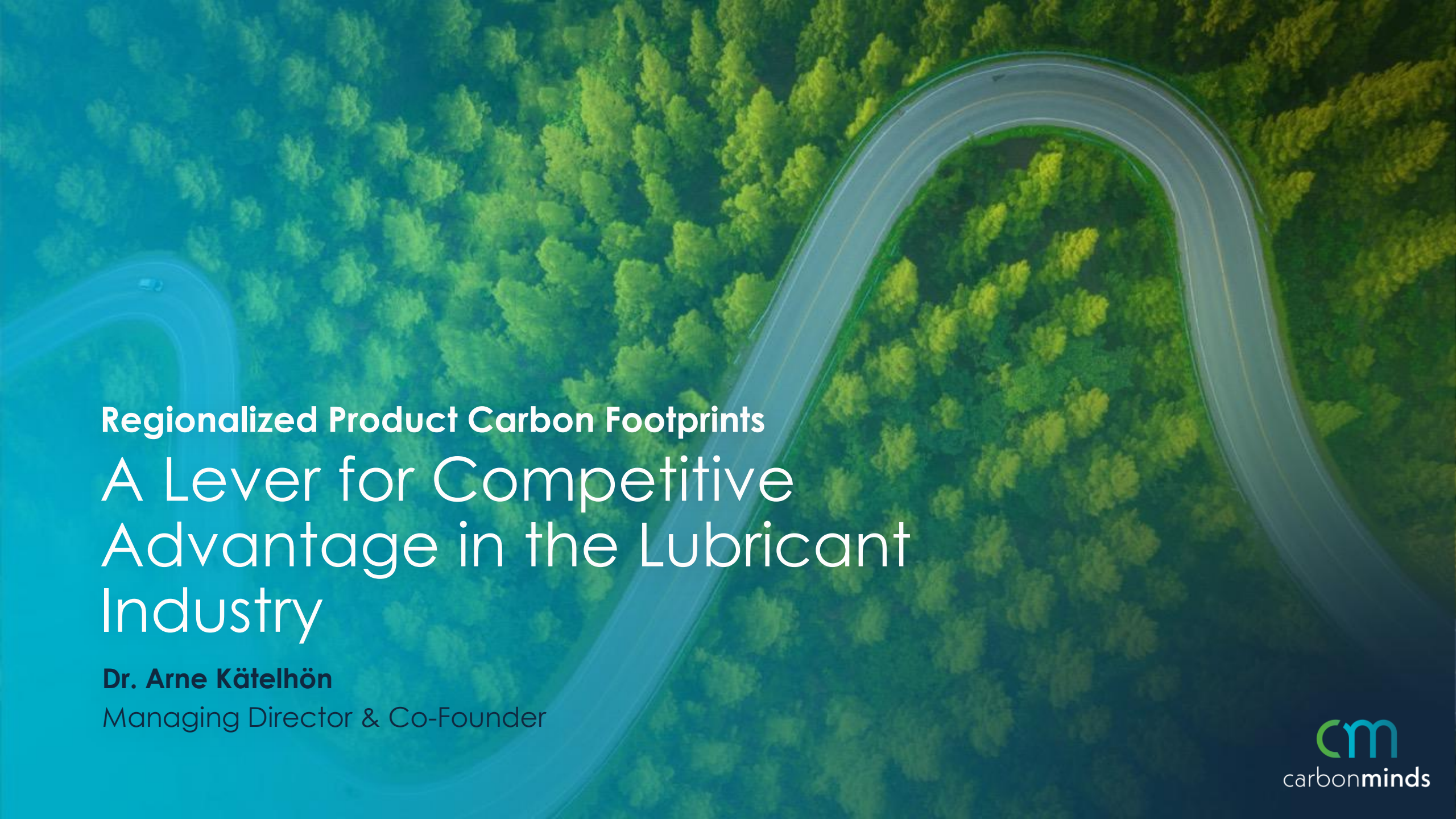




Regionalized Product Carbon Footprints A Lever for Competitive Advantage in the Lubricant Industry

Dr. Arne Kätelhön

Managing Director & Co-Founder



Taking Net Zero in
Process Industries from
Ambition to
Achievement.



Data

Life Cycle Assessment and Product
Carbon Footprint Database for
Lubricants, Chemicals and Plastics



Services

Life Cycle Assessment, Product
Carbon Footprints, Certifications and
Emission Reduction Costs



Training

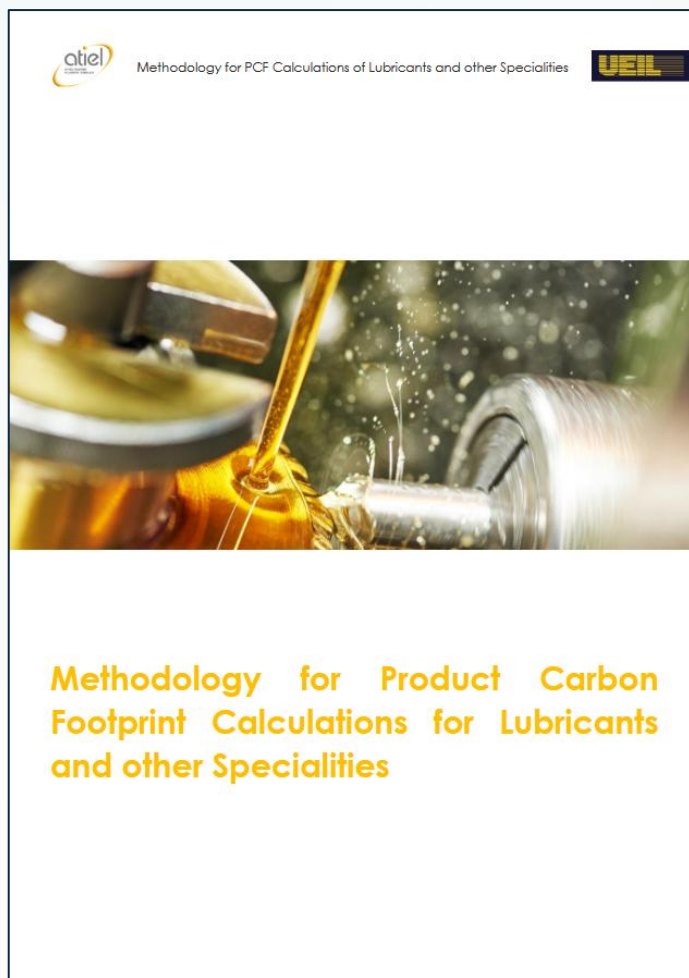
Life Cycle Assessment and Product
Carbon Footprints – at your place,
virtual, or at our place.

REFERENCES



and more...

Strong focus on the Lubricants Industry



- Joint development of a harmonized Product Carbon Footprint calculation methodology with UEIL and ATIEL
- Development of regionalized Product Carbon Footprint and Life Cycle Assessment data for lubricants and additives

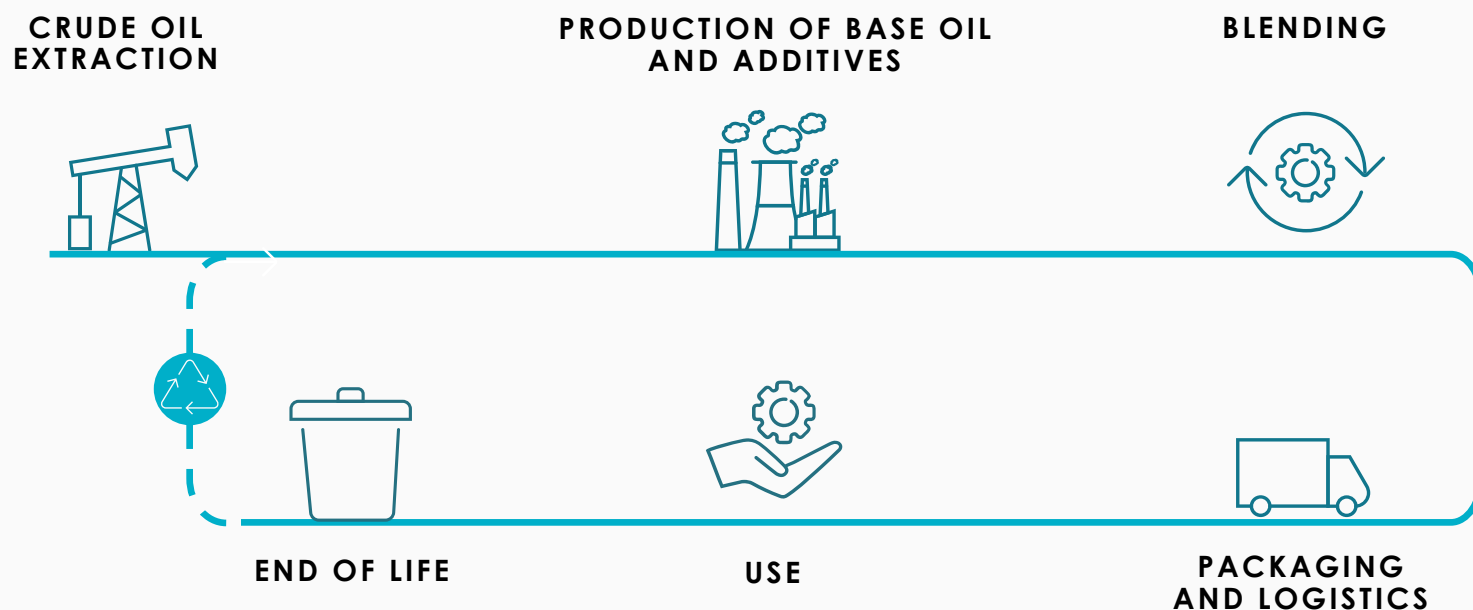
Insights from Deloitte's **2025 C-Suite Sustainability report**

83% of respondents
increased sustainability investments
over past year despite less
stakeholder pressure

66% reported positive
impact on revenue generation

Sustainability
has become
a Revenue
Driver

Product Carbon Footprints



What are product carbon footprints (PCFs)?

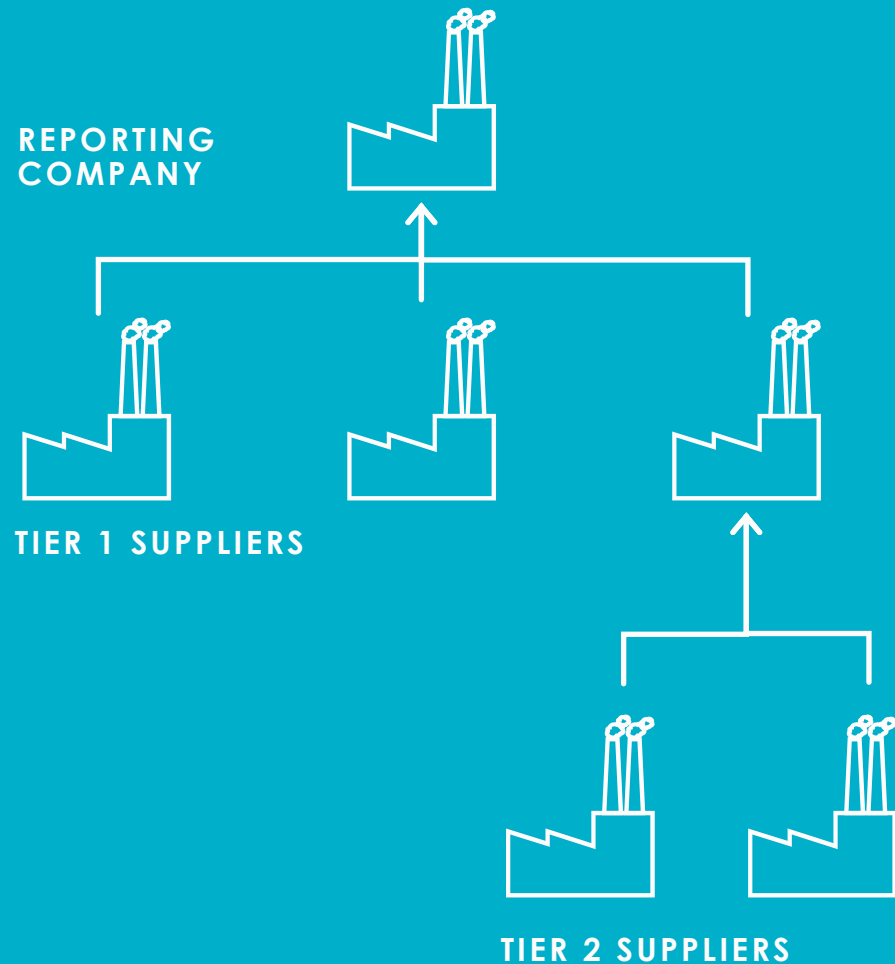
- Measure emissions caused by a product over the life cycle
- Expressed in CO₂e/kg

Key characteristic

- Performance indicator for the joint performance between you and your supply chain

Dependencies among companies in a supply chain

Chain reactions driving sustainability

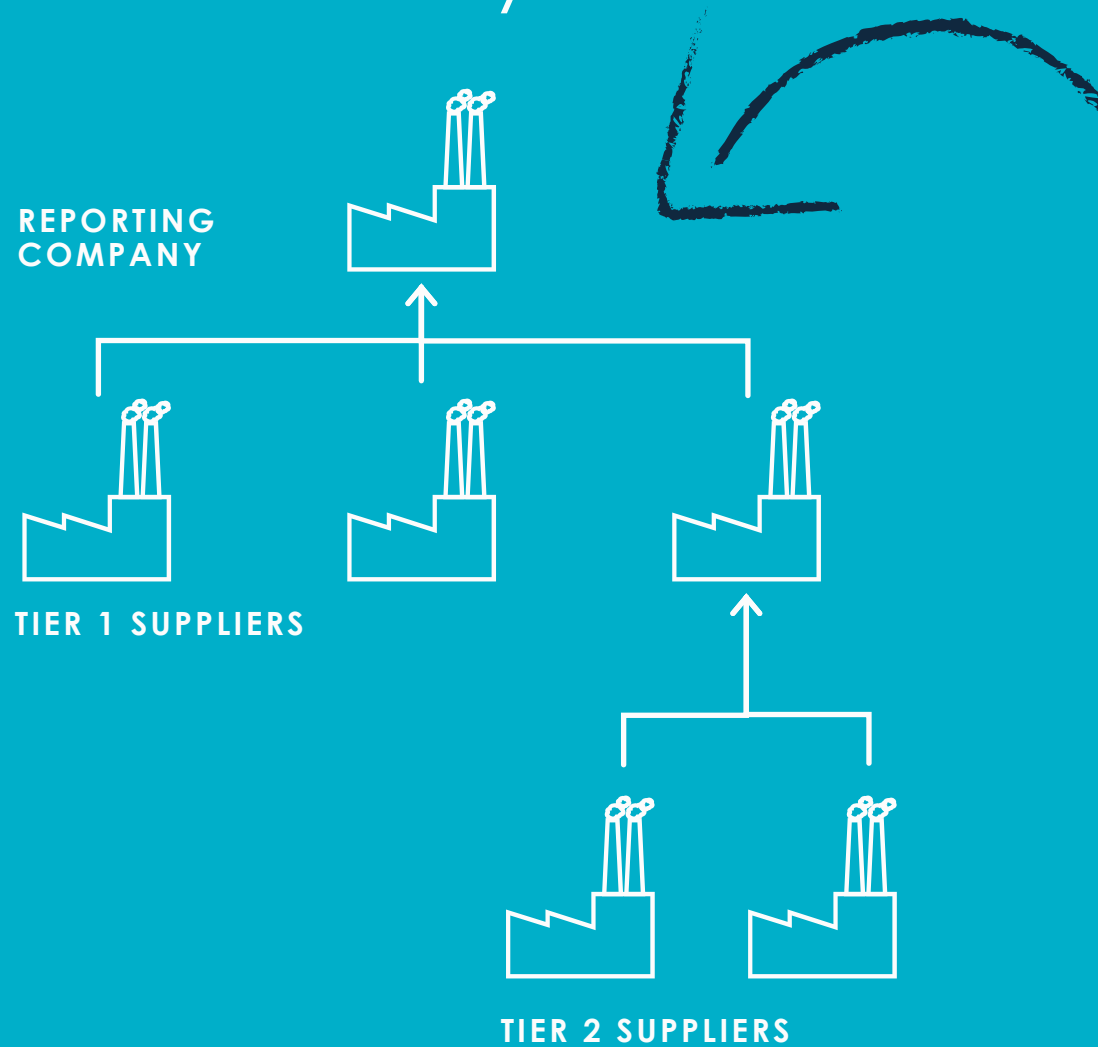


1

Demand for transparency

- Product Carbon Footprints
- Life Cycle Assessments
- Corporate sustainability

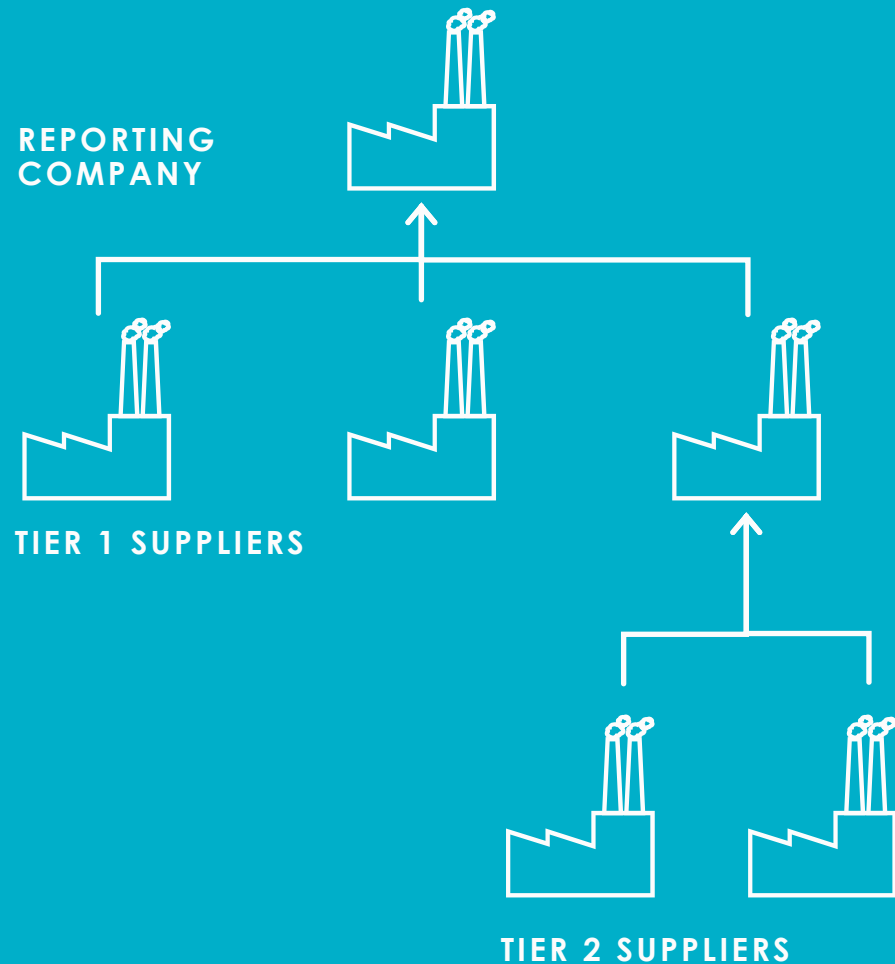
Chain reactions driving sustainability



EXAMPLE:



Chain reactions driving sustainability



1

Demand for transparency

- Product Carbon Footprints
- Life Cycle Assessments
- Corporate sustainability

2

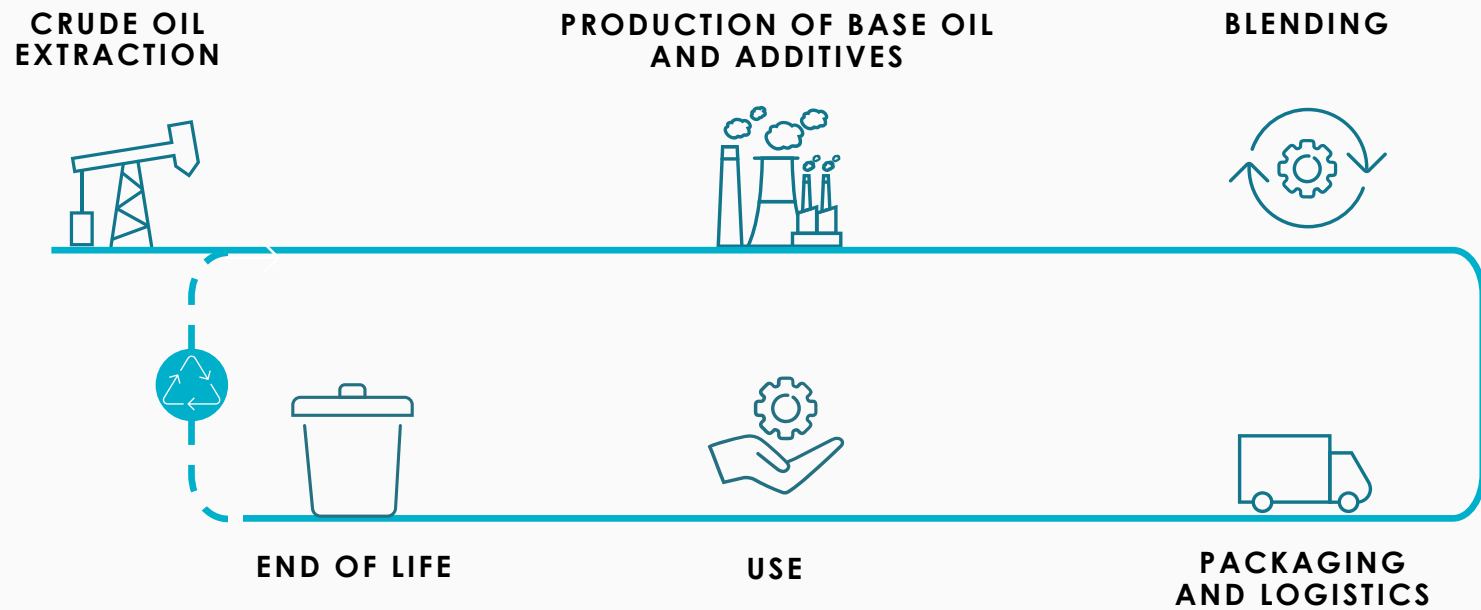
Demand for reduction

- Lower climate impacts
- Reliable targets & progress

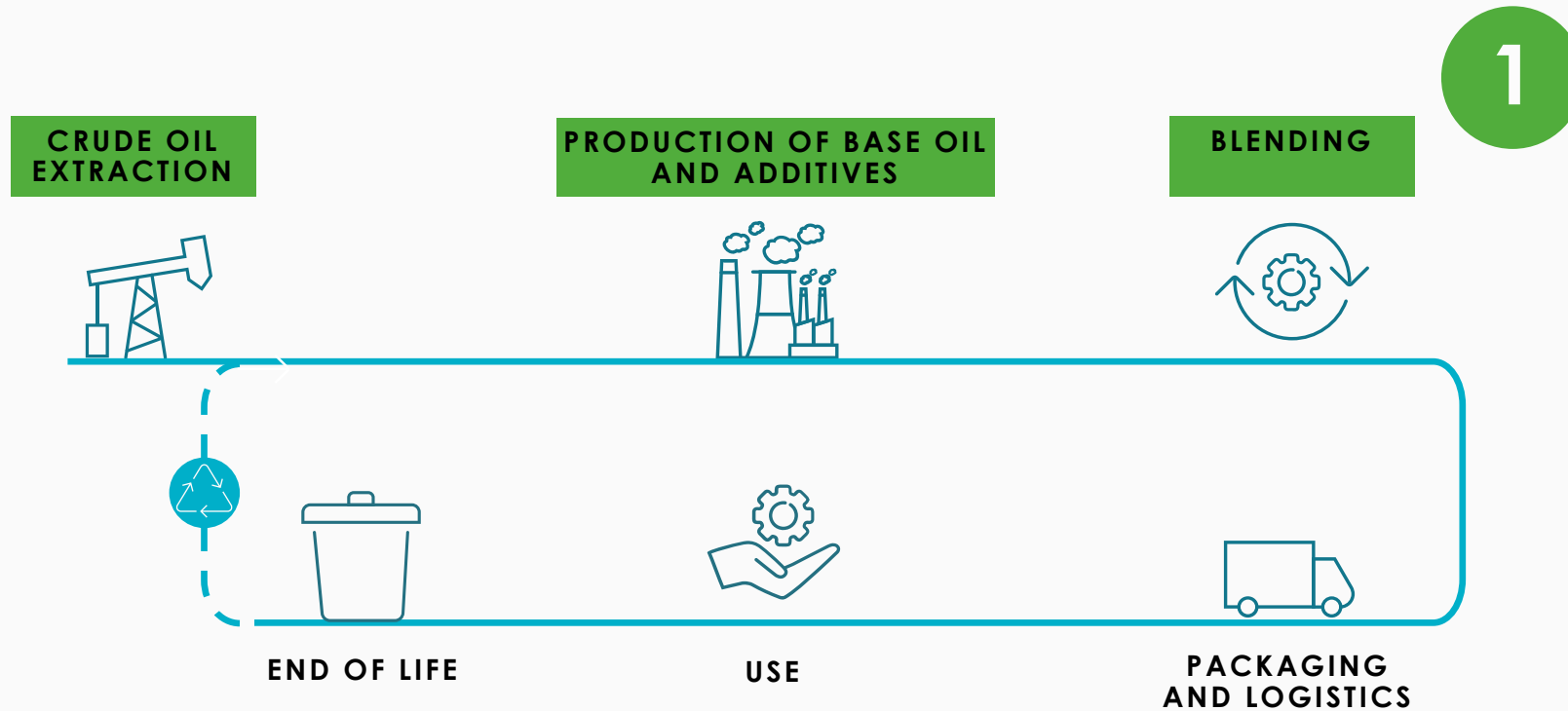
Turning Market Dynamics into Competitive Advantage with Regionalized Product Carbon Footprint data



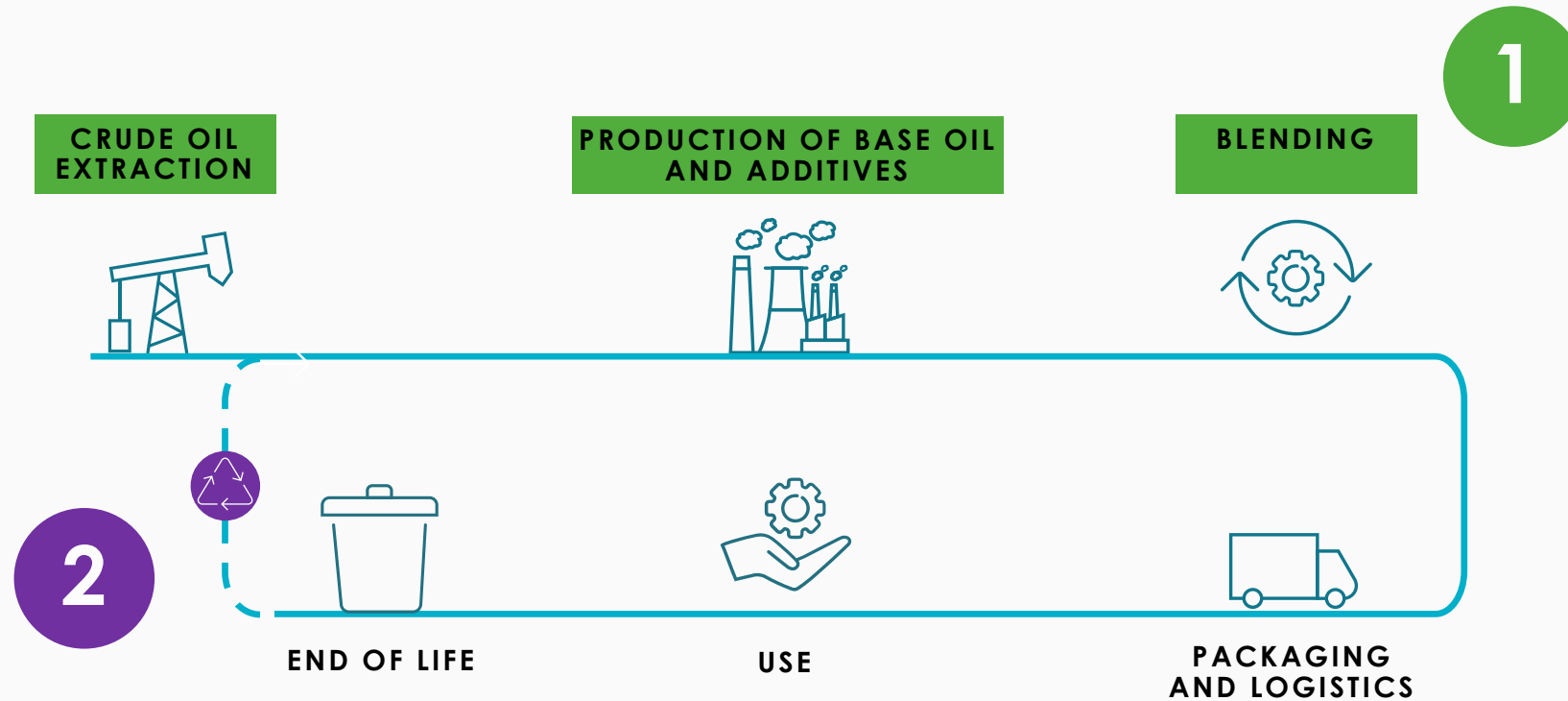
Two scenarios:



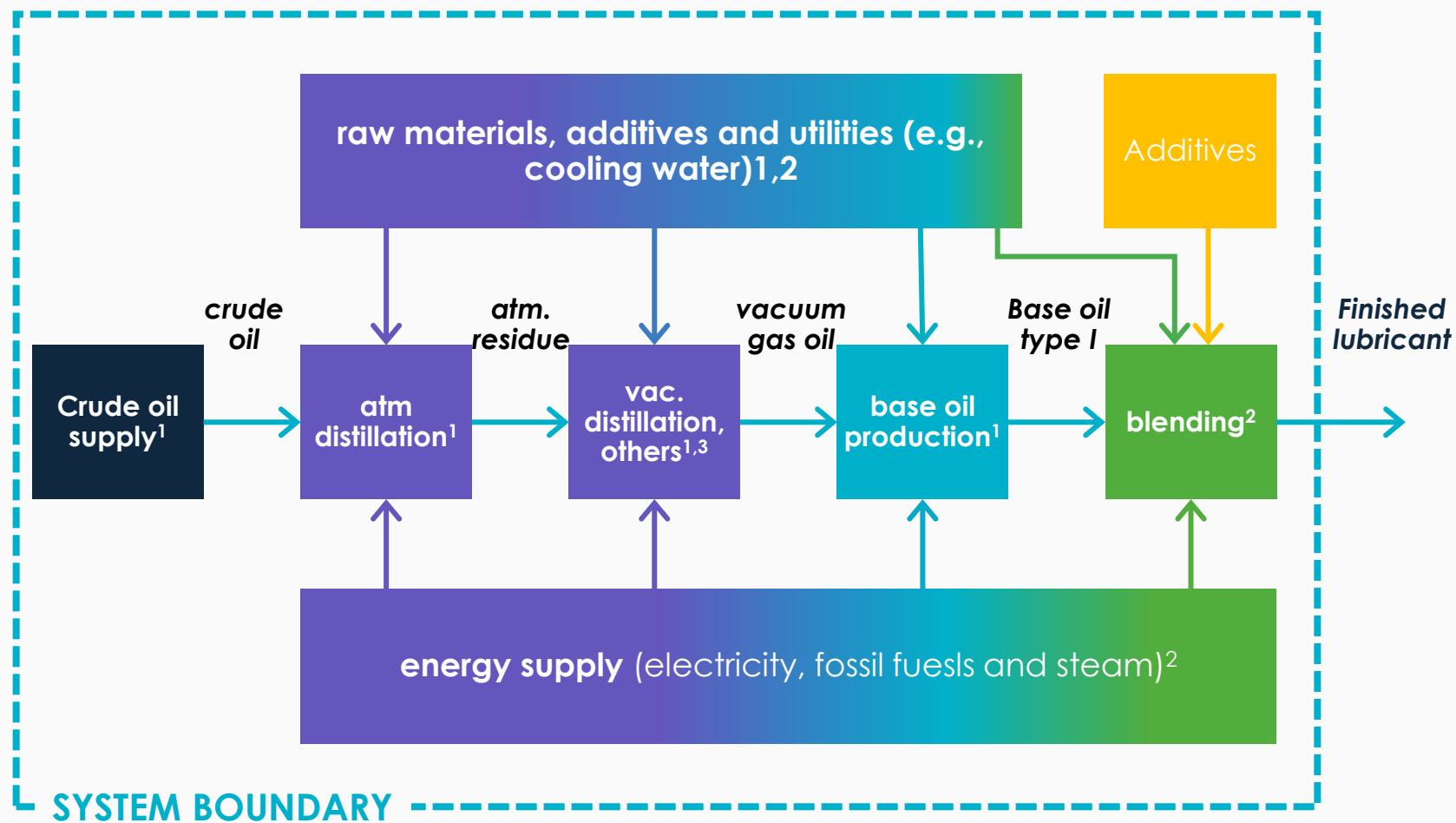
Two scenarios:



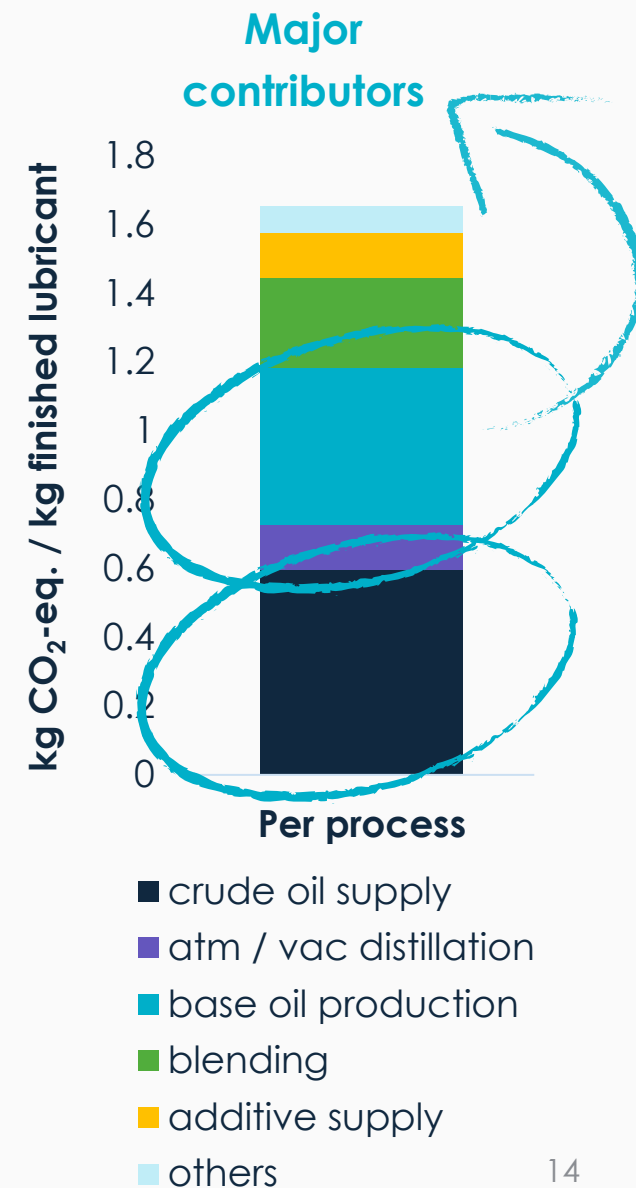
Two scenarios:



Example: Average Product Carbon Footprint result of finished lubricants in Europe



Declared Unit: Production of 1 kg of finished lubricant

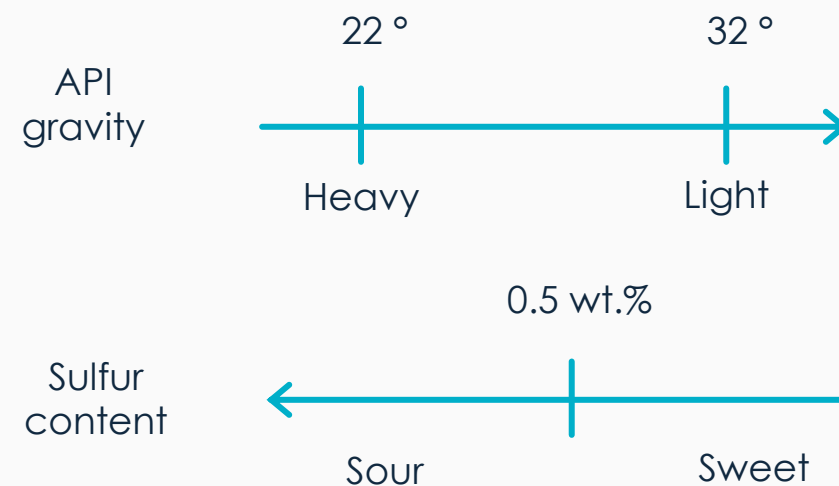




Complexity of crude oil data

Varying crude oil emissions due to

- API gravity
- Sulfur content
- Geology & others

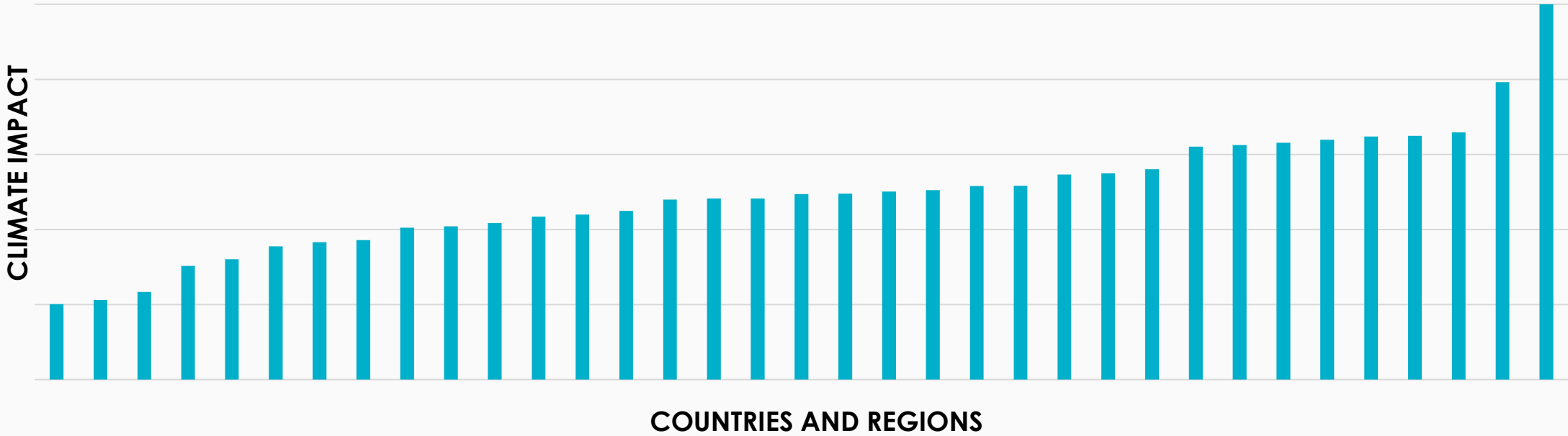




CRUDE OIL DATA

Importance of regionalization

Impacts of the crude oil consumption mix in different countries and regions

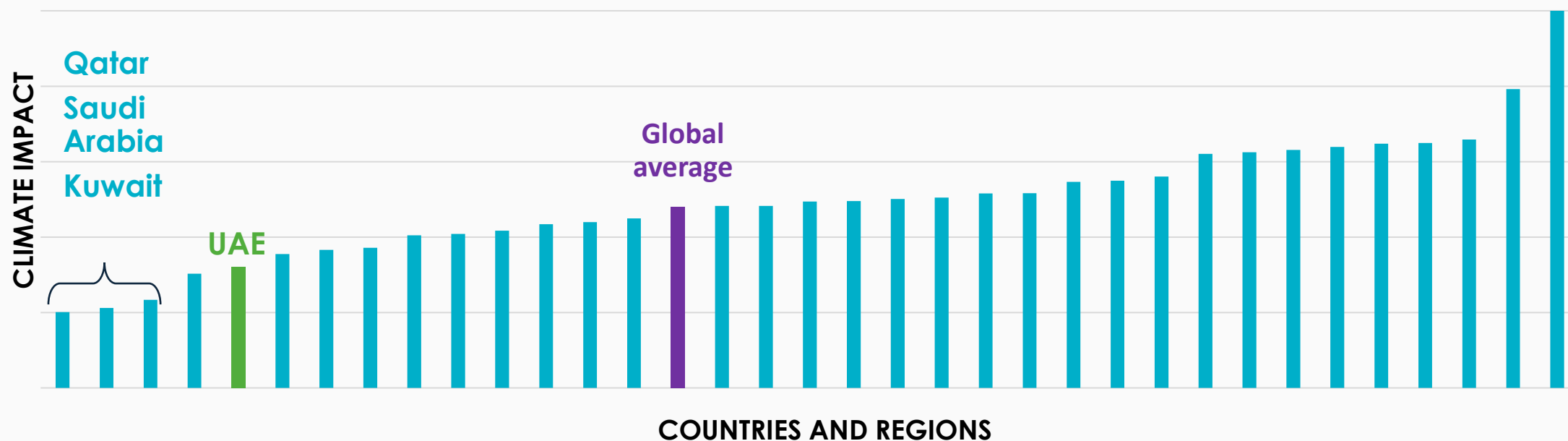


CRUDE OIL DATA

Importance of regionalization



Impacts of the crude oil consumption mix in different countries and regions



- Large differences between countries and regions
- Lower climate impacts of crude oil in Middle East



Complexity of base oil data

Varying base oils emissions due to

- Feedstock
- Energy supply
- Supply chain (Type I-III vs. IV - V)

Category	Supply chain
Group I	Mineral base oil
Group II	Mineral base oil
Group III	Mineral base oil
Group IV	Synthetic poly alpha olefins
Group V	All other base oils not included in Groups I, II, III, or IV

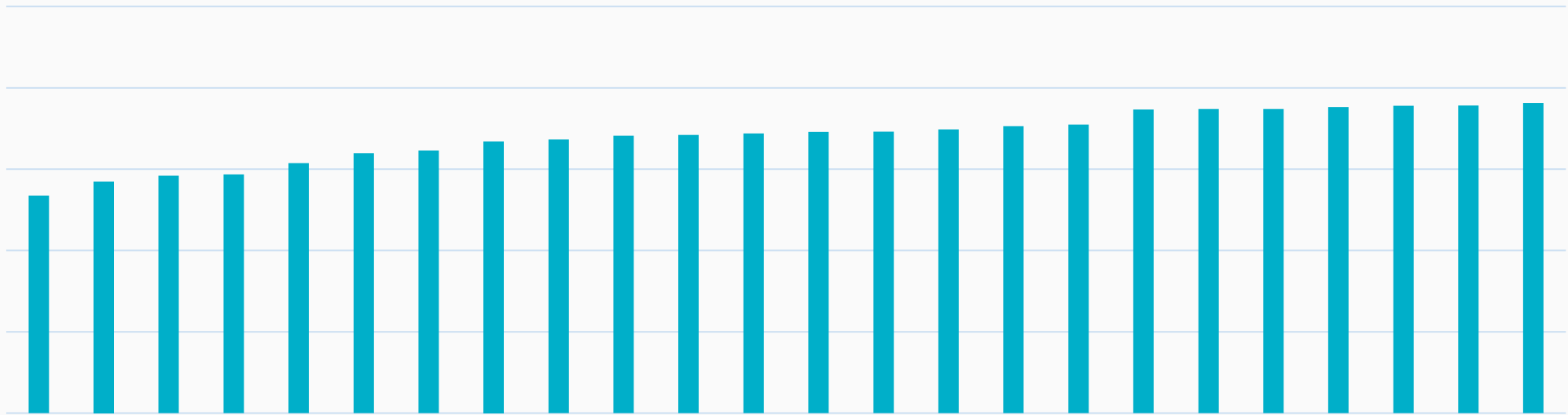


Climate impact of base-oil production

Example: Type 2

Impacts of the base oil production in different countries and regions

CLIMATE IMPACT



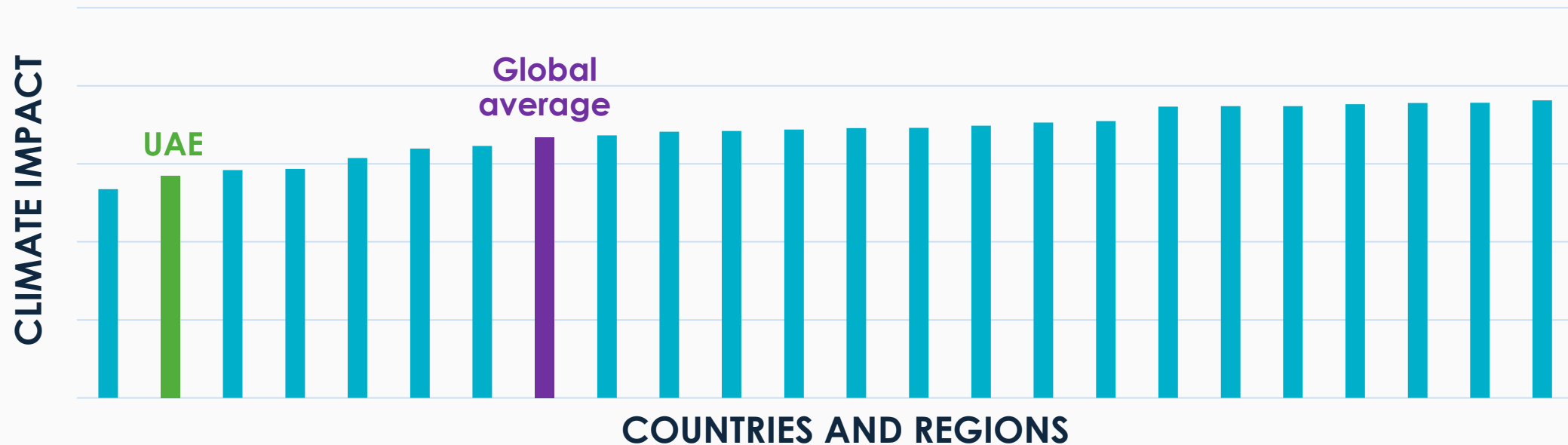
COUNTRIES AND REGIONS



Climate impact of base-oil production

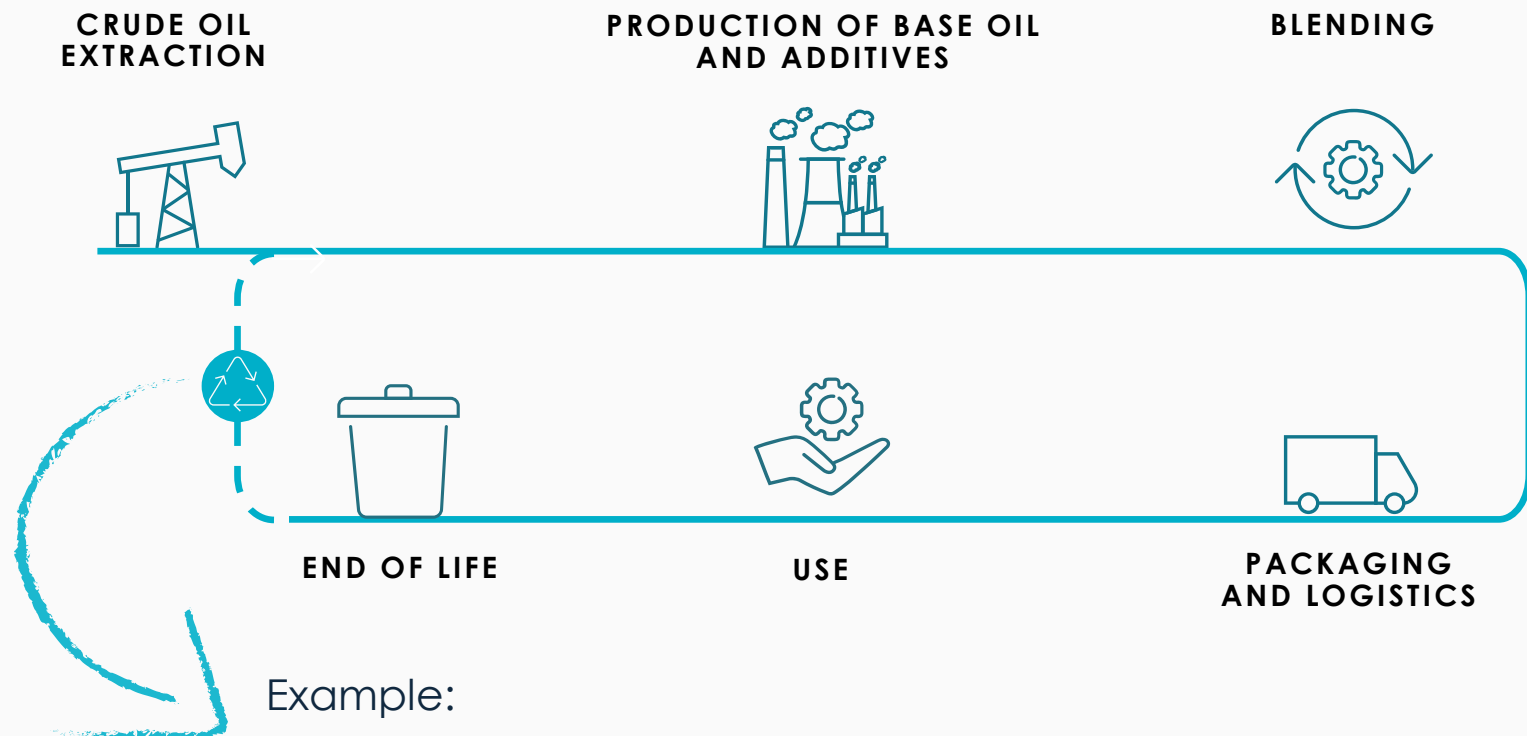
Example: Type 2

Impacts of the base oil production in different countries and regions



- Large regional differences in the climate impact of base oils
- **Credible reporting of low climate impacts enables product differentiation**

Two scenarios:



Example:

Re-refined base oil via hydrogenation (Type II)



Climate impact of Re-refining via hydrogenation (Type II)

Impacts of the base oil production in different countries and regions



Re-refining offers substantial carbon footprint reduction potential across regions

Competitive advantages through climate impact reporting & reduction



Market requirements

- Transparency on emissions
- Progress on climate impact reduction



Regional advantages

- Large differences in climate impacts across production regions



Closing the loop

- Substantial climate impact reductions possible through re-refining of base oils

THANK YOU

Dr. Arne Kätelhön, Managing Director and Co-Founder

E-Mail: arne.kaetelhoeen@carbon-minds.com

Web: www.carbon-minds.com

