



LCA Within the Supply Chain

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CRODA

Overview

- Introduction to Croda
- Life Cycle Assessment at Croda
 - Upstream Supply Chain Carbon – Approach and challenges
 - Cradle-to-gate Carbon Footprinting
 - Quantifying Avoided Downstream Carbon



Who We Are & What We Do

Since 1925, we have been the name behind the high performance ingredients and technologies in some of the biggest, most successful brands in the world: creating, making and selling speciality chemical ingredients that are relied on by industries and consumers everywhere.

Our Business Model



Engage

We work in close partnership with customers and develop emerging technologies around the world



Create

We design innovative ingredients that enhance everyday products



Make

We manufacture to consistently high standards across the world



Sell

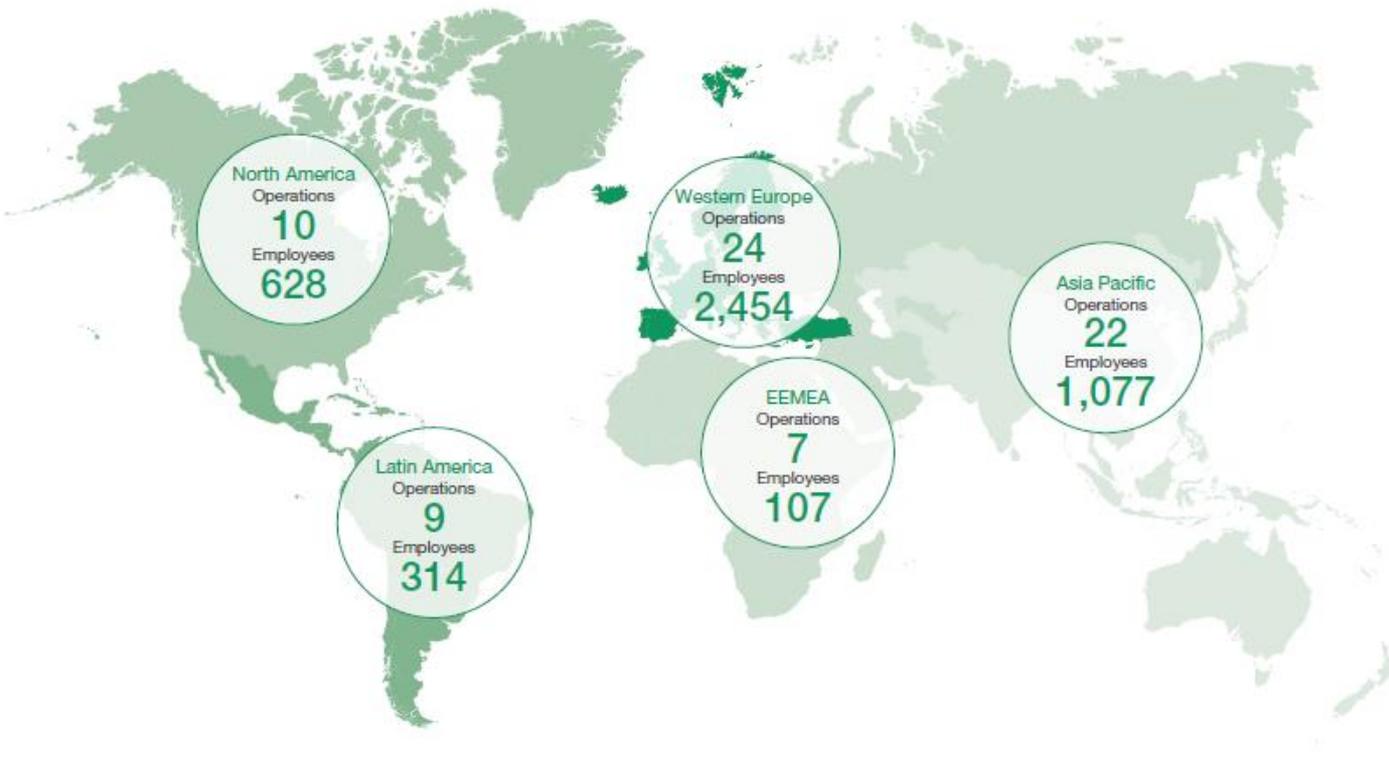
We generate revenue by selling our ingredients directly to customers

Where We Operate

38 Countries

72 Operating Sites

4,580 Employees



Our global team

Markets We Serve

Personal Care

Life Sciences

Health Care

Crop Care

Industrial Chemicals

Performance Technologies

Smart Materials

Energy Technologies

Home Care &
Water Treatment

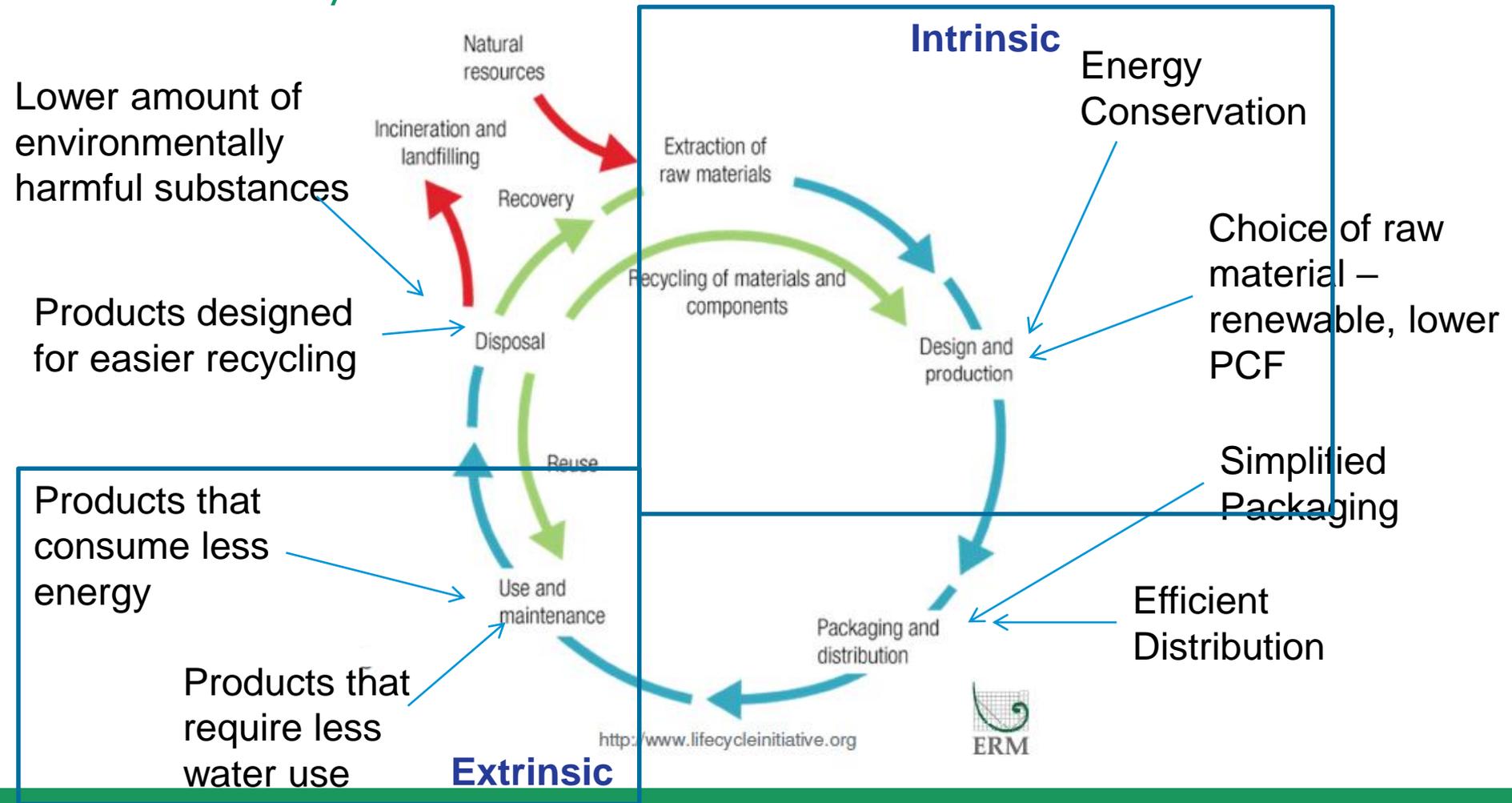


Smart Science to Improve Lives

CRODA

Life Cycle CO₂e Assessment

Life Cycle Assessment



Cradle to Gate Carbon Footprint

- 2017 saw the introduction of in-house LCA capability, purchase of SimaPro software licence and training
- Cradle-to-gate LCAs, focusing on Climate Change impact factor (Carbon Footprint) – following technical standard ISO14067

Benefits:

- Customers are asking us for this carbon footprint information
- We can see where the largest carbon impacts lie within our supply chains and manufacturing processes

Environmental Impact Categories

| | |
|---|---|
|  | Climate change |
|  | Ozone depletion |
|  | Human toxicity (cancer and non-cancer effects) |
|  | Particulate matter |
|  | Photochemical ozone formation |

| | |
|--|--|
|  | Acidification |
|  | Eutrophication: freshwater, marine |
|  | Ecotoxicity: terrestrial, freshwater, marine |
|  | Land transformation |
|  | Water depletion |
|  | Resource depletion |

Supply Chain Carbon

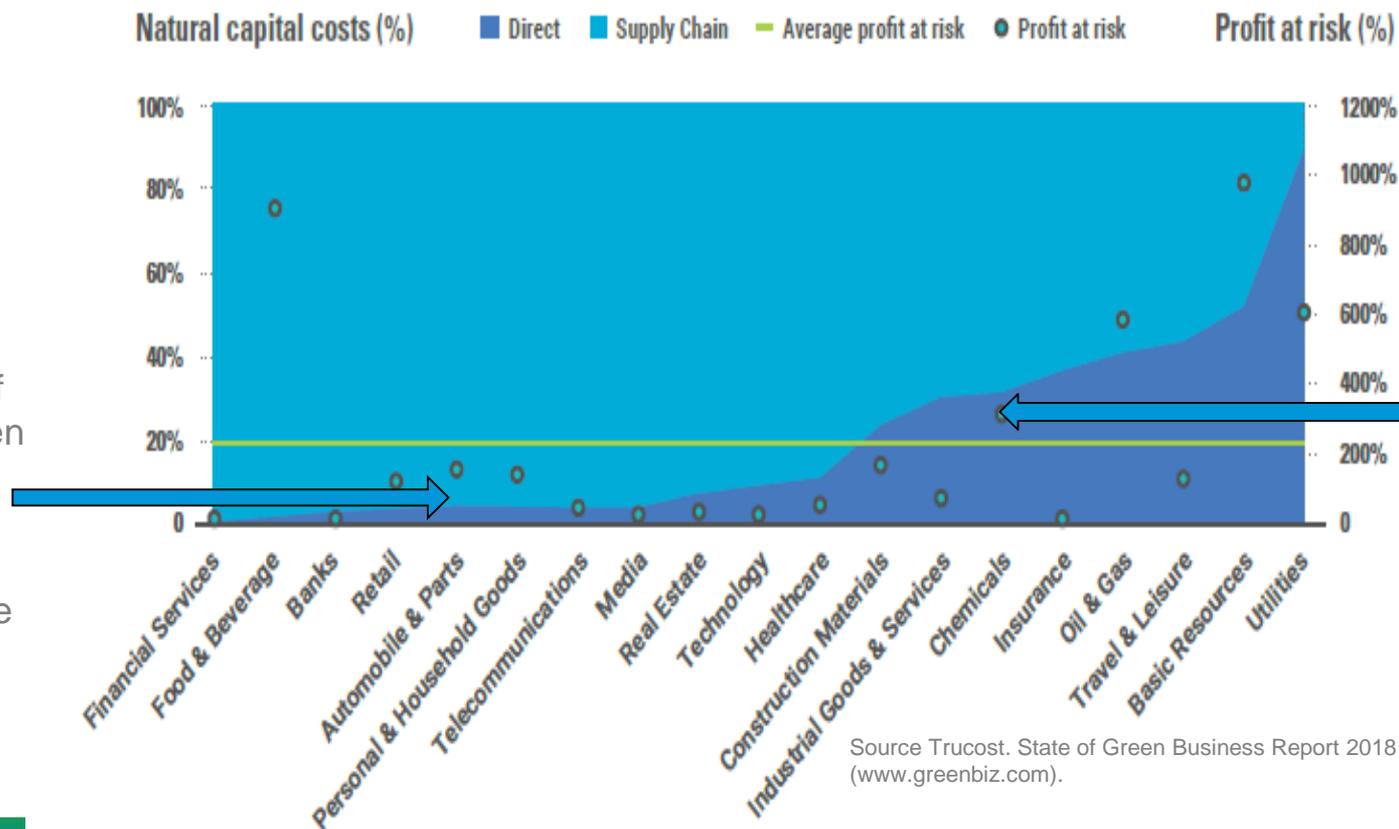


Supply Chain Carbon

MAJORITY OF CORPORATE NATURAL CAPITAL COSTS COME FROM SUPPLY CHAIN FOR MOST SECTORS

SOURCE: Trucost, 2017

Ca 95% of environmental burden in supply chain for automotive

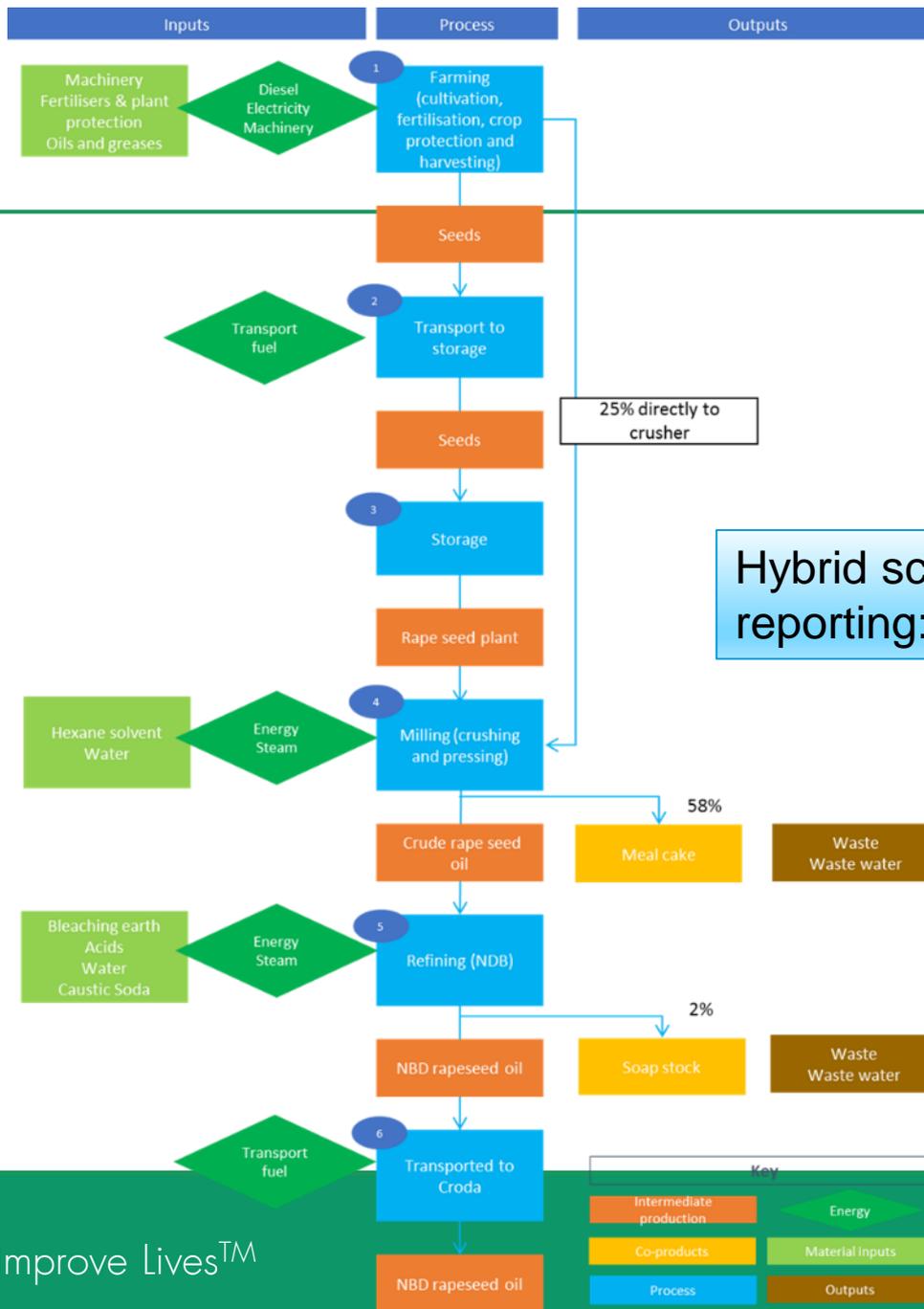


Ca 60-70% of environmental burden in supply chain and 30-40% in manufacture of chemicals

Source Trucost. State of Green Business Report 2018 © 2018 GreenBiz Group Inc. (www.greenbiz.com).

Upstream Carbon Impact

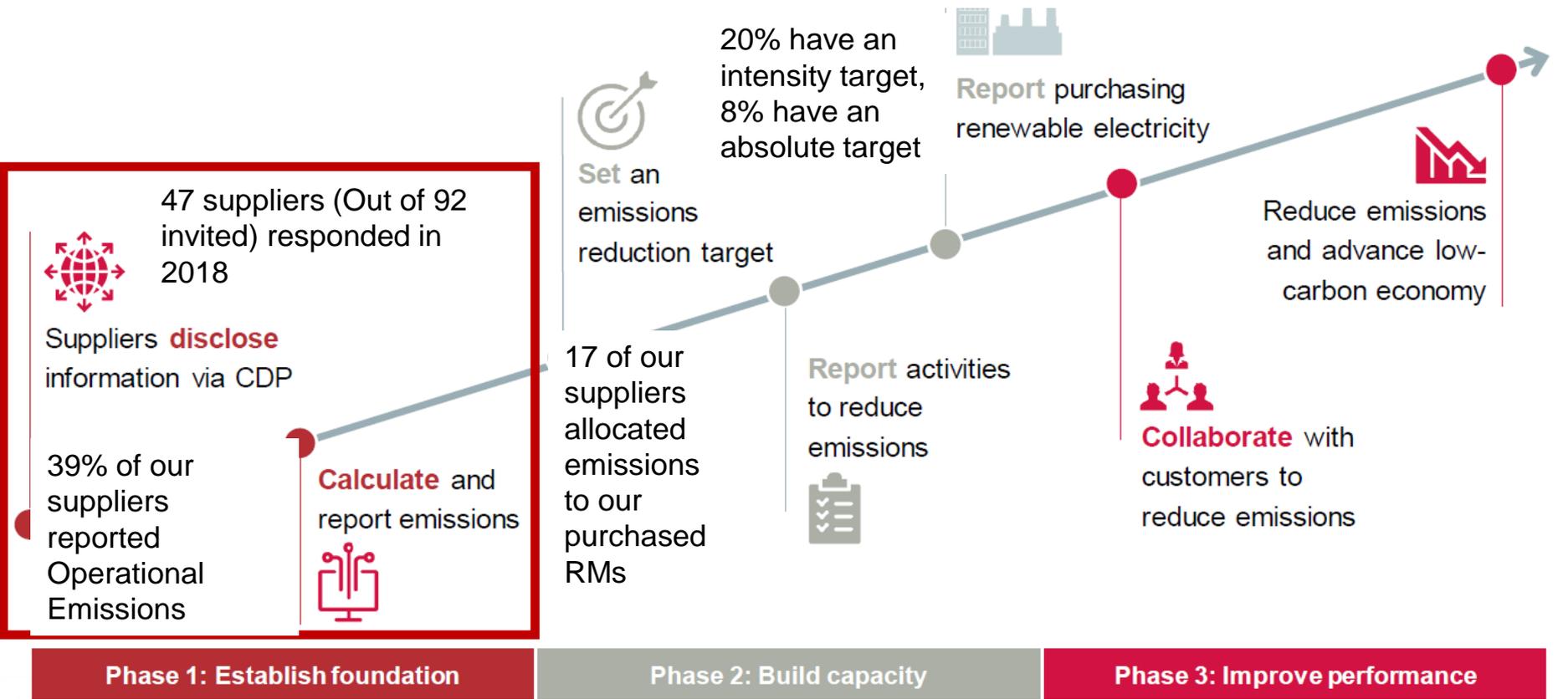
- Purchased Goods & Services largest category of Scope 3 emissions
- We need to understand where the carbon impacts lie in our raw material supply chains
- We use a hybrid model to report:
 - DEFRA spend factor
 - For several key raw materials we have mapped out the supply chain to Croda's gate



CDP Supply Chain



- Croda is one of 115 Purchasing Organisations who have joined the CDP Supply Chain initiative
- We annually request emissions data associated with raw materials purchased from ~100 suppliers

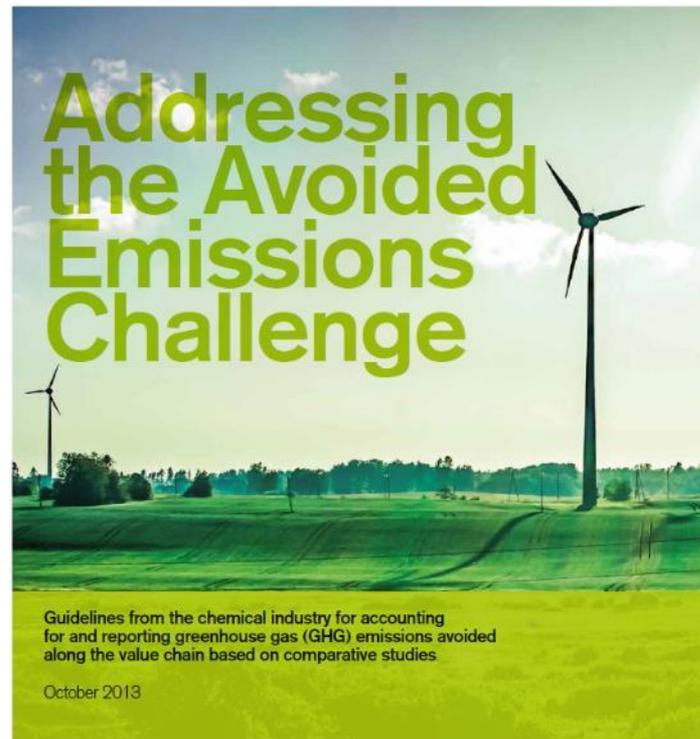




Carbon Cover: Avoided Downstream Emissions

Avoided Emissions

- Our products (or ingredients) lead to enhanced performance or efficiency of the end product in the end application – that is why our customers buy them
 - ***Where is the carbon saving associated with this effect?***
- By using our products rather than either the less effective industry standard, or no product, what is the quantity of CO₂ emissions avoided over the end product lifecycle in application?



Perfad™ Friction Modifiers

- Dosed into engine oil by customers at 0.5%
- Outstanding friction reduction properties leads to a 1% increase in fuel efficiency¹
- 1 vehicle requires 4kg oil, therefore 1 tonne of PFM sold is used to treat 50000 vehicles
- Assuming 20,000 km between oil changes, 1 tonne of PFM provides increased fuel efficiency for 1 billion vehicle kilometres.
- Calculating the fuel used to travel this distance (using average fuel economy figures) and taking into account 1% saving,
- 1 tonne PFM sold avoids emission of **1755 tonnes CO₂** !
1. In house testing



Summary

- **LCA Challenges:**
 - Primary Data Collection
 - Understanding of End Application – Use and End of Life contribution of our additives
 - Resource requirements
- **LCA Benefits:**
 - Informed Decision Making
 - Enhanced Customer Relationships
 - Driving Behaviour Change



