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MANCHESTER 1824

The University of Manchester

Carbon Footprinting the Lifecycle of Products – the CCaLC Tool

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What is CCaLC?

- A carbon footprinting tool with ‘difference’
- Enables quick and easy estimations
- A powerful tool for reducing and managing carbon footprints
- Follows internationally accepted methodologies
  - ISO 14044 and PAS2050
- Simple to use by non-experts
- Developed in close collaboration with industry
- Free of charge!

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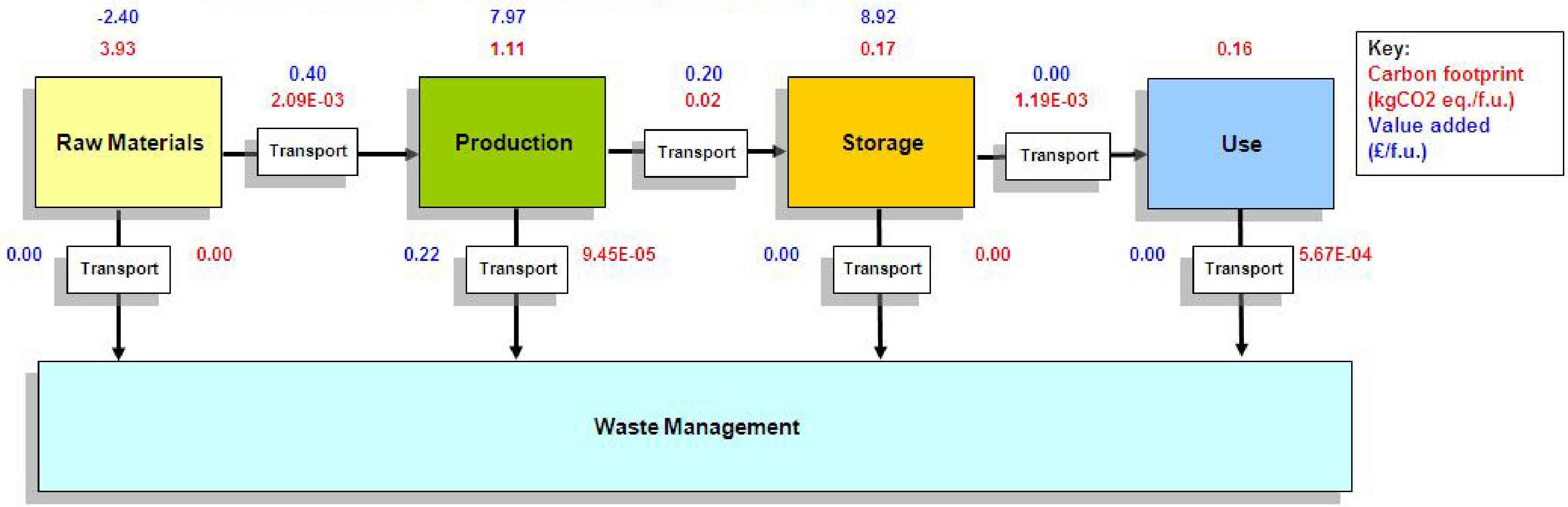
Questions explored within CCaLC

- What is the carbon intensity of a supply chain/product/process?
- Where are the ‘hot spots’?
- What are the optimum low-carbon options for reducing the carbon intensity?
- What would be the cost? And value added?
- How would other environmental impacts change?

Enter system details | View carbon footprint graph | View data quality assessment | View other environmental impacts | View value added analysis | View co-products

Functional unit (f.u.) microwave lasagne (4 people) 1 kg



Total carbon footprint:	**5.40**	**kg CO_2 eq./f.u.**
Total value added:	**5.67**	**£/f.u.**

Warning: some value data are missing or are zero

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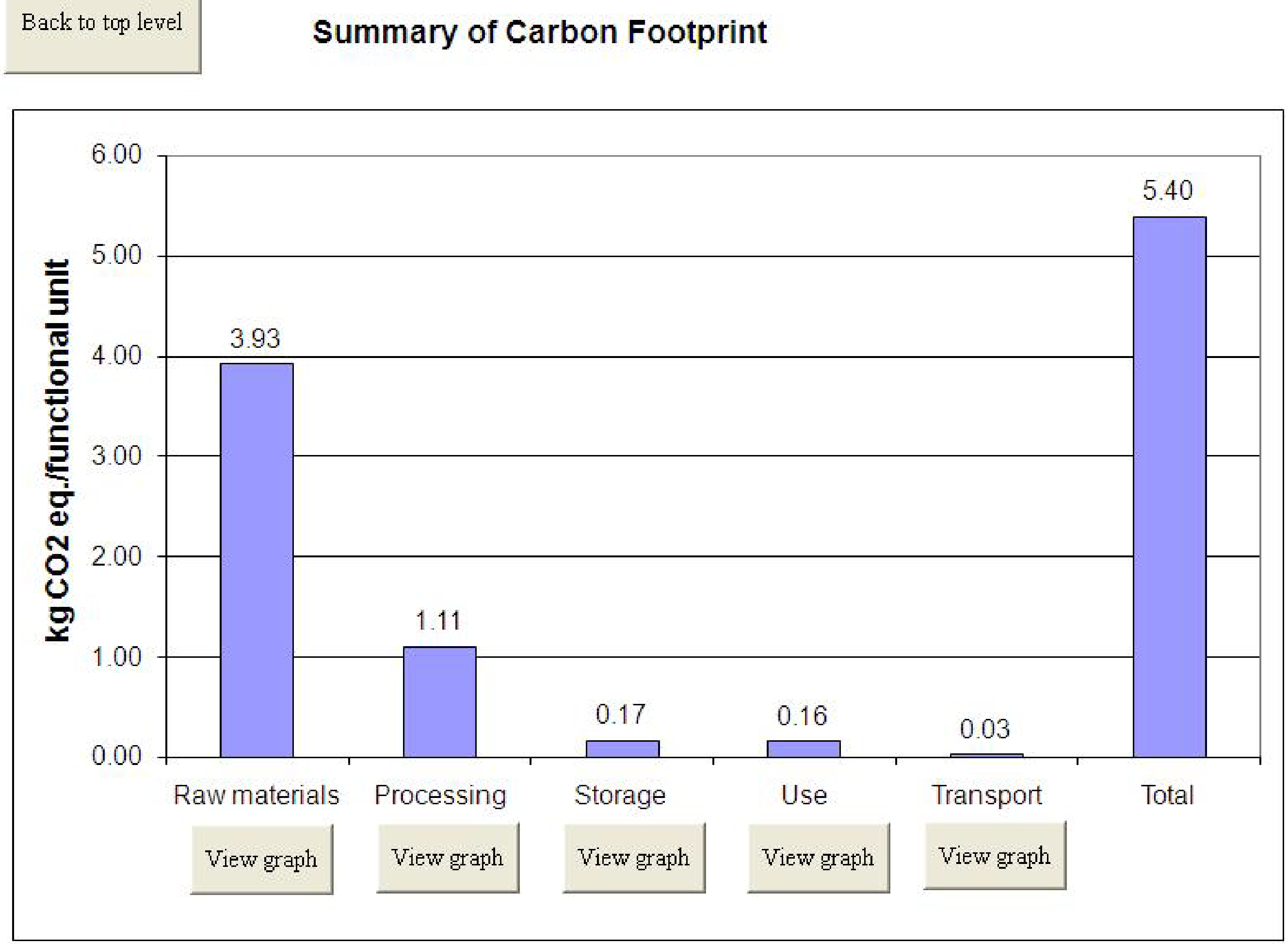
CCaLC lifecycle footprinting

Back to top level



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Raw Materials

Back to top level | Define materials | Define energy | Define packaging | Define waste | Define land use change | View carbon footprint graph

Stage: Raw Materials

Total carbon footprint for stage: 3.93 kg CO_2 eq/f.u.

Total costs for stage: 2.40 £ /f.u.

Raw material	Amount (kg/f.u.)	CO2 eq. (kg/kg raw material)	CO2 eq. (kg/f.u.)	Cost (£/kg raw material)	Cost (£/f.u.)	Used in which processing stage?
Beef minced meat at slaughterhouse	0.50	4.35	2.18	4.10	2.05	Stage1
Cheese	0.10	11.30	1.13	1.89	0.19	Stage2
Olive oil	0.03	2.94	0.09	2.13	0.06	Stage1
Onions	0.10	0.50	0.05	0.40	0.04	Stage1
Pasta	0.15	0.81	0.12	0.15	0.02	Stage2
Salads, green	0.01	3.30	0.03	0.20	2.00E-03	Stage1
Tomatoes	0.10	3.29	0.33	0.30	0.03	Stage1
Vegetables, processed	0.01	0.30	3.00E-03	0.15	1.50E-03	Stage1
		Total:	3.93	Total:	2.40	

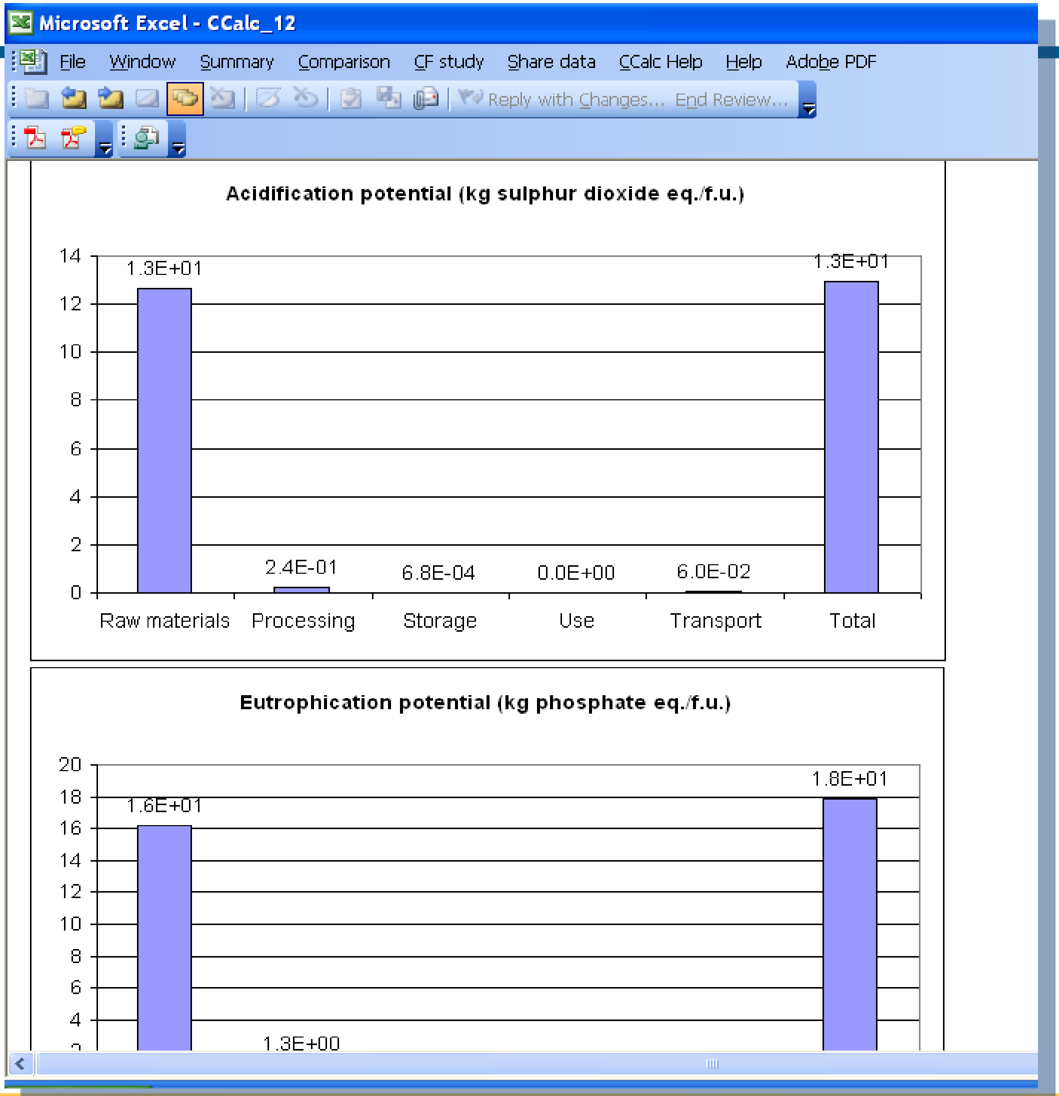
Energy type	Amount (MJ/f.u.)	CO2 eq. (kg/MJ energy)	CO2 eq. (kg/f.u.)	Cost (£/MJ energy)	Cost (£/f.u.)
		Total:	0.00	Total:	0.00

Packaging for raw materials	Amount (kg/f.u.)	CO2 eq. (kg/kg packaging)	CO2 eq. (kg/f.u.)	Cost (£/kg packaging)	Cost (£/f.u.)	Going to which processing stage?
		Total:	0.00	Total:	0.00	

Waste	Amount (kg/f.u.)	CO2 eq. (kg/kg waste)	CO2 eq. (kg/f.u.)	Cost (£/kg waste)	Cost (£/f.u.)
		Total:	0.00	Total:	0.00

Other environmental impacts

- Acidification
- Eutrophication
- Ozone depletion
- Photochemical smog
- Human toxicity



Databases and case studies

- Databases
  - Materials
  - Energy
  - Transport
  - Packaging
  - Waste

Over 4000 datasets

- Case studies
  - Chemicals & related
  - Food & drink
  - Bio-feedstocks
  - Biofuels

Over 30 case studies

Companies who have piloted CCaLC

INEOS
corus
CRODA
CROWN PAINTS
BARR SOFT DRINKS
B&Q
EVONIK INDUSTRIES
HUHTAMAKI
innospec specialty chemicals
J.W. OSTENDORF
POLYFLOR COVERING THE WORLD
SELDEN
techtron
THOR
Turtle WAX
Kellogg's
PRA

Company Feedback – reported benefits

- Modelling options – what ifs
- Accessible to all
- Transparent – you can see cause and effect
- Identifies hotspots and priorities
- Provides focus
- Very good tool for carbon footprint data analysis
- Can be as simple or as detailed as required - as good as the data input quality
- Compliant with PAS2050 guidelines
- Provides for other environmental impacts
- Easily amended – data changes simple

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Company Feedback - Results

- Destroyed preconceptions
  - e.g. Kellogg's total carbon footprint
    - distribution 4%
    - raw materials 42%
- Enabled design of more sustainable products
- Modelling options – what ifs
- Accessible to all
- Transparent – you can see cause and effect
- Can be as simple or as detailed as required
- Created focus on energy / efficiency priorities
- Mechanism to engage with suppliers

- Without consultants or software
- And you don't <u>have</u> to Carbon Label…

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Case Study – Paint Formulation

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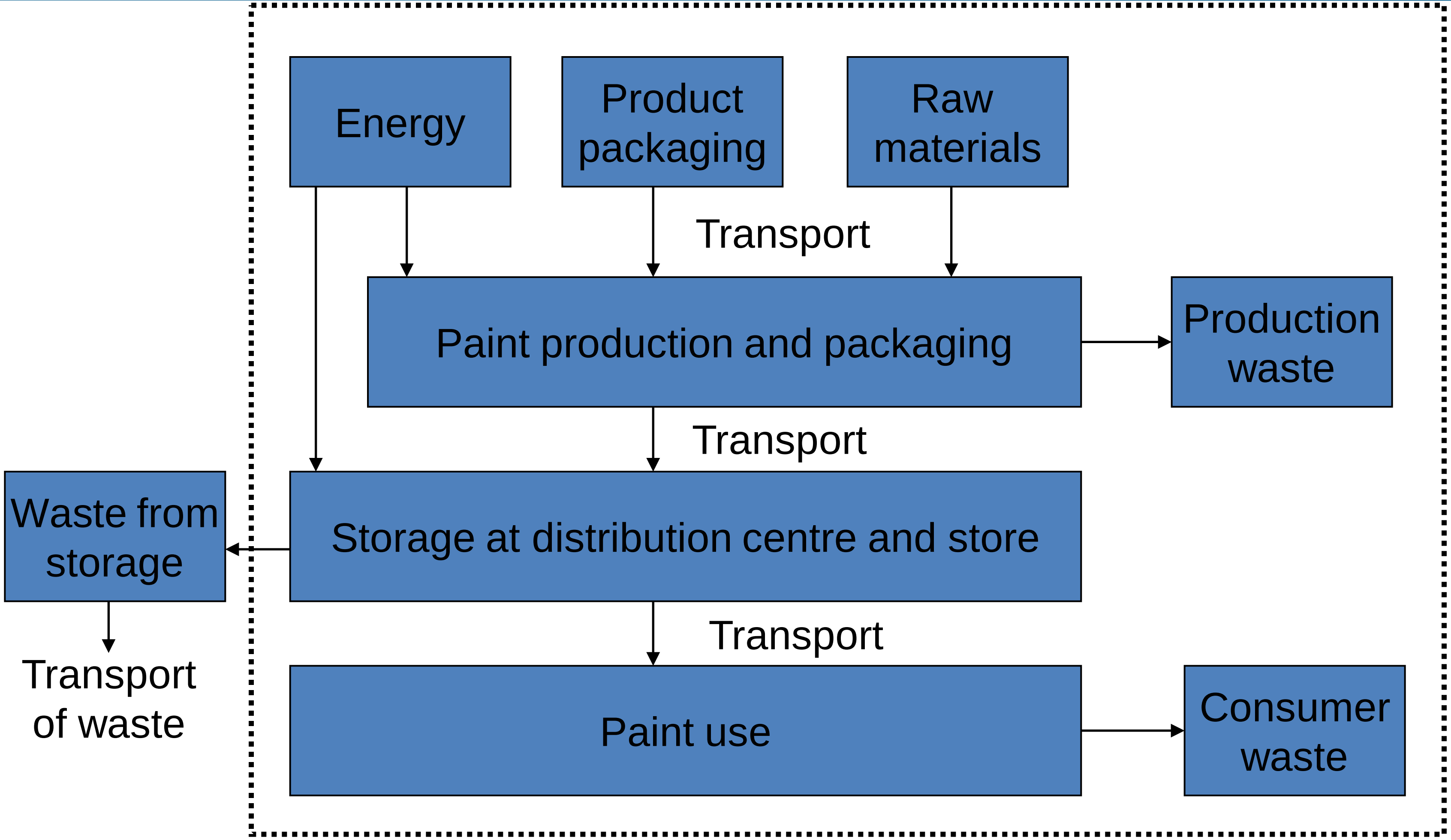
Objectives of the study

- To calculate the carbon footprint of water-based paint
- To consider the influence of the unit of analysis on the carbon footprint
- To identify hot spots
- To consider the impact of consumer behaviour on the carbon footprint

System boundary



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Functional units

- Production of 1000 kg of water-based paint
- Covering the area of 50 m^2

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Assumptions

Raw materials
TiO_2 20 - 40%
Filler 10 – 30%
Additives 50%

Distribution
Ambient storage
5 days in DC
10 days in store

Use phase
90% use rate
6 m^2/kg market entry
10 m^2/kg high performance

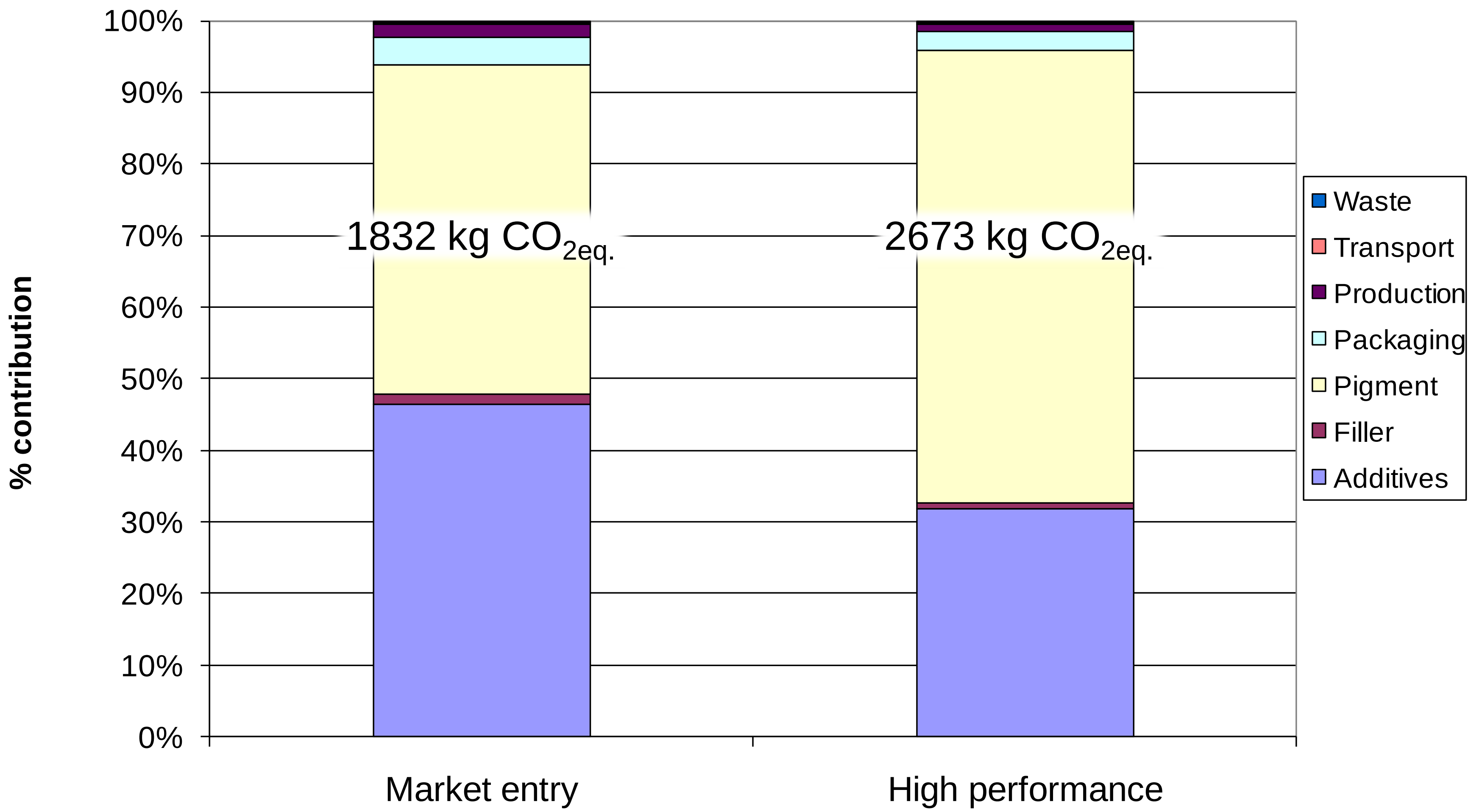
Packaging unit
10 L plastic container
Wrap film

Energy
Electricity UK

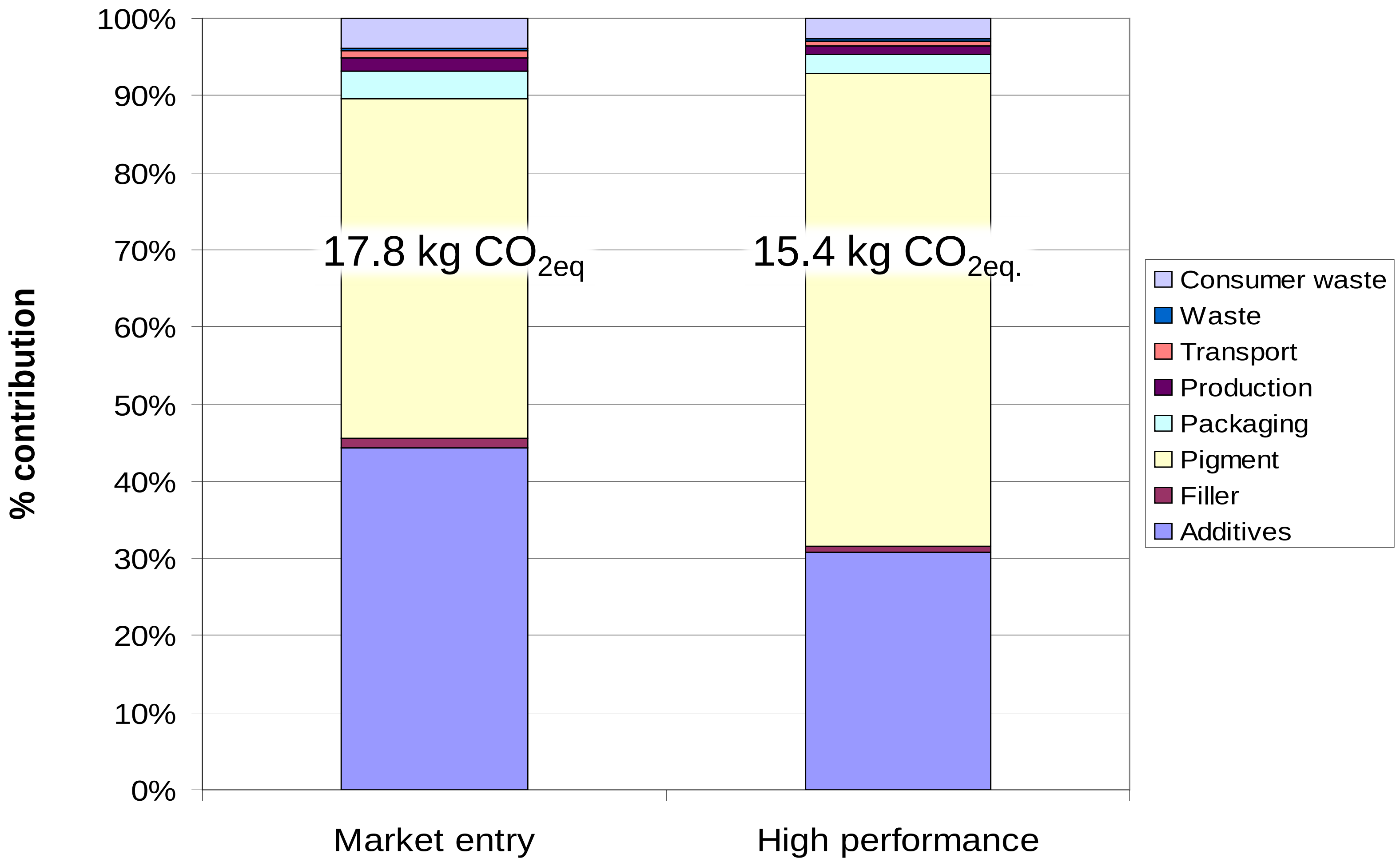
Transport
22 t truck 100 km

Waste
Landfill

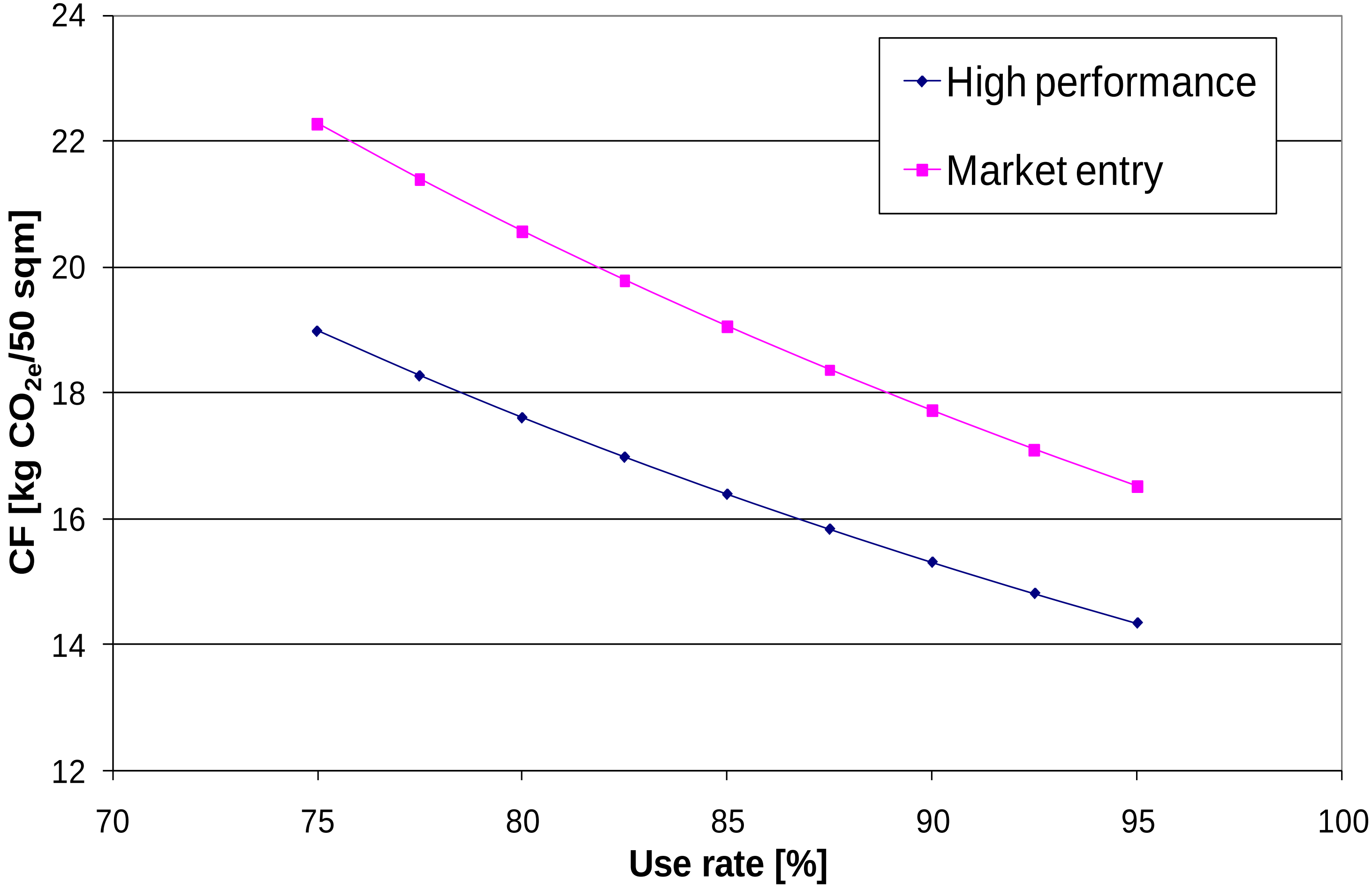
Carbon footprint of 1000 kg paint



Carbon footprint per 50 m² covered



CF versus use rate at consumer



Conclusions

- Carbon Footprint of different formulations differ significantly
- Functional unit important to define the 'best' formulation
- Raw materials are typically paramount for the Carbon Footprint of formulated products
- Databases for raw materials need to be improved
- Consumer behaviour is important

www.ccalc.org.uk

www.chemistryinnovation.co.uk

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