



# Conscious Footprint Model

Background report (public version)



**CE Delft**

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Background report (public version)

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FT: Tree planting programme

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# 1 Introduction

This report provides background data for the Conscious Footprint Model. An introduction to the model can be found in Annex A. Instructions on how to use the model are incorporated in the model itself.

The Conscious Footprint Model is an Excel model which contains an LCA (Life Cycle Assessment) database that is specifically designed to measure and monitor the environmental performance of the Conscious Hotels. The Conscious Footprint Model gives an indication of the potential environmental impacts of the hotel. Due to the large amount of items and activities associated with the hotel service, this is not an exact representation, but rather an educated estimation based on LCA data.

With the model, Conscious Hotels can monitor the environmental performance of their hotels throughout the years and investigate where improvements are possible. The model can be filled in for one hotel at a time and provides insight into the environmental performance of the entire hotel. The environmental performance is also subdivided into the three topics that are used by Conscious' management:

- food & beverages (F&B);
- fixtures, furniture & equipment (FF&E);
- operation.

The Conscious Footprint Model additionally incorporates the six promises that Conscious is actively involved with:

- No Burning (100% electric hotels and kitchens).
- No Toxins (100% organic food, plastic diet, no harmful materials).
- Meat no Need (vegetables on the menu, meat as supplement).
- Keep it Close (90% of all transport within 90 km of the hotels).
- Close the Cycle (reused, recycled and biobased products).
- Re Wild (planting trees, green hotels).



## 2 Scope & methodology

### 2.1 Scope

The LCA scope of the Conscious Footprint Model is cradle-to-grave, which means all life-cycle phases from material production to waste disposal are included. Based on the topics used by the management of the hotel (F&B, FF&E, Operations) and the different types of data, the hotel is subdivided into five main sections:

- F&B;
- FF&E;
- Operation;
  - Amenities;
  - energy, water & laundry;
  - waste.
- Transport of F&B, FF&E, amenities, laundry & waste;
- Tree planting programme.

### 2.2 System boundaries

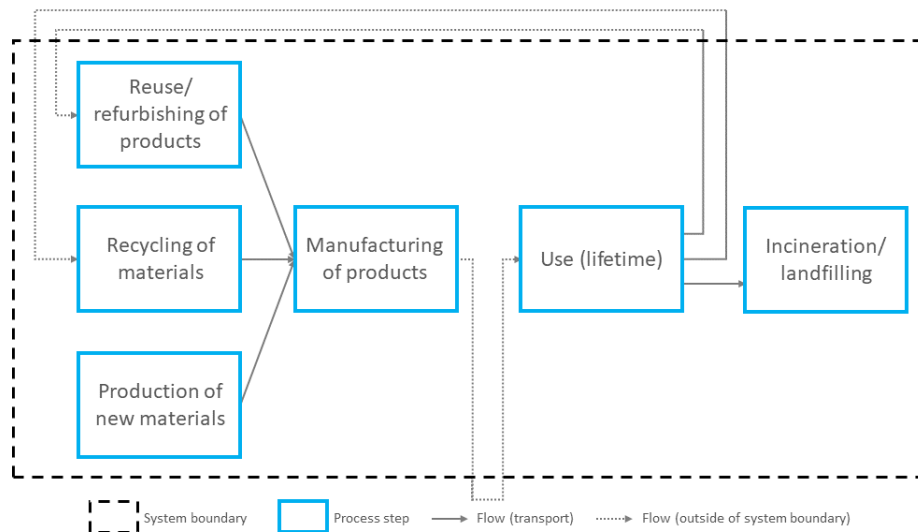
The model focusses on the hotel service of the Conscious Hotels. This means food, beverages, furniture, amenities, energy, water, laundry services, freight transport and waste are included in the system boundaries. Guest transport, employee commute and the activities of tourists outside of the hotel fall outside of the system boundaries, as this is not an inherent part of the hotel service itself. Small items, single furniture and other objects and services that are assumed to be of little influence to the environmental performance of the hotel such as pencils, printing paper, and small one-of-a-kind furniture are excluded as well. The building housing the hotel is also not taken into account, due to lack of data and due to the fact that buildings have a very long lifetime. Because of this very long lifetime, its contribution to the total impact of the hotel service is limited (Bruinsma, 2016). The functional unit is one year of hotel service. This functional unit can also be translated into one hotel guest, by dividing the total yearly impacts of the hotel by the amount of guests.

The waste disposal of food and beverages is included separately in the waste section, as most food is consumed and therefore not disposed of. All FF&E and amenities are disposed of after use. As such, the waste disposal of items in these sections are taken into account directly in their impacts. Recycling of materials and reuse/refurbishment of products is cut-off after transport to the disposal site, which means the impacts of recycling and reuse/refurbishment are entirely allocated to the recycled/reused/refurbished material or product (Figure 1).

All transport of final FF&E and amenity items to the hotel (use phase) is not taken into account in the FF&E and amenities sections, but is reported separately in the Transport section (Figure 1).



Figure 1 - System boundaries of hotel study, FF&E & amenities



\* The transport of final FF&E and amenity items to the hotel (use phase) is not included in the impact of the FF&E and amenities themselves, but is reported separately in the Transport section. The transport of products for recycling or reuse/refurbishment is allocated entirely to the recycled material and reused/refurbished products.

## 2.3 Methodology

The Conscious Footprint Model calculates the environmental footprint of a hotel, based on Life Cycle Assessment (LCA) data. For background data ecoinvent 3.8 cut-off (cut-off), Agri-footprint 5 (economic allocation) and Carbon Minds 2022 are used, combined with research by CE Delft and other literature. In chapter 3 more detailed information is provided.

Four impact categories are included, which are expressed in the corresponding impact unit and in a more understandable unit where possible:

- climate change (kg CO<sub>2</sub>-eq. and km driven by a combustion engine car);
- biodiversity (species lost, no further translation);
- land use (m<sup>2</sup> crops per year and UEFA football fields);
- human toxicity (kg 1,4-Db-eq. and euro health costs).

All impacts are calculated using the ReCiPe 2016 impact assessment method in SimaPro 9.3. In SimaPro the impact of individual materials, food, beverages, energy sources, water, laundry services, transport, waste disposal and trees are modelled and calculated. The calculated values are consequently embedded into the Conscious Footprint Model, in the LCA database ('key figures') of each section. These impacts can be accessed by the user of the model.

All impacts are grouped under the six promises of Conscious:

- No Burning (climate change);
- No Toxins (toxicity);
- Meat no Need (climate change, biodiversity, land use);
- Keep it Close (climate change);
- Close the Cycle (climate change);
- Re Wild (climate change, biodiversity, land use).

# 3 Background data & assumptions

All sections in the Conscious Footprint Model contain a dedicated LCA database with key figures. In this chapter the background data and assumptions for these key figures is provided.

For F&B the effect of organic cultivation could not be quantified, but a qualitative explanation is provided in the F&B section of the measures chapter (Chapter 4). Supplementary information about fish is present in the F&B section of Chapter 4 as well, as not all environmental effects of fish can be calculated with the LCA methodology at this time.

## 3.1 Food & beverages (F&B)

All food and beverages consumed at Conscious are grouped into larger food and beverage groups. This is done to make it possible to work with the myriad of data present about food and beverages. The groups are based on an analysis of the different food and beverage types consumed at Conscious, in combination with food categories used in a recent food study by CE Delft (2022 not yet published). The results of the F&B are shown for aggregated parent groups. The groups and parent groups are presented in Table 1.

Table 1 - Food/beverage groups and parent groups (expressed per kg\*)

Food & beverage group*	Parent group
Bread & wheat products	Bread, wheat & cereal products
Cheese	Cheese
Cooking oil	Cooking oil
Avocado	Fruit
Fruit, berries (strawberries, blackcurrant, blue berries, etc.)	Fruit
Fruit, local (apple, pear, etc.)	Fruit
Fruit, preserves	Fruit
Fruit, subtropical (oranges, lemons, grapes, etc.)	Fruit
Fruit, tropical (banana, mango, pineapple, etc.)	Fruit
Fruit, greenhouse (strawberries, etc.)	Fruit
Beans & peas	Vegetables
Onion & garlic	Vegetables
Vegetables, for cooking (broccoli, cauliflower, cabbages, spinach, etc.)	Vegetables
Vegetables, raw (tomato, bell pepper, cucumber, carrots, lettuce, etc.)	Vegetables
Vegetables, preserves	Vegetables
Vegetables, greenhouse (tomato, cucumber, etc.)	Vegetables
Eggs	Eggs
Meat, beef	Meat
Meat, kroket	Meat
Meat, game	Meat
Meat, pork	Meat
Meat, poultry	Meat



Food & beverage group*	Parent group
Meat, lamb	Meat
Meat, veal	Meat
Meat substitute	Meat substitute
Fish, shellfish & clams	Fish
Fish, farmed	Fish
Fish, freshwater	Fish
Fish, marine	Fish
Tofu/tempeh	Tofu/tempeh
Milk/yoghurt	Milk & yoghurt
Milk/yoghurt, vegetarian	Milk & yoghurt, vegetarian
Nuts	Nuts
Potatoes & roots	Potatoes & roots
Rice	Rice
Sauce	Sauce
Spices & herbs	Spices & herbs
Honey	Honey
Sugar & candy	Sugar & candy
Pastries & cake	Sweets
Chocolate	Sweets
Beer*	Beverages
Wine*	Beverages
Liquor/spirits*	Beverages
Mineral water*	Beverages
Soft drink*	Beverages
Fruit juice*	Beverages
Coffee	Beverages
Tea	Beverages

\* The indicated beverages are expressed per litre, instead of kg.

### 3.1.1 Data uncertainty

Calculating the environmental impacts of food and beverages is associated with a high uncertainty. Impacts can vary as much as 50-fold for the same type of food or beverage (Poore & Nemecek, 2018). The impacts in the Conscious Footprint Model are therefore meant as an indication of the potential impacts the F&B, even more so than the impacts in all other sections of the hotel.

The food impacts in the Conscious Footprint Model show that animal products in particular have high environmental impacts. This is in line with the findings of Poore & Nemecek (2018), who found that even with the high variability of food impacts, the impacts of animal products is typically higher than the impacts of vegetable substitutes. It is important to note as well that the benefits of replacing animal products with vegetable substitutes are higher than the benefits of replacing conventional animal products with organic animal products (Poore & Nemecek, 2018, Milieu Centraal, 2022). A vegetarian/vegan menu is therefore more effective to reduce the environmental impacts of the F&B than an 100% organic menu which includes meat.

The effect of organic food is not included in the Conscious Footprint Model, due to lack of LCA data. Specifically for fish, the effect on biodiversity is an underrepresentation of



reality. More information about the effect of organic agriculture and the biodiversity impact of fish can be found in Subsection 4.1.1 and 4.1.2, respectively.

### 3.1.2 Data

For all food and beverages, the Agri Footprint 5 database<sup>1</sup> is used whenever possible. This is the most extensive food database available for consumers in the Netherlands. If this database is not sufficient, data from ecoinvent 3.8 cut-off is used. For some food and especially beverages, the data availability of both these databases is still not sufficient, however. As such, data from research by CE Delft and other literature is used as well.

Important literature includes:

- Arzoumanidis et al., (2019);
- Aubin et al., (2018);
- Bianchi et al., (2021);
- CE Delft, (2022a);
- CE Delft, (2021);
- Cordella et al., (2008);
- Eriksson et al., (2016);
- Pignagnoli et al., (2021);
- Pluimers et al., (2011);
- Saxe, (2010).

Packaging is taken into account as well. Beverages are packaged in specific bottles, based on Pluimers et al. (2011) and statements by Conscious. Food is packaged in either plastic (5% weight of food) or cardboard (10% weight of food), based on Pongrácz (2007). The packaging can be changed in the model, which is particularly relevant for the environmental impacts of beverages. The reuse of plastic and glass packaging can also be increased (default: no reuse). It is important to note that the impacts of plastic packaging are generally lower than of glass and cardboard packaging, especially for single use packaging.

Finally, the impacts on carbon footprint and land use of all individual food groups is compared with the environmental data of food by the RIVM (2021). For food groups where the difference between the modelled data and the RIVM data is larger than 100%, a correction is made to approach the RIVM data. Because the exact scope of the RIVM data (which also includes distribution) is not known and could therefore deviate from the scope of this project, the data is only used as a comparison. The environmental data of the RIVM does not include biodiversity or toxicity.

## 3.2 Fixtures, furniture & equipment (FF&E)

The FF&E data collection is the most extensive task during the data collection and is focused on those items which are present in the highest numbers and/or are particularly heavy. The weight and composition of the furniture is estimated by employees by sending queries to suppliers, weighing furniture items by hand, measuring the thickness of different parts and online searches for exact or similar items. The lifetime of the items is estimated, based on experience of both CE Delft and Conscious. All FF&E items included in this project are shown in Table 2.

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<sup>1</sup> [Blonk sustainability: agri-footprint tool](#)



Table 2 - FF&E items, including weight and lifetime

Item	Weight (kg)	Lifetime (years)
Not reported in the public version of this background report		

### 3.2.1 Data

For all materials in the FF&E items, background data from ecoinvent 3.8 cut-off is used. Both the production and the disposal of furniture is taken into account. For this a large amount of primary, recycled and reused materials are present in the model. Additionally, some specific products like mattresses, bathroom mirrors and kettles. Laptops and bicycles fall out of the scope of this project, but key figures are included in the LCA database and figures in the model (not in the final impact of the hotel).

The impacts of the materials include both the production of the materials and the manufacturing of products from these products. Polyethylene (PE), for example, includes the production of PE granulate and the extrusion of this granulate into a final product. Material losses during manufacturing are included as well.

For recycled plastics and rubber, metals, glass and polyurethane foam ecoinvent data was available. Recycled wood, ceramics, feathers, leather and textiles were modelled roughly to approach their impacts. For these materials, the impact of the basic material is removed, while the manufacturing of a product is still included. All reused materials are modelled with zero environmental impacts, as reuse often only involves small interventions for which the impacts are deemed negligible.

## 3.3 Operation: amenities

The amenities include all items that are consumed at Conscious and therefore not part of the FF&E. These are presented in Table 3. The amount of linen and towels that is consumed, is based on consumption data per guest from thesis of Bruinsma (2016)

Table 3 - Amenities

Item
Cleaning agent surface
Cleaning agent sanitary
Linen
Towels
Body wash/lotion
Shampoo

### 3.3.1 Data

The linen and towels are based on the FF&E data for textiles (cotton). The cleaning agents, body wash and shampoo are entirely based on data from the thesis of Bruinsma (2016).

## 3.4 Operation: energy, water & laundry

The energy use at hotels is associated with the use of electricity (fossil and/or renewable) and natural gas. Hotels also use water and make use of external laundry services to clean their towels, linen and other textiles.

### 3.4.1 Data

In Table 4 the types of energy, water and laundry are provided, with their respective unit and source.

Table 4 - Types of energy, water & laundry, with source

Type	Unit	Source
Electricity	kWh	CE Delft (2022b)
Electricity, wind	kWh	ecoinvent
Electricity, solar PV-panels, ownership	kWh	ecoinvent
Electricity, solar park	kWh	ecoinvent
Heat, natural gas	MJ & m <sup>3</sup>	ecoinvent
Water	m <sup>3</sup>	ecoinvent
Washing Van der Kleij	kg textile	Bruinsma (2016)

The impacts of renewable electricity can be calculated with two methods, as is explained in Subsection 3.4.2 below.

### 3.4.2 Impacts of renewable electricity

The environmental impacts of renewable electricity can be calculated with two methods:

1. Based on GVO's (Garantie van Oorsprong/Guarantee of Origin).
2. Based on additionality of the electricity contract.

In the Conscious Footprint Model, the impacts of renewable electricity are supplied for both methods in the LCA database (key figures). The default choice is set to the GVO method, as this is customary method in the Netherlands at this time. The additional method provides better insight into the actual effect of the renewable energy contract, however.

#### GVO

A GVO is a certificate<sup>2</sup> which guarantees that the total amount of electricity used by the final consumer is compensated by the generation of the same amount of electricity with Dutch renewable resources by the electricity producer. As such, even though the consumer does not directly make use of the renewable electricity, the GVO allows the environmental benefit of the renewable electricity to be entirely allocated to the consumer. This means the environmental impacts of the electricity use by the consumer is very low, compared to the average Dutch electrical grid.

#### Additionality

The final user is only partly responsible for the realisation of extra capacity of renewable energy in the Dutch electrical grid, however. In fact, the development and realisation of renewable energy projects is largely financed with subsidies by the Dutch government, such as the SDE++<sup>3</sup>. The GVO bought by final consumers only covers a part of the total costs. GVO's therefore add less extra capacity of renewable energy than the purchase of private PV-panels by the final user would.

<sup>2</sup> A GVO certificate must comply with article 15 of the [European Directive 2009/28/EC](#)

<sup>3</sup> [Stimulering Duurzame Energieproductie en Klimaattransitie \(SDE++\)](#)



With the method of additionality the environmental benefits of renewable energy are allocated to the final user, based on their financial contribution to the development of extra capacity of renewable energy. For wind and solar energy the final consumers contributes 24% and 11% of the total costs, respectively (CE Delft, 2020). The impact of the remaining 76% and 89% is based on the average Dutch electrical grid, as these costs for the final user are identical to any other consumer of (grey) electricity in the Netherlands.

### 3.5 Operation: waste

Waste is created in the kitchen, by employees and by guests. In the Conscious hotels, this waste is sorted and collected separately. Waste that is not recycled, is assumed to be incinerated in accordance with the National Waste Management Plan (LAP)<sup>4</sup>. The impacts of recycling are entirely allocated to the use of recycled materials (see Section 3.2).

The benefits of energy recovery during incineration are not included. The avoided impacts associated with recycling are not included either, but these can be included with a yes/no switch in the Model. These are not included by default, as these avoided impacts are outside of the scope and boundaries of this project.

#### 3.5.1 Data

In Table 5 the types of waste are provided for incineration, with their respective source.

Table 5 - Types of waste, with source

Waste type	Source incineration
Paper	Paperboard, ecoinvent
SWILL	Biowaste, ecoinvent
Plastic and cartons*	Polyethylene, ecoinvent
Glass	Glass, ecoinvent
Can	Aluminium, ecoinvent
Beer mash	Biowaste, ecoinvent
Bulky waste	Residual waste, ecoinvent
Rest	Residual waste, ecoinvent

\* The impact of plastic and cartons (PMD) is modelled as plastic incineration. This is a worst-case approach.

### 3.6 Transport

As mentioned in Section 2.2, the transport of F&B, FF&E, amenities, laundry and waste is calculated separately, based on the total weight of the food/items/waste.

Three types of general transport distances are used for all transport:

- Local;
- European;
- Intercontinental.

The distance of the local, European and intercontinental transport are estimated with Google Maps<sup>5</sup> and Sea-distances<sup>6</sup>. Passenger transport is out of the scope of this project,

<sup>4</sup> [Lap3: Slimmer omgaan met grondstoffen](#)

<sup>5</sup> [Google maps](#)

<sup>6</sup> [Sea distances](#)



but key figures are included in the LCA database and figures in the model (not in the final impact of the hotel). The transport distance of the laundry is based on the thesis of Maarten Bruinsma (2016). The impact of transport is almost always relatively small, compared to the impact of the items that are transported. Reducing the impact of the transported items is therefore more effective to lower the environmental impacts of the hotel service, than reducing the transport distance.

Table 6 - Types of transport, with distance and transport mode

Transport type	Distance (km)	Transport mode
Transport, local	150	Freight, lorry (average)
Transport, local, cooled	150	Freight, lorry (cooling)
Transport, Europe	1,500	Freight, lorry (average)
Transport, Europe, cooled	1,500	Freight, lorry (cooling)
Transport, intercontinental	15,000 + 150	Freight, ocean (regular container) + Freight, lorry (average)
Transport, intercontinental, cooled	15,000 + 150	Freight, ocean (cooling container) + Freight, lorry (cooling)
Transport laundry	74	Freight, lorry (average)

The origin of F&B, FF&E, amenities, destination of laundry and waste is estimated by Conscious employees (Table 7).

Table 7 - Origin/destination of F&B, FF&E, amenities, laundry and waste

Origin per section	NL	Europe	Outside Europe
F&B (food)	Not reported in the public version of this background report		
F&B (beverages)			
FF&E			
Amenities			
Waste			
Laundry			

### 3.6.1 Data

Transport data from ecoinvent 3.8 cut-off is used for all transport methods. In Table 8 the background data for the transport modes mentioned in Table 6 are shown.



Table 8 - Sources for transport modes mentioned in Table 6

Transport type	Background data
Transport, local	Transport, freight, lorry, unspecified {RER}  market for transport, freight, lorry, unspecified.
Transport, local, cooled	Transport, freight, lorry with refrigeration machine, cooling {GLO}  market for
Transport, Europe	Transport, freight, lorry, unspecified {RER}  market for transport, freight, lorry, unspecified.
Transport, Europe, cooled	Transport, freight, lorry with refrigeration machine, cooling {GLO}  market for.
Transport, intercontinental	Transport, freight, sea, container ship {GLO}  transport, freight, sea, container ship. + Transport, freight, lorry, unspecified {RER}  market for transport, freight, lorry, unspecified.
Transport, intercontinental, cooled	Transport, freight, sea, container ship with reefer, cooling {GLO}  transport, freight, sea, container ship with reefer, cooling. + Transport, freight, lorry with refrigeration machine, cooling {GLO}  market for.
Transport laundry	Transport, freight, lorry, unspecified {RER}  market for transport, freight, lorry, unspecified.

### 3.7 Tree planting programme

With tree planting programmes, the emission of CO<sub>2</sub> can be offset elsewhere. Tree planting programmes should only be used to offset CO<sub>2</sub> that cannot be reduced by hotels themselves.

Calculating the effects of tree planting programmes is difficult, especially with regards to land use. Land use is very case-sensitive and cannot be generalised. With tree planting programmes land can be reforested, for example, but this could potentially have a negative impact on the local land use (for example, when a former tropical rainforest is reforested with plantation trees). As such, the effect on land use is too uncertain and is not included in this project.

#### 3.7.1 Data

*In this public version of the background report, the data for the tree planting programmes that Conscious is involved in are not presented.*



## 4 Measures

Conscious has taken measures to reduce the environmental impacts of its hotels. To measure the effect of these measures, a Conscious Footprint Model with an alternative hypothetical Conscious Westerpark Hotel has been made. This is an exact copy of the Conscious Westerpark model, but the effects of all measures have been undone. If the effect of a measure is a 30% reduction of electricity consumption, for example, the total electricity consumption of Westerpark is divided by 0,7 to remove the effect of the measure in the hypothetical alternative.

Only measures which are quantifiable with the available data are taken into account. Additionally, the focus of the alternative hypothetical hotel is on measures with the most effect on the total impacts of the hotel. Some measures are effective on their own, but only affect products or activities which have a small contribution to the total hotel impact. These are only included at the end of the project, if time is available.

*In this public version of the background report, the measures of Conscious are not presented.*

### 4.1 Food & beverages (F&B)

All F&B measures can be found Table 9. The effects of the measures that are included in the models are presented as well.

Table 9 - F&B measures

Measure	Included in model?	Effect
Not reported in the public version of this background report.		

Measures on organic products and fish are not quantified, due to lack of LCA data. Instead, the environmental impacts of organic products and of fish are explained qualitatively in Subsection 4.1.1 and 4.1.2, respectively.

Plastic packaging has a relatively low impacts, especially when compared to glass (single use) and cardboard. The impacts do not include microplastics, however, because no uniform measuring methods or impact assessment methods for microplastics have been established yet (Salieri et al., 2021, Corella-Puertas et al., 2022, Yusuf et al., 2022).

#### 4.1.1 Organic agriculture: environmental benefits

Organic products have better nutritional quality, contain less pesticides, have less biodiversity impacts and have a positive influence on local soil health, ecosystem resilience and animal welfare (Van der Werf et al., 2020, Milieu Centraal, 2022, Consumentenbond, 2018). The benefits of organic products do not outweigh the relative high impacts of animal products, however (Poore & Nemecek, 2018, Milieu Centraal, 2022). A 100% vegetarian/vegan menu with conventional agricultural products is therefore more effective to reduce the environmental impacts of F&B than a 100% organic menu which includes meat.



The beneficial effects of organic food cannot yet be entirely captured by the current LCA methodology. The LCA methodology was originally designed for industrial products, rather than food. As such, LCA studies focus on the impacts per unit of a product (such as the impact per kg of food). Because the yields of intensive agriculture systems are higher than the yields of organic agriculture, this means the impact per kg of agriculture product can be higher for organic food for climate change, land use, eutrophication and acidification. To adequately assess agriculture, however, a more fine-grained approach to LCA is required where local factors are taken into account as well. Organic agriculture often has a beneficial effect on local soil, local climate and local ecosystem characteristics, compared to intensive agriculture. As a result, the impacts per unit of land occupied and the impacts on the entire local system (for example on the biodiversity of neighbouring natural areas) is often lower for organic agriculture (Van der Werf et al., 2020, Milieu Centraal, 2022, Pré Sustainability, 2016). In current LCA studies with a focus on impacts per unit of product, these factors are underrepresented or not taken into account at all (Van der Werf et al., 2020).

Measuring the effects of indirect land use change and biodiversity is also currently still challenging, even though both impact categories are important for all agricultural activities. For indirect land use change there is still no consensus on how to include the effects of this land use change in LCA. For biodiversity, an LCA-compatible method that can consider the impacts of agriculture on biodiversity is still lacking as well. Currently, biodiversity is predominantly being measured based on direct land use, which is not suitable for the comparison of different production systems (Van der Werf et al., 2020).

Organic agriculture is not perfect, however (Milieu Centraal, 2022, Pré Sustainability, 2016, Consumentenbond, 2018). Some labels for organic products do not include social impacts and none include energy and water consumption, for example. Additionally, the impact on climate change of organic agriculture is not necessarily lower than conventional agriculture and can in fact be higher (Milieu Centraal, 2022, Consumentenbond, 2018).

#### 4.1.2 Fish: biodiversity

One of the most important environmental impacts for marine products such as fish is the effect on marine ecosystem quality and biodiversity (Scherer et al., 2022). This effect is currently difficult to model, however, and is therefore underrepresented in LCA studies and LCA data (Scherer et al., 2022, Winter et al., 2017). Most importantly, overexploitation (overfishing) is not taken into account in unified impact assessment methods such as ReCiPe 2016, even though this a main driver of ecosystem changes in marine environments. Instead, the focus lies on habitat change, climate change and pollution (Winter et al., 2017). Methods to include overexploitation are available (Emanuelsson et al., 2014), but the environmental data (emissions, pressures, etc.) in the Agri footprint and ecoinvent databases does not align with these methods.

The LCA data on fish in the Conscious Footprint Model therefore cannot reflect the effects of overfishing, but instead predominantly focuses on the impacts of fishing itself. These include the use of boats, fuel and fishing nets and are relatively representative for climate change, land use and toxicity, but not for biodiversity.

## 4.2 Fixtures, furniture & equipment (FF&E)

All FF&E measures can be found in Table 10. The effects of the measures that are included in the models are presented as well.





Table 10 - FF&E measures

Measure	Included in model?	Effect
Not reported in the public version of this background report.		

### 4.3 Operation: amenities

All FF&E measures can be found Table 11. The effects of the measures that are included in the models are presented as well.

Table 11 - Amenity measures

Measure	Included in model?	Effect
Not reported in the public version of this background report.		

### 4.4 Operation: energy, water & laundry

The effect of energy, water and laundry measures can be found Table 12. The effects of the measures that are included in the models are presented as well.

Table 12 - Energy, water & laundry measures

Measure	Included in model?	Effect
Not reported in the public version of this background report.		

### 4.5 Operation: waste

The effect of waste measure can be found in Table 13. The effects of the measures that are included in the models are presented as well.

Table 13 - Waste measures

Measure	Included in model?	Effect
Not reported in the public version of this background report.		

### 4.6 Transport

All transport measures can be found Table 14. The effects of the measures that are included in the models are presented as well.

Table 14 - Transport measures\*

Measure	Included in model?	Effect
Not reported in the public version of this background report.		



## 4.7 Tree planting programme

The effect of tree planting programmes can be found in Table 15.

Table 15 - Tree planting measures

Measure	Included in model?	Effect
Not reported in the public version of this background report.		



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