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# A CARBON FOOTPRINT FOR THE PEAT AND SUBSTRATE INDUSTRY

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## ABSTRACT

The peat and substrate industry is under fire for its alleged impact on nature and the climate. In view of this, Klasmann-Deilmann GmbH is taking advantage of the opportunities that result from a sustainability strategy aligned with international standards in order to disclose its own performance to the public under ecological, economic and social criteria. A key element here is the publication of an annual Sustainability Report, of which a climate footprint now forms an integral part. This is the first time that a company in the peat and substrate sector has calculated its emissions from peat extraction and from the production and sale of growing media. For example, in 2014, the so called "company carbon footprint" increased by 0.69 % compared to 2013. At the same time the carbon footprint per m³ of substrate decreased by 2.26 % compared to the previous year. The proposed article gives an insight to the calculation of the carbon footprint which leads to a range of projects to reduce or compensate for the emissions generated. They are part of a $CO_2$ reduction strategy.

***Keywords:*** **-**

## INTRODUCTION

The call for ever-increasing sustainability has long since been heard by industry. A company will no longer be judged solely in terms of profits and job security. Rather, it will increasingly be viewed in terms of its societal role, assessed by the extent to which it is committed to addressing the ecological and social aspects of its own actions, keeping future generations in mind. In 2011, Klasmann-Deilmann began publishing Sustainability Reports. Those for 2013 and 2014 comply with criteria under the fourth generation of the GRI guidelines (published in 2013), which have a distinct focus on the 'materiality of reported issues'.

## CLIMATE FOOTPRINT

One focus of international efforts to enhance sustainability is on climate protection. In the light of ongoing climate change, it is necessary to reduce greenhouse gases such as carbon dioxide ($CO_2$) and methane ($CH_4$), which are the worst culprits in global warming. In order to be able to demonstrably achieve progress in this regard, more and more businesses are having their own climate footprint calculated, which discloses the greenhouse gases caused in a year and their sources. Annual updates enable a company to find out whether it is succeeding in reducing emissions of these gases. For this purpose, the various gases are usually converted into '$CO_2$ equivalents'.

The biggest challenge in drawing up a climate footprint for Klasmann-Deilmann involved calculating emissions from peat, peat extraction and substrate production, since no other business had determined or published such data. The services of Cologne-based firm MEO Carbon Solutions GmbH were enlisted, which developed a 'greenhouse gas calculator' tailored to the company's requirements. SGS United Kingdom Ltd. (Cheshire, UK), contracted to independently assess the results, verified the climate footprint with reference to ISO 14064-1.

This calculator's structure was based on the study commissioned by EPAGMA on the life cycle assessments (LCAs) of key substrate constituents (QUANTIS, EPAGMA 2012). The outcome was a modular structure that served as the basis for carbon footprinting both for the company as a whole and at individual product level. It also adopted other significant parameters, such as standard values for raw peat in terms of storage density, carbon/nitrogen content and degradation rate, as well as pre- and after-use scenarios.

With regard to ongoing and future measures to reduce emissions, the calculator can be employed to assess the positive impact of carbon-offsetting and/or avoidance measures. This calculates, at corporate level, the extent to which the use of fossil fuels is avoided or offset by using – for example – short-rotation forestry (SRF) plantations, forests and managed woodland, photovoltaic plants or woodchip heating systems. Alternative substrate constituents such as wood fibre, compost and coco pith offer further savings potential for the product-based carbon footprint. The choice of production location can also have a positive effect on the carbon footprint of a growing medium.

## CARBON FOOTPRINT 2014

On the basis of corporate data for the 2013 financial year, a corporate carbon footprint (CCF) and a product carbon footprint (PCF) were disclosed for the first time in July 2014. The company published its carbon footprint for the 2014 financial year in the autumn of 2015.

Taking into account all climate-related factors along the value chain 'from raw-material extraction to the factory gate, including transport', the corporate carbon footprint for 2014 reveals emissions of 274,271 t $CO_2$ equivalent (previous year: 272,390 t). At an annual turnover of EUR 165.0 million, this yields a figure for the year under review of 1.66 kg of $CO_2$ equivalent per euro of turnover. With the total volume of growing media and raw materials sold standing at 3.32 million $m^3$, this translates into an average carbon footprint – expressed per cubic metre of substrate, per annum – of 82.52 kg of $CO_2$ equiv.$m^{-3}$.

Table 1: Carbon footprint of Klasmann-Deilmann GmbH (2014/13)

| **Emission source** | **2014 in t $CO_2$ eq** | **% of total footprint** | **2013 in t $CO_2$ eq** | **Change 2013/14 as a %** |
|---|---|---|---|---|
| Extraction areas: Reference scenarios | - 134,961 | - 49.21 | - 148,560 | - 9.15 |
| Extraction areas: Peat extraction, interim storage | 192,618 | 70.23 | 210,972 | - 8.70 |
| Extraction areas: After-use scenarios | 52,177 | 19.02 | 54,424 | - 4.13 |
| Extraction areas: End use 1/100 | 7,767 | 2.83 | 8,346 | - 6.94 |
| **Extraction areas: Subtotal for emissions** | **= 117,601** | **42.87** | **= 125,182** | **- 6.06** |
| Energy consumption: Extraction areas | 20,575 | 7.50 | 19,657 | + 4.67 |
| Energy consumption: Other sites | 1,832 | 0.67 | 1,414 | + 29.56 |
| Transport: Raw materials, internal | 6,518 | 2.38 | 5,751 | + 13.34 |
| Transport: Raw materials and substrates to the customer | 62,421 | 22.76 | 59,690 | + 4.58 |
| External suppliers: Peat inclusive of transport | 37,613 | 13.71 | 38,021 | - 1.07 |
| External suppliers: Packaging materials | 4,575 | 1.67 | 4,657 | - 1.76 |
| Alternative substrate constituents and additives inclusive of transport | 22,408 | 8.17 | 17,650 | + 26.96 |
| Other areas of activity (SRF, other forestry, photovoltaic installations, woodchip heating) | 728 | 0.27 | 368 | + 97.83 |
| **Carbon footprint of company as a whole** | **274,271** | **100.00 %** | **272,390** | **+ 0.69** |
| Total quantity of substrates and raw materials incl. retail ($m^3$) | 3,323,670 $m^3$ | | 3,226,356 $m^3$ | |
| **Carbon footprint per $m^3$ of substrate** | 82.52 kg $CO_2$ equiv. | | 84.43 kg $CO_2$ equiv. | - 2.26 |

**EXPLANATORY NOTES ON THE CARBON FOOTPRINT FOR 2014/2013**

1. Extraction sites: The disclosed decrease in emissions compared with the verified 'base year' (2013) results chiefly from the return of land following cessation of extraction and from below-target extraction quantities owing to unfavourable weather conditions.
2. Reference scenarios: The fundamental idea behind the reference scenario is the fact that bogs and peat extraction areas already emitted trace gases that affect the climate in the form of $CO_2$, $N_2O$ or $CH_4$ before they became the company's property and consequently its responsibility in terms of climate change. Even without peat extraction, the sites would have continued to emit these gases into the atmosphere. By this line of reasoning, the emissions pertaining to this time-based reference scenario have been credited to the firm or deducted from its carbon footprint.
3. Peat extraction, interim storage: To date, relatively little is known about the long-term effects of $CO_2$ emissions from peat products. It is still largely unclear what quantities of greenhouse gases are released in the various stages of the value chain (e.g. actively worked peat extraction sites, storage of peat in stacks, peat in growing media) over a given time. Although the available data (also used in our calculations) are based on scientific findings, they nevertheless contain some uncertain factors – especially because most of the measuring campaigns and studies do not relate to the active phase of peat extraction. With regard to emission factors for peat extraction areas, the calculation is based on the approach adopted by the German Federal Ministry of Education and Research (BMBF) report 'Klimaschutz durch Moorschutz' ('Combating Climate Change by Protecting Peatlands'; source: Drösler 2011). The figures stated in this report are based on the then most up-to-date information obtained from direct greenhouse gas measurements on German bog sites. According to this study, the level of emissions from the different use categories – agriculture, afforestation, drained raised bogs, natural raised bogs and re-wetting – depends on the water table depth in a given case (Drösler 2011, p. 7-9). For the peat extraction phase that was not taken into account in the BMBF report, Klasmann-Deilmann applied a general water depth of –30cm. At the same time, however, a 50% lower emission rate was assumed in order to reflect the reduced respiration processes (no autotrophic respiration, potentially reduced heterotrophic respiration). On this basis, applying the above-mentioned model, an average emissions level of 10.73 t $CO_2$ equivalent per hectare, per year was calculated, forming the starting point for all further calculations derived from peat and substrates. Most recently, HÖPER referred to measurement results that are below these estimates (see HÖPER 2015, p.142, dry raised bog (NI), p.145, Westermoor 1 and 2).
4. After-use scenarios: These are the emissions that arise after peat harvesting ceases (in relation to peatland restoration, for instance), before the area begins to sequester greenhouse gases once more.
1. End use 1/100: Emissions disclosed here result from degradation of raw peat. Peat used as a raw material or substrate progressively releases stored carbon – by means of respiratory processes as it reacts with atmospheric oxygen – into the environment in the form of $CO_2$. The assessment of peat's climatic impact is based not on how much carbon remains in the growing medium, but on the proportion emitted in the form of $CO_2$. In this connection, Klasmann-Deilmann converts emission totals into $CO_2$ equivalents with a global-warming potential for the next 100 years (GWP100). In the corporate carbon footprint, an aggregate mean value for the year under review is adopted, derived from the overall GWP100 score (1% of the GWP100). In extending the 'cradle to gate' system boundary, emissions from transport are also included. Emissions arising during the end use of products are, however, excluded. A distinction is therefore made between the emissions attributed to the company and those attributed to subsequent users, such as horticultural businesses or consumers. This last point, in particular, prompted extensive discussions, as a considerable proportion of greenhouse gases was not included in the climate footprint. The rationale behind this decision was that, in the same way that an oil producer is not responsible for a car driver's petrol consumption, a substrate producer cannot be held to account for the way a product is used by a customer.
2. Subtotal for emissions in 2014: This line gives the sum total of all emissions resulting from the extraction areas.
3. Energy consumption: The year-on-year increase in emissions is due chiefly to higher diesel consumption in raw-materials extraction owing to unfavourable weather conditions. Additionally, all energy consumed by

our sales companies is also included for the first time although this, totalling 260 t $CO_2$ equivalent, is fairly negligible.

4. Extraction sites: This line refers to the emissions of the lead company and subsidiaries that own peat extraction operations, and primarily includes diesel, power and natural-gas consumption.
5. Other sites: This gives the total emissions from the production and sales companies which, particularly in administrative buildings, result from electricity and natural-gas consumption.
6. Transport: Substrates and raw peat are relatively bulky and heavy. To an increasing extent, they are shipped abroad from our production facilities – often to destinations overseas. This results in high costs and causes environmental impact. In order to identify the emissions resulting from transport, we have recorded the data for all in-house transport, transport by additive suppliers, transport by other external suppliers of raw peat materials and transport of finished growing media 'ex works' for each individual location and each substrate component, inclusive of the annual supply quantities for the Group. These detailed figures – based on the transport distance between the factory gate and a destination in the centre of the country in question, modes of transport (road, rail and water), and the number of transport units (e.g. containers) involved – are related to appropriate emission factors.
7. Because production quantities were up year-on-year, emissions (disclosed in the climate footprint) from internal transport of raw materials and from the logistics services of external transport providers also rose.
8. Raw materials, internal: This line states the emissions resulting from the transport of raw materials within the Klasmann-Deilmann Group.
9. Raw materials and substrates to customers: These emissions are those originating from transport to the customer worldwide. A detailed breakdown was provided for transport by road, container, water and rail.
10. Not included here are internal and customer-related empty runs, as the hauliers and transport providers whose services are enlisted are (in accordance with relevant joint agreements) responsible for providing onward and return transport.
11. External suppliers: Emissions attributable to the company that arise from the purchase and transport of substrate constituents, as well as from packaging film and pallets, remained roughly unchanged year-on-year.
12. Peat inclusive of transport: The emissions disclosed here are those from the extraction and transport of peat that the company does not extract itself but buys in from outside.
13. Packaging material: This line gives the total emissions resulting from the use of packaging film, paper, cardboard and pallets.
14. Further sources of emissions: Against a background of increasing production quantities of green compost, wood fibre and corporate-owned SRF plantations, and the greater need for additives owing to increased manufacture of growing media, emissions from the following activities rose.
15. Alternative substrate constituents and additives including transport: Emissions stated in this line result chiefly from the production of our own alternative growing-media constituents, 'TerrAktiv' (green compost) and 'Klasmann GreenFibre' (wood fibre). It also includes those emissions generated by suppliers through the manufacture and transport of additives such as fertiliser and lime. As Klasmann-Deilmann uses these products, emissions here are attributed to the company.
16. Other areas of activity: Emissions disclosed here are those resulting from establishment and maintenance of SRF plantations, forestry, woodchip heating systems and photovoltaic installations.

## 'POSITIVE FOOTPRINT'

17. The Renewable Energy and Resources business unit is to be considerably expanded in the coming years. It will also contribute to emissions avoidance but, under the requirements of the ISO 14064 standard, is disclosed separately from the climate footprint. The chief reason for this is that the bulk of the energy generated in this way will not be consumed by Klasmann-Deilmann itself, but fed into the grid and sold. In addition to the carbon footprint for 2014, a 'positive' carbon footprint has therefore also been drawn up (i.e. one that includes only carbon-positive measures). It discloses how many emissions from fossil energy sources such as coal, oil and natural gas are avoided by the use of renewable energy, and captured by forest resources.

Table 2: Emissions avoidance (2014/13)

| Emissions avoidance | 2014 in t $CO_2$ eq | 2013 in t $CO_2$ eq | Change 2013/14 as a % |
|---|---|---|---|
| Use and generation of renewable energy and of forest resources | - 11,209 | - 10,467 | 7.09% |

18. The greenhouse gas calculator classifies emissions into three groups known as scopes, in conformity with ISO 14064 and the requirements of the Kyoto Protocol. Scope 1 includes all emissions directly generated from combustion processes within in-house facilities. Scope 2 covers emissions relating to purchased energy, such as electricity or heat. Scope 3 refers to emissions from third-party services and purchased preliminary services.

## $CO_2$ REDUCTION STRATEGY

19. Based on our carbon footprint, measures are identified to reduce or offset the emissions caused by the company, and a $CO_2$ reduction strategy is developed including the following areas of activity:
20. Of the scenarios for reducing or offsetting emissions, those that are realistic involve measures to either avoid the use of fossil fuels or enable direct carbon capture. These include afforestation, management of woodland and SRF plantations, and production of heat energy from corporate-owned SRF sites. The greater part of the energy generated in this way would not be consumed by the company itself, but fed into the grid and sold. It has therefore been decided not to include the positive effects in the greenhouse gas footprint, but to publish these separately in a footprint including only carbon-positive measures.
21. Internal transport, as well as that bought in from transport providers, is a crucial factor within the carbon footprint and harbours fundamental potential for additional emissions avoidance. One approach relates to the weight of raw materials and growing media: the lighter these are, the greater the volumes that can be carried in each transport unit. A number of internal projects have already been launched, aimed at reducing the weight of raw materials and products.
22. Furthermore, the use of peat-substitute bulking constituents in our growing media has a positive impact on our carbon footprint at both product and corporate level. The target is to increase the proportion of alternative constituents by 2020 to 15% by volume of the annual production total.
23. Since 2015, all Klasmann-Deilmann Group companies based in Germany have obtained their electricity from hydropower with a guarantee of origin.
24. A large part of the emissions originate from extraction sites. The firm is, therefore, discussing ways of putting its methods of extracting peat on a more sustainable footing. However, particular caution needs to be exercised here, as being reliably supplied with raw materials constitutes the backbone of its core business.
25. Moreover, data drawn from the literature – which form the underlying basis for emissions disclosures from the extraction areas – will be reviewed in accordance with scientific criteria. The company is currently, on a trial basis, conducting a measuring campaign on German and Lithuanian peatland sites, the plan being to continue this project if it yields reliable results. In consequence, the actual measured levels arising from peat extraction may lead to revision of the climate footprint. It is also conceivable that the measured values will be lower than expected, allowing emissions to be revised downwards. A ‘reduction’ of this kind would, then, be a measured, computational effect, not one resulting from emission-reducing measures. In order that acceptance of this project and its outcome is as widespread as possible, dialogue is being sought with interested environmental and climate organisations.