



Overview of CCaLC

www.ccalc.org.uk



CCaLC – Carbon footprinting tool

- Simple to use by non-experts
- Underpinned by internationally accepted methodologies
 - ISO 14044 and PAS 2050
- Includes comprehensive databases (5500+ items)
 - Materials, energy, transport, packaging, waste
- Free of charge
- Developed in close collaboration with industry and other organisations



Some CCaLC collaborators

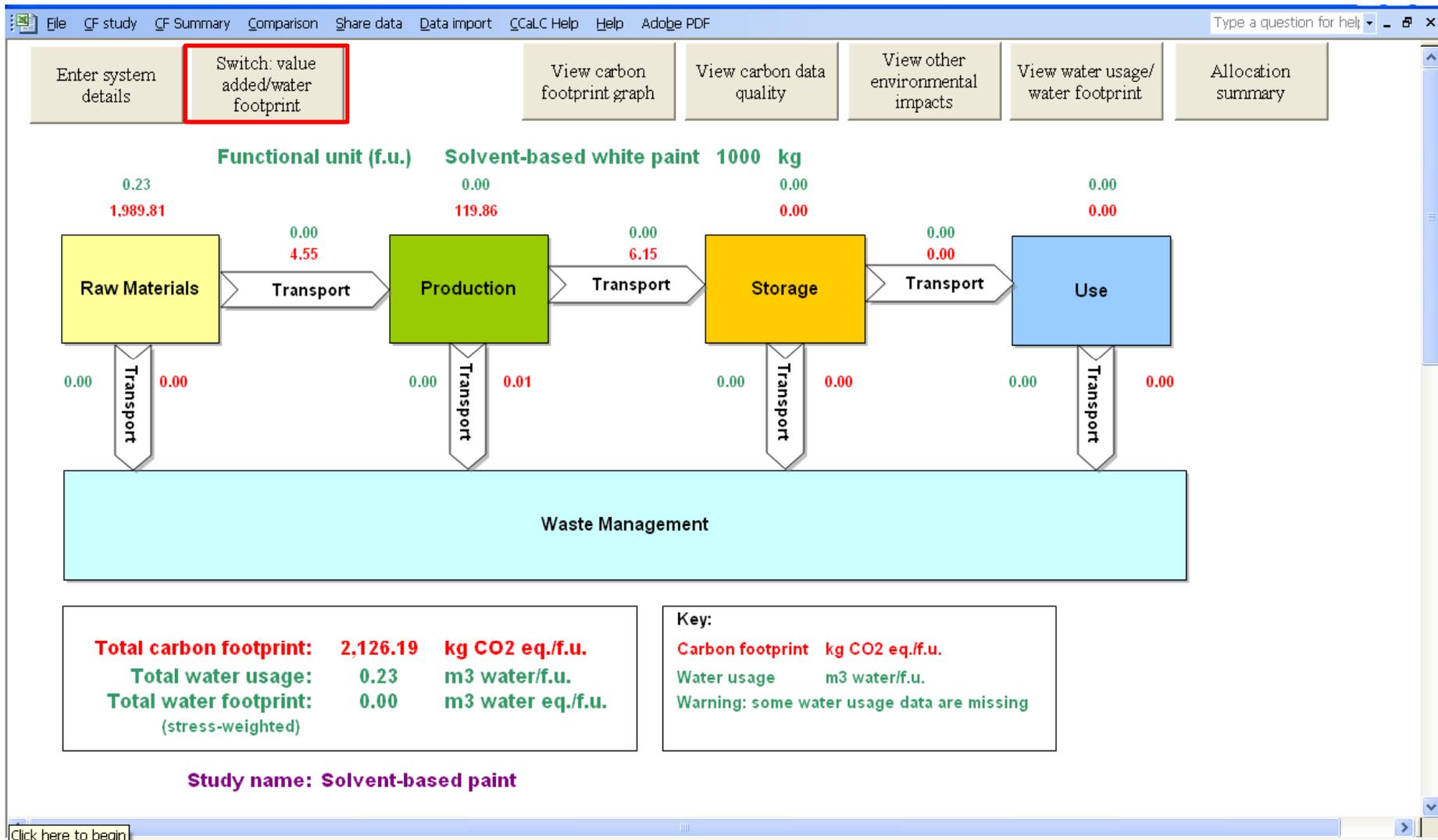
- AG Barr
- B&Q
- BACS
- British Coatings Federation
- Chemistry Innovation
- Crown Paints
- Croda
- DEFRA
- Greggs
- Huhtamaki
- INEOS ChlorVinyls
- International Cuisine
- J.W. Ostendorf
- Johnson Matthey
- Kellogg's
- NWDA
- PolyFlor
- Premier Foods
- SRM
- The Paint Research Association

Questions that can be explored within CCaLC

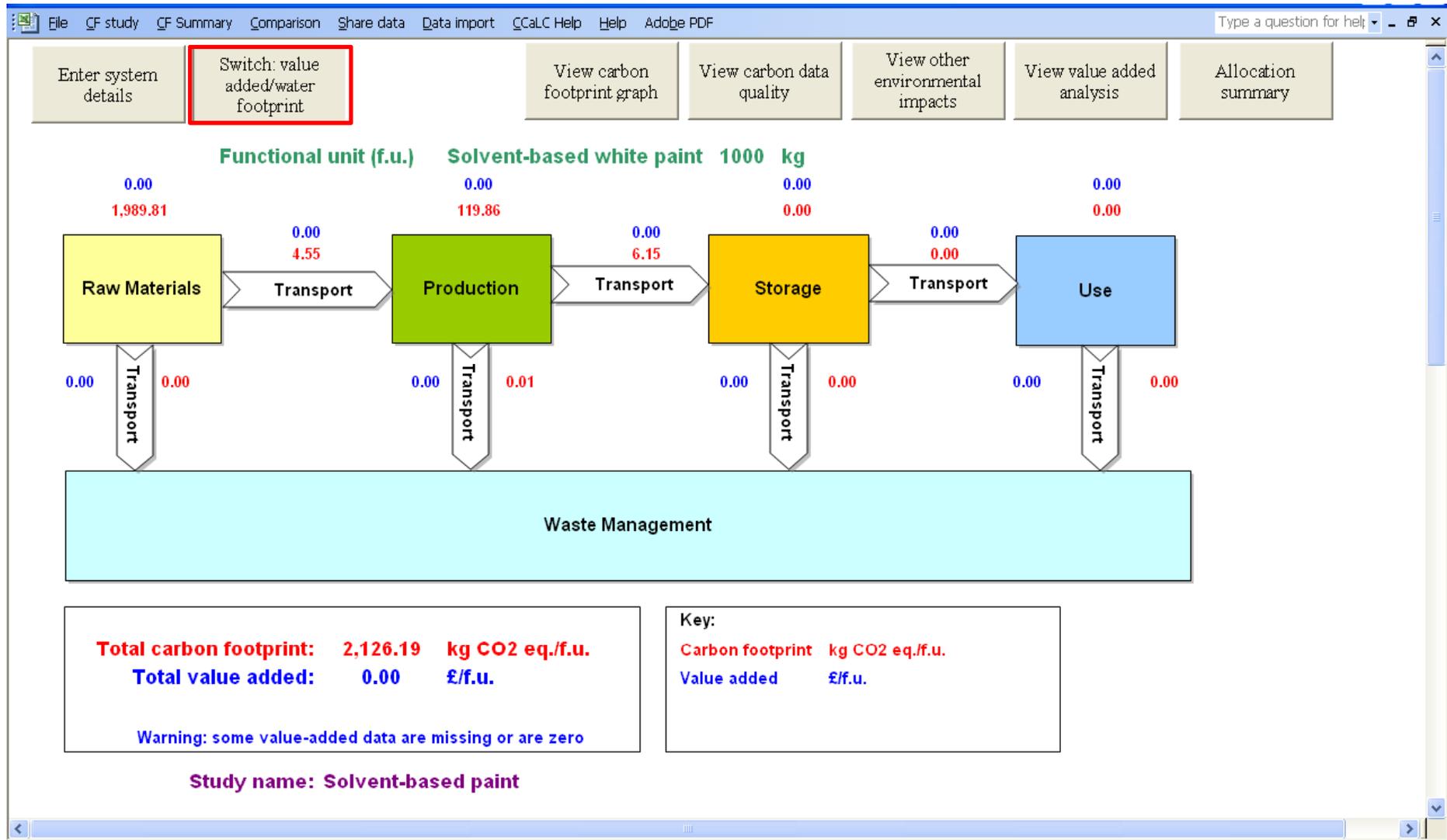


- What is the carbon intensity of a supply chain/product/process/technology?
- Where are the 'hot spots'?
- What are the optimum low-carbon options for reducing the carbon intensity?
- What would be the cost? And value added?
- How would other environmental impacts change?

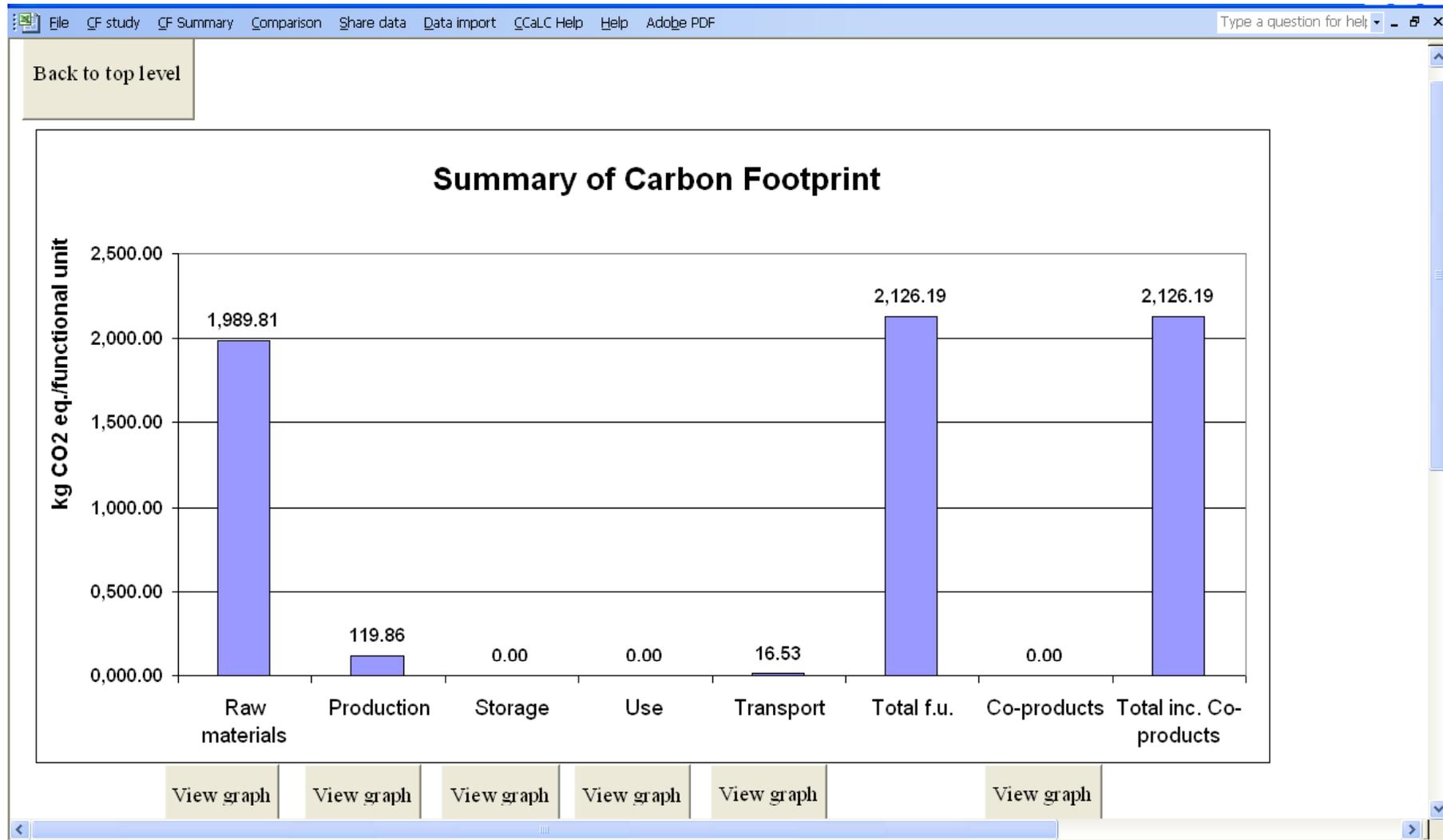
CCaLC: Top-level view showing carbon and water footprint



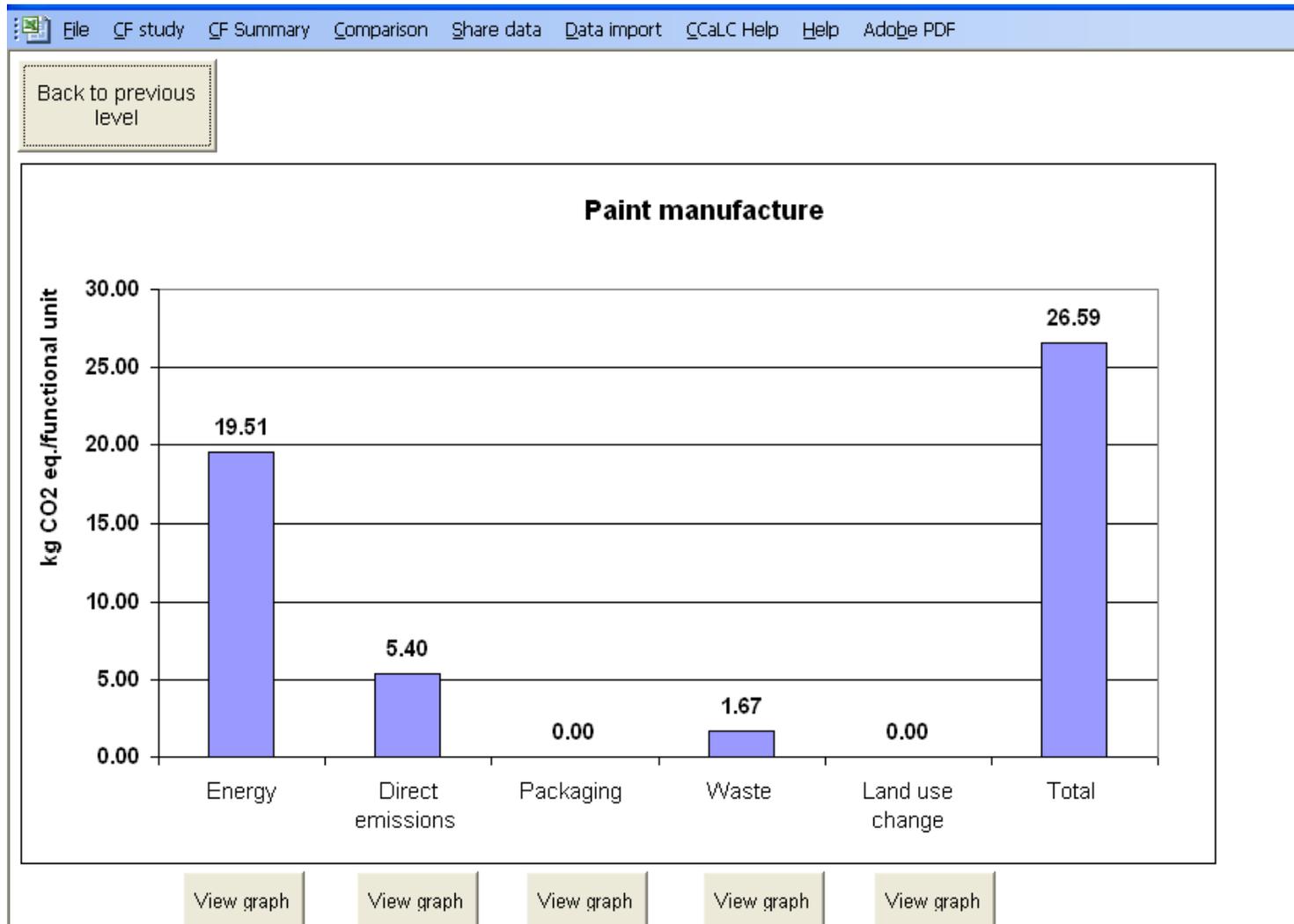
CCaLC: Top-level view showing carbon footprint and value added



Identifying carbon 'hot spots': The overall system



Identifying carbon 'hot spots': Individual life cycle stages

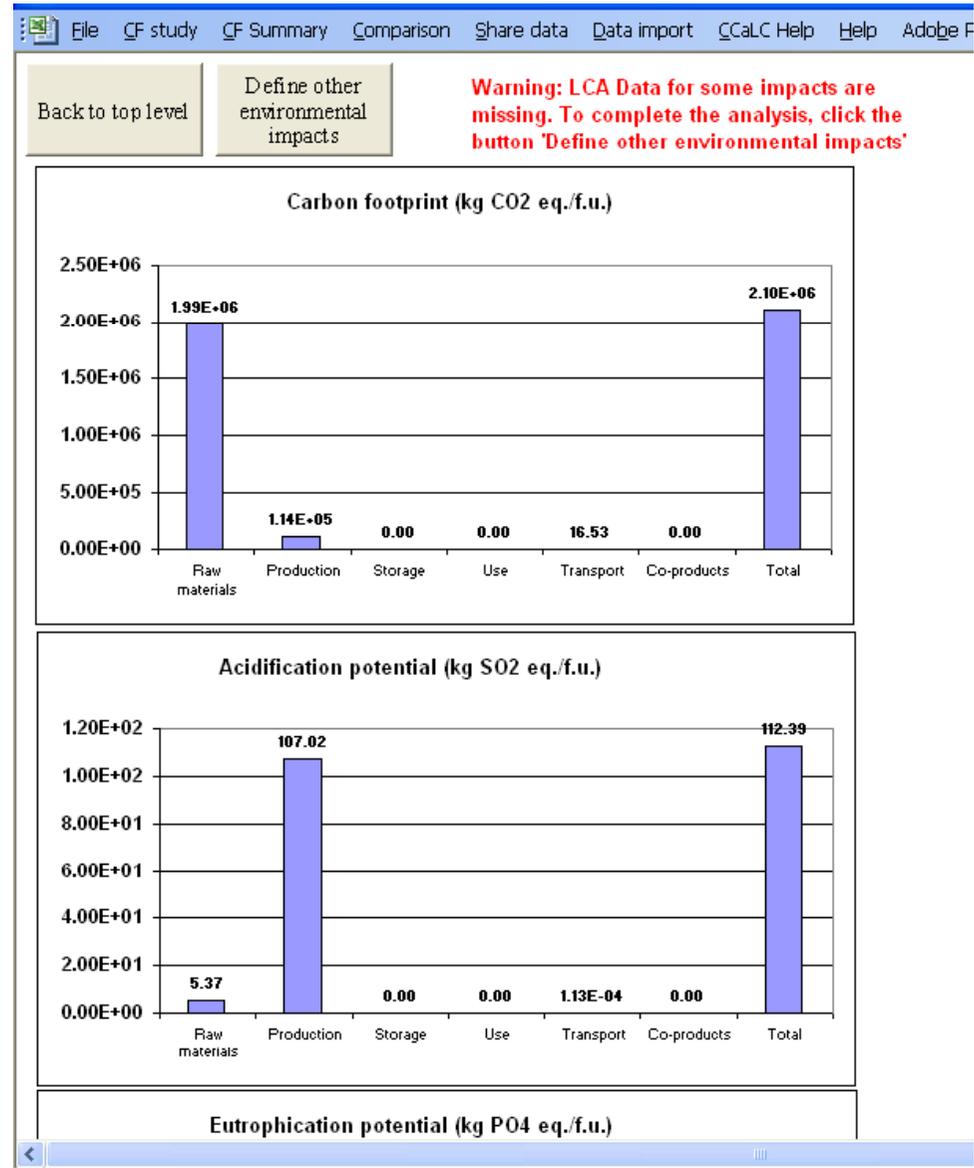


Calculating other environmental impacts in parallel with the carbon footprint



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

www.ccalc.org.uk





Databases and case studies available within CCaLC

○ Databases

- Materials
- Energy
- Transport
- Packaging
- Waste

Over 5500 datasets

○ Case studies

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

Over 50 case studies

Databases: An example showing the CCaLC material databases



File CF study CF Summary Comparison Share data Data import CCaLC Help Help Adobe PDF

Back to top level **Define materials** Define energy Define packaging Define waste Define land use change

Functional unit: Solvent-based white paint 1000 kg
 Stage: Raw Materials

Total carbon footprint for stage: 1,989.81 kg CO₂ eq/f.u.
 Total costs for stage: 0.00 £ /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.)
Additives and solvents, for paint	120.90	1.10	132.64	0.00	0.00
Binder (50% conc.)	200.00	1.97	393.32	0.00	0.00
Filler	110.00	0.05	5.45	0.00	0.00
Heavy Fuel Oil	1.70	0.34	0.59	0.00	0.00
Pigment (TiO ₂)	350.00	4.16	1,456.21	0.00	0.00
Process water - from surface water	230.00	6.51E-03	1.50	0.00	0.00
propane/ butane, at refinery, Europe	0.16	0.61	0.10	0.00	0.00
Total:	1,012.76	Total:	1,989.81	Total:	0.00

Energy	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	Total:	0.00

Packaging	Amount (kg/f.u.)	CO2 eq. (kg/kg packaging)	CO2 eq. (kg/f.u.)	Cost (£/kg packaging)	Cost (£/f.u.)
EURO Pallet (20 times-reuse)	28.42	N/A	N/A	N/A	N/A
Polyethylene film (LDPE)	1.28	N/A	N/A	N/A	N/A

Define raw materials:

Define materials | Modify Database | Search database

CCaLC database Ecoinvent database User-defined

Database section:

- All materials
- Agricultural inputs
- Biofuels/biofeedstocks
- Construction materials
- Chemicals & related
- Food & drink
- Metals
- Water

Select stage for material use: Amount (kg/f.u.):

Data quality for amount: Cost (£/kg):

Agricultural inputs
 define inputs in terms of mass per agricultural area
 define inputs in terms of mass per f.u.

Comments on amount used:

Details | Impacts

kg CO₂ eq./kg:

Year:

Location:

Source:

Data quality of dataset:

Comments:

Case studies available within CCaLC



File Summary Comparison **CF study** Share data Data import CCaLC Help Help Adobe PDF

Type a question for help

Enter system details View carbon footprint graph View data quality assessment View other environmental impacts View value added analysis Allocation summary

Functional unit (f.u.) 0

0.00 0.00 0.00 0.00 0.00 0.00

0.00 0.00 0.00 0.00 0.00 0.00

Raw Materials Transport Production Transport Storage Transport Use

Transport Transport Transport

0.00 0.00 0.00 0.00

Select study to open:

- Biofuels/biofeedstocks
- Chemicals
- Food/drink
- User defined
- Packaging

Acrylic acid-sq.beet-alloc.
Acrylic acid-sq.beet-sys.exp.
Acrylic acid-wheat-alloc.
Acrylic acid-wheat-sys.exp.
Bioethanol-sq.beet-alloc.
Bioethanol-wheat-alloc.
Butanediol-sq.beet-alloc.
Butanediol-sq.beet-sys.exp.
Butanediol-wheat-alloc.
Butanediol-wheat-sys.exp.

OK Cancel

Total carbon footprint: 0.00 tonne CO2
Total value added: 0.00 £/f.u.

Defining life cycle stages: Raw materials



File CF study CF Summary Comparison Share data Data import CaLC Help Help Adobe PDF Type a question for help

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

Functional unit: Solvent-based white paint 1000 kg
Stage: Raw Materials

Total carbon footprint for stage: 1,989.81 kg CO₂ eq/f.u.
Total costs for stage: 0.00 £ /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.)	Database section	Production stage
Additives and solvents, for paint	120.90	1.10	132.64	0.00	0.00	CCaLC/Materials/Chemicals	Paint manufacture
Binder (50% conc.)	200.00	1.97	393.32	0.00	0.00	CCaLC/Materials/Chemicals	Paint manufacture
Filler	110.00	0.05	5.45	0.00	0.00	CCaLC/Materials/Chemicals	Paint manufacture
Heavy Fuel Oil	1.70	0.34	0.59	0.00	0.00	CCaLC/Materials/Chemicals	Paint manufacture
Pigment (TiO ₂)	350.00	4.18	1,456.21	0.00	0.00	CCaLC/Materials/Chemicals	Paint manufacture
Process water - from surface water	230.00	6.51E-03	1.50	0.00	0.00	CCaLC/Materials/Water	Paint manufacture
propane/ butane, at refinery, Europe	0.16	0.61	0.10	0.00	0.00	Ecoinvent/Materials/Oil	Paint manufacture
Total:	1,012.76	Total:	1,989.81	Total:	0.00		

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

Packaging	Amount (kg/f.u.)	CO2 eq. (kg/kg packaging)	CO2 eq. (kg/f.u.)	Cost (£/kg packaging)	Cost (£/f.u.)	Database section	Production stage
EURO Pallet (20 times-reuse)	28.42	N/A	N/A	N/A	N/A	CCaLC/Packaging	Paint packaging
Polyethylene film (LDPE)	1.28	N/A	N/A	N/A	N/A	CCaLC/Materials/Chemicals	Paint packaging



Defining life cycle stages: Individual production stages

File CF study CF Summary Comparison Share data Data import CaLC Help Help Adobe PDF Type a question for help

[Back to production](#)
[Define stage](#)
[Define energy](#)
[Define waste](#)
[Define land use change](#)
[System expansion/ Allocation](#)
[View carbon footprint graph](#)

Functional unit: Solvent-based white paint 1000 kg
Stage: Paint manufacture

Total carbon footprint for stage: 26.59 kg CO₂ eq./f.u.
Total costs for stage: 0.00 £ /f.u.

Material/Packaging inputs	Amount (kg)	Cost (£/kg)	Cost (£/f.u.)
Additives and solvents, for paint	120.90	0.00	0.00
Binder (50% conc.)	200.00	0.00	0.00
Filler	110.00	0.00	0.00
Heavy Fuel Oil	1.70	0.00	0.00
Pigment (TiO ₂)	350.00	0.00	0.00
Process water - from surface water	230.00	0.00	0.00
propane/ butane, at refinery, Europe	0.16	0.00	0.00
Total:	1,012.76	Total:	0.00

Total mass in (materials + packaging) (kg)	1012.76
Total mass out (materials + waste) (kg)	1010.90
Mass balance (kg)	1.86

Energy type	Amount (MJ/f.u.)	CO ₂ eq. (kg/MJ energy)	CO ₂ eq. (kg/f.u.)	Cost (£/MJ)	Cost (£/f.u.)	Database section
Electricity (low voltage) - UK grid	105.00	0.19	19.51	0.00	0.00	CCaLC/Energy
Total:	105.00	Total:	19.51	Total:	0.00	

Amount CO₂ eq. /kalka CO₂ eq.

Defining life cycle stages: Use stage



File CF study CF Summary Comparison Share data Data import CaLC Help Help Adobe PDF Type a question for help

Back to top level Define use Define energy Define waste Define carbon release from product disposal Define biogenic carbon storage System Expansion View carbon footprint graph

Functional unit: Solvent-based white paint 1000 kg
Stage: Use

Total carbon footprint for stage: 0.00 kg CO₂ eq./f.u.
Total costs for stage: 0.00 £ /f.u.

Material inputs	Amount (kg)
Total:	0.00

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

Direct GHG emissions	Amount (kg/f.u.)	CO2 eq. (kg/kg GHG)	CO2 eq. (kg/f.u.)
Total:	0.00	Total:	0.00

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

Use

Appliances GHG emissions All emissions

Define greenhouse gas emissions directly emitted from stage:

Greenhouse Gas: Amount kg/f.u.

- Carbon Dioxide
- Carbon Dioxide (biogenic)
- Methane
- Methane - biogenic
- Nitrous Oxide
- Sulphur Hexafluoride
- CFC-11
- CFC-12

kg CO₂ eq./kg GHG

Exit

Defining life cycle stages: Transport



File CF study CF Summary Comparison Share data Data import CaLC Help Help Adobe PDF Type a question for help

Back to top level Define transport View graph

Functional unit: Solvent-based white paint 1000 kg
Transport stage: Raw Materials-->Processing

Total carbon footprint for stage: 4.55 kg CO₂ eq./f.u.
Total water usage for stage: 0.00 m³/f.u.
Total water-footprint (stress-weighted) for stage: 0.00 m³ eq./f.u.

Material transported	Transport Type	Distance (km)	Mass transported (kg)	Carbon footprint (kg CO ₂ eq./f.u)	Empty return trip?	Water usage(m ³ /f.u.)	Water footprint (stress-weighted m ³ eq./f.u.)	Database
Additives and solvents, for paint-->>Paint manufacture	22t truck	100.00	120.90	0.70	No	0.00	0.00	CCaLC
Binder (50% conc.)-->>Paint manufacture	22t truck	100.00	200.00	1.16	No	0.00	0.00	CCaLC
Filler-->>Paint manufacture	22t truck	100.00	110.00	0.64	No	0.00	0.00	CCaLC
Pigment (TiO ₂)-->>Paint manufacture	22t truck	100.00	350.00	2.04	No	0.00	0.00	CCaLC

Transport data currently missing for:

- Heavy Fuel Oil--> Paint manufacture
- Process water - from surface water--> Paint manufacture
- propane/ butane, at refinery, Europe--> Paint manufacture
- EURO Pallet (20 times-reuse)--> Paint packaging
- Polyethylene film (LDPE) --> Paint packaging
- PP container, for paint (10 l)--> Paint packaging

Select material to define transport for:

- Additives and solvents, for paint-->Production - Paint manufacture
- Binder (50% conc.)-->Production - Paint manufacture
- Filler-->Production - Paint manufacture
- Heavy Fuel Oil-->Production - Paint manufacture
- Pigment (TiO₂)-->Production - Paint manufacture
- Process water - from surface water-->Production - Paint manufacture
- propane/ butane, at refinery, Europe-->Production - Paint manufacture
- EURO Pallet (20 times-reuse)-->Paint packaging
- Polyethylene film (LDPE) -->Paint packaging
- PP container, for paint (10 l)-->Paint packaging

Exit

Define transport:

Transport details | Modify transport database | Search database

CCaLC database Ecoinvent database User database

Transport Type: 40t truck Distance(km): 0

Packing density kg/litre: 1

Empty return trip?

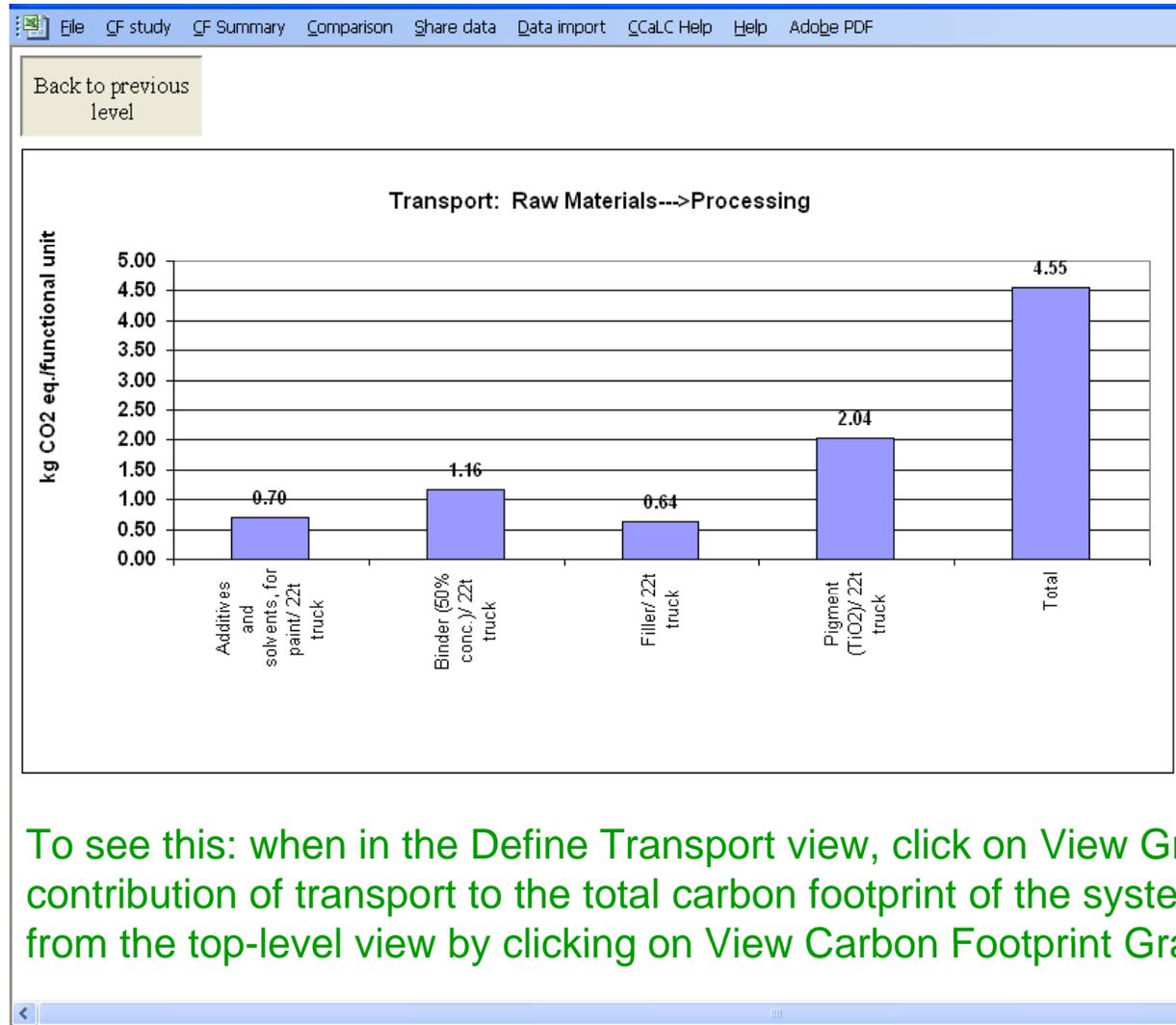
Data quality for amount: Medium

Cost of transport £/f.u. 0

Comments on amount used:

Update

Identifying hot spots: Transport



Waste management: Carbon footprint by life cycle stage



File CF study CF Summary Comparison Share data Data import CaLC Help Help Adobe PDF

Back to top level View carbon footprint graph

Functional unit: Solvent-based white paint 1000 kg

Summary of carbon footprint from waste

Waste from:	Mass waste (kg/f.u.)	Carbon footprint (kgCO2 eq./f.u.)
Raw Materials:		
	Total:	0.00
Production:		
disposal, inert material, 0% water, to sanitary landfill from Paint manufacture	1.33	0.02
disposal, limestone residue, 5% water, to inert material landfill from Paint manufacture	8.90	0.06
disposal, paint, 0% water, to municipal incineration from Paint manufacture	0.67	1.59
	Total:	1.67
Storage:		
	Total:	0.00
Use:		
	Total:	0.00
	Combined total for waste:	1.67

To see this: from the top-level view, click on Waste management



CCaLC helps to follow the PAS2050 methodology

Microsoft Excel - CCaLC_tool

File Summary Comparison CF study Share data Data import CCaLC Help Help Adobe PDF

Type a question for help

Back to top level Define use Define energy Define waste **Define carbon release from product disposal** Define bio-genic carbon storage View carbon footprint graph

Stage: Use

Total carbon footprint for stage: 2

Total costs for stage:

Material inputs	Amount (tonne)
Dried waste solids	0.57
Total:	0.57

Energy type	Amount (MJ/f.u.)	CO2 (tonne/ene)

Direct GHG emissions	Amount (tonne/f.u.)	CO2 eq. (tonne/tonne GHG)	CO2 eq. (tonne/f.u.)
Total:			0.00

...	Amount	CO2 eq.	CO2 eq.	Cost

al mass in (tonne)	0.57
l mass out (tonne)	0.57
ss balance (tonne)	-4.05E-17
Stored carbon (tonne/f.u.)	0.00

Define carbon storage:

Carbon storage in a product can be calculated for specific or general cases(See PAS2050, Annex C.1). For specific cases, the user must specify the number of years the carbon is stored for. For general cases, the user must calculate a weighting factor using the methodology in the PAS.

Specific case (full storage)

Prolonged release (storage or take up)

Time to emission (years): Weighting factor:

Data quality: Amount of stored carbon (tonne/f.u.):

Update Exit

Estimating data quality



File CF study CF Summary Comparison Share data Data import

CF data quality by stage:

Stage	CF data quality
Raw materials	High
Co-products/System expansion	
Processing stages	
Paint manufacture	High
Paint packaging	High
Stage 3	
Stage 4	
Stage 5	
Stage 6	
Stage 7	
Stage 8	
Stage 9	
Stage 10	
Average Processing	High
Storage	
Use	
Transport stages	
Raw Materials--->Processing	Medium
Paint manufacture--->	Medium
Paint packaging--->	
Stage 3--->	
Stage 4--->	
Stage 5--->	
Stage 6--->	
Stage 7--->	
Stage 8--->	
Stage 9--->	
Stage 10--->	
Processing--->Storage	Medium
Storage--->Use	
Raw Materials--->Waste	
Production--->Waste	Medium
Storage--->Waste	
Use--->Waste	
Average Transport	Medium

Viewing the summary of results



File CF study **CF Summary** Comparison Share data Data import CaLC Help Help Adobe PDF

Back to analysis Summary: Solvent-based white paint 1000 kg

Total carbon footprint: 2126.19 kg CO2 eq./f.u.

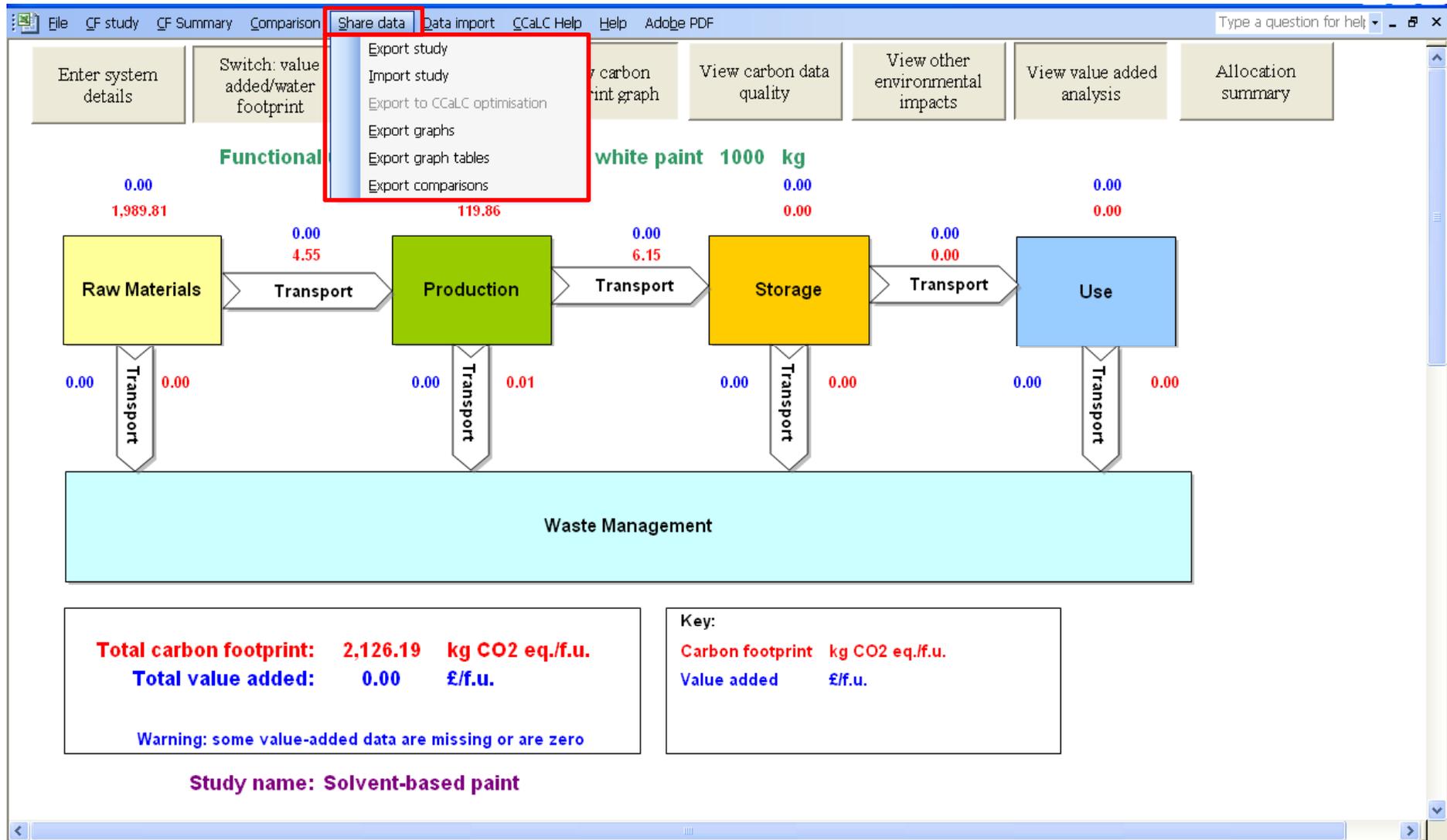
Category	Percentage
Raw materials	93.6%
Production	5.6%
Storage	0.0%
Use	0.0%
Transport	0.0%

Category	Value (kg CO2 eq./f.u.)
Raw Materials	1,989.81
Energy	19.51
Direct GHG emissions	5.40
Packaging	93.27
Transport	16.53
Waste	1.67
Land use change	0.00
Carbon storage	0.00
Total per f.u.	2,126.19
Co-products	0.00
Total inc. Co-products	2,126.19

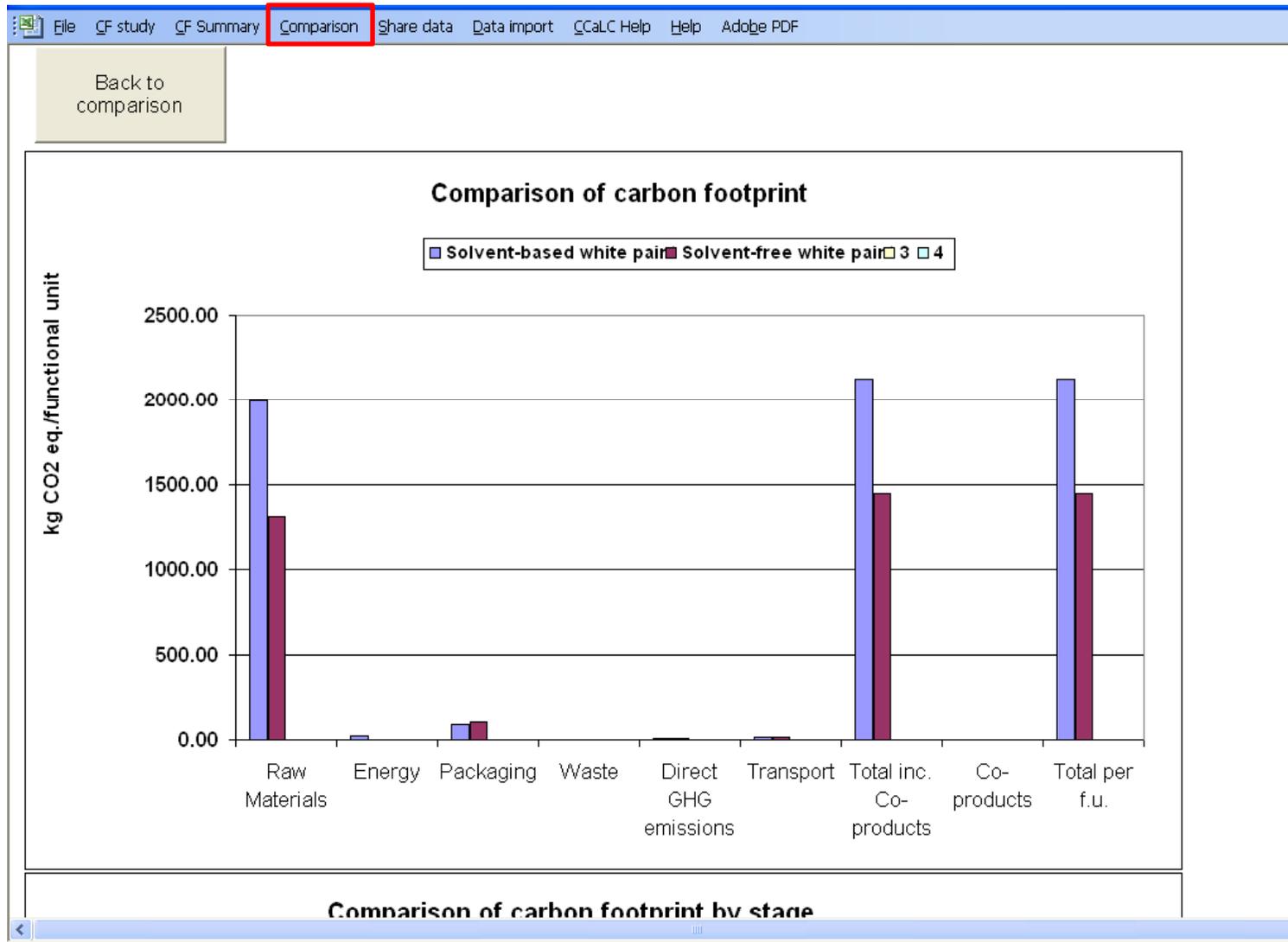
Stage	Value (kg CO2 eq./f.u.)
Raw Materials	1,989.81
Paint manufacture	26.53
Paint packaging	93.27
Stage 3	0.00
Stage 4	0.00
Stage 5	0.00
Stage 6	0.00
Stage 7	0.00
Stage 8	0.00
Stage 9	0.00
Stage 10	0.00
Storage	0.00
Use	0.00
Transport	16.53
Total per f.u.	2,126.19
Co-products	0.00
Total inc. Co-products	2,126.19

Carbon footprint by stage	
Analysis name:	Functional unit
Solvent-based white paint	1000 kg
	kg CO2 eq./f.u.
Raw Materials	1989.81
Paint manufacture	26.53
Paint packaging	93.27
Stage 3	0.00
Stage 4	0.00
Stage 5	0.00
Stage 6	0.00
Stage 7	0.00
Stage 8	0.00
Stage 9	0.00
Stage 10	0.00
Storage	0.00
Use	0.00
Transport	16.53
Total per f.u.	2,126.19
Co-products	0.00
Total inc. Co-products	2,126.19
Carbon footprint by category	
Raw Materials	1,989.81
Energy	19.51
Direct GHG emissions	5.40
Packaging	93.27
Transport	16.53
Waste	1.67

Sharing data and studies



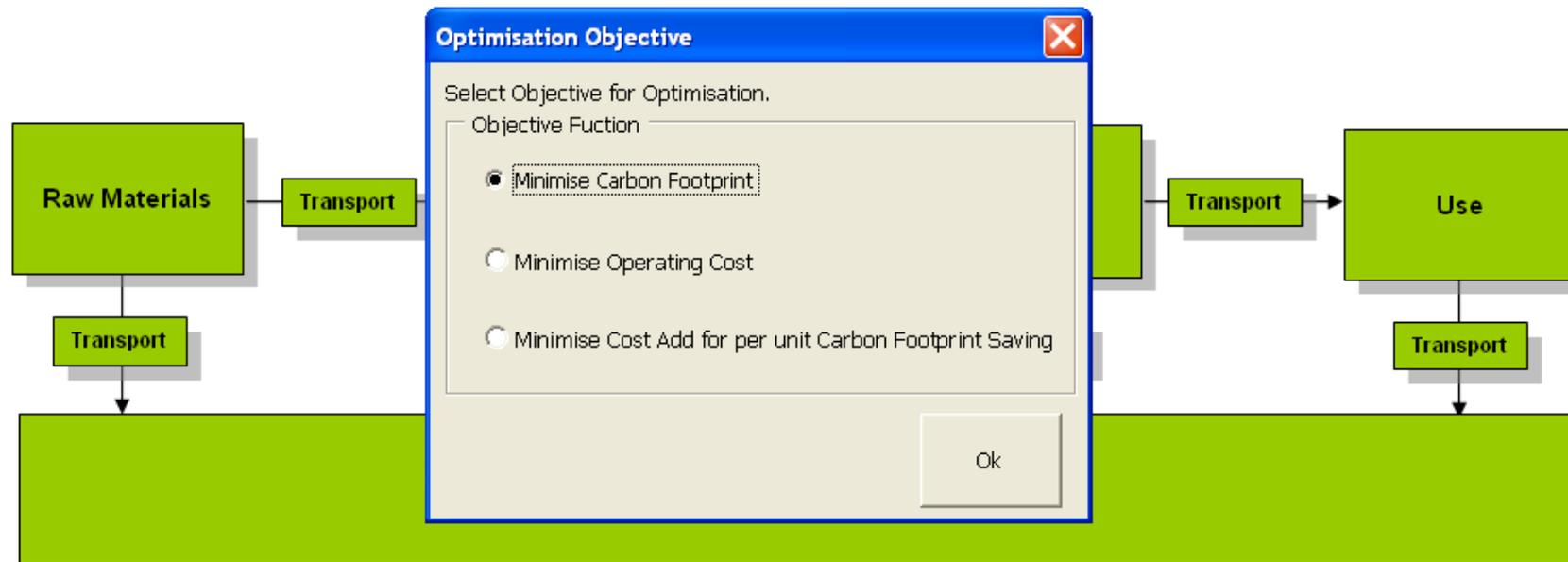
Comparison of alternatives



Reducing carbon footprints at minimum costs: CCaLC Optimiser



Functional unit (f. u.) **Optimisation Case** 1000 m2
Objective: Minimise Carbon Footprint





Optimising carbon footprints: CCaLC Optimiser

