

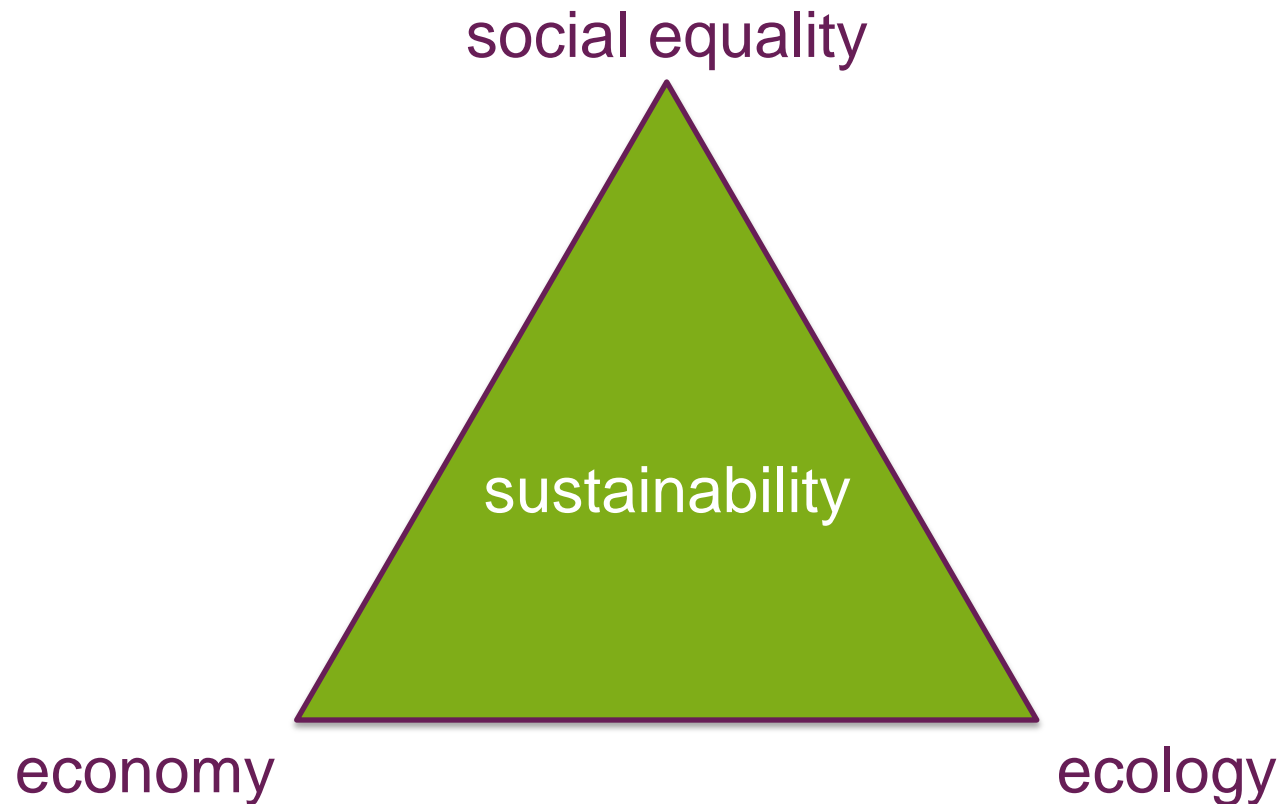
42th International research conference of IARIGAI (2015)

# **The choice of an LCIA method from a practitioner's perspective – An example of laminating films in the printing and packaging industry**

K. Radermacher / U. Jung / J.M. Marzinkowski

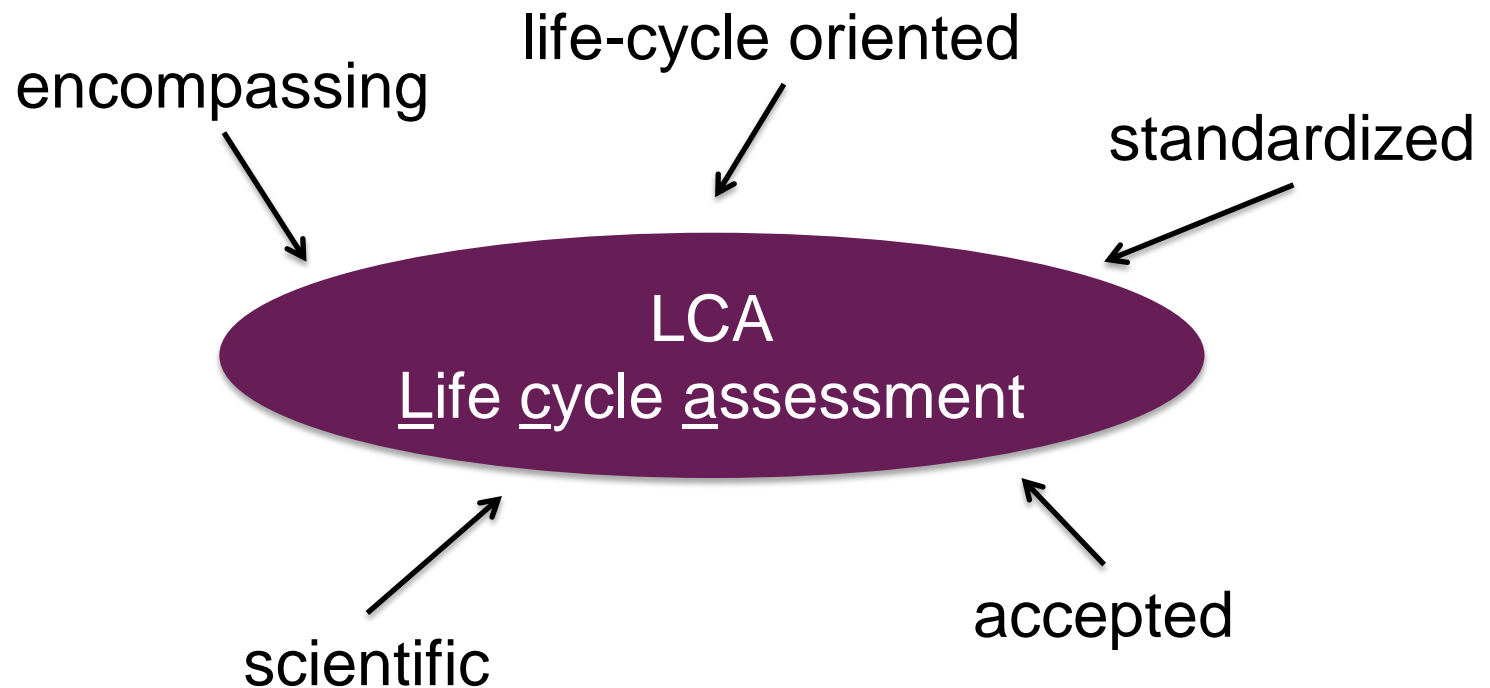
# BACKGROUND

## SUSTAINABLE BEHAVIOR IN TODAY'S SOCIETY



## BACKGROUND

# ADVANTAGES OF THE LIFE CYCLE ASSESSMENT



# BACKGROUND

## STRUCTURE OF THE LIFE CYCLE ASSESSMENT

1. Goal and scope definition

2. Inventory analysis



3. Impact assessment (LCIA)



Choice of LCIA method:

- substances considered
- characterization factors used

4. Interpretation

# RESEARCH QUESTION

Many LCIA methods exist.

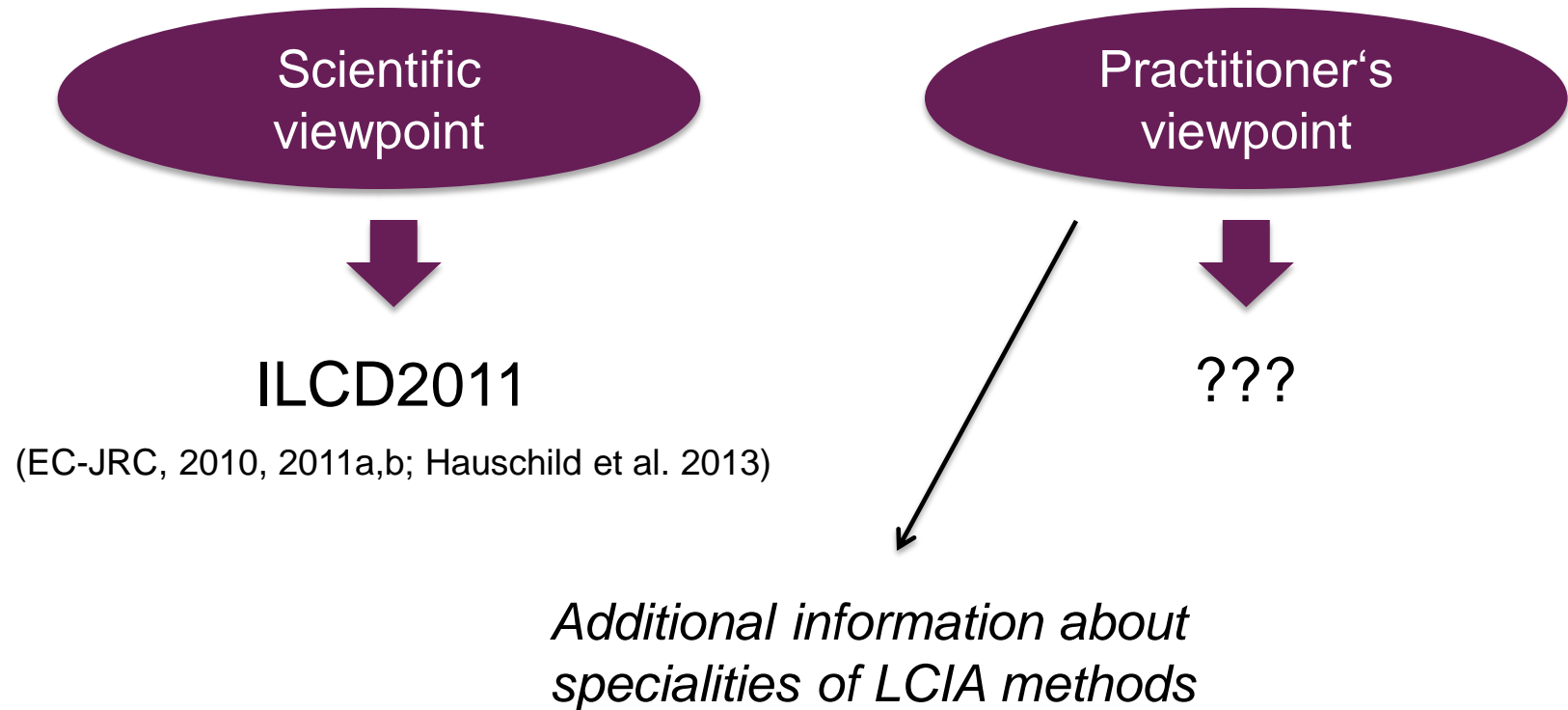
Different LCIA methods create different LCA results.

What's **correct** and more **appropriate**?



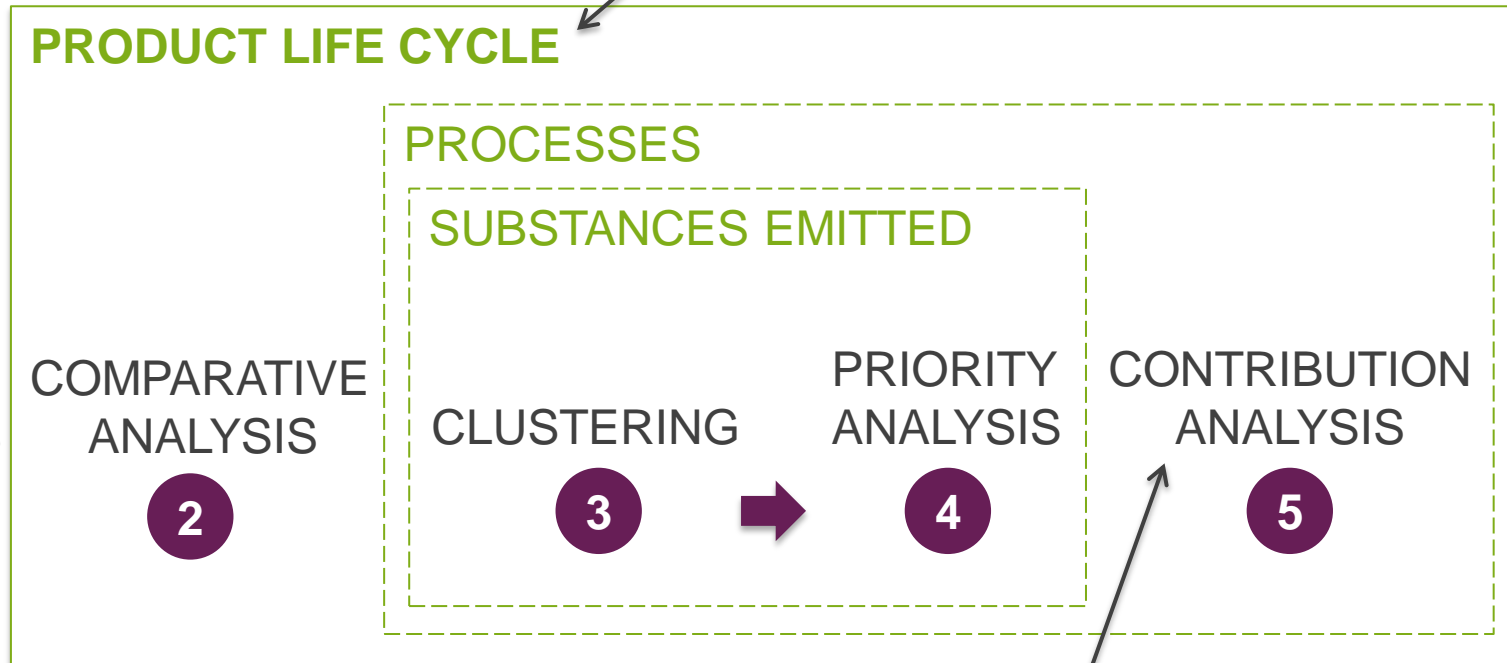
How could practitioners decide about the LCIA method to be chosen?

# RESEARCH QUESTION STRATEGY



# STRUCTURE OF ANALYSIS

an example of laminating films  
(Radermacher et al., 2013a, 2014)



MULTI-LEVEL APPROACH  
of Radermacher et al. (2014)

# PRE-SELECTION OF LCIA METHODS

...

Mostly used for long time

**EDIP2003**

**CML2001**

One of the newest

**ReCiPe2008**

method comparison

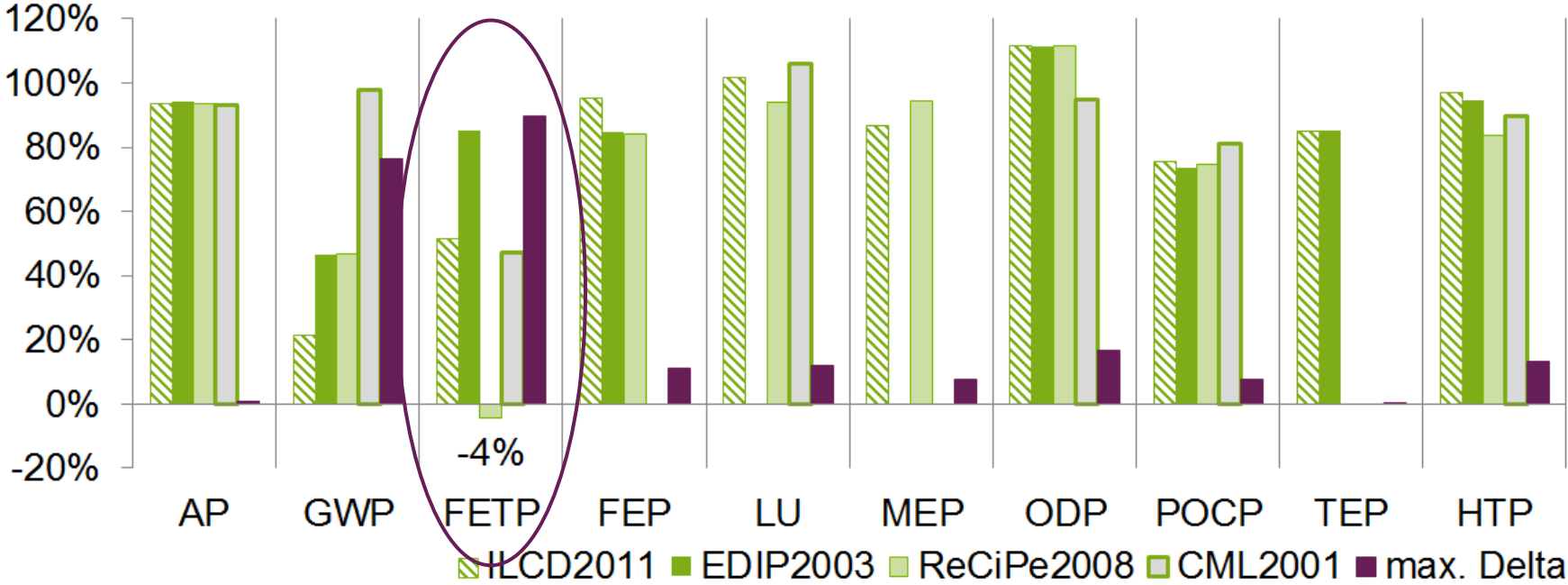
Most appropriate from a scientific viewpoint

**ILCD2011**



# COMPARATIVE ANALYSIS: LAMINATING FILMS

Comparative analysis of laminating films:  
Differences in % applying LCIA methods EDIP, CML, ReCiPe and ILCD



AP ... Acidification; GWP ... Global warming; FETP ... freshwater ecotoxicity; FEP ... Freshwater eutrophication; LU ... Land use; MEP ... Marinewater eutrophication; ODP ... ozone depletion; POCP ... ozone creation; TEP ... Terrestrial eutrophication; HTP ... Human toxicity

# CONCLUSIONS FROM COMPARATIVE ANALYSIS

2

- Decisive differences were found in the toxic assessment, especially in the freshwater ecotoxicity.
- These results agree with former publications.

*Decision: We concentrated on the impact categories of the toxic assessment; these are the aquatic ecotoxicity and the human toxicity.*



# PRIORITY ANALYSIS OF SUBSTANCES: CLUSTER OF SUBSTANCES

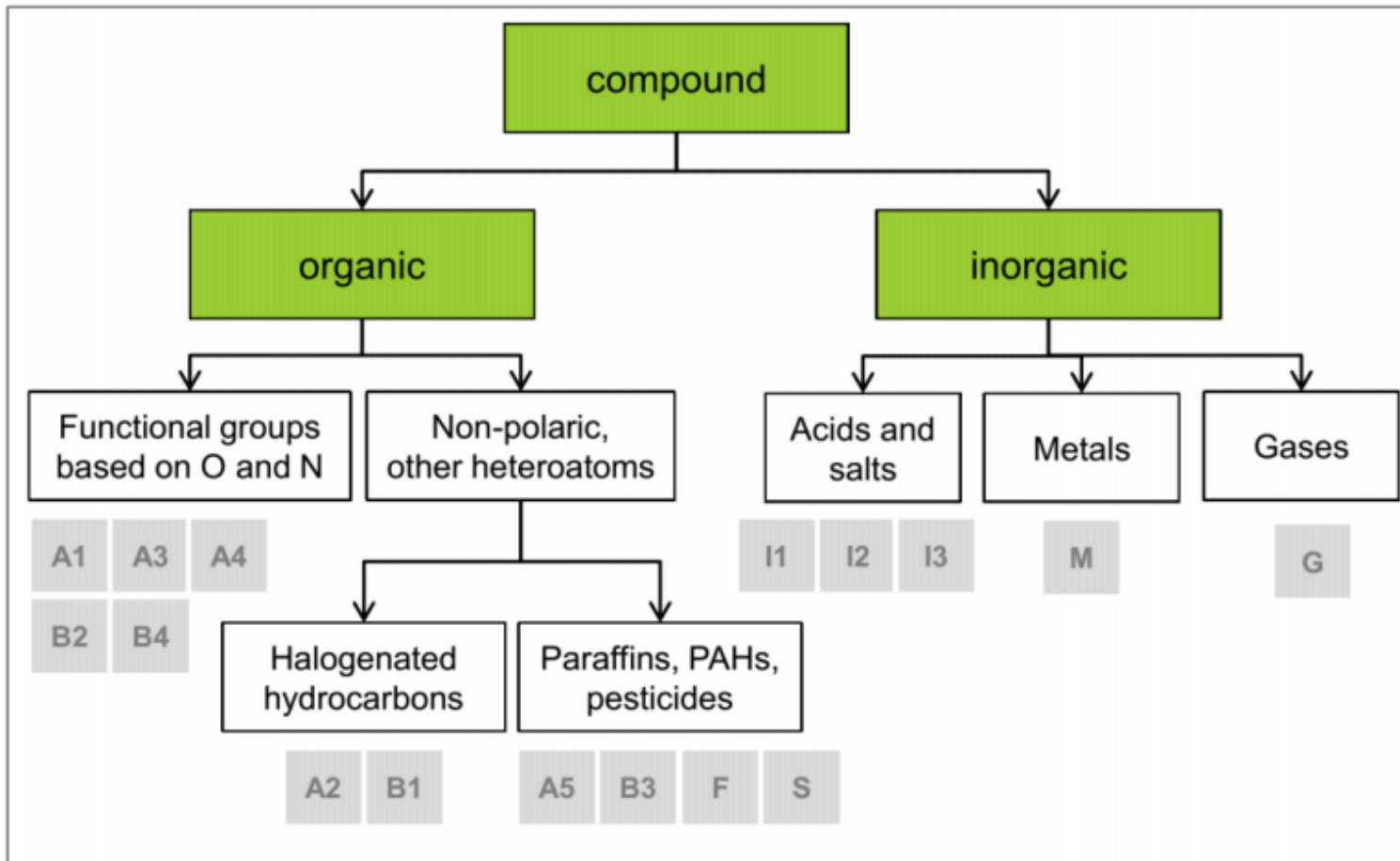


Figure 2. Substance groups built from the chemical properties of emissions

# PRIORITY ANALYSIS OF SUBSTANCES: AQUATIC ECOTOXICITY

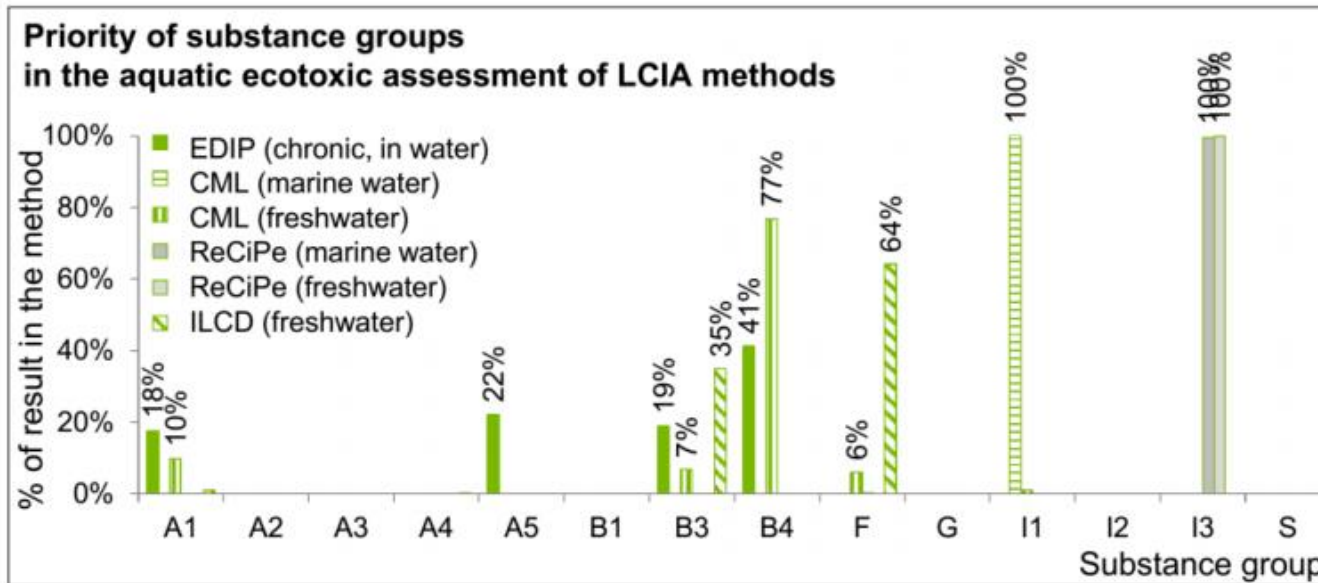


Figure 3. Priority analysis of substances in the aquatic ecotoxicity of EDIP, CML, ReCiPe and ILCD for marine and freshwater; Metals are not included

	organic	inorganic		organic	inorganic
EDIP	X		ReCiPe (marine)		X
CML (marine)		X	ReCiPe (freshw.)		X
CML (freshw.)	X		ILCD (freshw.)	X	

# PRIORITY ANALYSIS OF SUBSTANCES: HUMAN TOXICITY

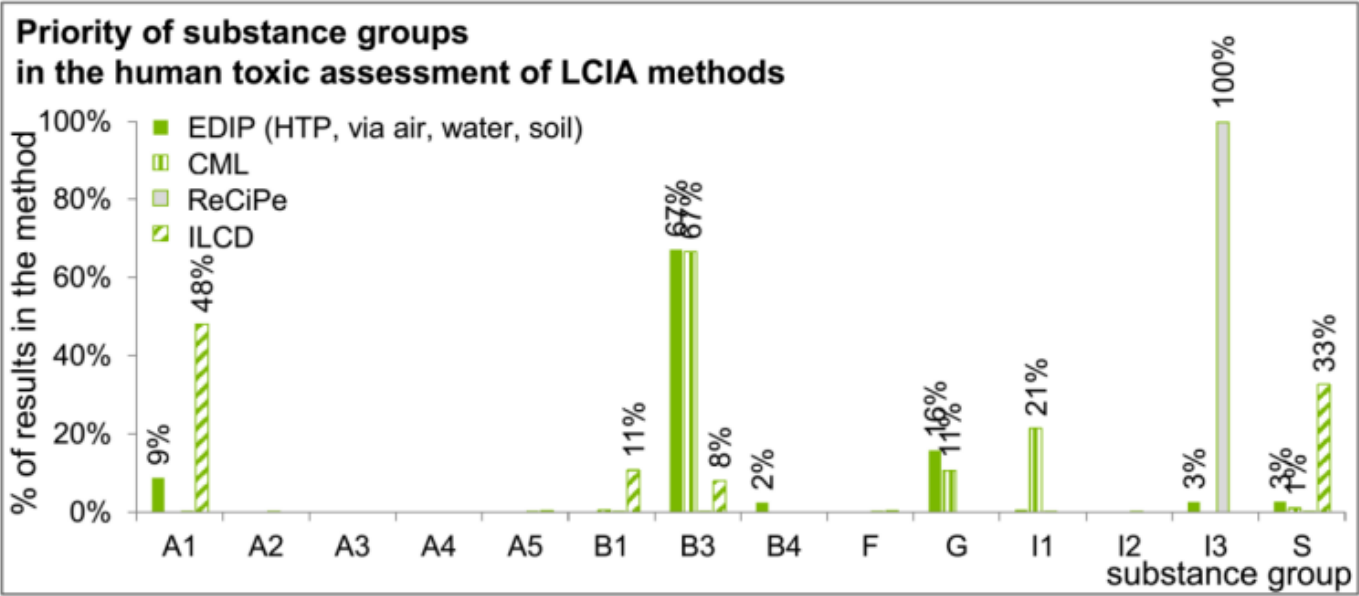


Figure 4. Priority analysis of substances in the human ecotoxicity of EDIP, CML, ReCiPe and ILCD;

*Metals are not included*

	organic	inorganic		organic	inorganic
EDIP	X	X	ReCiPe		X
CML	X	X	ILCD	X	

# CONCLUSIONS FROM PRIORITY ANALYSIS

- All of the methods have got a priority on metals
- Besides the metals, ILCD2011 has a priority on organic substances
- The priority is also found in EDIP2003; in CML2001 the priority of organics exist but is not as clearly.
- ReCiPe2008 is focused on the inorganic compounds

*Decision: ILCD was compared directly with EDIP matching most clearly the organic nature of the product system. CML and ReCiPe are also reported.*

# CONTRIBUTION ANALYSIS: BASED ON THE MULTI-LEVEL APPROACH

## LEVEL I

### Life cycle stages

material extraction, material production, manufacturing, end-of-life

## LEVEL II

### Process types

auxiliaries, direct emissions, energy, infrastructure, transport, packaging, waste, raw material

## LEVEL III

### Process groups focussed on material properties

fuels, inorganics, metals, organics, infrastructure, others



#### based on the Multi-Level approach in

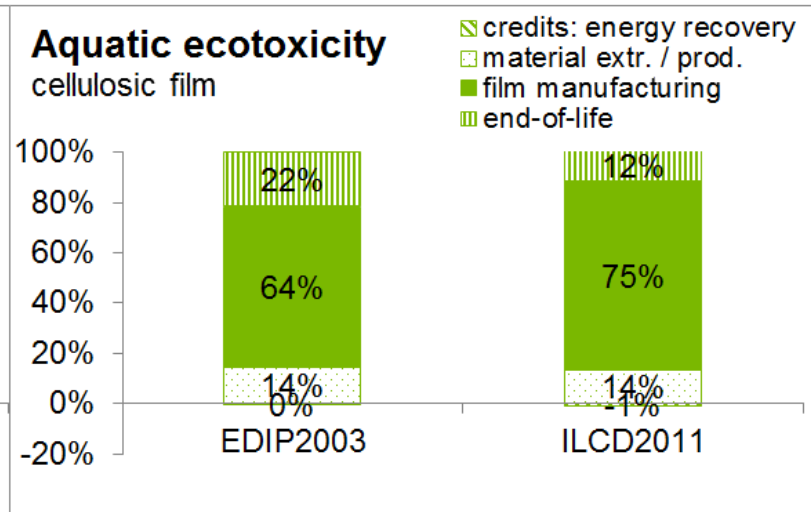
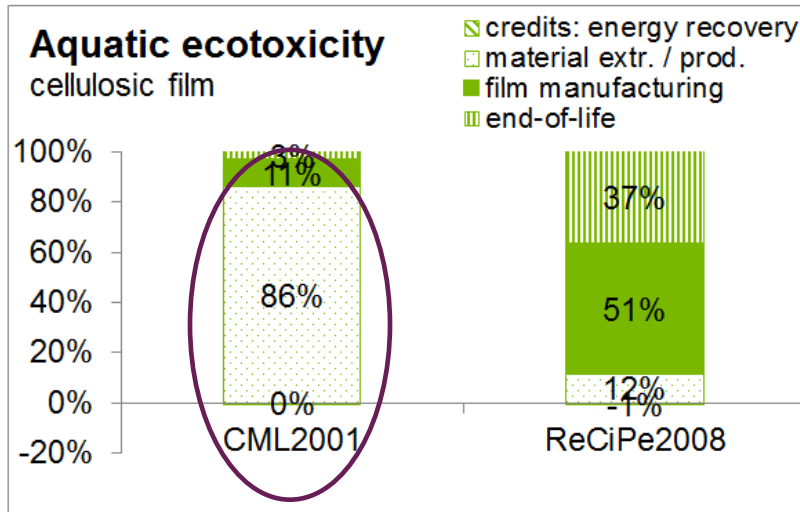
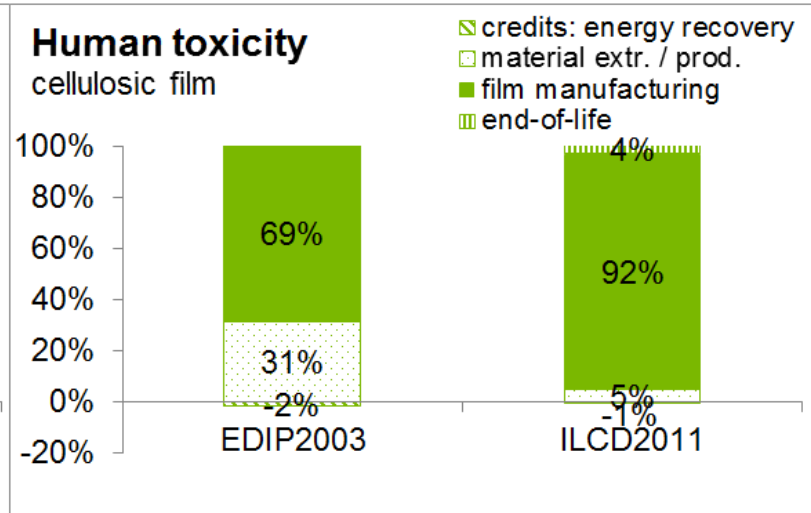
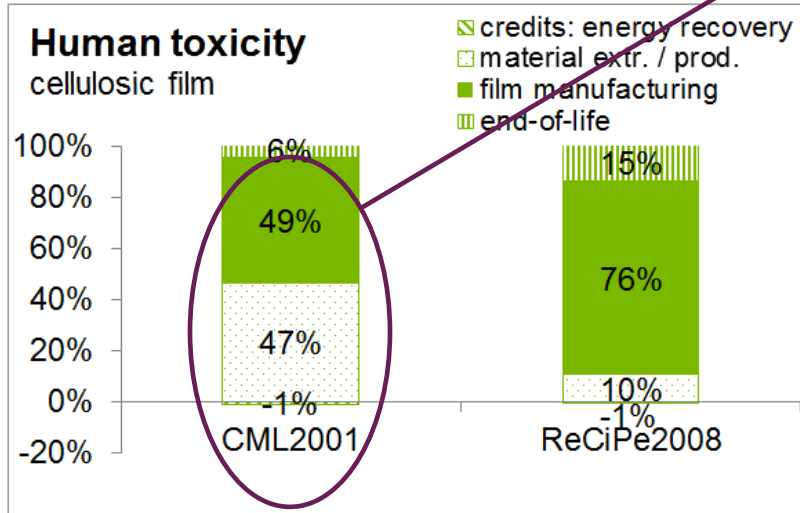
K. Radermacher, U. Jung and M.J. Marzinkowski (2014). Life cycle oriented analysis of laminating films for the printing and packaging industry using a Multi-level approach, *J. Print and Media Technol. Res.* 3(2014)3, Copyright (c)2014 IARIGAI

# CONTRIBUTION ANALYSIS: LEVEL I

*specialities in CML*  
(material extr./prod.)

main contributor:  
film manufacturing

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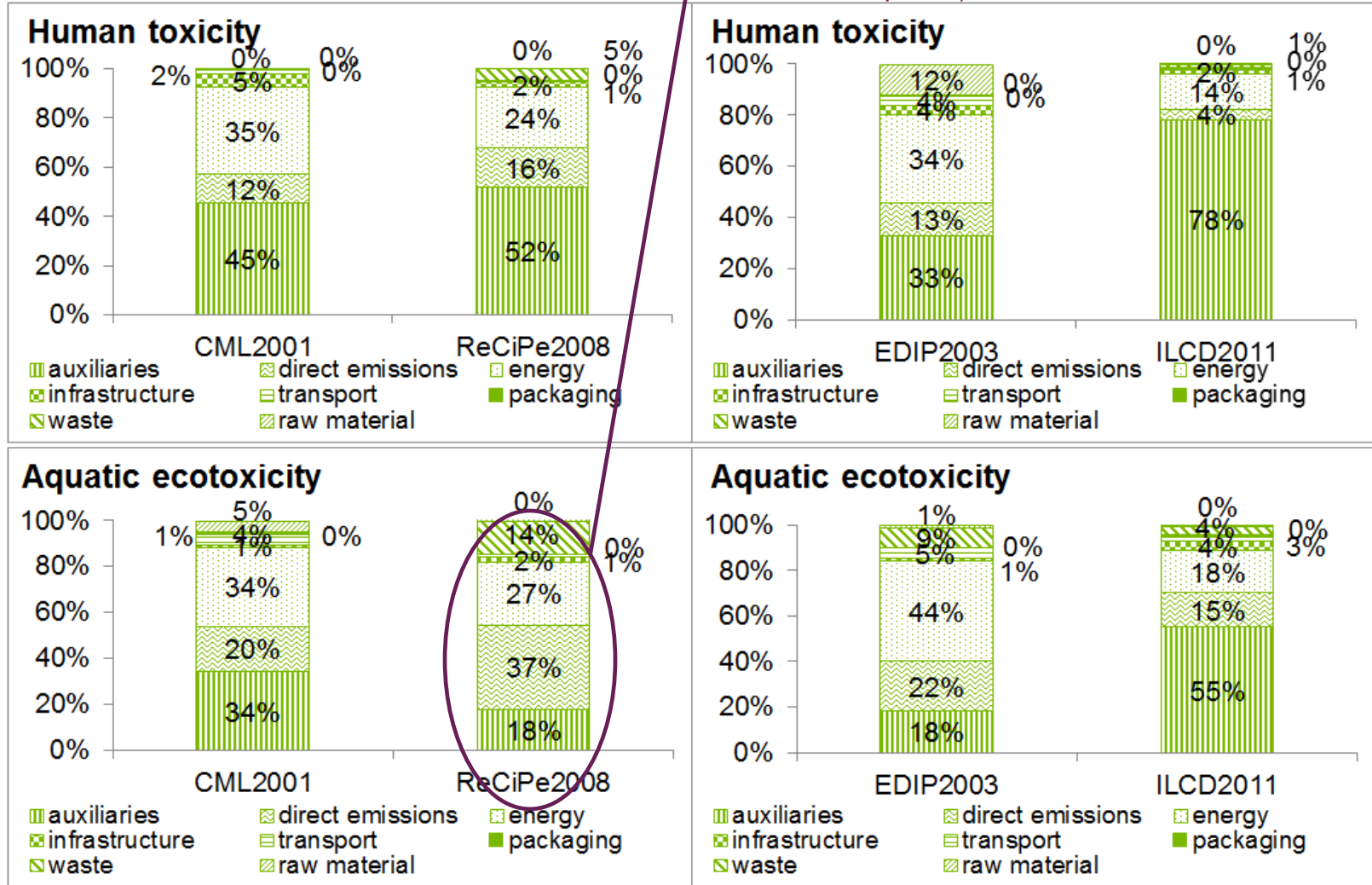




# CONTRIBUTION ANALYSIS: LEVEL II

important:  
energy + auxiliaries

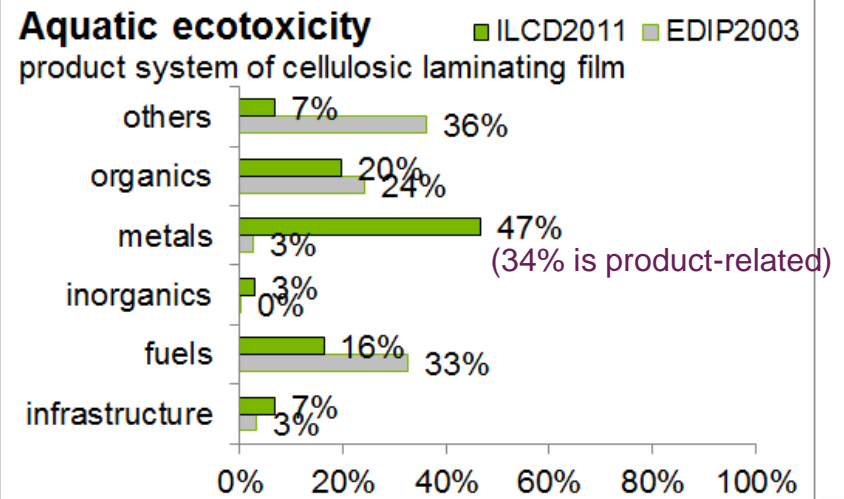
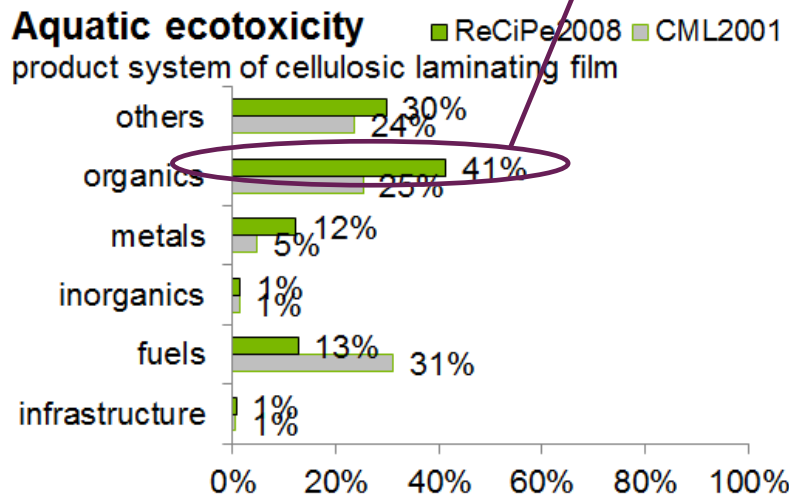
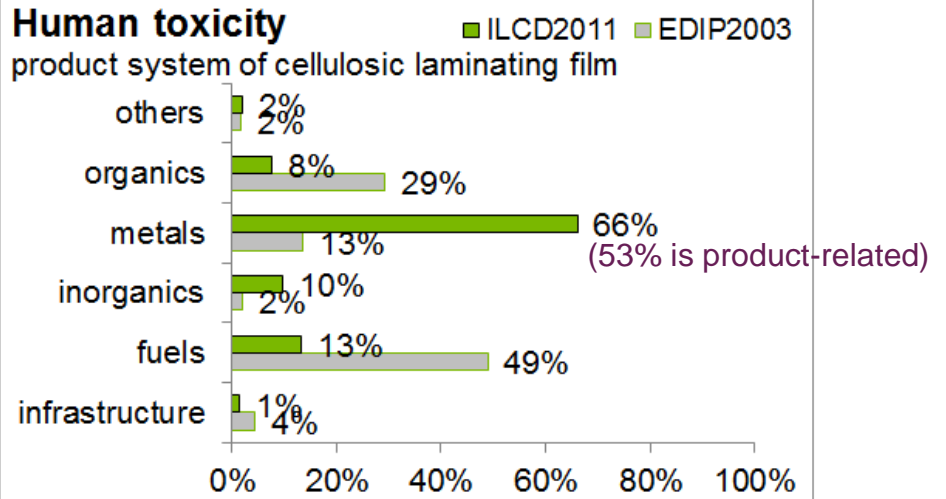
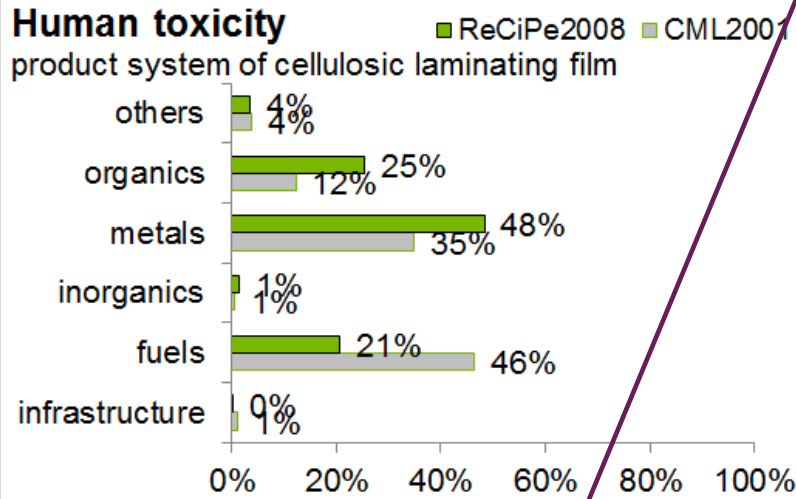
*specialities in ReCiPe*  
(direct emissions from  
the end-of-life phase)



# CONTRIBUTION ANALYSIS: LEVEL III

*specialities in ReCiPe*

(37% is caused by waste treatment)



# CONCLUSIONS

- The clustered priority analysis generates additional information about the LCIA methods and their specialities
- ILCD2011 is also appropriate from a product-related perspective of practitioners
- Metals are highly considered; however, in ILCD2011, they are mainly located in product-related processes
- A special prioritization of supporting processes could not be found

*ILCD2011 seems to be also appropriate from a practitioner's perspective. The results are mainly product-related.*

# THANK YOU FOR YOUR ATTENTION



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