Consultation summary*

<u>CLP Regulation</u>

One of the main manufacturers of mineral wool for growing media purposes in Europe reported that its mineral wool falls under the Note Q provisions (see Section 3.1), fulfilling all of the conditions for the exclusion of classification as hazardous under this Note. This statement was accompanied by the Safe Use Instructions Sheet of the product, which also states a terpolymer binder not classified according CLP Regulation, present in the product in a range of 0 – 5% weight.

<u>Mineral wool limit</u>

Approximately 50% of the respondents suggested that no mineral wool should be allowed in SI or GM for the purposes of the EU Ecolabel, as it is a material that could potentially pose a risk on human health. One third of respondents suggested that there should be no limitation to the use of mineral wool, especially for GM, as it has to be used as a 100% substrate. Stakeholders reported that mineral wool is not as important to SIs, as they are mainly organic products and mineral wool does not have an organic content.

<u>Reuse and recycling of materials</u>

A number of respondents reported that mineral wool is not currently reused or recycled to a significant extent. This is due to the fact that preparation for reuse requires a lot of energy and disinfection of the material, while virgin material offers a number of useful properties such as absence of pathogens, pests and weeds, resulting in reduced need for plant protection chemicals, water and fertiliser.

On the other hand, one of the main manufacturers of mineral wool for growing media purposes in Europe reported different product manufacture processes that incorporate recycled mineral wool:

- Bricks: the mineral wool is granulated and used as substitute of sand. This process is used by some construction materials manufacturers in the United Kingdom, Germany and the Netherlands.

- Cement: the cement industry usually incorporates very diverse wastes in cement production, both as raw material and fuel. Recycled mineral wool is used by some construction materials manufacturers in Japan.
- Compost: the mineral wool is granulated and used as substitute of structural materials. This process is used by some compost manufacturers in France, Switzerland, Austria and Germany.

Moreover, the majority of stakeholders agreed that all mineral wool in EU Ecolabel should either be reused or recycled, or it should be obtained from the residues of mining operations. Market data obtained during the consultation showed that the only virgin mineral wool is currently used in the EU.

Current use and sources

13,000 m^3 of mineral wool was reported to be used by professional growers per year in Latvia and 3,000 m^3 by professional growers in Denmark. For Latvia, this represented 15% of the total GM consumption, while for Denmark it represented less than 1% of the GM market.

When asked about country sources for SI, GM and mulch constituents, none of the respondents reported any sources for SI and mulch. For GM mineral wool, France, Denmark and the Netherlands were suggested as country sources.

Selected responses

The following responses illustrate the above summary of the consultation.

“The role of a soil improver is to enrich the soil with organic matter. Mineral wool does not contain organic matter. In addition it is 100% inert, which implies that it does not retain water nor nutrients. These aspects are however crucial for a soil improver. In addition, mineral wool is not biodegradable and will pollute the soil. Therefore we advise to exclude mineral wool from soil improvers.”

“The aim of Ecolabel is to stimulate the use of renewable resources for the production of growing media. We would like to suggest limiting the amount of mineral wool in growing media, since mineral wool is not renewable. The maximum percentage of mineral wool allowed in growing media should be scientifically determined based on the added values of mineral wool to growing media.”

“Not aware of mineral wool use in the UK in GM or SI, most goes to re-cycling some to landfill.”

"An inert material as rockwool should not be disposed. Important is the disinfection before using again. Recycling uses a lot of energy; not good for the environment"

“We believe there should be no limit for Growing Media since introducing other (organic) materials would compromise the sustainability benefits of a using mineral wool substrate, such as a clean start free from pest and disease organisms, reduced use of water and fertiliser and the ability to grow in closed systems thereby reducing emissions of water and fertiliser. For Soil Improvers we suggest that the limit be set at an appropriate level to ensure that the Ecolabel limits for Hazardous Substances (Section 6) are not exceeded.”

“Before mineral wool is admitted in SI or GM it should be ensured that there are ways to recycle/recover it and that it does not contain toxic or harmful substances. Otherwise mineral wool could pose a risk to human health or the environment.”

A3.4.2 *Conclusions to consultation*

We conclude from the stakeholder consultation that there is little need or stakeholder interest in the inclusion of mineral wool in SI and mulches, and that mineral wool as a component constituent of general GM used for growing plants in pots and tubs is not supported. We would support this view, as there would also be uncontrolled and un-quantified health risks to consider from dusts generated during handling by amateur gardeners, as well as a difficulty to dispose of spent GM containing mineral wool.

According to the feedback received from one of the manufacturers of mineral wool for GM purposes, waste mineral wool can be granulated and used as a substitute of structural materials such as bark, sand and soil in the production of compost. This process is carried out by some compost manufacturers in France, Switzerland, Austria and Germany. The critical phase in the recycling process is the effective separation of plastic and mineral wool to avoid the contamination of the final compost.

It was reported that mineral wool can enhance certain compost features such as structure and ability to retain moisture, while it can also improve the composting process (air-water balance and nutrients). This last aspect is relevant since the End of Waste Criteria for Biodegradable Waste that is currently under development include requirements for additives (inputs different from biowaste and biodegradable residues): "*only additives are allowed that are needed to improve the process performance and/or environmental performance of the composting process"* (IPTS 2013). Additives are sometimes needed to improve the composting/digestion process and may be flocculating agents, polymers for dewatering, trace elements to enhance micro-organism functioning, precipitants, enzymes to improve anaerobic biodegradation process, anti-foam agents, complexing agents, macronutrients, emulgators, antiscalants. Additives that are used to increase the usefulness or economic value of the products (e.g. fertilisers) could be added once the compost is awarded end-of-waste status.

In addition, the End of Waste Criteria for Biodegradable Waste currently include requirements for the input materials in the production of compost. Examples of input materials used for producing compost/digestate materials falling outside the proposed scope for EU end-of-waste criteria are non-biodegradable polymers and plastics (including oxo-biodegradable plastics), metal, glass, stones, ground rock, sand, soil other than that attached to plant parts, non-biodegradable oils and fats

These considerations point out the condition of granulates made from waste mineral wool to be allowed as input of the composting process: it shall be considered an additive according the definition given by the EoW criteria for biodegradable waste. The other option would be the incorporation in compost once it has achieved the EoW status, as an additive that improves certain physical and/or chemical properties of the soil improver. Both alternatives allow the incorporation of granulates made from waste mineral wool as constituent of the soil improver, upon demonstration of its capacity of improving the composting process and/or the features of compost.

We do consider that there is a mineral wool application for GM comprising 100% mineral wool (mineral growing media) in some commercial horticultural applications (closed-cycle recirculating hydroponic systems). Under these conditions, the risks from handling this material would be more readily controlled and the recycling of the used mineral wool more likely (although the consultation suggests that virgin mineral wool is preferred due to the difficulty and need to clean and sanitise spent mineral wool GM for use in the same application). It has been reported that services are available from private companies in Europe that

recover mineral wool from grown crops' soil, remove residual plant matter and residual drainage water and recycle the used material for the production of new GM or other products, such as bricks for construction.

Therefore, we conclude and would recommend that the EU Ecolabel prohibited the use of mineral wool in SI and mulches and as a part constituent of GM. Consideration should then be given to the acceptability of the use of 100% mineral wool GM in the commercial horticulture market.

A3.5 What are the sources of mineral wool that should be limited

Mineral wool may be manufactured from extracted natural mineral sources or from recycled waste materials, especially glass (Defra 2007). In addition, mineral wool growing media might be made by directly re-using mineral wool waste, e.g. from buildings, or recycling spent mineral wool GM (Rockwool B.V.Grodan 2011). The EU Ecolabel for GM that include 100% mineral wool, for the special case of commercial horticultural applications, should then consider the source of the mineral wool.

Whilst the consultation indicated that the reuse of mineral wool GM is difficult, as the material needs to be cleaned and sanitised to minimise the risk of plant pathogens, we would consider that this should be encouraged. The alternatives to be considered are the use of waste materials to manufacture mineral wool e.g. glass and sand, and the use of waste mineral wool directly or manufacture of mineral wool from raw resources. The extraction of minerals is a large scale industrial activity (about 3 billion tpa in Europe[19]) and the fraction of this used for mineral wool production is consequently very small.

Limited LCA studies have investigated some but not all of these options to a limited extent.

A3.5.1 *LCA of mineral wool sources*

EPAGMA study (2012)

The 2012 EPAGMA study assessed the impact of different GM on the environment and human health.

Environmental indicators: Four environmental indicators were used in this study.

1. Climate change: This refers to the impact on global warming and is measured in kg $CO2eq \cdot m^{-3}$.

2. Resources: The two categories contributing to this indicator are mineral extraction and primary non-renewable energy consumption. Impact is measured in $MJ \cdot m^{-3}$.

3. Human health: Human toxicity (carcinogenic and non-carcinogenic effects), respiratory effects (inorganics and organics), ionising radiation and ozone layer depletion are the categories looked into when assessing the impact to human health. The damage is measured in $DALY \cdot m^{-3}$, where DALY stands for Disability Adjusted Life Years.

[19] http://ec.europa.eu/enterprise/sectors/metals-minerals/non-energy-extractive-industries/construction-minerals/index_en.htm

4. Ecosystem quality: This indicator quantifies the impact on the natural development and occurrence of species within their habitats and consists of aquatic ecotoxicity, terrestrial ecotoxicity, acidification, eutrophication, terrestrial acidification/nitrification and land occupation. Impact is measured in PDF·m^2·y·m^{-3}, where PDF stands for Potentially Disappeared Fraction of species.

Functional unit: The chosen functional unit is the following: *"To provide 1 m3 (EN 12580) of growing media for each of the following five areas of application: fruity vegetables, pot plants, young plant production using loose-filled trays, tree nursery stock, and hobby market."*

System boundaries: The LCA includes all processes from raw material extraction to the end-of-life stage of all product constituents. The product system is divided into six principal life cycle stages: production, delivery, processing, distribution, use and end of life.

Results: For fruity vegetables, the following three mixes were used:

- Mix 1.1 – 100% white peat
- Mix 1.2 – 100% mineral wool produced from basalt
- Mix 1.3 – 100% coir pith

The impact of these mixes on climate change and resources was estimated and is presented at the following graphs.

Figure 0-12: Impact of different GM used in the growing of fruity vegetables on climate change

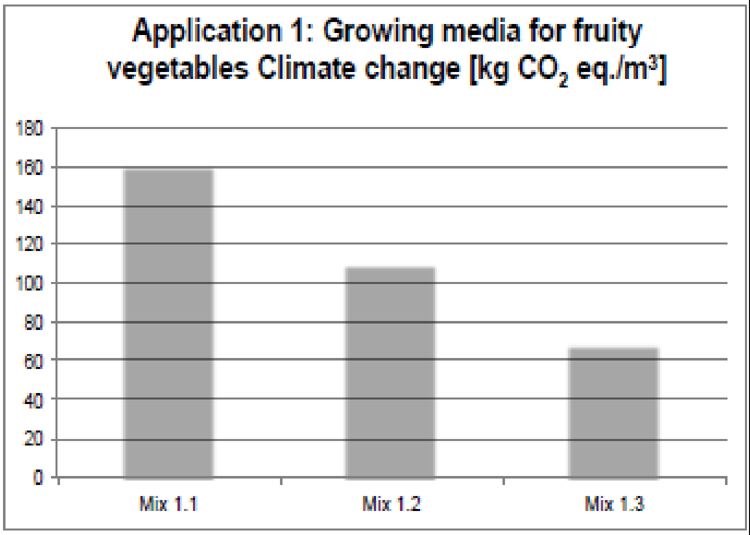
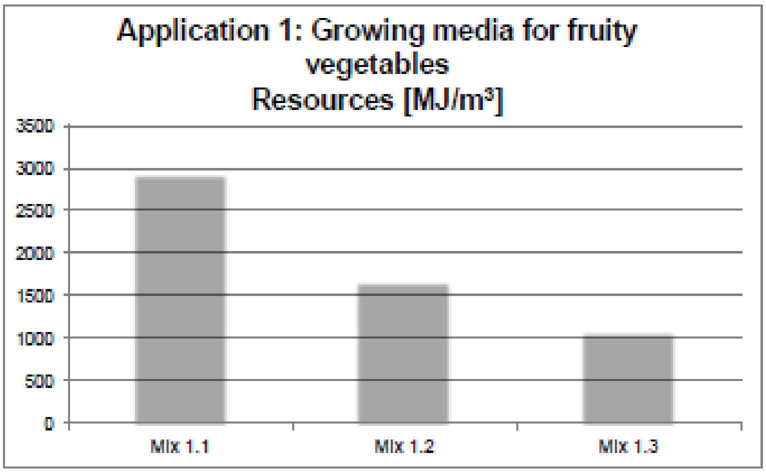


Figure 0-13: Impact of different GM used in the growing of fruity vegetables on resources



The study concluded that mineral wool has a lower impact on climate change and resources than white peat; however, it still has a higher impact than coir pith. The energy consumption during the production process contributes to 70% of the Ecosystem quality impacts and to more than half Climate change and Resources.

NNFCC study (2008)

The LCA study by NNFCC (National Non-Food Crops Centre) (2008) examined the 'environmental profile' of insulation materials consisting of natural fibres and mineral wool.

The following environmental indicators have been examined:

1. Abiotic resource depletion potential: This refers to non-living resources like minerals, coal or crude oil and characterisation is based on ultimate reserves and extraction rates. The unit of indicator result is kg of antimony equivalent.

2. Global warming potential (GWP100): This indicator refers to the impact of GHG emissions on the atmosphere radiation heat adsorption. Emissions are characterised as the global warming potential for a 100-year horizon. The unit used is kg CO_2 equivalent.

3. Ozone depletion potential: This refers to the deterioration of the stratospheric ozone layer that stops solar UV-B radiation from entering the atmosphere. The units of indicator result are kg of CFC-11 equivalent.

4. Human toxicity potential: This category is related to the harmful effects of substances on human health. Emissions are characterised as human toxicity potential in an infinite time horizon, in kg 1,4-dichlorobenzene equivalent.

5. Ecotoxicity potential: Ecotoxicity is divided into two categories depending on the environmental sub-compartment: freshwater aquatic ecotoxicity and terrestrial ecotoxicity. The ecotoxicity impact categories refer to the potential toxic effects of substances in the natural environment. Results are expressed in kg 1,4-dichlorobenzene equivalent.

6. Photochemical oxidant creation potential: Also known as photo-oxidant formation. Characterisation results are expressed in kg ethylene equivalent.

7. Acidification potential: This indicator is related to the acidification of the environment by pollutants such as SO_2 and NOx. Emissions are characterised as the acidification potential in kg SO_2 equivalent.

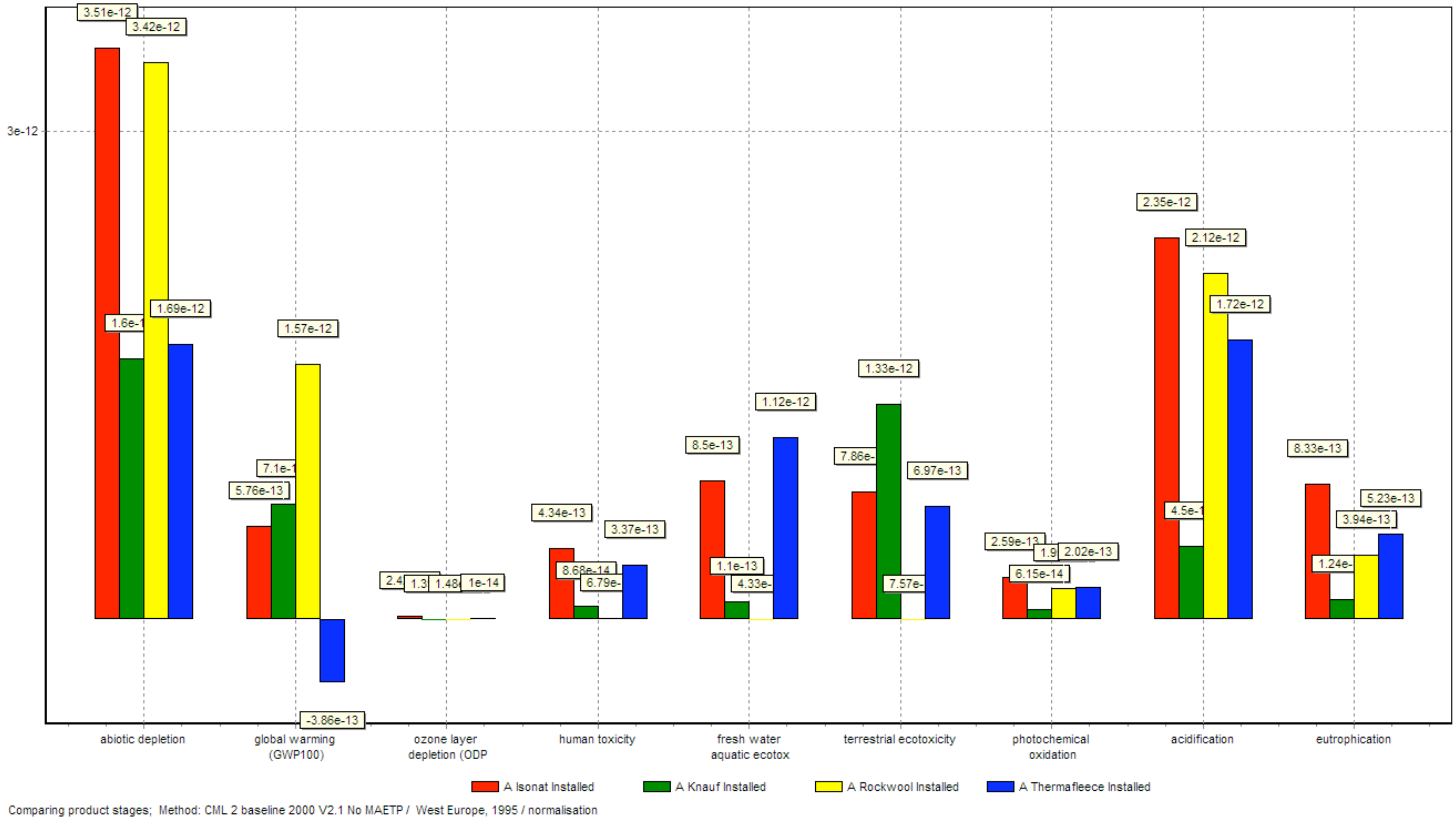
8. Eutrophication potential: This impact category characterises emissions of nutrients such as N and P into kg PO4 equivalent.

System boundaries: The scope of this study is a cradle to grave assessment of natural fibre insulation (NFI) materials following the principles of ISO 14040. The study includes each stage of the raw material collection, processing, manufacturing, maintenance and final disposal of the insulation materials chosen for the study.

Functional unit: The functional unit chosen for the study was for the insulation of a one square metre 'unit' area within the 'cold roof' space of a house*: "The manufacture, installation, use and disposal of insulation material for a 1 m2 area of the central part of a first floor plasterboard/timber ceiling in a UK domestic house to a U-value of 0.16 W/m²k for a period of 60 years' service".*

Results: The study included glass fibre wool manufactured by KNAUF and mineral wool manufactured by ROCKWOOL. Both processes were similar except that the KNAUF process used significant amounts of recycled glass (typically 30-60% and up to 80%, although the content in the example was not described) whilst the ROCKWOOL process used mainly virgin raw minerals (77%) and 23% recycled materials. Both processes included some finite percentage of raw mineral in the feedstock. The details of the LCA were not fully apparent, but, in terms of abiotic resource depletion potential and the global warming potential, the ROCKWOOL product had more than twice as large an adverse impact as the KNAUF product.

Figure 0-14: Environmental impact of insulation materials (NNFCC 2008)



Although not definitive and an exact like for like comparison, we suspect that a higher burden for these parameters is at least in part a result of using a higher percentage of raw minerals by the ROCKWOOL process.

ESU –Services study (2012)

The ESU-Services study (2012) looked at the environmental impact of the production chain of rock wool by Flumroc, a rock wool producing company in Switzerland.

Environmental indicators: Three indicators were used in this study.

1. Cumulative energy demand (CED): The CED describes the consumption of fossil, nuclear and renewable energy sources throughout the life cycle of a good or a service. This includes the direct uses as well as the indirect or grey consumption of energy due to the use of, e.g. plastics as construction or raw materials. CED for both renewable (hydro, solar, wind, geothermal, biomass) and non-renewable (fossil and nuclear) energy were calculated in this study.

2. Global Warming Potential 2007: The unit used is kg CO_2 equivalent.

3. Ecological Scarcity 2006: The ecological scarcity method (Frischknecht et al. 2008) evaluates the inventory results on a distance to target principle. The calculation of the eco-factors is based on one hand on the actual emissions (actual flow) and on the other hand on Swiss environmental policy and legislation (critical flow).

Functional unit: The functional unit of this study is 1 kg of packed rock wool at the plant.

System boundaries: The study includes the production, the packing of the rock wool products, the administration and the waste streams.

Results: The study indicated that most of the environmental impacts were associated with the manufacturing process and that, contrary to earlier studies, the mining aspects were not so significant. However, in this study, a key parameter that reduced the impact of the mining was a set of assumptions regarding the production of air pollution particles.

A3.5.2 *Conclusions on sources*

There are a limited number of LCA studies assessing the environmental impact of mineral wool as an insulation material and in GM. The context and underlying assumptions in the LCAs are not clear from the reports.

On the basis of the limited LCA data and the consultation feedback, we would recommend that mineral wool for EU Ecolabel purposes is only acceptable if sourced from a manufacturing process that uses at least 60% waste material as input. Where any manufacturing process uses raw extracted minerals in the production of mineral wool, this should be only be sourced from sites that are not special protected sites as in the current EU Ecolabel criteria.

A3.6 Proposed criteria for mineral wool in SI, GM and mulches

This section summarises our recommendations for mineral wool criteria for EU Ecolabel for growing media, soil improvers and mulches.

A3.6.1 *Mulches*

The use of mineral wool as mulch or as a constituent of mulch does not seem an appropriate use for this material. Our proposal would be that mineral wool is not permitted in EU Ecolabel mulch.

A3.6.2 *Soil Improvers*

The inclusion of mineral wool in soil improvers would be a rare occurrence and any specific advantage of a soil improver having mineral wool as a constituent is not immediately apparent. Most soil improvers would be largely based on single constituent composts or digestates or other organic matter. On this basis, our proposal is that mineral wool should not be permitted in EU Ecolabel soil improvers.

In the case of granulates made from waste mineral wool, more information is needed to assess the suitability of this constituent in soil improvers awarded the EU Ecolabel.

A3.6.3 *Growing media*

The inclusion of mineral wool in growing media is considered a possibility. However, given the uncontrolled nature of the risk from dusts from handling growing media by amateur gardeners, we propose that mineral wool is not allowed as a constituent in general GM that would be used in pots and tubs, but is restricted to its use in commercial horticultural applications (closed-cycle recirculating hydroponic systems) as 100% mineral wool GM. Under these conditions, the risks from inhalation of fibre may be controlled and the spent GM may be recycled for the same application or alternatively disposed of by some other route.

A3.6.4 *Management of used mineral wool growing media*

<u>Mineral wool as growing media for non-professional uses</u>

The management of spent GM raises further concerns that suggest the exclusion of mineral wool from GM. Spent GM may be re-used by the amateur gardener or placed in household waste, which may in turn hinder the recycling process, leading to disposal of the waste mineral wool in landfill.

It is our view that it would be impractical to arrange and manage a totally separate recycling route for mineral wool containing GM, so that the used GM could undergo a processing step that removed the mineral wool. We foresee that the volumes collected from amateur users would be low and very variable.

<u>Mineral wool as growing media for commercial applications</u>

Arisings of spent GM composed of 100% mineral wool in commercial hydroponic applications would be on a sufficient scale that the used GM could be collected and effectively cleaned and recycled. We understand from the stakeholder consultation that the re-use of this GM is not practised due to the difficulty of cleaning and mitigating risks from spreading plant pathogens. However, such issues are not insurmountable, and might be considered, together with recycling into other mineral wool applications. Disposal of used mineral wool to landfill would not represent a significant health risk due to the general inert nature and containment of landfill but would represent a loss of potential resources.

The current EU Ecolabel GM criteria recognise this and provide in Criterion 6b (see Section A3.2.1) requirements for the after use of mineral GM. In our view, these provisions should be retained, but discussions should be conducted with respect to revising some of the requirements – for example, decreasing the threshold from 30,000 m^3 and increasing the volume of used GM to be recycled to a value greater than 50%.

A3.7 Proposed criteria

In summary our proposed criteria for mineral wool are as follows.

Table 0-21: Proposed criteria

Parameter	Growing Media	Soil Improver	Mulch
Mineral wool permitted	**Yes, under provisions set out below.** **A, Only for GM composed of 100% mineral wool used in commercial horticultural applications.** **B, The mineral wool is sourced from recycled mineral wool or from a manufacturing process that uses at least 60% waste as feedstock and that any raw minerals used in the manufacturing process are not sourced from a specially protected habitat site** **C, Mineral wool and substances present in it are not classified as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction according to Annex VI of CLP regulation.** **D, After use as a GM, the mineral wool is recycled as per existing [or modified] requirements of the current EU Ecolabel GM Criterion 6b.**	**No**	**No**

A3.7.1 *What reporting/declarations should be required*

In the case of use in a 100% mineral wool growing medium, a declaration that the mineral wool is derived from recycled mineral or manufactured from a process using at least [60%] recycled waste (state source) and that any raw extracted minerals are not sourced from a protected habitat site.

For mineral growing media the following declaration should be required:

- For all substantial professional markets (i.e. where the applicant's annual sales in any one country in the professional market exceed 30,000 m³ [or an agreed lower threshold volume]), the applicant shall fully inform the user about available options for the removal and processing of growing media after use. This information shall be integrated in the accompanying fact sheets.

- The applicant shall demonstrate that at least 50% [or an agreed higher percentage]) by volume of the growing media waste generated in EU-25 is recycled after use. The applicant should inform the Competent Body, in an annual recycling report, about the option(s) on offer and the response to these options, in particular:

- a description of collection, processing and destinations. At any time, plastics should be separated from minerals/organics and processed separately;

- an annual overview of the volume of growing media collected (input) and processed (by destination).

A3.8 References

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A4. Mineral Extraction

A4.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included the potential revision of the position regarding mineral extraction. The scope of this project also includes development of an EU Ecolabel for mulches for which the inclusion of mineral extraction criteria is also considered here.

Recommendations for the revised parameters are included in the main report. This Annex provides the justification for the revised position regarding mineral extraction.

A4.2 Background

A4.2.1 *Requirement to revise EU Ecolabel mineral extraction criteria for SI and GM*

JRC/IPTS are currently developing proposals for a revision of the Ecolabel criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-22) that should be taken into consideration at the next revision which included mineral extraction. At present mineral extracted from natural sources are permitted as an ingredient of SI and GM conditional on the status of the mineral extraction site. However the environmental impact of this from an LCA perspective might be unfavourable compared to other mineral sources.

Table 0-22: Issues to be addressed in revision of Soil Improver and Growing Media EU Ecolabel criteria

Issues to be addressed	Growing Media	Soil Improvers
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

In this section, we have considered the proposed revision of criteria for mineral extraction relevant to growing media, soil improvers and mulches. This excludes consideration of the use of mineral wool, as our proposals for revision of the EU Ecolabel criteria for this particular material is described in Section A3.

A4.2.2 *Current EU Ecolabel mineral extraction criteria for GM and SI*

In the current EU Ecolabel criteria, the Criterion 1.3 for both SI and GM clearly indicates that minerals extracted from natural resources can be used as a constituent, provided they are not sourced from protected sites.

"Minerals shall not be extracted from:

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.

Minerals applied as or in soil improvers/growing media are for example sand, clay, perlite, and mineral wool (as far as allowed by National legislation). The criteria also apply to minerals imported from non EU countries in which case the provisions of the United Nations' Conventions on Biological Diversity are guiding."

Many inorganic materials may be included in SI and GM, and many of these can be supplied from waste recovery rather than utilisation of raw mineral resources.

<u>Proposed revision scope</u>

In this revision, we have considered several factors that we think should inform on our proposals regarding the mineral extraction. These factors are:

- What minerals are considered
- What products might allow extracted mineral as a constituent
- What level of extracted mineral if allowed would be acceptable
- What sources of extracted mineral might be considered acceptable
- What reporting/declarations should be required

A4.3 What minerals are considered

The CEN 1999 report CR13456 indicates there are many types of minerals (Table 0-23) that may be considered as constituents of growing media and soil improvers.

Table 0-23: Minerals for Soil Improvers and Growing Media

Mineral constituent*	**Description**	**SI**	**GM**
Clay	Mineral material obtained from natural deposits	X	X
Pumice	Naturally expanded volcanic material	X	X
Broken Lava/Porous Volcanic Rock	Product obtained from naturally expanded volcanic material	X	X
Broken lava	Product obtained from naturally expanded volcanic material	X	X

Sand	Mineral material obtained from natural deposits	X	X
Soil	Mineral particles of clay, silt and sand naturally occurring with or without organic matter	X	X
Exfoliated Vermiculite	Granular material manufactured from naturally occurring hydrated micaceous mineral, expanded/exfoliated by heat to form a laminar structure		X
Expanded Perlite	Granular material manufactured from naturally occurring hydrated volcanic rock, expanded by heat to form a cellular structure		X
Expanded Clay/Slate	Product obtained by heating up and expansion of clay particles		X
Coal mine spoil	Mineral particles, mainly slates, coming from coal extraction, in its natural state or combusted at 1 100 °C, once ground and classified.		X
Blast furnace gravel	Product obtained as the coarse fraction from water cooling (granulated product) or air cooling (crystallized product) of cast slag originating from cast iron obtained in a blast furnace		X
Expanded Clay/Slate	Product obtained by heating up and expansion of clay particles		X

*The specific case for the use of mineral wool is considered in a separate section (Section A3).

A4.4 What products might allow extracted minerals as a constituent

A4.4.1 *Minerals as constituent of mulch*

We define mulches (see Section 2.4.3) as "A protective covering placed around plants to prevent the loss of moisture, control weed growth, and reduce soil erosion".

Mulch is usually considered to consist of large particles of materials such as wood chips and bark applied on the surface of soil. The use of inorganic materials as soil covering is not in our view considered as acceptable within our interpretation of mulch definition. Soil coverings with stone chips or pebbles may occur as a semi-permanent covering and, although this would suppress weeds and retain moisture, it is not in our view mulch, as it has a decorative function. Therefore, we propose that inorganic materials and especially extracted minerals are not permitted in EU Ecolabel mulch.

During the stakeholder consultation, carried out as part of this project, the following data on mineral use in mulch was received:

- France (data source: CAS survey) – Total volume of mulches consumed is 0.5 Mm^3 or higher. 5% of this consists of minerals (schist, pouzzolan, expanded clay) while the rest consists of 73% barks and 22% of diverse organic materials (flax, straw, wood chips).
- Italy – Total volume of mulches consumed is 0.1 Mm^3, of which 40% is volcanic aggregates

These responses indicate that, in some member states, soil coverings composed of mineral materials may be considered as "mulch". However, the volumes are indicated as relatively low (25,000 m^3 in France and 40,000 m^3 in Italy). We assume that, from the stakeholder responses, most other member states do not regard mineral coverings on soil as mulch.

A4.4.2 *Minerals as constituent of Soil Improvers*

Soil improvers are also most typically derived from composted biowaste applied to soils. Blends with various components are rare. We consider that it is unlikely to be a soil improving activity to include substantial amounts of inorganic materials to soil. Soil improvers are generally organic materials, added to provide additional soil organic carbon. However, the addition of a mineral such as sand to soil of very poor quality with high clay content might be considered as soil improving, by increasing soil drainage. Adding lime to soils to adjust (increase the soil pH in acid soils) is also a common practice and might be considered as a soil improver. An effective microbial sanitation process for sewage sludge is to mix the sewage sludge with lime. The resultant high pH and heat evolved as the lime dissolves provides the sanitation. The resultant limed sludge then can be used on acid soils to provide both fertiliser and soil pH adjustment.

The definition of soil improver likely to be applied in the revision of the Fertiliser Directive includes an overall definition and splits this into organic and inorganic soil improvers and specifically excludes lime (DGEI 2012).

- Soil improver means a material added to soil in situ whose main function is to maintain or improve its physical and/or chemical and/or biological properties, with the exception of liming materials.
- Organic soil improver means a soil improver containing materials of biological origin and whose main function is to increase soil organic matter content.
- Other soil improvers means a soil improver that maintains or improves soil physical properties or decrease soil pH without addition of organic matter.

During the stakeholder consultation carried out as part of this project, the following data on mineral use in SI was received:

- Netherlands – A total of 0.5 Mm^3 SI was reported to be consumed in total, while 0.05 Mm^3 perlite is used in SI by professional growers.
- France – A small amount of recycled mineral wool was reported to be used in SI by amateur gardeners, but no specific quantity was provided.

No other comments or data were received. In our view the exclusion of inorganic minerals from soil improvers is not justified and should be included within EU Ecolabel SI.

A4.4.3 *Minerals as constituent of Growing Media*

Growing media are products that are generated for specific applications and, for some of those, the inclusion of inorganic constituents may be beneficial and provide the quality for the GM. The inclusion of inorganic constituents derived from natural sources in growing media therefore seems a reasonable proposition to consider. Additionally, for some applications such as in commercial horticulture growing plants in hydroponics involves the use of a wholly mineral growing medium.

During the stakeholder consultation carried out as part of this project, the following data on mineral use in mulch was received:

- Italy – Total volume of GM consumed was reported to be 3 Mm^3, with approximately 15% being minerals (5% perlite, 5% vermiculite and 5% pumice). This is broken down as follows:

- Pumice - 120,000 m^3 for amateur gardening, 240,000 m^3 for professional gardening, 20,000 m^3 for private sector landscaping and 20,000 m^3 used by public sector and local authorities
- Perlite - 6,000 m^3 for amateur gardening, 12,000 m^3 for professional gardening, 1,000 m^3 for private sector landscaping and 1,000 m^3 used by public sector and local authorities
- Clay - 600 m^3 for amateur gardening, 1,200 m^3 for professional gardening, 100 m^3 for private sector landscaping and 100 m^3 used by public sector and local authorities
- Expanded clay 600 m^3 for amateur gardening, 1,200 m^3 for professional gardening, 100 m^3 for private sector landscaping and 100 m^3 used by public sector and local authorities
- Vermiculite - 600 m^3 for amateur gardening, 1,200 m^3 for professional gardening, 100 m^3 for private sector landscaping and 100 m^3 used by public sector and local authorities

- Netherlands - Total volume of GM consumed is 4 Mm^3, of which 25,000 m^3 is vermiculite and 100,000 m^3 is perlite, with perlite mainly used in peat mixes and vegetable growing in glass houses.
- Denmark – Total volume of GM consumed was reported to be 620,000 m^3, with 350,000 m^3 being used by the amateur market and 270,000 m^3 by professionals. Of this 3,000 m^3 is virgin mineral wool, 3,500 m^3 is perlite used for amateur gardening and 8,000 m^3 used for professional gardening and 6,000 m^3 is clay used for amateur gardening.

These responses indicate widespread inclusion of minerals in growing media.

A4.4.4 *Minerals in EU Ecolabel for SI, GM and mulches*

In conclusion, our view is that minerals should be accepted as constituents of EU Ecolabel SIs and GMs but excluded from EU Ecolabel mulch. The remainder of this document then considers the use of extracted minerals in SI and GM only.

A4.5 What level of (extracted) mineral if allowed would be acceptable

On the assumption that mineral constituents were to be permitted as a constituent of GM and SI, a proposal is required to define what limit (if any) might apply to the percentage of mineral in these products, and if any additional limit or restriction should be placed on the source of the mineral. The current EU Ecolabel criteria for SI and GM do not describe any limits for the mineral constituents, only that they are declared and are not from notified sites. Our view is that SI can potentially contain mineral materials, but the requirement of an organic matter content of at least 20% (see “Other Criteria” in Section A7) must be taken into consideration. This also applies for GM, except for GM used in closed-cycle recirculating hydroponic systems, where 100% mineral material is proposed to be permitted. Whenever mineral materials are used, a key question is whether there should be any restriction on source.

Mineral constituents may be derived from recycled waste sources as well as being extracted from natural resources. Within the context of EU Ecolabel, our position would be that an assessment is required of the environmental impacts of extraction versus recycling, in order to define proposals.

A4.5.1 *Units*

Given the likelihood that different constituents would have different and variable moisture contents and different bulk densities, it would be inappropriate to express the percentage in terms of volume or wet weight.

Our preference is that it should be expressed as a percentage on a dry matter basis, which would be a precise measurement.

A4.5.2 *LCA studies*

Some LCA studies have examined the environmental impact of growing media and soil improvers containing inorganic mineral constituents from various sources, including those from mineral extraction. These are discussed below.

A4.5.3 *EPAGMA (2012)*

Scope: The study carried out by Quantis on behalf of EPAGMA in 2012 was a comparative LCA of growing media only. Five different applications were considered, namely fruity vegetables, pot plants, young plant production using loose-filled trays, tree nursery stock and hobby market. Mixes for the same application were compared with each other. Examined components were peat, bark, perlite, green compost, wood fibres, coir pith, mineral wool and rice hulls.

Environmental indicators: Four environmental indicators were used in this study:

1. Climate change. This refers to the impact on global warming and is measured in kg CO_2 eq/m^3.

2. Resources. The two categories contributing to this indicator are mineral extraction and primary non-renewable energy consumption. Impact is measured in MJ/m^3.

3. Human health. Human toxicity (carcinogenic and non-carcinogenic effects), respiratory effects (inorganics and organics), ionizing radiation and ozone layer depletion are the categories looked into when assessing the impact to human health. The damage is measured in DALY/m^3, where DALY stands for Disability Adjusted Life Years.

4. Ecosystem quality. This indicator quantifies the impact on the natural development and occurrence of species within their habitats and consists of aquatic ecotoxicity, terrestrial ecotoxicity, acidification, eutrophication, terrestrial acidification/nitrification and land occupation. Impact is measured in PDF/m^2/y/m^3, where PDF stands for Potentially Disappeared Fraction of species.

Functional unit: The chosen functional unit is the following: "To provide 1 m3 (EN 12580) of growing media for each of the following five areas of application: fruity vegetables, pot plants, young plant production using loose-filled trays, tree nursery stock, and hobby market."

System boundaries: The LCA includes all processes from raw material extraction to the end-of-life stage of all product constituents. The product system is divided into six principal life cycle stages: production, delivery, processing, distribution, use and end of life.

Results: A perlite mix (20% perlite, 80% white peat v/v) was tested for two of the applications, namely GM for pot plants and GM for young plants using loose-filled trays. The perlite mix was found to have the lowest impact on climate change, human health and ecosystem quality amongst GM for pot plants, while it also had the lowest impact on human health and ecosystem quality amongst GM for young plants using loose-filled trays. The results are presented in Figure 0-15 and Figure 0-16 below.

Figure 0-15: Impact of GM for pot plants on environment and human health - Mix 2.2 contains 20% v/v perlite. (EPAGMA 2012)

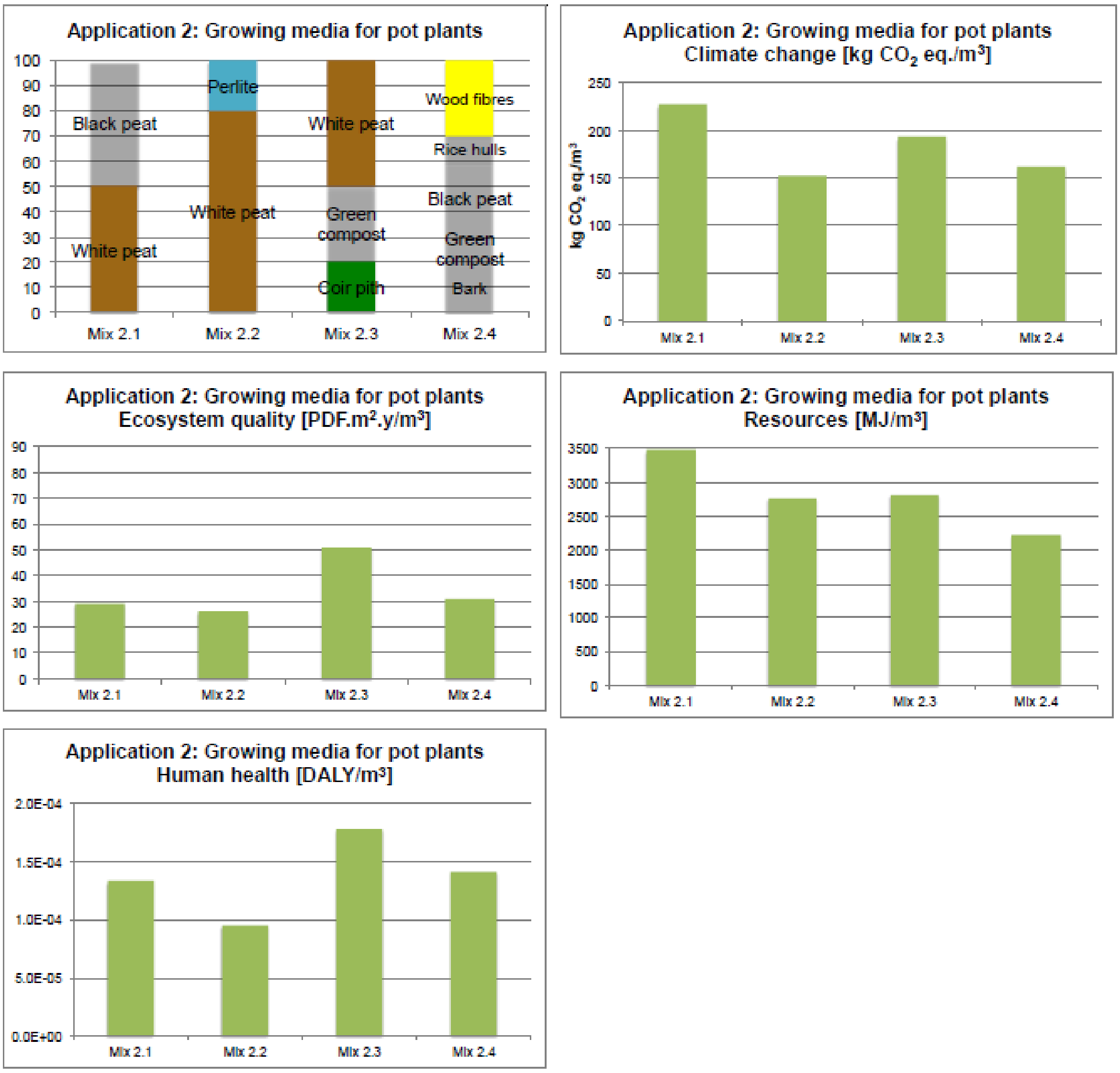
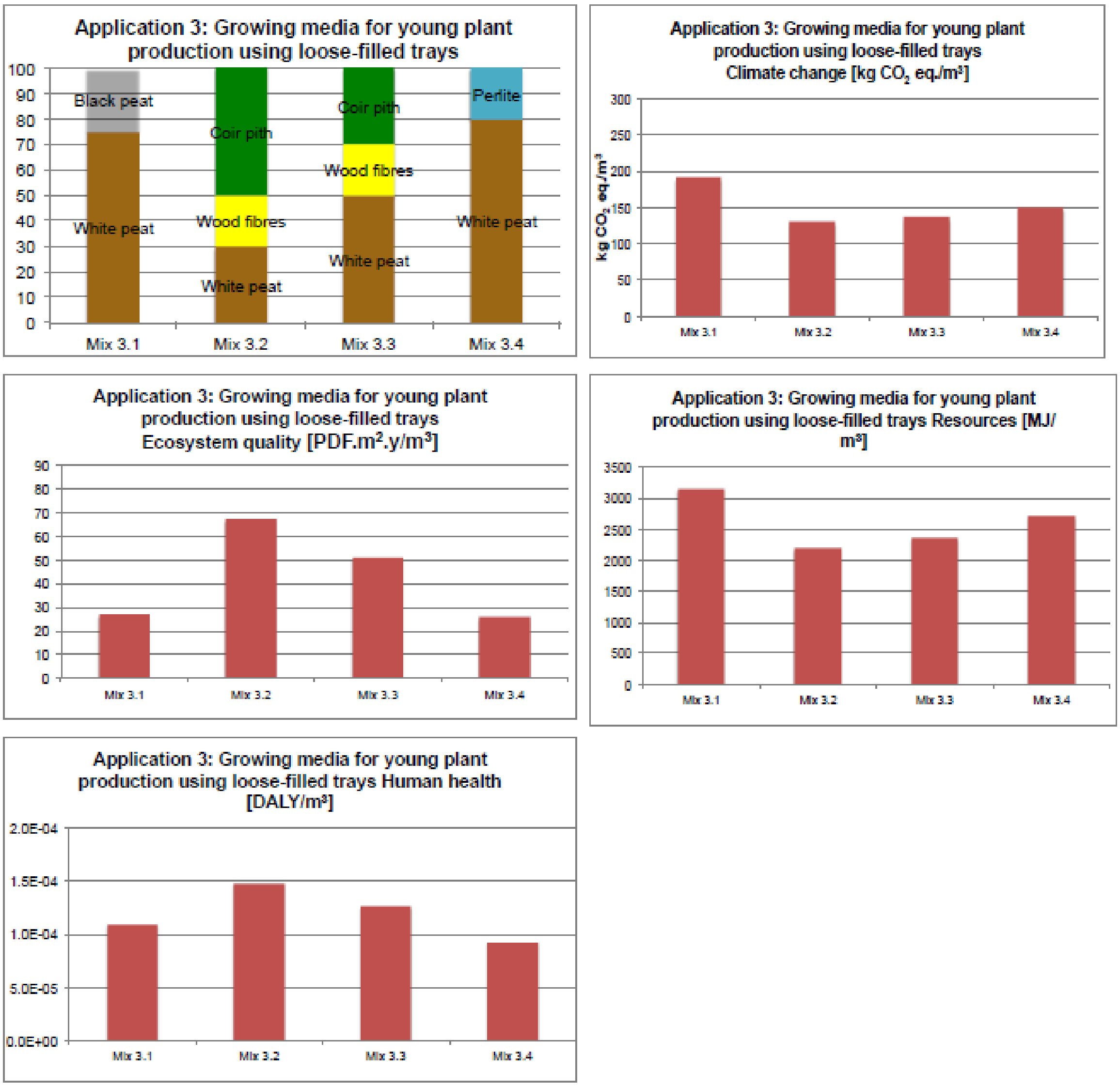


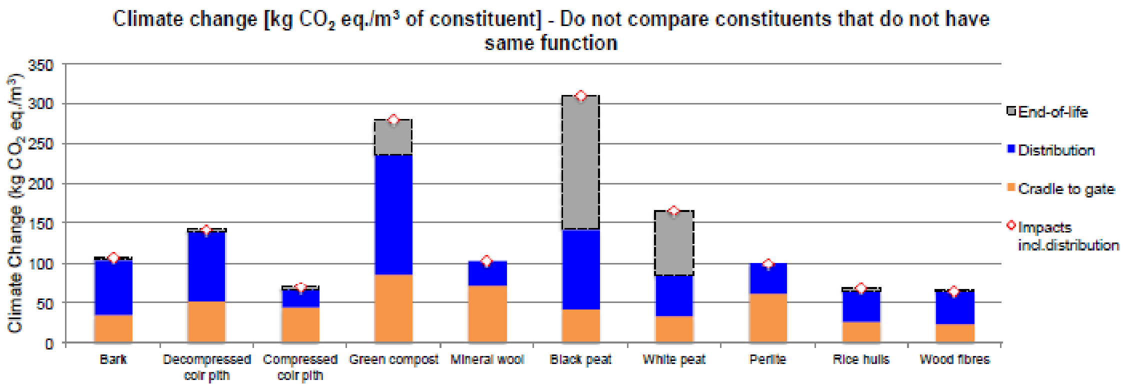
Figure 0-16: Impact of GM for young plant production using loose-filled trays on environment and human health - Mix 3.4 contains 20% v/v perlite. (EPAGMA 2012)



It was reported that energy consumption for perlite expansion contributes to 70% of the climate change impact calculated in the study. Blasting contributes more than half of the impact on ecosystem quality, while, for human health, the transport and processing stages have the highest impact. The method used to calculate the impact of each lifecycle stage on the environment and human health has not been described in the report. However, it is stated that primary and secondary data from perlite suppliers were used and covered extraction, transport and processing.

Figure 0-17 presents the estimates climate change impact of each individual constituent. However, the report specifies that only constituents that have the same function should be compared to each other (ie. peat, coir and mineral wool for application 1).

Figure 0-17: Results for Climate change indicator for 1 m3 of the different constituents.



As shown in Figure 0-17, around 60% of the climate change impact of perlite results from its cradle to gate life stage, while 40% occurs as a result of distribution. Note that he data should be used only to compare constituents that are functionally equivalent (i.e. constituents in area of application 1: peat, coir pith and mineral wool).

A4.5.4 *Defra (2008)*

The study assessed the carbon footprint of selected GM constituents, comparing GHG emissions (CO_2, CH_4 and N_2O) from their production, processing, transport and use phase. Two different methods are used for assessing the impact of different constituents: the 'LCA' carbon footprint where all emissions are included in the final total; and the 'offset' carbon footprint, which excludes emissions of carbon dioxide from biogenic materials and deducts emissions associated with stored carbon.

Perlite and vermiculite are mined and processed globally, although the main sources are South Africa, Greece, China and the United States. For vermiculite, a significant number of commercial mines can also be found in Australia, Brazil, Kenya and Zimbabwe. Primary data on many aspects of mining, extraction and processing was difficult to obtain, which resulted in secondary data being used in a number of calculations. Secondary data has been extracted from academic papers, 'grey' reports and the internet. The original remit for this study included quantifying the GHG emissions associated with changes in land use for peat, perlite and vermiculite, but excluded green compost and forestry materials.

Environmental indicators: GHG emissions were used as an environmental indicator for this study and they are expressed in kg of CO_2 equivalent.

Functional unit: The functional unit used throughout this report is the metric tonne (t), meaning 1000 kg, at end-use stage of the life cycle.

System boundaries: The phases considered during the study were the following.

- Changes in land use - The study found that surface mining of perlite ore and vermiculite involves great changes in land use, but, unlike peat extraction, it has no obvious burden of GHG production. It is likely that removing the rock and soil that lies above the ore body (over-burden), prior to blasting, increases emissions of both CO_2 and N_2O, but for how long and in what quantity is difficult to quantify. However, the amounts involved are assumed to be low for each tonne of material produced and are not investigated further. Moreover, as vermiculite ores are extracted from dry and mainly barren landscapes, the mining operation is considered to be GHG neutral.

- Extraction and processing – For perlite, the study takes the average of values for GHG emissions from extraction and processing from two different reports. This includes the diesel and electricity used to extract and process one tonne of the material. For vermiculite, this study assumes that mining and screening of the ore is the same as for perlite.
- Secondary processing – Crude perlite rock contains embedded water which when quickly heated to above 871°C, causes the crude rock to expand as the water vaporizes. The expanded particles are moved out of the furnace and cooled, graded and packed. The study uses information taken from literature and provides some estimates of the energy required and the CO_2 emissions produced during perlite production. Perlite and vermiculite, which require heating to a high temperature in gas fired furnaces for expansion, emit the highest emissions during processing.
- Transport, distribution and retail – Perlite is assumed to be imported mainly from Greece, while vermiculite is impoerted from South Africa. GHG emissions due to fuel use during transport, as well as fuel use for distribution to retailers are used to calculate the total emissions of this phase.
- End of life - End use is different to the preceding organic materials. Both perlite and vermiculite are mineral materials that contain no carbon and are considered a stable substrate under normal conditions. Deterioration (decomposition) of perlite does not release any GHGs.

The system boundary, as specified in PAS 2050, excludes all the GHG emissions associated with capital goods.

Results: The average contribution of the different lifecycle stages to GHG emissions is shown in Table 0-24.

Table 0-24: Average contribution of different lifecycle stages to GHG emissions (reported by volume (kg CO2e m-3))

	Perlite		**Vermiculite**	
	LCA approach	**Offset carbon approach**	**LCA approach**	**Offset carbon approach**
Extraction	8.6% (6)	8.6% (6)	7.7% (5)	7.7% (5)
Processing	69.1% (48)	69.1% (48)	66.2% (43)	66.2% (43)
Transport	22.3% (15.5)	22.3% (15.5)	26.2% (17)	26.2% (17)
End use	No impact	No impact	No impact	No impact
Total	**100% (69.5)**	**100% (69.5)**	**100% (65.0)**	**100% (65.0)**

Although perlite and vermiculite do not emit CO_2 during their end use stage, neither do they sequester carbon, so the GHGs emitted during their production and transport stages ensure that they are always contributors to global warming. On the basis of the LCA above a growing medium composed entirely of perlite would have a slightly higher impact than one composed entirely of vermiculite. Both the LCA and the carbon approach followed in this study concluded that processing for expansion accounted for the highest impact on GHG emissions (69% for perlite and 66% for vermiculite), while extraction only accounted for 8.6% for perlite and 8% for vermiculite. Transport of vermiculite from South Africa had a only a slightly

higher CO2 emission for transport (127 kg CO2/t) compared with perlite (91 kg CO2/t) largely because shipping emissions are lower than road haulage.

Therefore there is no significant improvement that we can see if Ecolabel prohibited the use of vermiculite and promoted the use of perlite as substitute.

A4.5.5 *Use of recycled/reused material*

There was a lack of information and data on the impact of recycled/reused minerals in comparison to the impact of virgin materials or the extent to which constituents like perlite, vermiculite, pumice and clay can be recycled for use in horticulture.

A study by Co Concept (2008) mentioned that there are not many options for recycling mineral constituents. Moreover, Hanna (2010) reported that planting greenhouse tomatoes in the same perlite more than once requires reconditioning to restore medium loose structure, desalination to remove excess salt and disinfection to guard against pest contamination. However, Hanna reported that reconditioning and treating perlite with hot water can be achieved, so even though using recycled materials could be challenging, reusing mineral constituents more than once could be feasible provided that they are adequately reconditioned.

A4.5.6 *Conclusions from LCA and proposed limit*

On the basis of the studies discussed above, we conclude that using some waste derived inorganic sources and recycling spent inorganic materials used in growing media is possible. However, recycling spent wholly mineral GM requires significant processing to enable its re-use. One of the main environmental impacts of using minerals from extracted raw sources is the processing of the raw materials into the mineral product, such as perlite. However, there is insufficient data to indicate whether this is a significantly greater environmental impact than using waste materials or re-processing spent mineral GM. We consequently propose that there is no specified limit on the amount or source (recycled waste or raw extracted material) of minerals used in GM and SI although there would be some limitation in some cases as a result of proposals for limitations on organic matter contents (see Section A7.5).

A4.6 What sources of extracted mineral might be considered acceptable

A4.6.1 *Mineral extraction for GM, SI and mulches*

Extracted minerals are currently produced in significant quantities, and the EU currently produces about 10 billion tonnes of extracted minerals annually[20]. Table 0-25 shows the global extraction tonnages of selected relevant minerals used in GM and SIs. It also shows the global extraction tonnages of minerals that are used widely in building materials and are thus extracted in significantly higher quantities.

[20] http://ec.europa.eu/enterprise/sectors/metals-minerals/non-energy-extractive-industries/construction-minerals/index_en.htm

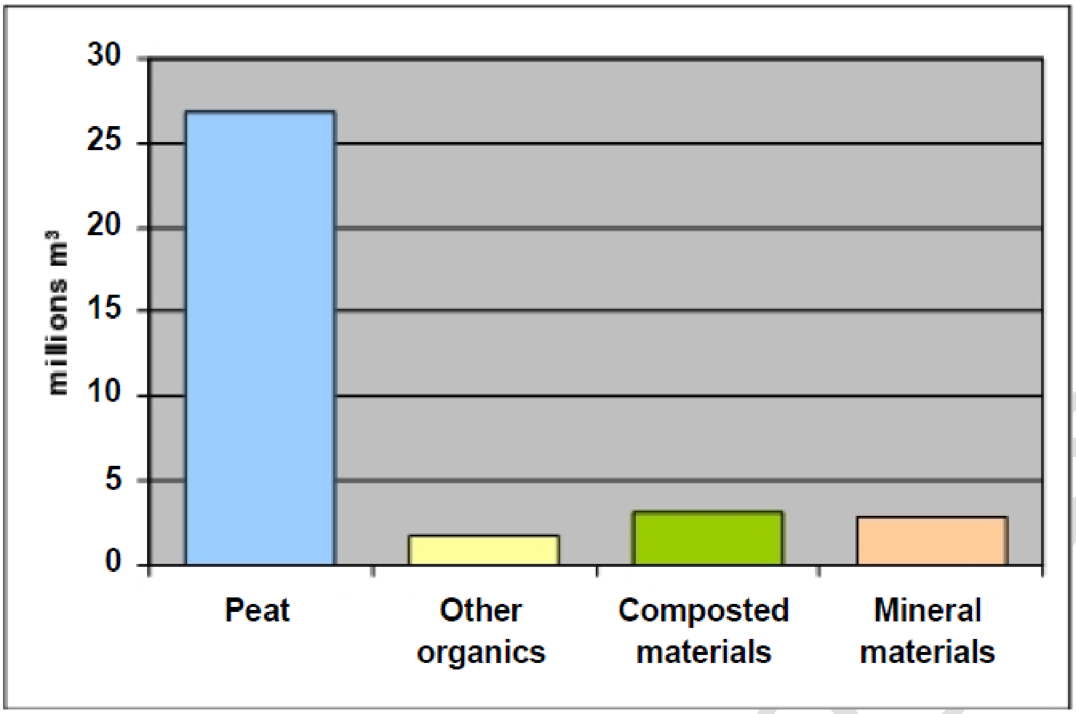
Table 0-25: Global extraction of some minerals (USGS, 2013)

Mineral	Global extraction 2011	Global extraction 2012 (estimated)	Main countries of origin	Uses
Perlite	1.77 Mt	1.7 Mt	Greece, USA, Turkey, Japan	Ceramics, hollow glass industries, production of explosives, horticulture, filter manufacture, electrode manufacture, cement production, zeolite industry, mineral fibre manufacture, metallurgical operations and insulation
Vermiculite	0.54 Mt	0.57 Mt	South Africa, China, USA	Horticulture, insulation, concrete production
Pumice and pumicite	18 Mt	17 Mt	USA, Iran, Italy, Saudi Arabia, Turkey	Abrasives, construction, horticulture, landscaping, concrete production
Clay (kaolin, bentonite and Fuller's Earth)	46.5 Mt	47 Mt	USA, Brazil, Mexico, Canada, UK	Pottery, brick and cement manufacturing, horticulture, pesticides, refractory products
Industrial Sand And Gravel (Silica)	138 Mt	140 Mt	USA, Canada, Mexico	Construction, landscaping, glass production, fiberglass insulation, foundry, ceramics, filters, cement production

Most extracted minerals come from sites that do not have special protected status, i.e. sites that are not Natura 2000 sites or Special Areas of Conservation (SACs), or sites that fall under Council Directive 92/43/EEC or the United Nations' Convention on Biological Diversity.

Co Concept (2008) included the following figure (Figure 0-18) with regards to the quantity of GM constituents used in the EU. This indicates that in general mineral materials comprise a low fraction of total GM production.

Figure 0-18: Quantity of different types of materials used for manufacturing GM in major producer countries. (Co Concept 2008)



A4.6.2 *Conclusions from mineral sources*

In conclusion we propose that minerals can be used in GM and SI under EU Ecolabel provided they are not extracted from:

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.

However, minerals would be excluded from EU Ecolabel mulches.

A4.7 What reporting/declarations should be required

We propose that the producer of the GM and SI should declare the type, amount and source of the mineral used in the product and if derived from raw mineral sources that it does not come from a protected site.

A4.8 EU Ecolabel Proposals

In conclusion, our proposals for extracted minerals are that such minerals can be used in GM and SI under EU Ecolabel, provided that they are not extracted from:

- notified sites of Community importance pursuant to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora,

- Natura 2000 network areas, composed of the special protection areas pursuant to Council Directive 79/409/EEC on the conservation of wild birds, and those areas under Directive 92/43/EEC together, or

equivalent areas located outside the European Community that fall under the corresponding provisions of the United Nations' Convention on Biological Diversity.

We would propose that extracted minerals are not permitted in EU Ecolabel mulches.

A4.9 References

Council Regulation (EC) No 66/2010 on the EU Ecolabel [2010] OJ L27/1 (Ecolabel Regulations)

Council Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals [2006] OJ L396/1 (REACH)

Council Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures [2008] OJ L353/1 (CLP)

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A5. Potentially Toxic Elements (PTEs)

A5.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included the potential revision of the potentially toxic elements (PTEs) limits for SIs and GMs. The scope of this project also includes development of an EU Ecolabel for mulches for which the inclusion of PTE limits are also considered here.

Recommendations for the revised parameters are included in the main report. This Annex provides the justification for the revised proposed limits for PTEs (which include heavy metals).

A5.2 Background

Requirement to revise EU Ecolabel PTE limits for Soil Improvers and Growing Media

JRC/IPTS are currently developing proposals for a revision of the EU Ecolabel criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-26) that should be taken into consideration at the next revision, which included heavy metals.

Table 0-26: Issues to be addressed in revision of Soil Improver and Growing Media EU Ecolabel criteria

Issues to be addressed	**Growing Media**	**Soil Improvers**
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

In this study, we have considered the proposed revision of PTE limits (which include heavy metals) in GM, SI and mulches.

Potentially Toxic Elements

The current EU Ecolabel for GM (EC 2006b) and SI (EC2006a) both refer to hazardous substances and contain limits (Table 0-27) that includes the non-metal element (fluorine) as well as heavy metals. The text in Section 2.4.5 of the SI manual refers to GM and is assumed to be a typological error in these documents. In the revision we propose to use the term potentially toxic elements (PTE) for these elemental substances and thereby encompass both metal and non-metal elements.

Current Ecolabel Limits for GM and SI

Table 0-27 shows the current limits for PTEs (heavy metals) in EU Ecolabel for GM and SIs. It can be seen that there are two sets of limits and that the first applies in all cases, while the second applies if the SI or GM contains material from industrial processes. This may be a cause for confusion and inconsistency as to what constitutes an industrial process and whether limits apply to just constituents, organic constituents or the final GM or SI product.

Table 0-27: Limits (mg/kg of dry weight) for PTEs in the current EU Ecolabel criteria for SI and GM

Parameter	GM Limit	SI Limit	Condition
Zn	300	300	In the organic growing media constituents, the content of the following elements shall be lower than the values shown *Note this is the same text for GM and SI*
Cu	100	100	
Ni	50	50	
Cd	1	1	
Pb	100	100	
Hg	1	1	
Cr	100	100	
Mo	2	2	Limit values are applicable to organic constituents only. Maximum allowable concentrations are applied only to products containing material from industrial processes, such as rice hulls, peanut hulls or sludges from the agro-food industry. *Note this is the same text for GM and SI*
Se	1.5	1.5	
As	10	10	
F	200	200	

The declaration required (same in both GM and SI) indicates:

*"**Declaration hazardous substances (criterion 2) (organics only).** A declaration must be included for the final product but also for every sludge component applied in the product"*

The presentation of the PTE limits in the current EU Ecolabel for GM and SI are therefore the same, and (in our opinion) are lacking in clarity and accuracy. These will be addressed in this proposed revision.

Proposed revision scope

In this revision, we have considered several factors that we think should be revised and have developed justifications for our proposed revisions. These factors are:

- What are the PTEs that would be limited
- Whether limits are applied to constituents and/or final products
- What minimum monitoring frequency should be applied
- What limits for the PTEs should be applied
- What test method should be applied

- What reporting/declarations should be required

A5.3 Factors considered in proposed revised PTE limits

A5.3.1 *Hazard and risk considerations*

Exposure to hazards

Setting suitable limits should consider the hazard and the risk of harm from exposure to the hazard. For SI, the principle exposure pathways when applied to agricultural land or in the home garden include:

- Ingestion or adsorption through handling.
- Accumulation in the soil to levels causing harm to soil biota and soil fertility.
- Incorporation into the food chain through uptake into plants used directly as food for human consumption or as fodder for animals.
- Run off into surface and ground water.

For GM which may be used by the householder for growing crops directly there is the risk from handling the GM and the hazard being taken up by the food crop and consumed. Additionally, the householder may apply the spent GM to their garden soils potentially raising the PTE content and increasing the risk from crops grown in the soil.

Limits should be applied that reflect an acceptable level of risk through any exposure pathway.

Bioavailability of elements

In the case of PTEs, a key consideration is the bioavailability of the element in question. Elements may be present in different forms, as free ions in solution, solid salts, ions adsorbed onto solid particles, free element, and as integral components of mineral constituents of soils. In general, it is only the free soluble ion that is of concern, as this is the form which is taken up by organisms. The distribution of any element between the different forms reflects its bioavailability, as does the ease with which one form may change into another, e.g the rate with which a solid salt may dissolve, forming free ions in solution. Bioavailability is affected by several external factors, such as pH and the solubility of different salts of the element. Hence, many soil metals limits are typically lower at lower pH values which reflect the greater solubility and therefore greater bioavailability of metal salts at lower pH values.

It is important to appreciate in this context that limits for elements are based on total element concentrations and do not differentiate between bioavailable forms and non-bioavailable forms. Hence, total elemental analysis of materials like soils includes the element forming the soil mineral matrix.

Elements as nutrients

It should also be appreciated that some PTEs are also essential nutrients and that they are only harmful in excessive concentrations. Elements such as Zn, Cu, Ni and Mo that are limited in the current EU Ecolabel criteria for SI and GM are also essential trace elements.

A5.4 What are the PTEs that should be limited

A5.4.1 *PTEs limited in current standards and specifications*

The current EU Ecolabel criteria for GM and SI include the PTEs in Table 0-27. It is possible that GM and SI will contain other elements that are potentially toxic and for which limits might be included in revised criteria. The current list includes the PTEs commonly regulated by most organic waste regulatory legislation. For example, the UK the Code of Practice for Sewage Sludge applications to agricultural soil (COPSS) includes the same full list of elements as the current EU Ecolabel criteria.

The most recently proposed limits for PTEs in composts and digestates as End of Waste (EoW) Criteria for Biodegradable Waste (IPTS 2013) include fewer elements, i.e. Zn, Cu, Ni, Cd, Pb, Hg, and Cr, compared with the current EU Ecolabel for GM and SI elements. The same document shows the PTE limits for composts and digestates from several member and other states. This indicates that no additional elements to those covered by the current EU Ecolabel are specified (see Section A5.11), although some do specify limits for chromium as total chromium and/or the most toxic form of chromium (Cr(VI)) in some composts (Table 0-28).

Table 0-28: National limits for forms of chromium total and Cr VI in composts (mg/kg dry matter)

Country	Regulation for compost use in agriculture	Cr (Total)	Cr (VI)
Spain	Real decree 824/2005 on fertiliser Class B	250	0
Greece	KYA 114218, Hellenic Government Gazette, 1016/B/17-11-97 [Specifications, framework and general programmes for solid waste management]	510	10
Italy	Laws on fertilisers (L 748/84: and: 03/98 and 217/06) for BWC/GC/SSC		0.5

According to UK's Health Protection Agency (HPA 2007), ingestion of large quantities of Cr(VI) can lead to severe respiratory, cardiovascular, gastrointestinal, hepatic and renal damage and potentially death. Cr(VI) compounds are classified as carcinogenic to humans by EPA[21], NIOSH[22] and IARC (2012), while Cr(III) compounds are not classifiable as to their carcinogenicity to humans. Moreover, Cr(VI) is a readily absorbed form of chromium by both inhalation and oral routes. The Health and Safety Executive (HSE 2011) has set a workplace exposure limit for Cr(VI) compounds of 0.05 mg/m^3 for an 8-hr TWA reference period. No significant effects of Cr(VI) on the environment have been reported in literature. Cr(VI) can be measured using ion chromatography, although the majority of existing methods are used to measure Cr(VI) concentration in air and water.

[21] http://www.epa.gov/iris/subst/0144.htm

[22] http://www.cdc.gov/niosh/topics/hexchrom/

Bolan *et al.* (2003) and Lee *et al.* (2006) reports that the inclusion of composts and other organic amendments in soil reduces the risk from Cr(VI) by encouraging its reduction to the much less toxic Cr(III) form. The fraction of Cr(VI) of the total Cr content is likely to vary. Labardo *et al.* (2003) estimated that Cr(VI) was about 6% of the total Cr content in composts they tested.

The initiative for the revision of the Fertiliser Regulations (EC 2003/2003) includes the aim of incorporating organic fertilisers as well as inorganic fertilisers. A recent study (DGEI 2012) includes an evaluation of the PTEs in fertilisers and proposes that the same elements as in the End of Waste Criteria proposals are adopted.

<u>Other PTEs of potential concern</u>

Most heavy metals and many other elements not presently covered by the current EU Ecolabel criteria would be toxic at high levels. Additional PTEs should only be considered if there are significant identified risks for exposure to harmful levels through the use of GM, SI and mulches. We have not found significant reports raising concerns with respect to other PTEs (that are not already covered in the current EU Ecolabel list of PTEs) in SI, GM and mulches.

However, other PTEs are listed within the Water Framework Directive that could potentially be present in GM, SI and mulches, and enter water sources following application and use of these products.

A5.4.2 *PTE limits in existing and imminent relevant legislation*

<u>End of Waste Criteria for Biodegradable Waste</u>

The limits proposed in the 3rd Working Document on EoW are listed in Table 0-29 below. The latest draft of the EoW limits however indicates less stringent limits for some PTEs (Zn and Cu). Limits in the current EU Ecolabel are equal to the ones proposed for EoW for Ni, Hg and Cr and lower for Zn, Cu, Cd and Pb.

Table 0-29: Limits (mg/kg DM) for PTEs as proposed in EoW Criteria for Biodegradable Waste

Element	EoW Limit 3rd Working document (2012)	EoW Limit Latest (2013)	Current EU Ecolabel Limit for SI and GM
Zn	400	600	300
Cu	100	200	100
Ni	50	50	50
Cd	1.5	1.5	1
Pb	120	120	100
Hg	1	1	1
Cr	100	100	100

Proposed testing is required on the final product, just after the composting/digestion phase and prior to any mixing with other materials. Compliance testing has to be carried out by external laboratories accredited for

this purpose, while the CEN/Horizontal standards for sampling and analysis have to be applied as far as available.

Sampling and analysis frequency indicated in the Draft Final Report must be as follows:

- The default sampling and analysis frequency is given by the formula: number of analyses per year = amount of annual input material (in tonnes)/10000 tonne + 1;
- A minimum measurement frequency is proposed for the recognition year: 4 samples or more (except for the smallest plants), as well as for the following years: 2 samples or more (except for the smallest plants);
- The smallest plants should be able to benefit from reduced sampling requirements: one sample for every 1000 tonnes input material, rounded to the next integer, is required in the recognition year for plants up to 3000 tonne annual input and only one yearly measurement is required for plants with an annual input up to 1000 tonne in subsequent years;
- All mandatory measurement frequencies are capped at 12 measurements per year.

It is essential to ensure that revised EU Ecolabel limits are consistent and compatible with EoW limits and, in particular, are not any more relaxed. Less stringent limits in the EU Ecolabel could lead to waste-derived material that does not meet EoW being used in products bearing the EU Ecolabel. Conversely, more stringent EU Ecolabel limits might mean that some waste attaining EoW status would not meet the EU Ecolabel limit. In our view, whilst the former is not acceptable, we think that more stringent limits for EU Ecolabel compared with EoW should not be ruled out, especially as this would mean that, to be fully aligned with current EoW proposals, some current EU Ecolabel limits would need to be relaxed. For example, relaxing the Zn limit from 300 to 600 mg kg/DM would seem a significant relaxation of EU Ecolabel limits.

Furthermore, it should not be permitted to dilute materials that do not meet EoW or EU Ecolabel limits with other materials so that the final product complies with the criteria.

<u>Fertiliser Regulations</u>

The Fertiliser Regulation (*Regulation (EC) No 2003/2003)* is currently being reviewed with the likely inclusion of SI and GM, and the limits proposed for PTEs are presented in Table 0-30. These include As and Cr(VI), in addition to the PTEs being discussed in the development of EoW criteria for biodegradable waste.

Table 0-30: Proposed PTE limits in the revised Fertiliser Regulation (mg/kg DM) (EC 2013)

Element	**Cd**	**Hg**	**Ni**	**Pb**	**As**	**Cr**	**Cr(VI)**	**Cu**	**Zn**
Inorganic fertilisers – primary and secondary	3/60 [†]	2	120	150	60	-	2	-	-
Inorganic fertilisers micronutrient	200	100	2000	600	1000	-	-	-	-
Organic fertilisers	1.5	1	50	120	-	100	n/s [*]	200	600

Element	Cd	Hg	Ni	Pb	As	Cr	Cr(VI)	Cu	Zn
Organo-mineral fertilisers	3	2	90	200	120	-	(‡)	-	-
SI	1.5	1	50	120	-	100	n/s (*)	200	600
GM	Not yet decided								
Plant biostimulants	3	1	120	120	-	-	-	200	200

(*) Not specified - but to be applied only to products from the leather industry

(†) 3 for products containing less than 5% P2O5 - 60 for products above 5% P2O5

(‡) Standard in development

Sewage Sludge Directive

In 2010, the Commission launched a study for the revision of the Sewage Sludge Directive (Directive 86/278/EEC). The current and proposed PTE limits are presented in Table 0-31.

In proposed limits, the moderate option for sewage sludge refers to introducing certain more stringent standards than the ones already existing in the Directive for heavy metals, some organics and pathogens. The stringent option refers to introducing more stringent standards across all substances and bans on application of sludge to some crops.

Table 0-31: Limit values for concentrations of PTEs in Sewage Sludge

	Current limits		**Proposed limits**			
	Values for concentration in soils to which sludge is applied (soil with a pH of 6 to 7) (mg/kg dry matter in a representative sample)	Concentration of heavy metals in sludge for use in agriculture (mg/kg dry matter in a representative sample)	Moderate option for SS (mg/kg dry matter)	Stringent option for SS (mg/kg dry matter)	ECN proposal for compost (mg/kg dry matter)	JRC proposal for compost (mg/kg dry matter)
Cd	1-3	20-40	10	5	1.3	1.5
Cr total	-	-	1 000	150	60	100

Cu	50-140	1,000-1,750	1 000	400	110	100
Hg	1-1.5	16-25	10	5	0.45	1
Ni	30-75	300-400	300	50	40	50
Pb	50-300	750-1,200	750	250	130	120
Zn	150-300	2,500-4,000	2,500	600	400	400

An important part of the sewage sludge regulation is that it includes limits on the metals content in soils which must not be exceeded through the application of sewage sludge. This provides a mechanism for controlling the risks from the application of sewage sludge to agricultural soils such as a SI.

EU Water Framework Directive

Annex X of the Water Framework Directive (Directive 2000/60/EC as amended by Directive 2008/105/EC) provides a list of priority substances that can present significant risks to the aquatic environment. Discharge or emission of those substances to the aquatic environment is being phased out across the EU and, since the application of materials to soil can be a route for contamination of surface and ground waters, any pollutant limits set under the EU Ecolabel should take those substances into account. A number of PTEs are included in the list of priority substances. Maximum limits are provided for the concentration of each substance in surface waters and these are presented in Section 0 of this report. As the limits are applicable to surface water rather than the soil or any leachate, it is not possible to translate them into specific limits for SI and GM. However, it is noted that all PTEs included in the list of priority substances, namely Pb, Cd, Ni, Hg and their compounds, are included in the EU Ecolabel revision.

National Standards

Section A5.11 shows the PTE limits of many EU National Standards for composts, digestates, and other organic soil amendments used in agriculture such as sewage sludge. These indicate that, with some exceptions, the same PTEs are limited as in the current EU Ecolabel criteria (see Section A5.4.1). Table 0-32 indicates the range of the national limits and shows that the lowest value in several of these standards is lower than current EU Ecolabel limits for SI and GM, but that the current EU Ecolabel limits are at the low end of the ranges.

Table 0-32: Lowest PTE limits in existing national standards

Element	**EU Ecolabel SI&GM limit (mg/kg dry matter)**	**National limit range (mg/kg dry matter)**	**Country with lowest limit value**
Zn	300	200 - 4000	Austria, Spain, Ireland, Slovenia, UK
Cu	100	70 - 1000	Austria, Germany, Spain
Ni	50	20 - 200	Belgium, Netherlands

Cd	1	0.7 - 7	Austria, Spain, Ireland, Slovenia, UK
Pb	100	45 - 750	Austria, Spain, UK
Hg	1	0.3 - 16	Netherlands
Cr	100	50 - 1000	Latvia

A5.5 Stakeholder Consultation feedback

Stakeholders were asked whether they agree with the existing PTE limits in the EU Ecolabel and, if not, whether they would propose alternative limits. The feedback received is summarised in Table 0-33.

Table 0-33: Stakeholder Consultation feedback on PTEs

PTE	Existing limit (mg/kg DM)	GI limit		SI limit	
		% Agreed	% Disagreed (Proposed alternative limits)	% Agreed	% Disagreed (Proposed alternative limits)
Zn	300	46%	17% (400, 600 and 1500 mg/kg DM)	42%	25% (400, 600 and 1500 mg/kg DM)
Cu	100	42%	21% (150, 400 and 600 mg/kg DM)	38%	29% (150, 200, 400 and 600 mg/kg DM)
Ni	50	54%	1% (80 and 100 mg/kg DM)	58%	1% (80 and 100 mg/kg DM)
Cd	1	38%	42% (1.5 mg/kg DM)	38%	29% (1.5 mg/kg DM)
Pb	100	46%	17% (150 and 200 mg/kg DM)	38%	21% (150 and 200 mg/kg DM)
Hg	1	63%	-	63%	-
Cr	100	42%	17% (50 and 300 mg/kg DM. Also a limit of 0.5 and 3.5 mg/kg DM for Cr(VI) was proposed)	42%	17% (50 and 300 mg/kg dm. Also a limit of 0.5 and 3.5 mg/kg DM for Cr(VI) was proposed)
Mo	2	46%	1% (it was suggested that no limit is needed)	46%	1% (3.5 mg/kg DM or no limit needed)
Se	1.5	38%	17% (it was suggested that no limit is needed)	38%	1% (it was suggested that no limit is needed)
As	10	38%	21% (25 or 40 mg/kg DM or	34%	21% (alt. limits proposed: 20,

			no limit needed)		25 or 40 mg/kg DM or no limit needed)
F	200	42%	13% (it was suggested that no limit is needed)	38%	1% (it was suggested that no limit is needed)

As shown in Table 0-33, for most parameters, the majority of respondents who expressed a view agreed with the existing limits. In the case of Cd, there was a slight majority indicating an increase in the level from 1 to 1.5 mg/kg DM. Respondents that disagreed with the existing limits proposed a higher (more relaxed) limit or suggested that no limit should exist for the respective elements. Some of the limits proposed by some of the respondents were significantly higher that current EU Ecolabel limits, and would also exceed the proposed EoW criteria presented in the Draft Final Report (IPTS 2013), such as the proposed limits for Zn, Cu and Cr of 1500, 600 and 300 mg/kg DM respectively. However, one stakeholder suggested that the limit for Cr should be reduced to 50 mg/kg DM from the current 100 mg/kg DM. Two other respondents suggested the introduction of a limit for Cr(VI) at 3.5 mg/kg DM and 0.5 mg/kg DM respectively.

The remaining stakeholders suggested that any limits for PTEs should be equal to the respective limits set in EoW Criteria, the UK PAS100 compost specification and the revised Fertiliser Regulation.

In our view the general feedback from stakeholders is that current limits (with the exception of Cd) are acceptable to most stakeholders and need only be made more stringent in order to be aligned with other new regulations if such new regulations are more stringent. At present our review of current on-going biodegradable waste and fertiliser regulation developments suggest that such an occurrence is unlikely. A minority of stakeholders would propose limits that were less stringent.

A5.6 PTE contents of typical GM, SI and mulch constituents

The PTE content in several but not all possible constituents of SI, GM and mulches have been investigated and reported in the scientific literature.

A5.6.1 *Composts and digestates*

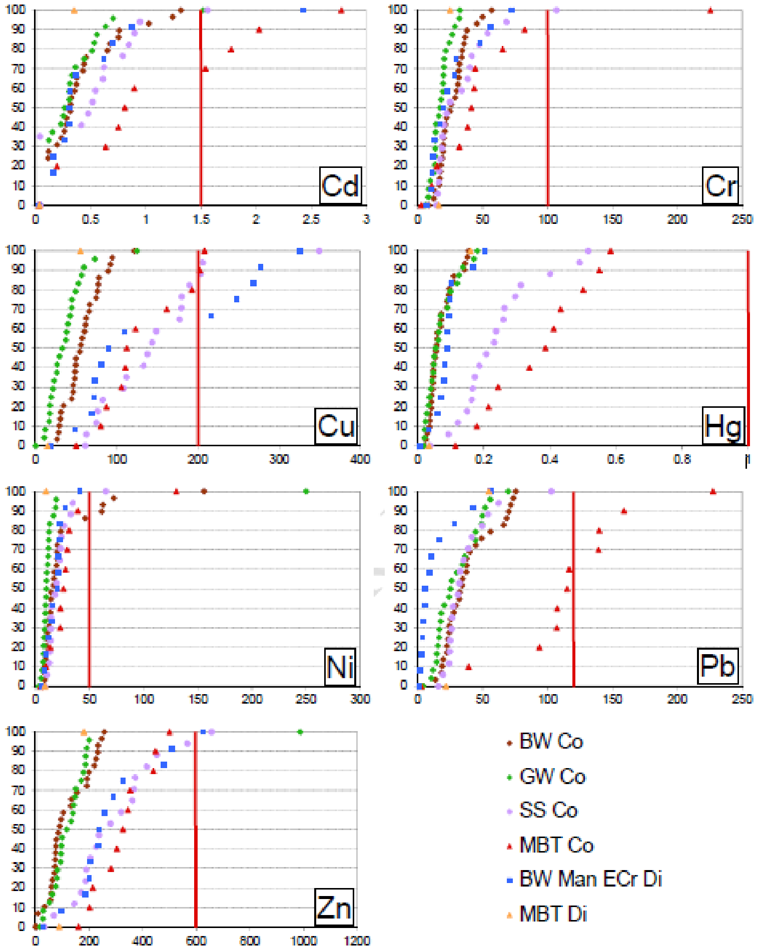
As part of the work taking place on setting EoW criteria for biodegradable waste, a sampling and analysis study was carried out across the EU (IPTS, 2013). The JRC sampling and analysis campaign (JSAC) looked at concentrations of PTEs and other chemicals in compost and digestate samples from different Member States. PTEs were measured by ICP-OES and the results and number of samples analysed are presented in Figure 0-19 below.

The following conclusions were derived from the study with respect to meeting proposed EoW criteria:

- Compost from source separated collection of bio-waste and green waste generally display the lowest overall heavy metal concentrations, except for Pb. Composts produced from source separated collection of green waste nearly always meet the proposed limit values (with sporadic exceedings), but several bio-waste composts exceeded the proposed Ni limits. At the same time, the exceeding values also demonstrate that analysis of the output material is necessary to avoid possible problems related to e.g. contaminated input materials;

- Sewage sludge compost generally meets the proposed limit values for Cd, Cr, Hg, Ni, Pb and Zn (with sporadic exceedings) but tends to have problems in meeting the proposed Cu limits;
- MBT compost generally meets the proposed limit values for Cr, Hg, Ni and Zn (with some sporadic exceedings) but tends to have problems in meeting the proposed limit values for Cd, Cu and Pb;
- Digestate generally meets the proposed limit values for Cd, Cr, Hg, Ni, Pb and Zn (with sporadic exceedings), displaying the generally lowest Pb levels of all materials, but tends to have problems in meeting the proposed Cu limits;
- "Other" samples can hardly meet the proposed limit values and show large exceedings.
- It was concluded that the proposed limit values are feasible targets.

Figure 0-19: PTE in compost and digestate samples collected by JRC (IPTS 2013) [23]



[23] The figure displays the results as cumulative graphs scaled from 0 to 100% of the total sample population for a material type, with every concentration data point representing an actual sample measurement. The horizontal axis represents the concentration (mg/kg d.m.) and the vertical axis the cumulative percentage of samples. The red bar represents the proposed maximum values for EU EoW product quality criteria (Co=compost; Di=digestate; BW=source separated bio-waste & green waste; GW= source separated green waste; SS=sewage sludge; MBT=mechanical biological treatment; Man=manure; ECr=energy crops)

A report prepared by the Working Group on Compost (WG Compost) of the Consulting & Development Technical Office for Agriculture on behalf of DG Env (DG Env, 2004) looked at the PTE content of compost. It was found that PTEs in compost produced from separately collected organic household waste were lower than compost derived from mixed municipal solid waste compost, particularly for Cd, Cu, Pb, Hg and Zn. National investigations indicated that green waste compost tended to have slightly lower PTE concentrations than biodegradable waste compost, while it was observed that, when sewage sludge or animal manure is used as source material, Cu and Zn usually reach higher concentrations. See Table 0-35 for summary of PTE contents.

Boldrin *et al.* (2010), compared the lifecycle emissions of compost and peat and reported that Zn, Cr, Cu and Pb were the PTEs with the highest concentrations in compost, while As, Ni, Se, Cd, Hg and Mo were also present (Table 0-35). Compost was found to leach 3–20 times more heavy metals and other compounds than peat. Andersen *et al.* (2011) and Jintai Su (2009) also reported the presence of As, Cd, Cr, Cu, Ni, Pb, Mo and Zn in compost. Smith (2009) reported that aerobic composting processes increase the complexation of heavy metals in organic waste residuals, and that metals are strongly bound to the compost matrix and organic matter, limiting their solubility and potential bioavailability in soil. Lead is the most strongly bound element and Ni the weakest, with Zn, Cu and Cd showing intermediate sorption characteristics.

In our view, the concentration of PTEs in composts and digestates may vary but, generally, the concentrations in composts derived from source segregated green waste are usually the lowest.

A5.6.2 *Peat*

Boldrin *et al.* (2010) investigated PTEs in the leachate from peat and compared this with leachate from compost. The PTE content of the peat was found to be low and much lower than those found in compost and mainly consisted of As, Ba, Cu, Cr and Pb (Table 0-35). Some information on toxic elements was included in Pakarinen and Tolonen (1976) where Canadian peat was found to have a lower concentration of Pb, Ni, Cr and Fe, while Finnish peat was found to have substantially higher concentrations of Pb (although this was still a relatively low value of about 40 mg/kg DM).

A5.6.3 *Coconut fibre*

Data on heavy metals and other PTE concentrations in coconut fibre were not found in the literature. Evans et al. (1996) reported the presence of Zn and Cu in coconut fibre but did not provide any results.

A5.6.4 *Bark and wood fibre*

A lack of information about PTE was observed for bark and wood waste. WRAP (2006) carried out a detailed analysis of chemical contamination in wood wastes, including wastes used in compost and mulch. Wood wastes were tested for As, Cd, Cr, Cu, Pb, Hg, Ni, Se and Zn. The concentration of PTEs found is shown in Table 0-34, which indicates maximum concentrations for As, Cu and Pb in mulches derived from wood waste can exceed current EU Ecolabel limits.

Table 0-34: Summary of PTE concentrations for mulch and compost (mg/kg DM) (WRAP, 2006)

Surfaces/Mulch

	As	Cd	Cr	Cu	Pb	Hg	Ni	Se	Zn	PCBs	Organo-tins		
n	20	20	20	20	20	20	20	0	20	20	2	1	0
Mean	12.43	0.23	25.30	28.93	81.50	0.13	1.78	<0.5	53.86	3.80	0.15	0.11	<0.05
Max	62.30	0.93	98.40	138.50	508.50	0.37	4.60	0.00	235.60	11.20	0.23	0.11	0.00
Min	0.50	0.09	2.40	2.20	1.60	0.10	0.70	0.00	3.00	0.21	0.06	0.11	0.00
STDEV	15.73	0.19	25.22	31.36	123.04	0.07	1.13	N/A	55.59	3.21	0.12	N/A	N/A

Compost

	As	Cd	Cr	Cu	Pb	Hg	Ni	Se	Zn	PCBs	Organo-tins		
n	8	8	8	8	8	8	8	0	8	8	0	0	0
Mean	8.95	0.33	17.34	16.81	106.13	0.14	7.00	<0.5	64.68	4.36	<0.02	<0.02	<0.05
Max	24.20	0.62	38.30	35.80	220.80	0.43	39.20	0.00	119.10	9.96	0.00	0.00	0.00
Min	2.50	0.11	5.70	4.50	34.30	0.10	1.50	0.00	34.70	0.34	0.00	0.00	0.00
STDEV	7.61	0.17	11.36	10.25	69.90	0.12	13.03	N/A	27.15	3.47	N/A	N/A	N/A

A5.6.5 *Rice hulls*

A few studies referred to the use of rice husks to absorb heavy metals. Foo and Hameed (2009) reported the use of rice husk ash to absorb Zn, Pb, Ni, Cd, Mo and Cr. Tarley and Arruda (2004), Souza *et al.* (2009) and Tanpaiboonkula *et al.* (2010) analysed the ability of rice husk ash to absorb a number of PTEs from sewage sludge, soil and aqueous effluents. However, no sources of information indicating the PTE content of rice hulls were found.

A5.6.6 *Mineral constituents*

No literature on the presence of PTEs in mineral wool, perlite and vermiculite was found.

A5.6.7 *PTEs in GM, SI and Mulches*

Apart from data on materials such as composts and digestates that might be used whole as SI there is little or no readily available literature values on the PTE content of GM, SI and mulches.

<u>Summary of PTE contents</u>

Information on PTE contents is not available for all potential constituents of GM, SI and mulches. Our precautionary approach is to assume that PTEs in materials where no data is available are similar to composts and digestates. This would mean that no EU Ecolabel SI, GM or mulch constituent should have a PTE level would be more relaxed than EU Ecolabel limit applied to composts and digestates as constituents. There is the potential that some GM may be specifically designed for particularly plant species that have high requirements for some essential PTEs. We think, however, that there would be very few markets for these products so no allowance needs to be made for them in this context. The PTE content of materials sampled and analysed in some of the reports discussed above are presented in Table 0-35.

Table 0-35: PTE content of compost, digestate, wood waste and peat samples analysed in scientific literature

Element	**EU Ecolabel limit (mg/kg DM)**	**PTE content in compost samples analysed (mg/kg DM)**					
		EoW Criteria IPTS 2013	DG ENV 2004	Boldrin 2010		WRAP 2006	
		Compost and digestate	Compost (range)	Compost n = 4	Peat (mean value) n = 7	Surfaces / Mulch from wood waste	Compost from wood waste

		(range)				(range)	(range)
Zn	**300**	80 – 1280	27 – 1570	154 – 395	11	3 – 235.6	34.7 – 119.1
Cu	**100**	30 – 480	8.4 – 455	36 - 135	1.7	2.2 – 138.5	4.5 – 35.8
Pb	**100**	30 – 270	4.83 – 728	28 - 34	10	1.6 – 508.5	34.3 – 220.8
Hg	**1**	0.04 – 1.28	0.044 – 17.8	0.14 – 0.53	0.06	0.1 – 0.37	0.1 – 0.43
Cr	**100**	20 – 230	4.7 – 209	18 - 29	1.8	2.4 – 98.4	5.7 – 38.3
Ni	**50**	10 – 250	0.05 – 149	7.2 – 13.5	0.8	0.7 – 4.6	1.5 – 39.2
Cd	**1**	0.3 – 2.8	0.075 – 5.5	0.37 – 0.62	0.12	0.09 – 0.93	0.11 – 0.62
Mo	**2**	-	-	-	-	-	-
Se	**1.5**	-	-	-	-	<0.05	<0.05
As	**10**	-	0.9 – 9.2	3.7 – 6.5	0.9	0.5 – 62.3	2.5 – 24.2
F	**200**	-	-	-	-	-	-

A5.7 Environmental Protection of Soils from PTEs

SI and mulches are applied to soils, and therefore any PTEs they contain will be added to existing PTEs within the receiving soil. It follows from this that the elevation of existing soil PTE concentrations through the addition of SI and mulches would depend on the loading to the soil and the frequency of applications. Therefore, if a SI or mulch with a low Pb content were applied in greater quantities and repeated over several years, the increase in soil Pb content might be greater than if a SI with a high Pb content were applied just once at a low loading rate. The risk of PTEs leaching from soil and contaminating surface and groundwater is a function of the mobility of the PTE in the soil. However, this risk would generally be greater for soils with higher PTE contents.

Therefore, in the case of SI and mulches, the resultant soil PTE content may be of more concern than the PTE content of the SI and mulch. This principle is applied in the application of sewage sludge to agricultural land.

A5.7.1 *Sewage Sludge application to agricultural soil*

The Sewage Sludge Directive (Directive 86/278/ EEC) limits the application of sewage sludge to agricultural soils based on soil limits above which sewage sludge may not be applied. The Directive lays down limit values for concentrations of heavy metals in the soil, in sludge and for the maximum annual quantities of heavy metals which may be introduced into the soil. The Directive is implemented by Member States as follows (EC and IEEP, 2009):

- Austria: the application of sludge may only occur on the basis of a certificate provided that the limit values are not exceeded. The sludge has to also have certain standards of hygiene.
- Bulgaria: sludge must be treated and meet the microbiological and parasitological requirements set out in Annex 3 of the transposing Regulation, as well as the requirements concerning heavy metal content, while permits from appropriate authorities are required for the use of sludge.
- Cyprus: the use of sludge from wastewater treatment plants for agricultural purpose is regulated by the Water Pollution Control Laws 2002-2006 and the Water Pollution Control (Use of Sludge in Agriculture) Regulations of 2002 (No. 517/2002) and the Code of Good Agriculture Practice Decree (No. 407/2002).
- Czech Republic: If sludge is not treated and does not meet the requirements of Decree No 382/2001 Coll. implementing Act No 185/2001 Coll. on waste, which is consistent with the Directive, it must not be used in agriculture.
- Denmark: sludge residues from septic tanks must be stabilised (anaerobic or aerobic digestion, composting, chemical stabilisation with lime/chalk or mineralisation) by composting at 55°C for a minimum 2 weeks or by a controlled process, which secures hygienic conditions.
- Estonia: the use of untreated sludge in agriculture is prohibited.
- France: an obligation is in place to bury such sludge in the soil immediately after application using equipment adapted for that purpose, or for such sludge to be treated to meet certain standards of hygiene.
- Under German water law, the contents of septic tanks with no drainage facilities (including similar installations) must be handed over to the local waste water management authorities and therefore cannot be used directly for agricultural purposes.
- Greece: Up to now, no sludge residues from septic tanks have been used in agriculture. In general, sewage sludge has not been used in agriculture, with an exception of very small quantities that have been used in the frame of research projects and pilot studies.
- Hungary: Sewage sludge not allowed in agriculture.
- Ireland: Article 3 of the Waste Management (Use of Sewage Sludge in Agriculture) Regulations 1998 states that sludge shall not be used or supplied for use in agriculture except in accordance with these Regulations.
- Italy: Decree No 99/1992, transposing the Directive, regulates the agricultural use of sewage sludge. Irrespective of its type or origin, the use of sludge in agriculture is authorised only if: a) it has been treated; b) it is suitable as soil fertiliser and/or improver and corrector; c) it does not contain substances that are toxic, harmful and/or persistent and/or bioaccumulable in concentrations that are harmful for the land, crops, animals, people and the environment in general.
- Latvia: sewage sludge from septic tanks may not be used in its pure form. Instead, it must be transferred to treatment plants and processed with sewage sludge used in agriculture in accordance with Section 29 of Cabinet Regulation No 362. Treated sewage sludge and compost made from

treated or untreated sewage sludge and with a dry matter that has a heavy-metal concentration by mass which does not exceed the limit concentrations referred to in Annex 9 to this Regulation may be used as fertiliser on agricultural land.

- Lithuania: A person intending to use sludge as a fertiliser (in agriculture or for energy crops) must have a fertilisation plan approved by the regional environmental protection department within the administrative area of which fertilisation will be carried out. A fertilisation plan is to be drawn up for no longer than 6 months. The response lists several restrictions from the transposing regulation required for a fertilisation plan. It is unclear from the response to which sewage sludge category septic tank residues belong and hence it is not possible to assess what measures are in place.
- Netherlands: All sludge applied in agriculture must be treated by biological, chemical or thermal means, through long-term storage or any other suitable method which kills off the majority of the pathogens present in the waste water sludge.
- Romania: Directive 86/278/CEE has been transposed through the Order of the Minister of Agriculture, Forests, Waters and Environment no. 344/2004 for the approval of Technical Guidelines on the protection of the environment and in particular of the soils when sewage sludge is used in agriculture (MO No. 344/2004). In accordance with the MO No 344/2004, untreated sludge cannot be used in agriculture.
- Slovakia: No specific conditions have been laid down. The application of such sludge residues on agricultural land is prohibited.
- Slovenia: The Decree stipulates that the input of sludge into farmland requires an environmental permit and lists a number of restrictions but septic tanks are not mentioned in the response.
- Sweden: No specific conditions have been deemed necessary according to Article 3 (2), when using sludge residues defined in 2 a) ii). Sweden has equal requirements for sludge defined in 2 a) i) and 2 a) ii) referring to Article 3 (1).
- UK: The Sewage Sludge Directive is regulated through the sludge use in agriculture regulations (Regulation 4 of the Sludge (Use in Agriculture) Regulations 1989) and associated code of practice for sewage sludge (see Table 0-36).

Table 0-36: UK Code of Practice for Agriculture Use of Sewage Sludge (Defra, 1996)

PTE	**Maximum permissible concentration of PTE in soil (mg/kg dry solids)**				**Maximum permissible average annual rate of PTE addition over a 10 year period (kg/ha)**
	pH 5.0 <5.5	pH 5.5<6.0	pH 6.0-7.0	pH >7.0	
Zinc	200	200	200	300	15
Copper	80	100	135	200	7.5
Nickel	50	60	75	110	3
	For pH 5.0 and above				

Cadmium	3	0.15
Lead	300	15
Mercury	1	0.1
Chromium	400	15
Molybdenum	4	0.2
Selenium	3	0.15
Arsenic	50	0.7
Fluoride	500	20

In the UK, the application of composts and digestates that have attained End of Waste status (i.e. that comply with the quality protocols and/or PAS100/110 specifications in Table 0-37) must also meet with the loading restriction to agricultural land to protect the agricultural soils. In our view, this is a sensible approach for the application of sewage sludge and other organic amendments to agricultural soils. As SIs may be repeatedly applied to soils, it would seem sensible that EU Ecolabel limits should not exceed soil PTE limits applied in the sewage sludge regulations and any associated soil PTE limits.

For mulches that are spread on the top of soils, the mulch is not incorporated into the soil. However mulches may degrade if they comprise organic matter, or become incorporated into the soil through soil turnover, e.g from the action of earthworms, which might lead to an increased concentration of the PTEs in the soil. Therefore, soils may also be at risk from accumulation of metals from repeated applications of mulch. In this case, we would also think that PTE application limits should apply so that also, in this case, the PTE limits for the mulches should not exceed any actual soil value.

Table 0-37: UK Quality Protocols and PAS specifications for compost and digestate

Compost	**Digestate**
Quality Protocol Compost (2012) - End of waste criteria for the production and use of quality compost from source-segregated biodegradable waste	Quality Protocol Anaerobic digestate (2010) – End of waste criteria for the production and use of quality outputs from anaerobic digestion of source-segregated biodegradable waste
PAS100: 2011 Specification for composted materials	PAS110:2010. Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source segregated materials

A5.7.2 *Growing media*

For GM, the situation is more complex. Spent GM may be used as a SI and hence, on this basis, should not have less stringent PTE limits than SI and mulches. As GM may be used to grow food for direct human consumption, there is a risk of producing PTE-contaminated food. The current EU Ecolabel PTE limits are based on total concentrations, and do not consider the bioavailability or leachability of the metals. The UK PAS100 specification for compost includes recommended tests that include determination of PTE contents soluble in water and/or calcium chloride and DPTA extracts. These tests are not obligatory requirements but are advised for some compost uses.

We have not found in the literature any clear reports of concerns or incidents of food contaminated with PTEs by this route. However, we take a precautionary view and consider that the limits for EU Ecolabel for GM should not be made less stringent so that such a risk might have increased.

A5.7.3 *Life Cycle Analysis of PTEs*

Boldrin *et al*. (2010) compared the lifecycle emissions of compost and peat and reported that compost was found to leach 3–20 times more heavy metals and other compounds than peat. No other LCA studies that include PTEs in their assessment were readily available in existing scientific literature.

A5.8 Proposed EU Ecolabel SI, GM and mulch PTE criteria

A5.8.1 *PTEs that should be limited*

Our recommendation is that the PTEs that should be limited in EU Ecolabel GM, SI and mulches are those that are currently limited, i.e. Zn, Cu, Ni, Cd, Cr, Pb, Hg, Mo, Se, As and F.

We do not propose that Cr(VI) should be included as a parameter within the EU Ecolabel criteria, although it is included in some national standards and has been proposed by one stakeholder respondent. A comprehensive evaluation of the need for a development of appropriate limits for Cr(VI) is beyond the scope of this study. The risks from Cr(VI) associated with SI, GM and mulches should be monitored and considered in the next EU Ecolabel revision of these products.

A5.8.2 *Limits applied to constituents and/or final product?*

In the current EU Ecolabel criteria, there are additional elements with limits if a constituent is from an industrial source (see Table 0-27). In our opinion, this is a confusing distinction which would require some interpretation and policing, and presents some potential for dispute as to whether such a constituent required monitoring of the additional parameters. To avoid confusion, we propose that this distinction is eliminated and the same elements are analysed in all EU Ecolabel products.

It is possible that some composts and digestates produced from wastes and that meet End of Waste (EoW) status would be used directly as product SI and mulches. From Section A5.4.2 above, it is clear that the PTE parameters that are likely to be applied in the EoW criteria are fewer in number than the ones proposed for the EU Ecolabel. Also the proposed limits for several PTEs in the EoW criteria are higher than the current Ecolabel criteria. We do not advocate reducing the stringency of the current Ecolabel PTE limits so that they match the End of Waste criteria limits as EoW are a minimum standard requirement whilst Ecolabel represents a higher quality standard. Additionally, the frequency of monitoring for the End of Waste criteria may not match the proposed frequency for the EU Ecolabel criteria. Some additional analysis of the

composts and digestates above the requirement for End of Waste is therefore likely to be required for EU Ecolabel SI and mulches.

For GM (and possibly some SI and mulches), the composts, digestates and indeed any other constituent may be mixed with other materials to produce the product. Therefore, there should be sampling and analysis of the final GM product. We also propose that all constituents need to be analysed at the same frequency as the product and that the same PTE limits are applied. This is to ensure that no highly contaminated waste is disposed of through dilution in an EU Ecolabel GM. This also means that material that has attained EoW status by meeting EoW criteria PTE limits but fails to meet Ecolabel PTE limits would not be permitted in Ecolabel GM, SI and mulch products. For example a compost attaining EoW status having a Zn content of 350 mg/kg dry matter (well below the proposed EoW limit of 600 mg/kg dry matter) would not meet the Ecolabel limit of 300 mg/kg dry matter and therefore not permitted in Ecolabel SI, GM and mulches.

A basic principle we propose to observe is that the limits for EU Ecolabel should not be more relaxed than any EoW criteria limit.

- All final products are analysed for PTEs, with some exceptions as indicated below with respect to materials attaining EoW status.
- All constituents are analysed for the same limits and PTEs as the final product and to the same frequency.
- Materials attaining EoW status used as constituents must also comply with Ecolabel monitoring frequency and PTE limits.

It is pointed out, however, that if the elements above were applied as we propose, this would be inconsistent with the current GPP criteria for gardening products and services, which includes the provisions in the existing EU Ecolabel criteria for GM and SI regarding the additional elements only being required if sludges are included from industrial sources (EC 2012).

"2. Hazardous substances in soil improvers used for fertilisation

Maximum concentrations of heavy metals in the waste before treatment (mg/kg dry weight) must meet the requirements below on hazardous substances. In the final product, the content of the following elements shall be lower than the values shown below, measured in terms of mg/dry weight:

Zn 300, Cr 100, Cu 100, Mo (*) 2, Ni 50, Se (*) 1.5, Cd 1, As (*) 10, Pb 100, F (*) 200, Hg 1

(*) Data relating to the presence of these elements are needed only for products containing material from industrial processes."

A5.8.3 *What minimum monitoring frequency should be applied*

The current SI and GM EU Ecolabel criteria include a minimum testing frequency prior to obtaining EU Ecolabel certification that requires two samples.

"Analytical tests according EN 13650 and ISO 16772 [Hg] are made on a representative sample from a product batch and at least one further representative sample from a different product batch, each of which was produced in the three months before the application date."

There is no stipulated minimum monitoring frequency in order to prove compliance and therefore that EU Ecolabel status has been maintained, although this is assumed to be agreed in the contract between the producer and the member state EU Ecolabel certifier.

In our view, this is an insufficient monitoring frequency description and that this should be specified in more detail as a minimum.

Monitoring frequency in other standards and specifications

Example frequencies before accreditation and following accreditation are given in Table 0-38.

Table 0-38: Monitoring frequency in existing standards

	PAS100 (compost)	**PAS110 (digestate)**	**Draft End of Waste**	**VLACO QAS (digestate)***	**Germany RAL GZ 256 (secondary raw material fertilisers and SI)**
Before Accreditation	3	3	4 in first year	Amount of samples is calculated on the basis of biodegradable waste input.	1 analysis for every full or partial batch of 1500 tons plant input, at least 4 tests. Max. 12 analyses per year
After Accreditation	1/5,000 m^3 or 1/year if production is <5,000 m3/a	1/6,000 m^3 digestate or once every 3 months (whichever is sooner)	1 per 10000 tonnes + 1 input up to a max of 12 per year.	Amount of samples is calculated on the basis of biodegradable waste input.	1 analysis for every full or partial batch of 2000 tons plant input, at least 4 tests. Max. 12 analyses per year

*As described in IPTS (2013)

Table 0-38 indicates that monitoring frequency varies and that it may be based on volume or tonnage and on inputs or outputs. Note also that the French standard NFU 44-051 adds further complexity as not only are the frequency of monitoring different for different sized of plants but also the frequency for each analytical tests differs. For example for a plant of 7,000 t/a requires 4 microbial and 3 inert impurity tests per year whilst for a plant of 350 to 3,500 t/a requires 2 microbial and 2 inert impurity tests.

In our view, the frequency of monitoring is important, as the greater the monitoring frequency, the greater the confidence in the final product quality. However, we recognise that monitoring is a financial burden. In our view, the risks from consumption of PTE contaminated food grown in GM is probably greater than the risks from SI and mulches. As a precautionary view, the frequency of monitoring might be higher for GM compared with SI and mulches.

Consultation feedback with respect to monitoring frequency

No specific feedback was received on monitoring frequency.

Proposed monitoring frequency

In our view, the minimum frequency for certification should match or even exceed the minimum indicated here. Our proposal would be for a minimum of four samples in three months prior to certification. Post certification, it was required that one sample is analysed for every 2,000 tonnes output on a dry matter basis up to maximum of 16 samples per year (four per quarter).

We would propose that this monitoring frequency is applied to SI, GM and mulches, but that consideration is given to applying more frequent monitoring for GM in the next revision of the EU Ecolabel.

We also propose that all constituents are monitored to the same frequency as the product, i.e. 4 samples taken in the three months prior to certification and one sample every 2,000 tonnes of constituent on a dry matter basis up to a maximum of 16 samples per year (four per quarter).

A5.8.4 *What PTE limits should be applied*

There are several routes for exposure to PTEs, and some PTEs are essential nutrients, but can also be harmful in excessive concentrations. Virtually all constituents of SI, GM and mulches will contain PTEs, and it would not be economically viable or technically possible to eliminate PTEs from the ingredients of SI, GM and mulches. Therefore some limit for each PTE should be set.

In the case of GM, we assume that the limits should be comparable to agricultural soil limits, on the basis that, if any householder grows fruit or vegetables in a GM, there is not a greater risk of consuming food with high levels of PTE compared with soil. No literature was found on health risks from PTEs that would set limits in GM any stricter than for SIs.

The difficulty is with the use of the spent GM. If it is placed in the household garden waste stream, then there would be sufficient control of the PTEs, as they are processed presumably into new composts and/or digestate. If, however, the householder recycles the GM into their own soil or mixed with other GM, then there is a risk of PTE accumulation, especially as the organic matter in the GM will decompose over time.

It is beyond the scope of this project to carry out a risk assessment of these aspects, as it would require an extensive understanding of the behaviour of householders and of spent GM if reused in the home environment.

Actual limits in existing standards and specifications for compost and digestate are summarised in Section A5.11. These are to some extent based on values achieved in actual composts.

Given that it is not possible to specify an application rate through the EU Ecolabel, and the use of spent GM in the home garden is uncontrolled, we would take the approach of setting the EU Ecolabel limits for GM, SI and mulches based on the lowest limits in the standards and specifications.

Proposed Ecolabel PTE limits

Our recommended proposed limits are therefore as presented in Table 0-39, and are the same limits as the current EU Ecolabel values for SI and GM. The limits for some parameters are more stringent than those currently being proposed for the EoW criteria for biodegradable waste, in particular for Cd (1.5 mg/kg DM), Pb (120 mg/kg DM), Cu (200 mg/kg DM) and Zn (600 mg/kg DM). However, we also recognise that the Draft Final Report on EoW Criteria for Biodegradable Waste (IPTS 2013) indicates that composts can be produced that readily attain lower values than these limits. Therefore there is also the option to decrease

limits further and if this option was considered we would propose that lower limits might be applied to GM, SI and mulches as indicated by the values in brackets in Table 0-39.

Table 0-39: Proposed PTE limits for EU Ecolabel SI, GM and Mulches (numbers in brackets are lower limit option)

PTE	**Growing media**	**Soil Improvers**	**Mulches**
Zinc	300 (250)	300 (250)	300 (250)
Copper	100 (80)	100 (80)	100 (80)
Nickel	50	50	50
Cadmium	1 (0.8)	1 (0.8)	1 (0.8)
Lead	100 (75)	100 (75)	100 (75)
Mercury	1 (0.75)	1 (0.75)	1 (0.75)
Chromium (total)	100 (75)	100 (75)	100 (75)
Molybdenum	2	2	2
Selenium	1.5	1.5	1.5
Arsenic	10	10	10
Fluorine	200	200	200

A5.9 What test method should be applied

CEN Committee TC223 (Soil Improvers and Growing Media) has historically developed standard methods for the analysis of these products. Methods are also being developed by CEN/TC 400 Project Horizontal to be applied across a wide range of materials (sludges, biodegradable wastes and soils). These horizontal methods would be paramount in the selection of methods for the EU Ecolabel revision.

Methods for the analysis of PTEs have been published by CEN/TC 400. In the case of PTEs, there are sometimes several methods for each PTE. At this stage, we would propose that, if more than one method has been suggested by CEN/TC400, then these should be permitted (although we understand the methods proposed for the EoW criteria are the inductively coupled plasma based methods rather than the flame atomic absorption spectrometry methods). However, detection limits vary and, for elements likely to have low limits, the preferred method should have an acceptable detection limit. We do not believe the CEN/TC400 committee has considered analysis for fluorine. Therefore, we would propose that the method applied to solid recovered fuel would be applicable.

Therefore, the following methods (Table 0-40) are proposed for PTE analysis which are those currently recommended by CEN/TC400 (with the exception of the method for F, the analysis of which has not been considered by CEN/TC400). Note these methods may be amended for Ecolabel in line with any further amendments arising from CEN/TC400. These tests are for total PTE contents. We do not propose that obligatory EU Ecolabel PTE tests should include tests for the soluble and bioavailable forms of the PTEs, but we would recommend that consideration for inclusion of such tests is given in the next revision.

Table 0-40: Proposed methods for PTE analysis

Parameter	Method CEN/TC400	Method other	Title
As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Se, Zn	EN 16171:2012		Sludge, treated biowaste and soil - Determination of elements using inductively coupled plasma mass spectrometry
As, Cd, Cr, Cu, Pb, Hg, Mo, Se, Zn	EN 16170:2010		Sludge, treated biowaste and soil - Determination of elements using inductively coupled plasma optical emission spectrometry
Cr, Ni, Zn	EN 16188:2012		Sludge, treated biowaste and soil - Determination of elements in aqua regia and nitric acid digests - Flame atomic absorption spectrometry method
As, Cd, Pb	EN 16174:2013		Sludge, treated biowaste and soil - Digestion of aqua regia soluble fractions of elements
Hg	EN 16175-1: 2013		Sludge, treated biowaste and soil - Determination of mercury - Part 1: Cold-vapour atomic absorption spectrometry (detection limit 0.03 mg/kg dm)
Hg	EN 16175-2: 2013		Sludge, treated biowaste and soil - Determination of mercury - Part 2: Cold-vapour atomic fluorescence spectrometry (detection limit 0.003 mg/kg dm)
F	Not available	EN 15408:2011	Solid Recovered Fuels – Methods for the determination of sulphur (S), chlorine (Cl), fluorine (F) and bromine (Br) content

There are also relevant standards that should apply regarding sampling and sample preparation that should be applied within the revised EU Ecolabel for GM, SI and mulches (Table 0-41).

Table 0-41: Standards regarding sampling and sample preparation

Parameter	Method CEN/TC400	Title

Parameter	Method CEN/TC400	Title
Sample preparation	EN 16179:2012	Sludge, treated biowaste and soil - Guidance for sample pretreatment
Sample preparation	EN 16173:2012	Sludge, treated biowaste and soil - Digestion of nitric acid soluble fractions of elements
Sample preparation	EN 16174:2012	Sludge, treated biowaste and soil - Digestion of aqua regia soluble fractions of elements

A5.9.1 *What reporting/declarations should be required*

The PTE content of the final EU Ecolabel product should be declared as a minimum.

A5.10 References

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A5.11 Further Information: PTE limits in European compost and digestate standards

The following tables are taken from the Draft Final Report on EoW Criteria (IPTS, 2013) and list PTE limits in EU compost and digestate standards.

Table 0-42: Heavy metal limits in European compost and digestate standards. Source ORBIT/ECN (2008) and stakeholder survey December 2010. Digestate standards are explicitly referred to. (IPTS, 2013)

Country	Regulation	Type of standard	Cd	Crtot	CrVI	Cu	Hg	Ni	Pb	Zn	As
			mg/kg d.m.								
AT	Compost Ord.:Class A+ (organic farming)	Statutory Ordinance	0.7	70	-	70	0.4	25	45	200	-
	Compost Ord.:Class A (agriculture; hobby gardening)		1	70	-	150	0,7	60	120	500	-
	Compost Ord.: Class B limit value (landscaping; reclam.) (guide value)*		3	250	-	500 (400)	3	100	200	1,800 (1,200)	-
BE	Royal Decree, 07.01.1998	Statutory decree	1.5	70	-	90	1	20	120	300	-
BG	No regulation	-	-	-	-	-	-	-	-	-	-
CY	No regulation	-	-	-	-	-	-	-	-	-	-
CZ	Use for agricultural land (Group one)	Statutory	2	100	-	100	1	50	100	300	10
	Landscaping, reclamation (draft Biowaste Ordinance) (group two)	Statutory Class 1	2	100	-	170	1	65	200	500	10
		Class 2	3	250	-	400	1.5	100	300	1200	20
		Class 3	4	300	-	500	2	120	400	1500	30
	Fertilizer law 156/1998, ordinance 474/2000 (amended)	**DIGESTATE** with dry matter > 13%	2	100		150	1	50	100	600	20
	Fertilizer law 156/1998, ordinance 474/2000 (amended)	**DIGESTATE** with dry matter < 13%	2	100		250	1	50	100	1200	20
DE	Quality assurance RAL GZ - compost / digestate products	Voluntary QAS	1.5	100	-	100	1	50	150	400	-
	Bio waste Ordinance	Statutory decree (Class I)	1	70	-	70	0.7	35	100	300	-
		(Class II)	1.5	100	-	100	1	50	150	400	-
DK	Statutory Order Nr.1650; Compost after 13 Dec. 2006	Statutory decree	0.8	-	-	1,000	0.8	30	120/60 for priv. gardens	4,000	25
EE	Env. Ministry Re. (2002.30.12; m° 87) Sludge regulation	Statutory	-	1000	-	1000	16	300	750	2500	-
ES	Real decree 824/2005 on fertilisers Class A	Statutory	0.7	70	0	70	0.4	25	45	200	-

Country	Regulation	Type of standard	Cd	Crtot	CrVI	Cu	Hg	Ni	Pb	Zn	As
							mg/kg d.m.				
	Class B		2	250	0	300	1.5	90	150	500	-
	Class C		3	300	0	400	2.5	100	200	1000	-
FI	Decree of the Ministry of Agriculture and Forestry on Fertiliser Products 12/07	Statutory decree	1.5	300	-	600	1	100	100	1,500	25
FR	NFU 44 051	standard	3	120		300	2	60	180	600	
GR	KYA 114218, Hellenic Government Gazette, 1016/B/17- 11-97 [Specifications framework and general programmes for solid waste management]	Statutory decree	10	510	10	500	5	200	500	2,000	15
HU	Statutory rule 36/2006 (V.18)	Statutory Co: 50; Se: 5	2	100	-	100	1	50	100	--	10
IE	Licensing/permitting of treatment plants by competent authority stabilised MBT output or compost not meeting class I or II	Statutory	5	600	-	600	5	150	500	1500	-
	(Compost – Class I)	Statutory	0.7	100	-	100	0.5	50	100	200	-
	(Compost – Class II)	Statutory	1.5	150	-	150	1	75	150	400	-
IT	Law on fertilisers (L 748/84; and: 03/98 and 217/06) for BWC/GC/SSC	Statutory decree	1.5	-	0.5	230	1.5	100	140	500	-
Luxembourg	Licensing for plants		1.5	100	-	100	1	50	150	400	-
LT	Regulation on sewage sludge Categ. I (LAND 20/2005)	Statutory	1.5	140		75	1	50	140	300	-
LV	Regulation on licensing of waste treatment plants (n° 413/23.5.2006) – no specific compost regulation	Statutory =threshold between waste/product	3			600	2	100	150	1,500	50
Netherlands	Amended National Fertiliser Act from 2008	Statutory	1	50		90	0.3	20	100	290	15
PL	Organic fertilisers	Statutory	3	100		400	2	30	100	1500	-
PT	Standard for compost is in preparation	-	-	-	-	-	-	-	-	-	-
Sweden	Guideline values of QAS	Voluntary	1	100	-	100	1	50	100	300	
	SPCR 152 Guideline values	Voluntary	1	100	-	600	1	50	100	800	-
	SPCR 120 Guideline values (**DIGESTATE**)	Voluntary	1	100	-	600	1	50	100	800	-
SI	Decree on the treatment of biodegradable waste (Official Gazette of the Republic of Slovenia, no. 62/08)	Statutory: 1st class*	0.7	80	-	100	0.5	50	80	200	-
		Statutory: 2nd class*	1.5	200	-	300	1.5	75	250	1200	-
		Statutory: stabilized biodegradable waste*	7	500	-	800	7	350	500	2500	-

Country	Regulation	Type of standard	Cd	Crtot	CrVI	Cu	Hg	Ni	Pb	Zn	As
							mg/kg d.m.				
		* normalised to an organic matter content of 30%									
SK	Industrial Standard STN 46 5735 Cl. 1	Voluntary (Mo: 5)	2	100		100	1	50	100	300	10
	Cl. 2	Voluntary(Mo: 20)	4	300		400	1.5	70	300	600	20
UK	UKROFS fertil.org.farming, 'Composted household waste'	Statutory (EC Reg. 2092/91)	0.7	70	0	70	0.4	25	45	200	-
	Standard: PAS 100	Voluntary	1.5	100	-	200	1	50	200	400	-
	Standard: PAS 110 (**DIGESTATE**)	Voluntary	1.5	100	-	200	1	50	200	400	-
EU ECO Label	COM Decision (EC) n° 64/2007 eco-label to growing media COM Decision (EC) n° 799/2006 eco-label to soil improvers	Voluntary [Mo: 2; As: 10; Se: 1.5; F: 200 [only if materials of industrial processes are included]	1	100	-	100	1	50	100	300	10
EU Regulation on organic agriculture	EC Reg. n° 2092/91. Compliacne with limits required for compost from source separated biowaste only	Statutory	0.7	70	-	70	0.4	25	45	200	-

Table 0-43: Admissible maximum dosage of heavy metals to the soil in national legislation and standards [g/ha* y]. Source ORBIT/ECN (2008) and stakeholder survey December 2010. (IPTS, 2013)

Country		Cd	Cr_{tot}	Cr^{VI}	Cu	Hg	Ni	Pb	Zn	As	Se
						[g/ha* y]					
EC	'Sewage sludge' 1) 10 y basis	150	3,000	-	12,000	100	3,000	15,000	30,000	-	-
AT	Sewage sludge 2)	20	1,250	-	1,250	20	250	1,000	5,000	-	-
	Fertiliser. Ord. 2 years basis	5	300	-	350	5	200	300	1,500	-	-
BE	Flanders: VLAREA (compost)yearly	12	500	-	750	10	100	600	1,800	300	-
	Wallonia: B1 type compost (field management without preliminary analyses of soil)	5	500	-	600	5	100	500	2,000		
	Wallonia: B2 type compost (field management with preliminary analyses of soil)	10	1000	-	1200	10	200	1000	4000		
CY	No data available	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CZ	Sewage sludge yearly *max. 5 t d.m./3y in agriculture*	5	200		500	4	100	200	2,500	30	
DE 1)	sewage sludge	16	1,500	-	1300	13	300	1,500	4,100	-	-
DK	7 t d.m. basis / calculated	5.6	700		7,000	5.6	210	840	28,000	-	-
	related to 30 kg P_2O_5/ha / calculated	3	-	-	-	6	75	300	-	-	-
EE	No data available	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
ES	RD 1310/1990 (SS) 10 years basis	150	3,000		12,000	100	3,000	15,000	30,000	-	-
FI	Sewage sludge	3	300		600	2	150	150	1,500	-	-
	Decree of the Ministry of Agriculture and Forestry on Fertiliser Products 12/07 (average based on 4,10 or 40 years application)	1.5									
FR	NF U 44 51 (comp.) 10 years basis	15	600		1,000	10	300	900	3,000	90	60
	NF U 44 51 (comp.) yearly	45	1,800		3,000	30	900	2,700	6,000	270	180
GR	No data available	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
HU	Sewage sludge (under Nr. 50/2001.)	150	10,000	-	10,000	100	2,000	10,000	30,000	500	1,000
IE	SI 148/1998 [use of sewage sludge in agriculture]	10	1000	-	1000	10	300	750	2500	-	-
IT	DCI 27/07/84 - MWC from mixed waste	15	2,000	15	3,000	15	1,000	500	10,000	100	-
LT	No data available	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
LU	No regulation	-	-	-	-	-	-	-	-	-	-
LV	Sewage sludge	30	600		1,000	8	250	300	5,000		
MT	No data available	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
NL	Nutrient loads (N,P) are the dosage limiting factor	-	-	-	-	-	-	-	-	-	-
PL	Sewage sludge	20	1,000		1,600	10	200	1,000	5,000	-	-
PT 1)	Sewage sludge /10 y basis	150	4,500		12,000	100	3,000	15,000	30,000	-	-
RO	No data available	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
SE	SNFS 1992:2 (sewage sludge)	0.75	40		300	1.5	25	25	600	-	-
SI	Sewage sludge use in agriculture on 10 year basis	15	2000	-	3000	15	750	2500	12000	-	-
SK	No regulation	-	-	-	-	-	-	-	-	-	-
UK	Sludge (use in agriculture) Regulations 3) sewage sludge average annual loading over 10 years	150	?	-	7,500	100	3,000	15,000	15,000	-	-

1) Directive 86/276/EEC; average within 10 years 2) Sew. Sludge Ordinance, Lower Austria (Class III)
3) S(UiA)regulations: Statutory Instrument 1989 No. 1263, The Sludge (Use in Agriculture) Regulations 1989
The QCP (England and Wales) sets maximum allowable concentrations for PTEs in soils that receive Quality Composts, as specified in the Sludge (Use in Agriculture) Code; these are more stringent than the soil PTE maximum allowable concentrations allowed in the regulations.
SS … sewage sludge

Table 0-44 gives an overview of the proposed EoW PTE limits, compared to compost limits in the Member States for compost aimed at normal agricultural applications. The table also includes the EU Eco-label limits and the EU regulation on organic agriculture.

Table 0-44: Heavy metal limits for compost aimed at use in agriculture compared to proposed limit values from the IPTS (2008) study

Country	Regulation	Type of standard	Cd	Crtot	CrVI	Cu	Hg	Ni	Pb	Zn	As
							mg/kg d.m.				
AT	Compost Ord.:Class A (agriculture; hobby gardening)	Ordinance	1	70	-	150	0.7	60	120	500	-
BE	Royal Decree, 07.01.1998	Statutory decree	1.5	70	-	90	1	20	120	300	-
BG	No regulation	-	-	-	-	-	-	-	-	-	-
CY	No regulation	-	-	-	-	-	-	-	-	-	-
CZ	Use for agricultural land (Group one)	Statutory	2	100	-	100	1	50	100	300	10
DE	Quality assurance RAL GZ - compost / digestate products	Voluntary QAS	1.5	100	-	100	1	50	150	400	-
DK	Statutory Order Nr.1650; Compost after 13 Dec. 2006	Statutory decree	0.8	-	-	1000	0.8	30	120	4000	25
EE	Env. Ministry Re. (2002.30.12; m° 87) Sludge regulation	Statutory	-	1000	-	1000	16	300	750	2500	-
ES	Real decree 824/2005 on fertilisers Class B	Statutory	2	250	0	300	1.5	90	150	500	-
FI	Fertiliser Regulation (12/07)	Statutory decree	1.5	300	-	600	1	100	150	1500	25
FR	NFU 44 051	standard	3	120		300	2	60	180	600	-
GR	KYA 114218, Hellenic Government Gazette, 1016/B/17- 11-97 [Specifications framework and general programmes for solid waste management]	Statutory decree	10	510	10	500	5	200	500	2000	15
HU	Statutory rule 36/2006 (V.18)	Statutory	2	100	-	100	1	50	100	--	10
IE	(Compost – Class I)	Statutory	0.7	100	-	100	0.5	50	100	200	-
IT	Law on fertilisers (L 748/84; and: 03/98 and 217/06) for BWC/GC/SSC	Statutory decree	1.5	-	0.5	230	1.5	100	140	500	-
LT	Regulation on sewage sludge Categ. I (LAND 20/2005)	Statutory	1.5	140		75	1	50	140	300	-
LU	Licensing for plants		1.5	100	-	100	1	50	150	400	-
LV	Regulation on licensing of waste treatment plants (n° 413/23.5.2006) – no specific compost regulation	Statutory	3	-		600	2	100	150	1500	50
NL	Amended National Fertiliser Act from 2008	Statutory	1	50		90	0.3	20	100	290	15
PL	Organic fertilisers	Statutory	3	100		400	2	30	100	1500	-
PT	Standard for compost is in preparation	-	-	-	-	-	-	-	-	-	-
SE	SPCR 152 Guideline values	Voluntary	1	100	-	600	1	50	100	800	-
SI	Decree on the treatment of biodegradable waste (Official Gazette of the Republic of Slovenia, no. 62/08)	Statutory	0.7	80	-	100	0.5	50	80	200	-
SK	Industrial Standard STN 46 5735 Cl. 1	Voluntary	2	100		100	1	50	100	300	10
UK	Standard: PAS 100	Voluntary	1.5	100	-	200	1	50	200	400	-
EU ECO Label	COM Decision (EC) n° 64/2007 eco-label to growing media; COM Decision (EC) n° 799/2006 eco-label to soil improvers	Voluntary	1	100	-	100	1	50	100	300	10
EU Regulation on organic agriculture	EC Reg. n° 2092/91. Compliacne with limits required for compost from source separated biowaste only	Statutory	0.7	70	-	70	0.4	25	45	200	-
Proposed limit values (IPTS, 2008)			1.5	100		100	1	50	120	400	

All values in mg/kg (dry weight). Red color shading indicates that a MS has a stricter limit than the proposal; green shading indicates equal or less strict limits (IPTS, 2013)

Further Information: Priority substances in EU Water Framework Directive

Annex X of the Water Framework Directive (Directive 2000/60/EC as amended by Directive 2008/105/EC) provides a list of priority substances that can present significant risks to the aquatic environment. The list of substances, along with the respective limits is presented below.

Table 0-45: Environmental quality standards for priority substances and certain other pollutants

ENVIRONMENTAL QUALITY STANDARDS FOR PRIORITY SUBSTANCES AND CERTAIN OTHER POLLUTANTS

PART A: ENVIRONMENTAL QUALITY STANDARDS (EQS)

AA: annual average;

MAC: maximum allowable concentration.

Unit: [μg/l]

(1)	(2)	(3)	(4)	(5)	(6)	(7)
No	Name of substance	CAS number (1)	AA-EQS (2) Inland surface waters (3)	AA-EQS (2) Other surface waters	MAC-EQS (4) Inland surface waters (3)	MAC-EQS (4) Other surface waters
(1)	Alachlor	15972-60-8	0,3	0,3	0,7	0,7
(2)	Anthracene	120-12-7	0,1	0,1	0,4	0,4
(3)	Atrazine	1912-24-9	0,6	0,6	2,0	2,0
(4)	Benzene	71-43-2	10	8	50	50
(5)	Brominated diphenylether (5)	32534-81-9	0,0005	0,0002	not applicable	not applicable
(6)	Cadmium and its compounds (depending on water hardness classes) (6)	7440-43-9	≤ 0,08 (Class 1) 0,08 (Class 2) 0,09 (Class 3) 0,15 (Class 4) 0,25 (Class 5)	0,2	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)
(6a)	Carbon-tetrachloride (7)	56-23-5	12	12	not applicable	not applicable
(7)	C10-13 Chloroalkanes	85535-84-8	0,4	0,4	1,4	1,4
(8)	Chlorfenvinphos	470-90-6	0,1	0,1	0,3	0,3
(9)	Chlorpyrifos (Chlorpyrifos-ethyl)	2921-88-2	0,03	0,03	0,1	0,1

No	Name of substance	CAS number (1)	AA-EQS (2) Inland surface waters (3)	AA-EQS (2) Other surface waters	MAC-EQS (4) Inland surface waters (3)	MAC-EQS (4) Other surface waters
(9a)	Cyclodiene pesticides:		Σ = 0,01	Σ = 0,005	not applicable	not applicable
	Aldrin (7)	309-00-2				
	Dieldrin (7)	60-57-1				
	Endrin (7)	72-20-8				
	Isodrin (7)	465-73-6				
(9b)	DDT total (7) (8)	not applicable	0,025	0,025	not applicable	not applicable
	para-para-DDT (7)	50-29-3	0,01	0,01	not applicable	not applicable
(10)	1,2-Dichloroethane	107-06-2	10	10	not applicable	not applicable
(11)	Dichloromethane	75-09-2	20	20	not applicable	not applicable
(12)	Di(2-ethylhexyl)-phthalate (DEHP)	117-81-7	1,3	1,3	not applicable	not applicable
(13)	Diuron	330-54-1	0,2	0,2	1,8	1,8
(14)	Endosulfan	115-29-7	0,005	0,0005	0,01	0,004
(15)	Fluoranthene	206-44-0	0,1	0,1	1	1
(16)	Hexachloro-benzene	118-74-1	0,01 (9)	0,01 (9)	0,05	0,05
(17)	Hexachloro-butadiene	87-68-3	0,1 (9)	0,1 (9)	0,6	0,6
(18)	Hexachloro-cyclohexane	608-73-1	0,02	0,002	0,04	0,02
(19)	Isoproturon	34123-59-6	0,3	0,3	1,0	1,0
(20)	Lead and its compounds	7439-92-1	7,2	7,2	not applicable	not applicable
(21)	Mercury and its compounds	7439-97-6	0,05 (9)	0,05 (9)	0,07	0,07
(22)	Naphthalene	91-20-3	2,4	1,2	not applicable	not applicable
(23)	Nickel and its compounds	7440-02-0	20	20	not applicable	not applicable
(24)	Nonylphenol (4-Nonylphenol)	104-40-5	0,3	0,3	2,0	2,0
(25)	Octylphenol ((4-(1,1′,3,3′-tetramethylbutyl)-phenol))	140-66-9	0,1	0,01	not applicable	not applicable
(26)	Pentachloro-benzene	608-93-5	0,007	0,0007	not applicable	not applicable
(27)	Pentachloro-phenol	87-86-5	0,4	0,4	1	1
(28)	Polyaromatic hydrocarbons (PAH) (10)	not applicable	not applicable	not applicable	not applicable	not applicable
	Benzo(a)pyrene	50-32-8	0,05	0,05	0,1	0,1
	Benzo(b)fluor-anthene	205-99-2	Σ = 0,03	Σ = 0,03	not applicable	not applicable
	Benzo(k)fluor-anthene	207-08-9				
	Benzo(g,h,i)-perylene	191-24-2	Σ = 0,002	Σ = 0,002	not applicable	not applicable
	Indeno(1,2,3-cd)-pyrene	193-39-5				

(29)	Simazine	122-34-9	1	1	4	4
(29a)	Tetrachloro-ethylene (7)	127-18-4	10	10	not applicable	not applicable
(29b)	Trichloro-ethylene (7)	79-01-6	10	10	not applicable	not applicable
(30)	Tributyltin compounds (Tributhyltin-cation)	36643-28-4	0,0002	0,0002	0,0015	0,0015
(31)	Trichloro-benzenes	12002-48-1	0,4	0,4	not applicable	not applicable
(32)	Trichloro-methane	67-66-3	2,5	2,5	not applicable	not applicable
(33)	Trifluralin	1582-09-8	0,03	0,03	not applicable	not applicable

(1) CAS: Chemical Abstracts Service.
(2) This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified, it applies to the total concentration of all isomers.
(3) Inland surface waters encompass rivers and lakes and related artificial or heavily modified water bodies.
(4) This parameter is the EQS expressed as a maximum allowable concentration (MAC-EQS). Where the MAC-EQS are marked as 'not applicable', the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges since they are significantly lower than the values derived on the basis of acute toxicity.
(5) For the group of priority substances covered by brominated diphenylethers (No 5) listed in Decision No 2455/2001/EC, an EQS is established only for congener numbers 28, 47, 99, 100, 153 and 154.
(6) For cadmium and its compounds (No 6) the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg $CaCO_3$/l, Class 2: 40 to < 50 mg $CaCO_3$/l, Class 3: 50 to < 100 mg $CaCO_3$/l, Class 4: 100 to < 200 mg $CaCO_3$/l and Class 5: ≥ 200 mg $CaCO_3$/l).
(7) This substance is not a priority substance but one of the other pollutants for which the EQS are identical to those laid down in the legislation that applied prior to 13 January 2009.
(8) DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU number 212-332-5); 1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU number 200-783-0).
(9) If Member States do not apply EQS for biota they shall introduce stricter EQS for water in order to achieve the same level of protection as the EQS for biota set out in Article 3(2) of this Directive. They shall notify the Commission and other Member States, through the Committee referred to in Article 21 of Directive 2000/60/EC, of the reasons and basis for using this approach, the alternative EQS for water established, including the data and the methodology by which the alternative EQS were derived, and the categories of surface water to which they would apply.
(10) For the group of priority substances of polyaromatic hydrocarbons (PAH) (No 28), each individual EQS is applicable, i.e. the EQS for Benzo(a)pyrene, the EQS for the sum of Benzo(b)fluoranthene and Benzo(k)fluoranthene and the EQS for the sum of Benzo(g,h,i)perylene and Indeno(1,2,3-cd)pyrene must be met.

A6. Pathogen Content

A6.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included the potential revision of the microbial pathogen limits for SIs and GMs. The scope of this project also includes development of an EU Ecolabel for mulches, for which microbial pathogen limits are also considered here.

Recommendations for the revised parameters are included in the main report. This section provides the justification for the revised proposed limits for microbial pathogens.

A6.2 Background

Requirement to revise EU Ecolabel microbial criteria for Soil Improvers and Growing Media

JRC/IPTS are currently developing proposals for a revision of the EU Ecolabel criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-46) that should be taken into consideration at the next revision, which included microbial criteria. Whilst it is difficult to eliminate microbial risks completely, it is our view that EU Ecolabel products should have high levels of risk mitigation, especially as incidents, as will be seen below, often make the public domain and can be very costly. The recent food scare for pathogenic *E. coli* in Germany resulted in false accusations of its source and resulted in a financial cost of over 0.5 billion euros. Such events associated with EU Ecolabel products (whether substantiated or not) would be unwelcome.

Table 0-46: Issues to be addressed in revision of SI & GM EU Ecolabel criteria

Issues to be addressed	**Growing Media**	**Soil Improvers**
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. coli* versus Helminth ova		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

In this section, we have considered the proposed revision of microbial criteria for growing media, soil improvers and mulches.

A6.2.1 *Current EU Ecolabel microbial criteria for GM and SI*

Table 0-47 shows the current limits for microbial contamination in EU Ecolabel GM and SIs, which are included in Section 2.4.10 (Health and Safety) for soil improvers and Section 2.4.7 for growing media (DG

Env 2006a and 2006b). The same criteria are used in both cases for GM and SI. There is a requirement to monitor *Salmonella spp* and either *E.coli* or Helminth ova*.*

Table 0-47: Current limits for microbial contamination in EU Ecolabel GM and SIs

Parameter	**Value**	**Notes**
Material sample		Product only analysed
Salmonella spp.	Absent in 25 g of fresh weight of material	Test method ISO 6579
Helminth ova	Absent in 1.5 g (units not specified)	Helminth ova test is to be executed only for products whose compost component is not exclusively derived from green, garden or park waste. Test method prXP X33-017
E. coli	<1000 MPN/g (most probable number) (units not specified)	*E. coli* test is to be executed only for products whose compost component is exclusively derived from green, garden or park waste. Test method ISO 11866-3

The declaration required (same in both GM and SI) is a statement on what compost component is derived from and the test results

"*the compost component in our product is exclusively derived from green, garden or park*

waste, that Salmonella is absent and that the product contains less E. coli then 1000 MPN/g.

Measured values:

……….(No./25 g f.w. – Salmonella)

………. (MPN/g - E. coli).

the compost component in our product is NOT exclusively derived from green, garden or park

waste, and that Salmonella and Helminth ova are absent.

Measured values:

……….(No./25 g f.w. - Salmonella)

……….. (No./1.5 g - Helminth ova)."

These refer only to the compost component so it is not immediately clear what testing and declaration would apply if the product did not contain compost. Additionally, there might be some discussion on whether a compost product is or is not exclusively derived from green, garden or park waste, as these may contain contamination not necessarily classed as these.

The presentation of the microbial limits in the current EU Ecolabel for GM and SI are therefore the same but may be considered unclear in meaning. These will be addressed in this proposed revision.

Proposed revision scope

In this revision, we have several factors that we think should be revised and have developed justifications for our proposed revisions. These factors are:

- What are the microbial criteria that would be limited
- Whether limits are applied to constituents and/or final products
- What minimum monitoring frequency should be applied
- What limits for the microbial criteria should be applied
- What test method should be applied
- What reporting/declarations should be required

A6.3 Factors considered in proposed revised microbial limits

A6.3.1 *Hazard and risk considerations*

Exposure to hazards

Setting suitable limits should consider the hazard and the risk of harm from exposure to the hazard. For soil improvers, the principle exposure pathways when applied to agricultural land or in the home garden include:

- Ingestion, inhalation and through injuries through handling.
- Contamination of and infection of plants (including crops) and animals from the contamination added to soils
- Consumption of contaminated food grown in contaminated soil.
- Contamination of other local environments such as neighbouring terrestrial habitats and water courses by wind, surface run off and transport by animals.

For growing media which may be used by the householder for growing crops directly, there is the risk from handling the growing media and the hazard being taken up by the food crop and being consumed. There are also risks from closer proximity to the product.

Limits should be applied that reflect an acceptable level of risk through any exposure pathway.

Microbial hazards

Microbial hazards come in many different forms, such as prions, viruses, bacteria, fungi, protozoa and small multicellular organisms (not strictly micro-organisms). They may be pathogenic to crop plants, plants in the general environment and animals including domestic, humans and animals in the natural environment. Additionally, they are living material and therefore have the capacity to increase in concentration and numbers if the environment is favourable. Many pathogenic micro-organisms are able to proliferate outside of the normal plant or animal host if conditions are suitable.

Microbial pathogens are often associated with the organic matter of their hosts. This material will be a major component of biowaste streams and, through composting and anaerobic digestion, a potential component of SI, GM and mulches. These characteristics are recognized in the Draft Final report on developing End of Waste (EoW) Criteria for Biodegradable Waste, but with little detailed discussion (IPTS, 2013).

“The presence of pathogens in the input material depends on the origin, storage and pretreatment. If the composting process does not provide the required conditions to reduce or even eliminate the pathogens during the composting process, these pathogens may still be present in the compost, and, in the worst case, some of them may even have multiplied during composting.”

Micro-organisms also grow quickly and therefore have a high capacity to increase in numbers rapidly and to adapt and mutate into new forms that may affect their pathogenicity. There are also a huge number of microbial pathogens and it is pertinent to note that microbes are considered one of the greatest threats to mankind (UN 2004). This is particularly pertinent in the context of world globalisation, the rapidity with which disease may spread and the introduction of alien species into new areas.

These characteristics mean that the hazard potential from microbes is significant and widespread.

A6.3.2 *Economic and reputational consideration*

Incidents associated with micro-organisms can be very damaging, both economically and from a reputational point of view. The recent incidence of pathogenic *E. coli* in Germany was initially and incorrectly blamed on contaminated produce from Spain (Euronews 2011). This incorrect accusation resulted in an economic loss that has been estimated as about 200 million euros per week (Guardian 2011).

There have also been several highly publicised cases of *Legionella* and *Aspergillus fumigatus* deaths associated with the use of GM, for which the headlines can still be found on the media websites. Whilst the number of incidents might be considered low, and the risk of such incidents occurring low, the consequences might be severely damaging if they do occur, as they attract significant media and public exposure.

A6.4 Monitoring and control of microbial pathogens

A6.4.1 *Principle of microbial monitoring*

There are a huge number of microbial pathogens comprising very different types and characteristics. Individual test methods are required to monitor each specific microbial pathogen and therefore it is clearly not viable to monitor for each pathogen. The general approach is to consider monitoring for key indicator organisms (which may not necessarily be pathogens) and, if these are at acceptable levels, to assume that other pathogens levels are equally acceptable.

Such indicator organisms may also be used to monitor the effectiveness of processing to mitigate pathogen risks as well as monitoring product quality. For example, determining the numbers before and after a pasteurisation step provides evidence of the effectiveness of the pasteurisation process.

Some of the indicator organism/pathogen limits in EU standards for compost and digestate are presented in Table 0-48. In Table 0-48, *Salmonella* and Helminth ova may be considered as pathogens, and *E.coli* and *Enterococcaceae* as indicators. For a more detailed list, please see Section A6.10.

Table 0-48: Pathogen limits in existing EU standards

Standard	*Salmonella*	*E.coli*	*Enterococcaceae*	Helminth Ova
End of Waste Criteria	Absent in 25g of sample	1000 CFU/g fresh mass	-	-
Animal Byproduct Regulation (ABPR)	Absent in 5 of 5 samples of 25g each	<1000 / g in 4 of 5 samples (or Enterococcaceae limit)	<1000 / g in 4 of 5 samples (or E. coli limit)	-
Germany RAL-GZ 245 (digestate)	Absent in 50g fresh matter	-	-	-
UK PAS100 (compost)	Absent in 25g fresh matter	1000 CFU/g fresh mass	-	-
UK PAS110 (digestate)	Absent in 25g fresh matter	1000 CFU/g fresh mass	-	-
Denmark	Absent (sample size not specified)	<100 CFU/g fresh mass	<100 CFU/g fresh mass	-
France (NFU-44-051)	Absent in 1g for gardening/ retailer use; Absent in 25g for other uses	-	-	Absent in 1g for gardening/ retailer use; Absent in 1.5g for other uses

A6.4.2 *Control of pathogens in growing media, soil improvers and mulches*

Control of pathogens in GM, SI and mulches would be largely based on using constituents that are free of pathogens and, if present, storing and using the products in a way that minimises the exposure and risk of the pathogens growing.

Where constituents (such as composts and digestates) are derived from waste and have a high risk of containing pathogens, they need to be treated to reduce the risk, i.e. the treatment should kill the pathogens. In most cases, this can be accomplished by exposing the waste to high temperatures for sufficient periods of time. This is the main principle in providing protection from pathogens in the context of composting and AD, particularly in the context of processing animal by-products.

Animal By-Product composting and AD

Animal-by-products are waste materials frequently used in composting and AD processes. The Animal By-Products Regulation (Regulation (EC) No 1069/2009) stipulates the processing requirements in order to allow the use of these products as composts and digestates.

Input materials allowed in compost and digestate under ABPR include (amongst others):

- manure and digestive tract content;
- animal parts fit for human consumption (not intended for human consumption because of commercial reasons);
- animal parts rejected as unfit for human consumption (without any signs of transmissible diseases) and derived from carcasses fit for human consumption;
- blood, hides and skins, hooves, feathers, wool, horns, hair and fur (without any signs of diseases communicable through them);
- former foodstuffs and waste from the food industry containing animal products;
- raw milk;
- shells, hatchery by-products and cracked egg by-products;
- fish or other sea animals (except sea mammals);
- fresh fish by-products derived from the food industry.

Hygienisation requirements are also included in the Regulation for each material Category. For Category 3 materials (including catering waste), the following requirements apply:

- maximum particle size before entering the composting reactor: 12 mm;
- minimum temperature in all material in the reactor: 70 °C;
- minimum time in the reactor at 70 °C (all material): 60 minutes.

As an alternative to the hygienisation processes listed in ABPR, Member States can use their own process provided that the process is demonstrated to achieve the following overall risk reduction:

(i) for thermal and chemical processes, by:

— a reduction of 5 log10 of *Enterococcus faecalis* or *Salmonella Senftenberg*

— reduction of infectivity titre of thermo-resistant viruses such as parvovirus by at least 3 log10, whenever they are identified as a relevant hazard; and

(ii) as regards chemical processes, also by:

— a reduction of resistant parasites such as eggs of *Ascaris* sp. by at least 99,9 % (3 log10) of viable stages.

Representative samples of the digestion residues or compost, taken during or immediately after transformation at the biogas plant or composting at the composting plant in order to monitor the process, must comply with the standards in the box overleaf.

Escherichia coli: n = 5, c = 1, m = 1 000, M = 5 000 in 1 g;

or

Enterococcaceae: n = 5, c = 1, m = 1 000, M = 5 000 in 1 g;

Furthermore, representative samples of the digestion residues or compost taken during or on withdrawal from storage must comply with the following standards:

Salmonella: absence in 25 g: n = 5; c = 0; m = 0; M = 0

Where:

n = number of samples to be tested;

m = threshold value for the number of bacteria; the result is considered satisfactory if the number of bacteria in all samples does not exceed m;

M = maximum value for the number of bacteria; the result is considered unsatisfactory if the number of bacteria in one or more samples is M or more; and

c = number of samples the bacterial count of which may be between m and M, the sample still being considered acceptable if the bacterial count of the other samples is m or less.

Digestion residues or composts that do not comply with the requirements set out above must be resubmitted to transformation or composting, and, in the case of Salmonella, handled or disposed of in accordance with the instructions of the competent authority.

Additionally, the ABPR requirements are a pre-requisite for attaining end of waste status for composts and digestates when animal by-products are used as composting and AD feedstocks. For example, the proposals for the EU end of waste criteria state that compost and digestate containing animal by-products will always be subject to the specific provisions of ABPR with regard to hygienisation, transport and use, and no national or EU-wide End of Waste regulations established for such materials can overrule or annul ABPR.

It is important to appreciate that some micro-organisms are heat resistant; prions, for example, have a very high heat tolerance, as do the spores of many sporulating bacteria, and these may therefore survive such heat treatments.

The current UK Quality Protocols for composts and digestates, alongside PAS100 and PAS110, which allow current EoW status, also refer to complying with ABPR in this context.

However, animal by-products are not the only source of microbial pathogens.

<u>Pathogens that might be of specific concern</u>

Prions

One of the aims of the ABPR was to help control the risks from some prion diseases such as BSE. Prions are very small infectious proteins that have the capacity to reproduce in the host. They are very stable to heat treatment and would require temperatures achieved in rendering processes above those prescribed in the ABPR for composting and digestate. Prions of this type are most likely associated with category 1 ABP

and therefore not permitted in composting and AD feedstocks (BSE is associated with nervous tissue). Given the controls on livestock management to prevent BSE entering the food chain, it is also thought likely that food waste has a very low risk of containing BSE or similar prions (see risk assessment of Gale 2002).

Therefore, the control of feedstocks indicates that, in our opinion, the risk from prions requires no further mitigation in the context of EU Ecolabel SI, GM and mulches. However, a watching brief should be maintained on possible constituents of these products, so that they do not increase these risks.

Legionella

There have been several incidents of Legionella (*L. longbeachae*) lung infections associated with composts in Australia, USA, Japan, Greece and the UK (BBC 2010), some of which are fatal. This organism is reportedly found in soils and composts, and infection is through inhalation of bioaerosols generated when handling composts. In Australia, where it is more common, warnings and handling guidance are provided. In the UK, the Health Protection Agency (HPA 2010) provided limited guidance, which indicates the risk is low in Europe based on the number of reported incidents.

Our view is that warnings might be placed on EU Ecolabel products, with associated hygiene guidance.

Aspergillus

Aspergillus are a group of fungi often associated with composting, some of which (especially *A fumigatus*) produce large numbers of spores and can be opportunistic pathogens causing lung infections. The risk of Aspergillus in bioaerosols from composting processes is well known and in the UK there are requirements for bioaerosol monitoring and limits for exposure (including for fungi) in most composting process Environmental Permits. The elimination of *A. fumigatus* from composts is unlikely to be possible and therefore the use of composts containing SI and GM would also present a risk from handling these products. In our view, warnings should be placed on EU Ecolabel products with associated hygiene guidance.

A fatal incident of *A. fumigatus* associated with compost occurred when an old bag of compost was opened (Guardian 2008). The implication is that *A. fumigatus* had grown significantly in the bag during storage. This raises the question of when monitoring should take place, and if additional consideration of storage should be given.

Clostridia

Clostridia are a group of anaerobic bacteria that produce heat resistant spores that can survive the heat treatments associated with ABPR compliance in composting and AD processes. They are ubiquitous in nature, occurring in soils, water sediments and animal digestive tracts, and will be found in biowastes. As they are anaerobic bacteria, they may also grow in mesophilic AD processes. The family includes many pathogens, including many that produce very potent toxins, e.g. botulinum produced by strains of *C. botulinum* (Johnson and Bradshaw 2001).

Several studies have indicated the presence of this bacterium in biowaste feedstocks, composts and digestates, and highlight that it may not be attenuated during the normal treatment process (Bagge *et al.* 2010, Bohnel and Lube 2000, Bohnel 2002). There are also concerns that the widespread application of

digestate to agricultural land in Germany has increased the incidence of botulism in farm animals and farm workers[24].

The risks from Clostridia have largely been under-researched, which may partly be due to the difficulty in eliminating spores and the large number of clostridial pathogens. For the EU Ecolabel, our view is that some form of additional monitoring that indicates some limitation on the numbers of clostridia present would provide some additional risk mitigation.

Plant pathogens

There are large number of plant pathogens of concern that may infect commercial crops and natural plants. These may be viruses, bacteria and fungi. Given the globalisation of markets, the risk of the spread of plant pathogens through the import of horticultural products should be considered, as the consequences might be significant. In the UK, for example, non-indigenous plant diseases such as sudden oak death (*Phytopthera ramorum*) and ash dieback (*Chalara fraxinea*) are causing significant damage to natural ecosystems. The origins of ash dieback in the UK might have been in part due to the import of infected horticultural nursery stock and natural spread by air from the continent (Forestry Commission 2013).

Some plant pathogens show heat resistance and can survive normal treatments. A review by Noble and Roberts (WRAP 2003b) indicated that a compost temperature of 55°C for 21 days was sufficient for ensuring the eradication of most plant pathogens, but some fungal pathogens such as *Plasmodiophora brassiciae* (clubroot) and *Fusarium oxysporum* f. sp. *Lycopersici* (tomato wilt) required a higher temperature (65°C) for the same period. Several plant viruses, including Tobacco Mosaic Virus and Tomato Mosaic Virus, were also heat tolerant. Therefore, full assurance of eradication of all plant pathogens cannot be made. The heat/temperature profile of 65°C for 7 days advised for composting in PAS100 is thought to provide adequate attenuation of most plant pathogens and animal pathogens.

In our view, there should be a low risk of plant pathogens in EU Ecolabel SI and GM that includes compost and digestate as an ingredient and that has undergone sufficient heat treatment. It could be very damaging if any incident were traced back to an EU Ecolabel product, although this is a risk issue, as full assurance cannot be provided. Additionally, we have more concerns if any constituent were derived from plant material and had not had a sanitation step. For example, raw plant by-products such as rice husks, coconut fibre, bark, wood chips and sawdust might contain live plant pathogens. It is our view that such materials should only be permitted in EU Ecolabel SI, GM and mulches if they have undergone a heat treatment under comparable conditions to those required for composting and AD ABPR compliance.

Animal pathogens

Animal pathogens (with the exception of microbes such as *Legionella, Aspergillus* and *Clostridia*) are in our view largely controlled through the current monitoring requirements and the ABPR heat/temperature requirements where these are derived from ABP. However, animal pathogens may be present in other green biowastes from faecal contamination. WRAP (2003) reported that animal pathogens found in compost

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[24] http://notrickszone.com/2011/05/19/biogas-plants-producing-deadly-botulism-could-be-catastrophic-to-wildlife/

are *Salmonella* and *E. coli*, but also endemic agents such as *Mycobacterium bovis*, *Mycobacterium paratuberculosis*, Bovine Viral Diarrhoea Virus (Mucosal Disease) and *Serpulina hyodysenteriae* (Swine Dysentery). WRAP (2009) reported the presence of *T. gondii* in green waste, due to cat litter contamination.

Therefore, any feedstock for GM, SI and mulches should be considered as containing some risk of containing animal pathogens and that, to reduce this risk, the feedstocks should have been subjected to a sanitation step.

A6.5 What are the microbial organisms that should be limited

A6.5.1 *Current EU Ecolabel monitoring*

The current EU Ecolabel criteria for GM and SI include monitoring for *Salmonella spp.* and either *E.coli* or Helminth ova*.* This section discusses the value in monitoring these organisms and whether these are sufficient.

Salmonella spp.

Salmonella are a genus of enteric pathogenic bacteria that are responsible for many mild to potentially fatal (typhoid) gastric diseases. They are often found associated with food stuffs and faecal material of animal origin. In particular, they are often associated with poultry and eggs and are a known hazard in the kitchen to be aware of during food preparation. Consequently, they are potentially present in compost and digestate feedstocks. They may also contaminate green and garden wastes if containing faecal material, e.g from animal bedding, and natural faecal deposition.

They do not produce heat resistant bodies and are therefore readily destroyed by the heat treatments applied in composting and AD processes to comply with ABPR. They are readily tested for in low cost microbiological tests that test for the group of *Salmonella* and are hence broad based rather than for a particular species. The test is widely applied in the context of standards or proposed standards for composts and digestates (Table 0-49), where typically the limit is none detected in 25 g of fresh weight of material, although some are more and some less stringent in some uses. In the 2nd working document for the End of Waste criteria for biodegradable waste, a limit of absent in 50 g was proposed, although this was reduced to absent in 25 g in the 3rd working document following consultation (IPTS 2012).

Table 0-49: EU Standards for compost and digestate – limits for Salmonella

Country	Standard	Limit
EU	ABP Regulation	None in 25 g for 5 samples
EU	Proposed end of waste criteria for biodegradable waste (Draft Final Report)	None in 25 g fresh weight
EU	Fertiliser Regulation (draft proposal)	None in 25 g fresh weight
Germany	RAL-GZ-256	None in 50 g fresh weight
UK	PAS100 and PAS110	None in 25 g fresh weight

Country	Standard	Limit
France	NFU-44-051	Gardening/retailer – None in 1 g Other uses – None in 25 g
Denmark	Biowaste ordinance	None (sample size not specified)
Italy	Fertiliser law	None in 25 g fresh weight
Latvia	Cabinet Regulation No. 530 25.06.2006	None in 25 g fresh weight

The presence or absence of *Salmonella* is not an effective indicator for general pathogen risk, as it is not always present in the feedstock. However, its absence is a reasonable indication that pathogen risks would be low for many non-sporulating ABP derived pathogens. On this basis, and considering the relatively low cost of testing, we see testing for this organism as valuable protection that should be maintained.

Helminth ova

Monitoring for Helminth ova is usually considered as an alternative test to that for *E. coli* (section 0), as an indicator for faecal contamination and hence faecal-derived pathogen risks.

Helminths are a collective name for flatworms (flukes and tapeworms) and roundworms (nematodes), many of which are parasites of the intestinal tract and produce eggs (ova) which are released and therefore may be found in faecal material. Helminths are transmitted to humans in many different ways, but the simplest is by accidental ingestion of infective eggs (*Ascaris, Echinococcus, Enterobius, Trichuris*) or larvae (some hookworms). The presence of ova may be used as a direct indicator of risks from helminths and of faecal material. Their presence in faecal material is not guaranteed, as they are parasites and not normal components of the intestinal organisms. Therefore, their absence is not a guarantee of no faecal contamination and consequently no risk from other feacal derived pathogens. In the current EU Ecolabel for GM and SI, there is a requirement to monitor for Helminth ova if the compost component is not exclusively green, garden and park waste. This recognizes that helminths are generally associated with ABP, but there is also no guarantee that park green waste is free of faecal material.

Monitoring for Helminth ova is less commonly carried out in many compost and digestate standards for which limits are similar (Table 0-50).

Table 0-50: EU Standards for compost and digestate – limits for Helminth Ova

Country	Standard	Limit
EU	ABP regulation	Not required (*E. coli* instead)
EU	Proposed end of waste criteria for biodegradable waste (Draft Final Report)	Not required (*E. coli* instead)

Country	Standard	Limit
Germany	RAL-GZ-256	Not required
UK	PAS110	*E. coli* instead but possibly included in specific cases at discretion of accrediting ABR body
France	NFU-44-051	Gardening/retailer – None in 1 g Other uses – None in 1.5 g
Italy	Fertiliser law	Not required but *Nematodes, trematodes, cestodes* must be absent in 50 g
Poland		Not required but *Ascaris, Trichuris, Toxocara* must be absent (sample size unspecified)

E. coli

Escherichia coli is a common microorganism found in significant numbers in the intestinal tract of all animals. Most strains are not pathogenic and live in the intestine as a normal part of the gut flora, but there are some notable pathogenic strains, e.g. O157. Its virtually universal presence in faecal material means that *E. coli* is used in many areas as an organism to indicate faecal contamination and, as a consequence, the potential presence of faecal-derived pathogens.

In the current EU Ecolabel criteria for SI and GM, the test for *E. coli* is applied for products whose compost component is exclusively derived from green, garden or park waste. These materials may be contaminated with faecal material and contain *E. coli*. Similarly, however, the *E. coli* would be an indicator of faecal contamination in EU Ecolabel SI and GM products for which helminth ova are currently tested. In our view, this would be preferable, as *E. coli* is an indicator of feacal contamination rather than a specific pathogen indicator. The presence and absence of *E. coli* does not provide an absolute guarantee of the presence or absence of faecal material and of faecal pathogens, However, it should be understood that the only surety for the presence or absence of a particular pathogen is to monitor specifically for the pathogen.

E. coli do not produce heat resistant spores and are therefore killed at the temperatures reached in ABPR compliant composting and AD processes. Where such processes have undergone heat treatments for ABPR compliance and the numbers of *E. coli* are low, this is used as an indication that the risk from faecal-derived pathogens is also low. However, it is possible that the initial numbers of *E. coli* were low and, if similarly low in the product, that could be interpreted as there being a low level of faecal contamination but that the heat treatment was insufficient to kill the *E. coli* and any potential faecal pathogens. Therefore, to be certain that the heat processing has resulted in mitigation of pathogen risks, monitoring of *E. coli* numbers should be carried out before and after treatment.

In the UK, the extent of sanitation in the treatment of sewage sludge destined for recycling to land is voluntarily regulated using *E. coli*, as described in the safe sludge matrix (ADAS 2001). For conventional sewage sludge, a 2-log reduction in *E. coli* numbers is required and, for advanced treated sludge, the target

is a 6-log reduction. In this case, monitoring is used directly to prove effective treatment, but this is only possible because sewage sludge by its very nature as being of faecal origin is guaranteed to contain high contents of *E. coli* before treatment. This approach is less suitable to biowaste composting and anaerobic digestion, as the level of *E. coli* in the input is not certain.

The analysis of *E. coli* is a relatively low cost and established methodology, and limits for *E.coli* appear widely in standards for composts and digestates, with similar limit of 1000/ g fresh weight (Table 0-51). Note there are some differences in methods and reporting units, e.g. as CFU (colony forming units) or MPN (mean probable number).

Table 0-51: EU Standards for compost and digestate – limits for E. coli

Country	**Standard**	**Limit**
EU	ABP regulation	1000/ g in 4 of 5 samples (units CFU or MPN not specified)
EU	Proposed end of waste criteria for biodegradable waste (Draft Final Report)	1000 CFU /g
EU	Fertiliser Regulation (draft proposal)	1000 CFU/ g fresh weight
Germany	RAL-GZ-256	
UK	PAS100 and PAS110	1000 CFU/ g fresh weight
France	NFU-44-051	Not used (Helminth ova instead)
Italy	Fertiliser law	Not used (*Enterobacteriaceae* instead)
Czech Republic	Biowaste ordinance	1000 CFU/ g
Spain		1000 MPN/g
Finland		1000 CFU/g
Latvia	Cabinet Regulation No. 530 25.06.2006	2500 CFU/g

A6.5.2 *Other indicators of faecal contamination*

In standards for composts and digestates, other tests have been employed that essentially look for enteric microbes or microbial groups that are universally found in faecal material. In standards, these may often be applied instead of or in addition to monitoring *E. coli* (Table 0-52, see also Section A6.10). These microbes and microbial groups have similar heat tolerance as *E. coli* and so will show a similar indication of the risk from faecal contamination.

In our view, these tests provide no clear additional protection than that from the more commonly applied *E. coli* test. As discussed above, we are aware of no clear benefit of the Helminth ova test over the *E. coli* test. We would propose that only the *E. coli* test need be applied in the proposed revised EU Ecolabel criteria as an indicator of faecal contamination and risk from heat labile faecal pathogens. In our view, monitoring other microbial parameters as indicators of other microbial risks that are not covered by the *Salmonella spp* and *E. coli* tests would be a preferable means of providing a broader pathogen protection.

Table 0-52: EU Standards for compost and digestate – limits for other indicators of faecal contamination

Country	Standard	Microbe and Limit
EU	ABP regulation	1000/ g in 4 of 5 samples
EU	Proposed end of waste criteria for biodegradable waste (Draft Final Report)	none
CZ	Biowaste Ordinance	Enterococcaceae 1000 CFU/ g
Denmark		Enterococcaceae 1000/ g
Ireland	Individual licence	Faecal coliforms 1000 MPN/ g
Italy	Fertiliser law	Enterobacteriaceae 1000 CFU/ g Faecal Streptococcus 1000 MPN/ g

A6.5.3 *Other possible microbial monitoring parameters*

There are many other possible micro-organisms of concern that might survive biowaste composting and AD treatment and therefore be present in any EU Ecolabel SI, GM or mulch using composts and digestates as a constituent. The difficulty of this is that monitoring would not provide more general assurance for a range of organisms, as there is no guarantee the target organism will be present in the feedstock. Absence of one target species only provides assurance regarding the target species. Indicator micro-organisms can be monitored and have been used in standards to assess the safety from other microbial types. Other microbial species that might be targeted are described below.

Sporulating bacteria

There are established monitoring methods for analyzing organic wastes for sporulating clostridia. A commonly used method is to analyse for *C. perfrigens*, which is a pathogenic bacterium of some concern causing gastoenteritus. Whilst, as with all indicator organism, it is not a guarantee that other heat resistant sporing species are absent, low numbers of *C .perfringens* would provide some assurance.

Viruses

As the discussion above indicates, there are some commercially important viruses of plants (tomato and tobacco mosaic viruses) that might survive composting, and monitoring for these is a possibility to consider.

Monitoring is, however, rare in composting standards, although the German Biowaste Ordinance uses Tobacco Mosaic virus as part of the Process Validation (see Section A6.10). In the Netherlands, there are also limits for Rhizomania virus.

Fungi

There are some fungal plant pathogens that also might survive composting. Some have been included in standards in Flanders in specific products e.g. root rot fungus (*Fusarium*) in materials to be used for seeding growth. In the Netherlands, there are also limits for *Plasmodiophora brassiciae.*

Summary

Our conclusion is that monitoring should include *E. coli* and *Salmonella* spp on EU Ecolabel SI, GM and mulches as an absolute requirement.

We also conclude that some measures should be considered that might entail additional testing for providing assurance against fungi, viruses and sporulating clostridia.

A6.6 Consultation Feedback

In the consultation with stakeholders, we asked whether they agreed with the current EU Ecolabel microbial tests, as well as whether testing for both *E.coli* and Helminth ova was necessary. In summary, about a third of respondents who answered that they agree with existing microbiological testing *E. coli,* Helminth ova and *Salmonella*). A quarter disagreed with existing tests, with the majority suggesting that testing for Helminth ova is not necessary. Approximately half of the respondents suggested that microbiological testing should be carried out on each constituent, while the other half believes that it is best to test the final product. No respondents agreed with introducing additional tests, apart from one that suggested testing for *Clostridium spp*. might be useful if it is found in the raw materials from which digestate is derived.

Overall, there was a general consensus of maintaining or reducing the microbial testing requirements for EU Ecolabel. The only responses that indicated a potential to enhance the testing requirement would be for monitoring of constituents rather than product, which was supported by half the respondents.

The cost of microbiological testing would be significant and, in our view, will have been a factor in these responses from stakeholders. However, we take a view that changes to the EU Ecolabel microbial testing should at least be considered.

A6.6.1 *Selected responses*

A selection of responses is presented below:

"These (Helminth Ova, E. coli, Salmonella) are the most important pathogens which should be tested on growing media, soil improvers or mulch. Analysis on the end product will give reliable results. There is no need to analyse the raw materials. This will make the procedure long and expensive"

"As in the previous revision process of the Ecolabel criteria we do not see any reason to determine Helminth Ova."

"We do not consider the Helminth Ova test necessary. The products do not contain sewage sludge. In any case the test has not given consistent results in inter-laboratory trials"

"The detection of Helminth Ova could be used has an alternative to E. coli and testing should only be carried out on the final product"

"It would be better if each individual constituent is tested so that the source can be identified in the event the relevant limit has been exceeded."

"Since any risks from the microbiological hazards will result from exposure to the final product, it seems appropriate to test only the final product"

"In our opinion it doesn't make any difference to undertake the tests on individual constituents and the final product or just on the final product."

"Microbiological testing is done after the treatment/production process is finished. The Microbiological tests are used as an evidence that hygienisation took place during the processing."

"(testing should be taken..)..On final product. Even if a component has a low level of microbiological contaminants it could be "polluted" by another component and be an excellent media for multiplication."

"Clostridium spp. (should be tested) if there is the presence among raw materials of the digestate"

"(testing should be taken) Post manufacturer, because this takes into account the processing steps and hazard control measures of the waste treatment plant (in case of compost). Whenever recontamination or regrowth of microbial parameters would occur, this is the responsibility of further operators in the production chain."

A6.7 **Microbial monitoring for EU Ecolabel SI, GM and mulches**

This section discusses the rational for the proposed EU Ecolabel microbial monitoring criteria for SI, GM and mulches.

A6.7.1 *Limits applied to constituents and/or final product?*

<u>Microbial content of constituents</u>

A report published by WRAP (2003) reported that organisms which may contaminate green compost include bacteria such as *Salmonella, Campylobacter, E. coli* (including enteropathogenic and enterohaemorrhagic types such as O157:H7), *Pasteurella, Listeria, Erysipelothrix, Staphylococcus aureus, Leptospira, Serpulina hyodysenteriae,* mycobacteria including perhaps *M. bovis* and *M. paratuberculosis*, spore-formers such as *C. perfringens* and *C. tetani* and rickettsias such as *Coxiella burnettii*. The majority of them are thought not to survive composting of animal manures although some, such as *Listeria*, mycobacteria and spore-formers, may be more resistant. The latter are, however, common contaminants in soil and their presence in compost would probably not create an increased hazard according to the report (WRAP, 2003). Lasaridi *et al.* (2006) also reported the presence of *Salmonella, Clostridium perfringens, Streptococci, Staphylococcus aureus* and *E. coli* in compost.

Paluszak *et al.* (2003) reported the presence of *Escherichia coli*, fecal streptococci D-group and *Salmonella senftenberg* W_{775} in peat soil. Waller *et al.* (2008) studied fungal species in different GM substrates, including peat, green waste compost, woodfibre, coir and bark. Fungi identified were *Aspergillus, Chaetomium, Mortierella, Mucor, Penicillium and Verticillium.* Beneficial *Trichoderma* species (*T. asperellum, T. harzianum* and *T. viride*) were present mostly in peats, while two of the peat samples contained *Fusarium oxypsorum* f.sp. *melonis*, pathogen of melons, and a species of *Rhizoctonia* pathogenic to barley and lupins.

There was a lack of scientific literature on microbial pathogens in other constituents.

Constituents or product?

In the current EU Ecolabel criteria, the microbial limits are applied to the EU Ecolabel product. This seems a reasonable position to take. Although microbial analysis may have been carried out on constituents such as composts and digestates at the time of their production and they have attained end of waste status, there may have been microbial growth in the compost and digestate and/or contamination between the production site and the production of the EU Ecolabel product.

Microbial monitoring for end of waste status should be acceptable for EU Ecolabel purposes when:

- the microbial testing of a compost or digestate has been carried out for end of waste criteria;
- the testing was carried out using the same microbial parameters and frequency as the EU Ecolabel proposals; and
- the compost or digestate is used as sole constituent in a SI, GM or mulch product.

Some stakeholders indicated that they would support monitoring of constituents on the grounds that it would facilitate following up incidents of criteria failure. In our view, this would be a normal process to investigate any EU Ecolabel product quality criteria failure, and that it is within the remit of any organisation to carry out additional monitoring of constituents if it has any doubt that it may fail the product quality criteria.

Product after storage

Additionally, there is a risk that pathogens may grow during storage of EU Ecolabel products and that some protection should be provided against such an event. The incident regarding *Aspergillus fumigatus* mentioned in Section 0 may have been due to growth during storage. It is possible to conceive that EU Ecolabel products would be stored in warm places for several months and that they contain sufficient water, biodegradable organic matter and nutrients that would allow microbial growth to occur. However, as it not possible to predict every storage combination, it would be difficult to provide effective limits for product as manufactured and for product stored under different situations.

For growth to have occurred during storage, favourable conditions for the proliferation of the microbe must be present. A key parameter is the biodegradability of the materials present in the GM or SI, as this provides the carbon and energy source for the microbial growth. Whilst composts may contain fully biostabilised, organic matter digestates will only be partially biostabilised. Also, in GM and SI, these materials may be mixed with other biodegradable materials that have not had any biological treatment (e.g. coconut fibre, rice husks) and therefore be relatively biodegradable. Therefore, the GM and SI products may contain differing amounts of biodegradable material and potential for pathogen growth during storage.

It would be possible, however, to carry out storage trials on products under conditions that are most conducive to microbial growth. These trials could include monitoring of EU Ecolabel microbial parameters and inoculation of trial batches with specific pathogens, noting whether they grow, remain unchanged or are attenuated during storage. Such trials could be required as a pre-requisite for EU Ecolabel application, and would only need to be repeated if the EU Ecolabel accreditation were being revisited. This approach would limit the financial burden of this additional monitoring and mimics ABPR approaches, where inoculated micro-organisms are used to confirm that process conditions are compliant.

Summary of constituent and/or product monitoring

In our view, microbial monitoring should be restricted to the product but include consideration that no enhancement of microbial risks occurs during product storage. Also, where the product is composed of a single material, such as compost or digestate that has attained end of waste status, then the monitoring for end of waste status may suffice for the product (as produced) if the monitoring method and frequency is as for the EU Ecolabel criteria.

A6.7.2 *What minimum monitoring frequency should be applied?*

The current SI and GM EU Ecolabel criteria include a minimum testing frequency prior to obtaining EU Ecolabel certification that requires only 2 samples.

"Analytical tests shall be made on a representative sample from a product batch and at least one further representative sample from a different product batch, each of which was produced in the three months before the application date."

There is no stipulated minimum monitoring frequency in order to prove Ecolabel status has been maintained, although this is assumed to be agreed in the contract between the producer and the member state Ecolabel certifier.

In our view, this is an insufficient monitoring frequency, and this should be specified in more detail. Example frequencies before accreditation and following accreditation are given in Table 0-53.

Table 0-53: Monitoring frequency in EU standards

	UK PAS100 (compost)	**UK PAS110 (digestate)**	**Draft End of Waste**	**Germany RAL GZ 256 (secondary raw material fertilisers and SI)**	**France NFU 44051 (organic fertilisers and soil improvers)**
Before Accreditation	3	3	4 in first year	one analysis for every full or partial batch of 1500 tons plant input, at least 4 tests	1-4 per year depending on plant input
After Accreditation	1/5,000 m3 or 1/year if production is <5,000 m3/a	1/6,000 m3 digestate or once every 3 months (whichever is sooner)	1 per 10000 tonnes + 1 input up to a maximum of 12 per year.	one analysis for every full or partial batch of 2000 tons plant input, at least 4 tests	1-4 per year depending on plant input

In our view, the minimum frequency for pre-certification should match or even exceed the minimum indicated here. Our proposal would be for a minimum of four samples to be tested from four different batches in the six months prior to certification. This should include proposals for storage trials as part of the pre-certification,

that each product batch is stored under final product conditions, (bagged or loose pile) for a period of three months at 37°C, and then tested for growth of microorganisms after 3 months.

In addition, our view is that, as with other compost and digestate specifications, there should be continued post-certification monitoring for ensuring compliance. This is proposed as a minimum of one sample every 2,000 tonnes on a dry matter basis, up to maximum of 12 samples per year (three samples per quarter).

A6.7.3 *What test micro-organisms*

In our view, there is benefit from simplifying the monitoring requirements to *Salmonella* spp. and *E.coli* for pre-certification (including product storage trials) and post-certification purposes.

We do not propose to increase the monitoring to include other microbial species, based mainly on the stakeholder feedback responses. However, we do consider that there are potential health risks to humans, animals and plants that are not fully understood and for which current composting and AD processing heat treatments may not provide sufficient risk mitigation. We recommend that consideration is given by member states to the inclusion of other microbial monitoring including for heat resistant spore forming bacteria, such as Clostridia, in this or the next revision of the EU Ecolabel criteria for SI, GM and mulches.

A6.7.4 *What limits and methods for the micro-organism tests should be applied*

The routine product monitoring test methods for *E. coli* and *Salmonella spp.* are proposed as being unchanged (Table 0-54) as this is in accord with current end of waste criteria for biodegradable waste and many current compost and digestate standards. The *E. coli* test method in the current EU Ecolabel SI and GM CEN Committee is ISO 11866-3, with values reported as MPN /g fresh weight. There is a test method for *E. coli* (CEN/TR 16193) under development by CEN/TC400 (Horizontal programme), which we would propose to apply as soon as it is fully published.

We are not aware of any CEN/TC400 method under development for *Salmonella spp*. Therefore, we would propose that the same method as used currently (ISO 6579) is applied, with the provision that this is replaced if a horizontal programme method is developed.

Table 0-54: Proposed limits and testing methods

Test	Limit	Method
E. coli	1,000 CFU /g fresh weight	CEN/TR 16193 - Sludge, treated biowaste and soil — Detection and enumeration of *Escherichia coli*
Salmonella spp.	Absent in 25 g fresh weight	ISO 6579

<u>Monitoring of stored product</u>

We propose that no growth of pathogens should occur during the storage period of product, i.e. the limits for *E. coli* and *Salmonella* spp. should not be exceeded following product storage.

A6.8 Proposed Microbial monitoring Criteria summary

The summary proposed monitoring requirements are therefore shown in Table 0-55. The same requirements to be applied to GM, SIs and mulches.

Table 0-55: Proposed microbial criteria

	E. coli	***Salmonella* spp**
Pre-certification – Product as manufactured	4 samples from separate batches in 6 months Limit - 1000 CFU/g fw	4 samples from separate batches in 6 months Limit - absent in 25g fw
Pre-certification – Product storage trial (testing after 3 months storage)	Same batches as for Product certification stored for 3 months. Limit - 1000 CFU/g fw	Same batches as for Product certification stored for 3 months. Limit - absent in 25g fw
Post-certification monitoring	1 sample every 2,000 tonnes (dry matter) up to 12 per year (3 per quarter) Limit - 1000 CFU/g fw	1 sample every 2,000 tonnes (dry matter) up to 12 per year (3 per quarter) Limit - absent in 25g fw

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A6.10 Further Information: Provisions from the EoW Criteria Work

Table 0-56: Provisions for the exclusion of pathogens, germinating weeds and plant propagules in compost in several European countries – Draft Final Report EoW Criteria for Biodegradable Waste

		Indirect TIME- TEMPERATURE Regime				Direct methods		
		°C	% H_2O	part. size mm	time	Application area	pathogens / weeds	product (P)/ approval of technology (AT)
ABP	Regulation *1069/2009*	70		12	1h	Cat. 3 material	*Escherichia coli OR Enterococcae* *Salmonella*	**Process validation**: < 1000 / g in 4 of 5 samples *1000-5000* / g in 1 of 5 samples **Final Compost**: Absent in 25g in 5 of 5 samples
EC/	'eco-label' *2006/799/EC* *2007/64/EC*					Soil improver growing media	*Salmonella sp.* *E. coli*[67] *Helminth Ova*[67] **Weeds/propagules**	Absent in 25 g < 1000 MPN *(most probable number)*/g Absent in 1.5 g Germinated plants: ≤ 2 plants /l
AT	*Statutory 'Guidline – State of the Art of Composting'*	55 – 65 flexible time/temp. regimes are described at min. 55°C 1 to 5 turnings during a 10 – 14 days thermophilic process			10 d	Land reclam. Agriculture Sacked, sport/ playground Technical use Horticulture/ substrates	*Salmonella sp.* *Salmonella sp.* *E. coli* *Salmonella sp.* *E. coli,* *Camylobacter,* *Listeria sp.* --- **Weeds/propagules**	Absent Absent If positive result recommendation for the safe use Absent Absent Absent Absent No requirements Germination ≤ 3 plants /l
BE	*VLACO*	60 55			4 d 12 d		*process control* **Weeds**	Time, temp relation Absent
CZ	*Biowaste Ordinance*	55 65			21 d 5 d		*Salmonella spp.* *E. coli* *Enterococcae*	Absent < 10^3 CFU / g < 10^3 CFU / g
DE	*Biowaste Ordinance*	55 60 [1)] 65 [2)]	40 40 40		14 d 7 d 7 d		*Salmonella senft.* *Plasmodoph. Brass.* *Tobacco Mosaic virus 1* *Tomato seeds* *Salmonella senft.* **Weeds/propagules**	**Process validation** [3)]: Absent Infection index: ≤ 0.5 Guide value bio-test: ≤ 8 /plant Germination rate /sample: ≤ 2% **Compost production**: Absent in 50 g sample Germination ≤ 2 plants/l
DK		55			14 d	Controlled	*Salmonella sp.*	Absent

	Indirect TIME- TEMPERATURE Regime				Direct methods		
	°C	% H_2O	part. size mm	time	Application area	pathogens / weeds	product (P)/ approval of technology (AT)
					sanitised compost	*E. coli* *Enterococcae*	< 100 CFU /g FM < 100 CFU /g FM
ES						*Salmonella sp.* *E. coli*	Absent in 25 g < 1000 MPN *(most probable number)*/g
FI						*Salmonella*	not found in a sample of 25 grams
						Eschrichia coli	1000 CFU/g
						Root rot fungus (for instance Fusarium)	Not ascertainable in substrates used in seedling production
						Globodera riostochiensis and pallida, Clavibacter michicanensis, Ralstonia solanacearum, Synchytrium endobioticum, Rhitzomania, Meloidogyne spp	Not ascertainable in a fertiliser product manufactured from root vegetable, beet and potato raw materia or from topsoil fractions accompanying these to the factory or barking plant.
						Other quarantine pests causing plant diseases	Not ascertainable in fertiliser products manufactured from plant waste or substrates in greenhouse production
FR	60			4 d	Gardening/ retailer	*Salmonella sp.* *Helminth Ova*	Absent in 1 g Absent in 1 g
					Other uses	*Salmonella sp.* *Helminth Ova*	Absent in 25 g Absent in 1.5 g
IE *Green waste*	---	---	---	---	Individual license! 2004	*Salmonella sp.* *Faecal colimforms*	Absent in 50g ≤ 1,000 MPN/g
Catering waste	60		400	2 x 2 d	Individual license! 2007	*Salmonella sp.* *Faecal colimforms*	Absent in 50g ≤ 1,000 MPN/g
Cat3 ABP	70		12	1 h			
IT	55			3 d			
Fertil. law						*Salmonella sp.*	Absent in 25 g sample
						Enterobacteriaceae	≤ 1.0 x 10^3 CFU/g
						Fecal Streptococcus	≤ 1.0 x 10^3 MPN/g
						Nematodes *Trematodes* *Cestodes*	Absent in 50 g sample Absent in 50 g sample Absent in 50 g sample
LV *Cabinet Regulation No. 530 25.06.2006*					Fertilisers	*Salmonella sp.* *E. coli*	Absent in 25 g sample < 2500 CFU /g
NL *Beoordeli*	55			4 d		*Eelworms*	Absent

	Indirect TIME- TEMPERATURE Regime				Direct methods		
	°C	% H_2O	part. size mm	time	Application area	pathogens / weeds	product (P)/ approval of technology (AT)
ngsrichtlijn keurcompost						*Rhizomania virus* *Plasmodoph. Brass.* *Weeds*	Absent Absent Germinating plants: ≤ 2 plants/l
PL					All applications	*Ascaris* *Trichuris* *Toxocara* *Salmonella sp.*	Absent Absent Absent Absent
SI Decree on the treatment of biodegradable waste (Official Gazette of the Republic of Slovenia, no. 62/08	55 60 65			14d 7d 7d		*Salmonella sp.*	Absent in 25 g
UK *PAS 100 voluntary standard*	65	50 min. 2 turnings		7 d[4)]	All applications	*Salmonella ssp.* *E. coli* **Weeds/propagules**	Absent in 25 g < 1000 CFU *(colony forming units)*/g Germinating weedplants: 0/l

A7. Other Criteria

A7.1 Introduction

Ricardo-AEA has been commissioned by JRC/IPTS to provide technical support for the potential revision of the EU Ecolabel criteria for Soil Improvers (SI) and Growing Media (GM). The scope of the work included the potential revision of several identified parameters as shown in Section A7.2.1 below. The scope of this project also includes development of an EU Ecolabel for mulches.

The current EU Ecolabel for SI and GM also contain several other criteria which may require some adjustment and updating, especially as it is intended to provide proposals for mulches as a separate product to SI and GM.

Recommendations for the revised parameters are included in the main report. This Annex provides the justification for the revised proposals for these other criteria.

A7.2 Background

A7.2.1 *Requirement to revise EU Ecolabel criteria for Soil Improvers and Growing Media*

JRC/IPTS are currently developing proposals for a revision of the EU Ecolabel criteria for SI and GM. A Commission Statement issued in April 2006 highlighted the issues (Table 0-57) that should be taken into consideration at the next revision which included microbial criteria. The scope of this project also includes development of an EU Ecolabel for mulches. In addition to the issues in Table, there are several other criteria that are relevant and that may require revision. In this annex, we have considered the proposed revision for other criteria relevant to EU Ecolabel SI, GM and mulches that are not covered in the table below.

Table 0-57: Issues to be addressed in revision of Soil Improver and Growing Media EU Ecolabel criteria

Issues to be addressed	Growing Media	Soil Improvers
Strengthening demands for heavy metals	X	X
Reducing the use of mineral wool (25% or 50%)	X	
Use of re-cycled/re-used mineral wool	X	
Extraction phase and emissions for minerals	X	
Re-look at the inclusion of peat	X	
Limits for relevant organic pollutants (*)	X	X
Test methods - *E. Coli* versus *Helminth Ova*		X
Sustainable resource management for ingredients		X

(*) Especially pesticides from fruit and vegetable sludges

A7.2.2 *Proposed revision scope*

In this revision, we have considered several factors in relation to “other” criteria that we think should be considered, and have developed justifications for our proposed revisions. These factors are:

- What are the current EU Ecolabel criteria
- Should the current EU Ecolabel criteria be amended and if so
- What limits if required should be applied
- What test method should be applied
- What reporting/declarations should be required

A7.3 Viable seeds and weeds

Both the EU Ecolabel for GM (Criterion 5) and SI (Criterion 7) currently include provision for testing for viable seeds and propagules with an associated declaration. According to the European Eco-label User Manual for Soil Improvers (DG Env 2006a) and the European Eco-label User Manual for Growing Media (DG Env 2006b):

“In the final product, the content of weed seeds and the vegetative reproductive parts of aggressive weeds shall not exceed two units per litre.

The criterion covers all viable seeds and propagules of undesired plant species found in end products.

Test methods: an overview and evaluation of standard test methods including a draft horizontal standard has been compiled as part of Project Horizontal. Ref.: Baumgarten, A., and Dersch, G., Contamination with Viable Weed Seeds and Plant Propagules, Horizontal-8, Agency for Health and Food Safety, Vienna, Austria, April 2004, the report can be downloaded from; http://www.ecn.nl/horizontal/downloads/finaldeskstudies/. See also paragraph. 2.3.”

The requirement and test method is not clearly defined in this statement.

We would propose that this requirement is retained for the revised EU Ecolabel for GM and SI. This would include inorganic GM as it may have become contaminated during product manufacture or have been derived from recycled wastes that have been in contact with plant material.

For mulch that generally has a much larger particle size than SI and GM, the testing may be difficult as it is not a fine soil like medium typically applied in such tests, although the mulch product is often applied to suppress weed growth. In this case, we would propose that testing is optional at the discretion of the Competent Body.

The method applied should be that recently developed by the Horizontal programme of CEN/TC400, i.e. CEN/TS 16201 Sludge, treated biowaste and soil - Determination of viable plant seeds and propagules.

It is beyond the scope of the project to consider the merits of this test. It is therefore proposed that the limit of 2 seed/propagules per litre of product in the current EU Ecolabel for GM and SI should be retained. However, the UK PAS100 compost specification has a limit of 0 propagules. We would recommend that this criterion is reconsidered at the next EU Ecolabel revision.

It should also be noted that this is a different test to the bioassay test we have proposed (see Section A6) for monitoring general toxicity through seed germination test (EN 16086-1:2011 Soil improvers and growing media – determination of plant response – Part 1: Pot growth test with Chinese cabbage).

A7.4 Electrical Conductivity

The current EU Ecolabel for growing media includes in Criterion 6a the requirement to determine the electrical conductivity of the product and defines a limit of 1.5 dS/m or 150 mS/m. According to the European Eco-label User Manual for Growing Media (DG Env 2006b):

"The electrical conductivity of the products shall not exceed 1.5 m or 150 mS/m. Electrical conductivity is the indirect measurement of salinity. It is an important parameter to be checked for every product coming into direct contact with plant roots. Unit of measurement is decisiemens per metre (dS/m) or millisiemens per metre mS/m. Test method: EN 13038."

There is no requirement to test for conductivity in the current EU Ecolabel for SI.

The electrical conductivity is a general measure of the soluble salt content of the product. It is known that one of the problems associated with the use of compost in GM is that composts tend to have high electrical conductivities to the extent that it can result in a poor performing GM. In our view, good product performance should be a quality characteristic that is a feature of a product bearing the EU Ecolabel.

It is not applicable for SI or mulches, which are added to or spread on soil and where the soluble elements that constitute the electrical conductivity would quickly dissipate.

The method applied should be that recently developed by the Horizontal programme of CEN/TC400, i.e. CEN/TS 15937 Sludge, treated biowaste and soil - Determination of specific electrical conductivity.

It is beyond the scope of the project to consider the merits of this test. It is therefore proposed that the limit of 150 mS/m in the current EU Ecolabel for GM should be retained. We would recommend that this criterion is also reconsidered at the next EU Ecolabel revision.

A7.5 Dry matter and organic matter content

The current EU Ecolabel for SI includes in Criterion 5a a requirement to measure the dry matter and organic matter content of the SI. Limits are set for these parameters (DG Env 2006a).

"Products shall be supplied in a solid form and contain not less than 25 % dry matter by weight and not less than 20 % organic matter by dry weight (measured by loss on ignition). Analytical tests shall be made on a representative sample from a product batch and at least one further representative sample from a different product batch, each of which was produced in the three months before the application date.

Test methods:

- Dry matter content: EN 13040

- Organic matter content: EN 13039"

The current SI EU Ecolabel limits for organic matter mean that this imposes a restriction that the SI must contain a significant amount of organic matter.

For GM, dry matter and organic matter content are not specific criteria, but organic matter content is required as part of the information required to be supplied with Criterion 6 – Information provided with the product. In order to measure this parameter, the dry matter content is required as well.

In the development of proposals on mineral extraction (Section A4), we have discussed the use of mineral materials in SI, GM and mulches. Note that separate proposals have been developed for the special case of mineral wool (Section A3).

In Section A4, we have proposed that:-

- for GM that the amount or source (recycled waste or raw extracted material) of minerals used in these products is reported but have not in that annex proposed any limits. This recognises that some GM used in commercial hydroponic horticulture may comprise wholly mineral media.
- for SI that the current limit for organic matter content (20% of the dry matter content is retained).
- for mulches, that these should not contain inorganic mineral constituents.

In our view, it is important that the dry matter and organic matter contents are recorded as information for SI, GM and mulches. A limit of not less than 25% dry matter effectively means that the product is a solid and not a very wet sludge. This might exclude many digestates, if generated by wet AD processes that do not include extensive dewatering treatments post AD. On this basis, it would be inappropriate to retain this limit for SIs. Therefore we propose that there is no dry matter limit applied to SI, but that a limit of no less than 25% is applied to GM.

Retaining the 20% organic matter limit however would exclude SI composed of high percentages of inorganic components. In Section A4, we have proposed no limit on inorganic amount. However, imposing an organic matter limit would ensure that SIs are always composed of substantial amounts of recycled organic matter. Further discussion with stakeholders at the AHWG meeting and thereafter is advised in order to resolve this issue. Therefore, we propose to maintain the requirement for a minimum 20% organic matter on a dry weight basis in SI.In terms of GM, a dry matter limit may be appropriate, to prevent wet sludges unsuitable for plant growth being marketed as EU Ecolabel GM.

Moreover, we propose introducing the requirement for a minimum level of organic matter on a dry weight basis in GM. Given that the current criteria require organic matter to come from recycled material, this limit will ensure the inclusion of a substantial amount of recycled material in GM. However, this limit cannot apply to GM comprised wholly of 100% mineral (including mineral wool) used in closed-cycle recirculating hydroponic systems and an exception is proposed in this case. In Section 0, it is proposed to allow peat in GM under certain conditions, up to a limit of 20% of the GM on a dry weigh basis. In that case, further considerations shall be needed to ensure that the proposed minimum level of organic matter is aimed to assure the inclusion of a substantial amount of recycled material in GM.

For mulches, we think it appropriate to have limits for dry matter and organic matter, to ensure mulches are not wet sludges. Proposed limits are therefore presented in Table 0-58.

Table 0-58: Proposed limits for dry and organic matter

Parameter	SI	GM	Mulch
Dry matter (% FW)	No limit but required for information	No less than 25% except for 100% mineral GM used in closed-cycle recirculating hydroponic systems.	No less than 25%
Organic matter as Loss on Ignition (%DM)	No less than 20%	No less than XX% except for 100% mineral GM used in closed-cycle recirculating hydroponic systems.	No less than 20%

The methods applied should be those that have recently been developed by the Horizontal programme of CEN/TC400:

EN 15934 - Sludge, treated biowaste, soil and waste - Calculation of dry matter fraction after determination of dry residue or water content

EN 15935 - Sludge, treated biowaste, soil and waste - Determination of loss on ignition

A7.6 Physical contaminants

The current EU Ecolabel for SI contains limits (Criterion 3) for the content of physical contaminants (DG Env 2006a).

"In the final product (with mesh size 2 mm), the content of glass, metal and plastic shall be lower than 0.5% as measured in terms of dry weight. The method expects that content of glass, plastics and metals (expressed as sum of each contribution) is valued in the product fraction exceeding 2 mm. Analytical tests shall be made on a representative sample from a product batch and at least one further representative sample from a different product batch, each of which was produced in the three months before the application date.

Test methods are for example:

- UNI 10780 (I,1999)9

- BGK (D,1998)10."

The test method is not clearly defined.

There is no requirement for this in the EU Ecolabel for GM, which seems inappropriate, owing to the risk from injury through handling GM.

Limits for these materials appear in several other standards (Table 0-59).

Table 0-59: Limits for physical contaminants in compost in EU standards (IPTS 2012)

Country		Impurities	∅ Mesh size	Limit values % d.m. (m/m)
AT	Compost Ordinance	Total; agriculture	2 mm	≤ 0.5 %
		Total; land reclamation	> 2 mm	< 1 %
		Total; technical use	> 2 mm	< 2 %
		Plastics; agriculture	> 2 mm	< 0.2 %
		Plastics; land reclamation	> 2 mm	< 0.4 %
		Plastics; technical use	> 2 mm	< 1 %
		Plastics; agric. excl. arable land	> 20 mm	< 0.02 %
		Plastics; technical use	> 20 mm	< 0.2 %
		Metals; agriculture	---	< 0.2 %
BE	Royal Decree for fertilisers, soil improvers and substrates	Total	> 2 mm	< 0.5 %
		Stones	> 5 mm	< 2 %
CZ	Act on fertilisers	Total, agriculture	> 2 mm	< 2%
	Biowaste Ordinance	Total, land reclamation	> 2 mm	< 2 %
DE	Bio waste Ordinance	Glass, plastics, metal	> 2 mm	< 0.5 %
		Stones	> 5 mm	< 5 %
ES		Total impurities (glass, metals, plastic)	> 2 mm	< 3 %
FI	Decree of the Ministry of Agriculture and Forestry on Fertiliser Products 12/07	Refuse (glass, metal, plastics, bones, rocks)	---	
		In packaged products		<0.2 % of fresh weight
		Sold in bulk		< 0.5 % of fresh weight
FR	NFU 44-051	Plastic films	> 5 mm	< 0.3 %
		Other plastics	> 5 mm	< 0.8 %
		Metals	> 2 mm	< 2.0 %
HU		No restrictions	---	---
IE	EPA waste license	Total; compost class 1 & 2	> 2 mm	≤ 0.5 %
		Total; low grade compost/MBT	> 2 mm	≤ 3 %
		Stones	> 5 mm	≤ 5 %
IT	DPR 915/82	Total	---	≤ 3
		Glass	---	≤ 3
			---	≤ 1
		Metals	---	≤ 0.5
	Fertil. law	Plastics	< 3.33 mm	< 0.45 %.
		Plastics	> 3.33 < 10 mm	< 0.05 %.
		Other inert material	< 3.33 mm	< 0.9 %
LV	Cabinet Regulation	Total (glass, metal, plastics)	> 4 mm	< 0.5 %

Country	Impurities	Ø Mesh size	Limit values % d.m. (m/m)
No. 530 , 25.06.2006			
NL Fertiliser act + various certification systems	Total Glass Glass Stones	> 2 mm > 2 mm > 16 mm > 5 mm	< 0.5 % < 0.2 % 0 < 2 %
	Biodegradable parts	> 50 mm	0
	Non soil based, non biologically degradable parts		< 0.5 %
SI Decree on the treatment of biodegradable waste (Official Gazette of the Republic of Slovenia, no. 62/08)	Glass, plastics, metal		
	1st class	< 2mm	< 0.5 %
	2nd class	< 2mm	< 2 %
	Stabilized biodegradable waste	< 2mm	< 7 %
	Minerals, stones		
	1st class	< 5mm	< 5 %
	2nd class	< 5mm	< 5 %
	Stabilized biodegradable waste	< 5mm	-
UK PAS 100 voluntary. standard	Total Herein included plastic	> 2 mm	< 0.5 % < 0.25 %
	Stones: other than *'mulch'* Stones: in *'mulch compost'*	> 4 mm > 4 mm	< 8 % < 16 %

Most of these national specifications impose limits on materials that are larger than 2 mm for glass, plastics and metal impurities, with a larger size (5 mm) for stones. This is similar to the current EU Ecolabel limits for SI. We would propose that the current SI EU Ecolabel limit is retained but is applied for SI, GM and mulches, as in Table 0-60.

Table 0-60: Proposed limits for physical contaminants

Parameter	SI	GM	Mulch
Physical contaminants Sum of: glass >2mm plastics >2mm Metals >2mm Stones >5mm	No more than 0.5%	No more than 0.5%	No more than 0.5%

A CEN/TC400 horizontal testing method has been developed for the determination of physical impurities (CEN/TS 16202 Sludge, treated biowaste and soil - Determination of impurities and stones). We propose that this method would be used for determination of physical contaminants in EU Ecolabel SI, GM and mulches.

A7.7 Nitrogen

The current EU Ecolabel for SI requires determination of and has limits for nitrogen content (Criterion 4) (DG Env 2006a).

"The concentration of nitrogen in the product shall not exceed 3 % total N (by weight) and inorganic N must not exceed 20% total N (or organic N ≥ 80%). A high level of organic N secures that N is released only slowly after application. Analytical tests shall be made on a representative sample from a product batch and at least one further representative sample from a different product batch, each of which was produced in the three months before the application date.

Testing methods:

- N_{total}: pr EN 13654/1-2

- $N_{mineral}$: pr EN13652"

For GM, there is no specific criterion for N, although Criterion 6 (information provided with the product) does include providing the C/N ratio, which then requires total N determination.

The application of SI to soils should take into account the content and form of N present, in order to understand the contribution of N to the soil and its availability to plants. Also, it is necessary to avoid applying too much readily available N, so that there is minimal excess N present that can cause eutrophication in surface waters from run-off or leach to groundwater as N. The SI application rates may vary, and therefore the loading of N to the soil is a key parameter to consider. This is related to both the N content of the SI and the loading rate of SI to the soil. In our view, limits on the N content of the SI would not provide sufficient information for minimising environmental risks from excessive N applications.

SI with high contents of readily biodegradable organic carbon and available N may increase the risk of significant microbial growth during storage of the product. We have indicated in our discussion on microbial criteria (Section A6) the possible risks of microbial pathogens growing in stored SI and GM. As the main nutrient encouraging such microbial growth would be the presence of biodegradable carbon, as the energy and carbon source, it is our view that limits for stability (see Section A7.8) should provide protection of this risk. Therefore, it is our view that the N content (total N, inorganic N and organic N) should be measured, and guidance indicated on the amount of N that would be applied to the soil at different SI loading rates.

With mulch, the addition of readily available N is not considered appropriate, as the material functions to suppress weed growth and not as a soil improver through fertilization of the soil. In this context, N limits for mulch seem appropriate.

For GM, the content of both total and mineral N content is important in the design of the GM for its function rather than any significant environmental risk. Digestates typically contain high contents of mineral N as a percentage of the total N. Many digestates would not meet the current EU Ecolabel criteria for SI. We would therefore consider that the N content of GM should be measured but have no limits. We would assume that responsible GM producers would not place on the market GM with excessive N contents, as this could cause inhibition and poor performance of the growing medium.

On this basis, we propose the following nitrogen limits (Table 0-61).

Table 0-61: Proposed nitrogen limits

Parameter	SI	GM	Mulch
Total N (% FW)	Information – no limit	Information – no limit	No more than 3%
Inorganic N (% of total N)	Information – no limit	Information – no limit	No more than 20%

Note the organic N content to be estimated by difference.

The following methods developed by CEN/TC400 horizontal are proposed to be used:

- EN 16168 - Sludge, treated biowaste and soil - Determination of total nitrogen using dry combustion method
- CEN/TS 16177 - Sludge, treated biowaste and soil - Extraction for the determination of extractable ammonia, nitrate and nitrite

A7.8 Biostability

The current EU Ecolabels for SI in Criterion 8(f) and GM in Criterion 6(f) require that information is to be provided about the product with regard to the stability of the organic matter (DG Env 2006a and 2006b).

"a statement about the stability of organic matter (stable or very stable) by national or international standard"

The measurement methods for organic matter biodegradability vary considerably in different Member States, as does the limits for what might be described as stabilised biowaste. For example, stability may be measured as oxygen consumption (AT4 test), carbon dioxide production (ORG020) or heat production (self-heating test) under aerobic conditions, or by biogas production tests (e.g. GB21) under anaerobic conditions. Some example biodegradability methods applied to biowaste are indicated in Table 0-62.

Table 0-62: Example biodegradability tests

Specification	Jurisdiction	Test and limit
PAS100 (compost)	UK	ORG0020 (CO2 production) – 16 mg CO_2/g organic matter.day
PAS110 (digestate)	UK	OFW004-005 (Volatile fatty acids) screening value – 0.43 g COD/g VS If exceeded then residual biogas potential test with limit of 0.25 l/g VS
Vlaco-standard	Flanders	Oxytop (oxygen consumption) – 50 mmol O/kg VS.h
Biowaste Ordinance	Germany	AT4 (oxygen consumption) – 10 mg O/g GB21 (biogas production – 30 l/kg
RAL GZ 256 (digestate)	Germany	Volatile fatty acids screening value as acetate <4000 mg/l. If exceeded biogas test and result consulted for compliance

The End of Waste Criteria for Biodegradable Waste Draft Final Report (IPTS 2013) includes the following criteria for biostability of compost and digestate:

"For compost stability, materials are allowed that display a Rottegrad IV or V (self-heating test temperature rise of max. 20 degrees C above ambient temperature) or a respirometric index result of maximum 15 mmol O_2/kg organic matter/h or 16 mg CO_2/g organic matter/day. The methods to be used should be EN standards 16087-1 and 16087-2. If a Member State already has an official method in place that differs from the two methods above, together with an associated limit value, the Member State competent authorities may complement or replace the two methods described above with its existing method and associated limit value as an eligible alternative. Materials being produced in one Member State and used or put on the market in a different Member State shall meet the requirements of both Member States for the stability criterion unless the receiving Member State recognizes the method of the producing Member State."

"For digestate stability, materials are allowed that display a stability value that meets one of the currently existing limit values (respirometric index result of maximum 50 mmol O_2/kg organic matter/h measured according to EN 16087-1, organic acids content of max 1500 mg/l or residual biogas potential of maximum 0.25 l/ g volatile solids). Alternatively, the competent authorities of a Member State may complement or replace the three latter methods and associated limit values with a new method and associated limit value that provide equivalent stability guarantees, as an eligible alternative. Materials being produced in one Member State and used or put on the market in a different Member State shall meet the requirements of both Member States for the stability criterion unless the receiving Member State recognizes the method of the producing Member State."

If compost is mixed with raw biodegradable materials, then significant decomposition might occur during storage. Digestates themselves are only partially bistabilised and will have the potential to degrade on storage as well. This might lead to microbial risks from the growth of pathogens during storage. We would recommend that limits are set by a recognised international biodegradability standard method to mitigate the risk of pathogen growth during product storage.

It is beyond the scope of this study to evaluate and propose such a standard method for the EU Ecolabel but recommend that this is considered in the next EU Ecolabel revision of SI, GM and mulches. We have proposed that, as part of the microbial criteria (Section A6), product storage trials are undertaken as part of the EU Ecolabel pre-certification tests. This would provide some protection against the risk of microbial pathogens growing in stored un-biostabilised products. Therefore, for this revision, we propose that the information statement is retained regarding the stability of organic matter (stable or very stable) by national or international standards (as currently required to accompany EU Ecolabel SI and GM products).

A7.9 Information provided with the product

Both the current EU Ecolabel for SI (Criterion 8) and GM (Criterion 6) include a requirement to state several parameters and provide information within "Information provided with the product". Some of these have been discussed above. We propose that these should be updated for SI, GM and mulches taking into account the proposals above and our other proposals, and the use of horizontal standard methods.

The proposed requirements are described in Table 0-63 below. New or amended proposals are highlighted in underlined red.

Table 0-63: Information required with the EU Ecolabel product

	GM	SI	Mulch
a	the name and address of the body responsible for marketing		
b	a descriptor identifying the product by type, including the wording		
c	a batch identification code		
d	the quantity (in volume and weight)		
e	the main input materials (those over 5% by volume and by weight) from which the product has been manufactured		
f	the recommended conditions of storage and the recommended 'use by' date;		
g	guidelines for safe handling and use (especially with respect to microbial risks)		
h	a description of the purpose for which the product is intended and any limitations on use. This should include a statement about the suitability of the product for particular plant groups (e.g. calcifuges or calcicoles)		
i	pH (Method		
j	Organic C content [EN 15936], total N content [EN16168] and inorganic N [CEN/TS 16177] content and C/N ratio (Method from horizontal)		
k	a statement about the stability of organic matter (stable or very stable) by national or international standard		
l	a statement on recommended methods of use		
m	SI and mulch only	in hobby applications: recommended rate of application expressed in kilograms or litres of product per unit surface (m^2) per annum	
n	Moisture content		
o	For mineral growing media the following declaration should be required: - For all substantial professional markets (i.e. where the applicant's annual sales in any one country in the professional market exceed 30,000 m³ [or an agreed lower threshold volume]), the applicant shall fully inform the user about available options for the removal and processing of growing media after use. This information shall be integrated in the accompanying fact sheets. - The applicant shall demonstrate that at least 50% [or an agreed higher percentage]) by volume of the growing media waste generated in EU-25 is recycled after use. The applicant should inform the Competent Body, in an annual recycling report, about the option(s) on offer and the response to these options, in particular: - a description of collection, processing and destinations. At any time, plastics should be separated from minerals/organics and processed separately; - an annual overview of the volume of growing media collected (input) and processed (by destination).		

A7.10 Conclusion

We recommend that the following methods and limits (Table 0-64) are used for the determination of parameters discussed in this report.

Table 0-64: Proposals on limits and testing methods for different parameters

<table>
<tr><th>Parameter</th><th>Method</th><th>Limit</th></tr>
<tr><td>Viable seeds and weeds</td><td>CEN/TS 16201 Sludge, treated biowaste and soil - Determination of viable plant seeds and propagules</td><td>In the final product, the content of weed seeds and the vegetative reproductive parts of aggressive weeds shall not exceed two units per litre</td></tr>
<tr><td>Electrical conductivity</td><td>CEN/TS 15937 Sludge, treated biowaste and soil - Determination of specific electrical conductivity</td><td>1.5 dS/m or 150 mS/m</td></tr>
<tr><td>Dry matter</td><td>EN 15934 - Sludge, treated biowaste, soil and waste - Calculation of dry matter fraction after determination of dry residue or water content</td><td>
<table>
<tr><td>Parameter</td><td>SI</td><td>GM</td><td>Mulch</td></tr>
<tr><td>Dry matter (% FW)</td><td>No limit but required for information</td><td>No less than 25% except for 100% mineral GM used in closed-cycle recirculating hydroponic systems</td><td>No less than 25%</td></tr>
</table>
</td></tr>
<tr><td>Organic matter</td><td>EN 15935 - Sludge, treated biowaste, soil and waste - Determination of loss on ignition</td><td>
<table>
<tr><td>Parameter</td><td>SI</td><td>GM</td><td>Mulch</td></tr>
<tr><td>Organic matter as Loss on Ignition (%DM)</td><td>No less than 20%</td><td>No limit for GM comprising of 100% mineral and used in closed-cycle recirculating hydroponic systems

No less than 20% for all other GM.</td><td>No less than 20%</td></tr>
</table>
</td></tr>
<tr><td>Physical contaminants</td><td>CEN/TS 16202 Sludge, treated biowaste and soil - Determination of impurities and stones</td><td>
<table>
<tr><td>Parameter</td><td>SI</td><td>GM</td><td>Mulch</td></tr>
<tr><td>Physical contaminants

Sum of:
glass >2mm
plastics >2mm
Metals >2mm</td><td>No more than 0.5%</td><td>No more than 0.5%</td><td>No more than 0.5%</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td><table><tr><td>Stones >5mm</td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Nitrogen</td><td>EN 16168 - Sludge, treated biowaste and soil - Determination of total nitrogen using dry combustion method

CEN/TS 16177 - Sludge, treated biowaste and soil - Extraction for the determination of extractable ammonia, nitrate and nitrite</td><td><table>
<tr><td>Parameter</td><td>SI</td><td>GM</td><td>Mulch</td></tr>
<tr><td>Total N (% FW)</td><td>Information – no limit</td><td>Information – no limit</td><td>No more than 3%</td></tr>
<tr><td>Inorganic N (% of total N)</td><td>Information – no limit</td><td>Information – no limit</td><td>No more than 20%</td></tr>
</table></td></tr>
</table>

A7.11 References

EC No. 1069/2009 (Animal By-Product Regulations, ABPR). Laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation).

Council Regulation (EC) No 66/2010 on the EU Ecolabel [2010] OJ L27/1 (Ecolabel Regulations)

Council Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals [2006] OJ L396/1 (REACH)

Council Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures [2008] OJ L353/1 (CLP)

DG Env, 2006a. European Eco-label User Manual for Soil Improvers, May 2006.

DG Env, 2006b. European Eco-label User Manual for Growing Media, May 2006.

EC 2012. GPP criteria for gardening products and services. http://ec.europa.eu/environment/gpp/pdf/criteria/gardening.pdf

EPAGMA, 2012. Comparative life cycle assessment of horticultural growing media based on peat and other growing media constituents. http://www.epagma.eu/default/home/news-publications/news/Files/MainBloc/EPAGMA_Growing-media-LCA_Final-report%20_2012-01-17_Quantis.pdf

IPTS, 2012. Technical Report for End-of-waste criteria on Biodegradable Waste subject to Biological Treatment - Third Working Document. August 2012. http://susproc.jrc.ec.europa.eu/activities/waste/documents/IPTS_EoW_Biodegradable_waste_3rd_working_document_wo_line_nr.pdf.

IPTS, 2013. Study Report on End-of-waste criteria on Biodegradable Waste subject to Biological Treatment – Draft Final Report. July 2013.

European Commission

J R C T E C H N I C A L R E P O R T S

Revision of European Ecolabel Criteria for Soil Improvers and Growing Media

Annex B

Example Stakeholder Questionnaire

September 2013

Institute for Prospective Technological Studies

Joint Research Centre

RICARDO-AEA

Developing an Evidence Base for EU Product Policy Instruments on Soil Improvers, Growing Media and Mulch

Stakeholder Questionnaire

This questionnaire has been prepared to inform and gather industry and other stakeholder input and opinion on Growing Media (GM), Soil Improvers (SI) and Mulch, for an EU Ecolabel for those products.

The data that you provide will help us understand current products and market conditions, and collect preliminary data of their environmental performance. It is your chance to influence the design of these environmental guidelines.

Friday April 19th is the deadline for posting questionnaires to

JRC-IPTS-SOILIMPROVERS@ec.europa.eu

and cc:

simon.gandy@ricardo-aea.com

All responses received through this questionnaire will be treated as confidential. Any publication we produce will be restricted to including data in an aggregated format only and comments will not be attributable unless this is specifically requested.

We rely heavily on stakeholder consultation, so your time and expertise are greatly appreciated and valued.

Thank-you in advance for your support.

For further information regarding this questionnaire, please contact:

+ JRC-IPTS-SOILIMPROVERS@ec.europa.eu
+ or Ricardo-AEA's Simon Gandy (simon.gandy@ricardo-aea.com); +44 7891 495 077
+ or visit our project website: http://susproc.jrc.ec.europa.eu/soilimprovers/

Date: March 2013

Quick Access Guide

This questionnaire has been developed in order to capture key information from interested stakeholders that will help to inform the revision of EU Ecolabel criteria revision for **for Soil Improvers (SI)** and **Growing Media (GM)**.

The next section provides more background to the programme being undertaken, before we present the questions themselves, under a series of section headings. We understand that time is precious, so the following table directs stakeholders to the relevant sections of the questionnaire, according to their roles. Where relevant we have also indicated in the *Table 0-65* which criterion is being addressed under each section. We would nevertheless appreciate if, according to your knowledge, you could express your opinion addressing the whole document.

Table 0-65: Questionnaire content and suggested sections for relevant stakeholders

Section	EUEB	Stakeholder	Criterion
1. Background			-
2. Your Company or Organisation	☑	☑	-
3. Scope and Definition	☑	☑	
4. Market Data	☑	☑	-
5. Sustainable Resource Management	☑	☑	-
5.1 Peat Criterion	☑	☑	1.1
5.2 Mineral Wool	☑	☑	1.3
6. Hazardous Substances	☑	☑	2
7. Organic Pollutants	☑	☑	-
8. Testing Methods and Microbial Risks	☑	☑	4 (GM)/

			6 (SI)
9. Environmental Life-Cycle Assessment		☑	-
10. Product Life-Cycle Costs		☑	-

1. Background

This project is being conducted by the Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS) and Ricardo-AEA. The IPTS is one of the seven scientific institutes of the Joint Research Centre (JRC), which is a Directorate-General of the European Commission. The mission of IPTS is to provide customer-driven support to the EU policy-making process by developing science-based responses to policy challenges that have both a socio-economic as well as a scientific/technological dimension.

The purpose of the project is to inform the revision of the EU Ecolabel criteria **for Soil Improvers (SI)** and **Growing Media (GM),** previously updated in 2005. In addition to SI and GM, the project will look to gather evidence to inform the development of EU Ecolabel criteria for **Mulch**. This questionnaire has been developed in order to capture key information from interested stakeholders which will help to inform the EU Ecolabel revision for these products.

The EU Ecolabel Regulation EC 66/2010 aims at reducing the negative impact of consumption and production on the environment, health, climate and natural resources. In 2005, a revision of the EU Ecolabel for SI and GM split the products into two different criteria, namely 2006/799/EC[25] for SI and 2007/64/EC[26] for GM. These criteria are also stated in the respective user manuals, namely the *European Eco-label User Manual for Soil Improvers (EC, 2006a)* and *European Eco-label User Manual for Growing Media (EC, 2006b).*

In April 2006, a Commission Statement highlighted the issues that should be taken into account during this revision. The issues around EU Ecolabel Criteria that were identified by the Commission Statement of 6th April 2006 are:

+ Strengthening demands for heavy metals
+ Reducing use of mineral wool
+ Use of re-cycled/re-used mineral wool
+ Extraction phase and emissions for minerals
+ Re-look at the inclusion of peat
+ Limits for relevant organic pollutants
+ Microbiological test methods for *E. coli* versus *Helminth Ova*

[25] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:325:0028:0034:EN:PDF

[26] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:032:0137:0143:EN:PDF

+ Sustainable resource management for ingredients

These points are considered in specific sections within the questionnaire. Please refer to *Table 0-65* above for further instructions regarding the layout of this questionnaire.

Stakeholders have access to background information, work in progress and, most importantly, registration of interest, through the official project website:

http://susproc.jrc.ec.europa.eu/soilimprovers/

Section	EUEB	Stakeholder
2. Your Company or Organisation	☑	☑

Please provide your company/organisation and contact details in *Table 0-66*.

Table 0-66: Contact details

Detail	Please enter your details below
Title	
* Name	
* Company/Organisation	
Type of Company (e.g. Manufacturer, Retailer)	
Job Title/Position	
Address	
Postal Code	
* Country	
Telephone Number	
* Email	
Web	

* *Please provide at least these details*

Section	EUEB	Stakeholder
3. Scope and Definition	☑	☑

A report[27] has already been completed on the appropriate scope and definition of SI, GM and mulches. Based on its findings, it recommended that the definitions of SI and GM are consistently applied and match those typically applied in CEN-developed standards for these products. It also recommended that a separate product "Mulch" is considered, for which EU Ecolabel criteria are developed. The revised EU Ecolabel criteria would then potentially include the three EU Ecolabel products (SI, GM, Mulch) with criteria values tabulated for each product. Some of these may be common to all products and some may have differences for the products.

The three definitions proposed are as follows:

Soil Improver:	Material added to soil in situ primarily to maintain or improve its physical properties, and which may improve its chemical and/or biological properties or activity.
Growing Media:	Material, other than soils in situ, in which plants are grown.
Mulch:	A protective covering placed around plants to prevent the loss of moisture, control weed growth, and reduce erosion and evaporation.

Do you agree with the above definitions? Please comment.	Y/N?

[27] *"Revision of European Ecolabel Criteria for Soil Improvers and Growing Media – Proposal of Product Definition, and Scope"*, JRC/IPTS and Ricardo-AEA, March 2013, available soon from the project website: http://susproc.jrc.ec.europa.eu/soilimprovers/

Section	EUEB	Stakeholder
4. Market Data	☑	☑

Market Share and Consumption

The total volume of GM consumed in Europe is estimated to be between 20 – 30 million m^3 with hobby applications accounting for 60% of this volume. In 2006, circa 9 million tonnes of compost were produced in the EU annually.

Where known, please provide estimates of the quantities (in units of volume or weight) of GM, SI and Mulch products consumed in the EU27 or per known country. Please also indicate the proportion of GM and/or SI containing peat in *Table 0-67*.

Table 0-67: Amounts of GM/SI/Mulch produced across the EU and/or per country

	Growing Media		Soil Improvers		Mulch
Country / Region	Volume Consumed per country	Fraction containing peat	Consumed per country	Fraction containing peat	Volume Consumed per country
eg Germany	*2.5M m^3*	*90%*	*0.5M m^3*	*2%*	*0.3M m^3*

For the EU27 or any known country, please provide a breakdown of the amounts of **Growing Media** constituent (by volume or weight) consumed by each market as requested in *Table 0-68*:

Table 0-68: GM amounts consumed per market segment for a given country

Market	Amateur Gardener	Professional Growers	Private Sector Landscapers	Public Sector/Local Authorities	Other Markets
Country					
Units (te, m^3, etc)					
Total Consumed					
Peat					
Compost (*)					
Mineral Wool (new)					
Mineral Wool (rec[†])					
Coir					
Bark					
Wood Fibre					
Perlite					
Clay					
Expanded Clay					
Pumice					
Rice Hulls					
Manure					
Sludges					
Vermiculite					
Others					

(*) see also next table

(†) recycled, recovered or reused mineral wool

Please provide any further market information or data sources in the following table:

In *Table 0-68*, we make mention of compost. Composts are typically defined by reference to the type, origin and characteristics of the source materials. Can you say anything about the relative shares of the composts used in the products identified above? Please, indicate it in *Table 0-69*. We would like to know the tonnages of different compost types consumed within your country, and the proportion of compost consumed within each market segment.

Table 0-69: Compost Types

			Proportion used per market (%)				
Compost Type	**Source**	**Tonnage produced**	**Amateur Gardener**	**Professional Growers**	**Private Sector Landscapers**	**Public Sector / Municipalities**	**Other Markets**
Biowaste	Kitchen and garden waste						
Green Waste	Garden and parks waste						
“VFG”	Vegetables, fruit and garden						
Biomix	Biowaste, green waste, sewage sludge						
Bark	Bark (*)						
Manure	Solid stable manure or dewatered slurry						
Sewage Sludge	Dewatered municipal sewage sludge						
Mixed waste	From residual MSW post MBT						
Other							

(*) usually not mixed with other organic residues but with additives as a nitrogen source

MSW = municipal solid waste; MBT = mechanical-biological treatment

Please provide any further market information or data sources in the following table:

For the EU27 or any known country, please provide a breakdown of the amounts of **<u>Soil Improvers</u>** constituent (by volume or weight) consumed by each market as requested in *Table* 0-70:

Table 0-70: SI amounts consumed per market segment for a given country

Market	Amateur Gardener	Professional Growers	Private Sector Landscapers	Public Sector/Local Authorities	Other Markets
Country					
Units (te, m^3, etc)					
Total Consumed					
Peat					
Compost					
Mineral Wool (new)					
Mineral Wool (rec[†])					
Coir					
Bark					
Wood Fibre					
Perlite					
Clay					
Expanded Clay					
Pumice					
Rice Hulls					
Manure					

Market	Amateur Gardener	Professional Growers	Private Sector Landscapers	Public Sector/Local Authorities	Other Markets
Sludges					
Vermiculite					
Others					

(†) recycled, recovered or reused mineral wool

Please provide any further market information or data sources in the following table:

Please provide a breakdown of the typical constituents for the following products in any known country in *Table 0-71*:

Table 0-71: Constituents of typical gardening products

	General Purpose SI	Seedling Growing Media	Potting Growing Media	Vegetable Growing Media	Mulch
Country					
Units (te, m^3, etc)					
Total Consumed					
Peat					
Compost					
Mineral Wool (new)					
Mineral Wool (rec†)					
Coir					
Bark					
Wood Fibre					

Perlite					
Clay					
Expanded Clay					
Pumice					
Rice Hulls					
Manure					
Sludges					
Vermiculite					
Others					

(†) recycled, recovered or reused mineral wool

Please provide any further market information or data sources in the following table:

Market Volumes

Which sources of information are you aware of, that could provide the following market volume data for growing media, soil improvers and mulch? (Please insert reference or website link if appropriate, and add further rows as required in *Table 0-72*).

Table 0-72: Product/market information sources for GM/SI/Mulch

Source of information	**GM / SI / Mulch – please indicate:**	**EU27 / Country**	**Data on... (mark with an X)**			
			Production	**Import**	**Export**	**Sales**

Are you able to provide any market (EU production, EU import and EU export) data and EU stock data in sold units (in thousands) for EU27, individual Member States and/ or data for your own company?

We are interested in the most recent data you might have available and any information on the forecast for 2013 and 2020. We prefer figures as tonnages or volume, but monetary data is welcome, too. Please email relevant documentation or any other information on sales and market size, to:

JRC-IPTS-SOILIMPROVERS@ec.europa.eu and simon.gandy@ricardo-aea.com.

5. Sustainable Resource Management

Section	EUEB	Stakeholder
Peat Criterion	☑	☑

The current EU Ecolabel criteria for SI and for GM both exclude peat. Which of the following statements do you support?	Y/N?
1. No inclusion of peat;	
2. Allowing a certain percentage of peat in growing media (please specify)	

Please elaborate on your response below and provide any documents to expand on your answer:

Should peat restrictions apply to certain markets? For example. hobby, commercial market etc. Please comment.	Y/N?

If peat is to be allowed as part of the EU Ecolabel criteria, should there be a restriction on its source e.g. sustainable sources? Please elaborate on your response below:	Y/N?

Section	EUEB	Stakeholder
Mineral Wool	☐	☐

The Commission is discussing a possible limit on the amount of mineral wool present in SI and GM products awarded the EU Ecolabel. Would this be challenging for existing products? From the options available (e.g. no limit, <50%, <25%, <10%, <5%, 0% (none) or your own other value), what is the lowest limit (on a dry weight basis) that you would support? Please also justify your response.

Mineral Wool Limit (Dry Weight %)	Growing Media:		Soil Improver:	

Should all mineral wool in EU Ecolabel SIs and GMs be either reused, recycled or recovered (i.e. should use of virgin mineral wools be banned)? Please justify you response in the table below. If known, please provide information on sources of such non-virgin mineral wool.	Y/N?

The EU Ecolabel Regulation forbid the inclusion of substances or mixtures that are classified as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction. However, some mineral wool may be classified as carcinogenic according to the Classification, Labelling and Packaging (CLP) Regulations, if it meets certain criteria.

To your knowledge, is any mineral wool used as a constituent of SI or GM that would be classified under CLP?	Y/N?
If yes, are there *other* products in the market that use mineral wool that would not be classified?	Y/N?
Please provide any further details in this box.	

Section	EUEB	Stakeholder
6. Hazardous Substances	☑	☑

Are you satisfied with the EU Ecolabel limits applied to GM and SI (see below)? If not, please suggest an alternative limit in *Table 0-73* and justify your response in the box below.

Table 0-73: Limits applied to GM and SI for hazardous substances

Element	mg/kg	Growing Media		Soil Improver	
		OK? Y/N	Alternative Limit?	OK? Y/N	Alternative Limit?
Zn	300				
Cu	100				
Ni	50				
Cd	1				
Pb	100				
Hg	1				
Cr	100				
Mo	2				
Se	1.5				
As	10				
F	200				

Please justify your response in the table below:

Are there any substances present in your product that may be classified as...?

1. toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction (CMR), in accordance with Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of substances and mixtures or
2. referred to in Article 57 of Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH),

Please indicate them in the *Table* 0-74.

Table 0-74: Substances classified under CLP

Substance	Classification	% w/w substance in Growing Media	% w/w substance in Soil Improver	Possible substitute

Section	EUEB	Stakeholder
7. Organic Pollutants	☑	☑

The Commission is considering setting a limit on the concentration of certain Persistent Organic Pollutants (POPs [‡]) present in EU Ecolabel GM and SI products. Would this criterion be challenging for existing products? Would you like to suggest what the limit might be? Please let us know your thoughts in the box below.

(‡) Namely: polyaromatic hydrocarbons (PAHs) e.g. benzo(a)pyrene, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), Perfluorinated surfactants, including PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid) , Adsorbable Organic Halogens, BTEX (benzene, toluene, ethylbenzene, and xylenes), Extractable Organic Halogens.

Section	EUEB	Stakeholder
8. Testing Methods and Microbial Risks	☑	☑

As part of the Ecolabelling requirements, the following test methods are undertaken for relevant products.

- Salmonella: ISO 6579
- E. coli: MPN/g: ISO 11866-3 (applicable only if exclusively green, garden and park waste)
- Helminth Ova: prXP X33-017 (applicable only if NOT exclusively green, garden and park waste)

Are you satisfied with the existing tests? Please justify your response below	Y/N?

Should the microbiological tests be undertaken on individual constituents (e.g. bark, rice husks etc.), as opposed to just on the final products? Please justify your response below	Y/N?

When should microbiological testing of products take place e.g. within a certain time limit post manufacturer or the point of sale?

Please justify your response below

Should other microbiological risks be accounted for within the EU Ecolabel standard e.g.:

- Legionella
- Clostridium
- Other?

Please justify your response below

Section	EUEB	Stakeholder
9. Environmental LCA	☐	☑

EU Ecolabel criteria focus on the key environmental impacts of a product. In order to identify these, a life-cycle assessment (LCA) approach is used. For this project, the EcoReport life-cycle tool will be used to identify and demonstrate the key environmental impacts associated with soil improvers, growing media and mulch. This will take into account the different life-cycle stages, including production, distribution, use and end of life.

This section of the questionnaire aims to clarify and gather additional information for the purposes of undertaking the environmental LCA.

<u>Extraction/Processing</u>

We are collecting data on the energy use and GHG emissions associated with the most common constituents of SI, GM and Mulches. This will feed into an LCA for each product.

Greenhouse Gas (GHG) Emissions

Some typical figures for the GHG emissions resulting from the extraction and processing of certain constituents are listed in the *Table 0-75*. Please indicate if you agree or disagree with these figures. Please provide us with an alternative figure and/or further sources of information where you can.

Table 0-75: Typical GHG Emissions for Selected SI, GM and Mulch Constituents

Constituent	Life-Cycle Stage	GHG emissions (kg CO_2e per te)	Agree? (Y/N)	Alternative figure(s)?	Source (*)
Peat	Extraction	36			
Compost	Collection	37			
Minerals (vermiculite, perlite, other raw materials)	Extraction	65			
Peat	Processing	24			
Compost	Processing	408			
Minerals (vermiculite, perlite, mineral wool)	Processing	536			

(*) Please provide information sources and/or studies to reference any suggested data (if necessary please attached within your responding email)

Energy Consumption

Our research shows that energy consumption relating to the extraction and processing phases varies greatly for each constituent, depending on the source and extraction practices used. Can you please provide us with an indication of energy consumption associated with the extraction and processing of each tonne of the following materials *(Table 0-76)*?

Table 0-76: Typical Energy Consumption (kWh per tonne) During Life-Cycle Stages

Constituent	Typical energy consumed during...		Source (*)
	Extraction / Collection	Processing	
Peat			
Compost			
Minerals (vermiculite, perlite, mineral wool)			

(*) Please provide information sources and/or studies to reference any suggested data (if necessary please attached within your responding email)

Peat-free GM and SI are often offered as an alternative product for consumers. Can you provide information or studies relating to the GHG emissions and energy consumption relating to the production and processing phases of one or more peat alternatives, such as coir, bark, wood fibre, rice husks?

<ins>Distribution</ins>

Please indicate in *Table 0-77* from which region/country the following constituents of GM, SI are Mulch are typically sourced for your country? If sourced from a range of countries, please include.

Table 0-77: Country sources for constituents of GM and SI

Product	Growth Media	Soil Improvers	Mulches
Peat			
Compost			
Mineral Wool (new)			
Mineral Wool (rec[†])			
Coir			
Bark			
Wood Fibre			
Perlite			
Clay			
Expanded Clay			
Pumice			
Rice Hulls			
Manure			
Sludges			
Vermiculite			
Lime			
Others			

(†) recycled, recovered or reused mineral wool

If available, please provide data sources and further information in the box below:

Typical and Actual Product Data

Our starting assumption for the streamlined LCA will be that the most popular mixes of constituents in Soil Improvers, Growing Media and Mulches will be as in the *Table 0-78*. Do you agree with those typical mixes? If not, please make whatever modifications you wish. You are also invited to suggest (in the Other column) alternative products that you think would be appropriate to include in the LCA model.

Table 0-78: Typical percentage components for GM and SI

All figures are percentages	**General Purpose SI**	**Seedling GM**	**Potting GM**	**Peat Free General Purpose GM**	**Peat Free Potting Mix**	**Other ________**
Peat	50.00	49.5	49.5			
Compost				20	10	
Mineral wood (new)						
Mineral wood (rec[†])						
Coir				50	20	
Bark				30	40	
Wood Fibre					30	
Perlite	24.50		49.5			
Clay						
Expanded Clay						
Pumice						
Rice Hulls						
Manure						
Sludges						
Vermiculite	24.50	49.5				
Lime	1.00	0.5	0.5			

All figures are percentages	General Purpose SI	Seedling GM	Potting GM	Peat Free General Purpose GM	Peat Free Potting Mix	Other ________
Other						
Total	**100**	**100**	**100**		**100**	

(†) recycled, recovered or reused mineral wool

Please provide any further market information or data sources in the following table:

Actual data on your best selling products (Growing Media, Soil Improvers and Mulches) would greatly help us improve the accuracy of the LCA modelling. Therefore, for your best selling products, please provide details of the material composition of the product. Please focus on best selling products, which may not necessarily be the top performing products.

Environmental Issues

To your knowledge, is there any direct pollutant emission (to air/water/soil) related to the different lifecycle phases of GM, SI or Mulches, in particular during their use and disposal phases e.g. nutrient leaching such as nitrate, phosphate, sodium, chloride etc.? Please justify your response below	Y/N?

Is there any potentially harmful or hazardous substance emission (to air/water/soil) related to the different lifecycle phases of SI, GM and Mulches, in particular during their use and disposal phases e.g. leaching of heavy metals? Please justify your response below	Y/N?

After-Use

LCA has indicated that the end of life stage can contribute significant GHG impacts for GM. Please indicate the most likely end of life routes for the following types of GM. Please indicate the most likely end of life routes for the following users in *Table 0-79*:

Table 0-79: Likely end of life routes for GM per market

	Households	Nurseries	Commercial Horticultural Business	Agri-business	Retailers	Other
Landscaping						
Reused as a soil improver						
Re-used as Mulch						
Recycled or re-composted						
Sold for Agricultural use						
Landfill						
Other						

Please provide any further market information or data sources below:

Consumer Behaviour

Does your product have a typical life time or replacement rate associated with it? For example, in some cases consumers are advised to replace GM and/or SI on a yearly basis in order to achieve the best results.

Consumers may delay peat decomposition by storing the peat at low temperatures, by keeping it relatively dry, or by restricting its access to oxygen and nutrients. Can you estimate how long such actions may be lengthening the life of Growing Media?

Section	EUEB	Stakeholder
10. Product Life-Cycle Costs	☐	☑

Understanding the life-cycle costs (LCC) of products is important to identify the most cost effective product to purchase over the product entire lifetime. An LCC approach may help to procure products with a better environmental performance, whilst offering financial savings to the purchasing body or individual.

<u>Product Prices</u>

Indicative product prices (converted from GBP using an exchange rate of £1=€1.15) are presented in *Table 0-80* for the shortlisted products.

Do you think these are prices representative for the product types? If no, please modify as required and justify your response below.	Y/N?

Table 0-80: Typical costs for a range of GM and SI products

Product	Description	Bags	Bulk (1m^3)
Growing Media (Peat Free)	**Mix of 50% coir, 30% bark fines, 20% recycled organic matter (BSI PAS100:2005 compliant)**	€9.30 (60L)	
Growing Media (Peat Free)	**Multi-purpose - Composted and stabilised coniferous tree bark fines plus added nutrients**	€4.20 (12L)	
Growing Media (50% Peat Free)	**Multi-Purpose - Composted and stabilised coniferous tree bark fines plus added nutrients**	€6.90 (50L)	
Growing Media (Peat Free)	**Peat Free (Premium Product)**	€19.50 (60L)	
Growing Media (Peat Free)	**Multi-Purpose**		€89.50
Soil Improver (Peat Free)	**shredded straw compost with iron minerals**		€89.50
Mulch	**Forestry Bark**	€6.50 (50L)	€82.10
Mulch	**Decorative Bark**		€114.20

11. Other Information

Other Product Developments

In order to understand the improvement potential of GM, SI and Mulch, it is important to identify best available technology and future products that are still in the design and development stages.

If relevant, please provide information in relation to other product developments/trends for Growing Media, Soil Improvers and Mulches, which may improve their environmental performance in the future (these can be submitted separately). This could include innovative products just coming onto the market or those planned to be introduced to the market in the next few years. It may include when future products are likely to be available, cost savings/payback times compared to existing products.

Such innovations could include new alternative peat products or advanced growing systems, such as hydroponics or aeroponics.

Are developments in other countries for GM, SI and Mulches which are likely to start to penetrate the European market significantly?

If you have any other relevant information on Soil improvers, Growing media, Mulch, please could you provide it below or email to:

JRC-IPTS-SOILIMPROVERS@ec.europa.eu or simon.gandy@ricardo-aea.com.

Many thanks indeed for your time in providing us with your information. Your contribution is very much appreciated.

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