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"Carbon Footprint of Knitted Garments/Accessories" Final Report

Performed for Qingdao Sino Textile Technique Co.,Ltd

Report TSNT01684717

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By Intertek

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April 8, 2024

This Is To Supersede Report TSNT01679386 Dated April 3, 2024

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1. INTRODUCTION

This study is commissioned by Qingdao Sino Textile Technique Co., Ltd(www.sinotextile.net) to assess the partial product carbon footprint with the support of a Life Cycle Assessment (LCA) approach concerning the knitted garments/accessories product produced by Qingdao Sino Textile Technique Co.,Ltd, which locates in Zoujiawa Village, Fuan Industrial Park, Jiaozhou, 266300 Qingdao, Shandong China.

This carbon footprint assessment study is performed following:

- the ISO 14040 & ISO 14044 standards but cannot be fully compliant because:
 - it is a single-indicator assessment: contribution to Climate Change (kg CO₂e), and
 - it is not peer reviewed.
- the ISO 14067:2018 standard: *Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification.*

1.1 Introduction of the Commissioner

The commissioner of this CFP study is Qingdao Sino Textile Technique Co.,Ltd (www.sinotextile.net), which is located in Zoujiawa Village, Fuan Industrial Park, Jiaozhou, 266300 Qingdao, Shandong China.

Sino Textile Technique Co., Ltd, is one of the leading Merino wool baby & kid products manufacturer and specialist in China. It focuses on circular knitting Merino wool products and export to Scandinavia/France/Germany/UK and other countries in Europe around 20 years.

1.2 Introduction of the Product

This CFP study is to focus on the evaluation of the greenhouse effect of the wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid made of 100% RWS wool knitted 1x1 rib 190g fabric described as below:

- Wool knitted cap solid - light colour (order#PO-00001329);
- Wool knitted cap solid - medium colour (order#PO-00001329);
- Wool knitted cap solid - dark colour (order#PO-00001329);
- Wool knitted body solid - light colour (order#PO-00001324/00001325/00001326);
- Wool knitted body solid - dark colour (order#PO-00001324/00001325/00001326);
- Wool knitted top solid - light colour (order#PO-00001320/00001321/00001322/00001323/00001778);
- Wool knitted top solid - medium colour (order#PO00001320/00001321/00001322/00001323/00001778);
- Wool knitted top solid - dark colour (order#PO-00001320/00001321/00001322/00001323/00001778);
- Wool knitted longjohn solid - light colour (order#PO-00001385/00001386/00001387/00001388);
- Wool knitted longjohn solid - medium colour (order#PO-00001385/00001386/00001387/00001388);
- Wool knitted longjohn solid - dark colour (order#PO-00001385/00001386/00001387/00001388);
- Wool knitted tube solid - light colour (order#PO-00001331);
- Wool knitted tube solid - dark colour (order#PO-00001331);
- Wool knitted turtle top solid - light&dark colour (order#PO-00001332);
- Wool knitted kneepatch pants solid - dark&light colour (order#PO-00001389);
- Wool knitted adult longjohn solid - light colour (order#PO-00001328);
- Wool knitted adult longjohn solid - dark colour (order#PO-00001328);
- Wool knitted adult top solid - light colour (order#PO-00001327);
- Wool knitted adult top solid - dark colour (order#PO-00001327).

2. GOAL AND SCOPE

2.1 Goal of the Study

The goals of the study are to:

- build an up-to-date and well-documented life cycle inventory (LCI) for wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid produced by qingdao sino textile technique co., ltd. the carbon footprint profile shall be presented for one piece of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid.
- evaluate the impact of climate change of the product from cradle to gate, excluding the distribution, maintenance, use phase, or the end-of-life phase of the product.

2.1.1 Reasons for the Study

This carbon footprint assessment study is to enhance the competitiveness of Sino's products in the sustainable consumer market, government procurement and evaluation of green financial product. It could also respond to the challenge of disclosure needs of stakeholders and the management requirements of sustainable supply chains.

2.1.2 Intended Application

The results of the study are to be applied as carbon footprint of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid.

This study is not intended to support any comparative assertion as defined in the ISO 14040, ISO 14044, and ISO 14067:2018 standards. Available published data is used to set the results of the study into perspective, for discussion and interpretation.

2.1.3 Intended Audience

The study is not intended to be published. The intended audience includes internal and external stakeholders. The internal stakeholders include those involved in operations, marketing, and communications. The external stakeholders include customers/consumers, the LCA community as well as the general public.

2.2 Scope of the Study

2.2.1 System Description

In the study, the product system of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid is studied, including the manufacture and transportation of raw materials, the manufacture/packaging/transportation (to Qingdao port) process of garments/accessories.

The garments/accessories delivery (from Qingdao port to customer), use and end-of-life treatment process are beyond the scope of the study.

2.2.2 Declared Unit

The declared units for the partial PCF study are defined as:

- The carbon footprint for processing one piece of wool knitted cap solid - light colour (order#PO-00001329);
- The carbon footprint for processing one piece of wool knitted cap solid - medium colour (order#PO-00001329);
- The carbon footprint for processing one piece of wool knitted cap solid - dark colour (order#PO-00001329);
- The carbon footprint for processing one piece of wool knitted body solid - light colour (order#PO-00001324/00001325/00001326);
- The carbon footprint for processing one piece of wool knitted body solid - dark colour (order#PO-00001324/00001325/00001326);
- The carbon footprint for processing one piece of wool knitted top solid - light colour (order#PO-00001320/00001321/00001322/00001323/00001778);
- The carbon footprint for processing one piece of wool knitted top solid - medium colour (order#PO-00001320/00001321/00001322/00001323/00001778);
- The carbon footprint for processing one piece of wool knitted top solid - dark colour (order#PO-00001320/00001321/00001322/00001323/00001778);
- The carbon footprint for processing one piece of wool knitted longjohn solid - light colour (order#PO-00001385/00001386/00001387/00001388);
- The carbon footprint for processing one piece of wool knitted longjohn solid - medium colour (order#PO-00001385/00001386/00001387/00001388);
- The carbon footprint for processing one piece of wool knitted longjohn solid - dark colour (order#PO-00001385/00001386/00001387/00001388);
- The carbon footprint for processing one piece of wool knitted tube solid - light dark colour (order#PO-00001331);
- The carbon footprint for processing one piece of wool knitted tube solid - dark colour (order#PO-00001331);
- The carbon footprint for processing one piece of wool knitted turtle top solid- light&dark colour (order#PO-00001332);
- The carbon footprint for processing one piece of wool knitted kneepatch pants solid -dark&light colour (order#PO-00001389);
- The carbon footprint for processing one piece of wool knitted adult longjohn solid - light colour (order#PO-00001328);
- The carbon footprint for processing one piece of wool knitted adult longjohn solid - dark colour (order#PO-00001328);
- The carbon footprint for processing one piece of wool knitted adult top solid - light colour (order#PO-00001327);
- The carbon footprint for processing one piece of wool knitted adult top solid - dark colour (order#PO-00001327);

The reference flow associated with the declared unit is one piece of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/audlt top solid and its primary packaging.

2.2.3 System Boundaries

The study is from cradle to gate, starts with the producing of raw wool, and ends by the wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid delivery to Qingdao port.

The processes included in the study to perform the assessment are

- The manufacture and transportation of raw materials,
- The manufacture of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid,
- The packaging of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid,
- The transportation of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid.

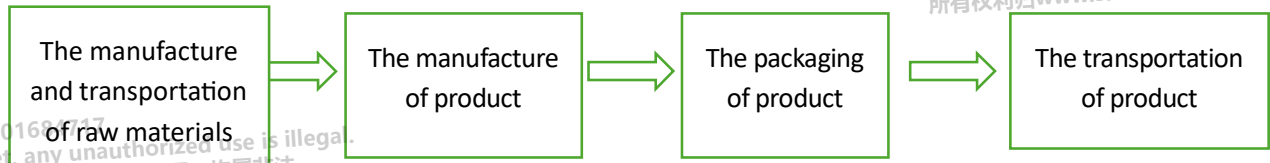


Figure 2-1: Schematic diagram of system boundaries

2.2.4 Assumptions

There is only one electricity meter in the semi-finished light coloured rib knitted fabric manufacturing workshop, and there is no separate reading of a single production line. Based on experience, we assume that the electricity consumption is distributed according to the equipment power, and calculate a coefficient to get the electricity consumption.

2.2.5 Cut-off Criteria

To delimit the system, the inclusion criterion has been set to 1%. Meanwhile, the sum of emissions from processes excluded from the system represents less than 5% of total impacts of the system contributing at each of the impact categories studied here. This value of 5% is the result of modelling constraints, including the availability of data.

In practice, modelling iterations were used, first by maximizing the potential impacts of each process throughout the life cycle. This allows identification of the processes that contribute more than 5% of total emissions of the system. Inventory data and modelling parameters of these processes were subsequently refined.

Exclusion due to cut-off criteria applies to the following parts of the system:

- plant infrastructure,
- consumption and wastes generated by office employees,
- domestic wastes generated on site, and
- some extremely low inputs/outputs of the study system.

2.2.6 Data Collection

The primary data related to the study system were collected through data collection questionnaires designed by Intertek and provided by Qingdao Sino Textile Technique Co., Ltd. without an onsite verification of the data. When bias appears between two sets of data considering the same subject, the one with more robust evidence is adopted, e.g., electricity invoices are preferred to meter reading data collected by the company employees. The upstream primary data were collected through data collection questionnaires designed by Intertek and filled out by the material suppliers of Qingdao Sino Textile Technique Co., Ltd, without an onsite verification of the data.

2.2.7 Geographical Area and Time Horizon

The geographical area considered is China for the materials and product manufacturing phase, the packaging and transportation of products. The calculations are made with primary data related to the production, collected from December 1st, 2022 to November 30th, 2023. All the processes (life cycle inventories from the LCA databases) are from LCA for Experts 10.7.1.28 (GaBi) and ecoinvent 3.9 database.

2.2.8 Data Quality Assessment

2.2.8.1 Representativeness

All the active data collected cover the whole production of the corresponding products, and therefore can represent the average production and emission status.

2.2.8.2 Completeness

All the counted active data related to the manufacturing process of wool knitted cap solid/body solid/top solid /longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid are collected.

2.2.8.3 Reliability

The primary data of wool, yarn, fabric and knitted wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid production were collected and provided by Qingdao Sino Textile Technique Co., Ltd and its suppliers, without an onsite verification of the data. The secondary data related to all production process are from LCA for Experts 10.7.1.28 (GaBi), ecoinvent 3.9 database and literature.

2.2.8.4 Consistency

Each part of data is collected and selected through accordant quality requirements and rules.

2.2.8.5 Reproducibility

The data, methods and modelling processes in this study can be reproduced in the LCA for Experts 10.7.1.28 (GaBi) calculation software.

2.2.8.6 Data quality evaluation

Table II-1: Data Quality Evaluation

Data Category		Data Source	Data Quality
Primary data	Site-specific data	Inputs, outputs, energy consumption Data sheets	+++
Secondary data	Transportation	Raw material transportation (from supplier gate to factory gate) and product transportation (from factory gate to Qingdao port) Baidu Map	++
	Emission factors	Raw materials, waste, energy, resource, etc. LCA for Experts 10.7.1.28 (GaBi) ecoinvent 3.9 Literature	++

Estimate data	Low quality	+
Secondary data	Medium quality	++
Primary data	High quality	+++

2.2.9 Allocation Procedures

2.2.9.1 Allocation of foreground data

In the system studied, the allocation rules are needed for production of the workshops. For example, in the manufacturing of wool knitted cap solid - light colour, the data of energy consumption (Electricity), tap water, waste generation and packaging are the overall data of the whole workshop, which need to be allocated by value, equipment power and weight .

2.2.9.2 Recycling

Recycling does not take place within the system boundaries.

2.2.10 LCIA Methodology and Impact Types

A detailed description is provided in Chapter 3.

2.2.11 Software and Database

The LCA modelling and calculations are made with LCA for Experts 10.7.1.28 (GaBi) software with database in both LCA for Experts 10.7.1.28 (GaBi) and ecoinvent 3.9.

2.3 Critical Review

No critical review is required. The critical review may be performed in the future if required.

3. LIFE CYCLE IMPACT ASSESSMENT (LCIA)

3.1 Impact Category: Climate Change

The climate change is a natural process of global warming which is involved in the radiation balance of the Earth. It is due to greenhouse gas (GHG) emissions in the atmosphere, mainly water vapor (which contributes most to the greenhouse effect), carbon dioxide (CO₂), and methane (CH₄). The GHGs absorb infrared radiation and increase the atmospheric temperature.

This originally natural phenomenon is becoming problematic because of GHG emission increase due to human activities. Each GHG has a different warming potential. It is calculated based a reference called the warming potential of CO₂ and a time-horizon, 100 years here (GWP100). Each GHG is assigned with a characterization factor expressing how many times more important the warming potential of this greenhouse gas is compared to CO₂, whose characterization factor equals 1 when averaged over the time horizon considered.

The calculation methodology is adopted from *IPCC 2021* and the characterization factors are from *IPCC AR6* according to the requirements of *ISO 14067:2018*.

The GHGs and their characterization factors for GWP100 are listed in **Table III-1**.

Table III-1: Characterization Factors for The Climate Change Impact Category, 100 Years

Category Name	Category Unit	Coefficient	Operator	Impact Unit	Impact Name
IPCC-Greenhouse effect (direct, 100 years)	g CO ₂ e	1	X	g	Carbon dioxide (CO ₂)
IPCC-Greenhouse effect (direct, 100 years)	g CO ₂ e	7,380	X	g	Carbon tetrafluoride (CF ₄)
IPCC-Greenhouse effect (direct, 100 years)	g CO ₂ e	29.8	X	g	Methane (CH ₄ , fossil)
IPCC-Greenhouse effect (direct, 100 years)	g CO ₂ e	27	X	g	Methane (CH ₄ , non-fossil)
IPCC-Greenhouse effect (direct, 100 years)	g CO ₂ e	265	X	g	Nitrous oxide (N ₂ O)
IPCC-Greenhouse effect (direct, 100 years)	g CO ₂ e	14,600	X	g	HFC-23 (CHF ₃)

According to the requirements of *ISO 14067:2018*, specific GHG emissions of the partial carbon footprint of the systems studied shall be included and documented separately.

Table III-2 shows the information about the specific GHG emissions.

Table III-2: Impact Categories of Carbon Footprint

Specific GHG Emissions	Reference Unit	Calculation Methodology
Fossil and biogenic GHG emissions and removals	kg CO ₂ e	Climate change, ISO 14067 GWP.
GHG emissions and removals from direct land use change (dLUC)	kg CO ₂ e	Climate change-Emissions from Land use change, ISO 14067 GWP
Aircraft GHG emissions	kg CO ₂ e	Climate change-Air craft emission, ISO 14067 GWP
Biogenic carbon in product	kg CO ₂ e	Climate change, Biogenic GHG emission, ISO 14067 GWP

Additionally, Net fossil and biogenic GHG emissions and removals are reported separately in the study report, as well.

3.2 LCIA Methodology

A life cycle assessment (LCA) approach is adopted to make the analysis of product carbon footprint. This consists of considering all direct and indirect environmental effects for the realisation of a function or for a declared unit (see Chapter 2).

The utilised methodology makes it possible to estimate the emissions, and to evaluate afterwards the partial carbon footprint during the life cycle of the studied system. This "Life Cycle Assessment" is standardised in the ISO 14040:2006 and ISO 14044:2006 norms, and the "Product Carbon Footprint" is standardised in the ISO 14067:2018 norm. Calculations are made with LCA for Experts 10.7.1.28 (GaBi), sphera®'s calculation software.

The main steps of the assessment are the following:

- elaboration of the process tree for each studied system,
- description of the incomes and outcomes of each process, and
- data research of consumptions and emissions ("elementary streams") for each process.

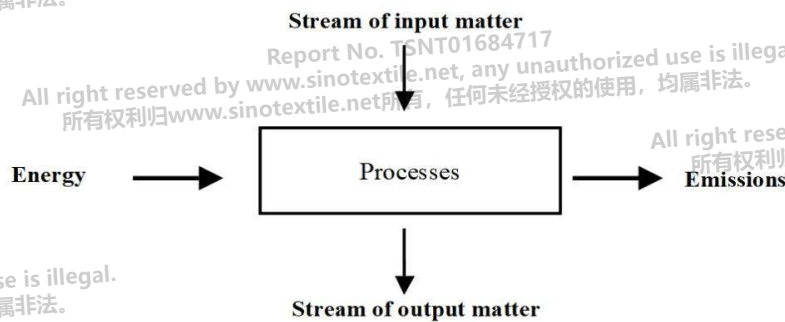


Figure III-1: Scheme of a Process in the Model Tree

Each process is characterised by:

- one (or more) streams of matter incoming from another process,
- one (or more) streams of matter outgoing to another process,
- consumption of energy, water, and mineral resources, and
- emissions of pollutants (in air, water, soil).

Once all processes are identified, their integration makes it possible to set up the whole system.

The modelling of the studied declared unit ends up in a process tree, designed to make it possible to model different systems and to distinguish the impacts of the different phases of the studied system. The environmental balance is calculated by aggregating the elementary flows of the different processes. As a result, all the direct and indirect elementary flows are automatically attributed to the declared unit.

In the LCIA phase, the different emissions are grouped in categories according to the degree of impact on environmental problems, climate change is the specific impact category in this study. For the impact category, some characterisation factors are associated to each emission value to express this effect on the global warming in a common unit (e.g., "kg CO₂e" is a unit for comparing the radiative forcing of a greenhouse gas to that of CO₂).

The carbon footprint thus can be quantified and evaluated, and the most contributing phases can be identified. Subsequently, some measures can be taken to prevent or limit the carbon footprint of these phases. The LCA approach can also help prevent taking decision about life cycle stages that only transfer the carbon footprint from one stage to another.

3.3 Categories of Contribution

Raw materials

Includes resource use and emissions associated with the production of all the main raw materials, which are raw wool, wool yarn, fabric, accessories, packaging materials..., plus the transportation of them to the factory gate, from cradle.

Manufacturing process

Includes resource use and emissions associated with the manufacturing process of the target product and all the additives taking part in the process from cradle.

Packaging

Includes resource use and emissions associated with the packaging materials of the target product from cradle.

Transportation

Includes resource use and emissions associated with the raw materials delivery from cradle and the target product delivery to the Qingdao port.

4. LIFE CYCLE INVENTORY (LCI) ANALYSIS

4.1 General

Primary data on manufacturing process of scoured wool, yarn, fabric and the wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid were collected and provided by Qingdao Sino Textile Technique Co., Ltd and its suppliers.

All the detailed data please refer to the following tables:

Tables from IV-1-1 to IV-1-12 show the LCI results of all relative raw data collection of manufacturing of light/medium/dark coloured wool yarn(1/58Nm).

**Table IV-1-1: Raw Data Collection - Manufacturing of Scoured Wool
 (Zhejiang New Chuwa Wool Co., Ltd)**

Product Name: Scoured wool		
Manufacturing 1 kg of Scoured wool		
Item	Consumption	Unit
Material Consumption		
Greasy wool	1.3697	kg/kg
Sodium carbonate	0.0080	kg/kg
Detergent	0.0181	kg/kg
Energy & Resource Consumption		
Tap water	12.0153	kg/kg
Electricity- national grid	0.3185	kWh/kg
Self-produced photovoltaic power generation	0.2640	kWh/kg
Purchased steam (pressure:0.6mpa, temperature:200℃)	1.9568	kg/kg
Diesel for forklift	0.0016	kg/kg
Consumables	0.0000	¥ /kg
Parts - hardware	0.0425	¥ /kg
Parts - machine accessories	0.0394	¥ /kg
Lubricating oil - gear oil	0.0382	g/kg
Lubricating oil - butter	0.0132	g/kg
Lubricating oil - hydraulic oil	0.0260	g/kg
Waste generated		
Wastewater - treated in own ETP	12.6803	kg/kg
Fallen wool (recycled)	0.0059	kg/kg
Waste short wool (recycled)	0.0488	kg/kg
Hazardous waste (Waste oil)	0.0475	g/kg
Hazardous waste(Packaging materials for chemicals)	0.1264	g/kg
Carbon dioxide emitted from diesel combustion	0.0051	kgCO ₂ e/kg
Carbon dioxide emitted from sodium carbonate	0.0033	kgCO ₂ e/kg
CH ₄ generated from wastewater treatment	0.4621	kgCO ₂ e/kg
Solid content in sludge (Combustion power generation)	0.2571	kg/kg
Water content in sludge	0.3142	kg/kg
Evaporation and loss of water	0.9716	kg/kg
HFCs generated from refrigerant in air conditioners	0.0121	gCO ₂ e/kg
Transport of Raw Materials and Waste		
by ship	6400.0000	km
By truck	120.3453	km

**Table IV-1-2: Raw Data Collection - Manufacturing of Greige Wool Sliver (Thicker Than 70s)
 (Zhejiang New Chuwa Wool Co., Ltd)**

Product Name: Greige Wool Sliver (Thicker Than 70s)		
Manufacturing 1 kg of Greige Wool Sliver (Thicker Than 70s)		
Item	Consumption	Unit
Material Consumption		
Scoured wool	1.1195	kg/kg
Wool spinning lubrication agent	0.0068	kg/kg
Antistatic agent	0.0119	kg/kg
Energy & Resource Consumption		
Electricity- national grid	0.8774	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	0.1078	kg/kg
Consumables	0.0026	¥/kg
Parts - Hardware	0.0052	¥/kg
Parts - Machine accessories	0.6335	¥/kg
Lubricating oil - gear oil	0.1829	g/kg
Lubricating oil - butter	0.0390	g/kg
Lubricating oil - hydraulic oil	0.1767	g/kg
Packaging		
Plastic bag (polyethylene)	0.0025	kg/kg
Waste generated		
Waste wool sliver (recycled)	0.1115	kg/kg
Hazardous waste (Waste oil)	0.0551	g/kg
HFCs generated from refrigerant in air conditioners	2.3058	gCO ₂ e/kg
Transport of Raw Materials and Waste		
By truck	28.7273	km

**Table IV-1-3: Raw Data Collection - Manufacturing of Shrinkproof Greige Wool Sliver (Thicker Than 70s)
(Zhejiang New Chuwa Wool Co., Ltd)**

Product Name: Shrinkproof Greige Wool Sliver (Thicker Than 70s)		
Manufacturing 1 kg of Shrinkproof Greige Wool Sliver (Thicker Than 70s)		
Item	Consumption	Unit
Material Consumption		
Greige wool sliver (thicker than 70s)	1.0240	kg/kg
Softener	0.0600	kg/kg
Sodium pyrosulfite	0.0167	kg/kg
Sulphuric acid (98%)	0.0495	kg/kg
DUROSLIP RT (Quaternized fatty amine ethoxylate)	0.0019	kg/kg
Resin finishing agent (12.5% solid content)	0.1594	kg/kg
Sodium carbonate	0.0425	kg/kg
Sodium hypochlorite	0.2350	kg/kg
Energy & Resource Consumption		
Tap water	15.8884	kg/kg
Electricity- national grid	0.5354	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	1.3520	kg/kg
Consumables	0.0002	¥ /kg
Parts - Hardware	0.0092	¥ /kg
Parts - Machine accessories	0.1601	¥ /kg
Lubricating oil - gear oil	0.0909	g/kg
Lubricating oil - butter	0.0159	g/kg
Lubricating oil - hydraulic oil	0.0490	g/kg
Packaging		
Plastic bag (polyethylene)	0.0031	kg/kg
Waste generated		
Waste wool sliver (recycled)	0.0046	kg/kg
Wastewater - treated in own ETP	16.7507	kg/kg
Carbon dioxide emissions from sodium carbonate	0.0177	kg/kg
CH ₄ generated from wastewater treatment	0.2037	kg/kg
Solid content in sludge (Combustion power generation)	0.0173	kg/kg
Water content in sludge	0.0212	kg/kg
Evaporation and loss of water	0.4897	kg/kg
HFCs generated from refrigerant in air conditioners	5.9439	gCO ₂ e/kg
Transport of Raw Materials and Waste		
By truck	33.8782	km

**Table IV-1-4: Treating of Wastewater
(Zhejiang New Chuwa Wool Co., Ltd)**

Product Name: Wastewater treated		
Treating 1 kg of wastewater		
Item	Consumption	Unit
Material Consumption		
Liquid caustic soda, 32%	0.0037	kg/kg
Ferric sulfate	0.0064	kg/kg
Polyaluminum chloride (PAC)	0.0030	kg/kg
Polyacrylamide (PAM)	0.0001	kg/kg
Energy & Resource Consumption		
Electricity- national grid	0.0082	kWh/kg
Parts - Hardware	0.0001	¥/kg
Parts - Machine accessories	0.0007	¥/kg
Lubricating oil - gear oil	0.0002	g/kg
Lubricating oil - butter	0.0000	g/kg
Lubricating oil - hydraulic oil	0.0018	g/kg
Waste generated		
Wastewater discharge	0.8159	kg/kg
Sludge (Combustion power generation, solid content 45%)	0.0170	kg/kg
Hazardous waste (Waste oil)	0.0013	g/kg
Hazardous waste(Packaging materials for chemicals)	0.0035	g/kg
Evaporation and loss of water	0.1747	kg/kg
HFCs generated from refrigerant in air conditioners	0.0006	gCO ₂ e/kg
Transport of Raw Materials and Waste		
By truck	44.5031	km

**Table IV-1-5: Raw Data Collection - Shrinkproof Light Coloured Wool Sliver (Thicker Than 70s)
 (Zhejiang Houyuan Textiles Inc.)**

Product Name: Shrinkproof Light Coloured Wool Sliver (Thicker Than 70s)		
Manufacturing 1 kg of Shrinkproof Light Coloured Wool Sliver (Thicker Than 70s)		
Item	Consumption	Unit
Material Consumption		
Shrinkproof greige wool sliver (thicker than 70s)	1.0091	kg/kg
Reactive dyes	0.0126	kg/kg
Levelling agent (34% solid content)	0.0112	kg/kg
Soaping agent (30% solid content)	0.0055	kg/kg
Softener (10% solid content)	0.0010	kg/kg
Caustic soda flakes	0.0022	kg/kg
Sodium carbonate	0.0279	kg/kg
Glacial acetic acid	0.0159	kg/kg
Energy & Resource Consumption		
Rainwater	3.4984	kg/kg
River water	29.9854	kg/kg
Reclaimed water	24.5555	kg/kg
Electricity- national grid	0.6088	kWh/kg
Self-produced photovoltaic power generation	0.1564	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	4.2076	kg/kg
Packaging		
Plastic woven bag (polyethylene)	0.0053	kg/kg
Waste generated		
Sludge (Combustion power generation, solid content 30%)	0.0892	kg/kg
Wastewater - treated in own ETP	58.0065	kg/kg
Evaporation and loss of water	4.2300	kg/kg
Waste wool sliver (recycled)	0.0084	kg/kg
HFCs generated from refrigerant in air conditioners	3.9373	gCO ₂ e/kg
Transport of Raw Materials		
By truck	5.5077	km

Table IV-1-6: Raw Data Collection - Manufacturing of Shrinkproof Medium Coloured Wool Sliver (Thicker Than 70s) (Zhejiang Houyuan Textiles Inc.)

Product Name: Shrinkproof Medium Coloured Wool Sliver (Thicker Than 70s)		
Manufacturing 1 kg of Shrinkproof Medium Coloured Wool Sliver (Thicker Than 70s)		
Item	Consumption	Unit
Material Consumption		
Shrinkproof greige wool sliver (thicker than 70s)	1.0091	kg/kg
Reactive dyes	0.0379	kg/kg
Penetrant agent (25% solid content)	0.0062	kg/kg
Levelling agent (34% solid content)	0.0223	kg/kg
Soaping agent (30% solid content)	0.0110	kg/kg
Softener (10% solid content)	0.0020	kg/kg
Caustic soda flakes	0.0022	kg/kg
Sodium carbonate	0.0279	kg/kg
Glacial acetic acid	0.0159	kg/kg
Energy & Resource Consumption		
Rainwater	4.2450	kg/kg
River water	36.3848	kg/kg
Reclaimed water	29.7142	kg/kg
Electricity- national grid	0.6393	kWh/kg
Self-produced photovoltaic power generation	0.1635	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	4.8233	kg/kg
Packaging		
Plastic woven bag (polyethylene)	0.0053	kg/kg
Waste generated		
Sludge (Combustion power generation, solid content 30%)	0.0892	kg/kg
Wastewater - treated in own ETP	70.3859	kg/kg
Evaporation and loss of water	4.7810	kg/kg
Waste wool sliver (recycled)	0.0084	kg/kg
HFCs generated from refrigerant in air conditioners	3.9373	gCO ₂ e/kg
Transport of Raw Materials		
By truck	10.7037	km

Table IV-1-7: Raw Data Collection - Manufacturing of Shrinkproof Dark Coloured Wool Sliver (Thicker Than 70s) (Zhejiang Houyuan Textiles Inc.)

Product Name: Shrinkproof Dark Coloured Wool Sliver (Thicker Than 70s)		
Manufacturing 1 kg of Shrinkproof Dark Coloured Wool Sliver (Thicker Than 70s)		
Item	Consumption	Unit
Material Consumption		
Shrinkproof greige wool sliver (thicker than 70s)	1.0091	kg/kg
Reactive dyes	0.0504	kg/kg
Penetrant agent (25% solid content)	0.0062	kg/kg
Levelling agent (34% solid content)	0.0223	kg/kg
Soaping agent (30% solid content)	0.0221	kg/kg
Softener (10% solid content)	0.0021	kg/kg
Caustic soda flakes	0.0022	kg/kg
Sodium carbonate	0.0279	kg/kg
Glacial acetic acid	0.0159	kg/kg
Energy & Resource Consumption		
Rainwater	5.0343	kg/kg
River water	43.1498	kg/kg
Reclaimed water	35.2856	kg/kg
Electricity- national grid	0.7460	kWh/kg
Self-produced photovoltaic power generation	0.1919	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200℃)	5.6443	kg/kg
Packaging		
Plastic woven bag (polyethylene)	0.0053	kg/kg
Waste generated		
Sludge (Combustion power generation, solid content 30%)	0.0892	kg/kg
Wastewater - treated in own ETP	83.4727	kg/kg
Evaporation and loss of water	5.6410	kg/kg
Waste wool sliver (recycled)	0.0084	kg/kg
HFCs generated from refrigerant in air conditioners	3.9373	gCO ₂ e/kg
Transport of Raw Materials		
By truck	12.4055	km

**Table IV-1-8: Treating of Wastewater
(Zhejiang Houyuan Textiles Inc.)**

Product Name: Wastewater Treated		
Manufacturing 1 kg of Wastewater Treated		
Item	Consumption	Unit
Material Consumption		
Ferric sulfate	0.0004	kg/kg
Polyaluminum chloride (PAC)	0.0003	kg/kg
Polyacrylamide (PAM)	0.0003	g/kg
Energy & Resource Consumption		
Electricity- national grid	0.0015	kWh/kg
Self-produced photovoltaic power generation	0.0004	kWh/kg
Waste generated		
Wastewater discharge	0.5823	kg/kg
Circulating water untreated	0.3966	kg/kg
Sludge (Combustion power generation, solid content 30%)	0.0011	kg/kg
CH ₄ generated from wastewater treatment	0.0014	kgCO ₂ e/kg
Evaporation and loss of water	0.0210	kg/kg
Transport of Raw Materials and Waste		
By truck	29.8271	km

**Table IV-1-9: Treating of Reclaimed Water
(Zhejiang Houyuan Textiles Inc.)**

Product Name: Reclaimed Water		
Manufacturing 1 kg of Wastewater Treated		
Item	Consumption	Unit
Material Consumption		
Citric acid	0.0088	g/kg
Oxalic acid	0.0097	g/kg
Sodium pyrosulfite	0.0091	g/kg
Sodium hydroxide	0.0063	g/kg
Reverse osmosis membrane (polyamide film composite)	0.0042	g/kg
Energy & Resource Consumption		
Circulating water untreated	1.0014	kg/kg
Electricity- national grid	0.0012	kWh/kg
Self-produced photovoltaic power generation	0.0003	kWh/kg
Waste generated		
Evaporation and loss of water	0.0014	kg/kg
Transport of Raw Materials		
By truck	15.0000	km

**Table IV-1-10: Raw Data Collection - Manufacturing of Light Coloured Wool Yarn (1/58Nm)
(Zhejiang Xiniao Textiles Inc.)**

Product Name: Light Coloured Wool Yarn (1/58Nm)		
Manufacturing 1 kg of Light Coloured Wool Yarn (1/58Nm)		
Item	Consumption	Unit
Material Consumption		
Shrinkproof light coloured wool sliver (thicker than 70s)	1.0551	kg/kg
Wool spinning lubrication agent	0.0032	kg/kg
Antistatic agent	0.0021	kg/kg
Wax	0.0016	kg/kg
Energy & Resource Consumption		
Lubricating oil	0.0002	kg/kg
Diesel for forklift	0.0022	kg/kg
Electricity- national grid	5.5914	kWh/kg
Self-produced photovoltaic power generation	0.4689	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	0.2823	kg/kg
Packaging		
Plastic bag (polyethylene)	0.0465	kg/kg
Corrugated box	0.0769	kg/kg
Paper tube	0.0409	kg/kg
Packing belt (PP)	0.0006	kg/kg
Waste generated		
Waste yarn (recycled)	0.0299	kg/kg
Waste wax (recycled)	0.0002	kg/kg
Waste packing belt (PP) (recycled)	0.0005	kg/kg
Waste paper tube (recycled)	0.0000	kg/kg
Waste wool (recycled)	0.0093	kg/kg
Carbon dioxide emissioned come from diesel combustion	0.0070	kgCO ₂ e/kg
HFCs generated from refrigerant in air conditioners	0.0215	kgCO ₂ e/kg
Water loss (discrease in yarn moisture regain rate)	0.0156	kg/kg
Transport of Raw Materials		
By truck	76.4955	km

**Table IV-1-11: Raw Data Collection - Manufacturing of Medium Coloured Wool Yarn (1/58Nm)
(Zhejiang Xinao Textiles Inc.)**

Product Name: Medium Coloured Wool Yarn (1/58Nm)		
Manufacturing 1 kg of Medium Coloured Wool Yarn (1/58Nm)		
Item	Consumption	Unit
Material Consumption		
Shrinkproof medium coloured wool sliver (thicker than 70s)	1.0551	kg/kg
Wool spinning lubrication agent	0.0032	kg/kg
Antistatic agent	0.0021	kg/kg
Wax	0.0016	kg/kg
Energy & Resource Consumption		
Lubricating oil	0.0002	kg/kg
Diesel for forklift	0.0022	kg/kg
Electricity- national grid	5.5914	kWh/kg
Self-produced photovoltaic power generation	0.4689	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	0.2823	kg/kg
Packaging		
Plastic bag (polyethylene)	0.0465	kg/kg
Corrugated box	0.0769	kg/kg
Paper tube	0.0409	kg/kg
Packing belt (PP)	0.0006	kg/kg
Waste generated		
Waste yarn (recycled)	0.0299	kg/kg
Waste wax (recycled)	0.0002	kg/kg
Waste packing belt (PP) (recycled)	0.0005	kg/kg
Waste paper tube (recycled)	0.0000	kg/kg
Waste wool (recycled)	0.0093	kg/kg
Carbon dioxide emissioned come from diesel combustion	0.0070	kgCO ₂ e/kg
HFCs generated from refrigerant in air conditioners	0.0215	kgCO ₂ e/kg
Water loss (discrease in yarn moisture regain rate)	0.0156	kg/kg
Transport of Raw Materials		
By truck	76.4955	km

**Table IV-1-12: Raw Data Collection - Manufacturing of Dark Coloured Wool Yarn (1/58Nm)
(Zhejiang Xinao Textiles Inc.)**

Product Name: Dark Coloured Wool Yarn (1/58Nm)		
Manufacturing 1 kg of Dark Coloured Wool Yarn (1/58Nm)		
Item	Consumption	Unit
Material Consumption		
Shrinkproof dark coloured wool sliver (thicker than 70s)	1.0551	kg/kg
Wool spinning lubrication agent	0.0032	kg/kg
Antistatic agent	0.0021	kg/kg
Wax	0.0016	kg/kg
Energy & Resource Consumption		
Lubricating oil	0.0002	kg/kg
Diesel for forklift	0.0022	kg/kg
Electricity- national grid	5.5914	kWh/kg
Self-produced photovoltaic power generation	0.4689	kWh/kg
Purchased steam (Pressure:0.6MPa, Temperature:200°C)	0.2823	kg/kg
Packaging		
Plastic bag (polyethylene)	0.0465	kg/kg
Corrugated box	0.0769	kg/kg
Paper tube	0.0409	kg/kg
Packing belt (PP)	0.0006	kg/kg
Waste generated		
Waste yarn (recycled)	0.0299	kg/kg
Waste wax (recycled)	0.0002	kg/kg
Waste packing belt (PP) (recycled)	0.0005	kg/kg
Waste paper tube (recycled)	0.0000	kg/kg
Waste wool (recycled)	0.0093	kg/kg
Carbon dioxide emitted come from diesel combustion	0.0070	kgCO ₂ e/kg
HFCs generated from refrigerant in air conditioners	0.0215	kgCO ₂ e/kg
Water loss (decrease in yarn moisture regain rate)	0.0156	kg/kg
Transport of Raw Materials		
By truck	76.4955	km



Total Quality. Assured.

Tables from IV-2-1 to IV-2-4 show the LCI results of all relative raw data collection of Manufacturing of semi-finished light/medium/dark coloured rib knitted fabric/light coloured interlock knitted fabric.

Table IV-2-1: Raw Data Collection - Manufacturing of Semi-Finished Light Coloured Rib Knitted Fabric (Qingdao Yujinbo Knitting Co., LTD)

Product Name: Semi-Finished Light Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Manufacturing 1 kg of Semi-Finished Light Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Item	Consumption	Unit
Material Consumption		
Light coloured wool yarn(1/58Nm)	1.0191	kg/kg
Lubricating oil	0.0016	kg/kg
Diesel(Forklift)	0.0003	kg/kg
Consumable parts (Metal)	0.0153	¥/kg
Energy & Resource Consumption		
Electricity- national grid	0.4796	kWh/kg
Waste generated		
Waste yarn	0.0191	kg/kg
Waste lubricating oil	0.0008	kg/kg
Waste packaging paper	0.0160	kg/kg
Waste packaging plastic	0.0054	kg/kg
Transport of Raw Materials		
By truck	825.6955	km

Table IV-2-2: Raw Data Collection - Manufacturing of Semi-Finished Medium Coloured Rib Knitted Fabric (Qingdao Yujinbo Knitting Co., LTD)

Product Name: Semi-Finished Medium Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Manufacturing 1 kg of Semi-Finished Medium Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Item	Consumption	Unit
Material Consumption		
Medium coloured wool yarn(1/58Nm)	1.0303	kg/kg
Lubricating oil	0.0016	kg/kg
Diesel(Forklift)	0.0003	kg/kg
Consumable parts (Metal)	0.0153	¥/kg
Energy & Resource Consumption		
Electricity- national grid	0.4796	kWh/kg
Waste generated		
Waste yarn	0.0235	kg/kg
Waste lubricating oil	0.0008	kg/kg
Waste packaging paper	0.016	kg/kg
Waste packaging plastic	0.0054	kg/kg
Transport of Raw Materials		
By truck	825.7208	km

Table IV-2-3: Raw Data Collection - Manufacturing of Semi-Finished Dark Coloured Rib Knitted Fabric (Qingdao Yujinbo Knitting Co., LTD)

Product Name: Semi-Finished Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Manufacturing 1 kg of Semi-Finished Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Item	Consumption	Unit
Material Consumption		
Dark coloured wool yarn(1/58Nm)	1.0235	kg/kg
Lubricating oil	0.0016	kg/kg
Diesel(Forklift)	0.0003	kg/kg
Consumable parts (Metal)	0.0153	¥/kg
Energy & Resource Consumption		
Electricity- national grid	0.4796	kWh/kg
Waste generated		
Waste yarn	0.0235	kg/kg
Waste lubricating oil	0.0008	kg/kg
Waste packaging paper	0.016	kg/kg
Waste packaging plastic	0.0054	kg/kg
Transport of Raw Materials		
By truck	825.6985	km



Total Quality. Assured.

Table IV-2-4 Raw Data Collection - Manufacturing of Semi-Finished Light Coloured Interlock Knitted Fabric (Qingdao Yujinbo Knitting Co., LTD)

Product Name: Semi-Finished Light Coloured Interlock Knitted Fabric (100% RWS Wool 240g)		
Manufacturing 1 kg of Semi-Finished Light Coloured Interlock Knitted Fabric (100% RWS Wool 240g)		
Item	Consumption	Unit
Material Consumption		
Light coloured wool yarn(1/58Nm)	1.0500	kg/kg
Lubricating oil	0.0016	kg/kg
Diesel(Forklift)	0.0003	kg/kg
Consumable parts (Metal)	0.0153	¥/kg
Energy & Resource Consumption		
Electricity- national grid	0.9578	kWh/kg
Waste generated		
Waste yarn	0.0500	kg/kg
Waste lubricating oil	0.0008	kg/kg
Waste packaging paper	0.0160	kg/kg
Waste packaging plastic	0.0054	kg/kg
Transport of Raw Materials		
By truck	825.7448	km

Tables from IV-3-1 to IV-3-4 show the LCI results of all relative raw data collection of manufacturing of finished light/medium/dark coloured rib knitted fabric/light coloured interlock knitted fabric.

Table IV-3-1: Raw Data Collection - Manufacturing of Finished Light Coloured Rib Knitted Fabric

Product Name: Finished Light Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Manufacturing 1 kg of Finished Light Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Item	Consumption	Unit
Material Consumption		
Semi-Finished Rib Knitted Fabric In Light Colour	1.1195	kg/kg
Sodium fatty alcohol polyoxyethylene ether sulfate	0.0112	kg/kg
Glacial acetic acid	0.0112	kg/kg
Mercerizing softener (40% Solid content)	0.0896	kg/kg
Wool softener	0.0448	kg/kg
Solubilised press agent	0.0224	kg/kg
Polyester thread for sewing	0.0370	g/kg
Energy & Resource Consumption		
Electricity-national grid	1.0440	kWh/kg
Water-underground water	67.1715	kg/kg
Natural gas	0.1192	kg/kg
Purchased steam (Pressure:0.4MPa, Temperature:160°C)	7.7452	MJ/kg
Midea air conditioner (R32 refrigerating fluid)	0.0292	gCO ₂ e/kg
Gree air conditioner (R410A refrigerating fluid)	0.0659	gCO ₂ e/kg
Packaging		
PVC packing bag	0.0020	kg/kg
Waste generated		
Waste Finished Knitted Fabric (recycled)	0.1179	kg/kg
Rejected material-plastic (recycled)	0.0010	kg/kg
Rejected material-paper (recycled)	0.0005	kg/kg
Rejected material-fabric (recycled)	0.0002	kg/kg
Waste water	67.1715	kg/kg
Transport of Raw Materials		
By truck	211.7079	km

Table IV-3-2: Raw Data Collection - Manufacturing of Finished Medium Coloured Rib Knitted Fabric ()

Product Name: Finished Medium Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Manufacturing 1 kg of Finished Medium Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Item	Consumption	Unit
Material Consumption		
Semi-Finished Rib Knitted Fabric In Medium Colour	1.1221	kg/kg
Sodium fatty alcohol polyoxyethylene ether sulfate	0.0112	kg/kg
Glacial acetic acid	0.0112	kg/kg
Mercerizing softener (40% Solid content)	0.0898	kg/kg
Wool softener	0.0449	kg/kg
Solubilised press agent	0.0224	kg/kg
Polyester thread for sewing	0.0371	g/kg
Energy & Resource Consumption		
Electricity-national grid	1.0464	kWh/kg
Water-underground water	67.3277	kg/kg
Natural gas	0.1195	kg/kg
Purchased steam (Pressure:0.4MPa, Temperature:160°C)	7.7632	MJ/kg
Midea air conditioner (R32 refrigerating fluid)	0.0293	gCO ₂ e/kg
Gree air conditioner (R410A refrigerating fluid)	0.0661	gCO ₂ e/kg
Packaging		
PVC packing bag	0.0020	kg/kg
Waste generated		
Waste Finished Knitted Fabric (recycled)	0.1205	kg/kg
Rejected material-plastic (recycled)	0.0010	kg/kg
Rejected material-paper (recycled)	0.0005	kg/kg
Rejected material-fabric (recycled)	0.0002	kg/kg
Waste water	67.3277	kg/kg
Transport of Raw Materials		
By truck	211.6750	km

Table IV-3-3: Raw Data Collection - Manufacturing of Finished Dark Coloured Rib Knitted Fabric ()

Product Name: Finished Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Manufacturing 1 kg of Finished Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)		
Item	Consumption	Unit
Material Consumption		
Semi-Finished Rib Knitted Fabric In Dark Colour	1.0929	kg/kg
Sodium fatty alcohol polyoxyethylene ether sulfate	0.0109	kg/kg
Glacial acetic acid	0.0109	kg/kg
Mercerizing softener (40% Solid content)	0.0874	kg/kg
Wool softener	0.0437	kg/kg
Solubilised press agent	0.0219	kg/kg
Polyester thread for sewing	0.0361	g/kg
Energy & Resource Consumption		
Electricity-national grid	1.0191	kWh/kg
Water-underground water	65.5719	kg/kg
Natural gas	0.1164	kg/kg
Purchased steam (Pressure:0.4MPa, Temperature:160℃)	7.5607	MJ/kg
Midea air conditioner (R32 refrigerating fluid)	0.0285	gCO ₂ e/kg
Gree air conditioner (R410A refrigerating fluid)	0.0644	gCO ₂ e/kg
Packaging		
PVC packing bag	0.0020	kg/kg
Waste generated		
Waste Finished Knitted Fabric (recycled)	0.0913	kg/kg
Rejected material-plastic (recycled)	0.0009	kg/kg
Rejected material-paper (recycled)	0.0004	kg/kg
Rejected material-fabric (recycled)	0.0002	kg/kg
Waste water	65.5719	kg/kg
Transport of Raw Materials		
By truck	211.6750	km

Table IV-3-4: Raw Data Collection - Manufacturing of Finished Light Coloured Interlock Knitted Fabric ()

Product Name: Finished Light Coloured Interlock Knitted Fabric (100% RWS Wool 240g)		
Manufacturing 1 kg of Finished Light Coloured Interlock Knitted Fabric (100% RWS Wool 240g)		
Item	Consumption	Unit
Material Consumption		
Semi-Finished Interlock Knitted Fabric In Light Colour	1.1765	kg/kg
Sodium fatty alcohol polyoxyethylene ether sulfate	0.0118	kg/kg
Glacial acetic acid	0.0118	kg/kg
Mercerizing softener (40% Solid content)	0.0941	kg/kg
Wool softener	0.0471	kg/kg
Solubilised press agent	0.0235	kg/kg
Polyester thread for sewing	0.0389	g/kg
Energy & Resource Consumption		
Electricity-national grid	1.0971	kWh/kg
Water-underground water	70.5882	kg/kg
Natural gas	0.1253	kg/kg
Purchased steam (Pressure:0.4MPa, Temperature:160°C)	8.1391	MJ/kg
Midea air conditioner (R32 refrigerating fluid)	0.0307	gCO ₂ e/kg
Gree air conditioner (R410A refrigerating fluid)	0.0693	gCO ₂ e/kg
Packaging		
PVC packing bag	0.0021	kg/kg
Waste generated		
Waste Finished Knitted Fabric (recycled)	0.1748	kg/kg
Rejected material-plastic (recycled)	0.0010	kg/kg
Rejected material-paper (recycled)	0.0005	kg/kg
Rejected material-fabric (recycled)	0.0002	kg/kg
Waste water	70.5882	kg/kg
Transport of Raw Materials		
By truck	211.6750	km

Tables from IV-4-1 to IV-4-9 show the LCI results of all relative raw data collection of Manufacturing of 19 types light/medium/dark coloured wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid /kneepatch pants solid/adult longjohn solid/adult top solid.



**Table IV-4-1: Raw Data Collection - Manufacturing of Wool Knitted Cap Solid
 - Light/Medium/Dark Colour (Order#PO-00001329)
 (Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Wool Knitted Cap Solid - Light/Medium/Dark Colour (Order#PO-00001329)		
Declared Unit: Manufacturing one piece of Wool Knitted Cap Solid - Light/Medium/Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Light/Medium/Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.0348	kg/piece
Dry cleaning agent	0.0068	g/piece
Lubricating oil	0.0022	g/piece
Main 55	0.1325	g/piece
Main 52	0.1123	g/piece
Care 13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Deco 62	0.1515	g/piece
Needle thread	0.4485	g/piece
Polyester thread	0.4968	g/piece
Nylon thread	0.7945	g/piece
Hangtag+String	0.6637	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.1876	kWh/piece
Tap water	0.0636	kg/piece
Gree air conditioner (R32 refrigerating fluid)	0.3855	gCO ₂ e/kg
Waste generated		
Waste paper	0.0008	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0050	kg/piece
Packaging		
Plastic film	0.0159	g/piece
GRS master polybag	0.1885	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Transparent hook	0.6804	g/piece
Transparent plastick pin	0.0259	g/piece
Carton	4.6396	g/piece
Transparent adhesive tape	0.0387	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231	km
By truck	104.5150	km



**Table IV-4-2: Raw Data Collection - Manufacturing of Wool Knitted Body Solid
 - Light/Dark Colour (Order#PO-00001324/00001325/00001326)
 (Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Wool Knitted Body Solid - Light/Dark Colour (Order#PO-00001324/00001325/00001326)		
Declared Unit: Manufacturing one Piece of Wool Knitted Body Solid - Light/Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Rib Knitted Fabric In Light/ Dark Colour (100% RWS Wool 1x1 Rib 190g)	0.0809	kg/piece
Dry cleaning agent	0.0147	g/piece
Lubricating oil	0.0047	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Main 52	0.1325	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
0.7cm woven tape	0.6342	g/piece
Elastic tape	0.1409	g/piece
15L YKK popper	3.3158	g/piece
Needle thread	0.8821	g/piece
Polyester thread	1.1016	g/piece
Nylon thread	1.9068	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.3642	kWh/piece
Tap water	0.1368	kg/piece
Gree air conditioner (R32 refrigerating fluid)	0.8481	gCO ₂ e/kg
Waste generated		
Waste paper	0.0017	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0107	kg/piece
Packaging		
Plastic film	0.0037	g/piece
GRS master polybag	0.3950	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	9.7255	g/piece
Transparent adhesive tape	0.0812	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	91.0840	km

**Table IV-4-3: Raw Data Collection - Manufacturing of Wool Knitted Top Solid
- Light/Medium/Dark Colour (order#PO-00001320/00001321/00001322/00001323/00001778)
(Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Wool Knitted Top Solid - Light/Medium/Dark Colour (Order#PO00001320/00001321/00001322/00001323)		
Declared Unit: Manufacturing one Piece of Wool Knitted Top Solid - Light/Medium/Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Rib Knitted Fabric In Light/ Medium/Dark Colour (100% RWS Wool 1x1 Rib 190g)	0.0950	kg/piece
Dry cleaning agent	0.0175	g/piece
Lubricating oil	0.0056	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
Needle thread	0.7624	g/piece
Polyester thread	1.1448	g/piece
Nylon thread	2.2700	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.3788	kWh/piece
Tap water	0.1631	kg/piece
Gree air conditioner (R32 refrigerating fluid)	1.0023	gCO ₂ e/kg
Waste generated		
Waste paper	0.0020	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0128	kg/piece
Packaging		
Plastic film	0.0044	g/piece
GRS master polybag	0.4539	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	11.1744	g/piece
Transparent adhesive tape	0.0933	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	79.4860	km

Table IV-4-4: Raw Data Collection - Manufacturing of Wool Knitted Longjohn Solid - Light/Medium/Dark Colour (Order#PO-00001385/00001386/00001387/00001388) (Qingdao Sino Textile Technique Co.,Ltd)

Product Name: Wool Knitted Longjohn Solid - Light/Medium/Dark Colour (Order#PO-00001385/00001386/00001387/00001388)		
Declared Unit: Manufacturing one Piece of Wool Knitted Longjohn Solid - Light/Medium/Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Light/ Medium/Dark Coloured Rib Knitted Fabric(100% RWS Wool 1x1 Rib 190g)	0.0719	kg/piece
Dry cleaning agent	0.0146	g/piece
Lubricating oil	0.0047	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Main 52	0.1325	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
Sofo GRS elastic tape	3.2450	g/piece
Needle thread	0.5315	g/piece
Polyester thread	1.0368	g/piece
Nylon thread	1.7706	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.3621	kWh/piece
Tap water	0.1364	kg/piece
Gree air conditioner (R32 refrigerating fluid)	0.8481	gCO ₂ e/kg
Waste generated		
Waste paper	0.0017	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0107	kg/piece
Packaging		
Plastic film	0.0037	g/piece
GRS master polybag	0.4313	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	10.6161	g/piece
Transparent adhesive tape	0.0886	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	108.0621	km

**Table IV-4-5: Raw Data Collection - Manufacturing of Wool Knitted Tube Solid
- Light/Dark (Order#PO-00001331)
(Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Wool Knitted Tube Solid- Light/Dark (Order#PO-00001331)		
Declared Unit: Manufacturing one piece of Wool Knitted Tube Solid- Light/Dark		
Item	Consumption	Unit
Material Consumption		
Finished Light/ Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.0450	kg/piece
Dry cleaning agent	0.0092	g/piece
Lubricating oil	0.0029	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
Deco 62	0.1515	g/piece
30# RWS label	0.1630	g/piece
Needle thread	0.2392	g/piece
Polyester thread	0.2160	g/piece
Nylon thread	0.6356	g/piece
Hangtag+String	0.6637	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.2252	kWh/piece
Tap water	0.0854	kg/piece
Gree air conditioner (R32 refrigerating fluid)	0.5397	gCO ₂ e/kg
Waste generated		
Waste paper	0.0011	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0067	kg/piece
Packaging		
Plastic film	0.0023	g/piece
GRS master polybag	0.1912	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Transparent hook	0.6804	g/piece
Transparent plastic pin	0.0259	g/piece
Carton	4.7060	g/piece
Transparent adhesive tape	0.0393	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	89.9131	km



Table IV-4-6: Raw Data Collection - Manufacturing of Wool Knitted Turtle Top Solid
- Light&Dark Colour (Order#PO-00001332)
(Qingdao Sino Textile Technique Co.,Ltd)

Product Name: Wool Knitted Turtle Top Solid – Light&Dark Colour (Order#PO-00001332)		
Declared Unit: Manufacturing one Piece of Wool Knitted Turtle Top Solid – Light&Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Light Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.0671	kg/piece
Finished Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.0363	kg/piece
Dry cleaning agent	0.0182	g/piece
Lubricating oil	0.0058	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
Needle thread	0.8225	g/piece
Polyester thread	1.4040	g/piece
Nylon thread	2.5197	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.3958	kWh/piece
Tap water	0.1701	kg/piece
Gree air conditioner (R32 refrigerating fluid)	1.0794	gCO ₂ e/kg
Waste generated		
Waste paper	0.0021	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0133	kg/piece
Packaging		
Plastic film	0.0046	g/piece
GRS master polybag	0.4433	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	10.9141	g/piece
Transparent adhesive tape	0.0912	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	94.1046	km

**Table IV-4-7: Raw Data Collection - Manufacturing of Kneepatch Pants Solid
- Dark&Light Colour(Order#PO-00001389)
(Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Kneepatch Pants Solid – Dark&Light Colour(Order#PO-00001389)		
Declared Unit: Manufacturing one Piece of Kneepatch Pants Solid – Dark&Light Colour		
Item	Consumption	Unit
Material Consumption		
Finished Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.0693	kg/piece
Finished Light Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.0091	kg/piece
Finished Interlock Knitted Fabric In Light Colour	0.0080	kg/piece
Dry cleaning agent	0.0158	g/piece
Lubricating oil	0.0050	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
Sofo GRS elastic tape	3.3830	g/piece
Needle thread	1.2485	g/piece
Polyester thread	1.1664	g/piece
Nylon thread	2.3835	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.3976	kWh/piece
Tap water	0.1477	kg/piece
Gree air conditioner (R32 refrigerating fluid)	0.9252	gCO ₂ e/kg
Waste generated		
Waste paper	0.0018	kg/piece
Waste plastic bag	0.0001	kg/piece
Waste cloth	0.0116	kg/piece
Packaging		
Plastic film	0.0040	g/piece
GRS master polybag	0.4433	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	10.9154	g/piece
Transparent adhesive tape	0.0911	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	81.9711	km

**Table IV-4-8: Raw Data Collection - Manufacturing of Wool Knitted Adult Longjohn Solid
 - Light/Dark Colour (Order#PO-00001328)
 (Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Wool Knitted Adult Longjohn Solid - Light/Dark Colour(Order#PO-00001328)		
Declared Unit: Manufacturing one Piece of Wool Knitted Adult Longjohn Solid - Light/Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Light/ Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.1999	kg/piece
Dry cleaning agent	0.0315	g/piece
Lubricating oil	0.0100	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
Needle thread	0.8820	g/piece
Polyester thread	1.5768	g/piece
Nylon thread	3.0418	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity-national grid	0.5307	kWh/piece
Tap water	0.2935	kg/piece
Gree air conditioner (R32 refrigerating fluid)	1.8504	gCO ₂ e/kg
Waste generated		
Waste paper	0.0036	kg/piece
Waste plastic bag	0.0002	kg/piece
Waste cloth	0.0230	kg/piece
Packaging		
Plastic film	0.0080	g/piece
GRS master polybag	0.8248	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	20.3072	g/piece
Transparent adhesive tape	0.1695	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	71.7698	km

**Table IV-4-9: Raw Data Collection - Manufacturing of Wool Knitted Adult Top Solid
- Light/Dark Colour (Order#PO-00001327)
(Qingdao Sino Textile Technique Co.,Ltd)**

Product Name: Wool Knitted Adult Top Solid - Light/Dark Colour (Order#PO-00001327)		
Declared Unit: Manufacturing one Piece of Wool Knitted Adult Top Solid - Light/Dark Colour		
Item	Consumption	Unit
Material Consumption		
Finished Light/ Dark Coloured Rib Knitted Fabric (100% RWS Wool 1x1 Rib 190g)	0.1989	kg/piece
Dry cleaning agent	0.0361	g/piece
Lubricating oil	0.0115	g/piece
Main 55	0.1123	g/piece
Care13	0.3374	g/piece
30# RWS label	0.1630	g/piece
Main 52	0.1325	g/piece
Deco 55	0.0918	g/piece
Satin loop	0.0283	g/piece
Sofo GRS elastic tape	4.7638	g/piece
Needle thread	0.6429	g/piece
Polyester thread	1.5120	g/piece
Nylon thread	2.5424	g/piece
Hangtag+String	1.3979	g/piece
Energy & Resource Consumption		
Electricity	0.5397	kWh/piece
Tap water	0.3368	kg/piece
Gree air conditioner (R32 refrigerating fluid)	2.0817	gCO ₂ e/kg
Waste generated		
Waste paper	0.0042	kg/piece
Waste plastic bag	0.0003	kg/piece
Waste cloth	0.0264	kg/piece
Packaging		
Plastic film	0.0092	g/piece
GRS master polybag	2.0818	g/piece
Price sticker	0.2730	g/piece
Prepack sticker	0.4547	g/piece
Carton	51.2522	g/piece
Transparent adhesive tape	0.4820	g/piece
Hangtag	0.9825	g/piece
Transport of Raw Materials and Final Product		
By plane	7231.0000	km
By truck	68.0146	km

4.2 Electricity

National grid electricity and photovoltaic power are used in this study. The electricity consumption of each process is shown in the table below:

Table IV-5: Electricity Consumption

Electricity Consumption		
Item	Consumption	Unit
Scoured wool-national grid	0.3185	kWh/kg
Scoured wool- self-produced photovoltaic power	0.2640	kWh/kg
Greige wool sliver (thicker than 70s)- national grid	0.8774	kWh/kg
Shrinkproof greige wool sliver (thicker than 70s)- national grid	0.5354	kWh/kg
Treating of wastewater (Zhejiang New Chuwa Wool Co., Ltd)- national grid	0.0082	kWh/kg
Shrinkproof light coloured wool sliver (thicker than 70s) - national grid	0.6088	kWh/kg
Shrinkproof light coloured wool sliver (thicker than 70s) - self-produced photovoltaic power	0.1564	kWh/kg
Shrinkproof medium coloured wool sliver (thicker than 70s) - national grid	0.6393	kWh/kg
Shrinkproof medium coloured wool sliver (thicker than 70s) - self-produced photovoltaic power	0.1635	kWh/kg
Shrinkproof dark coloured wool sliver (thicker than 70s) - national grid	0.7460	kWh/kg
Shrinkproof dark coloured wool sliver (thicker than 70s) - self-produced photovoltaic power	0.1919	kWh/kg
Treating of wastewater (Zhejiang Houyuan Textiles Inc.) - national grid	0.0015	kWh/kg
Treating of wastewater (Zhejiang Houyuan Textiles Inc.)- self-produced photovoltaic power	0.0004	kWh/kg
Treating of reclaimed water (Zhejiang Houyuan Textiles Inc.) - national grid	0.0012	kWh/kg
Treating of reclaimed water (Zhejiang Houyuan Textiles Inc.) - self-produced photovoltaic power	0.0003	kWh/kg
Light/medium/dark coloured wool yarn (1/58nm) - national grid	5.5914	kWh/kg
Light/medium/dark coloured wool yarn (1/58nm) - self-produced photovoltaic power generation	0.4689	kWh/kg
Light/medium/dark coloured semi-finished rib knitted fabric	0.4796	kWh/kg
Light coloured semi-finished interlock knitted fabric - national grid	0.9578	kWh/kg
Light coloured finished rib knitted fabric - national grid	1.0440	kWh/kg
Light coloured finished interlock knitted fabric - national grid	1.0971	kWh/kg
Medium coloured finished rib knitted fabric - national grid	1.0464	kWh/kg
Dark coloured finished rib knitted fabric - national grid	1.0191	kWh/kg
Wool knitted cap solid - light/medium/dark colour(Order#PO-00001329) - national grid	0.1876	kWh/piece
Wool knitted body solid - light/dark colour (Order#PO-00001324/00001325/00001326) - national grid	0.3642	kWh/piece
Wool knitted top solid - light/medium/dark colour (order# PO 00001320/00001321/00001322/00001323/00001778) - national grid	0.3788	kWh/piece
Wool knitted longjohn solid - light/medium/dark colour (Order#PO-00001385/00001386/00001387/00001388)- national grid	0.3621	kWh/piece
Wool knitted body solid - light/dark colour (Order#PO-00001331) -national grid	0.2252	kWh/piece
Wool knitted turtle top solid – light&dark colour (Order#PO-00001332) -national grid	0.3958	kWh/piece
Kneepatch pants solid – dark&light colour(Order#PO-00001389) -national grid	0.3976	kWh/piece
Wool knitted adult longjohn solid - light/dark colour(Order#PO-00001328) -national grid	0.5307	kWh/piece
Wool knitted adult top solid - light/dark colour (Order#PO-00001327) -national grid	0.5397	kWh/piece

4.3 Secondary Data

The secondary data used are summarized in **Table IV-6** as below:

Table IV-6: Secondary Data And Source

Data Name	Data Source
CN: Process steam from hard coal 85% sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Electricity grid mix sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Natural gas mix sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Copper (99.99%; cathode) ICA	LCA for Experts 10.7.1.28 (GaBi)
CN: Electricity grid mix sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Tap water from surface water sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Electricity from photovoltaic sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Process steam from hard coal 85% sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Heavy fuel oil at refinery (1.0 wt.% S) sphera	LCA for Experts 10.7.1.28 (GaBi)
CN: Diesel mix at filling station (100% fossil) sphera	LCA for Experts 10.7.1.28 (GaBi)
DE: Hazardous waste in waste incineration plant sphera <p-agg>	LCA for Experts 10.7.1.28 (GaBi)
DE: Hazardous waste in waste incineration plant sphera <p-agg>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Antistatic agent (quaternary ammonium compound) sphera	LCA for Experts 10.7.1.28 (GaBi)
RER: Polyethylene film (PE-LD) plasticseurope	LCA for Experts 10.7.1.28 (GaBi)
GLO: Softener (fatty acids amino compounds) sphera	LCA for Experts 10.7.1.28 (GaBi)
EU-28: Sulphuric acid (96%) sphera	LCA for Experts 10.7.1.28 (GaBi)
EU-28: Sodium hypochlorite (NaOCl, 175 g Cl ₂ /l) plasticseurope	LCA for Experts 10.7.1.28 (GaBi)
CN: Wax / Paraffins at refinery sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Reactive dyes sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Non-ionic surfactant (fatty acid derivate) sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Equalizing agent (on basis alcohol ethoxylate) sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Soaping agent (acrylic polymer) sphera	LCA for Experts 10.7.1.28 (GaBi)
DE: Sodium hydroxide (caustic soda) mix (100%) sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Detergent (fatty acid sulphonate derivate) sphera	LCA for Experts 10.7.1.28 (GaBi)
CH: Epoxy Resin (EP) sphera	LCA for Experts 10.7.1.28 (GaBi)
GLO: Palm kernel oil methylester (incl. LUC, incl. peat emissions, 75 cm) erasm	LCA for Experts 10.7.1.28 (GaBi)
GLO: Equalizing agent (on basis fatty amines and ethoxylates) sphera	LCA for Experts 10.7.1.28 (GaBi)
AUS: Greasy wool, PPhilippa M. Brock, Phillip Graham, Patrick Madden and Douglas J. Alcock (Greenhouse gas emissions profile for 1 kg of wool produced in the Yass Region, New South Wales: A	Literature
RER: Polypropylene film (PP) plasticseurope	LCA for Experts 10.7.1.28 (GaBi)
EU-28: Kraftliner 2018; by-products: tall oil, turpentine; substitution EoL; [mass allocation] sphera/FEFCO <p-agg>	LCA for Experts 10.7.1.28 (GaBi)
US: Corrugated product sphera/AF&PA <p-agg>	LCA for Experts 10.7.1.28 (GaBi)

Data Name	Data Source
GLO: Truck, Euro 3, 7.5 t - 12t gross weight / 5t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, up to 7.5t gross weight / 2.7t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, 12 - 14t gross weight / 9.3t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, 14 - 20t gross weight / 11.4t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, 20 - 26t gross weight / 17.3t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, 26 - 28t gross weight / 18.4t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, 28 - 32t gross weight / 22t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Truck, Euro 3, more than 32t gross weight / 24.7t payload capacity sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Container ship, 5,000 to 200,000 dwt payload capacity, ocean going sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
GLO: Cargo plane, 65 t payload sphaera <u-so>	LCA for Experts 10.7.1.28 (GaBi)
CN:Kerosene / Jet A1 at refinery sphaera	LCA for Experts 10.7.1.28 (GaBi)
Nylon 6 {RoW} market for nylon 6 Cut-off, U	ecoinvent 3.9
Nylon 6-6 {RoW} market for nylon 6-6 Cut-off, U	ecoinvent 3.9
Polyaluminium chloride {GLO} market for polyaluminium chloride Cut-off, U	ecoinvent 3.9
Polyacrylamide {GLO} market for polyacrylamide Cut-off, U	ecoinvent 3.9
Acetic acid, without water, in 98% solution state {GLO} market for acetic acid, without water, in 98% solution state Cut-off, U	ecoinvent 3.9
Butyl acrylate {RoW} market for butyl acrylate Cut-off, U	ecoinvent 3.9
Oxalic acid {GLO} market for oxalic acid Cut-off, U	ecoinvent 3.9
Fibre, polyester {GLO} market for fibre, polyester Cut-off, U	ecoinvent 3.9
Glycerine {RER} market for glycerine Cut-off, U	ecoinvent 3.9
Tetrachloroethylene {RoW} market for tetrachloroethylene Cut-off, U	ecoinvent 3.9
Polyacrylamide {GLO} market for polyacrylamide Cut-off, U	ecoinvent 3.9
Sodium pyrophosphate {GLO} market for sodium pyrophosphate Cut-off, U	ecoinvent 3.9
Textile, nonwoven polypropylene {GLO} market for textile, nonwoven polypropylene Cut-off, U	ecoinvent 3.9
Polypropylene, granulate {GLO} market for polypropylene, granulate Cut-off, U	ecoinvent 3.9
Polyethylene, low density, granulate {GLO} market for polyethylene, low density, granulate Cut-off, U	ecoinvent 3.9
Aluminium chloride {GLO} market for aluminium chloride Cut-off, U	ecoinvent 3.9
Citric acid {GLO} market for citric acid Cut-off, U	ecoinvent 3.9
Neutralising agent, sodium hydroxide-equivalent {GLO} market for neutralising agent, sodium hydroxide-equivalent Cut-off, U	ecoinvent 3.9
Calcium carbonate, precipitated {RoW} market for calcium carbonate, precipitated Cut-off, U	ecoinvent 3.9
Potato starch {GLO} market for potato starch Cut-off, U	ecoinvent 3.9
Maize starch {GLO} textile production, woven cotton Cut-off, U	ecoinvent 3.9
Textile, nonwoven polyester {GLO} market for textile, nonwoven polyester Cut-off, U	ecoinvent 3.9
Cellulose fibre {RoW} market for cellulose fibre Cut-off, U	ecoinvent 3.9
Acrylic binder, with water, in 54% solution state {RoW} market for acrylic binder, with water, in 54% solution state Cut-off, U	ecoinvent 3.9
Others	Literature

5. RESULTS

5.1 Fossil and Biogenic Climate Change

The fossil and biogenic climate change of 19 types of knitted garments/accessories are reported separately, results detailed by phase are as follows:

Table V-1-1: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Cap Solid - Light Colour (Order#PO-00001329)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.2730	0.0358	2.3088	93.74%
[2] Product manufacturing	0.1498	0.0000	0.1498	6.08%
[3] Packaging	0.0037	0.0000	0.0037	0.15%
[4] Transportation	0.0006	0.0000	0.0006	0.02%
Total	2.4271	0.0358	2.4629	100.0%

Table V-1-2: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Cap Solid - Medium Colour (Order#PO-00001329)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.3714	0.0384	2.4098	93.99%
[2] Product manufacturing	0.1498	0.0000	0.1498	5.84%
[3] Packaging	0.0037	0.0000	0.0037	0.14%
[4] Transportation	0.0006	0.0000	0.0006	0.02%
Total	2.5255	0.0384	2.5639	100.0%

Table V-1-3: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Cap Solid - Dark Colour (Order#PO-00001329)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.3235	0.0377	2.3612	93.87%
[2] Product manufacturing	0.1498	0.0000	0.1498	5.96%
[3] Packaging	0.0037	0.0000	0.0037	0.15%
[4] Transportation	0.0006	0.0000	0.0006	0.02%
Total	2.4776	0.0377	2.5153	100.0%

Table V-1-4: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Body Solid - Light Colour (Order#PO-00001324/00001325/00001326)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	5.2671	0.0831	5.3502	94.70%
[2] Product manufacturing	0.2909	-0.0001	0.2908	5.15%
[3] Packaging	0.0078	0.0000	0.0078	0.14%
[4] Transportation	0.0011	0.0000	0.0011	0.02%
Total	5.5669	0.0830	5.6499	100.0%

Table V-1-5: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Body Solid - Dark Colour (Order#PO-00001324/00001325/00001326)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	5.3846	0.0876	5.4722	94.81%
[2] Product manufacturing	0.2909	-0.0001	0.2908	5.04%
[3] Packaging	0.0078	0.0000	0.0078	0.14%
[4] Transportation	0.0011	0.0000	0.0011	0.02%
Total	5.6844	0.0875	5.7719	100.0%

Table V-1-6: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Top Solid - Light Colour (order#PO-00001320/00001321/00001322/00001323/00001778)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.1709	0.0975	6.2684	95.24%
[2] Product manufacturing	0.3026	-0.0001	0.3025	4.60%
[3] Packaging	0.0090	0.0000	0.0090	0.14%
[4] Transportation	0.0014	0.0001	0.0015	0.02%
Total	6.4839	0.0975	6.5814	100.0%

Table V-1-7: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Top Solid - Medium Colour (order#PO-00001320/00001321/00001322/00001323/00001778)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.4395	0.1047	6.5442	95.44%
[2] Product manufacturing	0.3026	-0.0001	0.3025	4.41%
[3] Packaging	0.0090	0.0000	0.0090	0.13%
[4] Transportation	0.0014	0.0001	0.0015	0.02%
Total	6.7525	0.1047	6.8572	100.0%

**Table V-1-8: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Top Solid
 - Dark Colour (order#PO-00001320/00001321/00001322/00001323/00001778)**

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.3088	0.1027	6.4115	95.35%
[2] Product manufacturing	0.3026	-0.0001	0.3025	4.50%
[3] Packaging	0.0090	0.0000	0.0090	0.13%
[4] Transportation	0.0014	0.0001	0.0015	0.02%
Total	6.6218	0.1027	6.7245	100.0%

**Table V-1-9: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Longjohn Solid
 - Light Colour (Order#PO-00001385/00001386/00001387/00001388)**

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	4.6916	0.0739	4.7655	94.10%
[2] Product manufacturing	0.2892	-0.0001	0.2891	5.71%
[3] Packaging	0.0085	0.0000	0.0085	0.17%
[4] Transportation	0.0012	0.0000	0.0012	0.02%
Total	4.9905	0.0738	5.0643	100.0%

**Table V-1-10: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Longjohn Solid
 - Medium Colour (Order#PO-00001385/00001386/00001387/00001388)**

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	4.8949	0.0793	4.9742	94.33%
[2] Product manufacturing	0.2892	-0.0001	0.2891	5.48%
[3] Packaging	0.0085	0.0000	0.0085	0.16%
[4] Transportation	0.0012	0.0000	0.0012	0.02%
Total	5.1938	0.0792	5.2730	100.0%

**Table V-1-11: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Longjohn Solid
 - Dark Colour (Order#PO-00001385/00001386/00001387/00001388)**

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	4.7960	0.0778	4.8738	94.22%
[2] Product manufacturing	0.2892	-0.0001	0.2891	5.59%
[3] Packaging	0.0085	0.0000	0.0085	0.16%
[4] Transportation	0.0012	0.0000	0.0012	0.02%
Total	5.0949	0.0777	5.1726	100.0%

Table V-1-12: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Tube Solid - Light Colour (Order#PO-00001331)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.9204	0.0462	2.9666	94.15%
[2] Product manufacturing	0.1799	-0.0001	0.1798	5.71%
[3] Packaging	0.0038	0.0000	0.0038	0.12%
[4] Transportation	0.0008	0.0000	0.0008	0.03%
Total	3.1049	0.0461	3.1510	100.0%

Table V-1-13: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Tube Solid - Dark Colour (Order#PO-00001331)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.9858	0.0487	3.0345	94.27%
[2] Product manufacturing	0.1799	-0.0001	0.1798	5.59%
[3] Packaging	0.0038	0.0000	0.0038	0.12%
[4] Transportation	0.0008	0.0000	0.0008	0.02%
Total	3.1703	0.0486	3.2189	100.0%

Table V-1-14: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Turtle Top Solid - Light&Dark Colour (Order#PO-00001332)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.5899	0.1061	6.6960	94.14%
[2] Product manufacturing	0.4064	-0.0001	0.4063	5.71%
[3] Packaging	0.0088	0.0000	0.0088	0.12%
[4] Transportation	0.0015	0.0001	0.0016	0.02%
Total	7.0066	0.1061	7.1127	100.0%

Table V-1-15: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Kneepatch Pants Solid - Dark&Light Colour(Order#PO-00001389)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	5.7885	0.0933	5.8818	94.71%
[2] Product manufacturing	0.3176	-0.0001	0.3175	5.11%
[3] Packaging	0.0088	0.0000	0.0088	0.14%
[4] Transportation	0.0018	0.0001	0.0019	0.03%
Total	6.1167	0.0933	6.2100	100.0%

Table V-1-16: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Adult Longjohn Solid - Light Colour (Order#PO-00001328)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	12.9609	0.2051	13.1660	96.75%
[2] Product manufacturing	0.4237	-0.0002	0.4235	3.11%
[3] Packaging	0.0163	0.0000	0.0163	0.12%
[4] Transportation	0.0027	0.0001	0.0028	0.02%
Total	13.4036	0.2050	13.6086	100.0%

Table V-1-17: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Adult Longjohn Solid - Dark Colour (Order#PO-00001328)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	13.2511	0.2161	13.4672	96.82%
[2] Product manufacturing	0.4237	-0.0002	0.4235	3.04%
[3] Packaging	0.0163	0.0000	0.0163	0.12%
[4] Transportation	0.0027	0.0001	0.0028	0.02%
Total	13.6938	0.2160	13.9098	100.0%

Table V-1-18: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Adult Top Solid - Light Colour (Order#PO-00001327)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	12.9191	0.2041	13.1232	96.51%
[2] Product manufacturing	0.4311	-0.0001	0.4310	3.17%
[3] Packaging	0.0404	0.0000	0.0404	0.30%
[4] Transportation	0.0028	0.0001	0.0029	0.02%
Total	13.3934	0.2041	13.5975	100.0%

Table V-1-19: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Adult Top Solid - Dark Colour (Order#PO-00001327)

Phase Contribution	Climate Change Fossil (kg CO ₂ e)	Climate Change, Biogenic (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	13.2079	0.2151	13.4230	96.59%
[2] Product manufacturing	0.4311	-0.0001	0.4310	3.10%
[3] Packaging	0.0404	0.0000	0.0404	0.29%
[4] Transportation	0.0028	0.0001	0.0029	0.02%
Total	13.6822	0.2151	13.8973	100.0%

5.2 Climate Change from Direct Land Use Change (dLUC)

Climate change from dLUC of 19 types of wool knitted garments/accessories are reported as below:

Table V-2-1: Climate Change of one Piece of Wool Knitted Cap Solid - Light Colour (Order#PO-00001329) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0178	99.44%
[2] Product manufacturing	0.0001	0.56%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0179	100.0%

Table V-2-2: Climate Change of one Piece of Wool Knitted Cap Solid - Medium Colour (Order#PO-00001329) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0187	99.47%
[2] Product manufacturing	0.0001	0.53%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0188	100.0%

Table V-2-3: Climate Change of one Piece of Wool Knitted Cap Solid - Dark Colour (Order#PO-00001329) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0180	99.45%
[2] Product manufacturing	0.0001	0.55%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0181	100.0%

Table V-2-4: Climate Change of one Piece of Wool Knitted Body Solid - Light Colour (Order#PO-00001324/00001325/00001326) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0415	99.52%
[2] Product manufacturing	0.0002	0.48%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0417	100.0%

**Table V-2-5: Climate Change of one Piece of Wool Knitted Body Solid - Dark Colour
 (Order#PO-00001324/00001325/00001326) from dLUC**

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0417	99.52%
[2] Product manufacturing	0.0002	0.48%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0419	100.0%

**Table V-2-6: Climate Change of one Piece of Wool Knitted Top Solid- Light Colour
 (order#PO-00001320/00001321/00001322/00001323/00001778) from dLUC**

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0487	99.59%
[2] Product manufacturing	0.0002	0.41%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0489	100.0%

**Table V-2-7: Climate Change of one Piece of Wool Knitted Top Solid - Medium Colour
 (order#PO-00001320/00001321/00001322/00001323/00001778) from dLUC**

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0511	99.61%
[2] Product manufacturing	0.0002	0.39%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0513	100.0%

**Table V-2-8: Climate Change of one Piece of Wool Knitted Top Solid- Dark Colour
 (order#PO-00001320/00001321/00001322/00001323/00001778) from dLUC**

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0490	99.59%
[2] Product manufacturing	0.0002	0.41%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0492	100.0%

**Table V-2-9: Climate Change Of one Piece of Wool Knitted Longjohn Solid - Light Colour
 (Order#PO-00001385/00001386/00001387/00001388) from dLUC**

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0369	99.46%
[2] Product manufacturing	0.0002	0.54%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0371	100.0%

Table V-2-10: Climate Change Of one Piece of Wool Knitted Longjohn Solid - Medium Colour (Order#PO-00001385/00001386/00001387/00001388) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0387	99.49%
[2] Product manufacturing	0.0002	0.51%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0389	100.0%

Table V-2-11: Climate Change Of one Piece of Wool Knitted Longjohn Solid - Dark Colour (Order#PO-00001385/00001386/00001387/00001388) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0371	99.46%
[2] Product manufacturing	0.0002	0.54%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0373	100.0%

Table V-2-12: Climate Change Of one Piece of Wool Knitted Tube Solid - Light Colour (Order#PO-00001331) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0231	99.57%
[2] Product manufacturing	0.0001	0.43%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0232	100.0%

Table V-2-13: Climate Change Of one Piece of Wool Knitted Tube Solid - Dark Colour (Order#PO-00001331) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0232	99.57%
[2] Product manufacturing	0.0001	0.43%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0233	100.0%

Table V-2-14: Climate Change Of one Piece of Wool Knitted Turtle Top Solid – Light&Dark Colour (Order#PO-00001332) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0514	99.42%
[2] Product manufacturing	0.0003	0.58%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0517	100.0%

Table V-2-15: Climate Change Of one Piece of Wool Knitted Kneepatch Pants Solid - Dark&Light Colour(Order#Po-00001389) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0449	99.56%
[2] Product manufacturing	0.0002	0.44%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.0451	100.0%

Table V-2-16: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Adult Longjohn Solid - Light Colour (Order#PO-00001328) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.1024	99.71%
[2] Product manufacturing	0.0003	0.29%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.1027	100.0%

Table V-2-17: Fossil and Biogenic Climate Change of one Piece of Wool Knitted Adult Longjohn Solid - Dark Colour (Order#PO-00001328) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.1030	99.71%
[2] Product manufacturing	0.0003	0.29%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.1033	100.0%

Table V-2-18: Climate Change Of one Piece of Wool Knitted Adult Top Solid - Light Colour (Order#PO-00001327) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.1019	99.71%
[2] Product manufacturing	0.0003	0.29%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.1022	100.0%

Table V-2-19: Climate Change Of one Piece of Wool Knitted Adult Top Solid - Dark Colour (Order#PO-00001327) from dLUC

Phase Contribution	Climate Change, dLUC (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.1025	99.71%
[2] Product manufacturing	0.0003	0.29%
[3] Packaging	0.0000	0.00%
[4] Transportation	0.0000	0.00%
Total	0.1028	100.0%

5.3 Climate Change from Aircraft

Climate change from aircraft of 19 types of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid are reported as below:

Table V-3-1: Climate Change of one Piece of Wool Knitted Cap Solid - Light Colour (Order#PO-00001329) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	4.1943E-08	0.00%
[3] Packaging	1.9958E-10	0.00%
[4] Transportation	1.0096E-03	100.00%
Total	1.0097E-03	100.0%

Table V-3-2: Climate Change of one Piece of Wool Knitted Cap Solid - Medium Colour (Order#PO-00001329) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	4.1943E-08	0.00%
[3] Packaging	1.9958E-10	0.00%
[4] Transportation	1.0096E-03	100.00%
Total	1.0097E-03	100.0%

Table V-3-3: Climate Change of one Piece of Wool Knitted Cap Solid - Dark Colour (Order#PO-00001329) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	4.1943E-08	0.00%
[3] Packaging	1.9958E-10	0.00%
[4] Transportation	1.0096E-03	100.00%
Total	1.0097E-03	100.0%

**Table V-3-4: Climate Change of one Piece of Wool Knitted Body Solid
- Light Colour (Order#PO-00001324/00001325/00001326) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.1428E-08	0.08%
[3] Packaging	4.1822E-10	0.00%
[4] Transportation	9.9660E-05	99.92%
Total	9.9742E-05	100.0%

**Table V-3-5: Climate Change of one Piece of Wool Knitted Body Solid
- Dark Colour (Order#PO-00001324/00001325/00001326) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.1428E-08	0.08%
[3] Packaging	4.1822E-10	0.00%
[4] Transportation	9.9660E-05	99.92%
Total	9.9742E-05	100.0%

**Table V-3-6: Climate Change of one Piece of Wool Knitted Top solid
- Light Colour (order#PO-00001320/00001321/00001322/00001323/00001778) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.4693E-08	0.01%
[3] Packaging	4.8059E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9669E-04	100.0%

**Table V-3-7: Climate Change of one Piece of Wool Knitted Top solid
- Medium Colour (order#PO-00001320/00001321/00001322/00001323/00001778) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.4693E-08	0.01%
[3] Packaging	4.8059E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9669E-04	100.0%

**Table V-3-8: Climate Change of one Piece of Wool Knitted Top solid
- Dark Colour (order#PO-00001320/00001321/00001322/00001323/00001778) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.4693E-08	0.01%
[3] Packaging	4.8059E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9669E-04	100.0%

**Table V-3-9: Climate Change of one Piece of Wool Knitted Longjohn Solid
- Light Colour(Order#PO-00001385/00001386/00001387/00001388) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.0958E-08	0.01%
[3] Packaging	4.5666E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9668E-04	100.0%

**Table V-3-10: Climate Change of one Piece of Wool Knitted Longjohn Solid
- Medium Colour(Order#PO-00001385/00001386/00001387/00001388) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.0958E-08	0.01%
[3] Packaging	4.5666E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9668E-04	100.0%

**Table V-3-11: Climate Change of one Piece of Wool Knitted Longjohn Solid
- Dark Colour(Order#PO-00001385/00001386/00001387/00001388) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.0958E-08	0.01%
[3] Packaging	4.5666E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9668E-04	100.0%

**Table V-3-12: Climate Change of one Piece of Wool Knitted Tube Solid
- Light Colour (Order#PO-00001331) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	5.0350E-08	0.01%
[3] Packaging	2.0244E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9665E-04	100.0%

**Table V-3-13: Climate Change of one Piece of Wool Knitted Tube Solid
- Dark Colour (Order#PO-00001331) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	5.0350E-08	0.01%
[3] Packaging	2.0244E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9665E-04	100.0%

**Table V-3-14: Climate Change Of one Piece of Wool Knitted Turtle Top Solid
- Light&Dark Colour (Order#PO-00001332) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	1.1376E-07	0.01%
[3] Packaging	4.6936E-10	0.00%
[4] Transportation	9.9678E-04	99.99%
Total	9.9690E-04	100.0%

**Table V-3-15: Climate Change Of one Piece of Wool Knitted Kneepatch Pants Solid
- Dark&Light Colour (Order#PO-00001389) from Aircraft**

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	8.8895E-08	0.01%
[3] Packaging	4.6936E-10	0.00%
[4] Transportation	9.9678E-04	99.99%
Total	9.9687E-04	100.0%

Table V-3-16: Climate Change of one Piece of Wool Knitted Adult Longjohn Solid - Light Colour (Order#PO-00001328) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	1.1856E-07	0.01%
[3] Packaging	8.7329E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9672E-04	100.0%

Table V-3-17: Climate Change of one Piece of Wool Knitted Adult Longjohn Solid - Dark Colour (Order#PO-00001328) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	1.1856E-07	0.01%
[3] Packaging	8.7329E-10	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9672E-04	100.0%

Table V-3-18: Climate Change of one Piece of Wool Knitted Adult Top Solid - Light Colour (Order#PO-00001327) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	1.2067E-07	0.01%
[3] Packaging	2.2042E-09	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9672E-04	100.0%

Table V-3-19: Climate Change of one Piece of Wool Knitted Adult Top Solid - Dark Colour (Order#PO-00001327) from Aircraft

Phase Contribution	Climate Change, Aircraft (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	0.0000E+00	0.00%
[2] Product manufacturing	1.2067E-07	0.01%
[3] Packaging	2.2042E-09	0.00%
[4] Transportation	9.9660E-04	99.99%
Total	9.9672E-04	100.0%

5.4 Summary

The Total value of carbon footprint from cradle to gate of 19 types of wool knitted cap solid/body solid/top solid/longjohn solid/tube solid/turtle top solid/kneepatch pants solid/adult longjohn solid/adult top solid are reported as below:

Table V-4-1: Partial Carbon Footprint of one Piece of Wool Knitted Cap Solid - Light Colour (Order#PO-00001329) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.2730	0.0358	0.0178	0.0000E+00	2.3266	93.75%
[2] Product manufacturing	0.1498	0.0000	0.0001	4.1943E-08	0.1499	6.04%
[3] Packaging	0.0037	0.0000	0.0000	1.9958E-10	0.0037	0.15%
[4] Transportation	0.0006	0.0000	0.0000	1.0096E-03	0.0016	0.06%
Total	2.4271	0.0358	0.0179	1.0097E-03	2.4818	100.0%

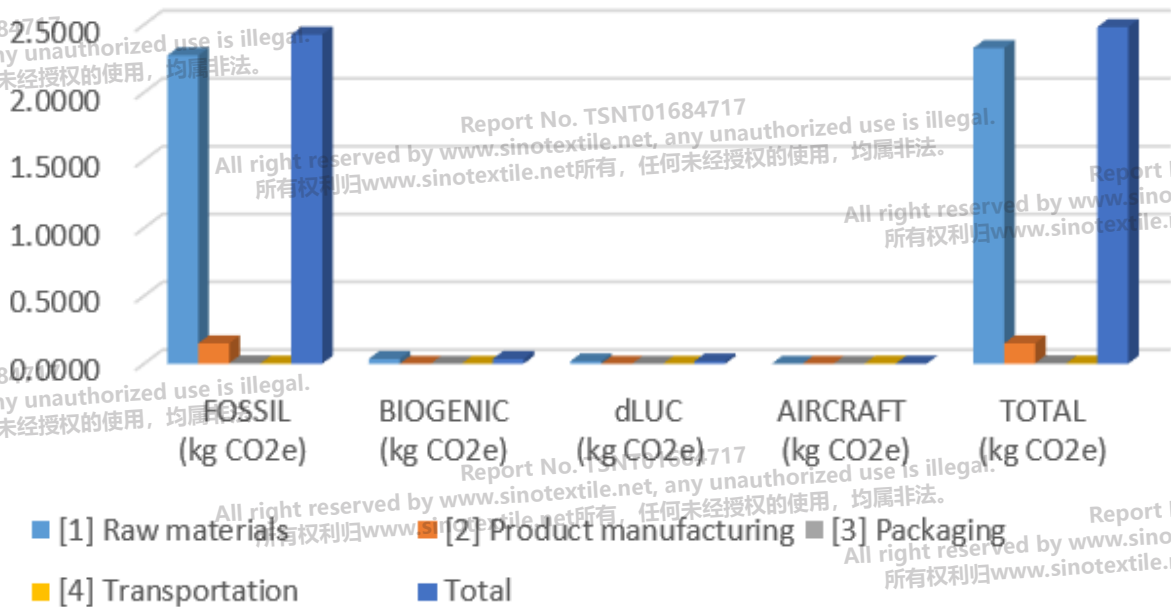


Figure V-4-1: Partial Carbon Footprint of one Piece of Wool Knitted Cap Solid - Light Colour (Order#PO-00001329) from Cradle to Gate

Table V-4-2: Partial Carbon Footprint of one Piece of Wool Knitted Cap Solid - Medium Colour (Order#PO-0001329) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.3714	0.0384	0.0187	0.0000E+00	2.4285	93.99%
[2] Product manufacturing	0.1498	0.0000	0.0001	4.1943E-08	0.1499	5.80%
[3] Packaging	0.0037	0.0000	0.0000	1.9958E-10	0.0037	0.14%
[4] Transportation	0.0006	0.0000	0.0000	1.0096E-03	0.0016	0.06%
Total	2.5255	0.0384	0.0188	1.0097E-03	2.5837	100.0%

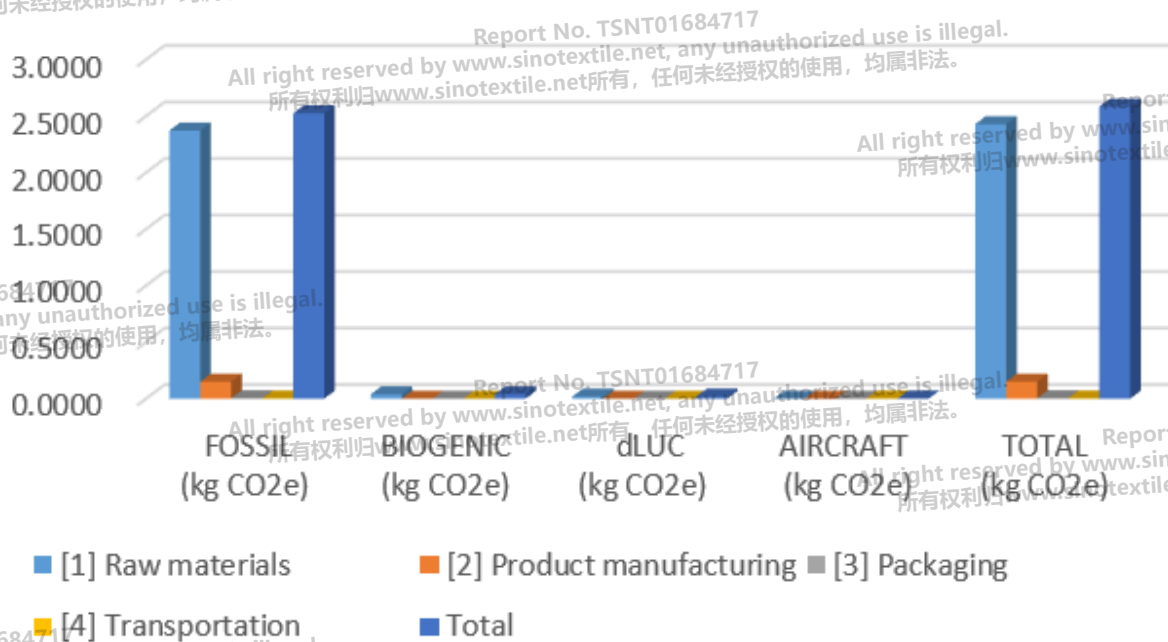


Figure V-4-2: Partial Carbon Footprint of one Piece of Wool Knitted Cap Solid - Medium Colour (Order#PO-0001329) from Cradle to Gate

Table V-4-3: Partial Carbon Footprint of one Piece of Wool Knitted Cap Solid - Dark Colour
(Order#PO-00001329) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.3235	0.0377	0.0180	0.0000E+00	2.3792	93.88%
[2] Product manufacturing	0.1498	0.0000	0.0001	4.1943E-08	0.1499	5.91%
[3] Packaging	0.0037	0.0000	0.0000	1.9958E-10	0.0037	0.15%
[4] Transportation	0.0006	0.0000	0.0000	1.0096E-03	0.0016	0.06%
Total	2.4776	0.0377	0.0181	1.0097E-03	2.5344	100.0%

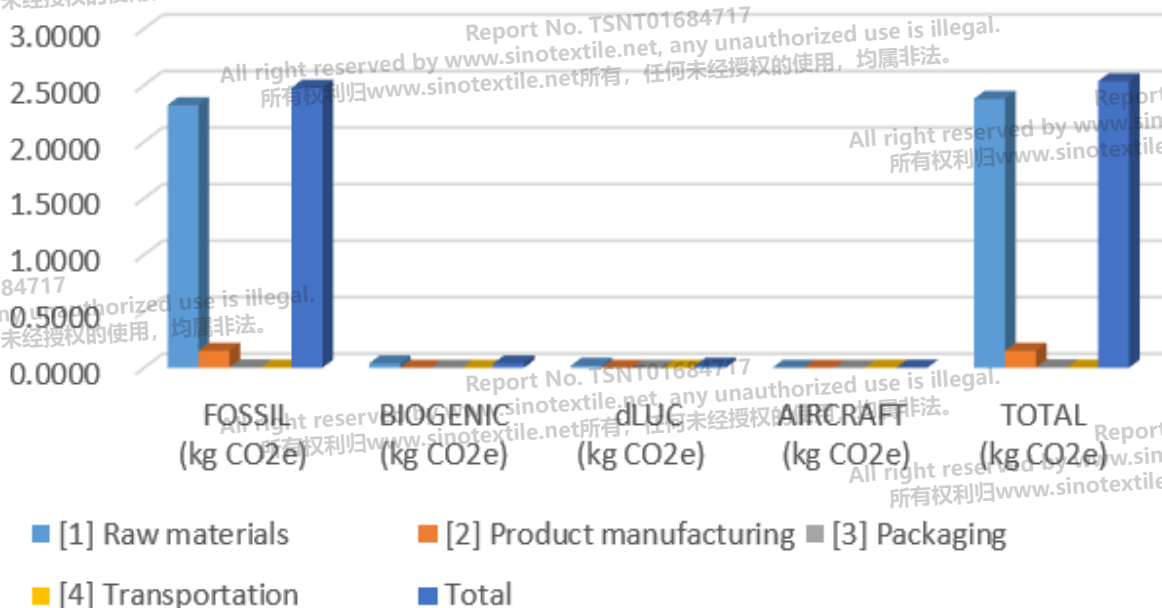


Figure V-4-3: Partial Carbon Footprint of one Piece of Wool Knitted Cap Solid - Dark Colour
(Order#PO-00001329) from Cradle to Gate

Table V-4-4: Partial Carbon Footprint of one Piece of Wool Knitted Body Solid - Light Colour (Order#PO-00001324/00001325/00001326) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	5.2671	0.0831	0.0415	0.0000E+00	5.3917	94.73%
[2] Product manufacturing	0.2909	-0.0001	0.0002	8.1428E-08	0.2910	5.11%
[3] Packaging	0.0078	0.0000	0.0000	4.1822E-10	0.0078	0.14%
[4] Transportation	0.0011	0.0000	0.0000	9.9660E-05	0.0012	0.02%
Total	5.5669	0.0830	0.0417	9.9742E-05	5.6917	100.0%

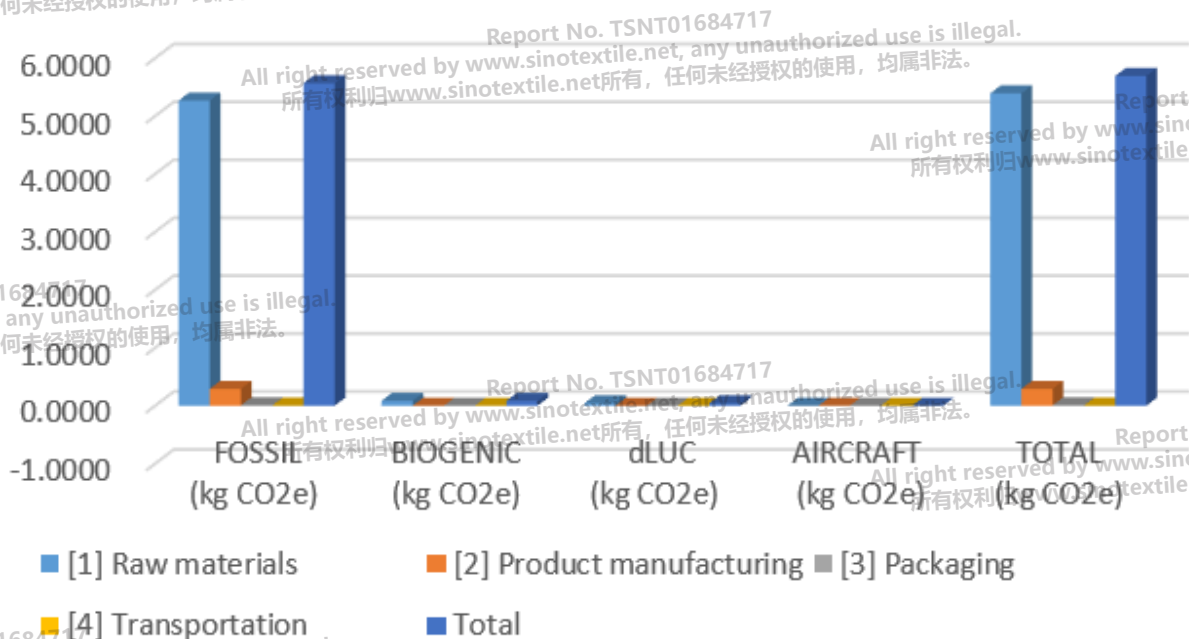
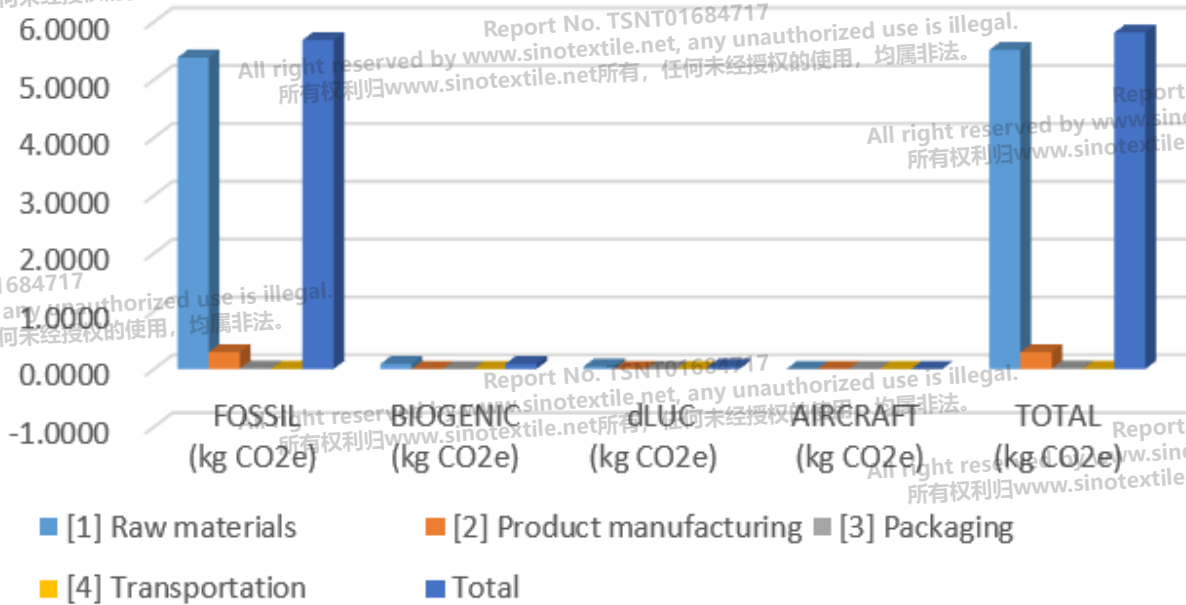


Figure V-4-4: Partial Carbon Footprint of one Piece of Wool Knitted Body Solid - Light Colour (Order#PO-00001324/00001325/00001326) from Cradle to Gate

**Table V-4-5: Partial Carbon Footprint of one Piece of Wool Knitted Body Solid - Dark Colour
 (Order#PO-00001324/00001325/00001326) from Cradle to Gate**

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	5.3846	0.0876	0.0417	0.0000E+00	5.5139	94.84%
[2] Product manufacturing	0.2909	-0.0001	0.0002	8.1428E-08	0.2910	5.01%
[3] Packaging	0.0078	0.0000	0.0000	4.1822E-10	0.0078	0.13%
[4] Transportation	0.0011	0.0000	0.0000	9.9660E-05	0.0012	0.02%
Total	5.6844	0.0875	0.0419	9.9742E-05	5.8139	100.0%



**Figure V-4-5: Partial Carbon Footprint of one Piece of Wool Knitted Body Solid - Dark Colour
 (Order#PO-00001324/00001325/00001326) from Cradle to Gate**

Table V-4-6: Partial Carbon Footprint of one Piece of Wool Knitted Top Solid - Light Colour (order#PO-00001320/00001321/00001322/00001323/00001778)from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.1709	0.0975	0.0487	0.0000E+00	6.3171	95.26%
[2] Product manufacturing	0.3026	-0.0001	0.0002	8.4693E-08	0.3027	4.56%
[3] Packaging	0.0090	0.0000	0.0000	4.8059E-10	0.0090	0.14%
[4] Transportation	0.0014	0.0001	0.0000	9.9660E-04	0.0025	0.04%
Total	6.4839	0.0975	0.0489	9.9669E-04	6.6313	100.0%

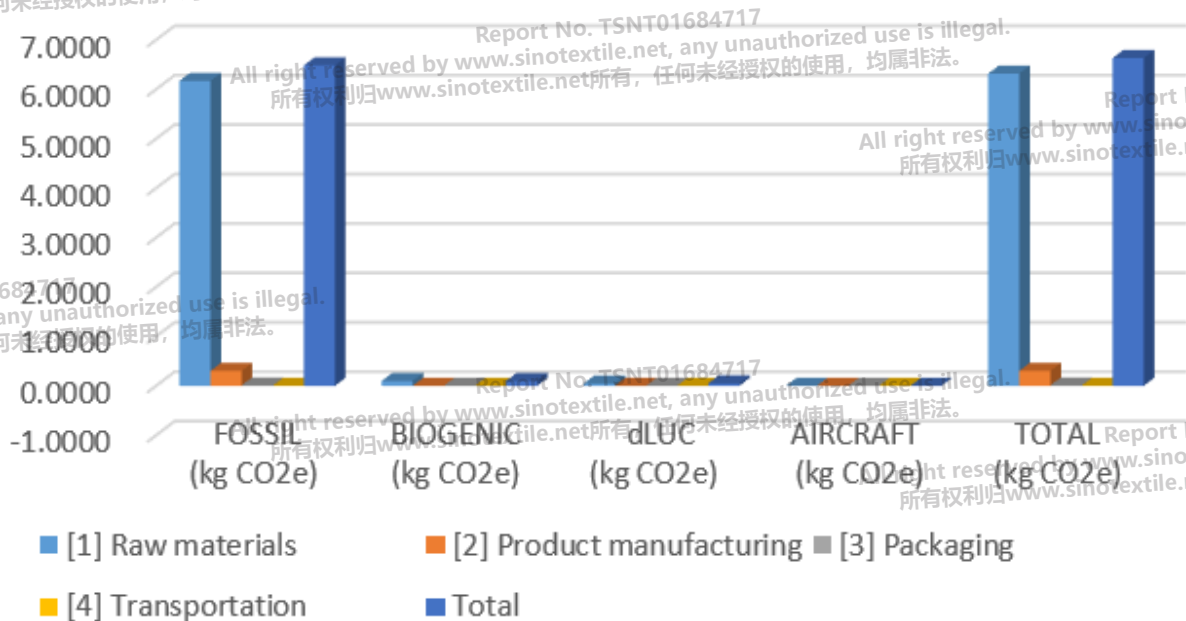


Figure V-4-6: Partial Carbon Footprint of one Piece of Wool Knitted Top Solid - Light Colour (order#PO-00001320/00001321/00001322/00001323/00001778)from Cradle to Gate

Table V-4-7: Partial Carbon Footprint of one Piece of Wool Knitted Top Solid - Medium Colour (order#PO-00001320/00001321/00001322/00001323/00001778) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.4395	0.1047	0.0511	0.0000E+00	6.5953	95.45%
[2] Product manufacturing	0.3026	-0.0001	0.0002	8.4693E-08	0.3027	4.38%
[3] Packaging	0.0090	0.0000	0.0000	4.8059E-10	0.0090	0.13%
[4] Transportation	0.0014	0.0001	0.0000	9.9660E-04	0.0025	0.04%
Total	6.7525	0.1047	0.0513	9.9669E-04	6.9095	100.0%

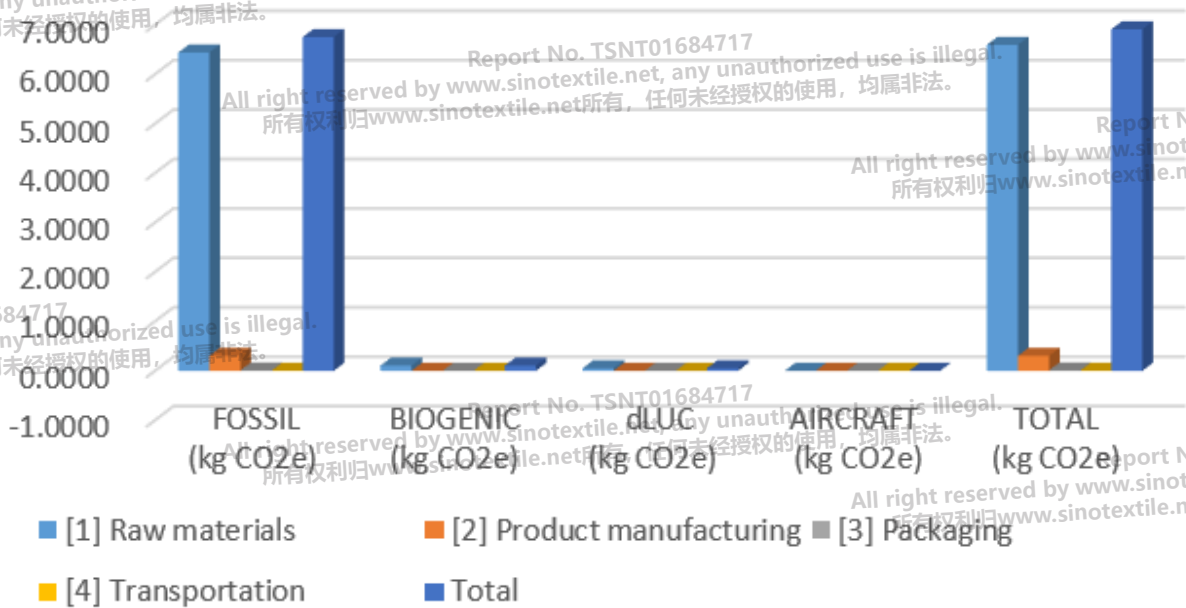
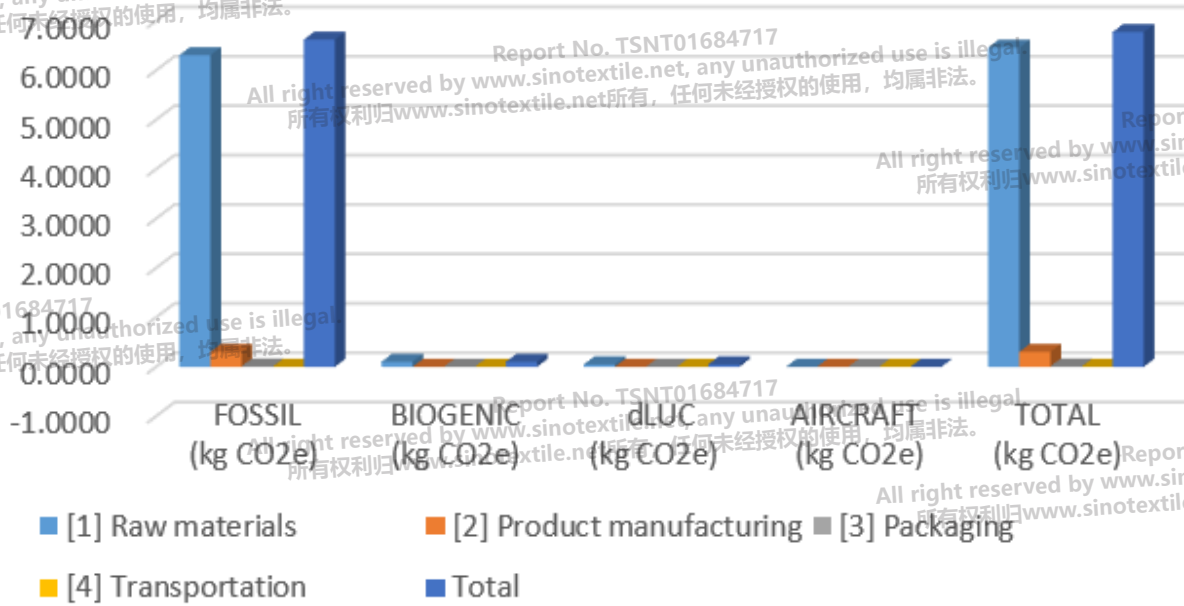


Figure V-4-7: Partial Carbon Footprint of one Piece of Wool Knitted Top Solid - Medium Colour (order#PO-00001320/00001321/00001322/00001323/00001778) from Cradle to Gate

**Table V-4-8: Partial Carbon Footprint of one Piece of Wool Knitted Top Solid - Dark Colour
 (order#PO-00001320/00001321/00001322/00001323/00001778) from Cradle to Gate**

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.3088	0.1027	0.0490	0.0000E+00	6.4605	95.36%
[2] Product manufacturing	0.3026	-0.0001	0.0002	8.4693E-08	0.3027	4.47%
[3] Packaging	0.0090	0.0000	0.0000	4.8059E-10	0.0090	0.13%
[4] Transportation	0.0014	0.0001	0.0000	9.9660E-04	0.0025	0.04%
Total	6.6218	0.1027	0.0492	9.9669E-04	6.7747	100.0%



**Figure V-4-8: Partial Carbon Footprint of one Piece of Wool Knitted Top Solid - Dark Colour
 (order#PO-00001320/00001321/00001322/00001323/00001778) from Cradle to Gate**

Table V-4-9: Partial Carbon Footprint of one Piece of Wool Knitted Longjohn Solid - Light Colour
 (Order#PO-00001385/00001386/00001387/00001388) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	4.6916	0.0739	0.0369	0.0000E+00	4.8024	94.12%
[2] Product manufacturing	0.2892	-0.0001	0.0002	8.0958E-08	0.2893	5.67%
[3] Packaging	0.0085	0.0000	0.0000	4.5666E-10	0.0085	0.17%
[4] Transportation	0.0012	0.0000	0.0000	9.9660E-04	0.0022	0.04%
Total	4.9905	0.0738	0.0371	9.9668E-04	5.1024	100.0%

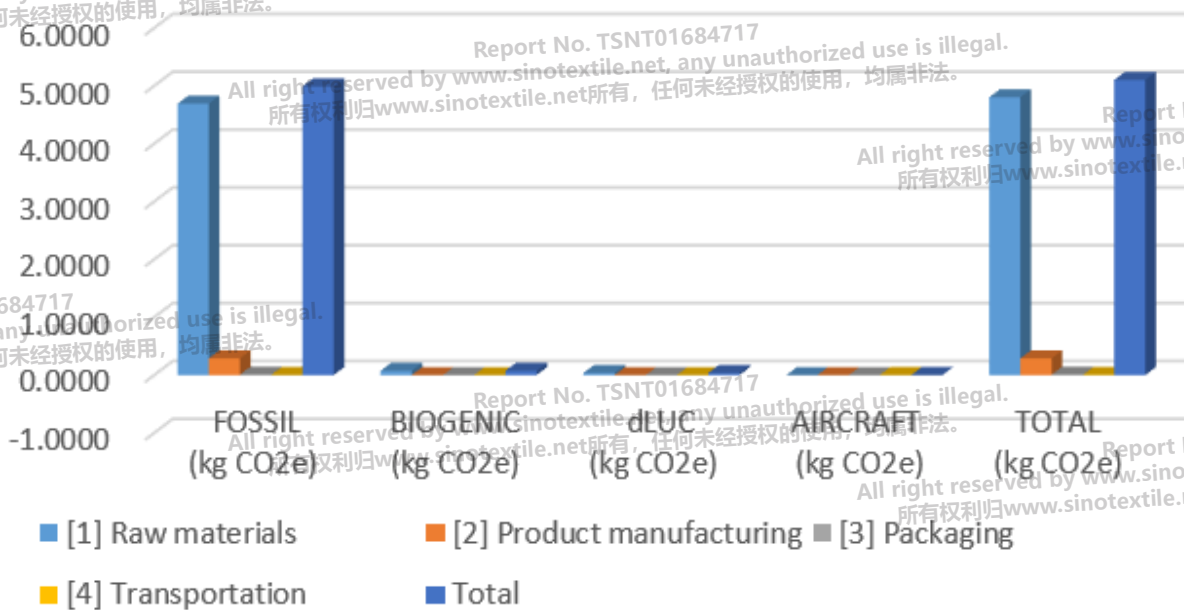


Figure V-4-9: Partial Carbon Footprint of one Piece of Wool Knitted Longjohn Solid - Light Colour
 (Order#PO-00001385/00001386/00001387/00001388) from Cradle to Gate

Table V-4-10: Partial Carbon Footprint of one Piece of Wool Knitted Longjohn Solid - Medium Colour (Order#PO-00001385/00001386/00001387/00001388) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	4.8949	0.0793	0.0387	0.0000E+00	5.0129	94.35%
[2] Product manufacturing	0.2892	0.0001	0.0002	8.0958E-08	0.2893	5.45%
[3] Packaging	0.0085	0.0000	0.0000	4.5666E-10	0.0085	0.16%
[4] Transportation	0.0012	0.0000	0.0000	9.9660E-04	0.0022	0.04%
Total	5.1938	0.0792	0.0389	9.9668E-04	5.3129	100.0%

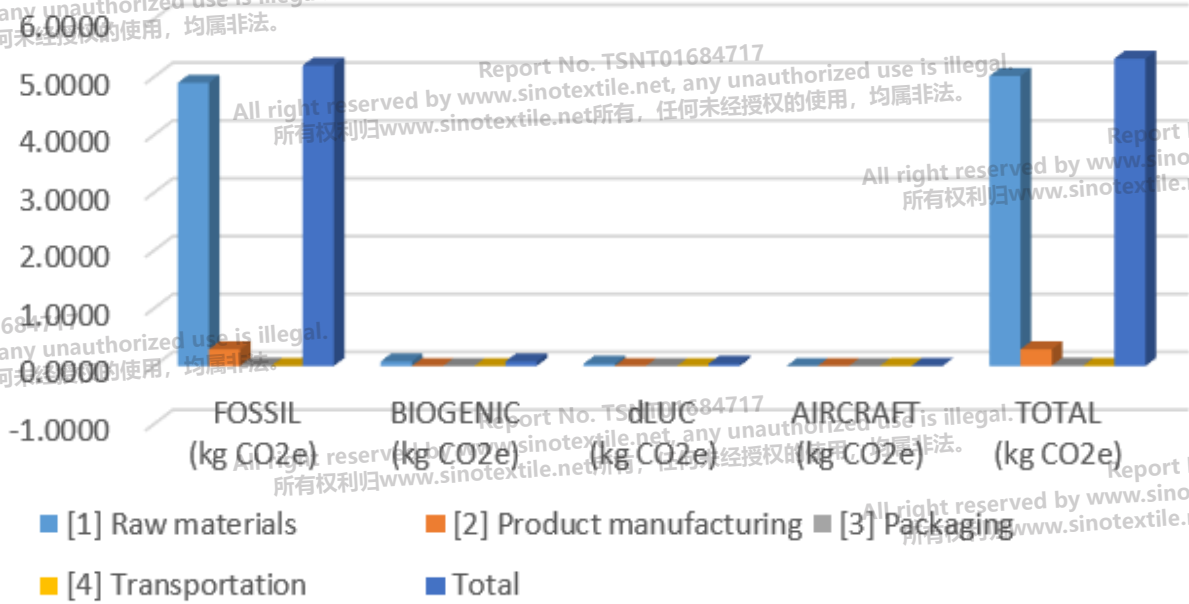


Figure V-4-10: Partial Carbon Footprint of one Piece of Wool Knitted Longjohn Solid - Medium Colour (Order#PO-00001385/00001386/00001387/00001388) from Cradle to Gate

Table V-4-11: Partial Carbon Footprint of one Piece of Wool Knitted Longjohn Solid - Dark Colour (Order#PO-0001385/0001386/0001387/0001388) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	4.7960	0.0778	0.0371	0.0000E+00	4.9109	94.24%
[2] Product manufacturing	0.2892	-0.0001	0.0002	8.0958E-08	0.2893	5.55%
[3] Packaging	0.0085	0.0000	0.0000	4.5666E-10	0.0085	0.16%
[4] Transportation	0.0012	0.0000	0.0000	9.9660E-04	0.0022	0.04%
Total	5.0949	0.0777	0.0373	9.9668E-04	5.2109	100.0%

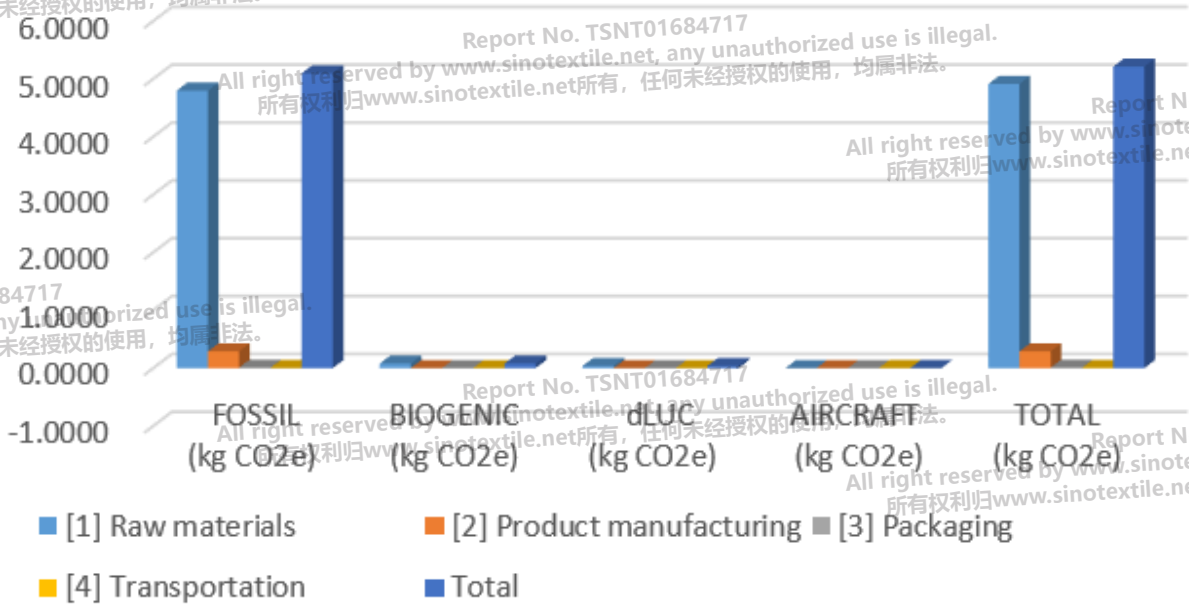


Figure V-4-11: Partial Carbon Footprint of one Piece of Wool Knitted Longjohn Solid - Dark Colour (Order#PO-0001385/0001386/0001387/0001388) from Cradle to Gate

Table V-4-12: Partial Carbon Footprint of one Piece of Wool Knitted Tube Solid - Light Colour (Order#PO-0001331) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.9204	0.0462	0.0231	0.0000E+00	2.9897	94.16%
[2] Product manufacturing	0.1799	-0.0001	0.0001	5.0350E-08	0.1799	5.67%
[3] Packaging	0.0038	0.0000	0.0000	2.0244E-10	0.0038	0.12%
[4] Transportation	0.0008	0.0000	0.0000	9.9660E-04	0.0018	0.06%
Total	3.1049	0.0461	0.0232	9.9665E-04	3.1752	100.0%

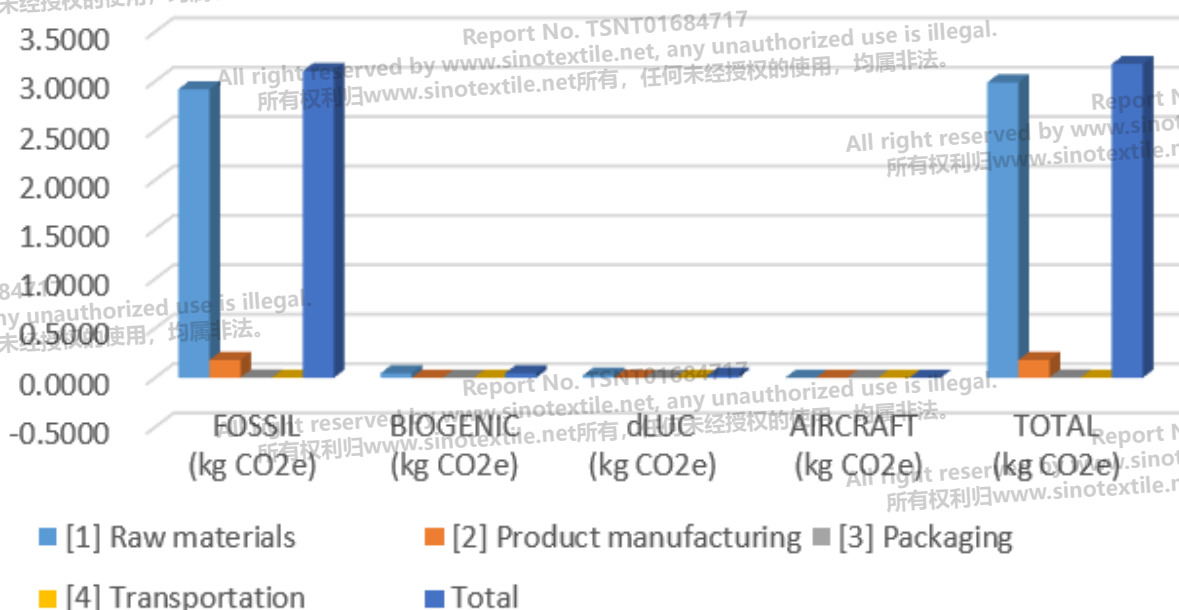


Figure V-4-12: Partial Carbon Footprint of one Piece of Wool Knitted Tube Solid - Light Colour (Order#PO-0001331) from Cradle to Gate



Total Quality. Assured.

Table V-4-13: Partial Carbon Footprint of one Piece of Wool Knitted Tube Solid - Dark Colour (Order#PO-00001331) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	2.9858	0.0487	0.0232	0.0000E+00	3.0577	94.28%
[2] Product manufacturing	0.1799	-0.0001	0.0001	5.0350E-08	0.1799	5.55%
[3] Packaging	0.0038	0.0000	0.0000	2.0244E-10	0.0038	0.12%
[4] Transportation	0.0008	0.0000	0.0000	9.9660E-04	0.0018	0.06%
Total	3.1703	0.0486	0.0233	9.9665E-04	3.2432	100.0%

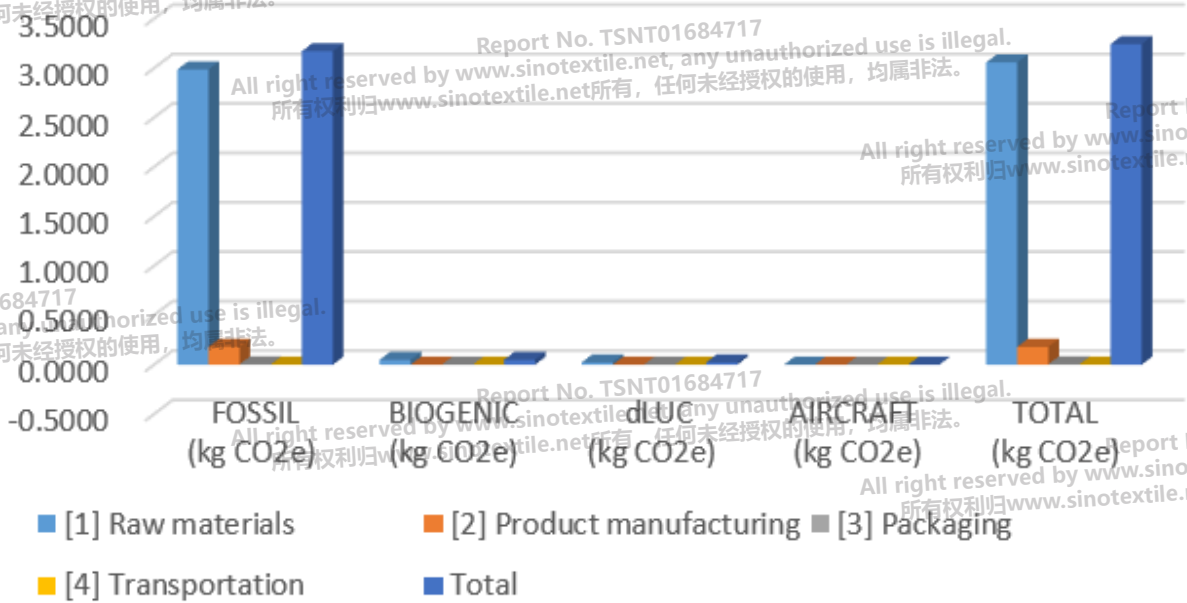


Figure V-4-13: Partial Carbon Footprint of one Piece of Wool Knitted tube solid - Dark Colour (Order#PO-00001331) from Cradle to Gate



Total Quality. Assured.

Table V-4-14: Partial Carbon Footprint of one Piece of Wool Knitted Turtle Top Solid – Light&Dark Colour (Order#PO-00001332) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	6.5899	0.1061	0.0514	0.0000E+00	6.7474	94.17%
[2] Product manufacturing	0.4064	-0.0001	0.0003	1.1376E-07	0.4066	5.67%
[3] Packaging	0.0088	0.0000	0.0000	4.6936E-10	0.0088	0.12%
[4] Transportation	0.0015	0.0001	0.0000	9.9678E-04	0.0026	0.04%
Total	7.0066	0.1061	0.0517	9.9690E-04	7.1654	100.0%

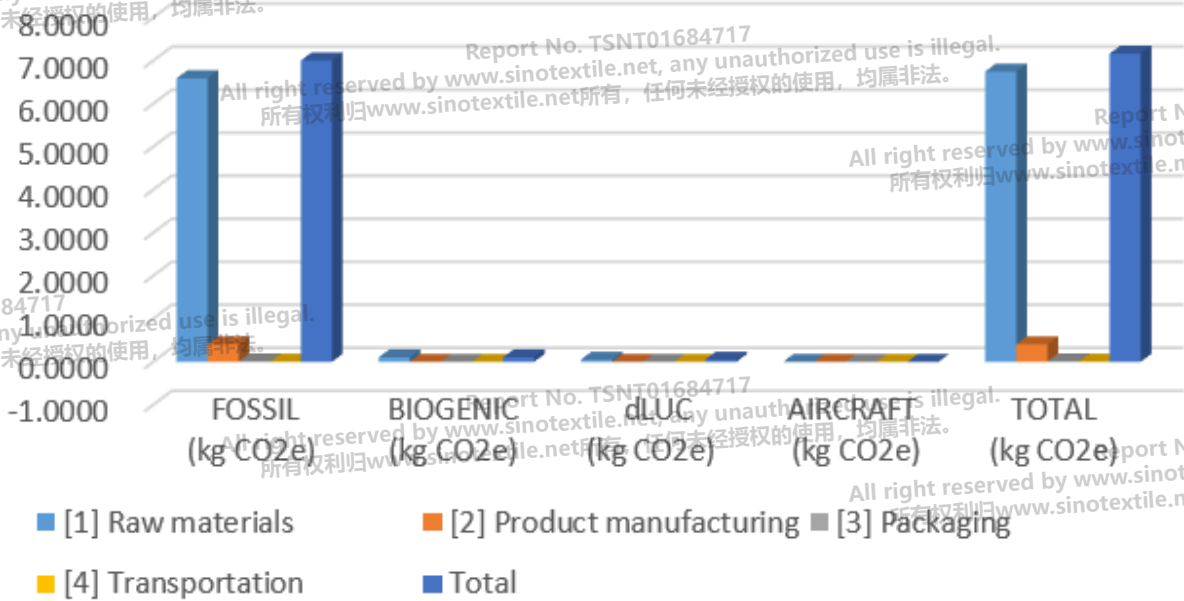


Figure V-4-14: Partial Carbon Footprint of one Piece of Wool Knitted Turtle Top Solid – Light&Dark Colour (Order#PO-00001332) from Cradle to Gate

Table V-4-15: Partial Carbon Footprint of one Piece of Wool Knitted Kneepatch Pants Solid – Dark&Light Colour (Order#PO-00001389) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	5.7885	0.0933	0.0449	0.0000E+00	5.9267	94.73%
[2] Product manufacturing	0.3176	0.0001	0.0002	8.8895E-08	0.3177	5.08%
[3] Packaging	0.0088	0.0000	0.0000	4.6936E-10	0.0088	0.14%
[4] Transportation	0.0018	0.0001	0.0000	9.9678E-04	0.0029	0.05%
Total	6.1167	0.0933	0.0451	9.9687E-04	6.2561	100.0%

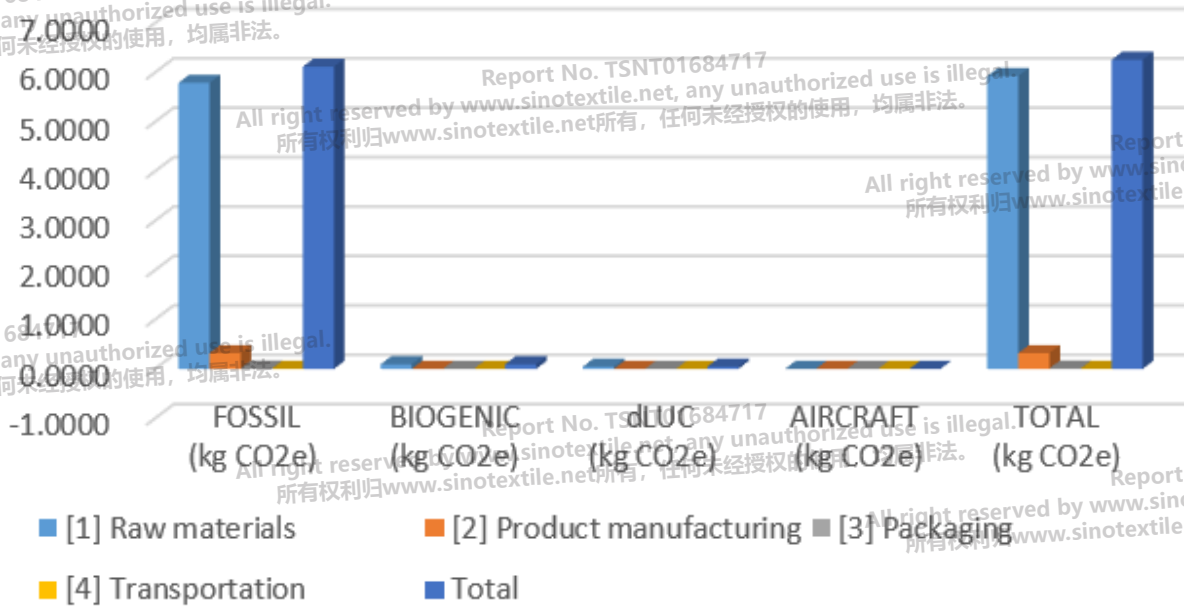


Figure V-4-15: Partial Carbon Footprint of one Piece of Wool Knitted Kneepatch Pants Solid – Dark&Light Colour (Order#PO-00001389) from Cradle to Gate

Table V-4-16: Partial Carbon Footprint of one Piece of Wool Knitted Adult Longjohn Solid - Light Colour (Order#PO-00001328) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	12.9609	0.2051	0.1024	0.0000E+00	13.2684	96.76%
[2] Product manufacturing	0.4237	-0.0002	0.0003	1.1856E-07	0.4238	3.09%
[3] Packaging	0.0163	0.0000	0.0000	8.7329E-10	0.0163	0.12%
[4] Transportation	0.0027	0.0001	0.0000	9.9660E-04	0.0038	0.03%
Total	13.4036	0.2050	0.1027	9.9672E-04	13.7123	100.0%

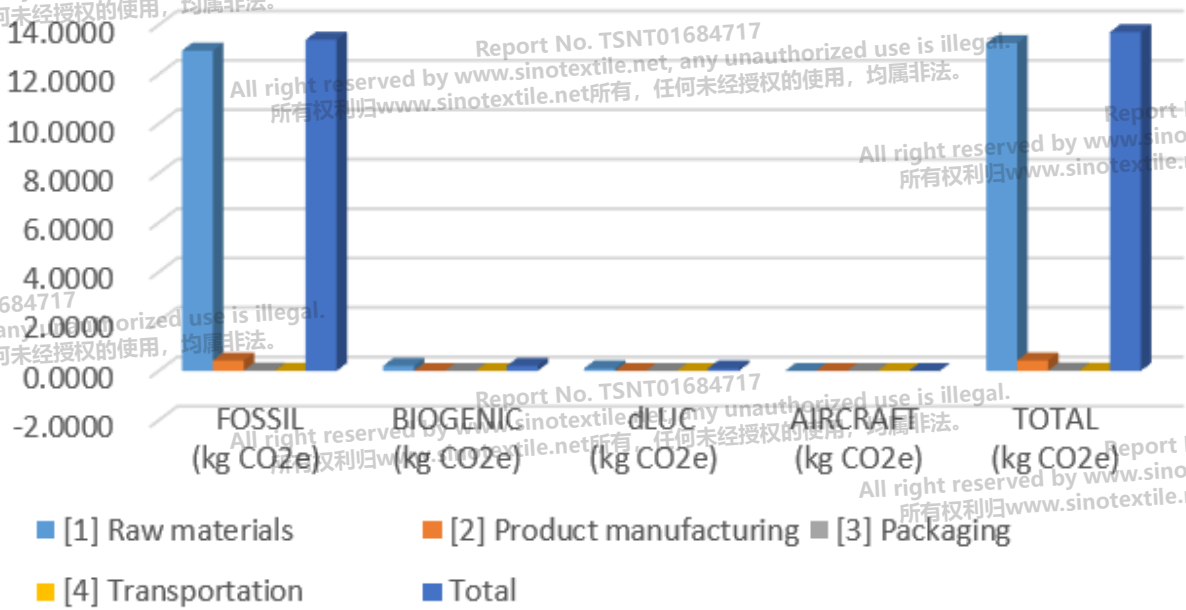


Figure V-4-16: Partial Carbon Footprint of one Piece of Wool Knitted Adult Longjohn Solid - Light Colour (Order#PO-00001328) from Cradle to Gate

Table V-4-17: Partial Carbon Footprint of one Piece of Wool Knitted Adult Longjohn Solid - Dark Colour (Order#PO-00001328) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	13.2511	0.2161	0.1030	0.0000E+00	13.5702	96.83%
[2] Product manufacturing	0.4237	-0.0002	0.0003	1.1856E-07	0.4238	3.02%
[3] Packaging	0.0163	0.0000	0.0000	8.7329E-10	0.0163	0.12%
[4] Transportation	0.0027	0.0001	0.0000	9.9660E-04	0.0038	0.03%
Total	13.6938	0.2160	0.1033	9.9672E-04	14.0141	100.0%

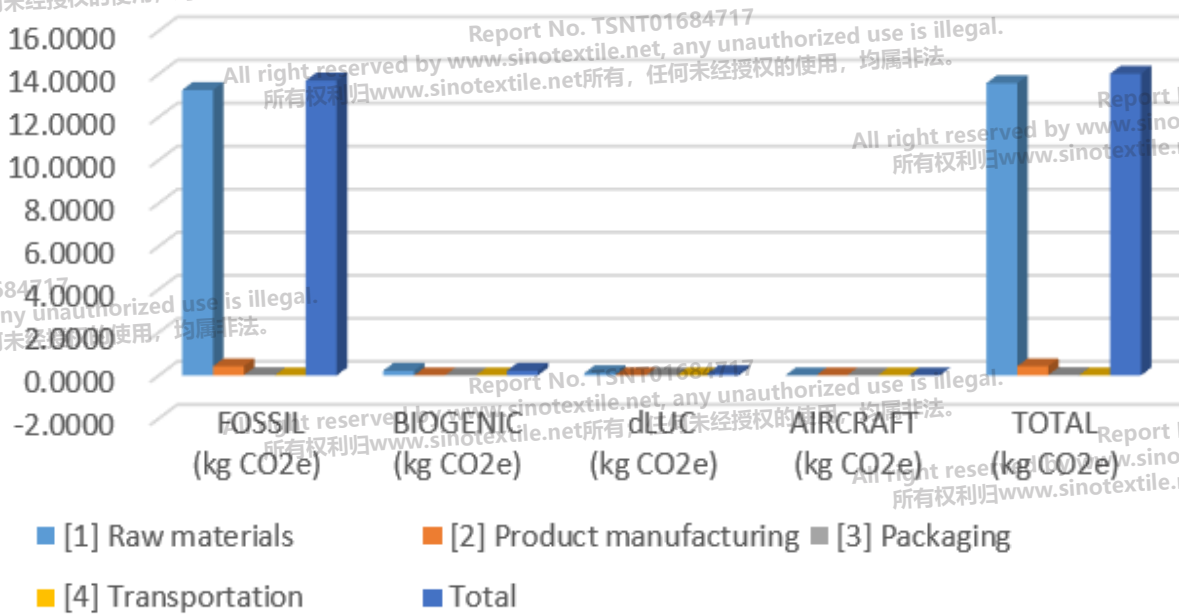


Figure V-4-17: Partial Carbon Footprint of one Piece of Wool Knitted Adult Longjohn Solid - Dark Colour (Order#PO-00001328) from Cradle to Gate

Table V-4-18: Partial Carbon Footprint of one Piece of Wool Knitted Adult Top Solid - Light Colour (Order#PO-00001327) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	12.9191	0.2041	0.1019	0.0000E+00	13.2251	96.53%
[2] Product manufacturing	0.4311	-0.0001	0.0003	1.2067E-07	0.4313	3.15%
[3] Packaging	0.0404	0.0000	0.0000	2.2042E-09	0.0404	0.29%
[4] Transportation	0.0028	0.0001	0.0000	9.9660E-04	0.0039	0.03%
Total	13.3934	0.2041	0.1022	9.9672E-04	13.7007	100.0%

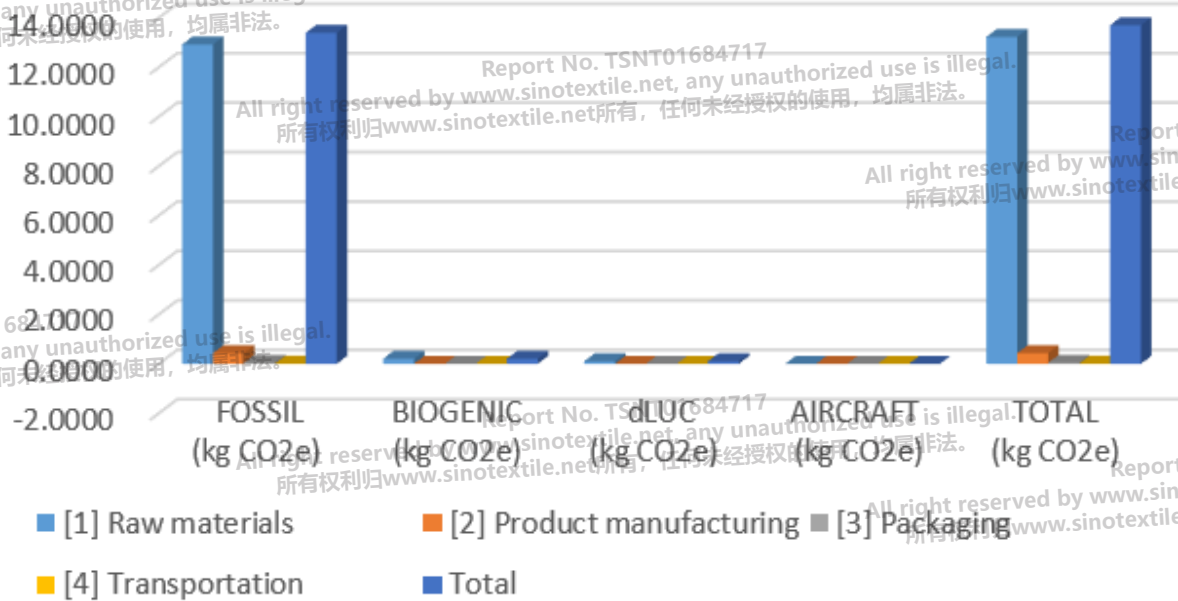


Figure V-4-18: Partial Carbon Footprint of one Piece of Wool Knitted Adult Top Solid - Light Colour (Order#PO-00001327) from Cradle to Gate



Total Quality. Assured.

Table V-4-19: Partial Carbon Footprint of one Piece of Wool Knitted Adult Top Solid - Dark Colour (Order#PO-00001327) from Cradle to Gate

Phase Contribution	Fossil (kg CO ₂ e)	Biogenic (kg CO ₂ e)	dLUC (kg CO ₂ e)	Aircraft (kg CO ₂ e)	Total (kg CO ₂ e)	Percentage Share (%)
[1] Raw materials	13.2079	0.2151	0.1025	0.0000E+00	13.5255	96.60%
[2] Product manufacturing	0.4311	-0.0001	0.0003	1.2067E-07	0.4313	3.08%
[3] Packaging	0.0404	0.0000	0.0000	2.2042E-09	0.0404	0.29%
[4] Transportation	0.0028	0.0001	0.0000	9.9660E-04	0.0039	0.03%
Total	13.6822	0.2151	0.1028	9.9672E-04	14.0011	100.0%

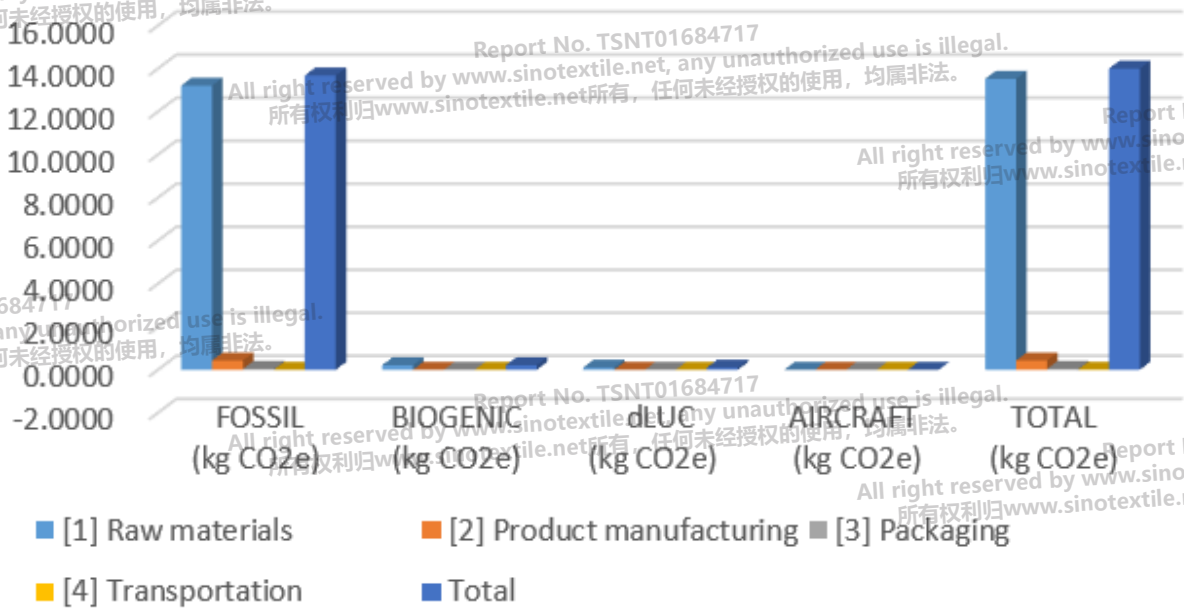


Figure V-4-19: Partial Carbon Footprint of one Piece of Wool Knitted Adult Top Solid - Dark Colour (Order#PO-00001327) from Cradle to Gate

6. INTERPRETATION

6.1 Conclusions

A result overview refers to **Table** product manufacturing in **Chapter 5**.
The partial LCA study reveals that depending on type:

- Regarding greenhouse effect, the 19 types of garments/accessories have different influence on total GHG emission, which are ranged from 2.4818 kg CO₂ eq to 14.0141 kg CO₂ eq. However, the raw materials used in these products have much greatly influence on total GHG emission, which account from 93.75% to 96.83%.
- Energy and resource consumption in product manufacturing account form 3.02% to 6.04% of the total impact, which is the second influential factor after the raw materials.
- The effect of product package and transportation are limited relatively

6.2 Completeness, Consistency, and Sensitivity Analysis

6.2.1 Completeness Analysis

The principles of data collection, cut-off rules and allocation methods used in this study meet the integrity requirements of LCA.

6.2.2 Consistency Analysis

The primary data, secondary data, system boundaries, etc. consistent with the research purpose and scope of this study.

6.2.3 Sensitivity Analysis

The sensitivity analysis is to identifies the significance of the impacts on carbon footprint regarding the variability of the parameters and the data.

As there is no separate meter, the total electricity consumption used in one piece of wool knitted cap solid - light colour (Order#PO-00001329) during the semi-finished light coloured rib knitted fabric manufacturing process in this study is assumed to be 0.4796 kWh/kg, in Alternative scenario 1, calculated by the ratio of equipment power to the total power of the workshop.

On the other hand, in Alternative scenario 2, the total electricity consumption used in one piece of wool knitted cap solid - light colour (Order#PO-00001329) during the semi-finished light coloured rib knitted fabric manufacturing process in this study is assumed to be 0.5545 kWh/kg, calculated by the ratio of the weight of this kind of fabric to the total weight of the fabric produced in the workshop.

Take one piece of wool knitted cap solid - light colour (Order#PO-00001329) as an example. Under scenario 1 and scenario 2, the sensitivity analysis results for the electricity consumption in the manufacturing process of semi-finished light coloured rib knitted fabric are as below. Sensitivity can be expressed as a percentage change of results present in **Table VI-1**.

Table VI-1: Sensitivity Analysis of The Alternative Scenarios of The Electricity Consumption

Alternative Scenario	Electricity Consumption (kWh/kg)	GWP100, TOTAL (kg CO ₂ e)	SENSITIVITY (%)
Alternative scenario 1	0.4796	2.4818	1.41%
Alternative scenario 2	0.5545	2.4861	0.72%

6.3 Uncertainty Assessment

The Monte Carlo method is used to calculate the uncertainty of the results. For raw data themselves, uncertainties may exist due to limitations of accuracy of the instruments, inconsistencies between the time spots of data recording, and the actual production time, etc.

Take wool knitted cap solid - light colour (Order#PO-00001329) as an example, the overview of uncertainty analysis result is shown in **Figure VI-2**. the horizontal axis represents the possible results, and the vertical axis represents the probability of the corresponding result occurring. the specific results refer to **Table VI-2** below.

Figure VI-2: Uncertainty Analysis of the Partial CFP Result

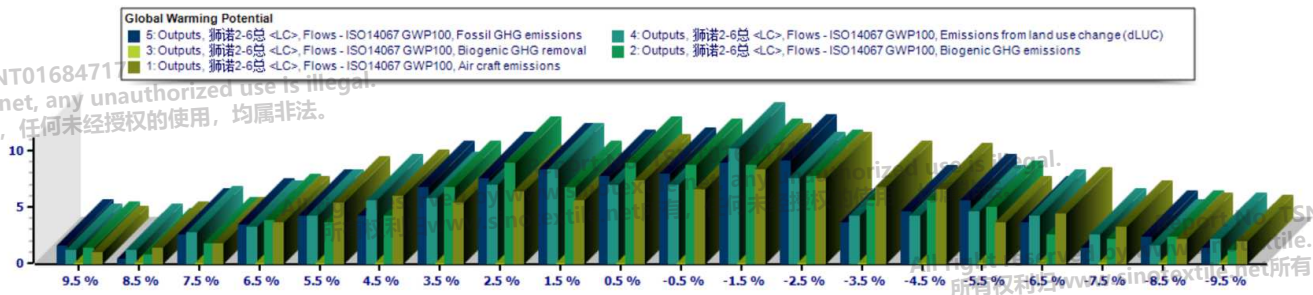


Table VI-2: Uncertainty Analysis Results

Data	Average Value (kg CO ₂ e)	Mid-Value (kg CO ₂ e)	Standard Deviation	Lower Limit of 80% Confidence Interval	Upper Limit Of 80% Confidence Interval
Aircraft (kg CO ₂ e)	0.0010	0.0010	5.13%	0.0009	0.0011
Biogenic Removal (kg CO ₂ e)	0.0000	0.0000	0.00%	0.0000	0.0000
Biogenic (kg CO ₂ e)	0.0409	0.0409	4.53%	0.0385	0.0434
dLUC (kg CO ₂ e)	0.0179	0.0179	5.08%	0.0168	0.0191
Fossil (kg CO ₂ e)	2.4279	2.4256	4.80%	2.2780	2.5789

6.4 Limit of the Study

Since the electricity consumption in fabric production is allocated by equipment power, there is limitation in this study.

6.5 Recommendations

Based on the above report, the recommendations are as follows:

- Additional measuring instruments, such as electric meters, may be added in the workshops to minimize assumptions and make the collected data more accurate.
- Increased use of renewable energy sources such as green electricity should reduce the total carbon emissions of finished products.

Prepared by:

Andrew Shen

Guo Li

Date: April 8, 2024



To : Qingdao Sino Textile Technique Co.,Ltd
Attn : Vincent Tangyi
Email:vincent@sinotextile.net
www.sinotextile.net

Date : April 08, 2024

Re : Report Revision Notification

Report Number TSNT01679386

Dated April 03, 2024

Please Be Informed That All The Content Recorded In The Above Captioned Report Will Be Void. This Captioned Report Is Now Supersede By A Revised Report, Number TSNT01684717 , Issued On April 08, 2024

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