Evaluation of the Responsible Sourcing Scheme for Growing Media

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Contents

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Acronyms

AD	Anaerobic Digestion
AHDB	Agriculture and Horticulture Development Board
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
DEFRA	Department for Environment, Food and Rural Affairs
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EU	European Union
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
GMA	Growing Media Association
HTA	Horticultural Trades Association
ISIC	International Standard Industrial Classification
LCA	Land Classification for Agriculture
MS	Microsoft
NH_4N	Ammonia
NO_3N	Nitrate Nitrogen
NPF	National Planning Framework
OHSAS	Occupational Health and Safety Assessment Series
RSS	Responsible Sourcing Scheme
SEPA	Scottish Environment Protection Agency
SSSI	Site of Special Scientific Interest
UK	United Kingdom
UNC	Underpinning National Capacity
UNESCO	United Nations Educational, Scientific and Cultural Organization

Executive Summary

In 2019, peat accounted for 48.8% of all growing media used in UK horticulture (retail and professional) or exported, declining to 24.9% by 2022 (HTA, AHDB, GMA and DEFRA, 2024*). Approximately 50% of the growing media is used in UK professional horticulture and 16.8% used in UK retail horticulture. In responses to a Scottish Government consultation on Ending the Sale of Peat in Scotland, over 77% of respondents reported seeking more information about the contents of growing media.

A consortium of the Horticultural Trades Association (HTA), growers and retailers, supported by DEFRA, have developed a responsible sourcing scheme (RSS) and supporting calculators. Their aim is for bags of compost available in retail outlets to be labelled such that consumers can obtain information to inform their purchases in terms of the environmental impact of products. The scheme will provide a rating of responsibility (scored A to E).

A short review was undertaken, for the Scottish Government, of the RSS calculator for the responsible sourcing and manufacturing of growing media. This is to inform the Scottish Government of whether support for the responsible sourcing scheme may help in planning the scope and timescales for limiting sales of peat, saving it and relevant industries the burden incurred by additional regulations. The aim of responsible sourcing of growing media delivers to five of the six outcomes proposed in the draft Scottish Environment Strategy, such as "*We use and re-use resources wisely and have ended the throw-away culture*" and "*We are responsible global citizens with a sustainable international footprint*".

The Responsible Sourcing Scheme (RSS) calculator provides a means of testing whether "growing media (and soil improvers) are made from materials sourced and manufactured in a way that is socially and environmentally responsible". The tests use seven criteria; climate change and carbon emissions are not dealt with a separate criterion but instead are included in categories focused on sustainability and long-term regrowth of the material.

Findings from the review of the calculator and documentation are summarised as follows.

i) The calculators and supporting materials provide an in-depth approach to assessing responsible sourcing and manufacturing of growing media. The process of preparing data for use in the RSS calculator is a valuable opportunity to understand products and their supply chains. However, businesses which try to implement the RSS calculator may not have the human capital required to source relevant literature, or the knowledge to select appropriate data.

ii) The lack of consideration of greenhouse gas (GHG) emissions and loss of carbon sinks are significant gaps. In the guidelines both are deemed to be out of scope. However, they can be expected to be important elements of responsible sourcing of growing media and a key reasons for banning the sale of peat for horticultural use.

iii) All criteria and weightings should be accompanied by narratives setting out their reasoning the basis of the model of the scoring used in the calculator. This would clarify the basis of scoring, choices of thresholds, and address peculiarities in some scoring profiles. Similarly, the P4 protocol should provide measures of physical, chemical or biological condition of soils as intimated in the Guidance Notes as requirements.

iv) The approach to developing scores for the responsibility index is described as a total level of proof across the supply chain. Weaknesses in this approach are the dilution of effects that arise at early stages of the production process, and inconsistences with how established schemes take account of maintaining or improving the social and economic well-being of workers.

v) For use in Scotland, the decision trees of some factors should be revised to increase their alignment with current or prospective Scottish Government policies (e.g., in relation to National Planning Framework 4 under Policy 5).

vi) Inconsistencies between the Guidance Notes and the P4 Decision Tree Powerpoint raise questions over what is coded into the calculator.

vii) Several factors identify the start of the mixing system as within scope, but the mixing system as being out of scope (e.g., water). There is no guide to distinctions between the two which risks inconsistent interpretations by users for the same type of product and between products. Re-use of waste should not be out of scope in life cycle stages, notably recycled materials, habitat and biodiversity for wool, bracken, agricultural crops, mineral-based, coir and peat.

viii) The RSS makes no reference to potential risks of peat replacements, such as biosecurity associated with plant products applied to soils and plants, and contamination with inert materials such as glass, metal and plastics, and herbicide residues. Account should also be taken of requirements for exporting plant products using growing media to the EU from a third country (e.g., UK) and compliance with regulations.

ix) Lessons could be learnt from the design and implementation of schemes such as the Roundtable on Sustainable Palm Oil scheme and Forest Stewardship Council (FSC), and implications of the proposed EU Directive on Corporate Sustainability Due Diligence on products such as growing media and soil improvers to provide insights on how the EU aim to foster sustainable and responsible corporate behaviour throughout global value chains.

If implemented, collecting scores generated would help with learning about uses, assumptions made by users, errors in user interpretation of questions, accuracy of entries, and decisions made after its use. Research into using QR codes to inform consumer purchases identifies challenges to be tackled by designers of the RSS to provide a standard which can be used by producers and retailers, with a means of visual communication which is trusted, easy to understand and accessible with minimal effort. A QR code by which further information about the product may not satisfy all those criteria. A short review of such approaches to inform the purchasing of growing media and soil improvers Is provided in the Appendix.

1. Introduction

The joint monitoring study of the Horticultural Trades Association (HTA), Agriculture and Horticulture Development Board (AHDB), Growing Media Association (GMA) and Department for Environment, Food and Rural Affairs (DEFRA) (2024*) report that in 2019, peat accounted for 48.8% of all growing media used in UK horticulture (retail and professional) or exported. By 2022 this had declined to 24.9%. They note that in 2022 peat represents half of the growing media used in UK professional horticulture, which compares with approximately 16.8% of growing media used in UK retail horticulture.

In February 2023, the Scottish Government consulted on Ending the Sale of Peat in Scotland (Scottish Government, 2023). Over 77% of respondents reported seeking more information about the contents of growing media. Moreover, a Scottish Trading Standards survey found that 90% of bags of compost did not display prominent information about peat content (Paul, 2021).

A consortium of the Horticultural Trades Association (HTA), growers and retailers, supported by DEFRA, have developed a responsible sourcing scheme. The aim of the scheme is for bags of compost available in retail outlets having a label which can be used by consumers to inform responsible purchases in terms of the environmental impact of products. The output of the calculation would provide a rating of responsibility (e.g., A to E) with an aim of informing consumers at the time of purchase of potted plants.

The Scottish Government indicate that, dependent on evaluation, supporting the responsible sourcing scheme (RSS) may help in planning the scope and timescales for limiting sales of peat, saving it and relevant industries the burden incurred by additional regulations. It also notes the risks of unintended

consequences of banning peat and transitioning to alternatives without considering their environmental impacts.

This report is of findings from short reviews of the materials associated with the responsible sourcing and manufacture of growing media. It covers the:

i) Responsible Sourcing and Manufacture of Growing Media calculator;
ii) Self-assessment questionnaire;
iii) P7 protocol, performance standards for amateur products;
iv) Guidance notes and associated flow charts for the calculator.

2. Review of the Responsible Sourcing and Manufacturing Calculator

A short review was undertaken of the RSS calculator for the responsible sourcing and manufacturing of growing media.

The RSS calculator provides a means of testing whether "growing media (and soil improvers) are made from materials sourced and manufactured in a way that is socially and environmentally responsible" (Guidance Notes, page 4). The tests use five criteria, of which two are included as within scope for the proposed scheme. Those are:

- Environmental accountability: They must have minimal impact on the environment.
- Social accountability: The supply chain must have transparent social compliance programmes in place.

Three other criteria were considered to be out of scope of the proposed scheme:

- Fitness for purpose: The growing media must be capable of growing plants or improving the physical, chemical or biological condition of soils (soil improvers).
- Product safety: They must be safe to use.
- Legality: They must comply with all legal requirements.

The elements of the scheme which were reviewed were the individual components of the calculator, covering the scoring systems, gap reporting, queries regarding scoring and weighting, and presentation.

The calculator is implemented in MS Excel, comprising tabs of:

- the product (e.g., peat);
- 'Material', which is the principal means of data entry for each material being assessed (example in Figure 1);
- a summary of the scores for each element of the calculator of energy use, water, social compliance, habitat and biodiversity, pollution, renewability, and resource use and efficiency (example in Figure 2).

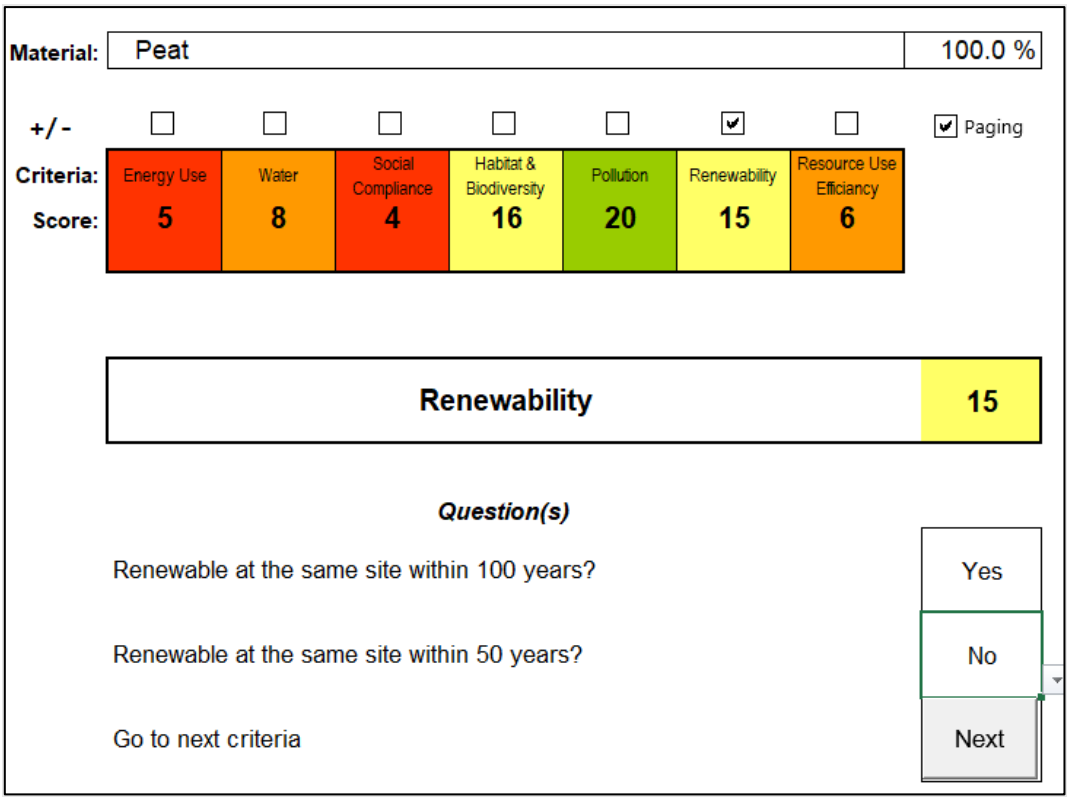


Figure 1. Interface to the 'Material' tab of the RSS calculator, showing the scores for each of seven elements, and the questions and assessment score for renewability (Source: RSS calculator).

For habitat and biodiversity, nine categories of bulk ingredients are provided in the calculator and represented in different decision trees and scores. These are: Peat, Wood based material (including biochar from forestry products), Coir pith, Minerals (other than peat), Recycled materials, Agricultural crops (energy crops for Anaerobic Digestion, oil seed rape straw, farmed *Sphagnum*), Bracken, Wool (sheep only), and Cork. For the assessments of each category, consideration is given to the extraction or growing and harvesting of raw materials and products.

The RSS calculator is supported by graphical representations of each element, provided as decision trees in MS Powerpoint. The Guidance Notes (page 9) explain that all criteria have an equal weighting in the calculation, with the product score being the sum of the ingredient scores weighted by percentage volume, presented in the ingredient rater MS Excel spreadsheet. However, we note that some of the decision trees for the same item are different between the Guidance Notes and the associated Powerpoint slides of the P4 Decision Tree version.

A summary of a review of the elements and components of the calculator follow.

3. Elements of the Responsible Sourcing Scheme Calculator

3.1 Energy Use (extraction, transport and production)

Energy use required in the extraction, transport and production of growing media are assessed within the calculator. The focus is on the use of fossil fuel energy at each stage of production and transport (page 12). Account is taken of the total of the percentages allocated of the impact at each stage of production for virgin by-products.

Detailed figures are provided for energy requirements with supporting references (e.g., forest site preparation, forest harvest; page 14). However, interactions between sources, production tiers and stated percentage impact are not well explained, instead it is just noted that the energy use will be

negligible (page 14). A supporting statement of the most common means of harvesting coconut would be appropriate (e.g., manually by climbing or pole).

There are potentially three eligible transport points in the supply chain that count towards energy consumption. Except for wool fleeces which quotes data from 2021 (page 15), the baseline figures reported in the Guidance Notes are 12 to 24 years old (pages 13 to 16). It would be desirable to use more contemporary data which may reflect improvements in engine efficiencies and in fuel, and in turn different levels of fuel usage. Consideration should also be given to how the categories and the allocation of scores to the traffic light system compare with the average use of renewable or fossil fuels in businesses using similar types of machinery (e.g., agriculture).-

Specific questions:

1: Is it realistic to have no energy use from fossil fuel, which is allocated a score of 20 (Figure 2)?

2: If the score of 20 is included, perhaps as an aspiration for 100% use of renewable energy, then a negligible level of non-renewable energy use (i.e., 0.1 kWh/m^3) would merit a score of 19 rather than a uniform incremental decrease with a subsequent allocation of 18 for the use of any energy from non-renewable sources.

3: Why does the scoring scale for use of energy not extend to 0?

4: What is the rationale for the profile of the scoring system (Figure 3)?

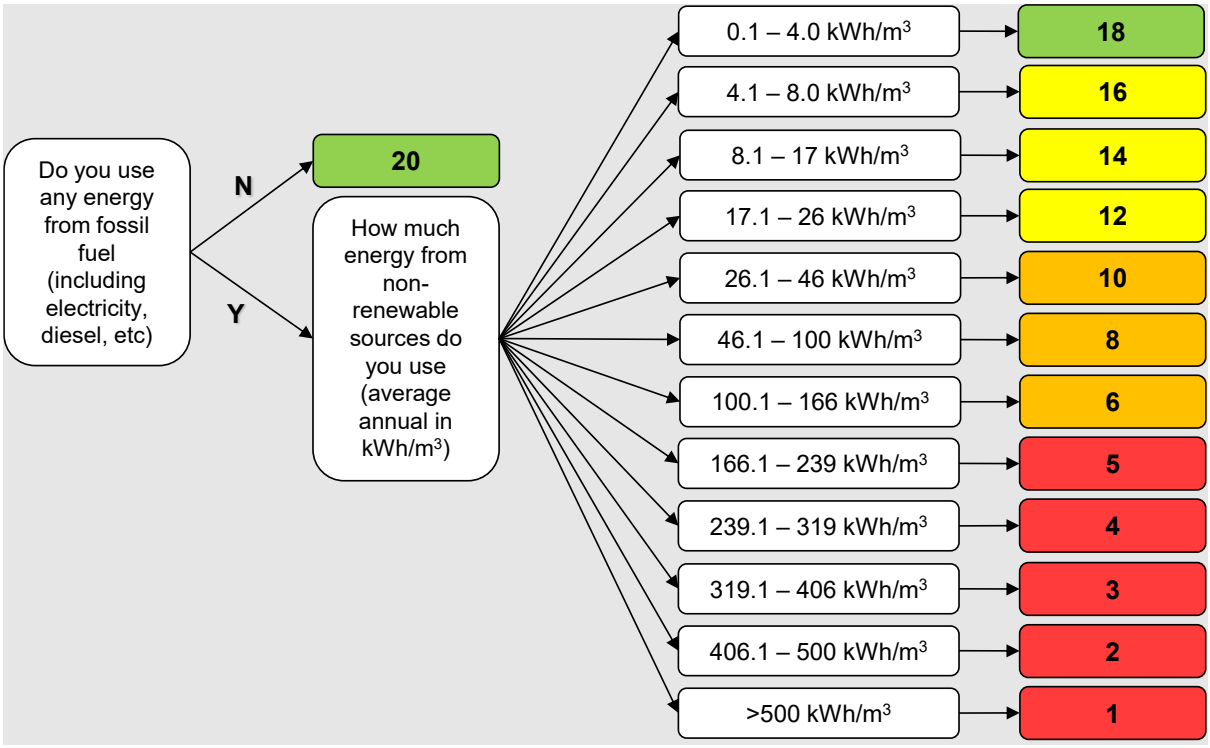


Figure 2. Decision tree - Energy use (in extraction, transport and production) (source: P4 Decision Tree, version).

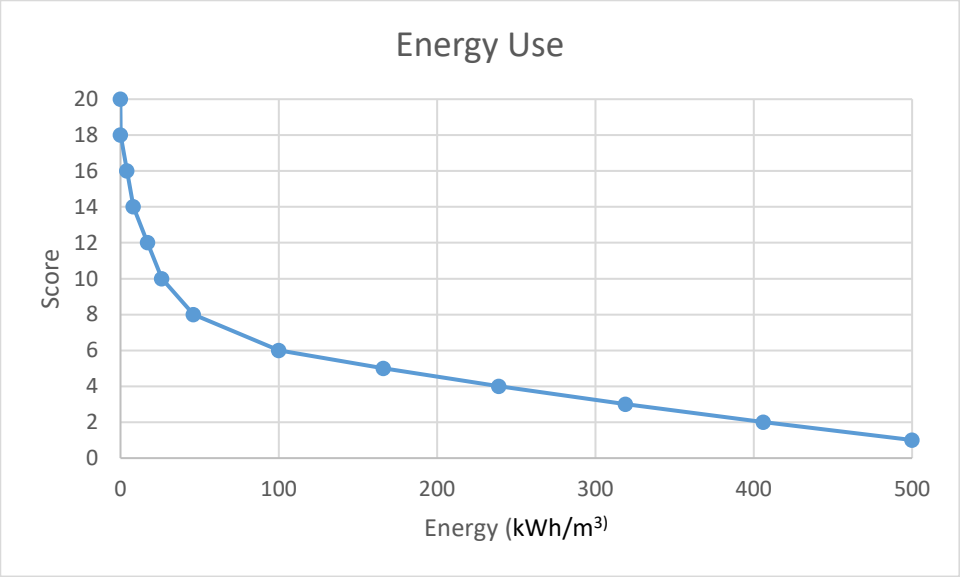


Figure 3. Profile of scores for energy use (source: extracted from RSS calculator).

3.2 Water Use (in extraction and production)

Water use required in the extraction and production of growing media is assessed within the RSS calculator. The focus is on water use for extraction and growing, transport to manufacture, processing and production, and the start of the mixing system, and potable and abstracted water for irrigation, washing and industrial processes (Guidance notes, pages 16, 17). Extraction and production of raw materials could be from areas which differ in water availability and stress, within the UK and internationally. As such the environmental impact of water extracted may not align with the use of volume as a measure. It is assumed that account would be taken of this in the percentages allocated to the impact at each stage of production for virgin by-products.

Although the life cycle stages identify the start of the mixing system as being within scope, the 'mixing system' is out of scope (page 16). No guidance could be found to explain where the distinction within the mixing system was defined. This risks inconsistent interpretations by users.

Out of scope also includes re-used water and harvested rainwater (page 17). It would be appropriate to include a question and path in the decision tree (Figure 4) to check if water is re-used or rainwater harvested, with scores given to reflect more efficient use of water resources. Including consideration of the management of rainwater would be consistent with the Scottish Government consultation on 'Water, Wastewater and Drainage Policy' (Scottish Government, 2023). A question on re-use of water would have some consistency with the inclusion of equivalent questions for wood-based materials (page 24) and peat (page 22).

Hyperlinks are not always correct, or current, to the relevant evidence papers (e.g., located in search but not with link in guidance notes - Value of Water Research Report Series No. 47, UNESCO-IHE, Delft, the Netherlands; page 17), or to the glossary of terms (e.g., start of mixing system, life cycle stages, in scope; page 16).

The baseline data (Guidance Notes pages 17 and 18) are 9 to 15 years old (e.g., statistics on farm water use in England from 2009/10) which have been superseded (e.g., Farm Business Survey 2017, from data collected 2015/16); National Statistics, 2017).

No explanation has been identified in the Guidance Notes for the basis for the profile of scores. The profile (Figure 5) seems unusual, particularly around the volume of 3,500 L/m^3 and for the scores 16

to 20. The impact of the apparent perturbation in the scoring model on the final output may be minor, but the apparent oddity weakens the robustness of the underlying evidence.

Specific questions:

1: Is the use of <1 L/m^3 potable water realistic? How does this relate to the average use of water in the production of growing media?

2: Should rain and harvested rainwater be considered if the water balance of catchments/landscape is affected/disrupted by cropping or plantations? For example, rainfed crops/plantations may limit downstream water availability for other uses.

3: What is the rationale for the profile of the scoring (Figure 5)?

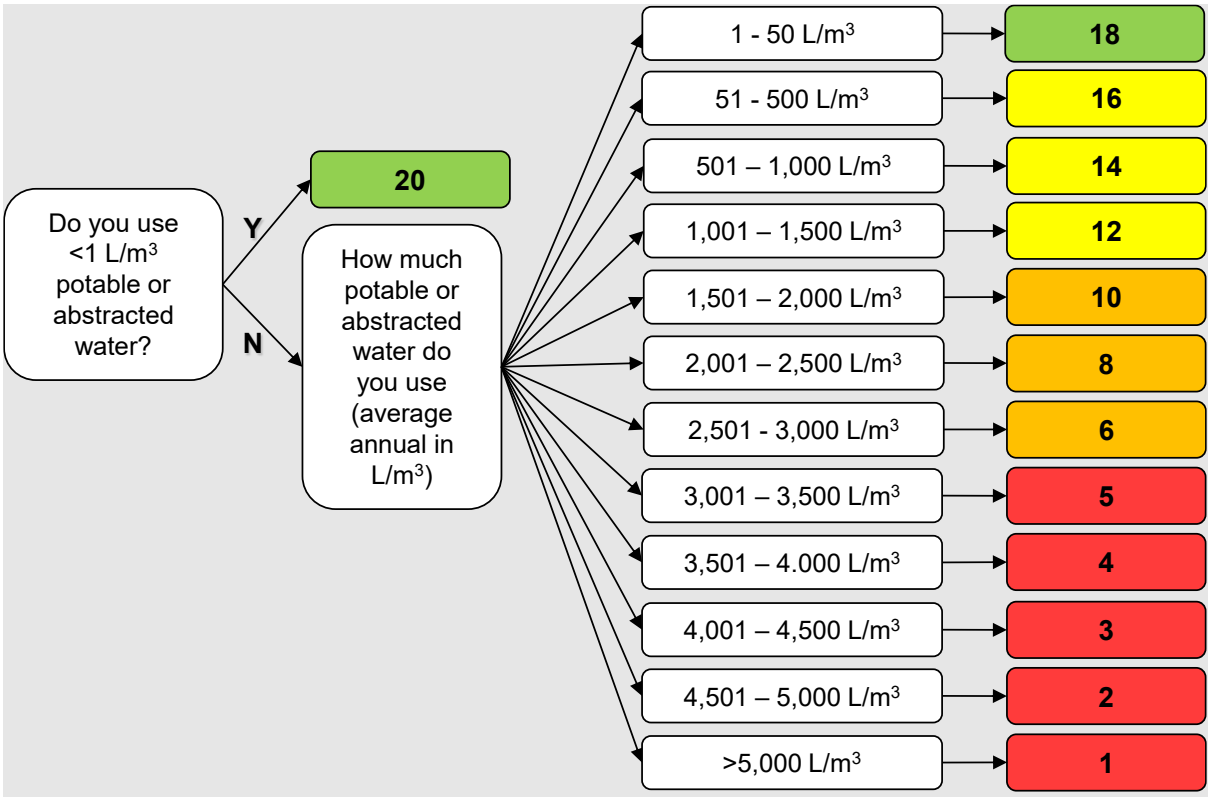


Figure 4. Decision tree – Water use (in extraction and production) (source: P4 Decision Tree, version).

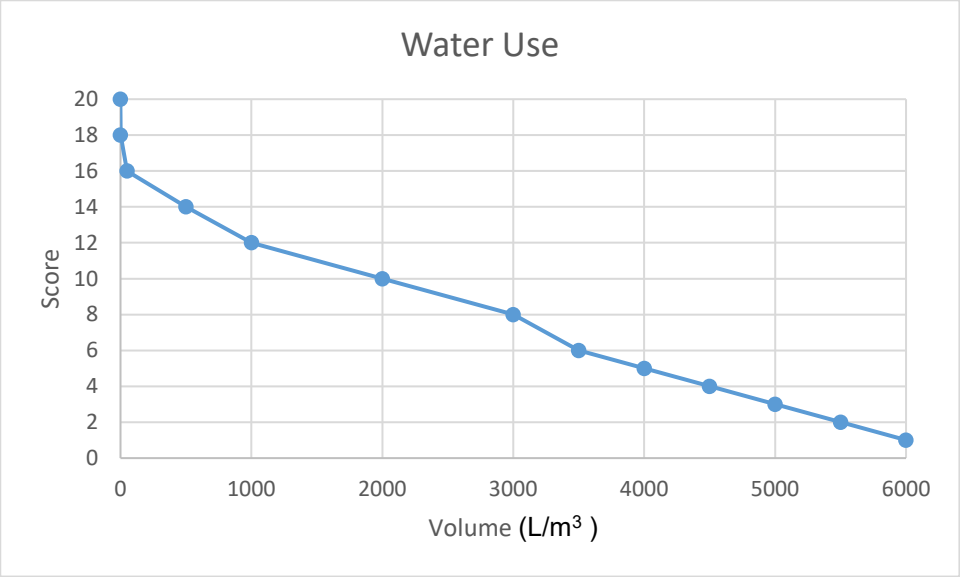


Figure 5. Profile of scores for water use (source: extracted from RSS calculator).

3.3 Social Compliance

Social compliance represents an assessment of transparency throughout the supply chain and is attributed as social accountability as a criterion of responsibility sourced and manufactured growing media and soil improvers (page 4). Scores are allocated across the full range of 0 to 20.

Scores given to the different forms of proof are pragmatic ways of considering the evidence provided. The Guidance Notes describe the types of evidence which are and are not sufficient as proof. For example, ISO14001 and ISO9001 are insufficient proof, and OHSAS18001 only offers partial proof as it does not cover the labour standards elements required but does for health and safety requirements (page 20/21).

The description of life cycle stages refers to issues in scope to be extraction, growing and harvesting, transport to manufacturers, processing and production, and the start of the mixing system. For several products (e.g., coir pith, cork, wood-based materials) the starting points are the processor or mill, except anaerobic digestate for which the starting point is the farm (page 19).

However, more comprehensive, and clearer, inclusion of circumstances of the production and harvesting of raw materials at source would be appropriate for a tool designed to inform socially responsible purchases. Several items considered to be out of scope would be appropriate to be included in a test of social compliance, specifically the operations at farm and forest levels (i.e., coir - coconut small holding and plantation, husk traders; Cork – forest and farm; wood-based materials – forest operations). Thus, answering the one question in the decision tree (Figure 6) will exclude the elements of the supply chain considered to be out of scope.

This is inconsistent with the requirements of Annex 2 self-assessment spreadsheet (Section 7), which asks questions under headings of labour, health and safety, business ethics, environment, and more general topics. The questions included include those on checking that suppliers adhere to standards (e.g., Do you have a written policy and procedure on how to evaluate and select your suppliers based on their ability to meet defined health and safety laws and standards?), and in relation to sourcing (e.g., Do you have a written policy on supplier sourcing that requires suppliers to have environmental / product related policies or standards e.g., ISO 14001, FSC?). It is likely that to compile information to

answer the latter question, about compliance with certain policies and standards, will require research into earlier points in the supply chain (i.e., plantation, forest, farm).

Related, accreditation by the FSC includes a requirement for the maintenance or enhancement of the social and economic wellbeing of workers (principle 2) and of local communities (principle 4). That applies throughout the supply chain, with no tapering of importance based upon the stage of the supply chain.

The allocation of the types of items noted above as out of scope is inconsistent with the arguments regarding wood-based products which explains the availability of schemes that assess whether wood and wood products are sourced from sustainably managed forests (page 24). Such items being out of scope is also inconsistent with expectations of obtaining farm or plantation level information in answering questions about coir pith (see Section 3.4.2).

As noted under other headings, reducing the relative weighting of the score based upon stage in the supply chain risks understating the consequences of adverse impacts (environmental, social, economic). This is recognised by the European Union in its proposed Directive on corporate sustainability due diligence (European Commission, 2022). This sets out a requirement for mandatory value chain due diligence, in which companies would be required to identify, prevent, or mitigate adverse impacts of their activities on biodiversity (Martino *et al*., 2024).

Similarly, the UK Government made provisions for due diligence obligations for forest-risk commodities within the Environment Act 2021 (DEFRA, 2022), although it only includes deforestation and land conversion that is illegal according to the local laws of the producer country.

The profile of scoring (Figure 7) seems unusual, particularly around the percentage of 41% to 50% and the score of 9. As with the scoring model of water use (Section 3.2), the impact of the apparent perturbation in the scoring model on the final output may be minor, but the apparent oddity weakens the robustness of the underlying evidence. The ranges for the test of proportions of the supply chain which can be proven to be compliant are inconsistent with no accompanying explanation, and no clear justification of how they relate to the evidence base. For example, what difference in evidence is expected to justify the score of 100% (scored as 100) of the supply chain being compliant compared to 99% (scored as 19). At the lower end of the range of scoring, why is the granularity of percentages reduced from 10% to 5%, with four ranges between 21% and 40%, and then increases to 20% (0% to 20%) with the score dropping from 4 to 0?

Specific questions:

1: Is there a penalty for having a lack of information in different categories of social compliance? *"Where no assessment has been carried out there is no proof of social compliance; assumptions cannot be made on the basis of country of manufacture and compliance with local law"* (Guidance Notes, page 20).

2: If there is no evidence of compliance should the evaluation stop, as with the implied veto in decision trees on peat (Section 3.4.1, Peat; Section 3.4.4, Minerals)?

3: Why is approach to testing the lowest range of the topic presented as a range (0 to 20%) instead of the equivalent approach to scoring in Minerals and Peat of "<X%"?

4: Why are the ranges for the test of proportions of supply chain not equal in value?

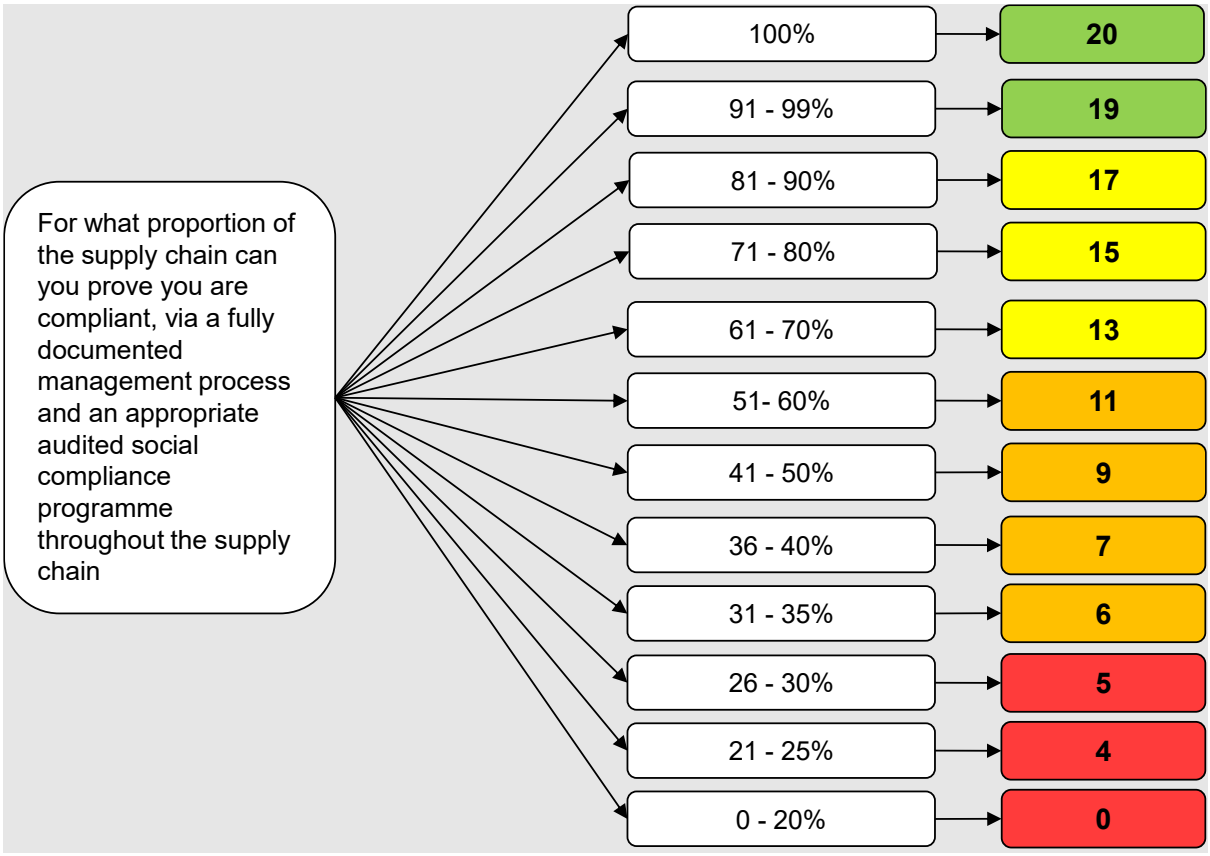


Figure 6. Decision tree – Social compliance (source: P4 Decision Tree, version).

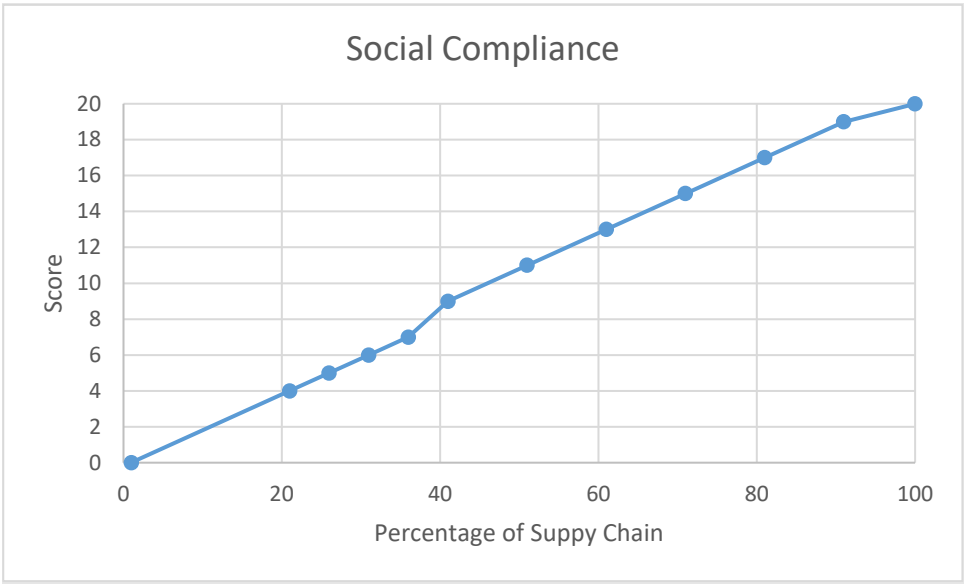


Figure 7. Profile of scores for social compliance (source: extracted from RSS calculator).

3.4 Habitat and Biodiversity

3.4.1 Peat

The RSS calculator is designed to inform consumers of responsible sourcing of growing media with a view to transitioning to the use of materials other than peat. The calculator includes peat as an option on the basis that its production is not prohibited and that some materials could become available due to development of sites for purposes other than fuel and horticulture (e.g., transport infrastructure, wind turbines) (e.g., page 22) (for example as per determination by Scottish Ministers of Cloiche windfarm, Highland, November 2023).

The Guidance Notes (page 21) define 'recycled peat; as “Waste peat removed from development sites; where removal of peat is not the purpose of development, i.e. the purpose is not peat extraction (for fuel or horticulture) and where it is demonstrated that excavation and removal is unavoidable”. In Scotland, such extraction would be permitted under National Planning Framework 4, Policy 5 (e.g. Energy Isles windfarm, Yell). A distinction in scores is made between whether peat is recycled, and whether it originates from a designated site (whether that is a local designation, e.g., Local Nature Conservation Sites, a national one, e.g., SSSI or SAC, or an international one, e.g., RAMSAR) which is given a score of zero, or has been extracted from a site for which there is a plan for peatland restoration, scores 0 to 16. However, no definition or list of designations is provided, leaving scope for different levels of user familiarity with designations and the basis of each type, and reasons for designation of individual sites.

Recycled peat scores highest score (20) but we note there is an argument that it should be penalised and given a lower score if it is commercialised by the same actors that commercialise virgin material. Although this element of the calculator is clearly included under the heading of Habitat and Biodiversity (Guidance Notes pages 20 to 22), it would be appropriate to restate the score of 20 for recycling of peat is only taking into account the perspective of habitat and biodiversity, with no account taken of the loss of carbon due to disturbance of the ground, storage of peat and its relocation. As noted above, the removal of peat for reasons such as those permitted under National Planning Framework 4 should also be recognised or else it creates inconsistencies in Scottish Government positions.

The Guidance Notes, page 23, refer to restoration to peatland or wetland scoring more highly than restoration to other habitats, and sites developed or drained before 2011 score much more highly than those developed or drained subsequently. No reference is made to when restoration processes would commence, with no reflection of timing (e.g. spatially scheduled restoration aligned with cessation of use of peat) within the scoring system. It also appears that reliance is placed on having an approved restoration plan to provide a form of assurance of restoration plans being successful. Such an assumption may not be appropriate. The scoring system would merit revision to take account of such issues.

We query whether the question “Does restoration have a biodiversity primary purpose?” is most appropriate regarding site restoration? There is an argument that restoration has a dual role of restoring the loss of biodiversity, alongside reducing greenhouse gas emissions, and re-building a carbon sink. The funding for peatland restoration may have been triggered first by the benefits for tackling climate change. So, the wording of the question may convey a narrower message than appropriate.

If no money is available for restoration, or the site will not be restored for biodiversity purposes, then the resulting score is 0. Peat from sites where there is a guaranteed external bond for restoration scores more highly than those where company funds are ring fenced. The difference in nature of the ring fencing of funds for sites drained before 2011 is 12 for areas for which more than 65% of the area is to be restored. The existence of a bond is important given the risks of companies going out of

business leaving commitments to restoration unfulfilled. There is also merit in having a higher penalty for the lack of an approved restoration plan.

The decision tree (Figure 8) indicates that "Any material from this site (or product containing this material) cannot meet the schemes definition of responsible no matter what it scores on other criteria." That pathway through the decision tree does not lead to any score. Should it be zero? In the calculator a 'yes' to that question leads to a score of zero. We note that score is carried through to the final summary, with no link to the responses to scores for other elements. For example, Figure 9 shows an example of the format of the output of the calculator, producing a summary score of 58, with that for habitat and biodiversity of zero. Note that this example is not intended as a basis for comparing the assessments derived from the calculator with outputs with other options of growing media.

The answer to questions about restoration could be considered for the joint purposes of mitigating GHGs alongside enhancing biodiversity. .

At present, one could argue that in the UK the primary purpose of peatland restoration is to sequester carbon, and that biodiversity aims have been secondary, similar to several other countries. For example, the Peatland Finance Ireland in the Republic of Ireland, notes "…a strong focus on emission reductions as well as community, water and biodiversity co-benefits"). In Finland, the EU Just Transition Fund provides €465 million for the restoration of peat fields back to carbon sinks, where possible, alongside supporting diversification of livelihoods, revitalising economic structures and boosting employment by reskilling and upskilling the workforce working in peat extraction and related sectors (European Parliament and Council of the European Union, 2022). If the primary purpose of peatland restoration is interpreted as enhancing the carbon sink and reducing GHG emissions then there is no clear response in the decision tree. Such a primary purpose should have a score higher than 0.

The RSS calculator should include consideration of greenhouse gas (GHG) emissions and the loss of carbon sinks, both deemed out of scope. However, this omits an important element of responsible sourcing of growing media and is a key purpose of the ban on the sale of peat for horticultural use. Businesses and retail consumers could be expected to look for information on carbon and GHG emissions associated with alternative growing media and soil improvers. Existing calculators could inform how to fill this gap. Such a dimension of climate change impacts would be valuable information to include alongside those relating to habitat and biodiversity.

An estimate of the reduction in the associated carbon sink, and GHG emissions, would be appropriate to be included alongside the factor of habitat and biodiversity, peat. The carbon calculator for wind farms on Scottish peatlands (Nayak *et al*., 2008), developed for the Scottish Government, could provide a basis for a simplified calculation of the loss of carbon due to extraction. Under Scotland's National Planning Framework 4, the carbon payback calculator is a requirement for development of windfarms on areas of peat, and its use and understanding of the required inputs validated.

Specific questions:

1: There is an argument that all uses of peat should be scored zero. It is renewable on a very long timescale that far exceeds the useful window for meeting the Paris Agreement targets. Consequently, all peat use reduces carbon stocks and, as it oxidises, is increasing CO_2 inputs into the atmosphere. A lower top score for sites that had been disturbed and restored would reduce the reward for the initial habitat destruction.

2: What significance is attached to site restoration with an externally held financial bond compared to ring-fenced company funds and policy? Why is 2011 a key date with respect to the development or drainage of sites, and why the significantly higher scores for those developed before 2011? How would sites which might become eligible for support from Peatland Action be reported?

3: Should the model for the total summary score reflect weightings of individual elements which can include an output of zero?

4: How significant is recycled peat in retail markets?

5: The criteria relating to the cut off year 2011 need adjusting so that one includes 2011.

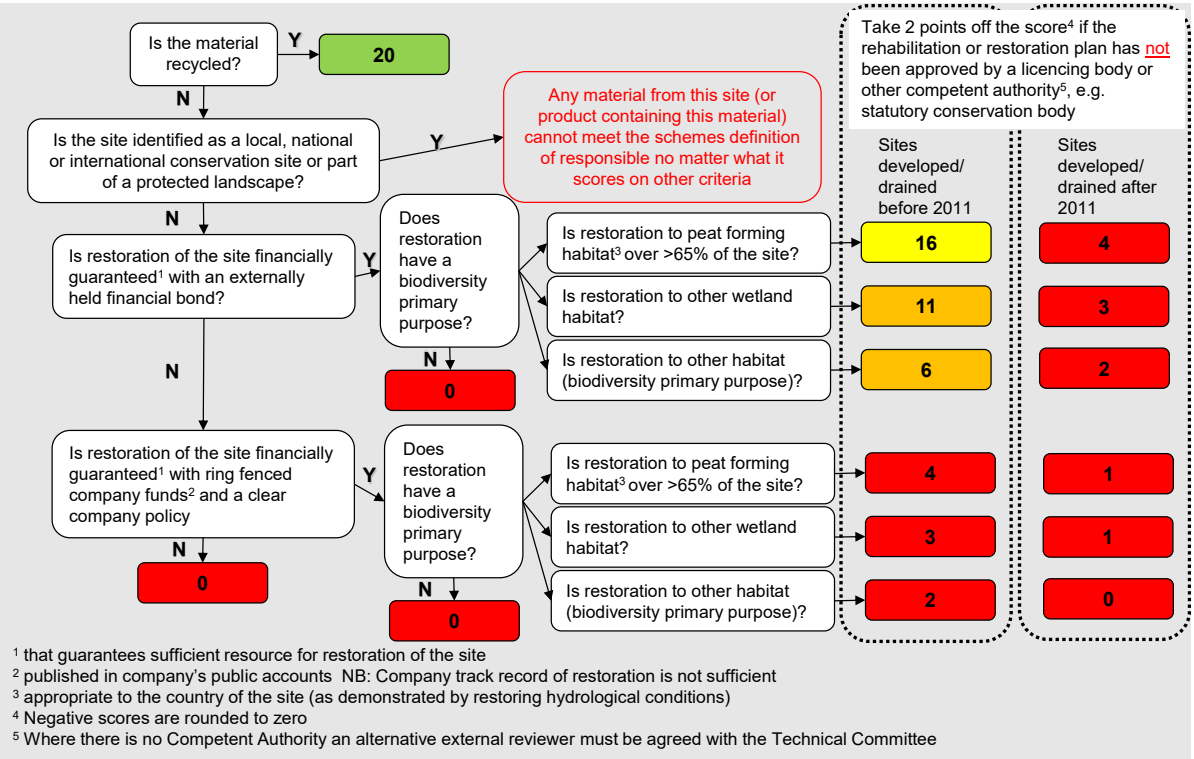


Figure 8. Decision tree habitat and biodiversity – peat (source: P4 Decision Tree, version 8).

Materials:				Scores							Material Totals	
	Sheet Id	*Material*	*Vol.*	Energy	Water	Social Compliance	Habitat & Biodiversity	Pollution	Renewability	Resource Use Efficiency	un-weighted	weighted
	Material 1	**Peat**	#### ####	5	8	4	0	20	15	6	58	58

Figure 9. Extract from the summary tab of the RSS calculator, showing an example of the presentation of scores for elements which includes a score of zero for habitat and biodiversity due to a source of materials being within a designated site (Source: RSS calculator).

3.4.2 Coir

Coir is the fibrous husk of the coconut shell (Coir Board, 2014). In the RSS calculator, coir is included as a growing media substrate or soil improver, providing a candidate alternative to peat.

Scores for the use of coir range from 18 down to 5. Scores are higher if sources can be geolocated and the area was previously agricultural land. Scores are also higher if the plantation is not a monocrop. If the source is not known, then a regional assessment of the expansion of coconut growing is used.

It is unclear why 10 years has been used as the threshold for the expansion of the coconut growing area from which the coir was sourced into non-agricultural areas. However, over time consideration may be required to take account of strategies for the adaptation of coconut production in response to climate change (e.g., Peries, 2023).

Coconut palms (like most woody plants) need 15 to 20 years to reach peak production (i.e., more than 10 years). So "land conversion in the last 10 years" does not seem an appropriate timeframe over

which to assess the market coir pith which is currently on the market. The timeline should be revised, and the score modified. One option is to create a tiered system of immediate, <10 years, 10 to 20 years, and >20 years, and provide a ranked scoring accordingly.

In the decision tree, a scenario of immediate conversion from agricultural land and not grown in a monocrop is scored 18 and considered "green". Presumably this reflects the land use change to one other than a monocrop. However, it seems to be a high score given the loss of agricultural land and no information on the types of trees that accompany coconut, and how the new plantation would contribute to biodiversity.

When the geolocation of the source of Coir is not known, reference is made to the use of a 'regional assessment'. The Guidance notes provide an example of the types of information which could be used in regional assessments, in relation to the use of water footprints for coir (Tables 9 and 10). However, for coir it notes that the decision tree can be entered after the first node reflecting the complexity of the supply chain and lack of information or availability of an existing regional assessment (page 25/26), bottom of Figure 10 below.

It is possible to score 12 on land cleared specifically to grow coconuts as long as it is not a monoculture. This seems a high number given the potential loss of biodiversity and carbon during clearance. We observe that the benefits of not growing coconuts in a monoculture on previously non-agricultural land are as high compared to growing on previously agricultural land in a monoculture. Both options score 12. Of the two options, the reward for land clearance is considered too high.

Greenhouse gas emissions are reported as being out of scope. At the level of individual plantations or holdings, this may be appropriate. However, in line with the regional approach (page 17), information could still be used from studies in the public domain. For example, Grasselly *et al*. (2009) assessed the GHG emissions from the manufacture, transport and end-of-life of the substrate coir. The report highlights emissions amounting to 367 g of CO_2-equivalent per kilogramme of substrate, or approximately 162 g to 244 g of CO_2-equivalent per square meter in the case of a single use.

Specific comments and questions:

1: What is the basis for ascribing the same score (12), irrespective of whether coconuts are grown in a monocrop plantation, following asking whether the previous land use was for agriculture (where geolocation can be confirmed)?

i.e., …

land was agriculture before coconut plantation, and now grown in a monocrop = 12;

land was not in agriculture before coconut plantation and now not grown in a monocrop = 12;

2: Is conversion from agricultural land the relevant question to be asked? A valid conversion could be one of commercial scale deforestation to plant coconuts whilst recognising it may take some time for the crop to generate coir.

3: Note that there may be a requirement to reflect on the definition of agricultural land. For example, in the International Standard Industrial Classification of All Economic Activities (ISIC, Rev. 4), as used by the World Bank, coconuts are classified as the Growing of oleaginous fruits. Therefore, maps of agriculture and coconuts using that internationally recognised classification scheme may not provide evidence of where coconuts have been planted in agricultural land (International Labour Organisation, 2024).

4: Should a question be included, and consequent pathways through the decision tree, regarding risk of new disease pressures associated with peat replacements (e.g., coir)?

5: Why has a timeframe of 10 years been used as the threshold for the expansion of the coconut growing area from which the coir was sourced into non-agricultural areas?

6: Given knowledge of GHG emissions associated with the production of substrate coir there is scope for its inclusion in the RSS calculator, probably in an additional decision tree.

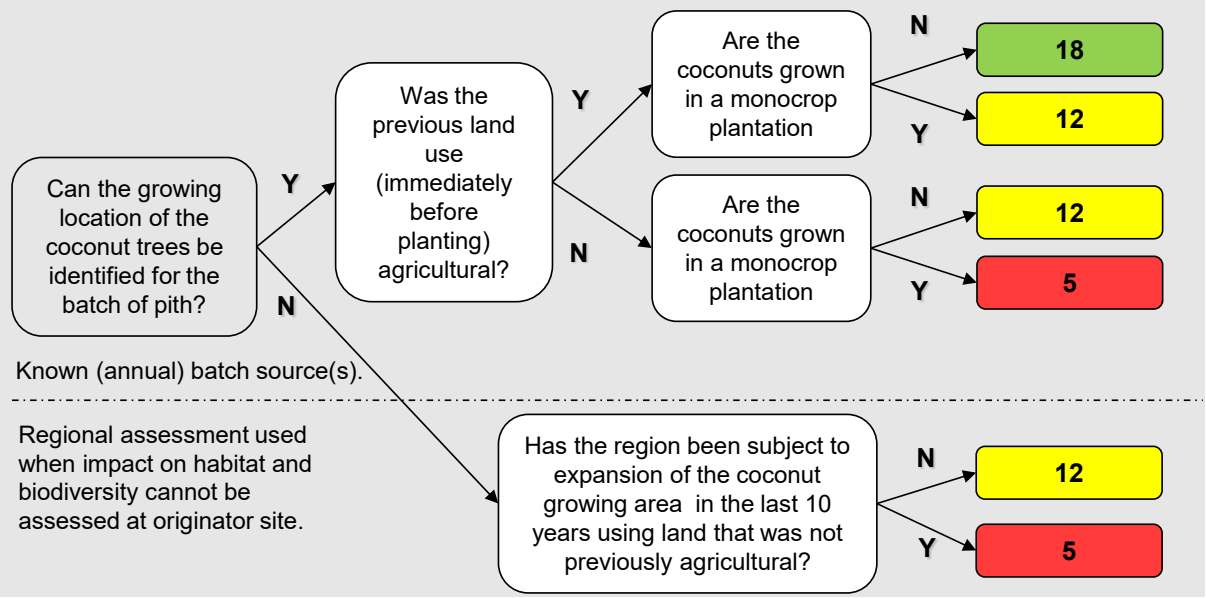


Figure 10. Decision tree habitat and biodiversity – Coir (source: P4 Decision Tree, version 8).

3.4.3 Wood-based material

Wood-based materials are listed as a 'material that comes from a tree, but excludes fruits, nuts, leaves, resins' (Guidance Notes, page 77). In the RSS calculator, wood-based material is included as a growing media substrate or soil improver, providing a candidate alternative to peat. Examples of such materials are wood chips, bark and sawdust as by-products from sawmills.

The decision tree shown in Figure 11 includes three types of wood products: biochar from rock and sawdust lower impact, bark and sawdust higher impact and biochar from woodchips, and wood chips. The Powerpoint with the set of decision trees does not include the set of scores for biochar from rock and sawdust lower impact. Figure 11 is taken from the Guidance Notes, page 24.

Scores for wood-based materials range from 20 down to 5, with a question as to whether the materials are recycled being the key determinant of a score of 20. The description of recycled is of "materials for a useful purpose that have already been used for another purpose as a replacement for virgin materials." These materials are virgin by-products (Table 2, page 6), usually from processing such as wood chips and sawdust from sawmilling processes. Some recycled materials may be recovered waste (page 75). The text associated with the question as to whether the input is recycled (Figure 11) would benefit from adding the clarification that raw recycled wood products (e.g., woodchip, sawdust) should be inputs to a composting process and subsequently used as a soil improver.

The scores for other sources depend upon the level of independent certification, with higher scores attributed to the greater the level of certification. Low scores are given if there is no proof that the material comes from a sustainably managed forest. However, for "non-sustainably forest management", it would be more appropriate if the score was 0 for all materials, or for there to be a greater range of options. This would be more consistent with the range of scores used in other factors (e.g., peat, minerals).

Compliance with FSC includes the maintenance or enhancement of the social and economic wellbeing of workers (principle 2) and of local communities (principle 4). Failing to achieve formal FSC accreditation, and thus standards such as those above, would lead to a score of 5. If there is no evidence of such accreditation, then there is an argument for the score to be lower than 5.

As noted in Section 3.3 regarding social compliance, a low level of compliance through the supply chain can be allocated scores below 5. Therefore, there is a potential inconsistency between non-compliance with FSC accreditation for wood-based materials, and scores which have a minimum of 5, and low scores in social compliance, which have a minimum of 0.

An estimate of GHGs and losses of carbon should be considered to accompany this factor. The Woodland Carbon Code could provide a basis for incorporating this information into the sustainability assessments.

Specific questions:

1: Why are bark and sawdust scored differently to wood chips?

2: Why are scores from non-sustainably managed forests not scored 0?

3: What is the source of assessment of independent certification that enables choice of one of the four options leading to the scores of products?

4: Why not start with a similar question to that of the Peat calculator - "is the site identified as a local, national or international conservation site o part of a protected landscape?" The same response of stopping the use of material would be appropriate. Similarly, stopping the use of "old-growth" forest of any type would prevent material being badged as sustainable by weaker certification schemes.

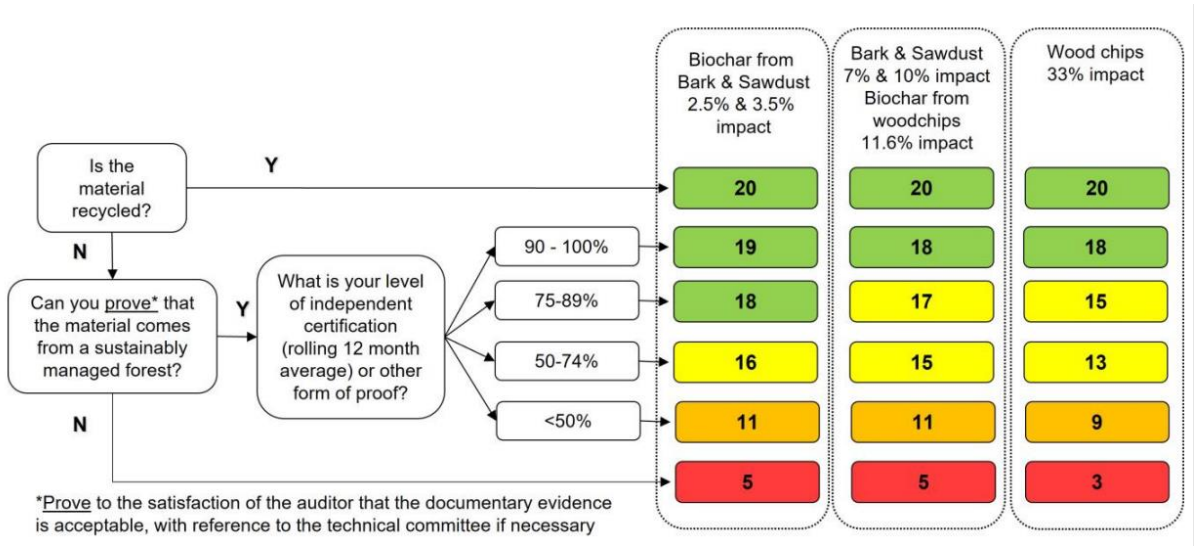


Figure 11. Decision tree habitat and biodiversity – Wood based material. (source: Guidance Notes, page 24).

3.4.4 Habitat and Biodiversity - Minerals

Minerals are defined as "any raw material extracted from the ground other than topsoil" (Guidance notes, page 74). In the RSS calculator, minerals are included as a growing media substrate or soil improver, providing a candidate alternative to peat. The approach taken is relatively simple which has its benefits. However, several aspects associated with the use of minerals results in weaknesses in the decision tree and its contents.

As with the element of Habitat and Biodiversity, Peat (Section 3.4.1) the decision tree (Figure 12) indicates that "Any material from this site (or product containing this material) cannot meet the schemes definition of responsible no matter what it scores on other criteria." Does the statement imply that the assessment overall should be zero?

Scores for mineral compost range from a maximum of 20, down to zero. A score of 20 is given to recycled material. Material sourced from a protected area cannot meet the definition of responsibly

sourced. The structure of the decision tree is similar to that of peat (Section 3.4.1), with scores dependent upon whether there is a restoration plan, how it might be financially guaranteed, and how much of the site is being restored for biodiversity.

The sources of some raw materials (e.g., perlite, the use of which in horticulture is credited to West of Scotland Agricultural College, often sourced in volcanic regions of Greece, Turkey, USA), or silica sand mined in Scotland, may not be appropriate to restore for purposes of biodiversity. In the latter case, after-use plans may be more appropriately designed to provide agriculture, woodlands or renewable energy. We also note comments in the Scottish Government's report on Collation of the results of the 2019 Aggregate Minerals Survey for Scotland (Mankelow *et al*., 2023). This observes that "some designations, notably SSSIs, may only coincide with a small part of an extant planning permission. However, the total sales and reserve for the mineral working are recorded even though there may be no extraction within the designation."

As with peat (Section 3.4.1), minerals from sites where there is a guaranteed external bond for restoration score more highly than those where company funds are ring fenced, with significantly lower scores if the area to be restored is less than a given threshold, in this case 75% and 50% (note that the threshold is 50% and so the relevant tests in the decision tree should be '≤ 49%'). If the proportion of the site to be restored is ≤ 49% the score allocated is 0. This risks understating a small, but nonetheless identifiable contribution to the future biodiversity of the site.

We note that under National Planning Framework 4 (NPF4), new sites of mineral extraction within Scotland require "assurance and clarity over the amount and period of the guarantee and in particular, where it is a bond, the risks covered (including operator failure) and the triggers for calling in a bond, including payment terms." (Policy 33, pages 92/93). Production sourced from other jurisdictions may have less clearly defined policies on financial guarantees. We also note that the existence of a bond does not guarantee the financial value is sufficient for the purpose if called upon (e.g., bonds for open cast coal mines when Scottish Coal was declared bankrupt).

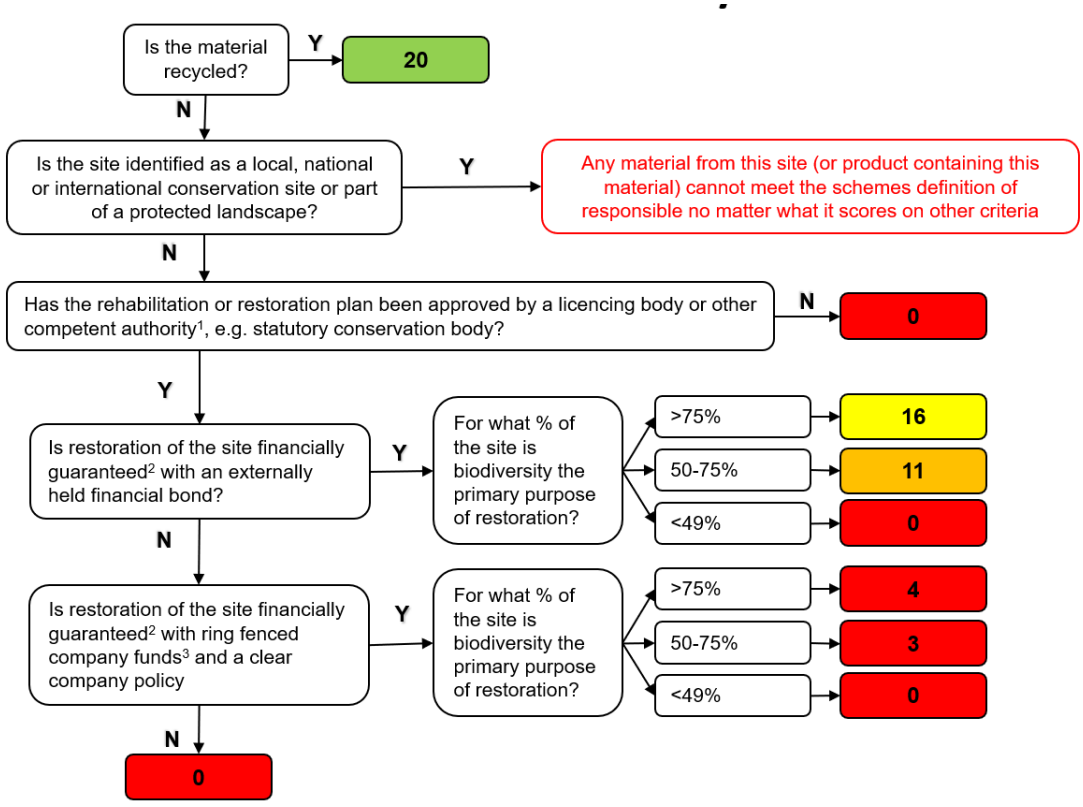
The Guidance Notes and decision tree provide no information on the logic of multiple thresholds or the basis of selecting their values, or how this criterion is defined, and thus the roles of the questions testing for funds for restoration or rehabilitation of sites.

Specific questions:

1: There is little difference in scores between recycled material (20) and that from a site where the previous habitat has been removed and then restored (16). This seems a small difference to account for the removal of the previous habitat and the long-time it might take to restore that habitat. A lower top score for sites that had been disturbed and restored would reduce the reward for the initial habitat destruction.

2: Minor discrepancy between numerical threshold in the Guidance Notes. In the Powerpoint and decision tree in Guidance Notes, page 25, on both decision paths on percentage of site primarily for biodiversity, the value should be <= 49% (i.e. not < 49%) as the next interval is 50-75%.

3: As with Peat, Section 3.4.1, a statement in the decision tree (Figure 12) implies a pathway that does not lead to any score ("Minerals extracted from sites identified as a local, national or international conservation site or part of a protected landscape are excluded from this scheme"). However, in the calculator a 'yes' to that question leads to a score of zero, and zero in the summary table.



[1] Where there is no Competent Authority an alternative external reviewer must be agreed with the Technical Committee
[2] that guarantees sufficient resource for restoration of the site
[3] published in company's public accounts NB: Company track record of restoration is not sufficient

Figure 12. Decision tree habitat and biodiversity – Minerals. (source: P4 Decision Tree, version 8).

3.4.5 Habitat and Biodiversity – Energy Crops (AD)

The Guidance notes refer to the "cultivation and harvesting of energy crops and on-farm transport to anaerobic digestion (AD) facility" (page 14). In the RSS calculator, energy crops are included for the assessment of their potential impacts on habitats and biodiversity.

The Powerpoint with the set of decision trees refers to the factor as energy crops (anaerobic digestion) whereas the Guidance Notes (page 28) refer to Agricultural crops (energy crops for AD, oilseed rape straw, farmed *Sphagnum*). Figure 12 is taken from the Guidance Notes, page 28.

The decision tree (Figure 12) comprises two questions, the primary one testing whether, prior to use for energy crops, the land was a semi-natural habitat, and the second whether it was in an environmental scheme or managed to an equivalent standard.

If land was previously a semi-natural habitat the score allocated is 0. If land was in a higher-level environmental scheme, the score allocated is 18, and if not then score is 6. However, the decision tree takes no account of the agricultural land classification or soil type on which energy or agricultural crops would be grown. In Scotland, the scoring system can, and should, take account of the Land Capability for Agriculture classification and its representation of the types of energy crops that may be grown in different areas dependent on environmental and soil characteristics (e.g., on carbon rich soils).

The current Scottish Government draft Bioenergy Policy Statement, section 2.5 (page 30), notes the assumptions made in modelling the potential for perennial energy crops. Those include exclusion of carbon rich soils (LCA class 4.1 to 6.1). This would be consistent with Policy 4 of NPF 4. Therefore, a decision node could be included which asks about land being on LCA classes 1 to 3.1, or 3.2 and upwards.

No reference is made to the species of energy crops. The Scottish draft Bioenergy Policy Statement notes that native energy crop species should be prioritised over non-native (page 32). A decision node could be included which asks about the species of energy crop (e.g., *Miscanthus*, Short Rotation Coppice, Short Rotation Forestry), and appropriate scores attributed accordingly.

Similarly, no reference is made to whether the land on which the crop is grown is designated (e.g., National Park, National Scenic Area). Such a designation would not preclude planting, noting that energy crops can form part of the landscape and biodiversity of an area, subject to an Environmental Impact Assessment (EIA). Martin *et al*. (2020), in reporting for Scottish Government through ClimateXChange noted thirteen technical and environmental constraints to land use for bioenergy feedstock supply which are estimated to have medium or high effects on crop area. Several of these are built into models which could be used to inform scores in the decision trees.

Specific questions:

1: Evidence to show the benefits of being in a higher tier scheme for biodiversity is available. However, the scale of benefits would not suggest that being in a higher tier is worth three times the points of being outside this tier. A higher score for the latter is justified.

3: Why is the maximum score that can be allocated 18 and not 20?

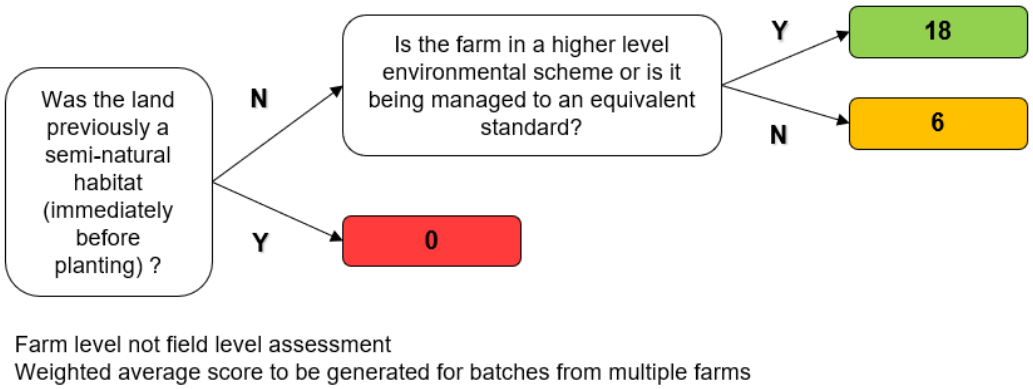


Figure 13. Decision tree habitat and biodiversity – Agricultural crops (energy crops for AD, oilseed rape straw, farmed *Sphagnum*) (AD) (source: Guidance Notes, page 28)

3.4.6 Habitat and Biodiversity – Bracken

Bracken is a fern. In the UK bracken is almost all *Pteridium aquilinum* subsp. *aquilinum* (L.) Kuhn with some *P. aquilinum* subsp. *pinetorum* in Scottish pinewoods (Pakeman, 2023).

In the Guidance notes bracken is identified as a raw material (>5% by volume) that makes up a growing media substrate or soil improver (page 72). Only extraction, growing and harvesting is reported as within scope of the analysis (page 29).

Scores for bracken range from 20 to 1, where 20 can be scored if a regulator approved plan is in place, 15 if that plan is not in place but best practice is being followed, and 1 in other circumstances.

Specific questions:

1: The statement “Is the material harvested from a site with a mechanical control plan?” appears superfluous. It appears to duplicate the second question “Is the bracken managed in accordance with a regulator approved plan?”. This question can be removed.

2: Many land managers will be controlling bracken outside of an agri-environment scheme. It is not clear why bracken within a scheme should be valued more highly than that outwith it. The same score would be justified for both contexts.

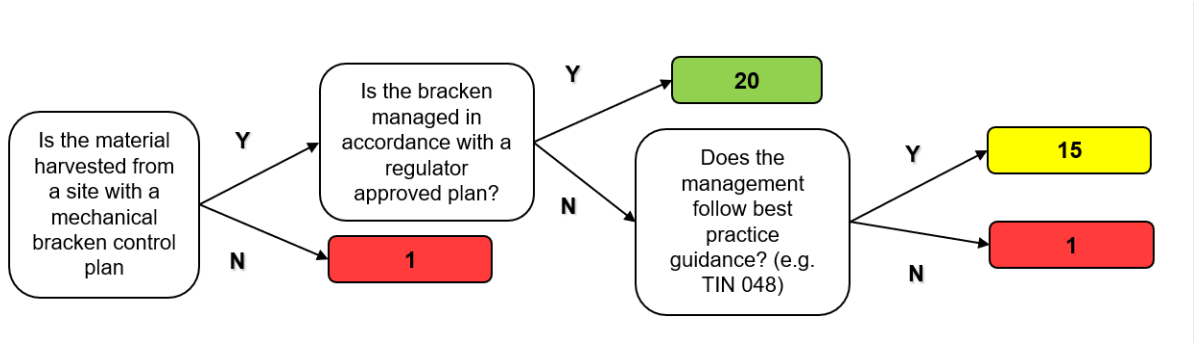


Figure 14. Decision tree habitat and biodiversity –Bracken (source: P4 Decision Tree, version 8).

3.4.7 Habitat and Biodiversity – Wool (sheep only)

When used in a mixture as compost or mulch, sheep's wool can be used as a soil improver. It provides a source of slow-release nitrogen and other trace elements, and has utility in weed and pest control, moisture retention and temperature regulation. In the RSS calculator, wool is included for the assessment of its potential impacts on habitats and biodiversity.

Scores allocated for wool range from 20 down to 1. The principal tests in the decision tree (Figure 15) are whether the wool came from an upland sheep farm or sheep used for habitat management, and sheep stocking densities with respect to habitats.

Most of the differences are driven by scoring lower wool which is derived from habitats that are grazed above optimal levels. Wool from upland sheep or those used for habitat management can score more than those of, presumably, lowland sheep on more intensive pastures.

A distinction should be made between "*upland sheep*" and "*sheep used for habitat management*". Note that upland sheep farming has a significant environmental cost in terms of loss of opportunity to repurpose land to sequester carbon, impact of grazing and trampling on organic soils, and consequences of overgrazing on biodiversity (see National Food Strategy; Dimbleby, 2020, 2021). This does not seem to be accounted for.

No explanation is provided for a difference in thresholds between uplands and lowlands, or for the details of the scoring (e.g., 2 x and 1.5 x optional levels). In the absence of such an explanation, the thresholds should be the same.

Greenhouse gas emissions from sheep are not taken into account. Information is available which could be used together with estimates of volume of woold materials used. The Scottish Government funded report on the estimation of sheep emissions and their mitigation in the Smart Inventory (Moxey and Thomson, 2020) reported that GHG emissions from sheep in Scotland were c.1.13 Mt CO_2e in 2018, of which enteric methane consistently accounts for c.78% and manure (including deposited from grazing) c.10%. They observe that a "decline in emissions of c.23% since 1990 is less than the c.33% decline in total sheep numbers, implying an increase in average emissions per animal (consistent with a shift in the national flock profile towards bigger breeds and heavier slaughter weights)." Such findings illustrate some of the complexity that can be anticipated in including GHG emissions, but which are a relevant part of such overall assessments.

Specific questions:

1: Why does wool from the uplands (e.g., score 20) potentially score more than wool from the lowlands (e.g., score 18)?

2: The penalty for straying above the optimal level in the uplands is a cliff edge drop in scoring, from a score of 20 to a score of 1. However, in the lowlands the impact is less abrupt, with a score of 10 for stocking densities between 1 x and 1.5 x the optimal level, a score of 5 for stocking densities between 1.5 x and 2.0 x. Only above 2.0 x the optimal level is the score reduced to 1.

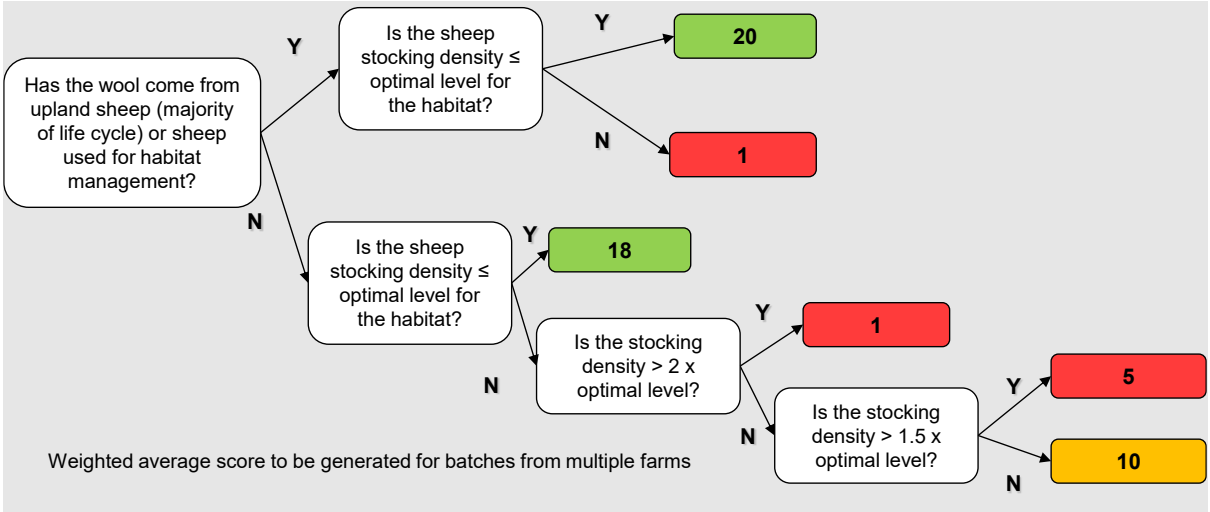


Figure 15. Decision tree habitat and biodiversity – wool (sheep only) (source: P4 Decision Tree, version 8).

3.5 Pollution

The RSS calculator takes account of pollution in gaseous or liquid forms, and their impacts upon water, soil or air. If no monitoring of these environmental receptors is being undertaken then the conclusion is that there is no evidence of an absence of pollution, and thus a score of 0 is allocated (Figure 16; Guidance Notes pages 32/33).

The user is asked if they can prove that as a result of regulator approved mitigation measures there is no negative impact of pollution, a Yes to which is attributed a score of 20. However, a breach could still arise despite such regulator approved measures, with the possibility of an enforcement action. However, there is no scope for a score less than 20.

If the answer to the question of proving there is no negative impact of pollution is No, and there are no enforcement actions, then the score is 12. The weighting on providing proof of no negative impacts of pollution seems high (i.e., a difference in score of 20 compared to 12).

Related, one might expect some form of monitoring to be used as a means of providing proof. Yet, if there is no regulator approved mitigation measures, and there is a means of monitoring, and no enforcement orders, the score is also 12. What action would be expected by a producer, or supplier?

The wording used in the footnote relating to 'potential to pollute' being a theoretical possibility without mitigation measures, would benefit from clarification. Linking the phrase to the definition in the Guidance Notes (page 74), which states that 'pollute (water, soil, air) is to discharge emissions that have, or have the potential to have, an adverse impact on the environment', the first reference to 'potential' seems to relates to the risk of a pollution event but the mitigation measures seem to refer to the reduction of adverse impacts on the environment.

The 12-month timeframe regarding the number of enforcement orders seems short. A longer timeframe would be more appropriate to demonstrate both current and historical compliance.

Greenhouse gas emissions are reported as being out of scope. However, greenhouse gases such as carbon dioxide would be considered a gaseous waste, and consistent with the definition provided on

page 73. The principal used could be that of regional assessments where available, as per coir pith (page 17).

The decision tree is overly simplistic with a score of 20 attributed for an answer to pollution potential of NO, taking no account of mitigation measures being implemented to recognised standards. It would be appropriate to test for such measures and to reflect their effectiveness through the attribution of scores (e.g., in the range between 12 and 20).

Specific questions:

1: The table of items in scope and out of scope relating to pollution (page 32) would benefit from explanations for some entries.

For example, for wood-based products, why is the starting point the sawmill and not forest operations? The inclusion of information on the source of raw materials, at forest or supplier level, would seem appropriate. As noted elsewhere, that is going to be required under the EU Due Diligence Directive and so for products which are imported from the EU, to possibly for products to be exported to EU customers. For wood materials sourced within the UK, the supplier should be able to confirm adherence to the UK Forestry Standard and relevant regulations (e.g., Environment Agency, SEPA), noting "Good forest practice requirement, reference number 7 Forest operations should be conducted to prevent watercourses being polluted with sediment or discoloured" (Forestry Commission, 2023).

2: For coir pith the starting point is noted as being the fibre mill (page 32). As above, consideration should be given to the starting point being the coconut small holding/plantation, rather than that being out of scope. This would be consistent with the EU Due Diligence Directive, and in line with the direction of travel of the forthcoming Scottish Government Environment Strategy of recognising potential environmental impacts of production and consumption in Scotland.

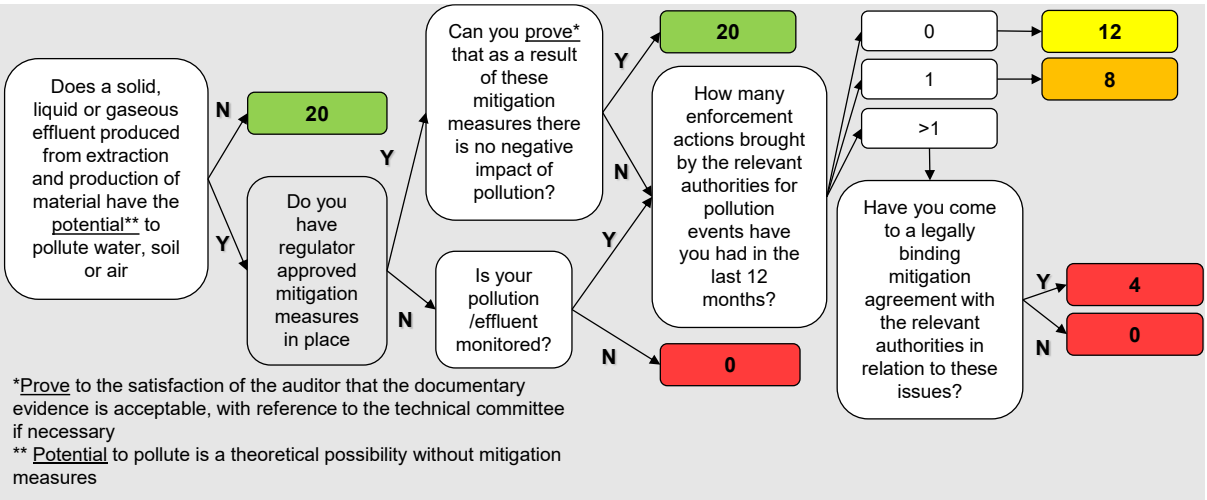


Figure 16. Decision tree pollution (source: P4 Decision Tree, version 8).

3.6 Renewability

The renewability criterion captures the impact of the substrate on atmospheric carbon dioxide levels and carbon cycling by means of the period over which emitted carbon dioxide is recaptured by the regrowth of the raw material on the same site (Guidance Notes, page 37).

The test in the decision tree is a question of the time period over which the materials are considered to be renewable (100, 50 and 5 years). However, the logic of scores of 1, 15 and 20 for renewability at 100, 50 and 5 years is not explained. For example, the score of 15 for "Renewable within 100 years" is generous considering the timeframes of environmental targets for biodiversity, such as the Scottish

Government target to have restored and regenerated biodiversity by 2045, climate change (net zero by 2045 for Scotland and 2050 for the UK), and timescales for peatland restoration. Consideration should be given to a lower score for renewability at sites within 50 years (e.g., 10).

In relation to peat and peatland restoration, Evans *et al*. (2021) report, as a guide, that for every 10 cm that the water table is raised, there could be a reduction of 3 tonnes CO_2 $ha^{-1}y^{-1}$. The rates of raising the water table could be approximately 20 mm per year for the first 10 years, reaching 35 mm per year for late stages of restoration. Information on water table depth would be site specific. Potentially, it may take 50 years for the restoration of peat drained to 1m depth and putting the site on a road to recovery (Evans *et al*., 2021). However, renewability of such sites relates to both the restoration of peat and peat forming vegetation, and site biodiversity (e.g., surface habitats). The guidance would benefit from greater detail on the definitions of renewability in Table 13, page 34.

We note that there is no consideration of within site variation in renewability. For example, some areas of a site may be less developed for extraction of peat, or restoration of surface vegetation, than others with greater scope for restoration, or more rapid progress towards recovery.

Reflecting upon the target dates for net zero of 2045 in Scotland, a time horizon of approximately 25 years would be appropriate for aligning the response on renewability, policy targets, and headline dates to which consumers may relate (e.g., 2045 or 2050).

Specific observations and questions:

i) Why is there no reference to the proportion of a site with respect to the extent of renewability, as well as time scales? This would recognise within site variability and be consistent with habitat and biodiversity – minerals (Section 3.4.4).

ii) The timescale of 'within 5 years' for which emitted carbon dioxide is recaptured through the regrowth of the raw material on the same site (Guidance Notes, page 34), appears very short for some factors. This does not seem to allow for year-to-year natural variability in emissions, or of the proxies (Guidance Notes, Table 13).

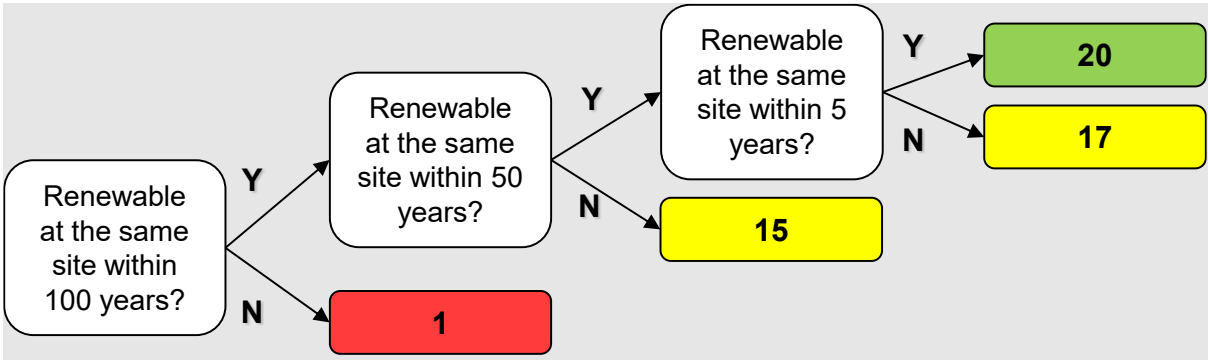


Figure 17. Decision tree renewability (source: P4 Decision Tree, version 8).

3.7 Resource Use Efficiency

Resource use efficiency reflects the proportion of waste generated and recycled or unrecycled amongst input materials, for the supply chain. Key questions in the decision tree ask whether materials are virgin or not, the existence of in scope waste generation, and the proportion of waste which is <5% or <1% of starting material volume (Figure 18).

The logic of the topmost branch of the logic tree on resource use efficiency seems inconsistent with the Energy Use decision tree.

There is only a 1-point difference in the response to the question "*Is the material used without significant processing <8.1 kWh/m^3*"? The available scoring for this branch is 19 or 20. However, if the

Energy Use decision tree is consulted (Figure 2), the score aligning with <8.1 kWh/m^3 has a score in the region of 16 to 20. Therefore, there appears to be a mismatch given that extraction and processing are in scope for both.

There is merit in considering inclusion in this decision tree of the lifespan of the material and reuse during the final use (e.g., horticultural production). For example, coir growing media should be replaced every four years in horticultural production, which is a major issue for the sector.

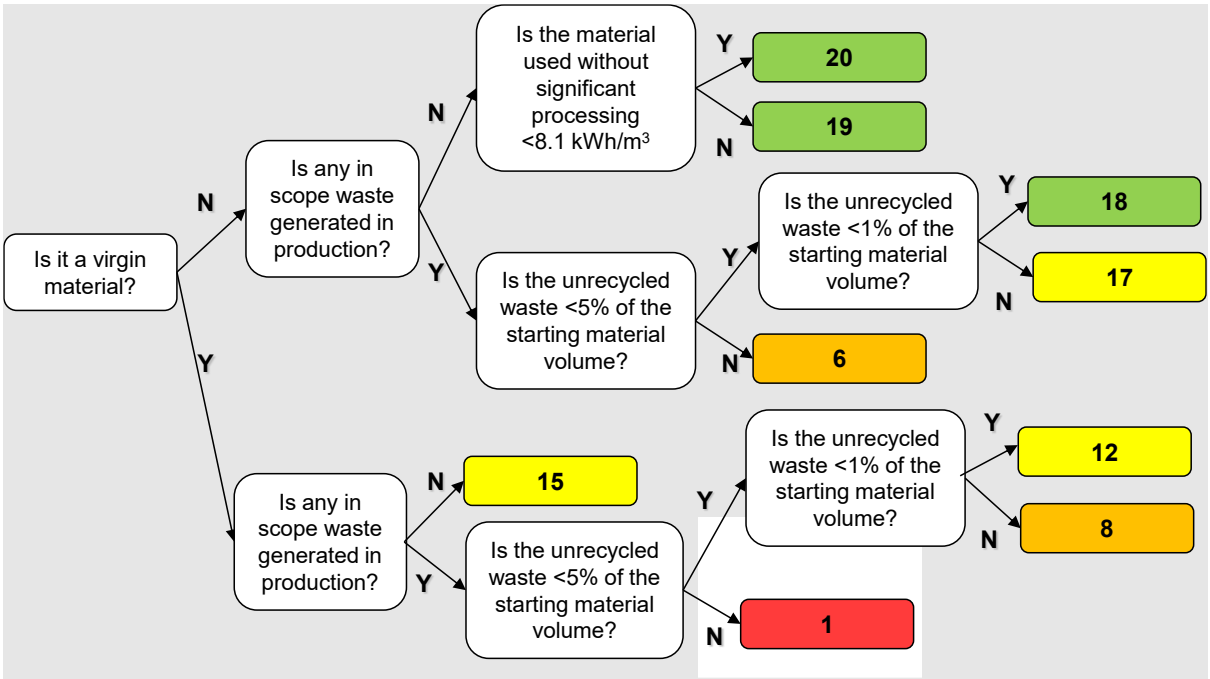


Figure 18. Decision tree Resource use efficiency (source: P4 Decision Tree, version 8).

3.8 Product Summary

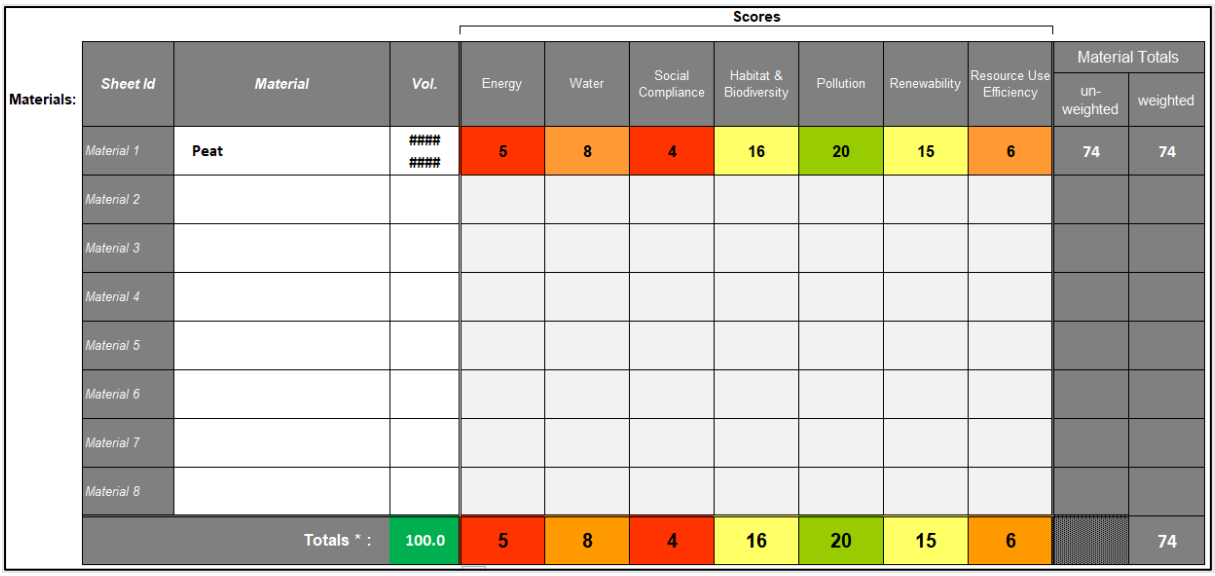
The Summary tab provides a view of the scores for the individual elements, with a colour coding and the overall assessment score (e.g., 74, in Figure 19). The scores for only one product are shown, using the example of peat. The scores for multiple products can be presented together, enabling the combined assessment to be summarised.

An assumption is that the final summary is for the use of the business to guide assessments of their own processes. However, if the summary was also to be made available to consumers, or other business in a supply chain (e.g., retailers) then aids to interpretation help with its usability.

The approach to summarising the assessment seems appropriate for providing oversight of the product(s). However, the presentation would benefit from:

i) a legend to indicate the significance of the colour coding, noting the limitations of interpretation created using colours which may not be distinguishable by those who are red/green colour blind.

ii) An indication of the maximum scores for Material Totals, without having to refer to the Guidance Notes (Section 5).



Materials:

Sheet Id	Material	Vol.	Scores: Energy	Water	Social Compliance	Habitat & Biodiversity	Pollution	Renewability	Resource Use Efficiency	Material Totals: un-weighted	weighted
Material 1	Peat	##########	5	8	4	16	20	15	6	74	74
Material 2											
Material 3											
Material 4											
Material 5											
Material 6											
Material 7											
Material 8											
	Totals * :	100.0	5	8	4	16	20	15	6		74

Figure 19. Interface to 'Material 1' tab of calculator, showing the scores for each of seven elements, and the questions and assessment score for renewability (Source: RSS calculator).

4. Guidance Notes

An extensive set of guidance notes have been prepared to accompany the assessment of responsible sourcing and manufacture of growing media. They state the ongoing nature of updates to the document.

The following additional observations and questions arose from a brief review of the Guidance Notes.

Page 4: Environmental accountability –

It would be a reasonable expectation that climate change impacts would include consideration of greenhouse gas emissions, or emissions reduced following site restoration, and an estimate of the carbon stored in the peat being extracted. For example, the prospective restoration of the site of the source of peat, or loss of carbon sink due to deforestation. This would be consistent with the topic of the decision tree on renewability (page 34), and the anticipated information available in provenancing alternative sources of growing media (e.g., Coir).

Pages 5 and 37:

Criteria –

i) A clear statement that "*Carbon emissions and climate change are not listed as a separate criterion although some elements are covered by the other criteria*."

As noted above, consideration of GHGs and the loss of a carbon sink are relevant for inclusion, calculations of which could be included under the criteria of Renewability. The Guidance notes observe the appropriateness of including assessments of both Greenhouse gas emissions and the Loss of carbon sinks (page 37). An aspiration is that "*in time it is intended that these will become in-scope.*" However, consumers and businesses may be encouraged to take greater account of the amount of GHGs associated with the sourcing and production of products.

Materials, starting and end points –

i) A statement that "*Where the digestate or biochar is a blend of sources the scores for the material should be the weighted average for the proportion of each source in the blend on an annual basis*."

The use of an annualised weighted average is a pragmatic approach. However, given the different potential feedstocks, there is potential for significant variability between batches of products which, on occasion, could exceed the assessment criteria.

ii) Topsoil is listed in the category of "*recycled material*". However, the basis for this categorisation would merit the inclusion of more information. Also, we note that topsoil is not mentioned in the list of "*virgin material*" categories, which would be expected in some contexts.

iii) The term "*Current good practice*" would merit further explanation, and possibly a supporting reference.

Page 10: Responsibility index -

i) The threshold scaling merits further explanation. The starting value is <77, with a compressed range to >101.

ii) A traffic light system for communicating classes in a scoring system is understandable and is used in many applications. However, the inclusion of values risks creating confusion when the same value falls into different coloured groupings.

Pages 38 to 71: Worked examples

The set of examples demonstrate the complexity of the assessment process. As such, a new entrant into the sector could be expected to struggle with implementing the process accurately.

The Guidance Notes contain detailed information on factors included in the RSS calculator, supported by references where available. However, we note a need to check some units to be certain that the calculations are accurately implemented and stated in the guidance. For example, on page 45, in relation to water use, reference is made to "*1 tonne bunker fuel oil is 12078.5 kWh (Table 5, litres per ton * kWh per litre for fuel oil)*." Is the unit of '*litres per ton*' intentionally referring to imperial weight or should it be metric tonnes? Which unit is used in the calculations? Similarly, there is a possible error in units on pages 17 and 43.

Although "*soil improvers*" are defined, this is a very wide category. Is there a separate guideline for those to accompany the calculator and guidance notes which focus on growing media? The only well-defined soil improver in the guidelines is biochar (e.g., page 6). If the guidelines are expected to target both growing media and soil improvers, more information and categories should be included on soil improvers or conditioners.

5. P7 protocol - Performance standards for amateur products

The P7 protocol is a methodology for a growing trial for developing a performance standard for amateur growing media.

On page 1, the protocol states "*Note:- 5 litres of the control substrate and the MP used in the test will be bagged up and kept for 12 months from the test, should there be a need for a repeat test after an audit.*"

Is there evidence that, after storage for 12 months, the biological function of the control substrate would be the same as at the point of original testing. Changes in such functions could have consequences for some of the assessment measures including pH, EC, NH_4-N and NO_3-N.

Guidance is merited in the protocol on a specific assessment of soil improvers for "*Fitness for purpose*".

6. Self-assessment Questionnaire

A self-assessment calculator is provided in the form of an MS Excel spreadsheet with a set of 39 questions under 5 headings (General, Labour, Health and Safety, Business Ethics and Environment). The calculator was reviewed with respect to the questions posed, weightings, and outputs.

The objective appears to be to enable a producer of growing media to obtain an insight to their business with respect to the sustainability of production. The output is an overall assessment reported as the total number of Major and Minor failures, and an overall assessment of Pass or Fail.

The self-assessment calculator was used with data for a hypothetical business loosely based upon a real example (Figure 20). This informed the following observations:

i) There appears to be no recipient of the assessment except that of the user. Is there an expectation of self-reporting to a forum, or use of the calculator to produce a self-assessed accreditation of sustainability? Is there a plan that there be such an assessment, and if so under whose auspices?

ii) What guidance is available for how the user can improve their activities in response to each question? For example, where would a business obtain guidance for the development of a business ethics or business integrity policy if they did not have one?

iii) How have attribution of potential Major or Minor failures been chosen?

iv) Some questions appear to have been attributed a Major failure which may be more appropriately considered to be Minor. Otherwise, the output may be misinterpreted as overly negative. For example, answering No to the question “Do you check your suppliers meet labour requirements, laws and standards at least once every 2 years?” leads to a Major failure.

- This seems a high penalty.
- What is significant about a 2-year threshold?
- What distinctions are made between laws and standards? For example, adherence to all legal requirements may not be synonymous with all forms of best practice in managing labour. The actions of suppliers are not captured in the self-assessment.
- A question which asks how the producer responds to learning that suppliers do not meet certain standards would be more important to their business. No such question is posed.

v) Clarification is required of the meaning and basis of the automated responses, in Column F, to questions in Column C.

- Cell F29 is assumed to be the heading for the automated responses in Column F downwards. The content of the cell is ‘N=’.
- The automated responses do not seem to align with that heading. The implication appears to be that the response of Major or Minor reflects the user’s answer of Yes or No.
- For example, row 30 question “Do you stay up to date with local laws / regulations and any changes to ensure that your supply chain is compliant with environmental and ethical laws?” Answer to hypothetical business, ‘Yes’. Automated response ‘Major’.
- Is the response an indication that this question is of ‘major’ significance in relation to the overall assessment? Or, is the response indicating a ‘Major failure’, consistent with the wording and colours in Cell E80?

vi) Row 34, question 'Do you require your suppliers, particularly those in areas you have identified as 'high risk' to have ethical/ social audits?' appears to be reported as a Major failure. It is more realistic for this to be considered a minor failure, noting that in some rural areas, suppliers (which could be micro- or SME businesses) may not have formal processes which would qualify as being 'audits'.

vii) The drop-down set of answers for the question in row 64 of 'How do you check that suppliers meet defined health and safety laws and standards?' do not align with the question (options for answer are Yes, No).

These responses could be used if the question could be reworded to 'Do you check that …'.

Health and Safety			
Health and Safety Management	Do you have a written policy and procedure on how to evaluate and select your suppliers based on their ability to meet defined health and safety laws and standards?	Yes	Major
	How do you check that suppliers meet defined health and safety laws and standards?		Minor
	Do you have a procedure for responding to health and safety non-compliances found in suppliers?	Yes	Major
	Do you have a dedicated senior manager and / or qualified safety officer responsible for health and safety?	Yes	Minor
Business Ethics			
Management Systems	Do you have a written Business Ethics or business integrity policy?		Major
	Do you have a written policy that requires your suppliers to meet business ethics standards?	Yes	Minor
	Do you check that suppliers meet business ethics standards?	Yes	Major
Anti-corruption	Do you have a written policy on prohibiting bribery, corruption and fraud within your business?	Yes	Major
5. Environment			
Management systems	Do you have a written policy on environmental management?	Yes	Major
	If yes, what does the policy cover?	Water, air, habitats	
	Have you identified and assessed the significant environmental impacts of your business?	Yes	Major
	Do you have a senior manager responsible for environmental management?	Yes	Minor
Supplier Environmental Impact	Do you have a written policy on supplier sourcing that requires suppliers to have environmental / product related policies or standards e.g. ISO 14001, FSC?	Yes	Minor
	Do you check that suppliers meet environmental policies or standards e.g. ISO 14001?	Yes	Minor
	Total Major failures	3	
	Total Minor failures	3	
		FAIL	

Figure 20. Extract from self-assessment calculator using entries of a hypothetical business, showing an overall Fail (note, cell highlighted in blue has drop down options which are inconsistent with the question posed).

It is unclear if there is an expectation that the self-assessment should be undertaken before the RSS calculator is used. On page 20 of the Guidance Notes reference is made to "*Self-assessment questionnaires (which meet the minimum requirements set out in Annex 2) are valued at half of the value of third-party audits (Table 11). Where no assessment has been carried out there is no proof of social compliance; assumptions cannot be made based on country of manufacture and compliance with local law*."

Specific question:

1: Is the self-assessment required before the RSS can be used (for answering the question on social compliance?).

7. General Comments and Conclusions

The draft Scottish Environment Strategy sets out the Scottish Government's ambitions for restoring Scotland's natural environment and how it plays its role in tackling the climate and nature emergencies. The responsible sourcing of growing media delivers to five of the six outcomes, such as "*We use and*

re-use resources wisely and have ended the throw-away culture" and "*We are responsible global citizens with a sustainable international footprint*".

The set of tools of the RSS, and supporting materials, provide an in-depth approach to the assessment of responsible sourcing and manufacturing of growing media. The process of preparing the entries for each factor in the calculator, identifying the relevant evidence, and discussing the detail, provides a valuable means of understanding products and their supply chains. However, we suggest it would be more appropriate for descriptions of the calculator and scheme to only refer to growing media as that is its focus.

However, also note that in several places in the Guidance Notes reference is made to soil improvers such as on:

Page 4 - the introduction to the basis of a scheme towards the responsible sourcing and manufacture of growing media links that and soil improvers when discussing core requirements and aim of such a scheme;

Page 5 - the 'seven criteria have been selected to assess growing media and soil improvers';

Page 20 – discussion of a decision tree for habitat and biodiversity issues ('associated with land management and land use change for each of the most common bulk ingredients of growing media and soil improvers').The Guidance Notes state that elements and assumptions will be kept under review, with the potential for materials not yet considered to be referred to a technical committee (page 21). For example, farmed *Sphagnum* is described as using the same decision tree as other agricultural crops despite having 100% of the allocated impact at the farm. This is an assumption which will be kept under review.

For each element of the sustainability calculator, the Guidance Notes list the documentation required for the assessment to be made. Examples of sources of generic information (e.g., water, page 25; coir pith, page 17) are provided. However, businesses which try to implement the calculator may not have the human capital required to undertake searches for relevant scientific or technical literature, and knowledge to select findings which are defensible (e.g., based upon observations and, or modelling) rather than journalism or contained within documents advocating a particular position.

The guidance provided should be consistent between documents. For example, the P7 protocol does not present any stated measures of the physical, chemical or biological condition of soils. Yet, in the requirement of "*Fitness for purpose" (page 4), the Guidance Notes state that "They must be capable of growing plants (growing media) or improving the physical, chemical or biological condition of soils*".

Similarly, consideration should be given to increasing the level of consistency between decisions trees of individual factors. For example, the decision tree and guidance for minerals (page 27) refers to "*Minerals extracted from sites identified as a local, national or international conservation site or part of a protected landscape are excluded from this scheme*", and an equivalent for peat (page 22). For consistency, there is merit in the inclusion of a similar statement for wood and coir materials.

Some factors would benefit from the inclusion in their decision trees of additional question nodes and branches. Additions would be of relevance UK wide, and some would improve alignment with current or prospective Scottish Government policies (e.g., Factor of water to align with the Water, Wastewater and Drainage Policy Consultation).

It is surprising that the re-use / recycling of waste is considered out of scope in the life cycle stages for most factors, notably recycled materials, habitat and biodiversity for wool, bracken, agricultural crops, mineral-based, coir and peat. For example, recycled mushroom compost may include peat as a growing medium, and could be used for other purposes, and is sold as a soil improver.

Several factors identify the start of the mixing system to be within scope, but that the mixing system is out of scope (e.g., water). There appears to be no guide as to the definitions and the distinctions

between the two. That could lead to inconsistent interpretations by users of the RSS calculator, both for the same type of product and between products.

Consideration should be given to the inclusion of animal waste (e.g., horse manure) as a factor. This is included in products which are commercially available, often in combination with other media (e.g., re-used mushroom compost, wheat straw) though has an associated risk. Companies have badged some such products as an 'eco-range' or equivalent (e.g., AWBS mushroom compost).

The description of the approach to scoring (Guidance Notes, page 9) states that not all the scores 0-20 are available on each tree. The scoring for some factors seems to represent aspirations, which may not be realistic (e.g., a score of 20 for energy use without any fossil fuels), whereas other scores reflect credible maxima or minima (e.g., energy crops, maximum score of 18).

No reference is made in the Guidance Notes or RSS calculator of potential risks that could be created by peat replacements. For example, an assessment of risk of new disease pressures could have been included decision trees of a factor such as coir. This would merit inclusion, particularly for factors which may include imported raw materials, such as coir, wood-based materials or wood fibre. We also note that the decision trees for some factors differ between those presented in the Guidance Notes and in the P4 Decision Tree Powerpoint provided. Where such differences are identified, the copy in the Guidance Notes has been used in the discussion of individual factors (e.g., habitat and biodiversity – Wood based material).

If the RSS calculator is implemented and used extensively, across commercial and domestic users, and with a wide range of factors, it would be desirable to have a means of collecting the scores being generated. This would help with learning about its uses, the types of assumptions made by users, errors in interpretation of the questions, level of accuracy of the entries, and final decisions made with its use.

A set of pilot trials could be set up to test its uses, and a means of submitting the completed calculator, anonymously if required, for analysis. These data could be used to provide baselines against which progress could be monitored for the effectiveness of the types of improvements identified in the Guidance Notes for each factor.

A challenge for the designers of the RSS calculator is to provide a standard which can be used by producers and retailers, covers the range of products which are available for sale, and has a means of visual communication which is trusted, easy to understand and accessible with minimal effort. A QR code by which further information about the product may not satisfy all those criteria.

In advance of the responsible sourcing scheme being implemented, there is merit in a review and lessons learnt from the implementation of certification schemes which are in place. Such schemes include the Roundtable on Sustainable Palm Oil (RSPO) certification scheme for palm oil suppliers, Forest Stewardship Council (FSC) for forestry and forest products. Such a review could also include the implications of the proposed EU Directive on Corporate Sustainability Due Diligence (European Commission, 2022) on products such as growing media and soil improvers. The aim of the Directive is to foster sustainable and responsible corporate behaviour throughout global value chains. Businesses will be obliged to identify, prevent, end or mitigate adverse impacts which include on the environment, such as pollution and biodiversity loss). Compliance will be a requirement for companies in the European Union. That may include products to be exported for sale within the EU. Therefore, adherence of products sold to or sourced from the European Union, such as growing media, to appropriate environmental, social and economic standards can be expected to become requirements in due course.

Due to a lack of an existing standard, the use of equal weightings for each criterion is an appropriate approach to minimise unconscious bias. However, the criteria for the factors of habitat and biodiversity peat and minerals state if material comes from a site identified as being of local, national, or

international conservation significance, or part of a protected landscape, then the materials cannot meet the definition of being responsibly sourced no matter the scores for other criteria. As noted in Sections 3.4.1 and 3.4.4, no consideration is given to the proportions of a site which might be affected, or whether extraction activity is legal and approved by the pertinent planning authorities. It would be appropriate for this criterion, and overriding weighting, to be accompanied by a narrative setting out the reasoning.

Clarity of criteria should ensure no conflicts with eligibility of the use of peat as part of growing media in relation to Scotland's National Planning Framework 4 (e.g., Policy 5 to protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development), and products grown in line with the National Islands Plan and Local Food Strategy.

The total level of proof is stated as being assessed across the supply chain. Different weightings are applied to each tier according to the length of the supply chain (Table 12, Page 20), with lower weightings for earlier stages of the supply chain. A disadvantage of this approach is that actions which conflict with requirements identified on page 4, at early stages in production, will dilute their influence on the final score. This seems inappropriate. The explanation is inconsistent with principles of established certification schemes, such as the FSC covering forest stewardship, which take into account the maintenance or improvement of the social and economic well-being of workers. In relation to growing media, the sourcing of raw materials from a coconut smallholding or plantation with poor employment conditions would have a low impact on the final score yet may rate highly in a consumer's perception of social compliance. The system of weightings would benefit from revisions.

Clarity would also be merited in the purpose of the impact percentages, noting the statement on page 20 of "*the percentage allocated impact at each stage of production for virgin by-products (Table 2 and Table 3) is not currently applied*." Is the impact percentage planned to be implemented at a later stage of development of the RSS calculator?

Placing GHG emissions, and loss of carbon sinks, out of scope omits an important element of responsible sourcing of growing media. Businesses and retail consumers seeking to make informed purchases in relation to sustainability of products, with a view to replacing peat, could be expected to look for information on carbon and greenhouse gas emissions associated with alternative growing media and soil improvers. Such an omission could impact public trust in product certification. Existing carbon calculators (e.g., Woodland Carbon Code) provide means of preparing estimates of environmental impacts relating to factors such as peat and energy crops (wood-based). The skills and investment of time to use existing carbon calculators, or variants thereof, would be consistent with the types of calculation required for preparing entries to the RSS calculator for factors such as energy use (worked examples, page 55). Such a dimension of climate change impacts would be valuable information to include alongside those relating to habitat and biodiversity.

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10. Appendix: Labelling and the use of Smart Codes

The aim of the Responsible Sourcing Scheme (RSS) calculator is to inform responsible sourcing and purchasing of growing media and soil improvers. A plan outlined by Scottish Government is that such products have an associated labelling which indicates the sustainability characteristics of products, as derived using the RSS calculator. The Guidance Notes, pages 9 and 10, outline the scoring and rating system, using colours and a lettering scheme (A to E). Prospectively, information underpinning such labelling would be accessible by the consumer (professional or retail). One option being considered is the use of a Quick Response (QR) code for smart packaging to be associated with the product labelling, accessible from a mobile device.

Potter *et al.* (2021) reviewed 56 studies of the effects of environmental labels on consumers' demand for more sustainable food products. They concluded that ecolabeling using a variety of messages and formats was associated with the selection and purchase of more sustainable food products. White *et al*. (2019) report that eco-labelling is recognised as more transparent and unbiased if certified by a third party which can validate claims of sustainability.

The Forest Stewardship Council (2023) commissioned Kantar on recognition of the FSC logo and its meaning, opinions of consumers and business on the purchase of wood products from sustainable sources. Findings from their survey of 1,279 UK adults aged 16 and over showed that 77% of those interviewed recognised the FSC logo, 25% reported that they know what it means, and a further 30% reported that they know 'roughly' what it means. Eighty-five percent of respondents recognised the logo and are likely to give preference to FSC certified products, and 41% who said they would always give preference to FSC certified products. Sixty percent of people reported that consumers have a responsibility to ensure that products purchased, and their packaging used, should be responsibly sourced.

The RSS calculator and associated responsibility index are not explicitly associated with a brand or a third party that can authenticate and certify the index classification. This may limit the effectiveness of the responsibility index and limit the influence on consumers.

Some of the factors incorporated in the RSS calculator and growing media responsibility index have been the subject of research in relation to consumer behaviour. For example, consumer preferences for sustainable attributes in plants, showed a willingness to pay a premium for energy and water savings, with 14% of consumers willing to pay the highest amount for improved production methods and container types (Yue *et al.,* 2016).

Based upon a review of food eco-labelling, Tiboni-Oschilewski *et al.* (2024) report that eco-labels can be a significant driver of intentions or behavioural change in consumers when noticed and well-interpreted. To be effective, they identified the following to be important: developing a product design process that embraces ESG-related claims, alongside cost engineering; ensuring that environmentally and socially responsible products account for a significant share of a company's innovation pipeline; that ingredients, materials, and processes that do not contribute to the ESG goal should be eliminated; consumers reward products that make multiple ESG-related claims (e.g. nutritious, carbon neutral); and that the products should be certified and controlled with transparency regarding the right for labels to be displayed and indicators and scope must be specified and defined in concrete terms. However, Tiboni-Oschilewski *et al.* (2024) also note that evidence of the effectiveness of eco-labelling in driving the choices of consumers is heterogeneous and not univocal.

Shao *et al.* (2016) identified the most significant barriers hindering consumers purchasing environmentally friendly products being a gap between consumer expectations and their perceptions of products with 'green information', in particular their environmental attributes (Tseng and Hung, 2013). Such a gap is attributed to inadequate information about products in relation to sustainability,

provided to consumers at the point of purchase (Bashir, 2022), and acts as a barrier to the choice of sustainable products and services (Shao, 2016; Meise *et al.*, 2014; Shao and Ünal, 2019). McGinnis *et al*. (2020) report that value-added information, such as that relating to environmentally plant attributes and production methods, are valued by younger consumers (in this study, defined as millennials).

Research undertaken in the Scottish Government Strategic Research Programme into consumer preferences and willingness of consumers in the UK and Spain to pay for nutrition labels, and effects of labels such as organic, local and low greenhouse gas emissions (GHG) (Akaichi *et al*., 2020). Results showed a willingness to pay premiums for certain combinations of food attributes and labels, with evidence, in the UK, of increased demand for beef mince with low fat content if also labelled as organic or low GHG. However, findings also note that it is not only food attributes and labels which influence how consumers perceive the usefulness of nutrition labels and health claims.

Further research in the Strategic Research Programme (2016-22) on sustainable production and consumption included a case study on consumer perceptions and behaviours in relation to food waste. The case study used representative surveys and causal econometric analysis to identify factors influencing household food waste linked to their understanding of date labelling, particularly 'best before' and 'use by' labels. Findings identified direct and indirect links between consumer perceptions and understanding of date labelling, and their intentions to reduce waste in a framework including food risk perceptions, attitudes towards waste, and access to relevant information (Thompson *et al*., 2020; Toma *et al*., 2020).

Alongside brand and marketing information, progressively retail products have been required to include information such as country of origin, place of business, ingredient declaration, and the net quantity of contents (e.g. food products, Food Standards Agency). The regulation of the European Parliament established a voluntary ecolabel award, the aim of which was to "promote products with a reduced environmental impact during their entire life cycle and to provide consumers with accurate, non-deceptive, science-based information on the environmental impact of products." (European Parliament, 2010).

Based upon information about sales of products making claims relating to Environmental, Social and Governance (ESG), over a five year period, Frey *et al*., 2023 of McKinsey and NielsenIQ, report that products making claims relating to ESG averaged 28% cumulative growth compared to 20% for products that made no such claims. Breaking that down by product claims they categorise as least prevalent (e.g. vegan, carbon zero), medium-prevalence (sustainable packaging, plant-based), and most prevalent (e.g. environmentally sustainable) sales grew by 8.5%, 4.7% and 2% respectively. They note that further research is required across a "variety of brands, categories, and other contexts to increase the generalizability of the findings."

Manufacturers have used opportunities offered by contemporary technologies to provide consumers with information about products, often linked to aspects of its marketing. In recent years, alongside textual, numerical and graphical materials on product wrapping, information about products has been accessible online via websites and social media, access to which has included bar or QR type codes.

Familiarity with QR codes, and their uptake as an infrastructural gateway, accelerated during COVID-19 as ways of accessing information by contactless means (e.g. de Seta, 2023), with users of Android OS (48%) and iPhone OS (45%) the leading consumers of QR codes (McKinsey, 2020). Rotsios *et al*. (2022) studied the effectiveness of the use of Quick Response (QR) Codes on consumer behaviour for a specific product (bottled milk) and market segment (Northern Greece). Their findings show that a QR Code on the packaging of food products, directing consumers to entertaining and enriched content, results in an increased level of usage.

Findings from research into factors that prompt consumers to scan QR codes (e.g. Okazaki *et al*., 2019) report the importance of the design of visual information in attracting consumers based upon their

level of curiosity. They identified the single most important factor for all consumers forming an intention to scan a QR code to be the perceived fit between the code advertisement and the brand. The format of an eco-label influences consumer visual attention, with logos capturing relatively more visual attention than text eco-labels. Additional visual attention to logos can increase the willingness to pay of consumers, and visual attention to text decrease their willingness to pay (Rihn *et al.*, 2019).

Bashir (2022) studied behavioural factors which are likely to influence consumers' intention to scan the QR codes, in Norway. They report that significant predictors of consumer attitudes towards, and intentions to, scan QR codes are their perceived ease of use and perceived usefulness of the QR codes, adding that the visual design and positioning of QR codes, and associated text, also influence scan intention. No conclusion was provided on the prospects of an intention to scan linked to generic types of product, of which growing media would be one.

It is likely that professional byers of growing media would have the knowledge to access the underlying information and a business reason to invest the time necessary to interpret the responsibility index, and query components of that scoring. Probably, accessing the information would be from an office environment rather than a warehouse or retail outlet. As such, there would be little constraint on the use of a link to a website and background assessments from the RSS calculator and responsibility index (Guidance Notes, page 10).

To be effective, the labelling on the growing media, with the associated QR code, needs to be visible and easily accessed, and the legend of the label to be immediately understood (e.g. clear guidance on which letter and colour represents a high score on the responsibility index and which corresponds to a low score).

In conclusion, from a limited review of published research, which does not include examples directly relating to growing media, findings show that there is potential for the use of well-designed visual labelling with access to supporting information, using QR codes or equivalents, to inform and influence consumer purchases. However, this is subject to practicalities of use, the type of user, and gaps in evidence of the effectiveness of such labelling and use of QR codes or equivalents.

A more in-depth review of literature would be required to understand the potential of the responsibility index to influence retail purchases of alternative growing media to peat, and how it should be implemented.

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