Carbon Footprint of Recycled Solvents

Solvent Recycling: Sustainability in Practice

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Chemspec 19th June 2014

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European Solvent Recycler Group

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Formed in 2004 as a European Industry Association

Members are Specialist Companies engaged in a wide range of Solvent Recycling Activities

Examples of Industries Served by ESRG Members…

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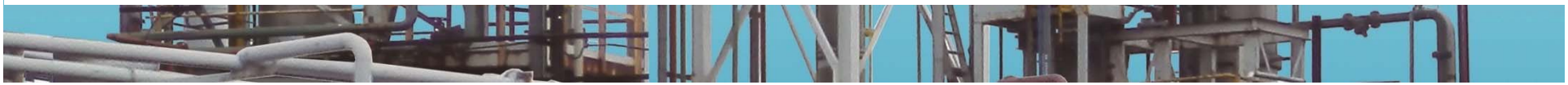

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Industries served by ESRG members…

Pharmaceutical

Industrial Cleaning

Automotive

CHEMICAL

Industrial Gases

Freon

FLUID DISPOSAL

Speciality Chemicals

FRIDGE RECYCLERS

Solvent & Chemical Trading

OIL & GAS

Aviation Industry

Dry Cleaning

PAINT, VARNISH, LACQUER & RESIN

Printing

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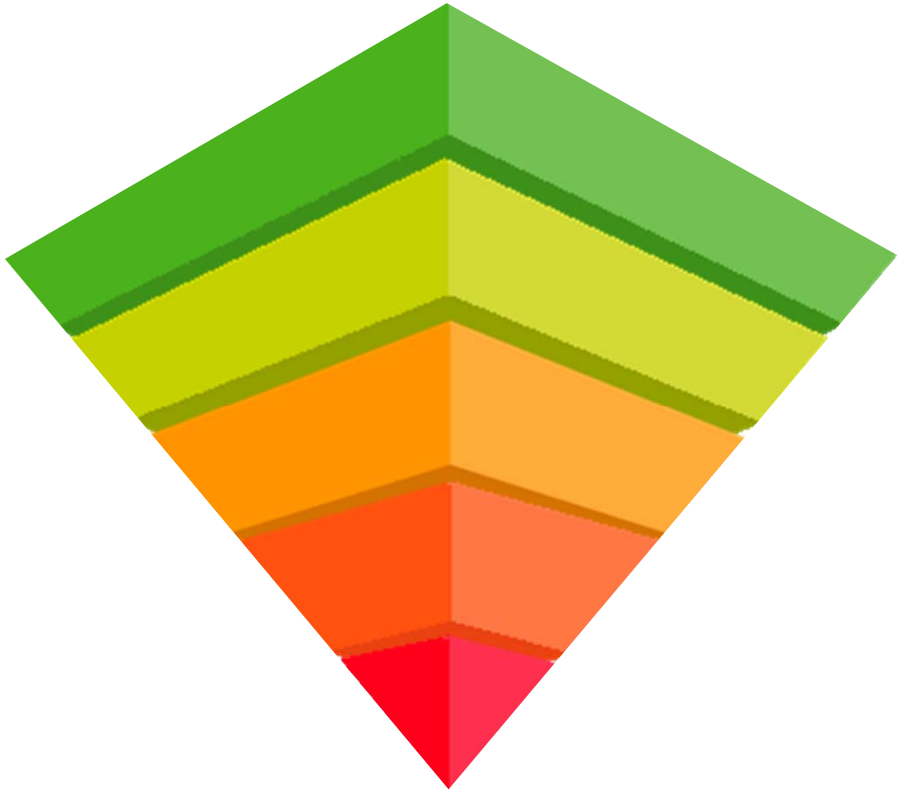
EU Directive 2008/98/EC The Waste Framework Directive enshrines the fundamental concept of Waste Hierarchy that lays down some basic waste management principles. ESRG and its members strongly support this concept.



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Associazione Italiana Commercio Chimico AssICC On line

BITOLEA SPA CHIMICA ECOLOGICA

Chemical RECYCLING ASSOCIATION

Chemoxy

DRAGON

DISLAUB

DISTILLER, S.A.

DNCP De Neef Chemical Processing

EGEO SOLVENTES

ECORAMBIENTE

FEDEREC SYRES Syndicat National des Régénérateurs de Solvants

FORTOM CHIMICA S.r.l.

La. Chi.

MULTICHIMICA PROGRESS IN CHEMICAL

NITROLCHIMICA

ORM BERGOLD CHEMIE

RG Richard Geiss GmbH Sustainable Solvent Recovery

RE RESOLVE

RCN CHEMIE GMBH

RABOCHEM

safetykleen

solvadis

Solveko

SAFECHEM be responsible

Speichim processing Séché global solutions

suez environnement SITA

sare Waste Solvent Recovery Facility

TRADEBE

Valls química Séché global solutions

VALOREC

vch Verband Chemiehandel

- In 2012 / 2013 ESRG commissioned a Carbon Footprinting Study to assess the impacts / benefits of solvent recycling.
- Ethos Research (Professor Adisa Azapagic) was commissioned to conduct this study following ISO 14044 methodology and using a life cycle assessment tool “CCaLC”.
- CCaLC tool is a multi-award winning life cycle assessment and decision support tool.
- Led by Professor Adisa Azapagic, CCaLC was developed at the University of Manchester and funded by EPSRC, NERC & Carbon Trust, with ESRG’s Tradebe (then SRM) as a project partner.

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Overview of CCaLC

- Designed for use by industry
- Simple to use by non-experts
- Underpinned by international standards
- Includes comprehensive databases (over 6,000 datasets)
- More than 4500 users
- Available free of charge (www.ccalc.org.uk)

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Solvents considered in the study

- Carbon footprinting of 6 solvents recycled by ESRG member companies:
  - ✓ Mixed solvents
  - ✓ Acetone
  - ✓ Tetrahydrofuran (THF)
  - ✓ Methyl Ethyl Ketone (MEK)
  - ✓ Triethylamine (TEA)
  - ✓ Perchloroethylene (PERC)

- Solvents chosen to be representative of techniques (simple distillation, fractional distillation, complex distillation) AND representative of a variety of solvent "families", i.e. mixed/single substance; non-chlorinated/chlorinated.

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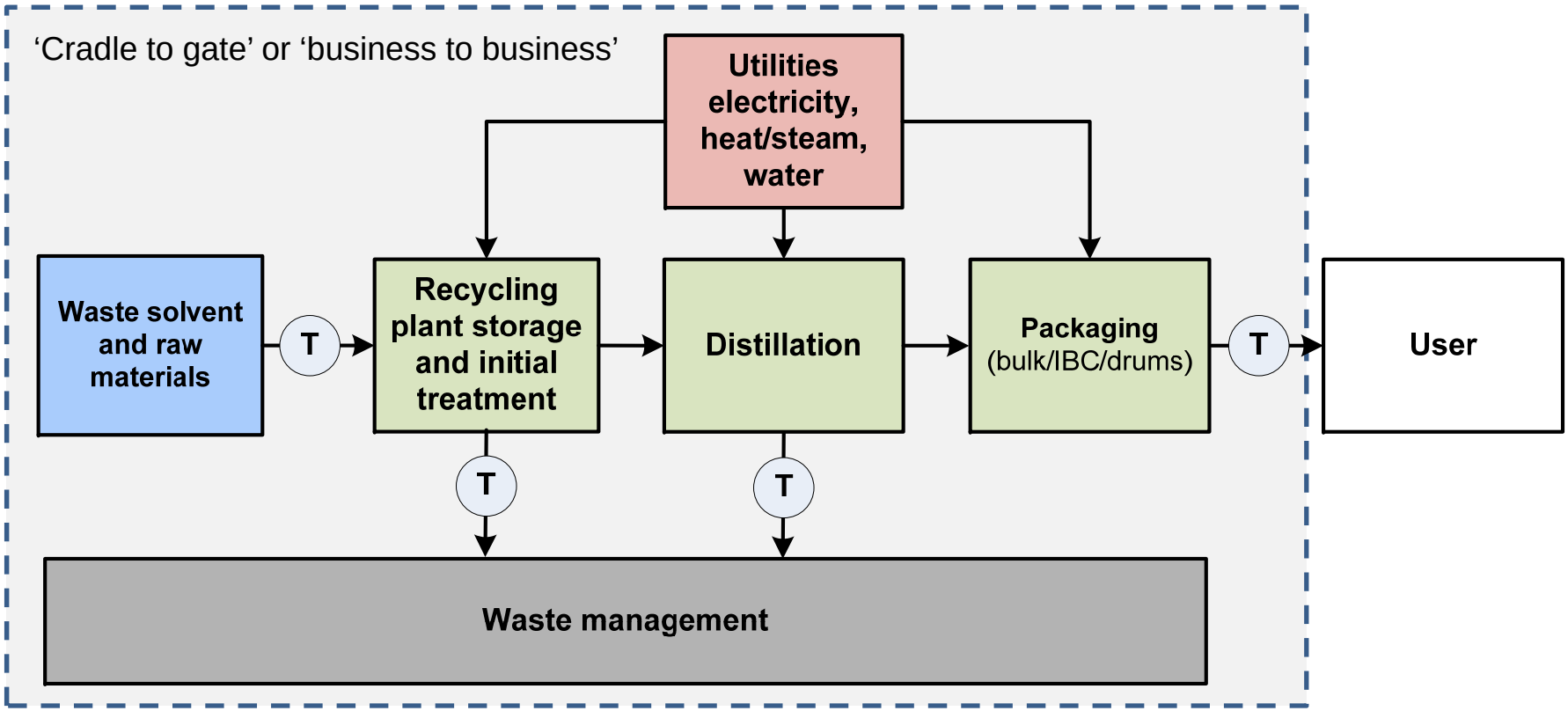
Scope of the study



- Unit of analysis: Production of 1 tonne of recycled solvent

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Data and main assumptions

- All primary data provided by solvent recycling companies
- Background LCA data from databases
  - ✓CCaLC and Ecoinvent
- System credits for waste incineration with heat recovery
  - ✓Waste used as fuel in cement kilns replacing coal

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System credits: Sensitivity analysis

Scenario	Fuel replacement	Credit to
Reference	Coal in cement kiln	100% solvent recycling company
Scenario 1	Coal in cement kiln	100% cement kiln company
Scenario 2	Coal in cement kiln	50% solvent recycling company 50% cement kiln company
Scenario 3	Petroleum coke in cement kiln	100% solvent recycling company
Scenario 4	Petroleum coke in cement kiln	50% solvent recycling company 50% cement kiln company

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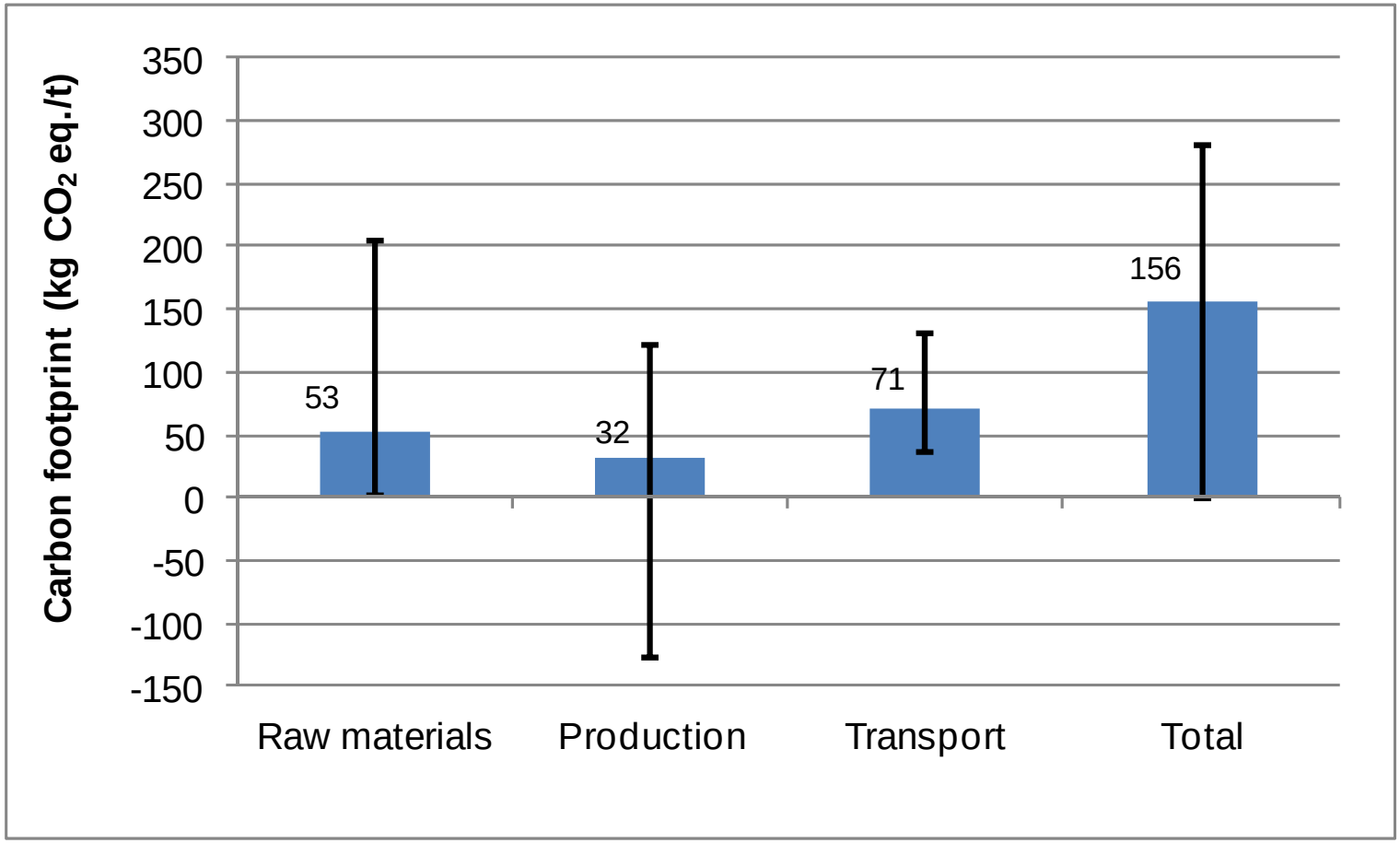
An example : Mixed solvents



[Raw materials include packaging of waste solvent; production includes solvent recycling process and waste management]

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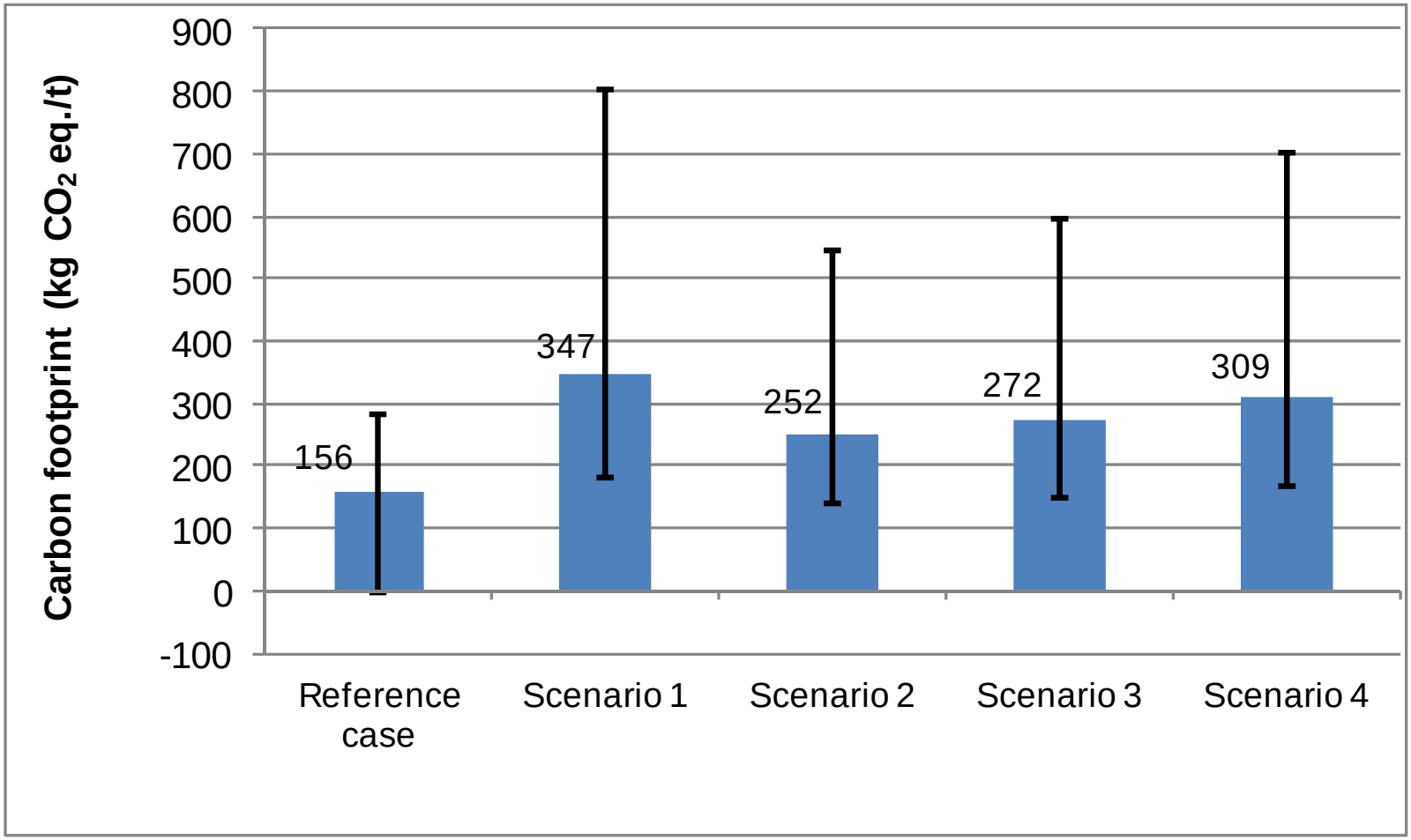
Sensitivity analysis: Mixed solvents



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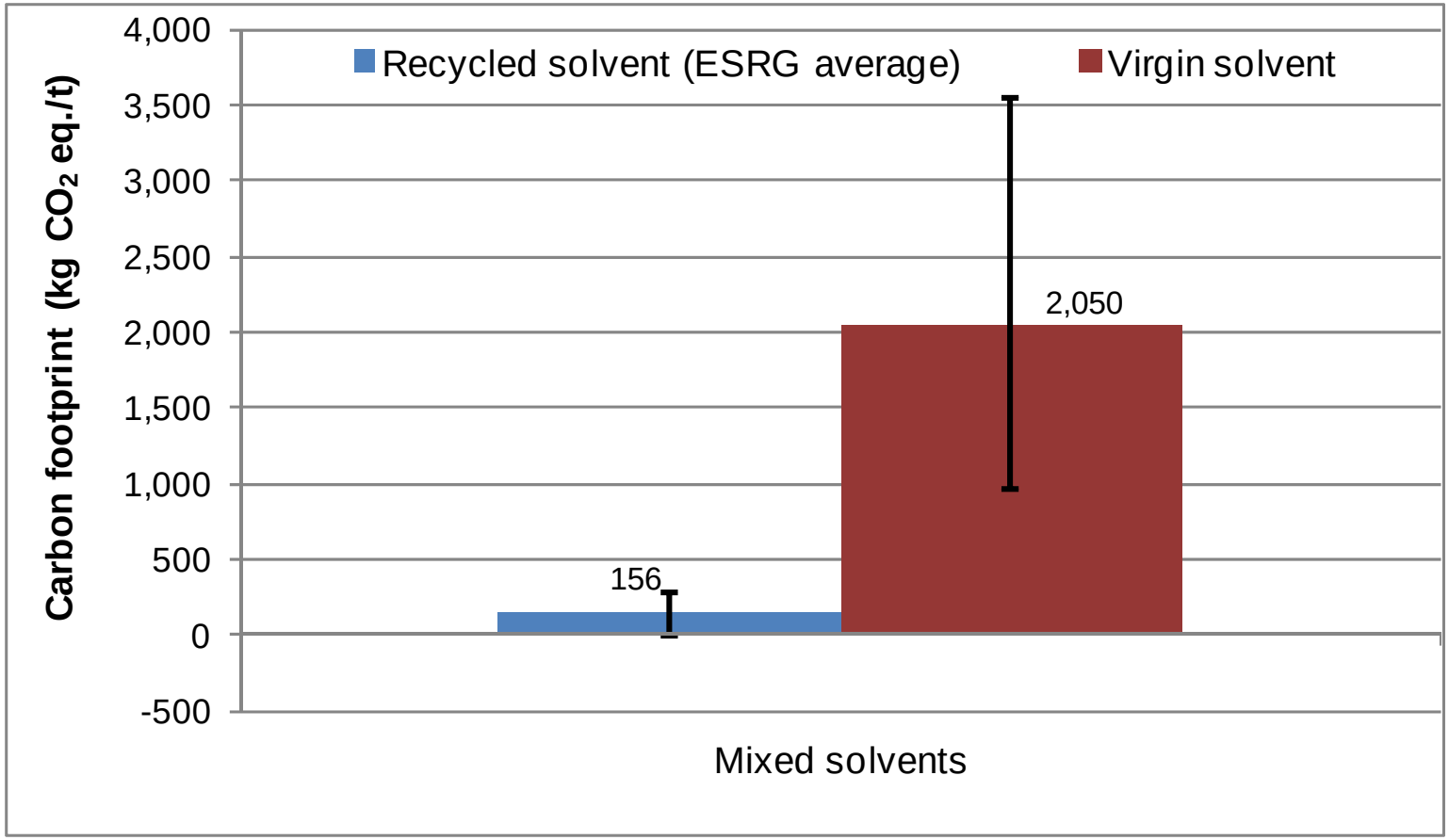
Recycled mixed solvents vs virgin solvent



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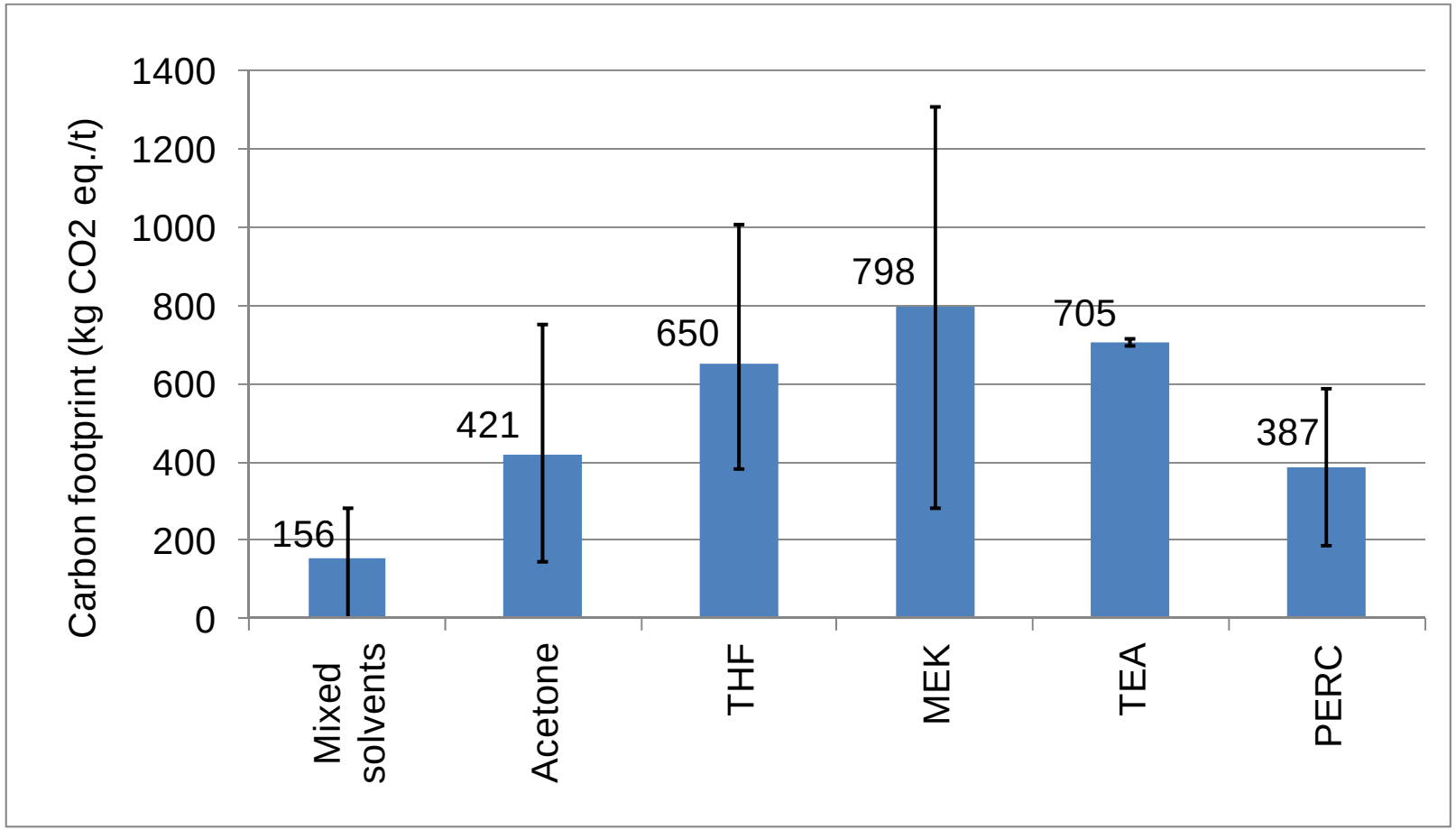
Carbon footprint: All solvents



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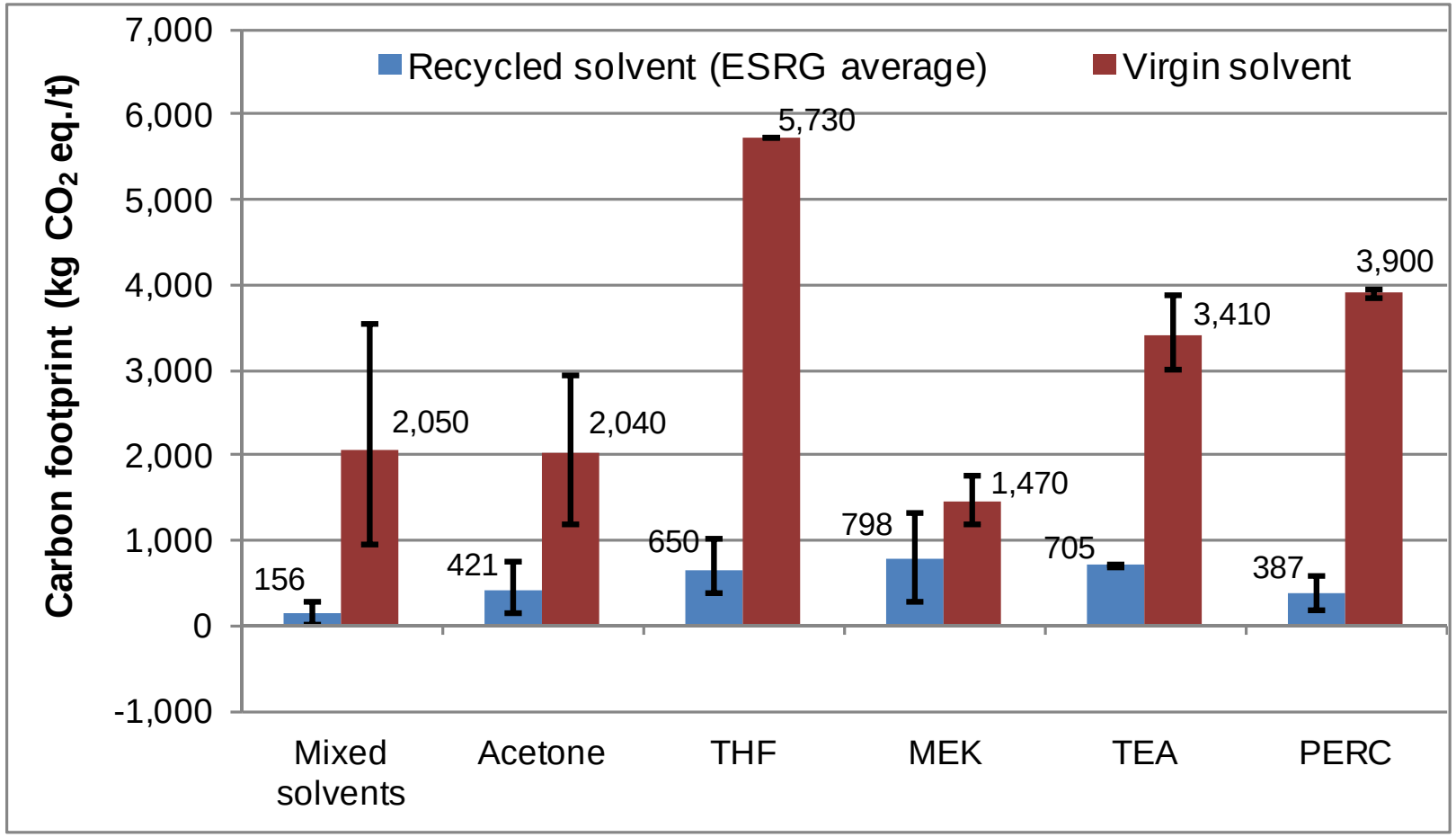
Recycled vs. virgin solvents



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Conclusions

- ESRG started out with conceptual support of the Waste Hierarchy
- This study shows the significant environmental benefits of recycling and factually underpins the validity of the concept
- Solvent recycling achieves:

Carbon footprint reductions of 46% - 92%

- The results are based on conservative assumptions (underestimates) as it does not include:
  - Multiple recycling loops – the study is based on a single recycle loop while most solvents can be recycled over and over again.
  - The footprint of the alternative disposal technique (e.g. incineration) that would have to be applied to the waste if it is not recycled.

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Conclusions

- ESRG's work can be provided via ESRG member companies to be built in to waste producers' own carbon footprinting or sustainability reports.
- Further producer & stream tailored carbon footprints are potential further developments.
- For further discussion and full study report, see our member companies in the exhibition hall or visit our website:
  - www.esrg-online.eu

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