

MIND THE GAP: IMPROVEMENT OF THE LIFE CYCLE INVENTORY FOR EPOXY RESINS

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ECCM22

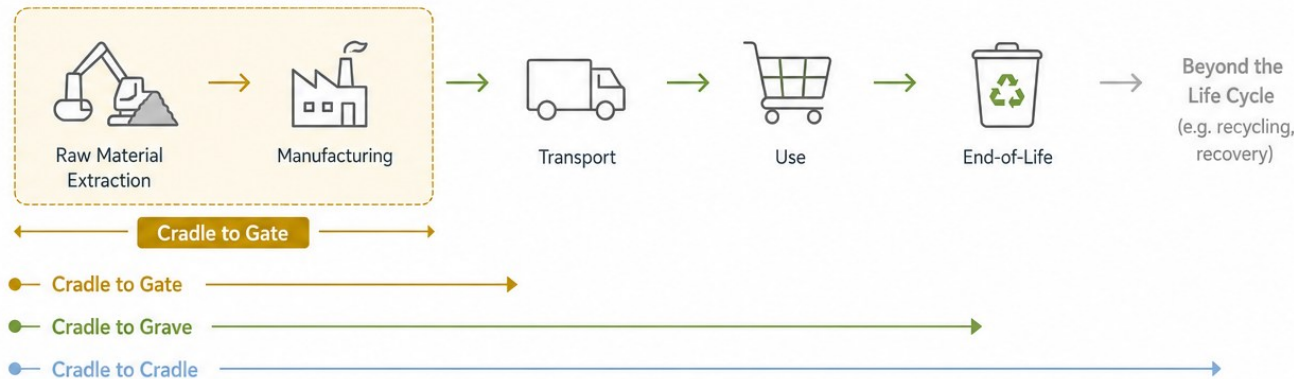
22nd EUROPEAN CONFERENCE ON
COMPOSITE MATERIALS



Key Aspects of Life Cycle Assessment



Life Cycle Stages



Generated with AI

Challenges



Data Availability

- Many fine chemicals are currently missing from databases
- Missing background information



Time Consuming

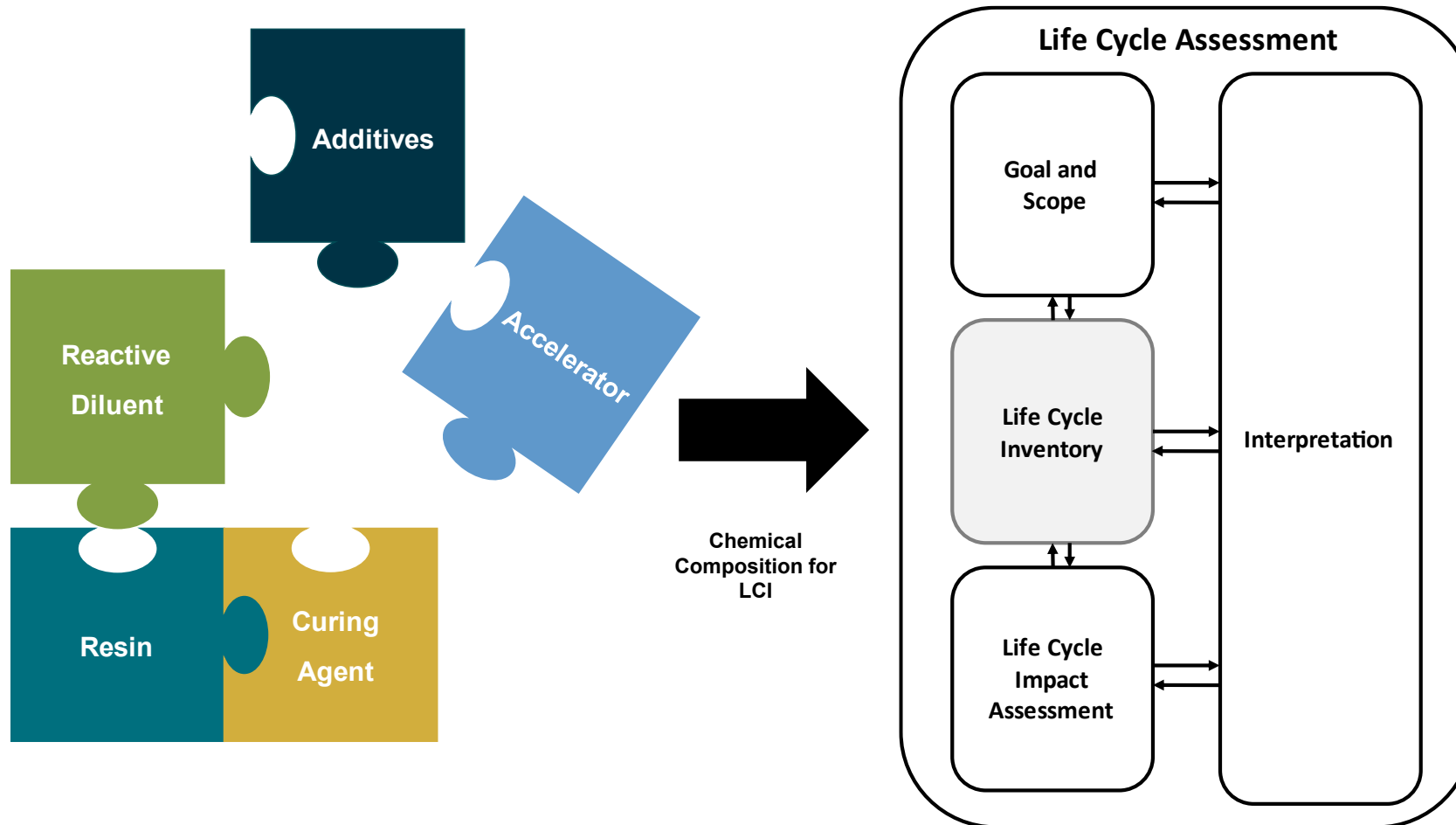
- Extensive research and a high level of detail required
- Expert knowledge needed



Cross-Topic

- Overlap between chemistry, synthetic resins and LCA

Life Cycle Inventory of Epoxy Resins



Status Quo

- Focus on the pure resin
- Exclusion of additives and curing agents
- Use of unsuitable proxy datasets
- Simplifications reduces overall modelling effort
- Not all environmental impacts are taken into account

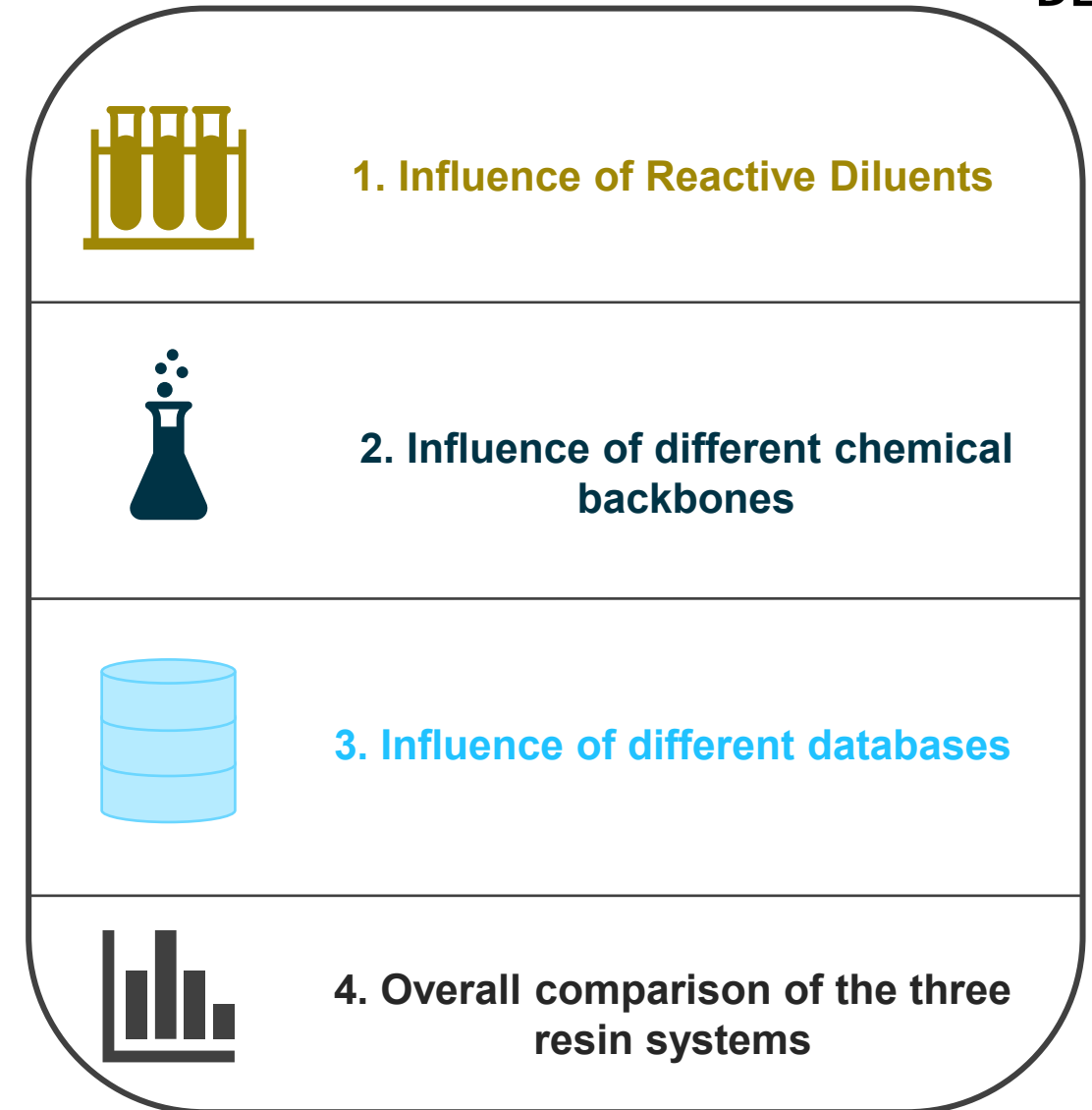
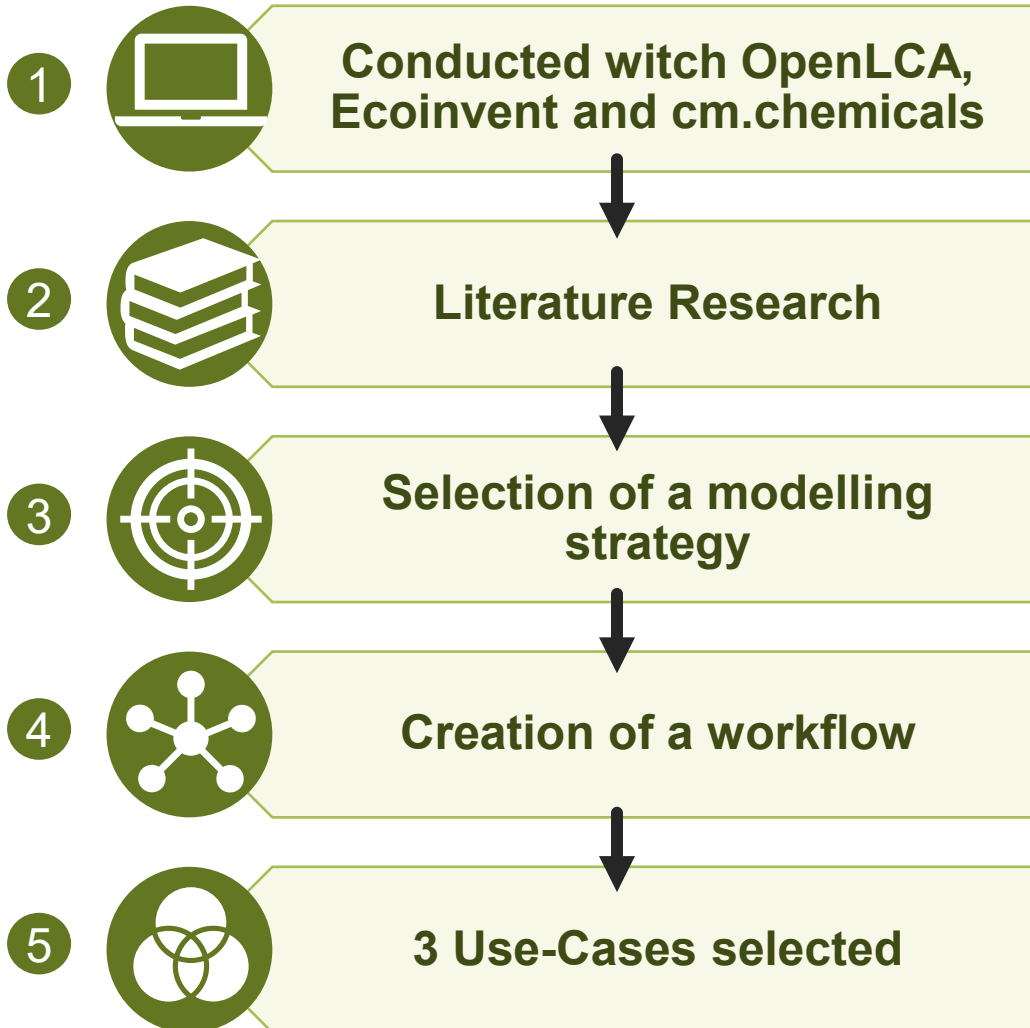
Implications for the end-user

- Lack of standardisation
- Limited comparability
- Different modelling strategies



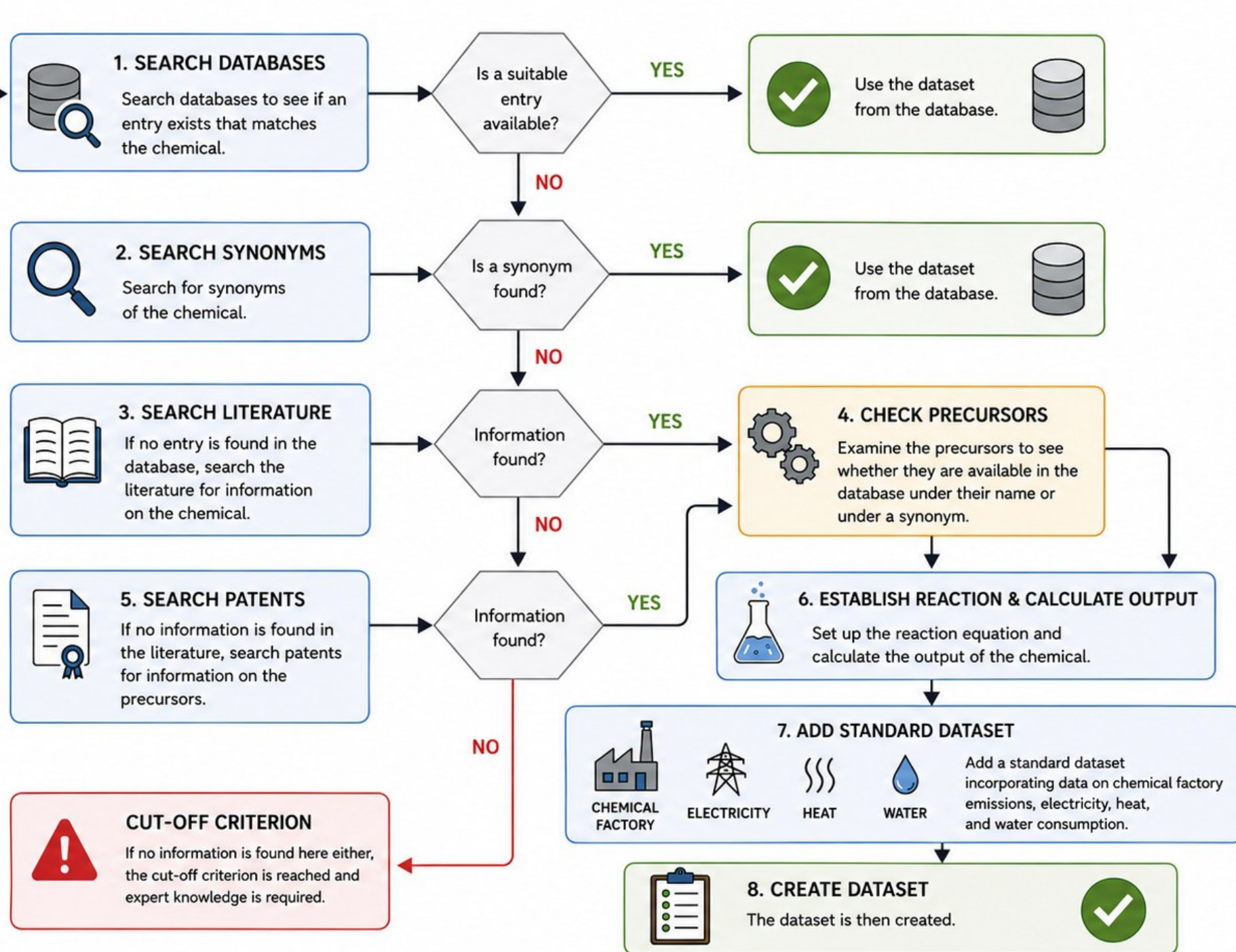
A comprehensive cradle-to-gate analysis can only be conducted by taking all components into account

Materials and Methods





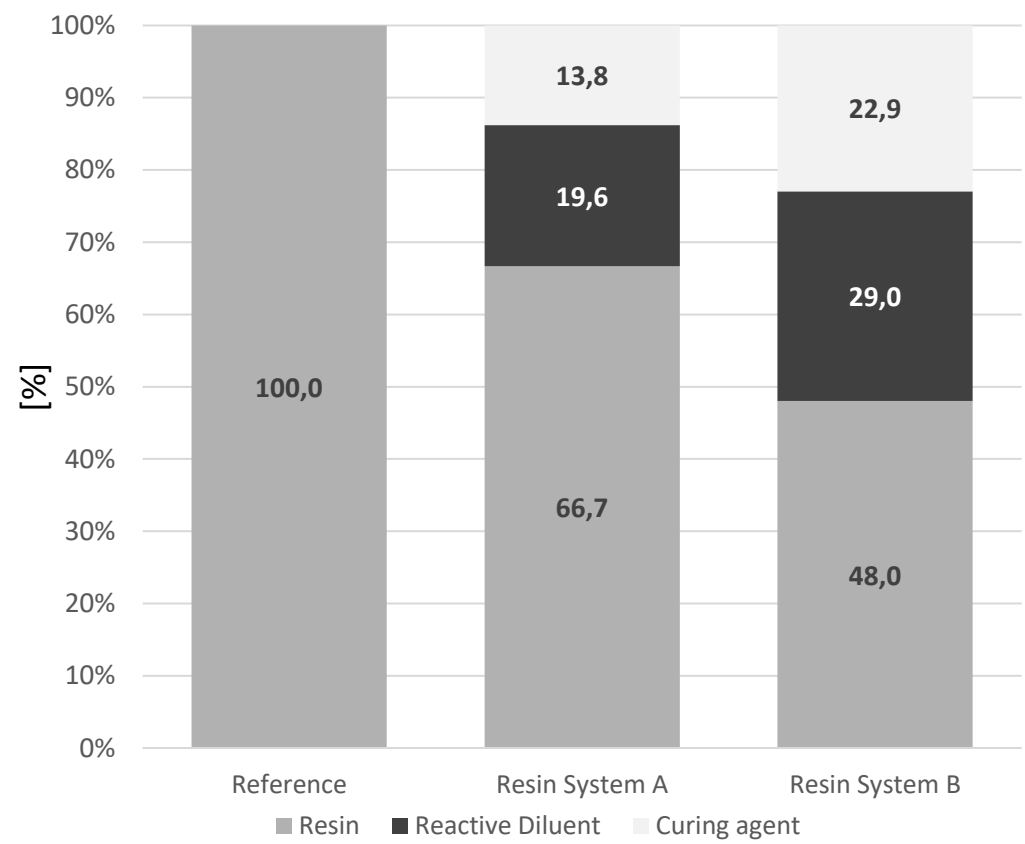
Flowchart redesigned with AI



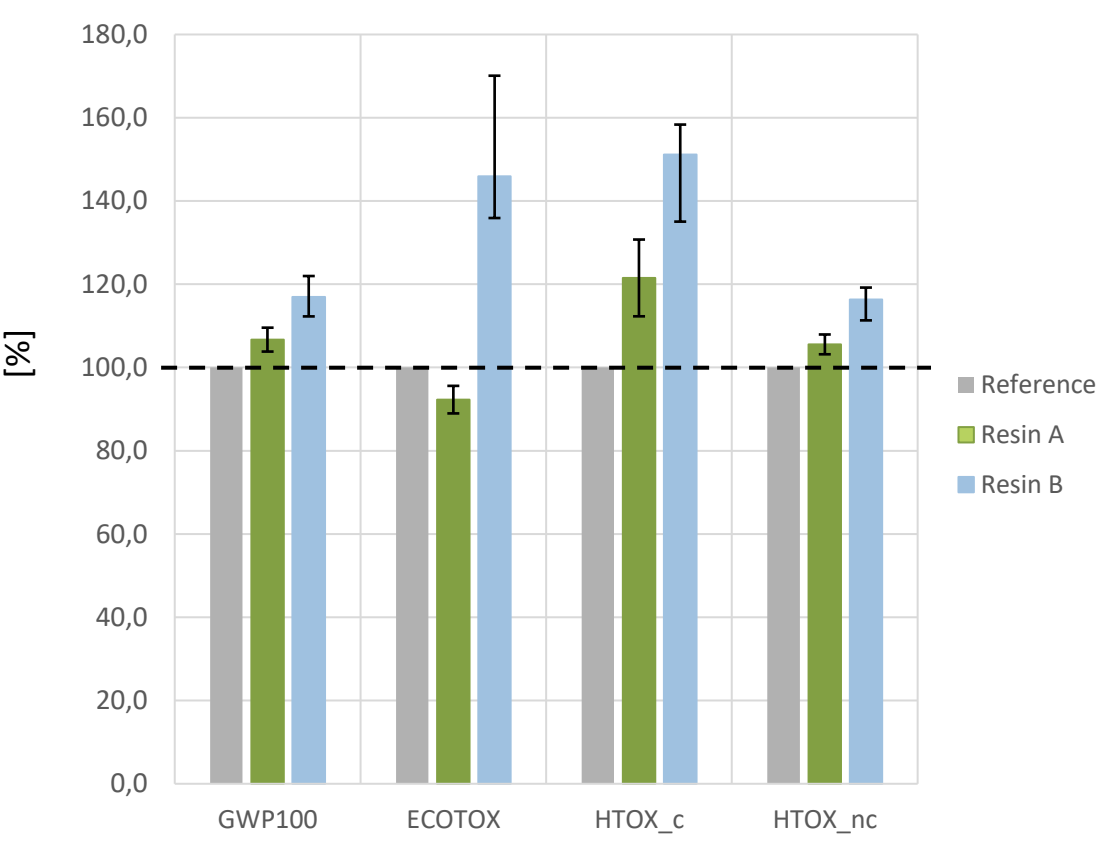
Influence of Reactive Diluents



RELATIVE CONTRIBUTION TO CLIMATE CHANGE

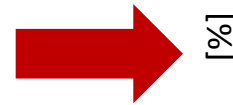
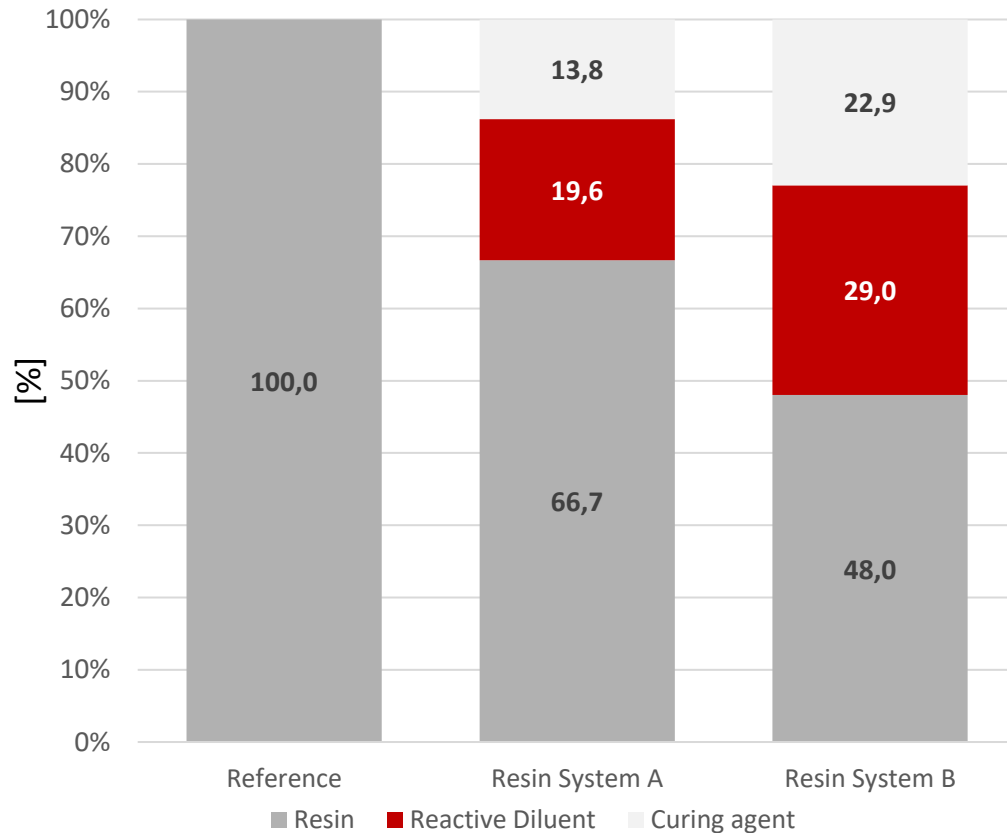


RELATIVE IMPACTS OF DIFFERENT REACTIVE DILUENTS

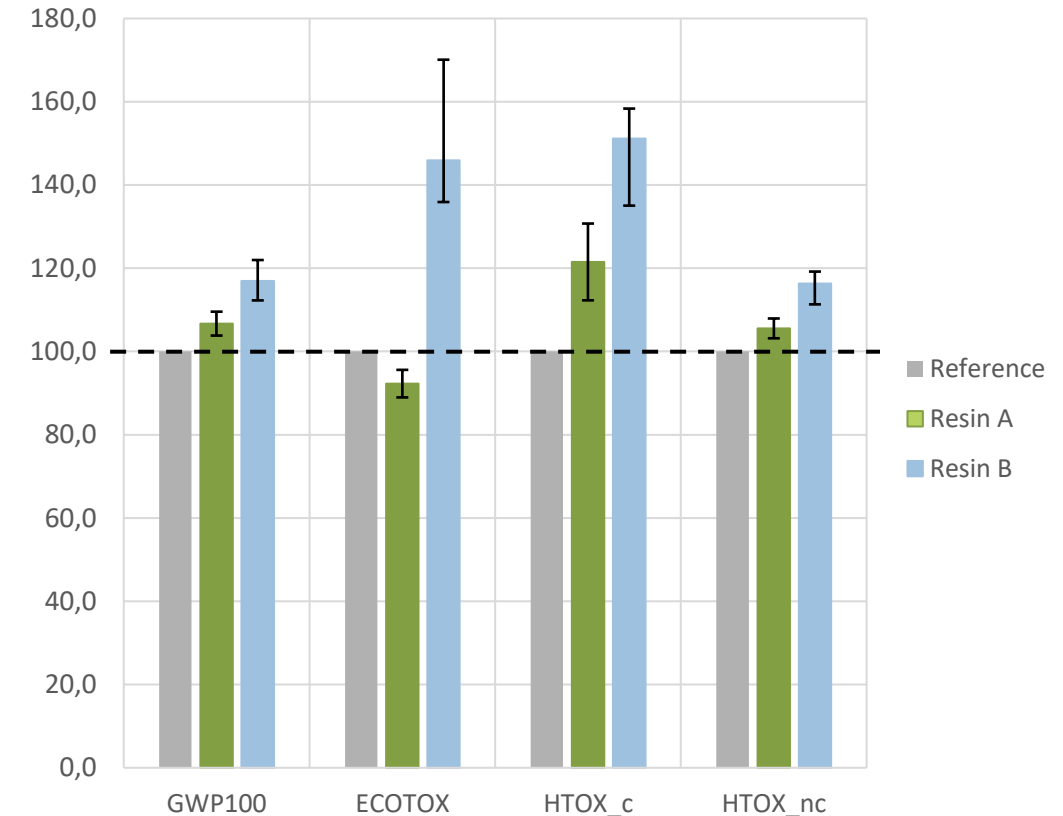


Influence of Reactive Diluents

RELATIVE CONTRIBUTION TO CLIMATE CHANGE

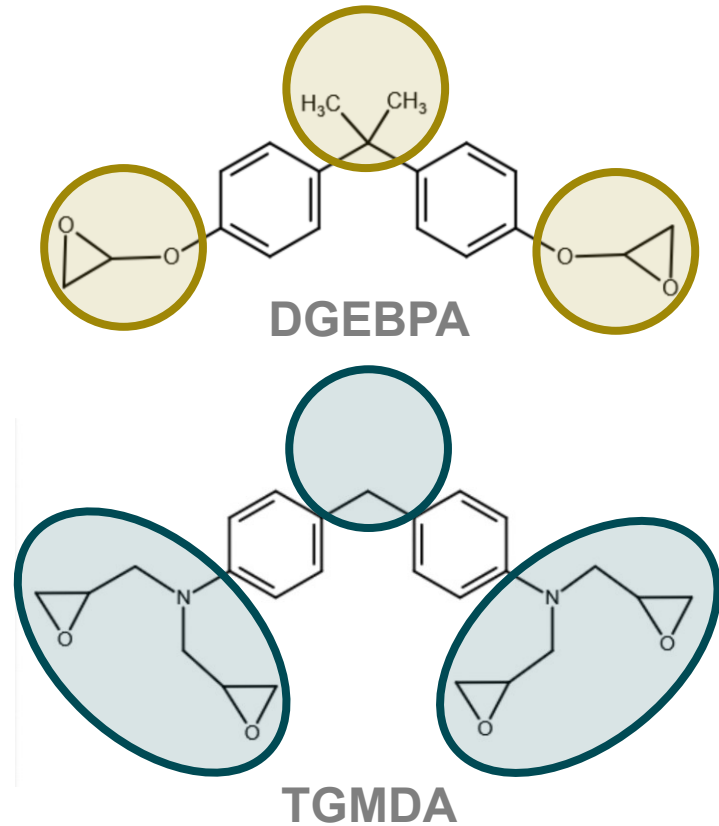


RELATIVE IMPACTS OF DIFFERENT REACTIVE DILUENTS

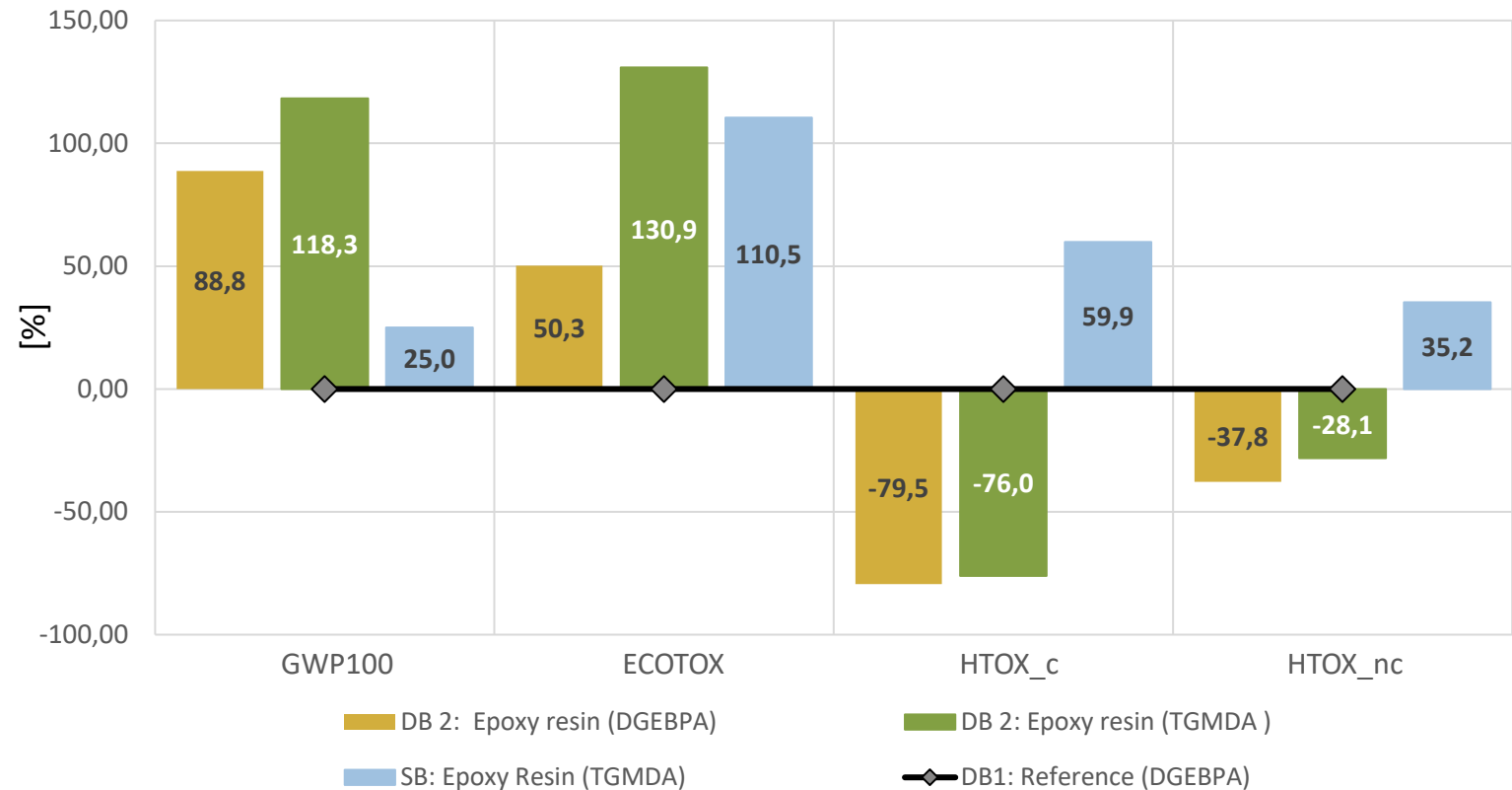


- The contribution to the overall result may be significant for individual impact categories such as climate change
- Differences in concentration can lead to considerable uncertainties

Different chemical backbones and database impacts

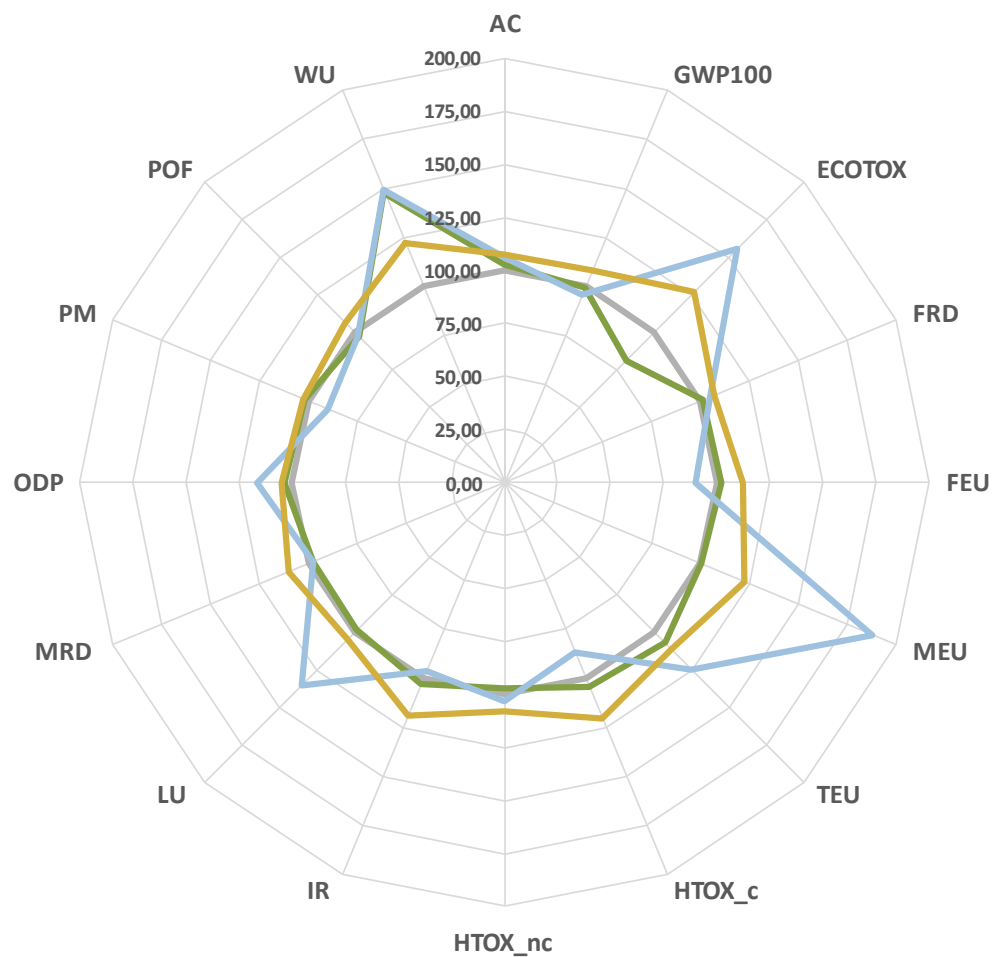


RELATIVE LCIA RESULTS ACROSS DIFFERENT DATABASES AND CHEMICAL STRUCTURES

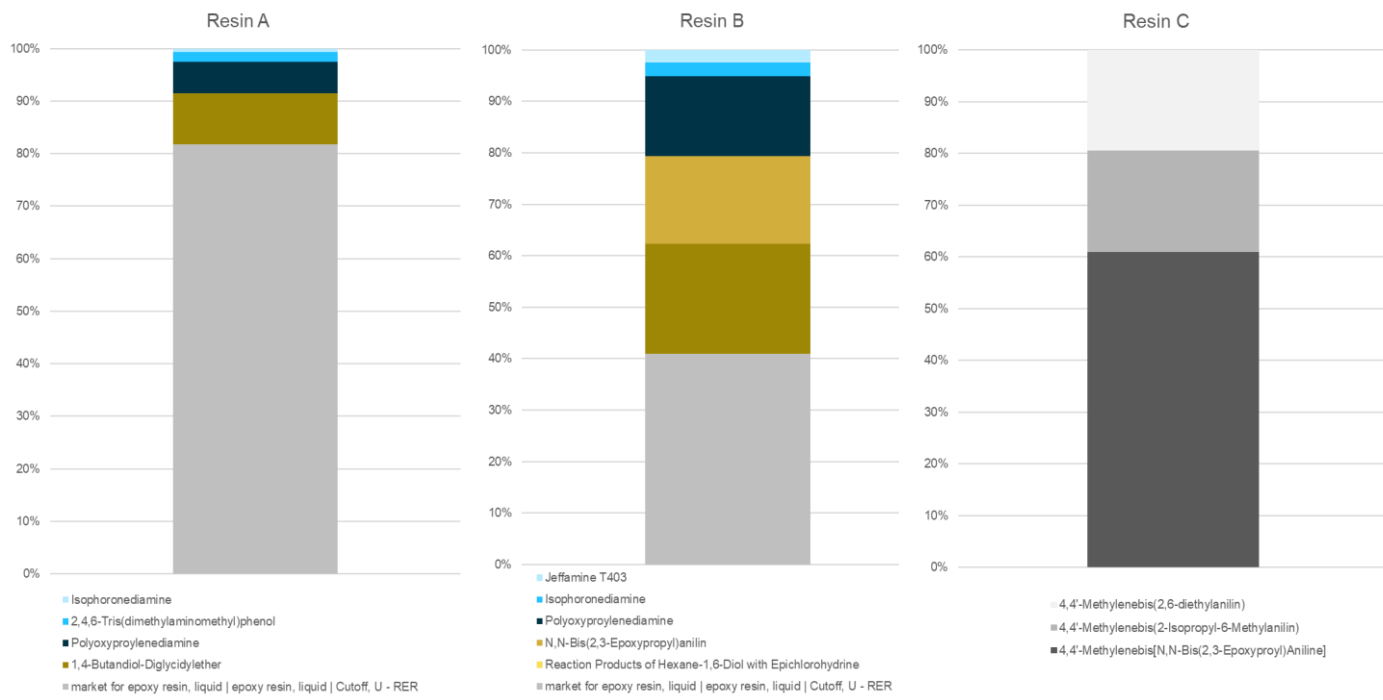


- Different structures cannot be compared directly → Manufacturing processes
- The use of different databases can lead to differing results and limit comparability

Comparison of the resin systems



RELATIVE CONTRIBUTION OF THE COMPONENTS TO ECOTOXICITY, FRESHWATER



Conclusion and Outlook



1. Robust **modelling strategy** helps to generate customized datasets
2. **Generalised Workflows** supports the creating consistent Life Cycle Inventories
3. The use cases examined **highlighted the uncertainties** involved in modelling of epoxy resins
4. Reactive diluents, curing agents and additives can have significant **influence on several impact categories**

1. The 'cradle-to-gate' approach is only one part of the LCA
2. The use phase and recycling are currently given very little consideration
3. Data on impacts in these life cycle phases are still missing

THANK YOU FOR YOUR ATTENTION!

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Get in touch!

