PRODUCT CARBON FOOTPRINT EXPLAINED

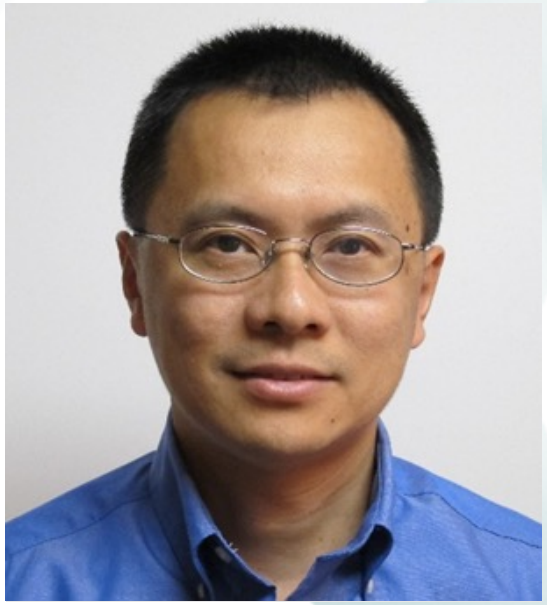
AVIENT™

INTRODUCTION

TODAY'S PRESENTERS FROM AVIENT

JAN SÜLTEMEYER, PH. D.

Global Innovation
& Sustainability Manager



LIANG XU, PH. D.

Senior Technology Manager

Specialty Engineered Materials
R&D and Technical Service

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DISCUSSION TOPICS

- Sustainability at Avient
- Carbon Emissions & Climate Change
- Understanding Carbon Footprint
- Calculating Product Carbon Footprint
- Impact of Material Selection
- Sustainable Material Technologies
- Conclusion

SUSTAINABILITY

AT AVIENT




OUR MISSION

ENABLE OUR CUSTOMERS' INNOVATION AND SUSTAINABILITY GOALS THROUGH WORLD CLASS PRODUCTS AND SERVICES AND EXCELLENCE IN THE FOUR CORNERSTONES OF:

PEOPLE **PRODUCTS** **PLANET** **PERFORMANCE**

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CARBON EMISSIONS & CLIMATE CHANGE

- **74%** of greenhouse gas emissions come from Carbon Dioxide (CO_2)[1]
- **92%** of CO_2 emissions are from the use of fossil fuels, especially for generation of electricity and heat, transportation, and manufacturing and consumption[1]

Source 1: https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors

CARBON EMISSIONS MUST BE ADDRESSED

- CO_2 emissions have increased by about 90% over the past 50 years[2]
- China contributes 30% of global CO_2 emissions[2]
  - Followed by the United States at 15% and European Union at 9%[2]

2460+
companies have set emission reduction targets[3]

70%
of countries have net zero targets[3]

1740+
companies set net zero commitments[3]

Source 2: https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data
Source 3. https://sciencebasedtargets.org/companies-taking-action

UNDERSTANDING CARBON FOOTPRINT

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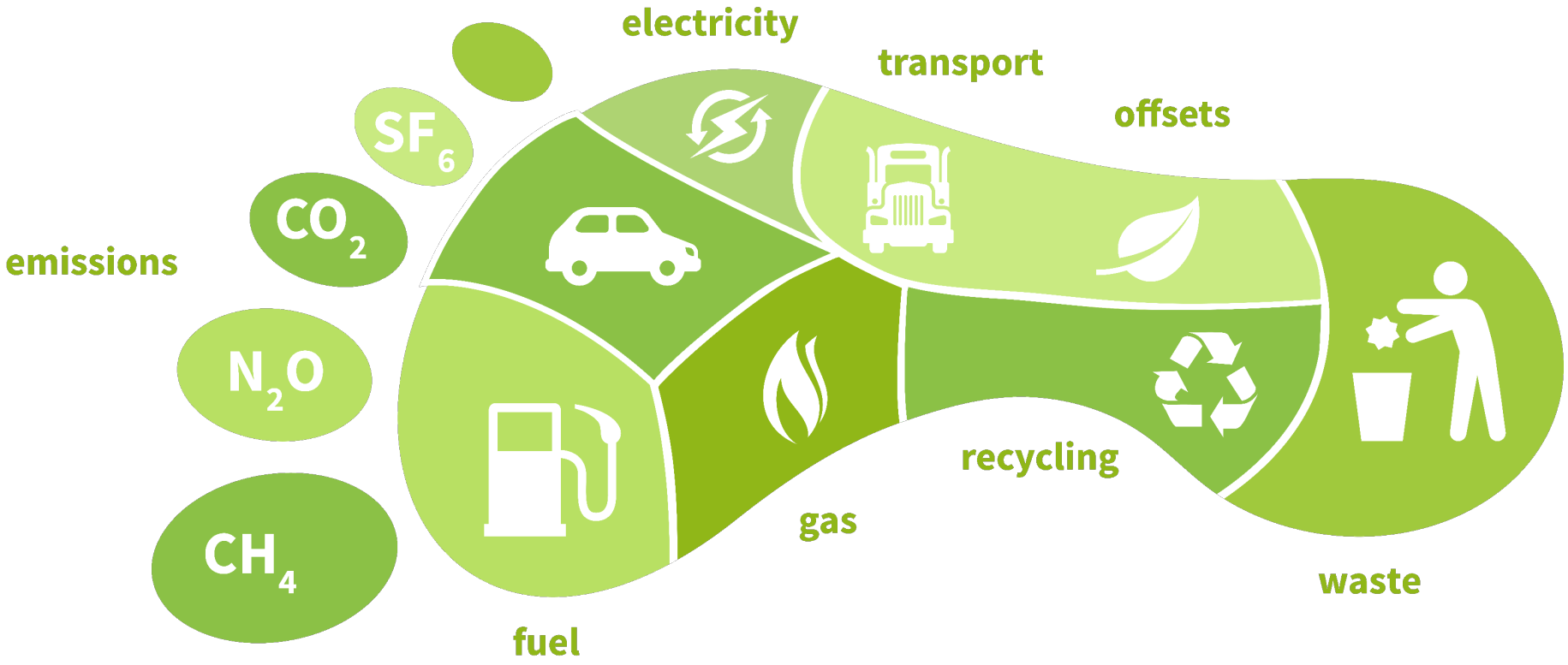
WHAT IS CARBON FOOTPRINT?

A carbon footprint describes the total climate change impact – greenhouse gas (GHG) emissions – that a product, action, or person has.



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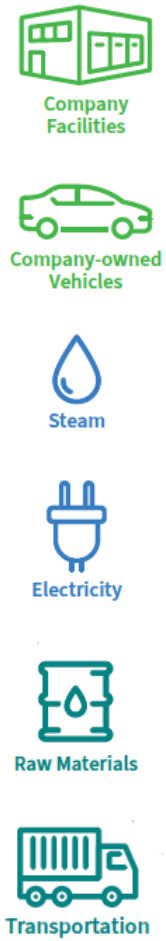
EMISSION TYPES



Scope 1

- GHG emissions caused directly from production

Scope 2

- GHG emissions caused by the generation of energy (steam, electricity, etc.)

Scope 3

- GHG emissions caused during the production of materials or products

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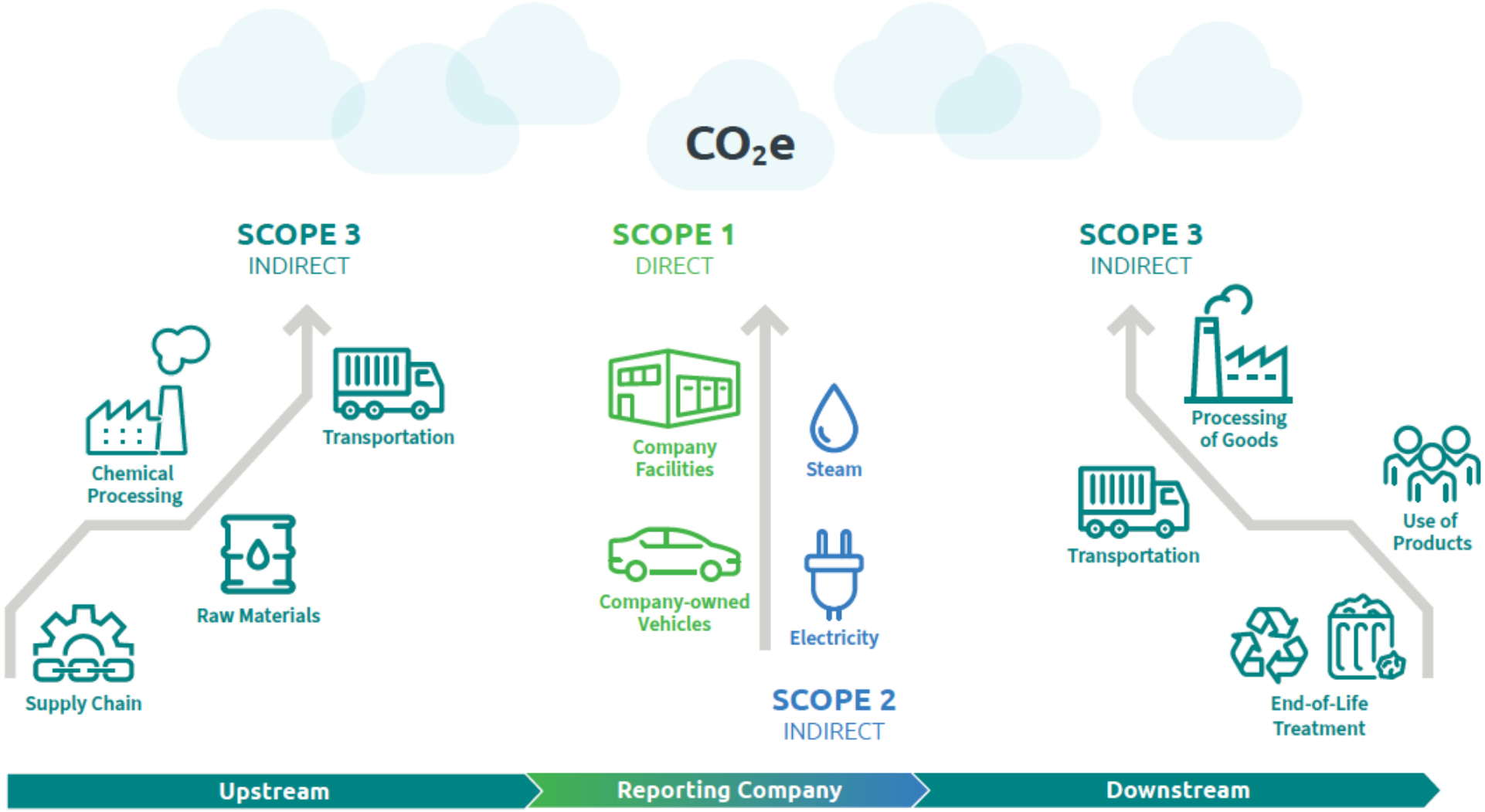
UNDERSTANDING CARBON FOOTPRINT



PRODUCT CARBON FOOTPRINT VS LIFE CYCLE ASSESSMENT

- **Product Carbon Footprint** is specifically focused on the greenhouse gas (GHG) emissions related to a product
- **Life Cycle Assessment (LCA)** is a technique to assess impact categories that can adversely affect the environment or human health (e.g., GHG emissions, land use, water use) associated with all the stages of a product's life cycle from raw material extraction to end of life

PCF is focused solely on GHG emissions while **LCA assesses a range of impact categories**, including GHG emissions

Note: The International Organization for Standardization provides guidelines and requirements for conducting a Life Cycle Assessment according to ISO 14040 and 14044

PRODUCT CARBON FOOTPRINT VS COMPANY CARBON FOOTPRINT

Product Carbon Footprint (PCF)

Company Carbon Footprint (CCF)
also known as Corporate Carbon Footprint

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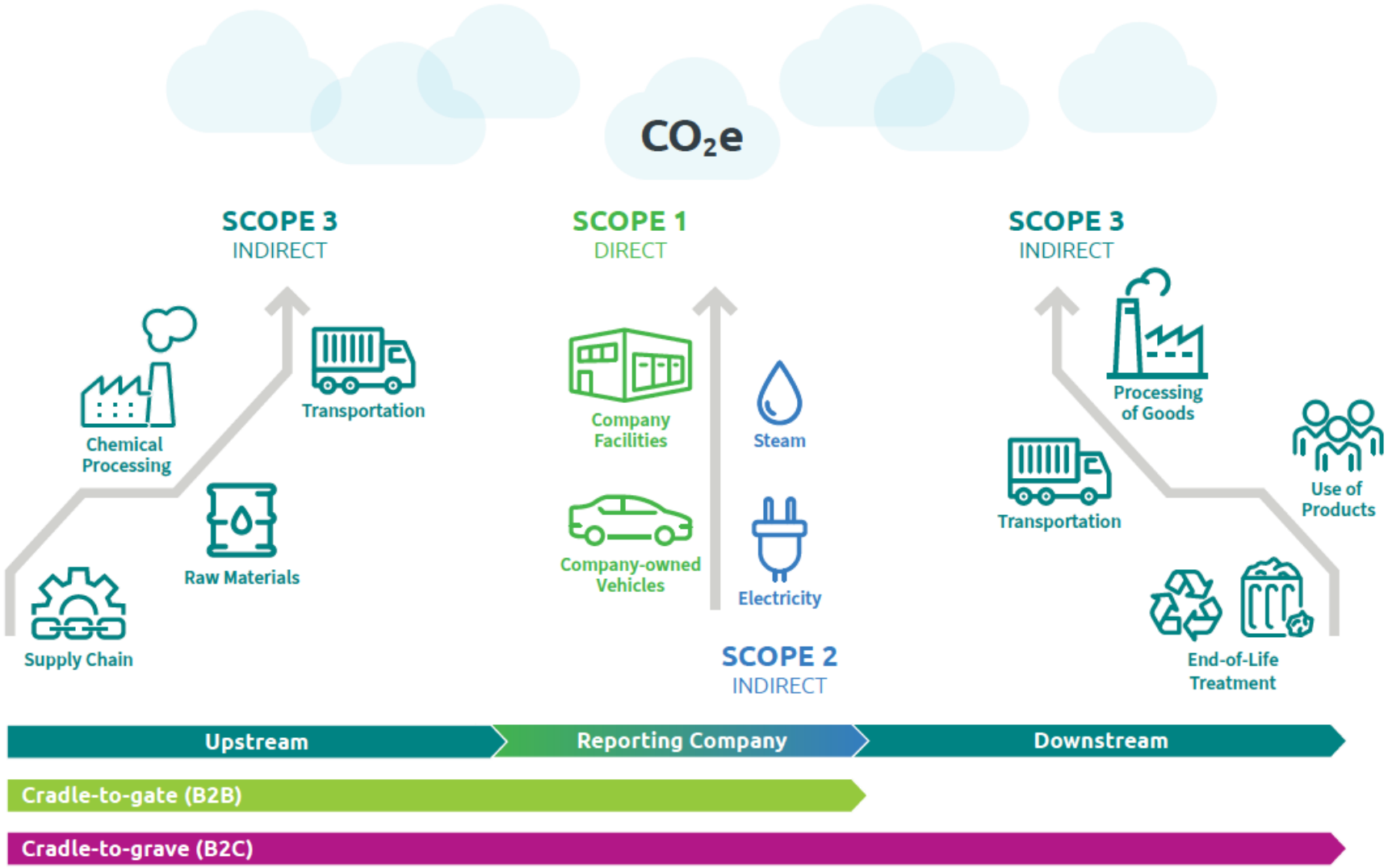
UNDERSTANDING PRODUCT CARBON FOOTPRINT



REDUCING CARBON FOOTPRINT

- Operations focus: reduce energy use & increase efficiency
- Alternative energy sources: renewables, non-fossil fuel sources
- **Product-specific impact:**
  - **Material selection**
  - **Product design**
  - **End-of-life consideration**

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BENEFITS OF A LOW PCF

- Slow global climate change
- Reduce air pollution and improve public health
- Save cost through lower energy and transportation costs

When we cut carbon emissions we help ensure cleaner air, water, and food for our generation and for generations yet to come.

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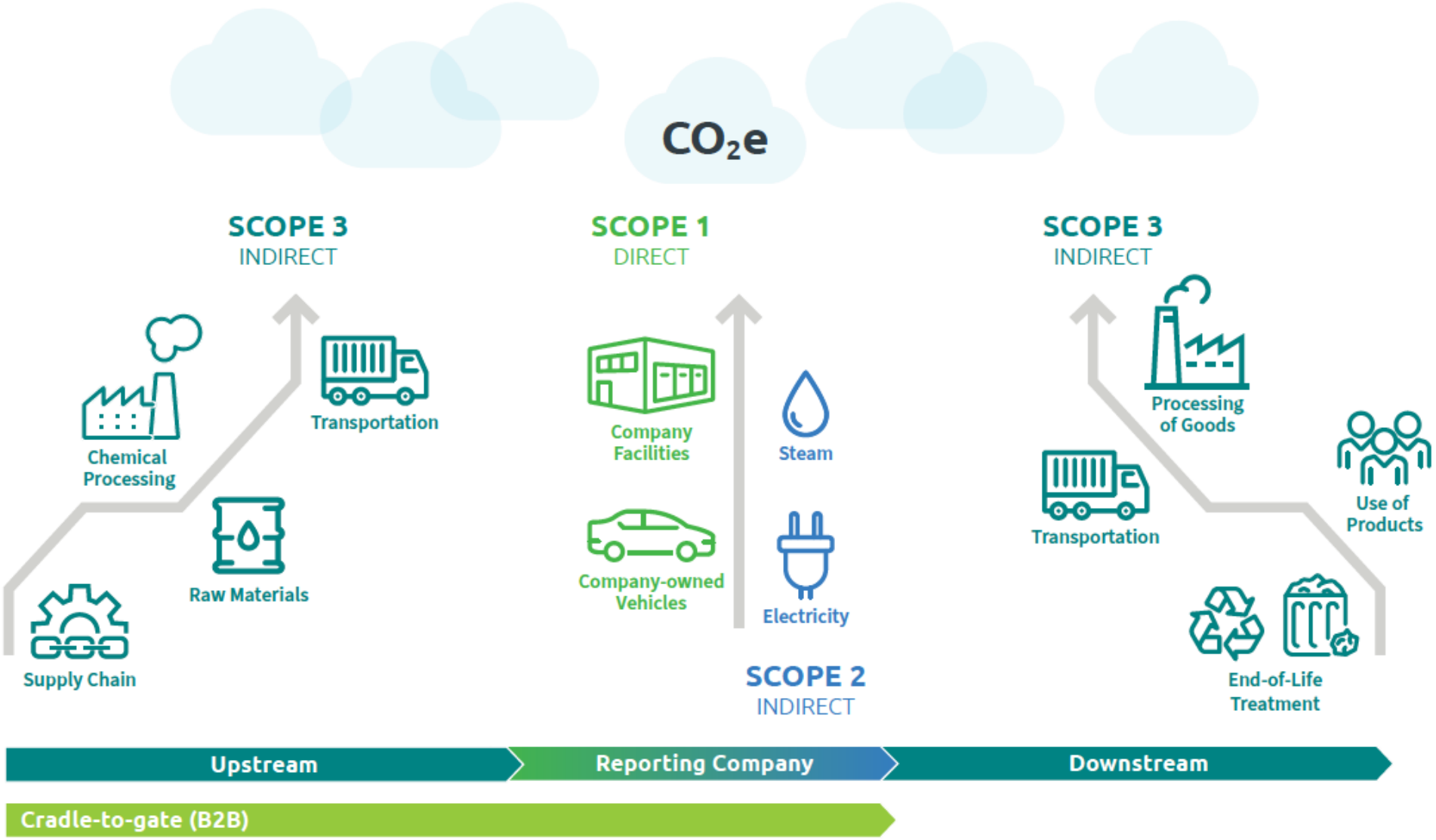
CALCULATING THE DATA

AVIENT'S PCF CALCULATOR

AVIENT'S PCF CALCULATOR



METHODOLOGY

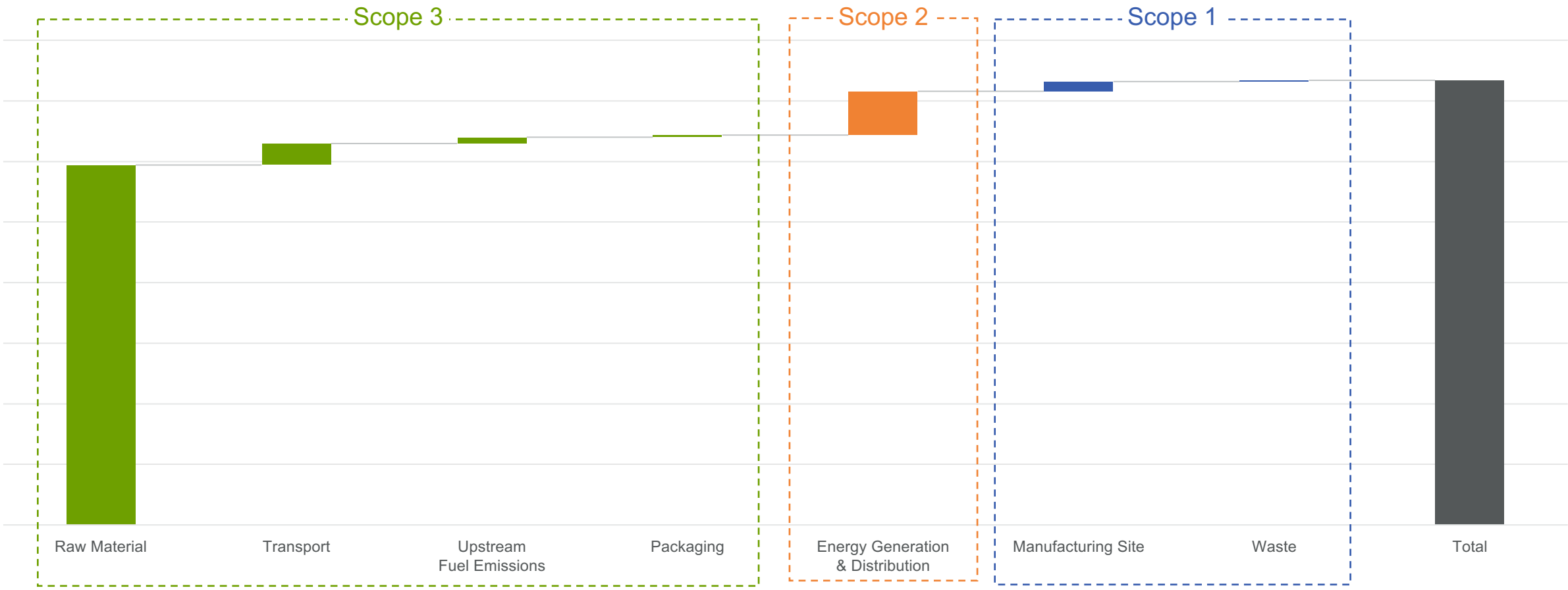
- Follows **ISO 14067:2018** Carbon Footprint of Products
  - Specifies principles and guidelines for the quantification and reporting of the carbon footprint of a product

- Third-Party **Certified by TUV**
  - Certificate confirms that a product meets defined criteria and defined safety-relevant aspects

CERTIFICATE

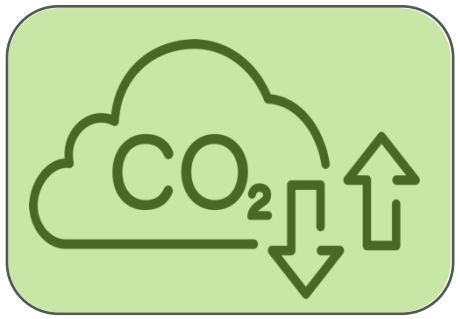
Certificate ID:	C01-2023-03-21257059
Certificate for:	**Review of Product Carbon Footprint Method of Avient Corporation**
Certified:	Avient Corporation 33587 Walker Road, Avon Lake OH 44012, United States
Accounting Scope:	Methodology for assessing the potential climate change effects for plastics in primary pellet forms, such as color and additive masterbatches, and compounds with reinforced fillers
Applied Standard:	ISO 14067: 2018 which is based on ISO 14040:2006 + A1:2020 /ISO 14044:2006 + A1:2018 + A2:2020
Review Report:	CF-2023-03-21257059
Valid until:	March 31st 2024

COMPREHENSIVE ANALYSIS OF PCF

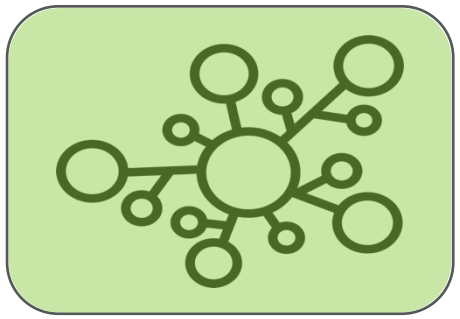


CARBON FOOTPRINT

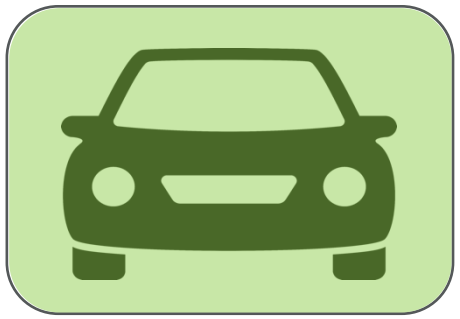
MANAGEMENT STRATEGIES



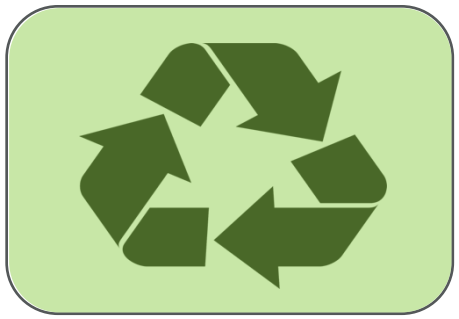
Baseline
carbon footprint of current Avient solution



Reduce
the carbon footprint of the solution



Reduce
material consumption / lightweighting



Improve
the recycling process

Enable
use of biopolymers

Carbon Footprint of Avient Products

Carbon Footprint of Customers Products

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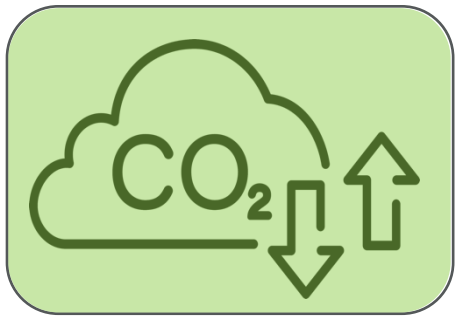
CARBON FOOTPRINT

MANAGEMENT STRATEGIES



Baseline
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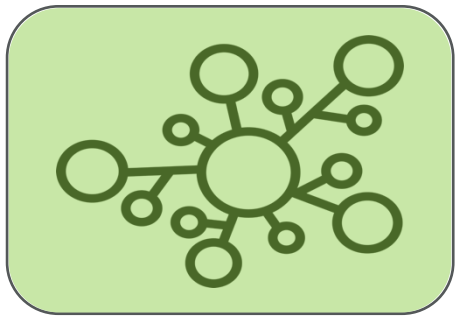

Reduce
the carbon footprint of the solution

Reduce
material consumption / lightweighting

Improve
the recycling process

Enable
use of biopolymers

Carbon Footprint of Avient Products

Carbon Footprint of Customers Products

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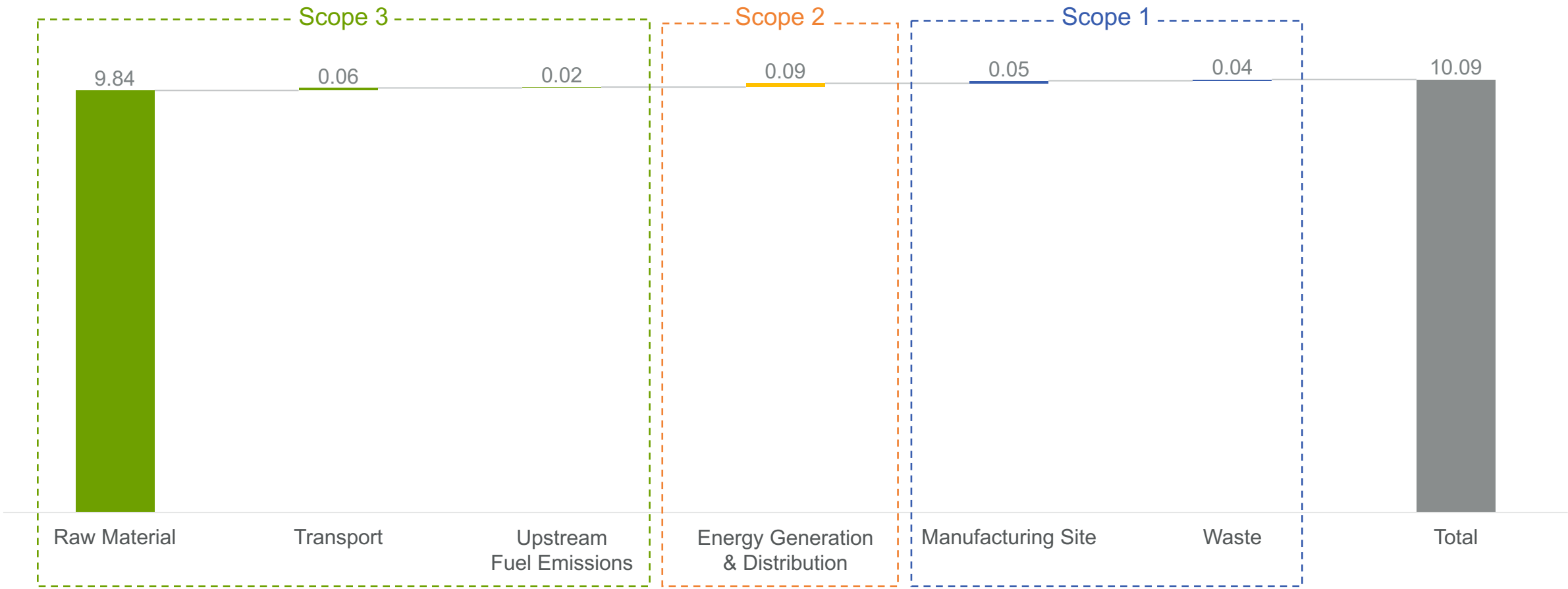
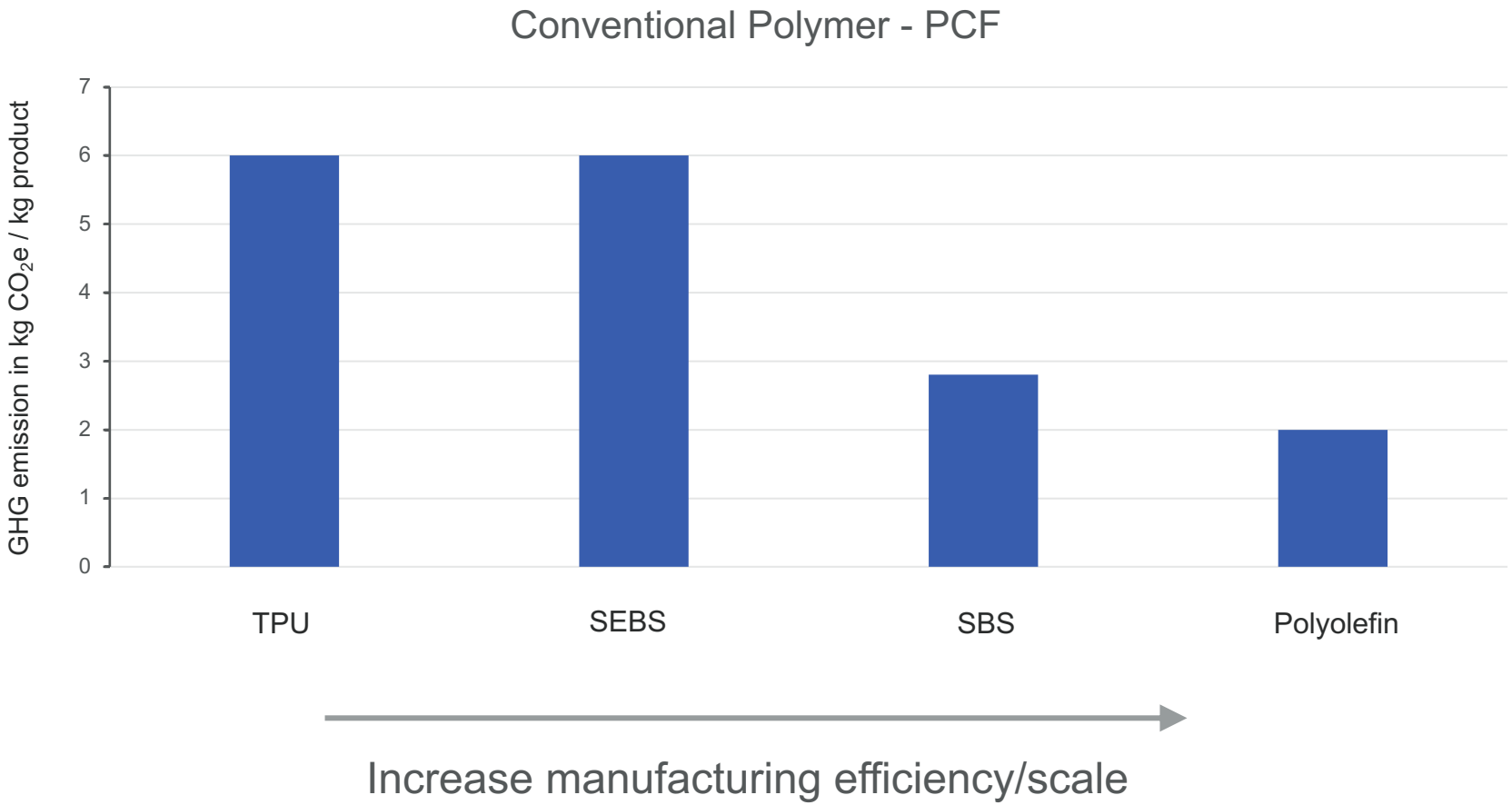
IMPACT OF MATERIAL SELECTION

COMPREHENSIVE ANALYSIS OF PCF

TRADITIONAL POLYAMIDE

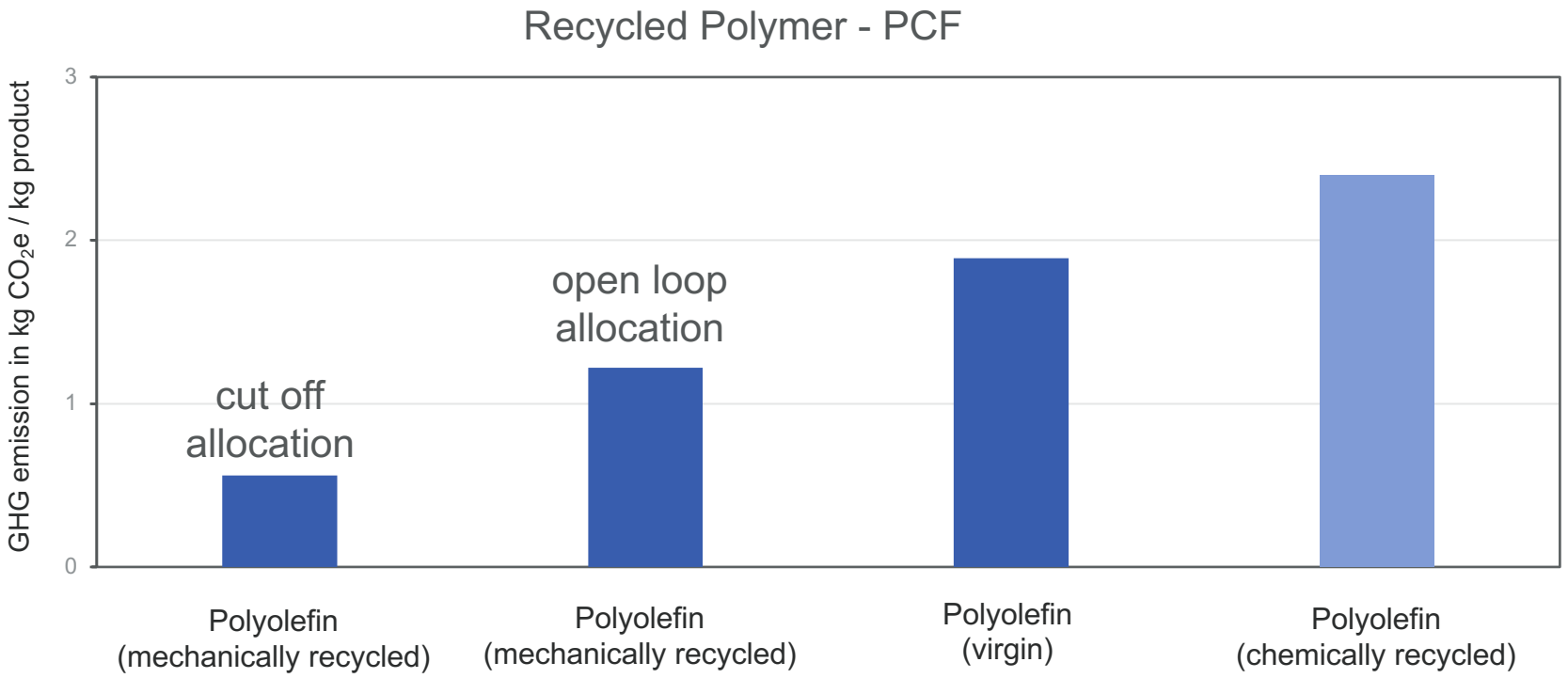


CONVENTIONAL POLYMERS



RECYCLED POLYMERS

POLYOLEFIN COMPARISON



Cut off:
All virgin material production burdens are assigned to the first use of the material.

Open loop:
Burdens are divided between virgin and recycled use of the material.

Mechanically recycled polymer shows reduced PCF compared to virgin polymer

Source: Life Cycle Impacts for Postconsumer Recycled Resins: Association of Plastic Recyclers December 2018 Report

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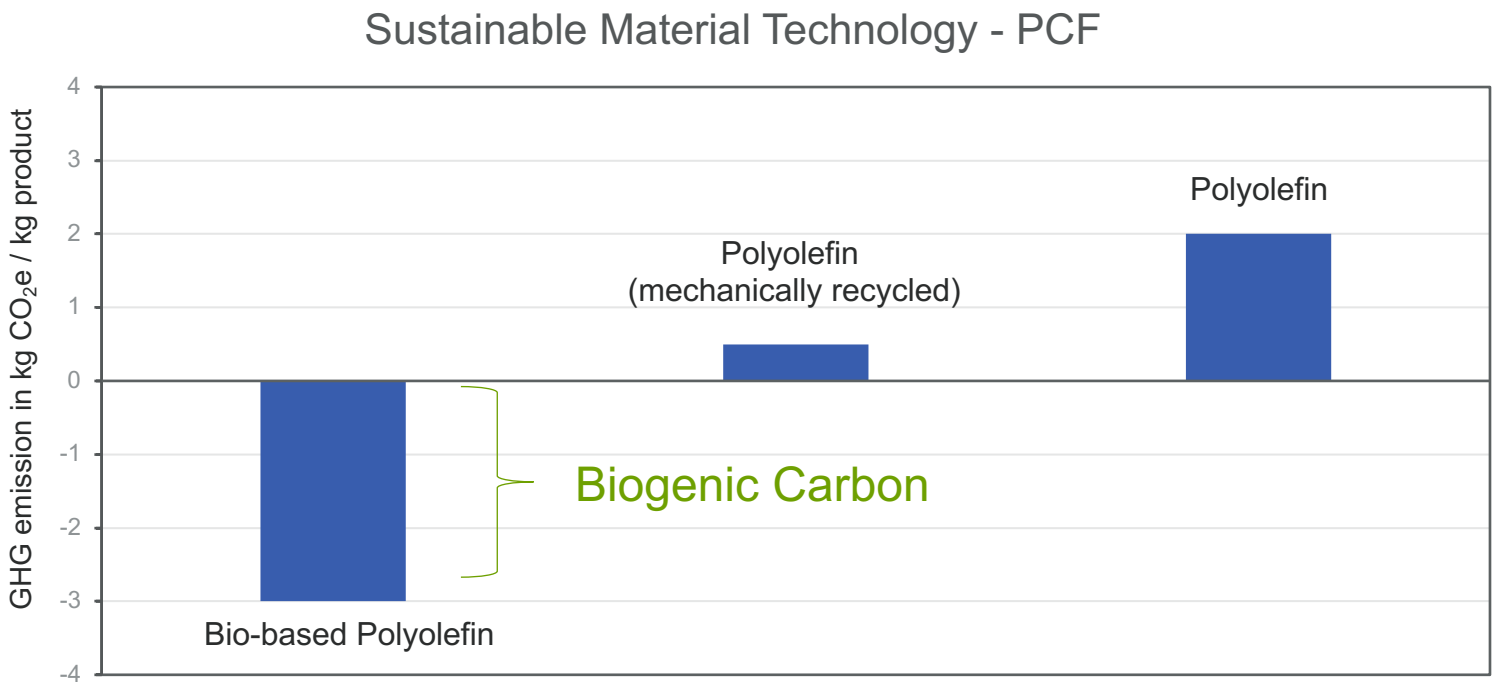
SUSTAINABLE POLYMERS

COMPARING POLYOLEFIN



Biogenic carbon:
Absorbed and stored by organic matter such as trees, plants and grasses.

Biogenic carbon helps to reduce PCF

Source: Life Cycle Impacts for Postconsumer Recycled Resins: Association of Plastic Recyclers December 2018 Report
I'm green™ bio-based PE Life Cycle Assessment

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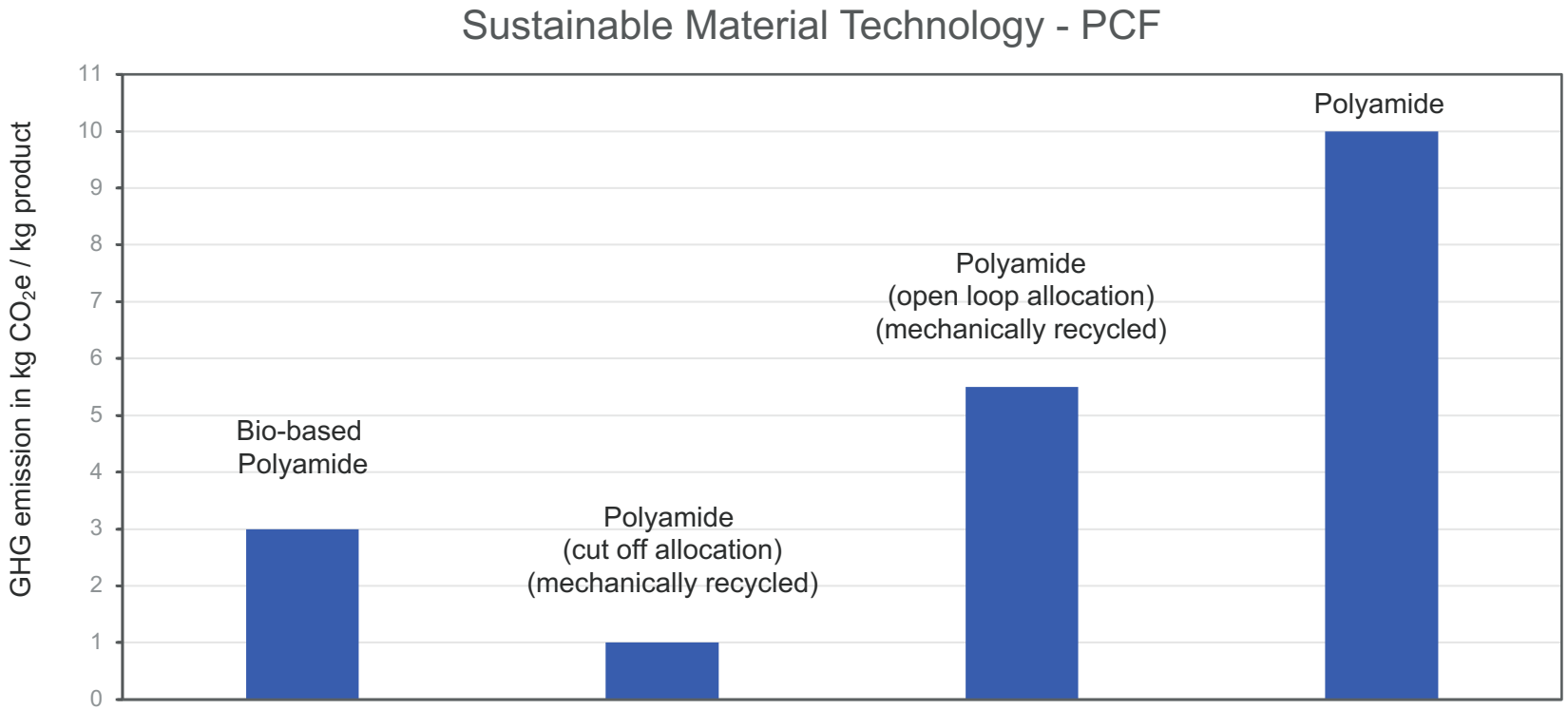
SUSTAINABLE POLYMERS

COMPARING POLYAMIDE



Recycled polymer can have lower PCF depending on how GHG emissions are allocated

Source: Life Cycle Impacts for Postconsumer Recycled Resins: Association of Plastic Recyclers December 2018 Report

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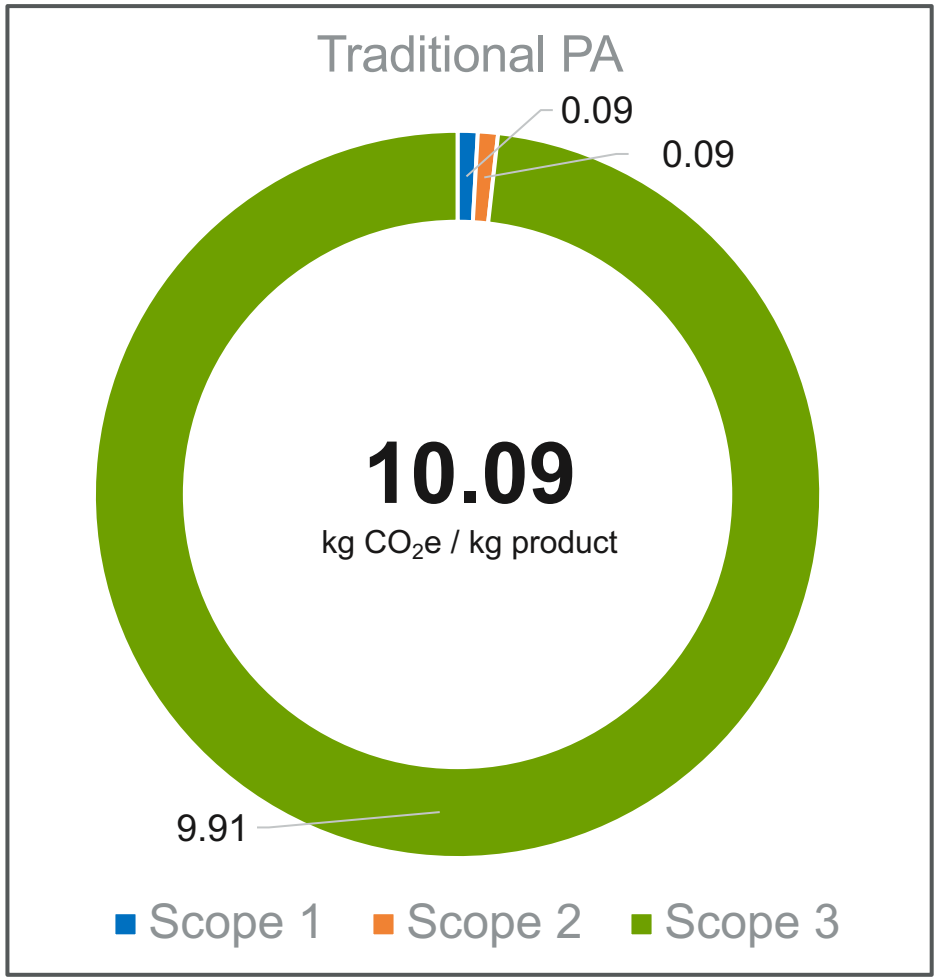
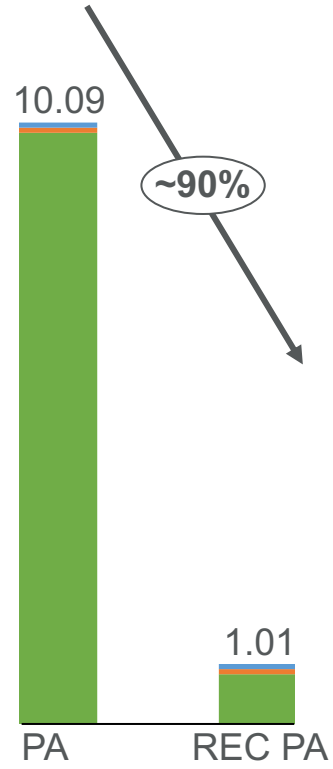
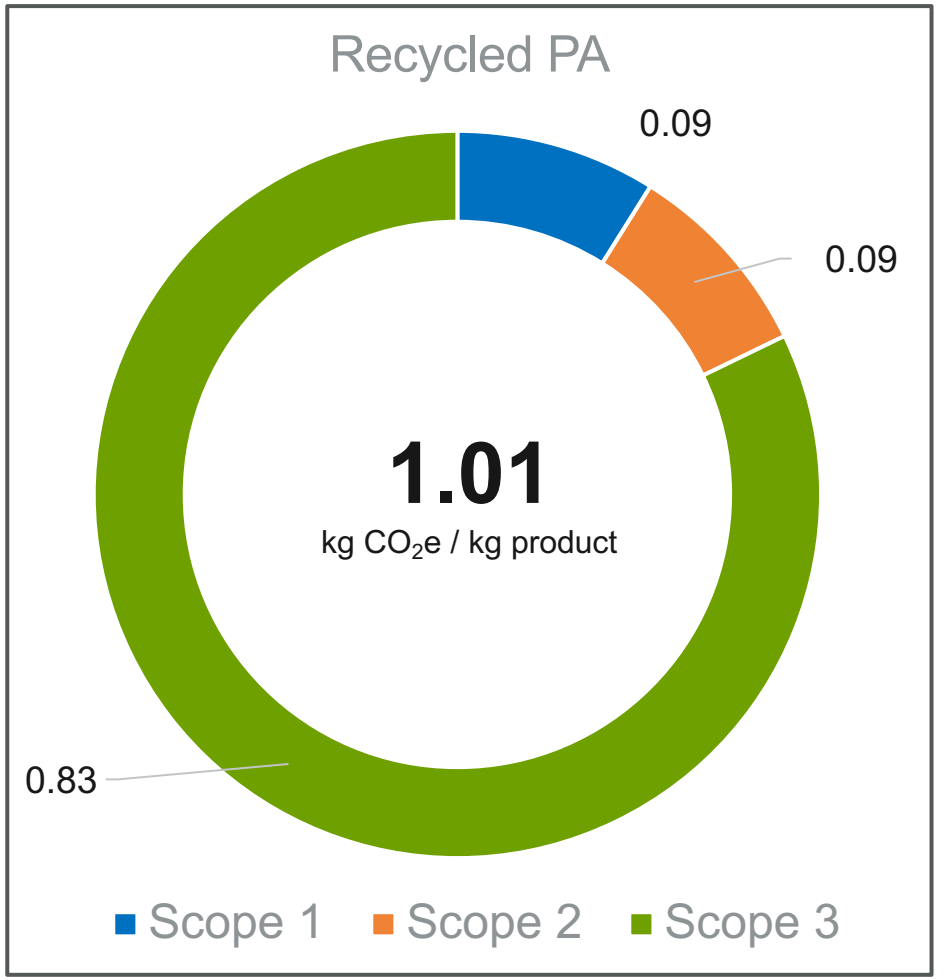
IMPACT OF RAW MATERIAL

TRADITIONAL PA VS. RECYCLED PA







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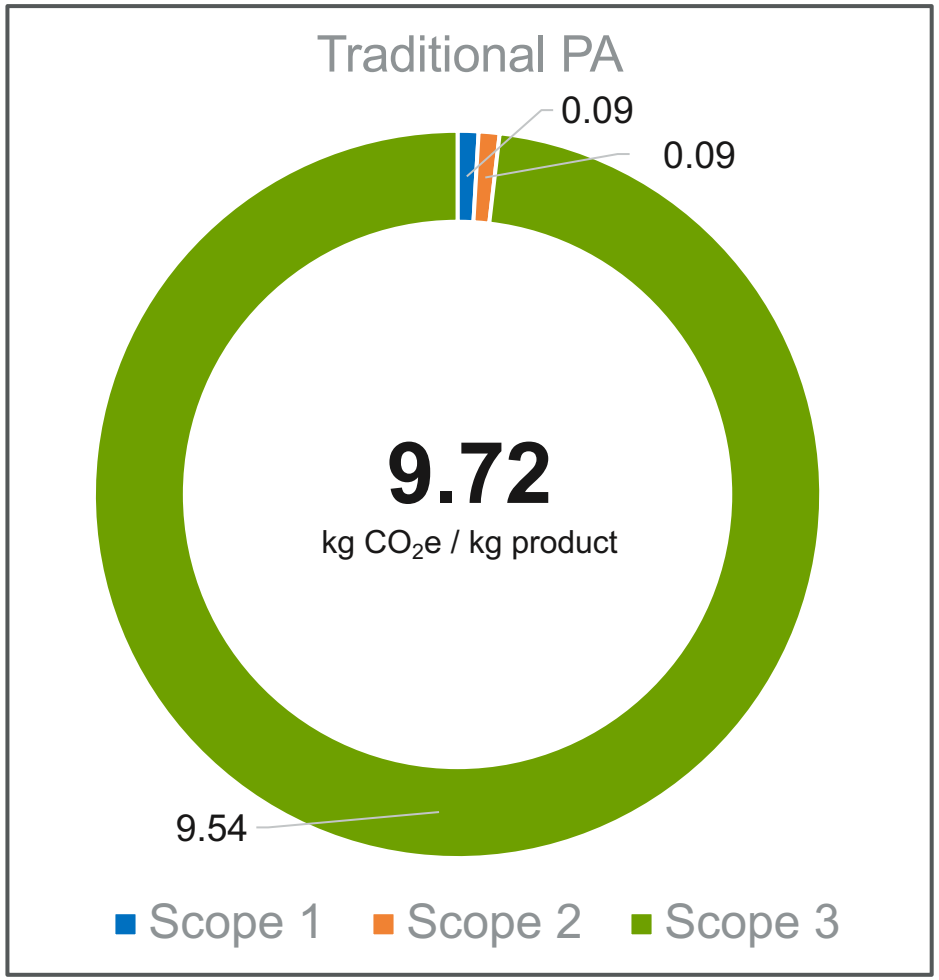
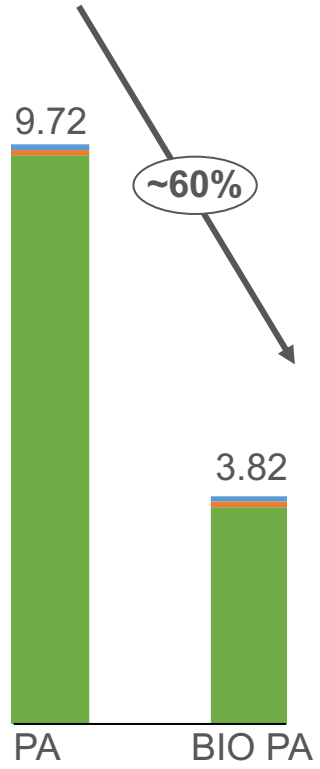
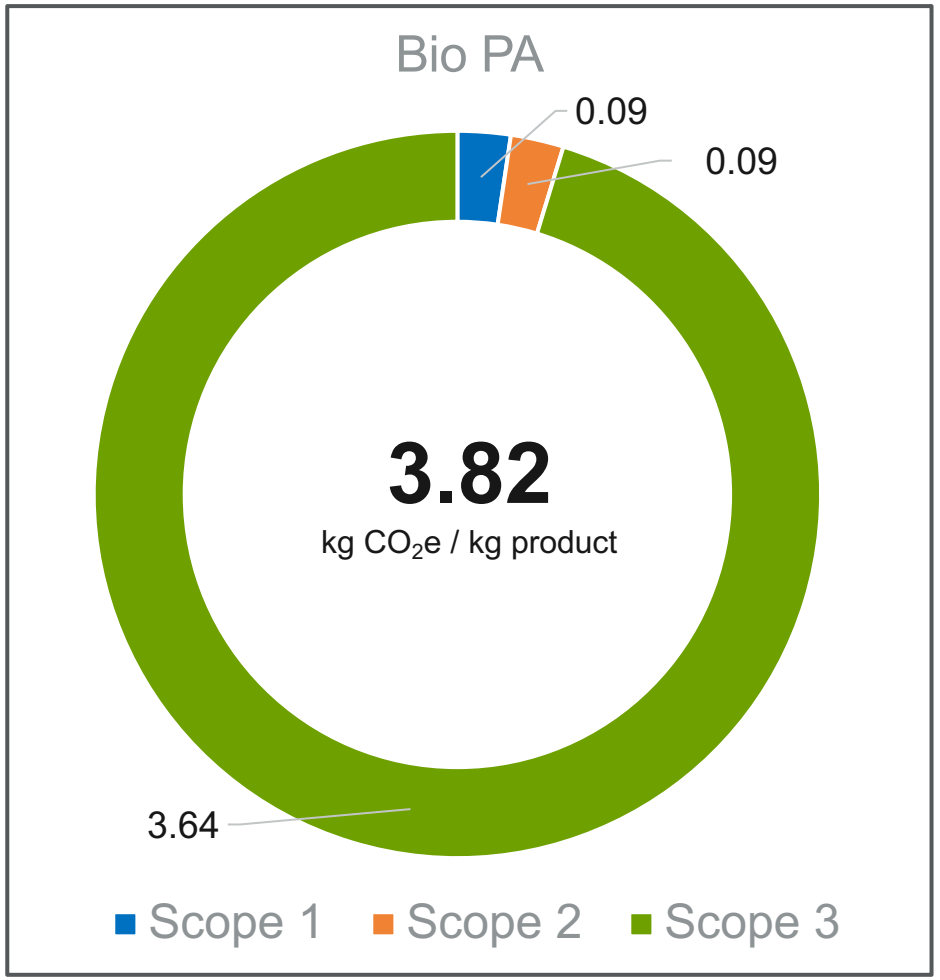
IMPACT OF RAW MATERIAL

TRADITIONAL PA VS. BIO PA







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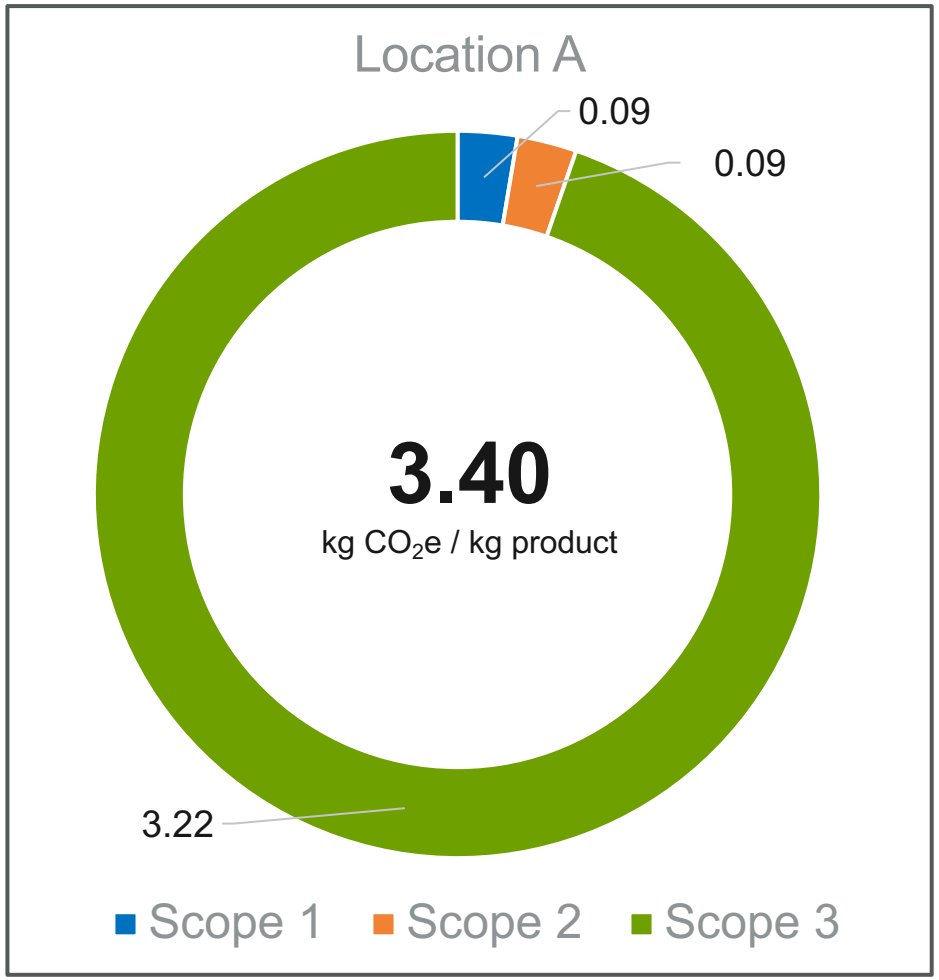
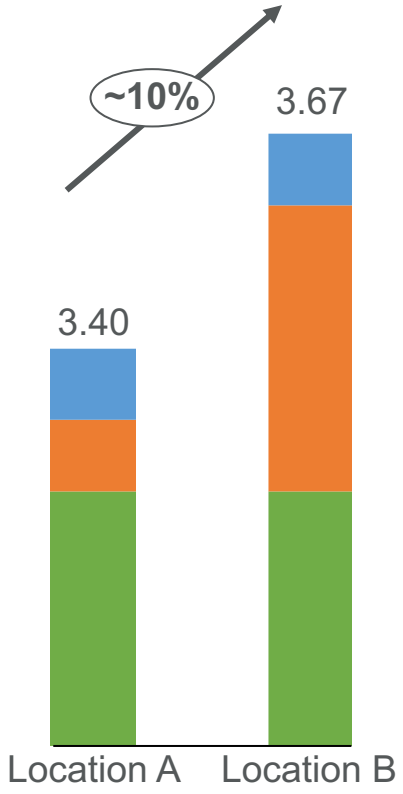
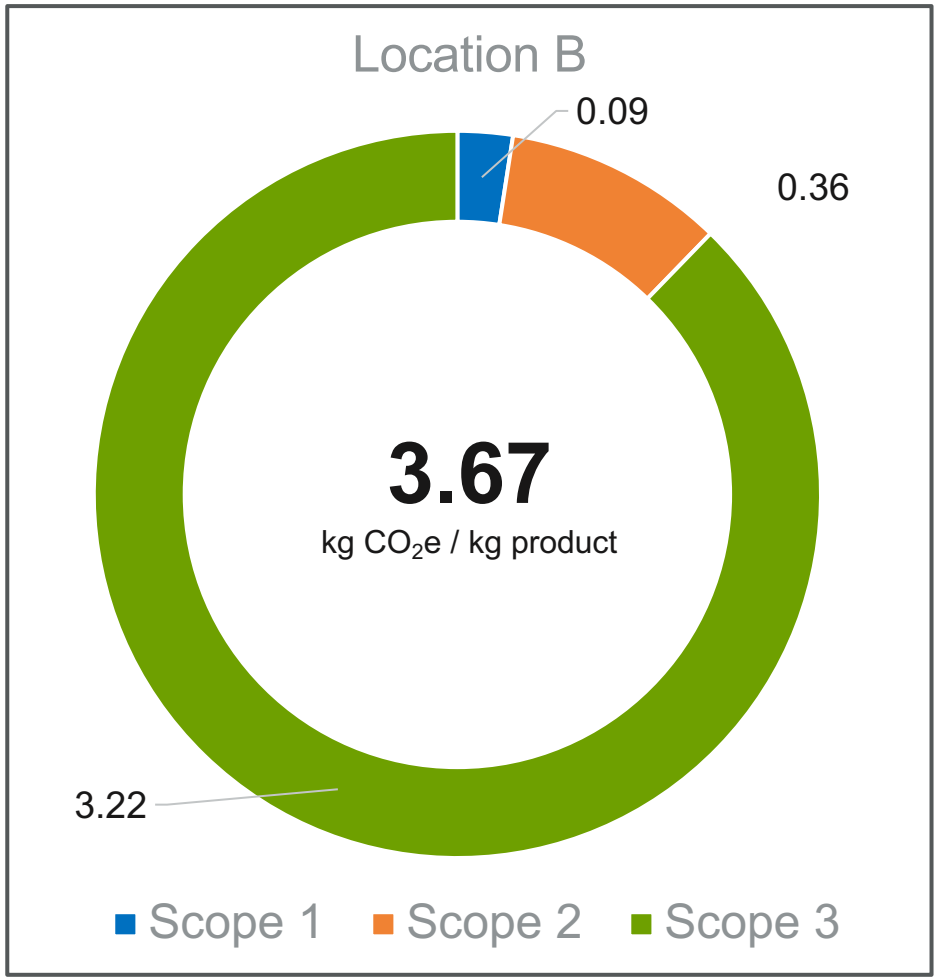
IMPACT OF MANUFACTURING PLANT

LOCATION A VS. LOCATION B







SUSTAINABLE MATERIAL TECHNOLOGIES

HOW AVIENT CAN HELP

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SOLUTIONS WITH SUSTAINABLE CONTENT

ACHIEVE LOWER PCF THAN TRADITIONAL MATERIALS

RESOUND™ REC
RECYCLED CONTENT TPES

NYMAX™ REC
RECYCLED NYLON
FORMULATIONS

EDGETEK™ REC PC
RECYCLED POLYCARBONATE
SOLUTIONS

MAXXAM™ REC
RECYCLED POLYOLEFIN
FORMULATIONS

GRAVI-TECH™ REC
RECYCLED FORMULATIONS

RESOUND™ BIO
THERMOPLASTIC
ELASTOMERS

NYMAX™ BIO
BIO-BASED POLYAMIDE
SOLUTIONS

EDGETEK™ BIO
FORMULATIONS

MAXXAM™ BIO
BIO-BASED POLYOLEFIN
FORMULATIONS

GRAVI-TECH™ BIO
BIO-BASED FORMULATIONS

Possible to reduce kg CO_2e / kg product 10 – 90%

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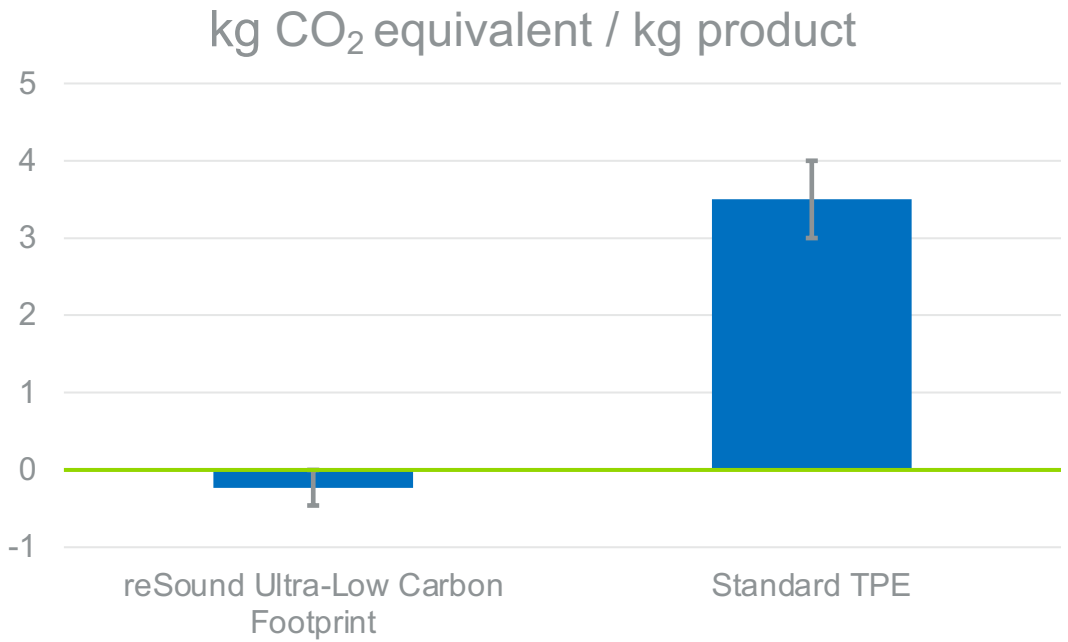
SUSTAINABLE SOLUTIONS

INDUSTRY-FIRST NEGATIVE PCF TPES

reSound™ Ultra-Low Carbon Footprint TPEs



- Comparable performance
- Globally available

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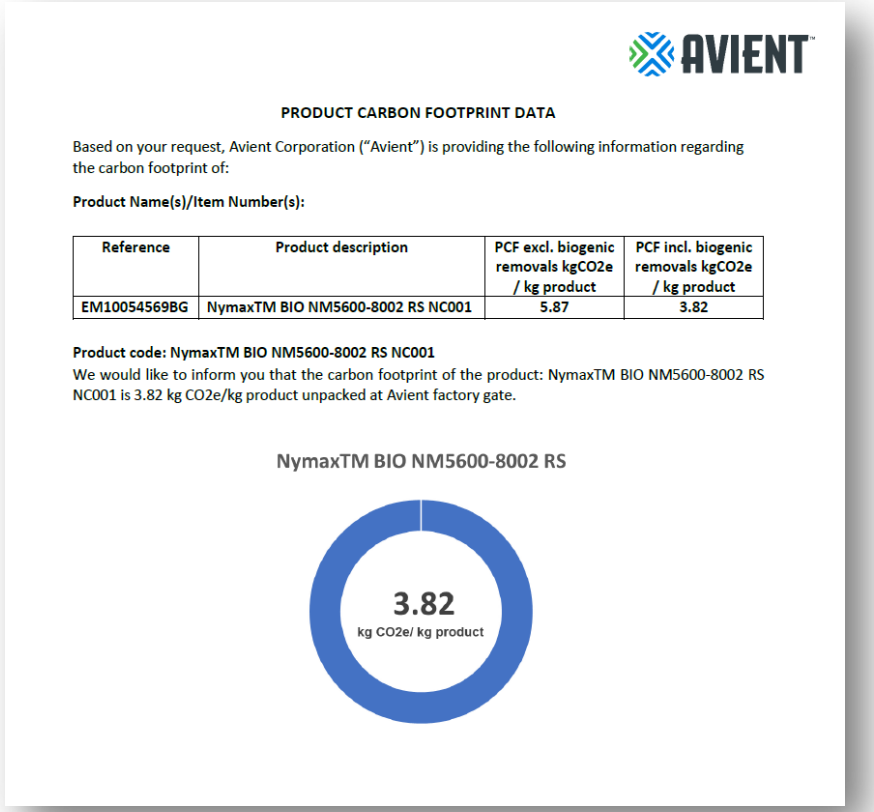
PCF CALCULATION REPORT

COMPONENTS



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PRODUCT CARBON FOOTPRINT DATA

Based on your request, Avient Corporation ("Avient") is providing the following information regarding the carbon footprint of:

Product Name(s)/Item Number(s):

Reference	Product description	PCF excl. biogenic removals kgCO2e / kg product	PCF incl. biogenic removals kgCO2e / kg product
EM10054569BG	NymaxTM BIO NM5600-8002 RS NC001	5.87	3.82

Product code: NymaxTM BIO NM5600-8002 RS NC001

We would like to inform you that the carbon footprint of the product: NymaxTM BIO NM5600-8002 RS NC001 is 3.82 kg CO2e/kg product unpacked at Avient factory gate.

NymaxTM BIO NM5600-8002 RS

Section 1. Product description & product carbon footprint

Section 1.1 Fossil emissions & biogenic removals/carbon captured

Section 2. Methodology description (reference guideline, boundaries system, cut-off rule, data quality check, limitations and assumptions)

Section 3. Legal disclaimer & report validity

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CONCLUSION

- Product carbon footprint is the measure of how much CO_2 equivalents were generated in the life cycle of a product
- While Scope 1 and 2 are included in the calculation, upstream Scope 3 from raw materials impacts PCF the most
- Lowering your PCF is a simple concept, but it's not easy. Avient can help customers by
  - **Formulating polymers** to have the lowest carbon footprint possible
  - **Incorporating recycled or bio-based content** into materials
  - **Providing ISO-compliant and TÜV-certified PCF data** for Avient materials

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QUESTIONS?

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