

# Carbon footprint of toilet and kitchen rolls (ISO 14067)

Quantitative assessment to support Oh Sheet!'s marketing claims.



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# Objectives

# Research objectives



The objective of this study is to develop a Carbon Footprint (ISO 14067) of 3 tissue paper products, to assess the environmental impacts associated with their life cycle.

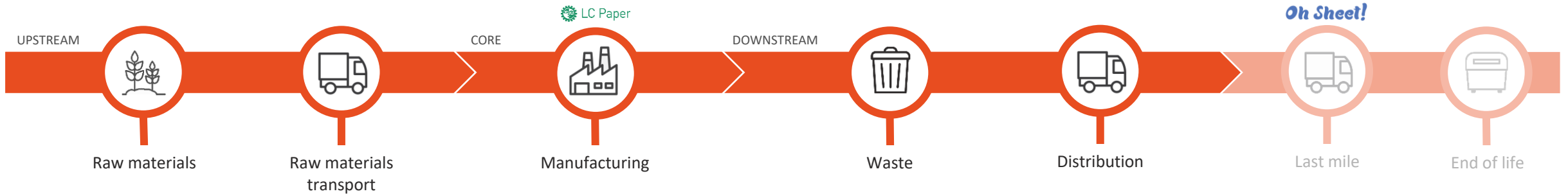
Through this study, Oh Sheet! will obtain quantitative environmental information associated with all stages of the life cycle of tissue paper products. This information will be relevant when it comes to identifying sources of impact, ordering priorities, making decisions focused on minimizing environmental impacts, implementing ecodesign strategies, and communicating product environmental information to consumers.

Specific objectives:

- Analyze and evaluate the environmental impact of three tissue paper products:
  - Box of 24 rolls of bamboo toilet paper.
  - Box of 24 rolls of recycled toilet paper.
  - Box of 6 bamboo kitchen paper rolls.
- Identify critical aspects in the product life cycle to be able to make decisions in the future.

# Methodology

# Methodology



The methodology applied has been the Product Carbon Footprint (ISO 14067). This method provides quantitative assessment of greenhouse gas (GHG) emissions of products, processes and services from a life cycle perspective in an objective, quantitative and transparent manner. The applied methodology includes all life cycle stages except last mile distribution and the end of life of products. That is, all the stages from the extraction of raw materials to the door of Oh Sheet!. The impact evaluation method used has been the GWP100 IPCC 2021, and the databases have been: Ecoinvent v3.8, OCCO 2022, and DEFRA 2022.

**Product.** The analysed products are: Box of 24 rolls of bamboo toilet paper; Box of 24 rolls of recycled toilet paper; and Box of 6 bamboo kitchen paper rolls.

**Functional unit.** 1 product of tissue paper.




**Scope of study and system boundaries.** *Cradle-to-gate.*

# Inventory analysis

# Inventory analysis



## System scope and hypotheses



LCA Stage	Scope	Source	Hypotheses
 Raw materials	<p>The system includes: Paper pulp, chemical additives, cardboard core, wastewater treatment plant chemicals, biomass, cardboard box and packaging film.</p>	<p>Data provided by LCPaper. Emission factors from Ecoinvent 3.8.</p>	<p>The ecoinvent emission factor for unbleached softwood pulp has been modified to incorporate bamboo. The emission factor of the recycled paper pulp has been considered 0 because the sorting is done in LCPaper and its impact is negligible. No deinking process involved. The biomass emission factor is equivalent to the chipping of forest biomass.</p>
 Raw materials Transport	<p>The system includes: Transport of raw materials and biomass from nearby forests.</p>	<p>Data provided by LCPaper. Calculation of distances using Google Maps. Emission factors from Ecoinvent 3.8.</p>	<p>The distance considered for transport of recycled paper has been 135 km (Average distances between LCPaper and the main paper producers).</p>
 Manufacturing	<p>The system includes: imported renewable electricity, self-produced photovoltaic electricity, water.</p>	<p>Data provided by LCPaper. Renewable electricity mix OCCC 2022. Emission factors from Ecoinvent 3.8.</p>	<p>The emission factor of the self-produced electricity has been considered 0, because the manufacture of photovoltaic panels have not been included. The Product Category Rule (PCR) of tissue paper indicates that <i>“The construction and maintenance of factory buildings and infrastructure”</i> do not have to be included.</p>



# Inventory analysis



## System scope and hypotheses

LCA Stage	Scope	Source	Hypotheses
 Waste	The system includes: waste produced in the manufacturing process and its transport.	Data provided by LCPaper. Calculation of waste transport distances using Google Maps. Emission factors from OCCC 2022.	
 Distribution	The system includes: Transport of the final product from LCPaper to Oh Sheet!.	Data provided by LCPaper. Calculation of distances using Google Maps. Emission factors from DEFRA 2022.	DEFRA's emission factor has been modified to reflect that the product has a low density.

# Results

24 toilet rolls box (bamboo)

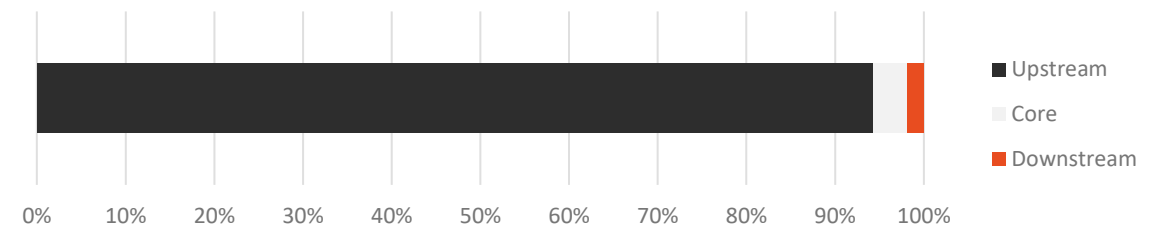
# Results CF



Results Carbon Footprint of 24 toilet rolls box (bamboo)



GWP100 (kgCO <sub>2</sub> eq/24 toilet rolls box)		
Raw Materials	1.38	73%
Transport Raw Materials	0.41	22%
Manufacturing	0.07	4%
Waste	0.04	2%
Distribution	0.00*	0%
<b>Total</b>	<b>1.90</b>	<b>100%</b>

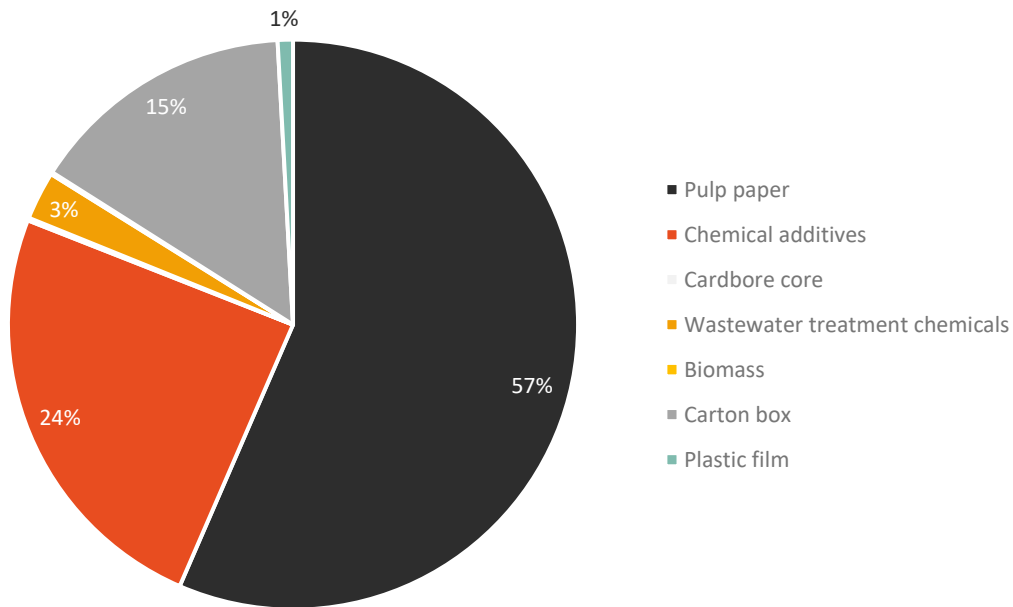


\*The transport provider makes a carbon offset. Actual carbon emissions are 0.32 kg CO<sub>2</sub> eq.

# Results CF



**Upstream** Results: This LCA category includes the Raw Materials stage and the Raw Materials Transport stage.



The impact associated with the **Upstream** category is mainly due to the production and transportation to LCPaper of the following raw materials:

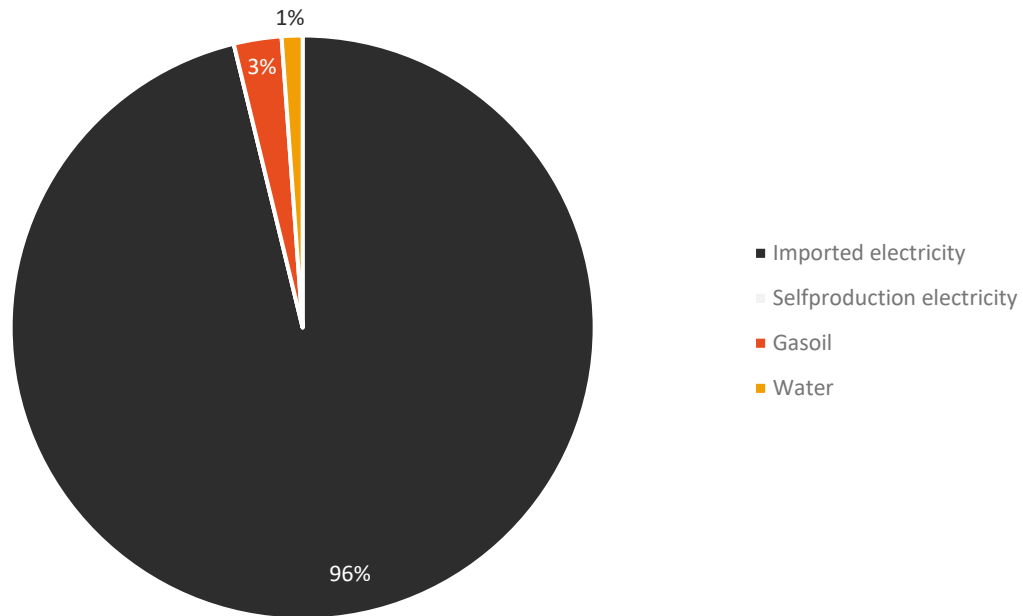
- Paper **pulp production** and transportation (57%).
- Production of **chemical additives** and their transport (24%).
- Production and transport of **packaging** (cardboard box 15% + film 1%).

<b>Kg CO2eq</b>	<b>Raw Materials</b>	<b>Transport Raw Materials</b>	<b>Upstream</b>
Pulp paper	0,6075	0,4065	1,0140
Chemical additives	0,4363	0,0025	0,4388
Cardbore core	0,0024	0,0003	0,0027
Wastewater treatment chemicals	0,0486	0,0007	0,0493
Biomass	0,0005	0,0021	0,0021
Carton box	0,2706	0,0013	0,2719
Plastic film	0,0146	0,0010	0,0155
<b>Total</b>	<b>1,38</b>	<b>0,41</b>	<b>1,79</b>

# Results CF



**Core** Results: This LCA category includes only the Manufacturing stage.



The impact associated with the **Core** category is mainly due to the energy inputs.

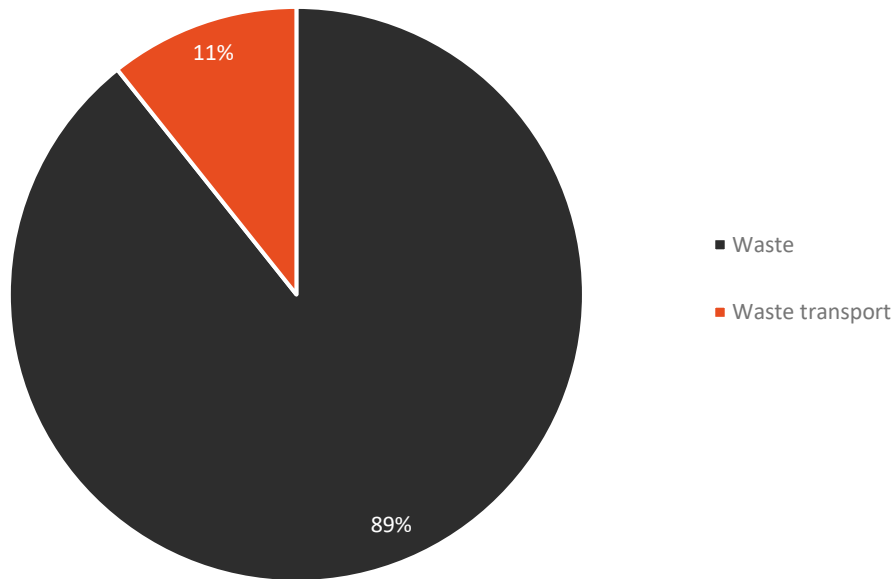
- 96% of the impact in the Core category is associated with the **imported electricity**.
- The self-produced electricity has no impact.
- There is no impact associated with the stationary combustions because the fuel is biomass.

<b>Kg CO2eq</b>	<b>Manufacturing</b>	<b>Core</b>
Imported electricity	0,0693	0,0693
Self-produced electricity	-	-
Gasoil	0,0019	0,0019
Water	0,0008	0,0008
<b>Total general</b>	<b>0,07</b>	<b>0,07</b>

# Results CF



**Downstream** Results: This LCA category includes the Waste Treatment stage and the Distribution.



The impact associated with the **Downstream** category is mainly due to the waste generated in LCPaper.

- 89% of the impact is due to the treatment of the **waste** generated in LCPaper.
- 11% of the impact is from waste transport.

Kg CO2eq	Waste	Distribution	Downstream
Waste	0,0325		0,0325
Waste transport	0,0039		0,0039
Distribution		0,00*	0,00
<b>Total</b>	<b>0,04</b>	<b>0,00</b>	<b>0,04</b>

\*The transport provider makes a carbon offset. Actual carbon emissions are 0.32 kg CO<sub>2</sub> eq.

24 toilet rolls box (recycled)



# Results CF



Results Carbon Footprint of 24 toilet rolls box (recycled)



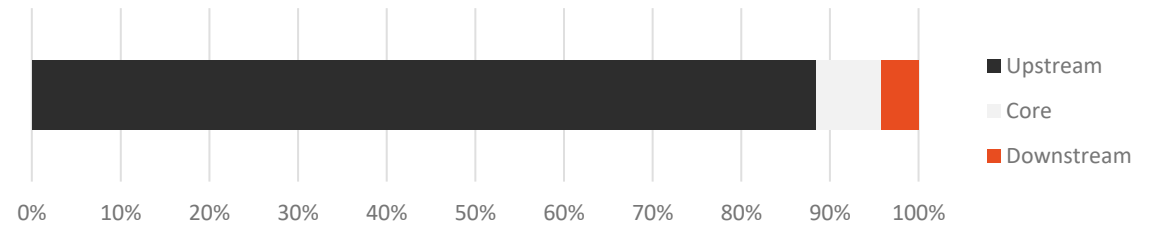
Recycled pulp



24 toilet rolls box

Product weight: 3.4 kg  
 Packaging weight: 0.3 kg  
 Total weight: 3.7 kg

GWP100 (kgCO <sub>2</sub> eq/24 toilet rolls box)		
Raw Materials	0.77	79%
Transport Raw Materials	0.09	9%
Manufacturing	0.07	7%
Waste	0.04	4%
Distribution	0.00*	0%
<b>Total</b>	<b>0.98</b>	<b>100%</b>

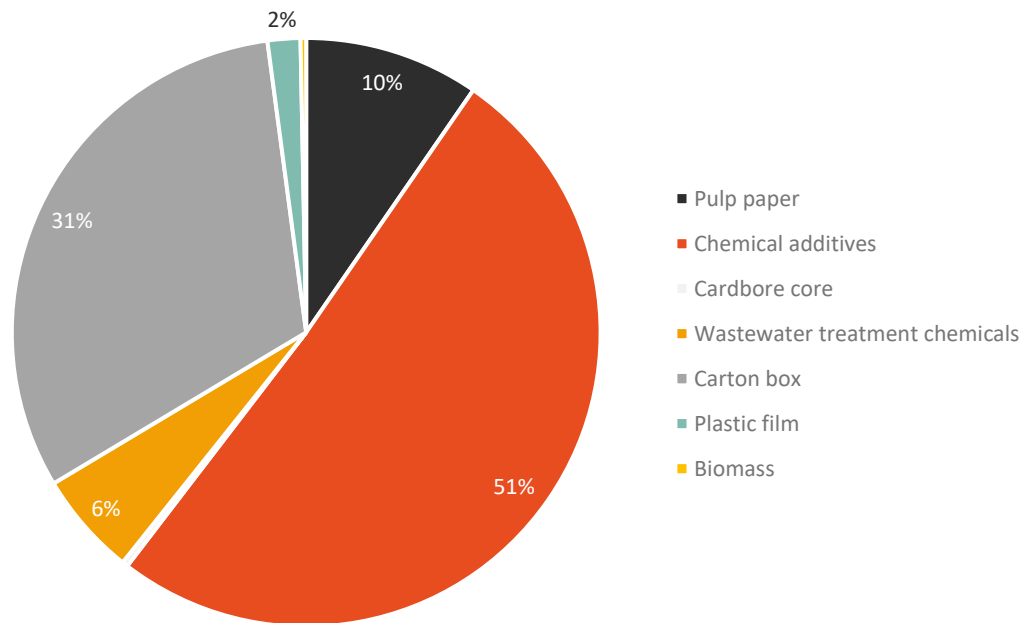


\*The transport provider makes a carbon offset. Actual carbon emissions are 0.32 kg CO<sub>2</sub> eq.

# Results CF



**Upstream** Results: This LCA category includes the Raw Materials stage and the Raw Materials Transport stage.



The impact associated with the **Upstream** category is mainly due to the production and transportation to LCPaper of the following raw materials:

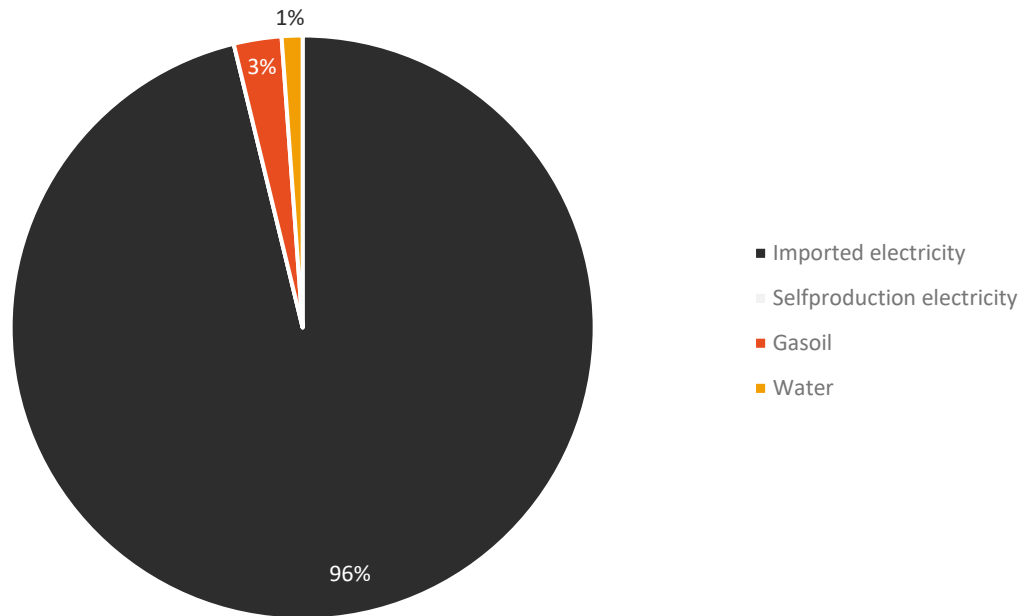
- Production of **chemical additives** and their transport (51%).
- Production and transport of **packaging** (cardboard box 31% + film 2%).
- The recycled pulp paper has no impact, just transportation to LCPaper.

Kg CO2eq	Raw Materials	Transport Raw Materials	Upstream
Pulp paper	-	0,0830	0,0830
Chemical additives	0,4363	0,0025	0,4388
Cardbore core	0,0024	0,0003	0,0027
Wastewater treatment chemicals	0,0486	0,0007	0,0493
Biomass	0,0005	0,0021	0,0027
Carton box	0,2706	0,0013	0,2719
Plastic film	0,0146	0,0010	0,0155
<b>Total</b>	<b>0,77</b>	<b>0,09</b>	<b>0,86</b>

# Results CF



**Core** Results: This LCA category includes only the Manufacturing stage.



The impact associated with the **Core** category is mainly due to the energy inputs.

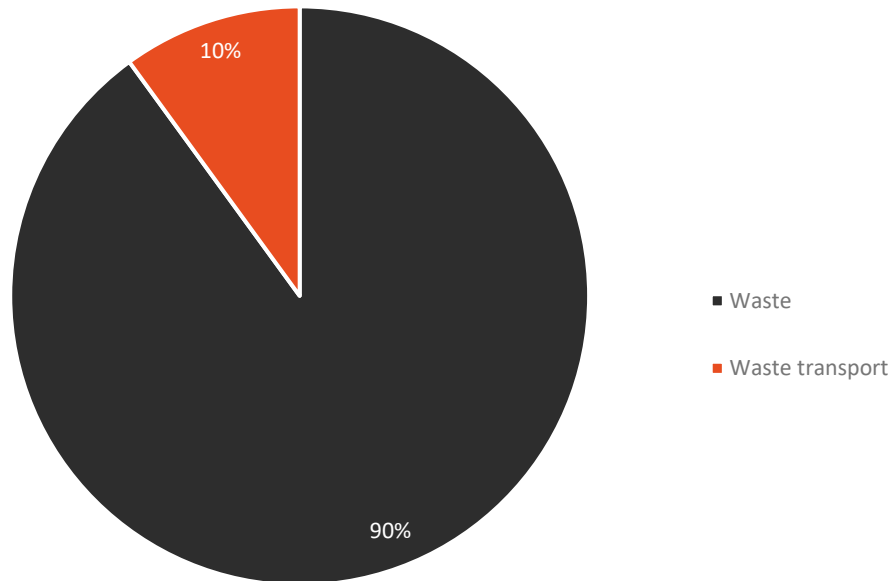
- 96% of the impact in the Core category is associated with the **imported electricity**.
- The self-produced electricity has no impact.
- There is no impact associated with the stationary combustions because the fuel is biomass.

<b>Kg CO2eq</b>	<b>Manufacturing</b>	<b>Core</b>
Imported electricity	0,0693	0,0693
Self-produced electricity	-	-
Gasoil	0,0019	0,0019
Water	0,0008	0,0008
<b>Total general</b>	<b>0,07</b>	<b>0,07</b>

# Results CF



**Downstream** Results: This LCA category includes the Waste Treatment stage and the Distribution.



The impact associated with the **Downstream** category is mainly due to the waste generated in LCPaper.

- 90% of the impact is due to the treatment of the **waste** generated in LCPaper.
- 10% of the impact is from waste transport.

<b>Kg CO2eq</b>	<b>Waste</b>	<b>Distribution</b>	<b>Downstream</b>
Waste	0,0368		0,0368
Waste transport	0,0041		0,0041
Distribution		0,00*	0,00
<b>Total</b>	<b>0,04</b>	<b>0,00</b>	<b>0,04</b>

\*The transport provider makes a carbon offset. Actual carbon emissions are 0.32 kg CO<sub>2</sub> eq.

6 kitchen rolls box (bamboo)

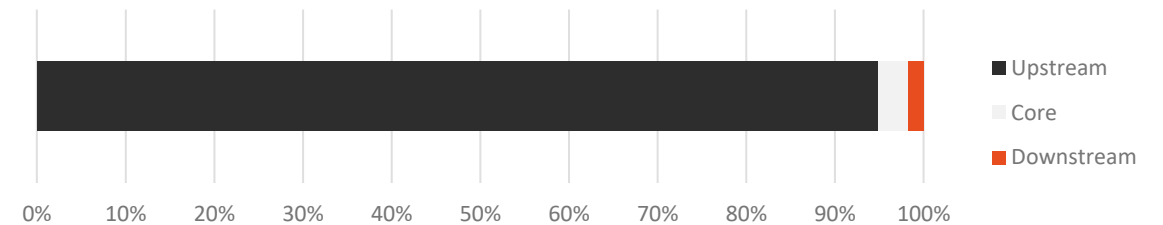
# Results CF



Results Carbon Footprint of 6 kitchen rolls box (bamboo)



GWP100 (kgCO <sub>2</sub> eq/6 kitchen rolls box)		
Raw Materials	0.61	75%
Transport Raw Materials	0.16	20%
Manufacturing	0.03	3%
Waste	0.01	2%
Distribution	0.00*	0%
<b>Total</b>	<b>0.81</b>	<b>100%</b>

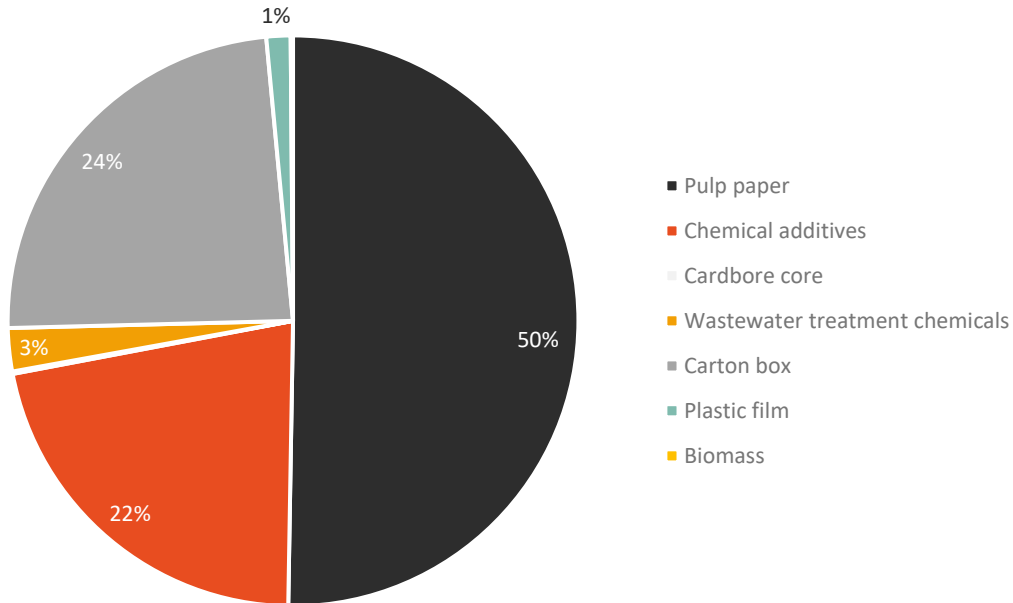


\*The transport provider makes a carbon offset. Actual carbon emissions are 0.12 kg CO<sub>2</sub> eq.

# Results CF



**Upstream** Results: This LCA category includes the Raw Materials stage and the Raw Materials Transport stage.



The impact associated with the **Upstream** category is mainly due to the production and transportation to LCPaper of the following raw materials:

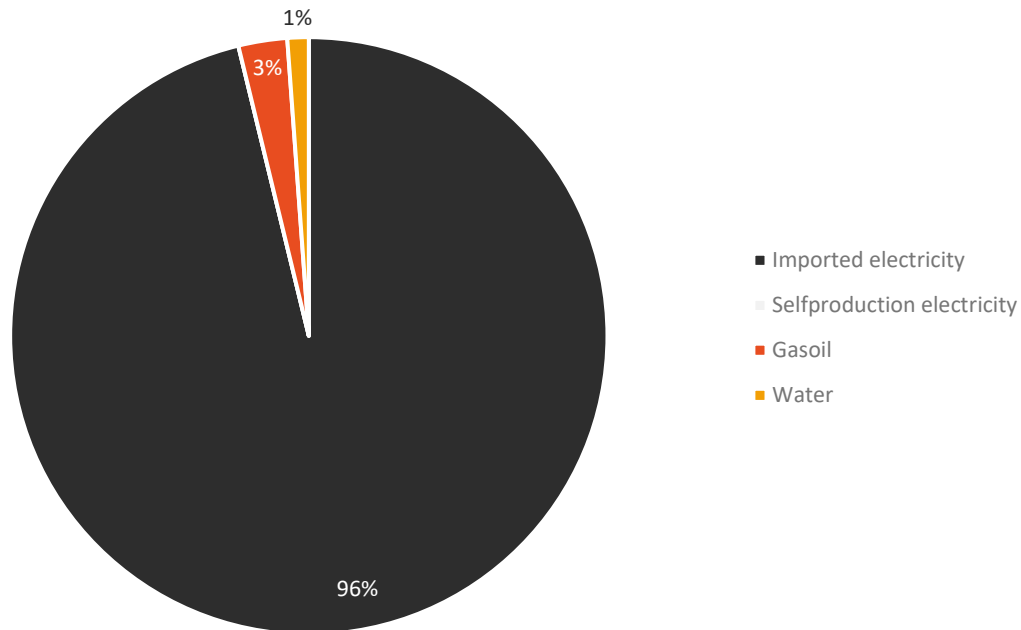
- Paper **pulp production** and transportation (50%).
- Production of **chemical additives** and their transport (22%).
- Production and transport of **packaging** (cardboard box 24% + film 1%).

<b>Kg CO2eq</b>	<b>Raw Materials</b>	<b>Transport Raw Materials</b>	<b>Upstream</b>
Pulp paper	0,2323	0,1554	0,3877
Chemical additives	0,1668	0,0010	0,1678
Cardbore core	0,0009	0,0001	0,0010
Wastewater treatment chemicals	0,0186	0,0003	0,0188
Biomass	0,1835	0,0009	0,1843
Carton box	0,0099	0,0007	0,0106
Plastic film	0,0002	0,0008	0,0010
<b>Total</b>	<b>0,61</b>	<b>0,16</b>	<b>0,77</b>

# Results CF



**Core** Results: This LCA category includes only the Manufacturing stage.



The impact associated with the **Core** category is mainly due to the energy inputs.

- 96% of the impact in the Core category is associated with the **imported electricity**.
- The self-produced electricity has no impact.
- There is no impact associated with the stationary combustions because the fuel is biomass.

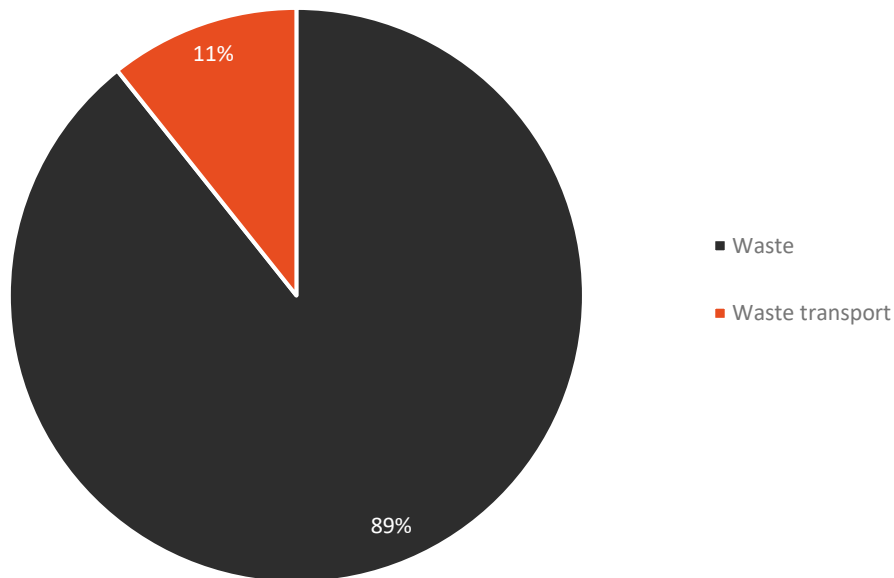
<b>Kg CO2eq</b>	<b>Manufacturing</b>	<b>Core</b>
Imported electricity	0,0265	0,0265
Self-produced electricity	-	-
Gasoil	0,0007	0,0007
Water	0,0003	0,0003
<b>Total general</b>	<b>0,03</b>	<b>0,03</b>



# Results CF



**Downstream** Results: This LCA category includes the Waste Treatment stage and the Distribution.



The impact associated with the **Downstream** category is mainly due to the waste generated in LCPaper.

- 89% of the impact is due to the treatment of the **waste** generated in LCPaper.
- 11% of the impact is from waste transport.

Kg CO2eq	Waste	Distribution	Downstream
Waste	0,0124		0,0124
Waste transport	0,0015		0,0015
Distribution		0,00*	0,00
<b>Total</b>	<b>0,01</b>	<b>0,00</b>	<b>0,01</b>

\*The transport provider makes a carbon offset. Actual carbon emissions are 0.12 kg CO<sub>2</sub> eq.

Results per kilogram of product

# Results CF



Results Carbon Footprint (**kg CO2 eq**) of 1kg of product:

	<b>Raw Materials</b>	<b>Transport Raw Materials</b>	<b>Manufacturing</b>	<b>Waste</b>	<b>Distribution</b>	<b>Total</b>
1 kg bamboo toilet paper	0,41	0,12	0,02	0,01	0,00*	<b>0,56</b>
1 kg recycled toilet paper	0,23	0,03	0,02	0,01	0,00*	<b>0,29</b>
1 kg bamboo kitchen paper	0,47	0,12	0,02	0,01	0,00*	<b>0,62</b>

\*actual emissions are 0.09 kg CO2 eq, but the transport provider makes a carbon offset

# Conclusions

# Conclusions



The Carbon Footprint study concludes that:

- **In respect to the product of 24 rolls of bamboo toilet paper, the impact is mainly concentrated in the acquisition of paper pulp and chemical additives** during the **Raw Materials stage (62%)**. The environmental impacts associated with the **transport of the raw materials (19%)** and the distribution of the product from LCPaper to Oh Sheet! in the **Distribution stage (15%)** are also remarkable.
- **With reference to the product of 24 rolls of recycled toilet paper, the impact is mainly concentrated in the acquisition of chemical additives** during the **Raw Materials stage (59%)**. The environmental impacts associated with the distribution of the product from LCPaper to Oh Sheet! in the **Distribution stage (25%)** are also notable.
- **Regarding the product of 6 rolls of bamboo kitchen paper the impact is mainly concentrated in the acquisition of paper pulp and chemical additives** during the **Raw Materials stage (65%)**. The environmental impacts associated with the **transport of the raw materials (17%)** and the distribution of the product from LCPaper to Oh Sheet! in the **Distribution stage (13%)** are also significant.

All products achieve a much better environmental performance than average tissue products. This is due to the use of **unbleached raw materials** and, especially, to a production system with **renewable electricity and biomass**.

The products made from **recycled paper pulp** has a better environmental performance than raw bamboo product.

# Limitations and improvement opportunities



- Paper pulp has a very high impact, however, **the emission factors considered are not from primary data**, they are from secondary data from reference databases (Ecoinvent 3.8). Getting primary data is an opportunity for improvement to have a more accurate calculation.
- The product of 6 rolls of bamboo kitchen paper has less impact (in absolute values) than the product of 24 rolls of bamboo toilet paper. This is because the 6 rolls of kitchen paper product weigh less than the 24 rolls of toilet paper. However, in relative values, kitchen paper has more impact. Since **for a kilogram of kitchen paper more kilograms of packaging are needed compared to toilet paper**. An opportunity for improvement would be to implement packaging ecodesign initiatives.
- Finally, distribution has a significant impact. Even if the logistics provider makes an offset, these **emissions could be reduced by looking for alternative means of transportation**.

# inèdit

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