2011 Product Footprint

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i-report tool prepared by:

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Introduction and Disclaimer

LCA is one tool among many that supports life cycle thinking in a business. Life cycle thinking is much like triple bottom line sustainability strategy. It represents a new mode of systems thinking for business that reframes performance and impacts to take into account more externalities. LCA is a tool that can assess the impacts of products and processes.

The Eco-Products LCA

Foodservice products from other companies are created in their unique supply chains, and we do not know how those chains all link together. Because of these differences, it is difficult to compare Eco-Products items against others, especially if our competitors don't look at their full impacts from a cradle-to-cradle approach like we do. This study is limited to Eco-Products items only, created in Eco-Products supply chains.

This life cycle inventory measures environmental impacts using the most up-to-date information available to examine Eco-Products unique products from the widest feasible scope – cradle-to-grave. This information is not intended to be comparative to other companies, products, or items made from similar materials.

This LCA study is not peer reviewed and should not be compared against other studies that are. We choose to share this information in hope that increased transparency and dialogue will occur in our industry in and around these types of foodservice products.

We know there are many ways to look at life cycle impacts, and our approach is one among many. We feel it is a good, sound, scientifically grounded approach.

For specific questions about our LCA, please contact this study's author Claudia Capitini sustainabilitymaven@ecoproducts.com

1 Scope of the study

1.1 System boundaries

The study accounts for all the phases of the life cycle for the entire product suite created by Eco-Products in 2011, including the manufacturing of the raw materials, transportation of the raw materials to the converting facility, manufacturing of the final product, all internal transportation during the manufacturing phase, packaging of the products, transportation of the product to the consumer, and end of life.

The use phase is accounted for (number of times the product is reused), but the cleaning of the reusable product is **not** taken into account.

The life cycle steps are broken down as follows in the model:

1. Materials The materials life cycle step includes the "cradle-to-gate" production of the materials. This includes all the impacts from the extraction of resources to the material manufacturing facility gates.

2. Transport of raw materials The transport of raw materials life cycle step includes the direct emissions due to the transport of the raw materials, as well as the fuel production.

3. Manufacturing The manufacturing life cycle step includes the electricity used at the converters, as well as the water usage and the scrap rate.

4. Transport inside manufacturing The transport inside manufacturing life cycle step includes the direct emissions due to the transport of the intermediate product (if any), as well as the fuel production.

5. Packaging The packaging life cycle step includes the production of the packaging materials as well as their transport.

6. Transport to warehouse The transport to warehouse life cycle step includes the direct emissions due to the transport of the final product to the warehouse, as well as the fuel production.

7. Transport to customer The transport to customer life cycle step includes the direct emissions due to the transport of the final product to the retailer, as well as the fuel production.

8. Transport to end-of-life The transport to end-of-life life cycle step includes the direct emissions due to the transport of the used product to its disposal, as well as the fuel production.

9. End-of-life The end-of-life life cycle step includes the disposal of the product in a landfill or incineration plant, according to US averages by material.

1.2 Data

Data are taken from GaBi 4 database, developed by PE International. Additionally, the end-of-life share of disposal in landfill vs. incineration of the used products is taken from the EPA's Municipal Solid Waste report.

1.3 Impact Assessment Methodology

The environmental impact assessment is based on the Tool for Reduction and Assessment of Chemical and Environmental Impacts (TRACI) methodology from the US Environmental Protection Agency. Biogenic carbon dioxide, however, is not considered as contributing to overall climate change because most of Eco-Products' products are fast-moving consumer goods. Thus, any biogenic carbon dioxide sequestered during biomass growth will be re-released a short time later at the products' at end-of-life.

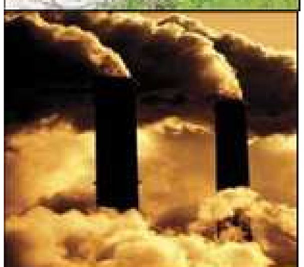
To measure toxicity, the USETox indicator has been selected. Social indicators and Land Use impacts have been developed by LBP-University of Stuttgart.

2 Executive Summary

2.1 Environmental indicators - Per scenario

Acidification [kg mol H+ equiv.]: Acidification refers literally to processes that increase the acidity (hydrogen ion concentration) of water and soil systems. This phenomenon is related to acid rains.

Eutrophication ("water pollution") [kg N-equiv] **:** Potential to over-fertilize surface waters, leading to proliferation of aquatic photosynthetic plant life, which distresses habitat for other aquatic life and alters the overall profile of the water body . The indicator is calculated by taking into account the natural pathway and consequences of the nutrient arrival to an aquatic environment.

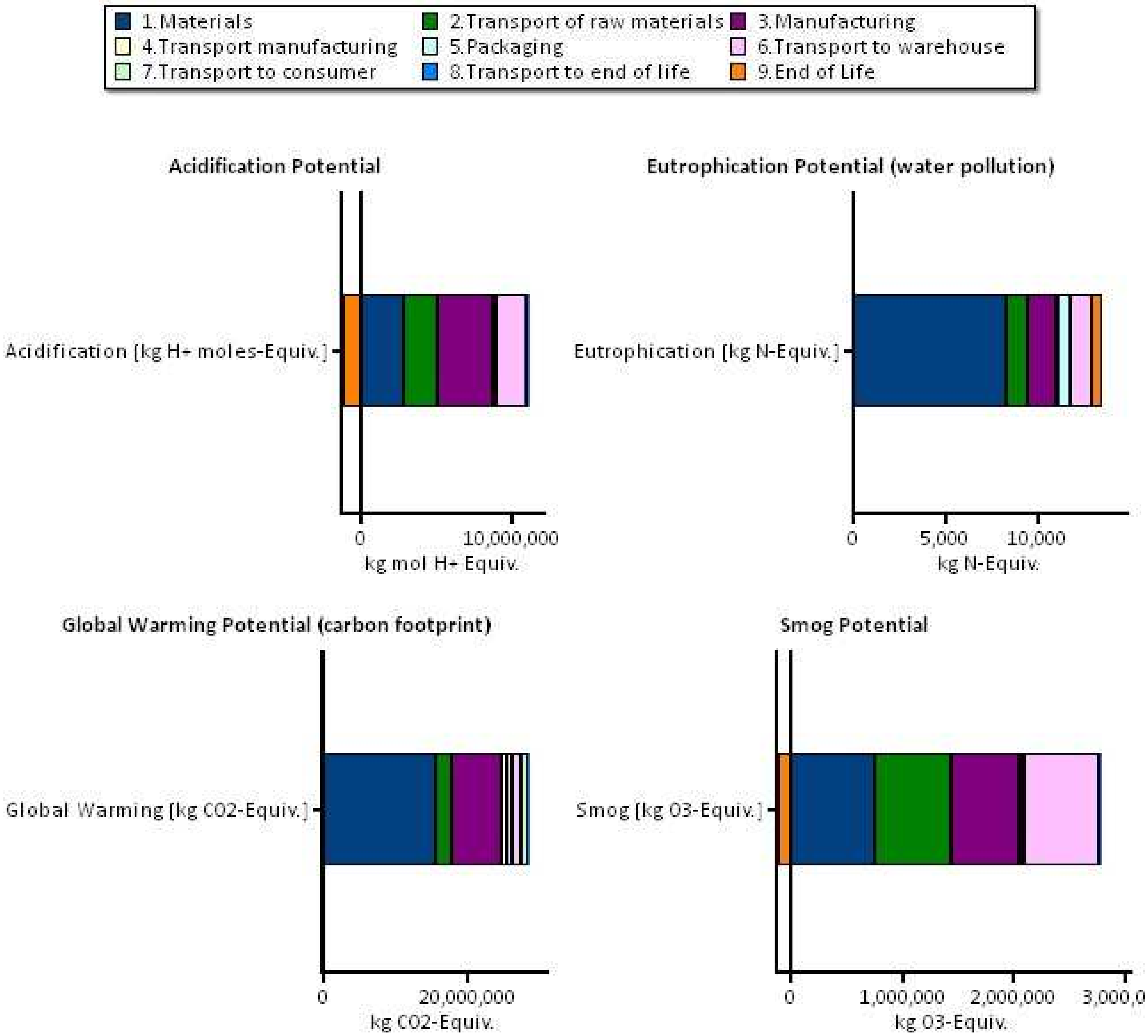


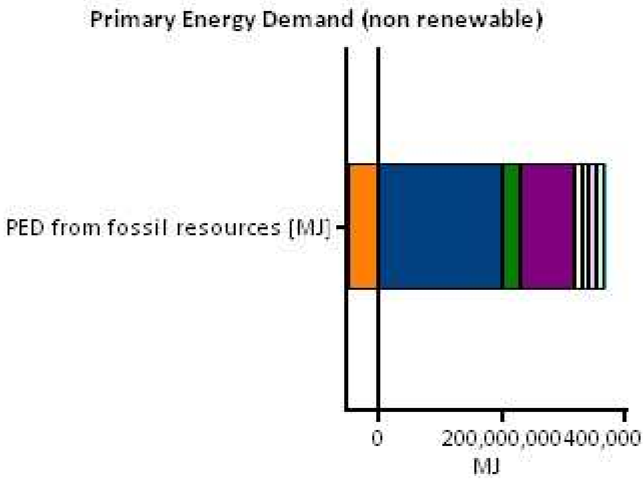
Global Warming ("carbon footprint") [kg CO2-equiv.] : Potential to increase global warming based on chemical's radiative forcing and lifetime. The indicator is calculated for a 100-year time horizon, and represents the sum of the different contributions of the chemical's global warming potentials.

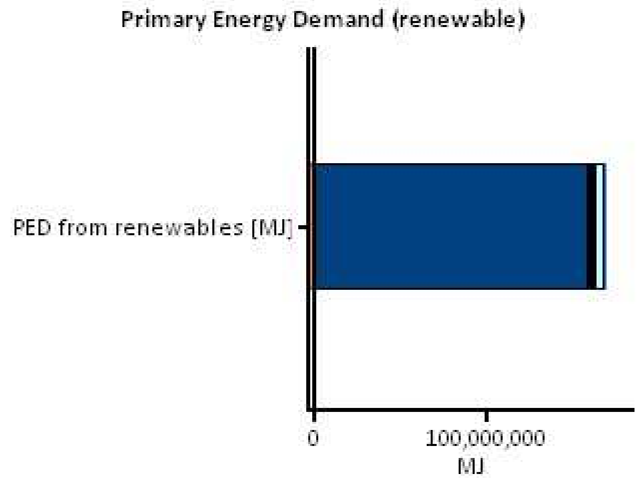
Smog [kg O3-equiv.]: A measure of emissions of precursors that contribute to low level smog, produced by the reaction of nitrogen oxides and volatile organic compounds (VOCs) under the influence of UV light

Primary Energy Demand [MJ]: A measure of the total amount of primary energy extracted from the earth. PED is expressed in energy demand from non-renewable resources (e.g. petroleum, natural gas, etc.) and energy demand from renewable resources (e.g. hydropower, wind energy, solar, etc.). Efficiencies in energy conversion (e.g. power, heat, steam, etc.) are taken into account.

	Eco-Products Full Product i-report
PED from fossil resources [MJ]	3.23E08
PED from renewables [MJ]	1.66E08
Acidification [kg H+ moles-Equiv.]	9.98E06
Eutrophication [kg N-Equiv.]	1.36E04
Global Warming [kg CO2-Equiv.]	2.84E07
Smog [kg O3-Equiv.]	2.67E06


1.Materials
2.Transport of raw materials
3.Manufacturing
4.Transport manufacturing
5.Packaging
6.Transport to warehouse
7.Transport to consumer
8.Transport to end of life
9.End of Life
Acidification Potential
Acidification [kg H+ moles-Equiv.]
0
10,000,000
kg mol H+ Equiv.
Eutrophication Potential (water pollution)
Eutrophication [kg N-Equiv.]
0
5,000
10,000
kg N-Equiv.
Global Warming Potential (carbon footprint)
Global Warming [kg CO2-Equiv.]
0
20,000,000
kg CO2-Equiv.
Smog Potential
Smog [kg O3-Equiv.]
0
1,000,000
2,000,000
3,000,0
kg O3-Equiv.





2.2 Total Carbon Footprint (Global Warming Potential)

Global Warming Potential (GWP) total = GWP 1 + GWP 2 + ...

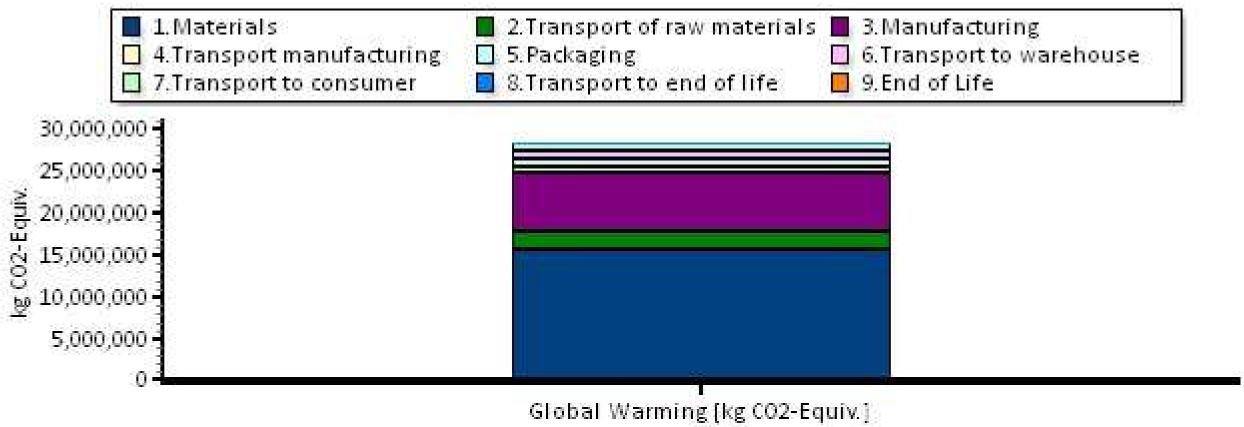
Global Warming [kg CO2-Equiv.]	2.84E007

3 Detailed Environmental Impacts

3.1 Global Warming Potential

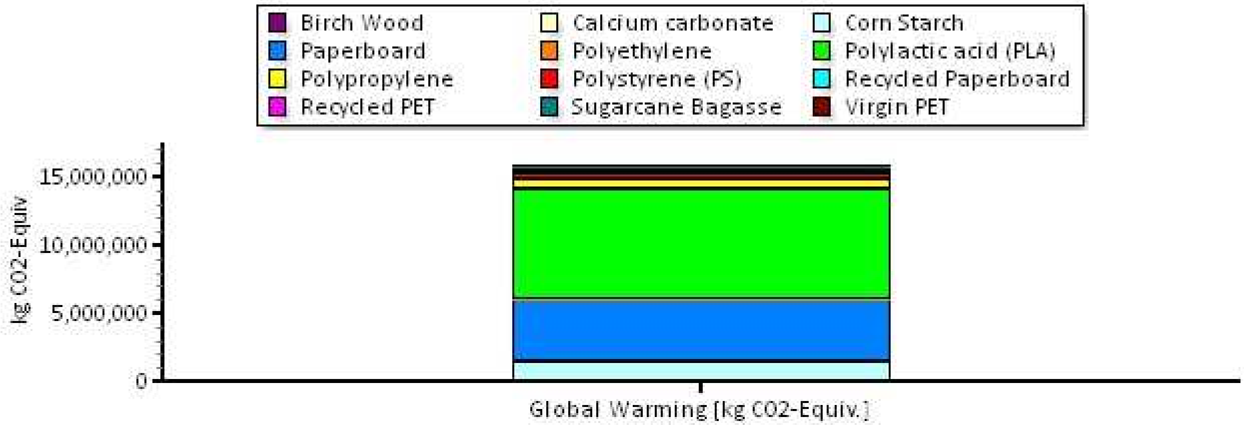
Global Warming ("carbon footprint") [kg CO2-equiv.] : Potential to increase global warming based on chemical's radiative forcing and lifetime. The indicator is calculated for a 100-year time horizon, and represents the sum of the different contributions of the chemical's global warming potentials.

3.1.1 Life Cycle



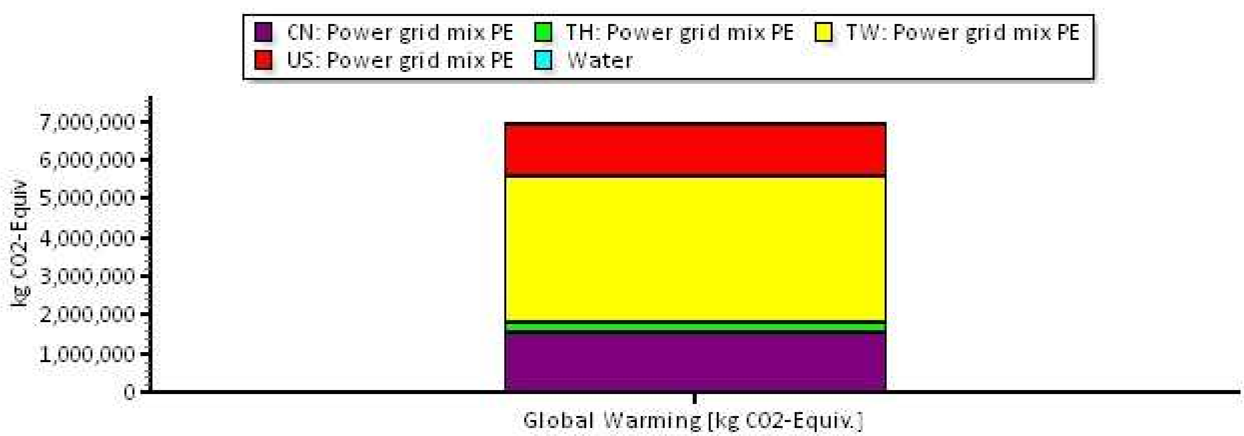
	Global Warming [kg CO2-Equiv.]
1.Materials	1.56E07
2.Transport of raw materials	2.26E06
3.Manufacturing	6.97E06
4.Transport manufacturing	7.63E05
5.Packaging	8.21E05
6.Transport to warehouse	1.16E06
7.Transport to consumer	8.68E05
8.Transport to end of life	2.17E04
9.End of Life	-3.40E05
No statement	3.12E05

3.1.2 Materials



	Global Warming [kg CO2-Equiv.]
Birch Wood	4.99E04
Calcium carbonate	6.20E00
Corn Starch	1.37E06
Paperboard	4.59E06
Polyethylene	6.59E04
Polylactic acid (PLA)	8.04E06
Polypropylene	6.90E05
Polystyrene (PS)	4.94E05
Recycled Paperboard	3.12E05
Recycled PET	6.86E04
Sugarcane Bagasse	1.75E04
Virgin PET	2.02E05

3.1.3 Manufacturing

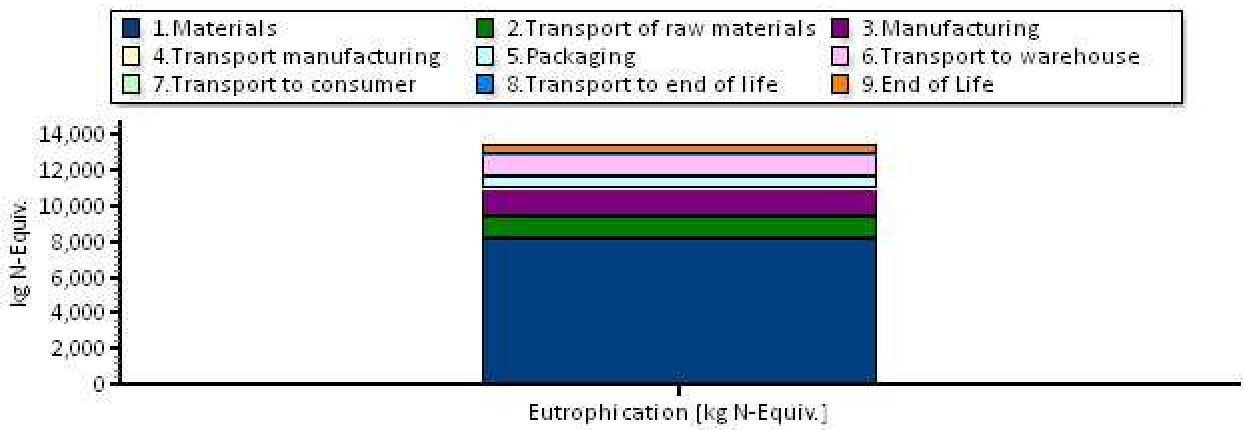


	Global Warming [kg CO2-Equiv.]
CN: Power grid mix PE	1.54E06
TH: Power grid mix PE	2.54E05
TW: Power grid mix PE	3.80E06
US: Power grid mix PE	1.34E06
Water	3.76E04

3.2 Eutrophication Potential

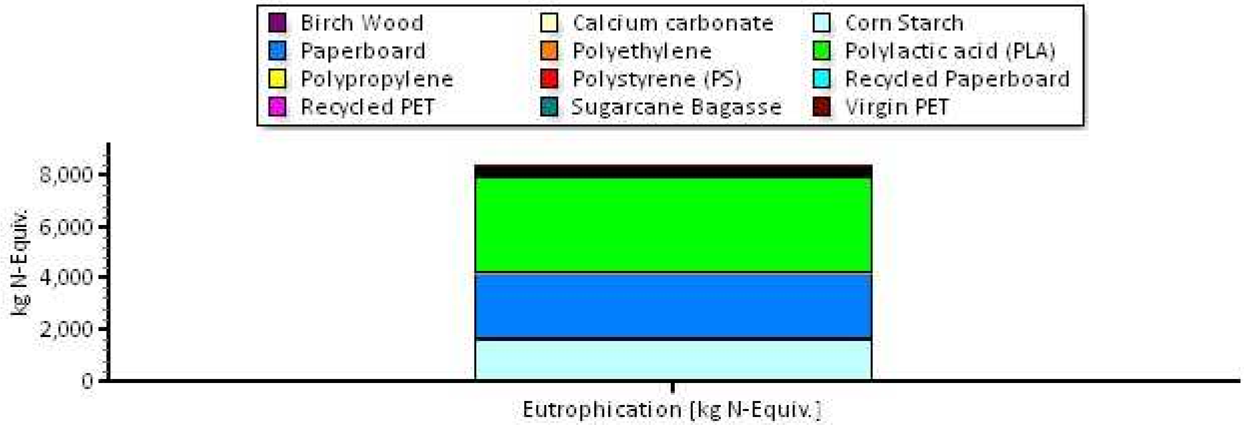
Eutrophication ("water pollution") [kg N-equiv] **:** Potential to over-fertilize surface waters, leading to proliferation of aquatic photosynthetic plant life, which distresses habitat for other aquatic life and alters the overall profile of the water body . The indicator is calculated by taking into account the natural pathway and consequences of the nutrient arrival to an aquatic environment.

3.2.1 Life Cycle



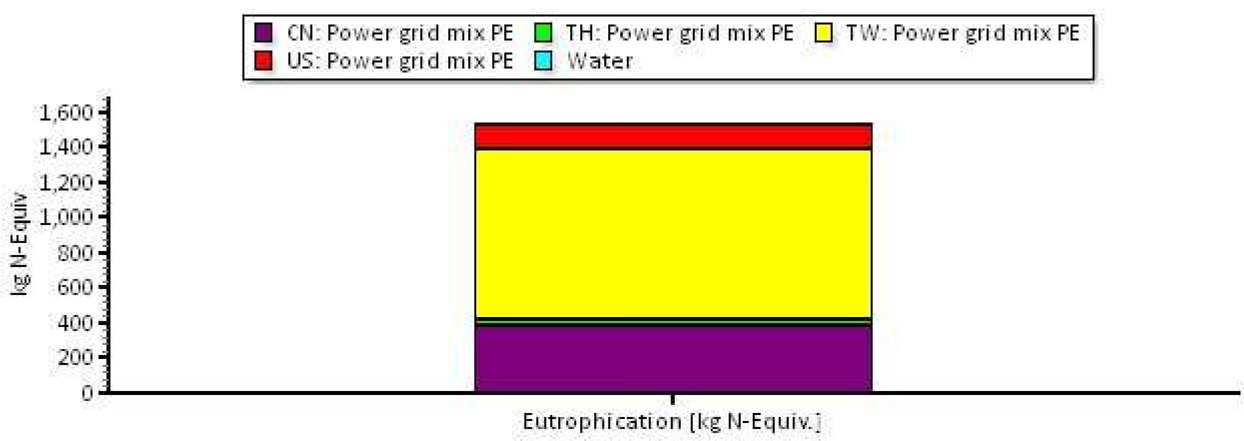
	Eutrophication [kg N-Equiv.]
1.Materials	8.24E03
2.Transport of raw materials	1.24E03
3.Manufacturing	1.54E03
4.Transport manufacturing	2.81E01
5.Packaging	6.69E02
6.Transport to warehouse	1.18E03
7.Transport to consumer	3.20E01
8.Transport to end of life	8.00E-01
9.End of Life	5.47E02
No statement	1.63E02

3.2.2 Materials



	Eutrophication [kg N-Equiv.]
Birch Wood	5.79E00
Calcium carbonate	1.21E-03
Corn Starch	1.62E03
Paperboard	2.55E03
Polyethylene	7.21E00
Polylactic acid (PLA)	3.74E03
Polypropylene	7.38E01
Polystyrene (PS)	4.22E01
Recycled Paperboard	1.63E02
Recycled PET	9.20E01
Sugarcane Bagasse	7.99E01
Virgin PET	1.79E01

3.2.3 Manufacturing

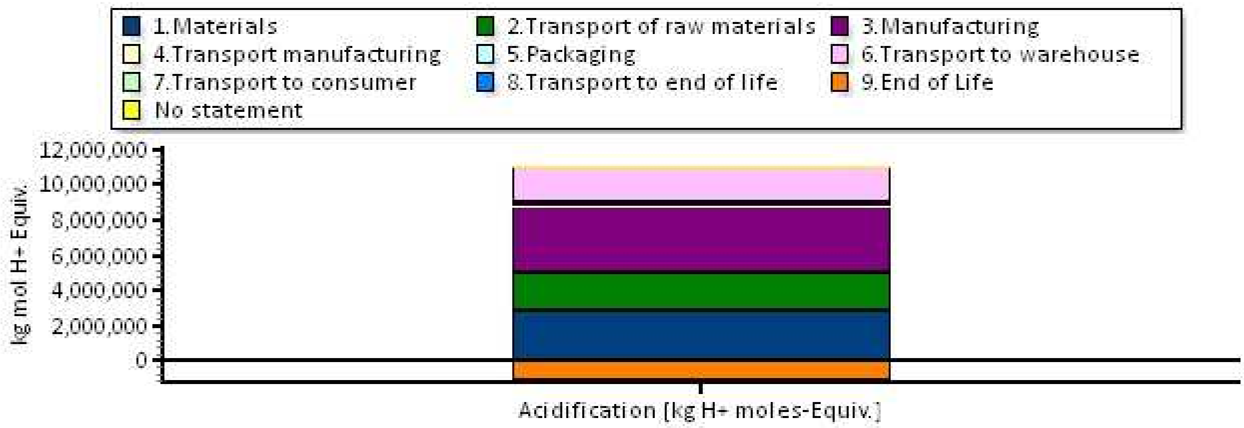


	Eutrophication [kg N-Equiv.]
CN: Power grid mix PE	3.89E02
TH: Power grid mix PE	3.83E01
TW: Power grid mix PE	9.65E02
US: Power grid mix PE	1.39E02
Water	3.65E00

3.3 Acidification Potential

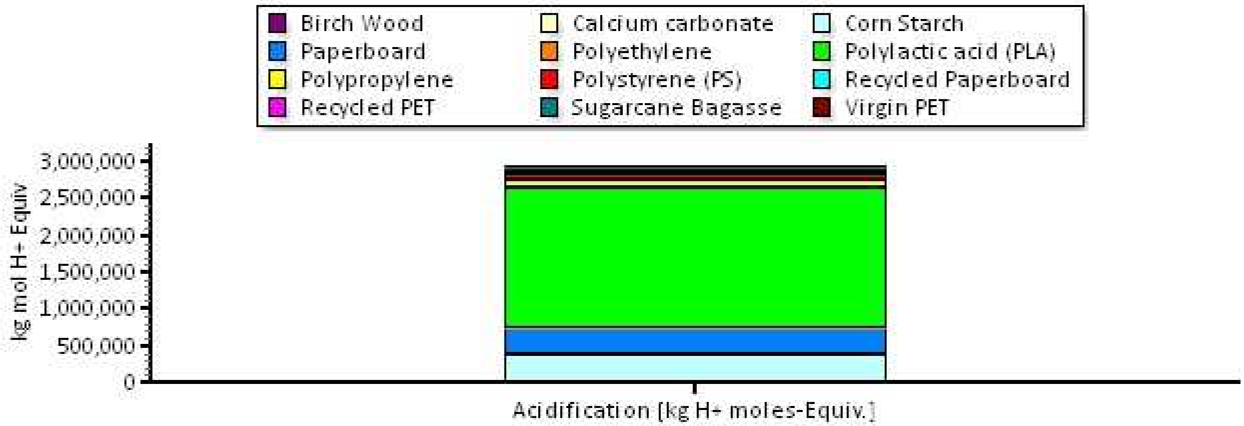
Acidification [kg mol H+ equiv.]: Acidification refers literally to processes that increase the acidity (hydrogen ion concentration) of water and soil systems. This phenomenon is related to acid rains.

3.3.1 Life Cycle



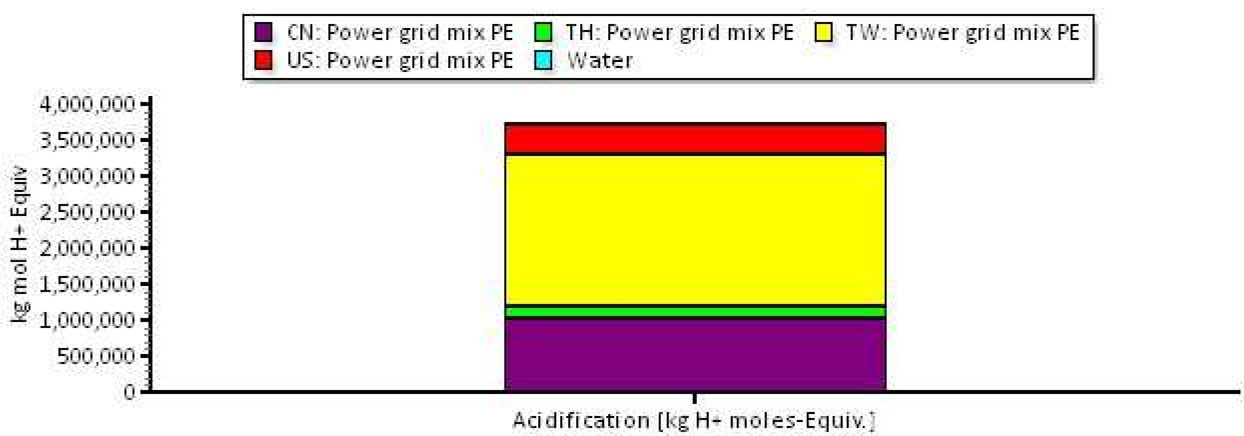
	Acidification [kg H+ moles-Equiv.]
1.Materials	2.91E06
2.Transport of raw materials	2.16E06
3.Manufacturing	3.73E06
4.Transport manufacturing	3.87E04
5.Packaging	1.29E05
6.Transport to warehouse	2.05E06
7.Transport to consumer	4.41E04
8.Transport to end of life	1.10E03
9.End of Life	-1.13E06
No statement	3.76E04

3.3.2 Materials



	Acidification [kg H+ moles-Equiv.]
Birch Wood	6.44E03
Calcium carbonate	1.81E00
Corn Starch	3.63E05
Paperboard	3.65E05
Polyethylene	1.17E04
Polylactic acid (PLA)	1.89E06
Polypropylene	1.26E05
Polystyrene (PS)	8.35E04
Recycled Paperboard	3.76E04
Recycled PET	2.94E04
Sugarcane Bagasse	1.33E04
Virgin PET	2.79E04

3.3.3 Manufacturing

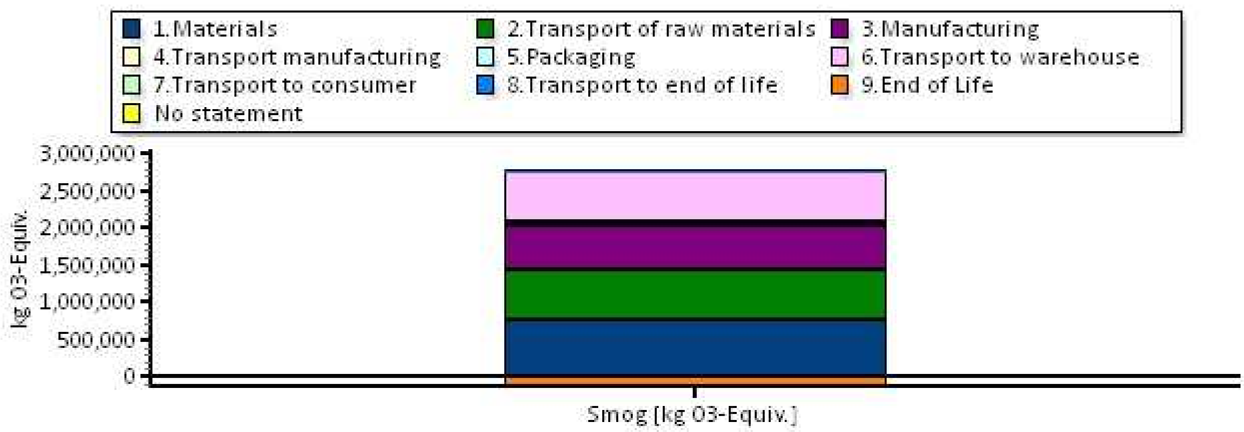


	Acidification [kg H+ moles-Equiv.]
CN: Power grid mix PE	1.04E06
TH: Power grid mix PE	1.51E05
TW: Power grid mix PE	2.11E06
US: Power grid mix PE	4.28E05
Water	3.26E03

3.4 Smog Potential

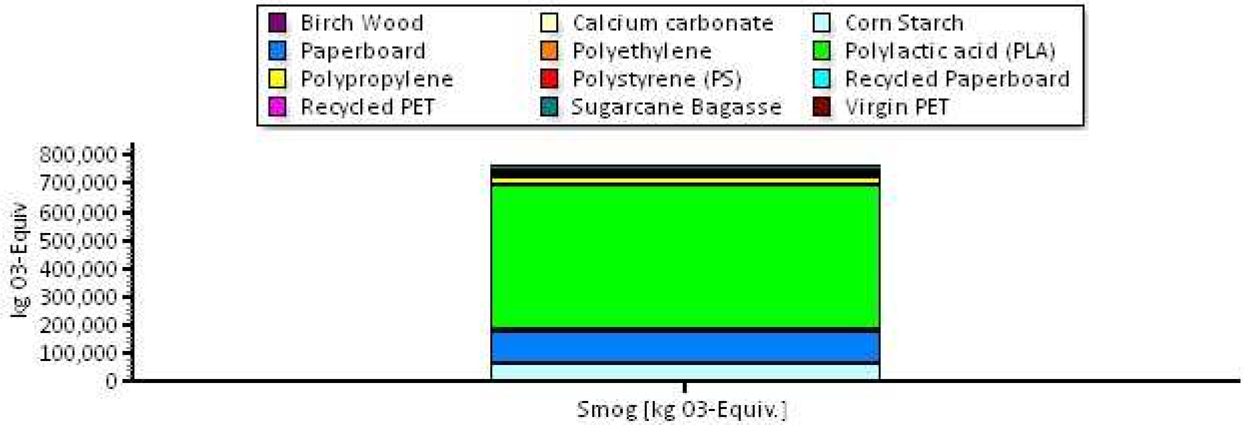
Smog [kg O3-equiv.]: A measure of emissions of precursors that contribute to low level smog, produced by the reaction of nitrogen oxides and volatile organic compounds (VOCs) under the influence of UV light

3.4.1 Life Cycle



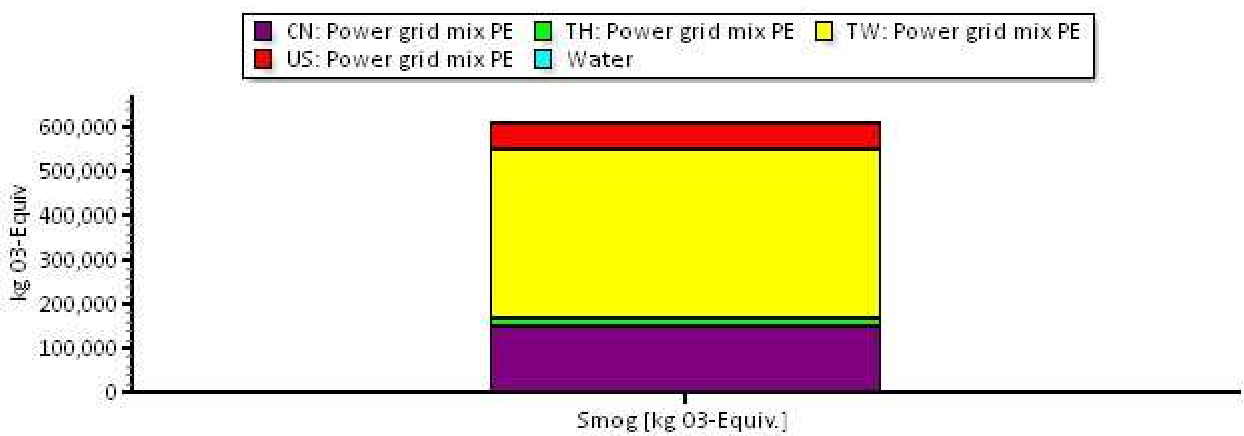
	Smog [kg O3-Equiv.]
1.Materials	7.54E05
2.Transport of raw materials	6.83E05
3.Manufacturing	6.11E05
4.Transport manufacturing	1.21E04
5.Packaging	3.68E04
6.Transport to warehouse	6.59E05
7.Transport to consumer	1.38E04
8.Transport to end of life	3.45E02
9.End of Life	-1.18E05
No statement	1.45E04

3.4.2 Materials



	Smog [kg O3-Equiv.]
Birch Wood	3.06E03
Calcium carbonate	3.27E-01
Corn Starch	5.79E04
Paperboard	1.19E05
Polyethylene	2.66E03
Polylactic acid (PLA)	5.15E05
Polypropylene	2.77E04
Polystyrene (PS)	1.30E04
Recycled Paperboard	1.45E04
Recycled PET	5.34E03
Sugarcane Bagasse	4.51E03
Virgin PET	6.30E03

3.4.3 Manufacturing



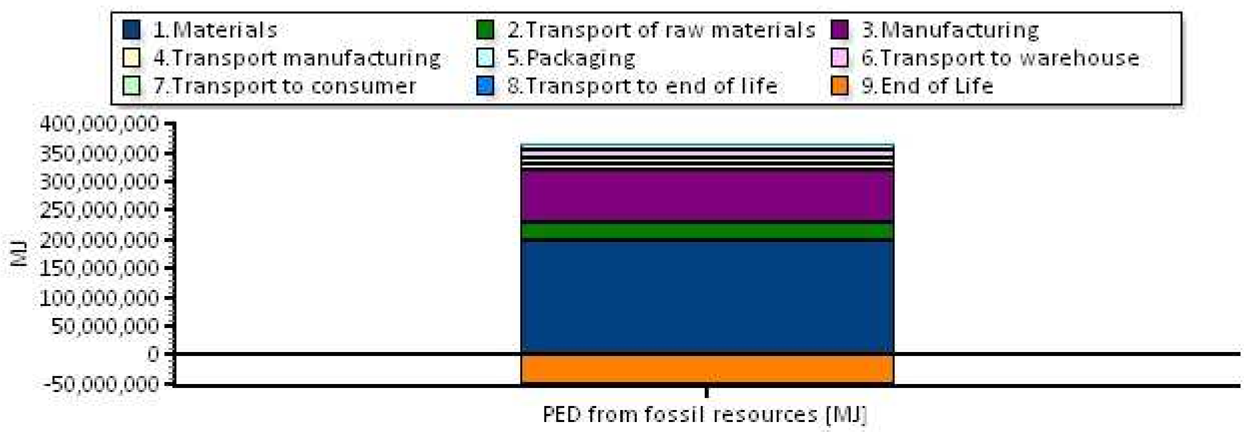
	Smog [kg O3-Equiv.]
CN: Power grid mix PE	1.49E05
TH: Power grid mix PE	1.90E04
TW: Power grid mix PE	3.83E05
US: Power grid mix PE	5.90E04
Water	9.66E02

3.5 Primary Energy Demand

Primary Energy Demand [MJ]: A measure of the total amount of primary energy extracted from the earth. PED is expressed in energy demand from non-renewable resources (e.g. petroleum, natural gas, etc.) and energy demand from renewable resources (e.g. hydropower, wind energy, solar, etc.). Efficiencies in energy conversion (e.g. power, heat, steam, etc.) are taken into account.

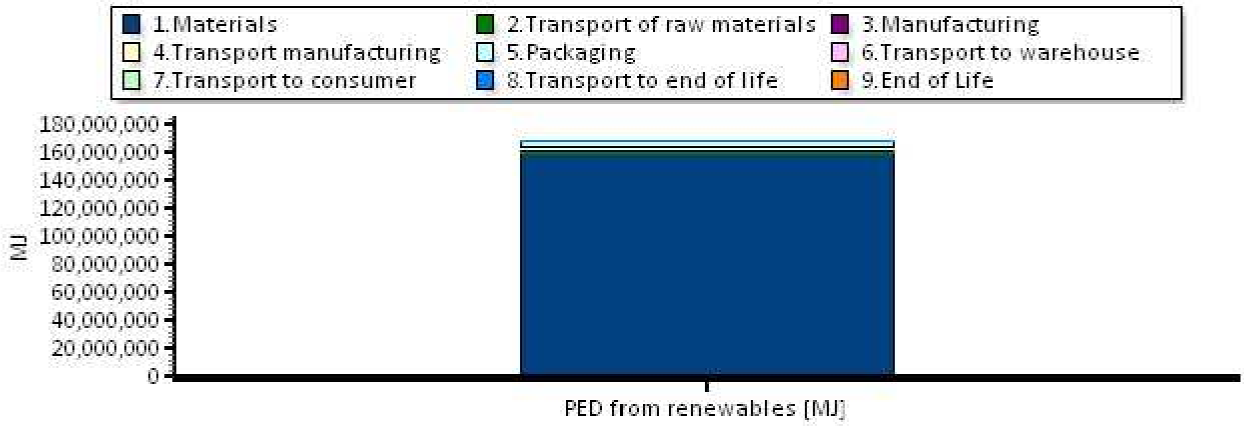
3.5.1 Life Cycle

3.5.1.1 Primary Energy Demand from fossil resources



	PED from fossil resources [MJ]
1.Materials	2.01E08
2.Transport of raw materials	3.02E07
3.Manufacturing	8.87E07
4.Transport manufacturing	1.08E07
5.Packaging	9.68E06
6.Transport to warehouse	1.44E07
7.Transport to consumer	1.23E07
8.Transport to end of life	3.07E05
9.End of Life	-4.89E07
No statement	5.01E06

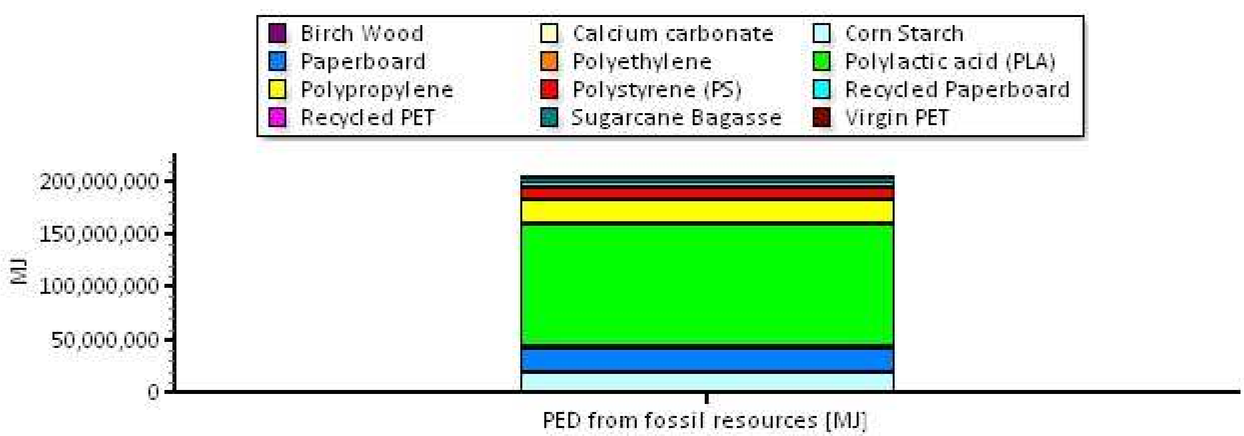
3.5.1.2 Primary Energy Demand from renewable resources



	PED from renewables [MJ]
1.Materials	1.59E08
2.Transport of raw materials	2.51E05
3.Manufacturing	3.06E06
4.Transport manufacturing	1.57E04
5.Packaging	5.84E06
6.Transport to warehouse	2.37E04
7.Transport to consumer	1.78E04
8.Transport to end of life	4.46E02
9.End of Life	-3.16E06
No statement	6.94E05

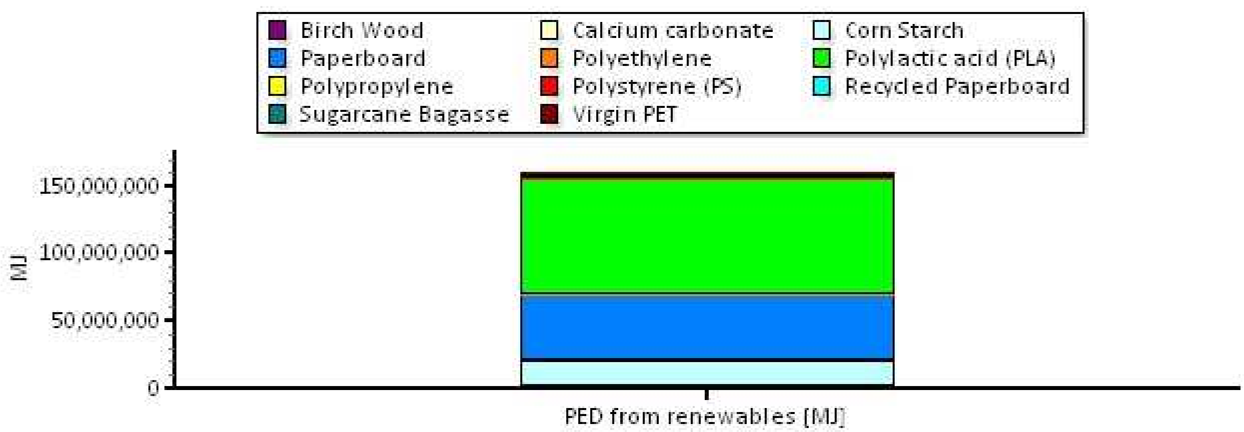
3.5.2 Materials

3.5.2.1 Primary Energy Demand from fossil resources



	PED from fossil resources [MJ]
Birch Wood	3.47E05
Calcium carbonate	1.38E02
Corn Starch	1.77E07
Paperboard	2.41E07
Polyethylene	2.43E06
Polylactic acid (PLA)	1.15E08
Polypropylene	2.36E07
Polystyrene (PS)	1.17E07
Recycled Paperboard	5.01E06
Recycled PET	9.81E05
Sugarcane Bagasse	1.68E05
Virgin PET	4.92E06

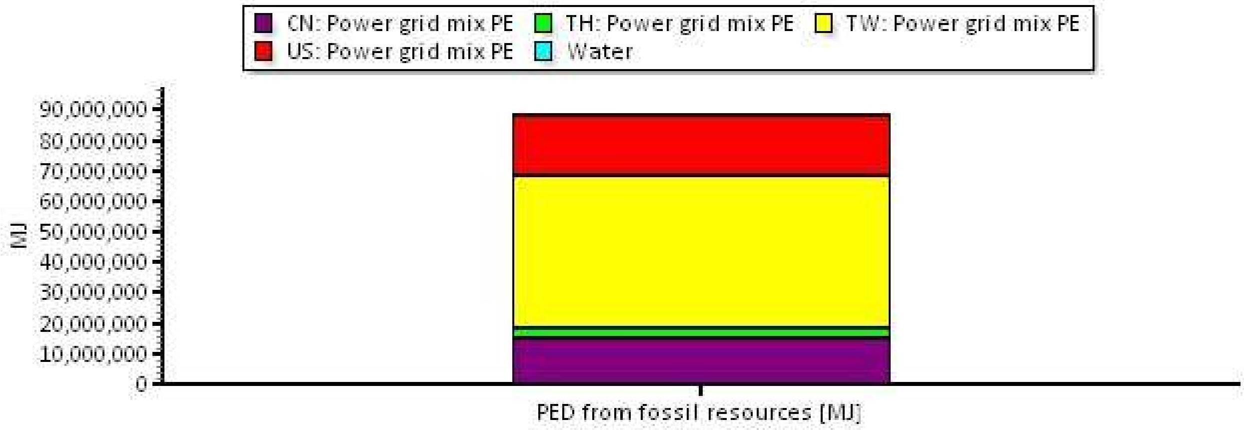
3.5.2.2 Primary Energy Demand from renewable resources



	PED from renewables [MJ]
Birch Wood	9.87E05
Calcium carbonate	3.70E00
Corn Starch	1.99E07
Paperboard	4.87E07
Polyethylene	1.25E04
Polylactic acid (PLA)	8.63E07
Polypropylene	1.55E05
Polystyrene (PS)	3.53E04
Recycled Paperboard	6.94E05
Sugarcane Bagasse	3.37E06
Virgin PET	3.69E04

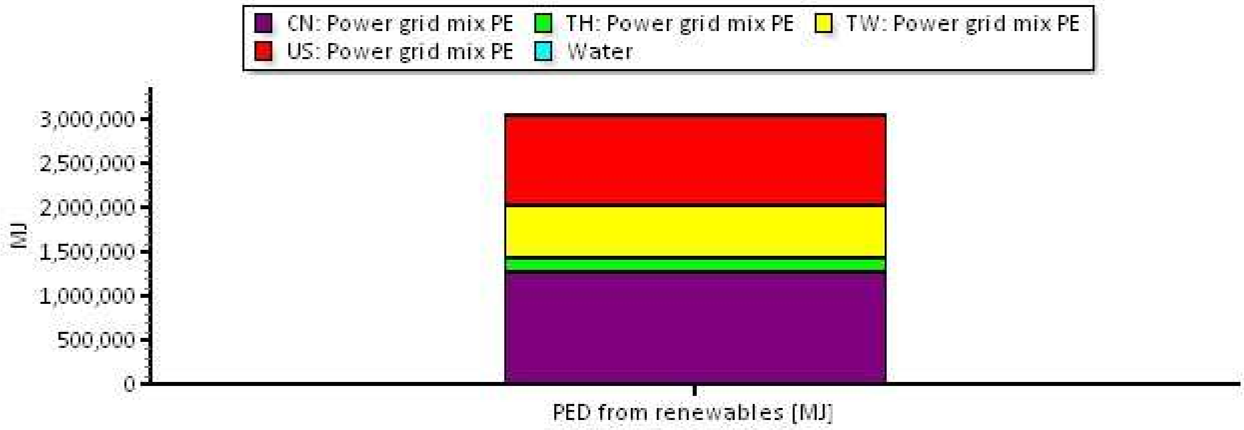
3.5.3 Manufacturing

3.5.3.1 Primary Energy Demand from fossil resources



	PED from fossil resources [MJ]
CN: Power grid mix PE	1.53E07
TH: Power grid mix PE	3.44E06
TW: Power grid mix PE	5.00E07
US: Power grid mix PE	1.94E07
Water	5.33E05

3.5.3.2 Primary Energy Demand from renewable resources



	PED from renewables [MJ]
CN: Power grid mix PE	1.27E06
TH: Power grid mix PE	1.72E05
TW: Power grid mix PE	5.72E05
US: Power grid mix PE	1.04E06
Water	4.25E03

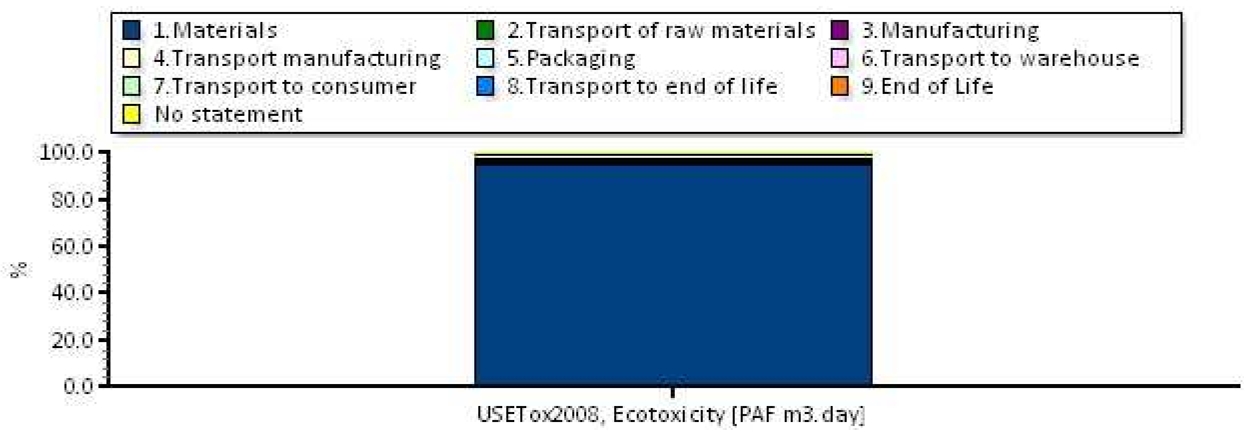
4. Toxicity Hotspots

In addition to the environmental impact categories detailed in previous sections, the study includes an evaluation of Human and Ecotoxicity using the USEtox™ characterization model. The precision of the current USEtox characterization factors is within a factor of 100–1,000 for human health and 10–100 for freshwater ecotoxicity. This is a substantial improvement over previously available toxicity characterization models. However, at present, the international LCA community has not formally adopted the USEtox characterization factors into recommended LCA best practice. Therefore, the USEtox characterization factors are used within this report to identify key components within product lifecycles which influence that product's toxicity potential. The life cycle results would indicate which materials show up as 'flags' but would not include the same level of detail for the USEtox metrics as the TRACI indicators because of the higher uncertainty of the USEtox model.

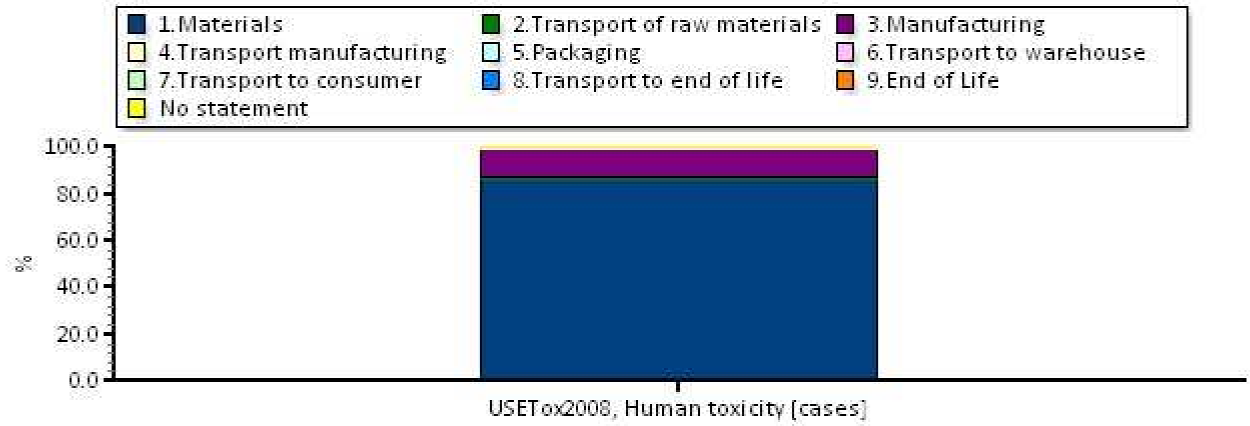
Consequently, no absolute numbers are shown in this section. The goal of this section is to show where the hotspots are for toxicity in the life cycle, but not to compare each scenario.

4.1 Toxicity hotspots in the life cycle

Ecotoxicity

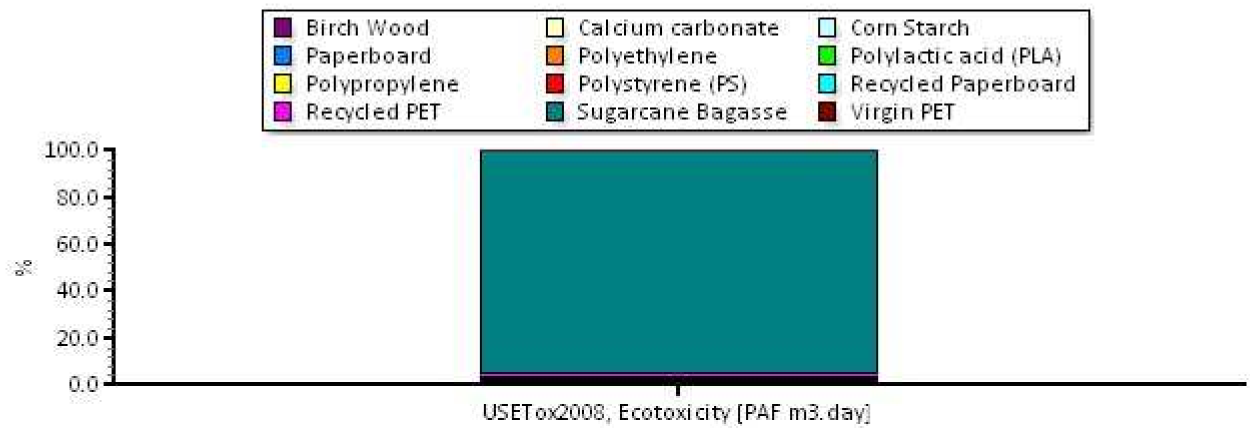


Human toxicity



4.2 Toxicity hotspots in raw materials used

Ecotoxicity



Human toxicity