

Reviewing Life Cycle Sustainability Evaluations of Biomass Value Chains: A Swedish Perspective

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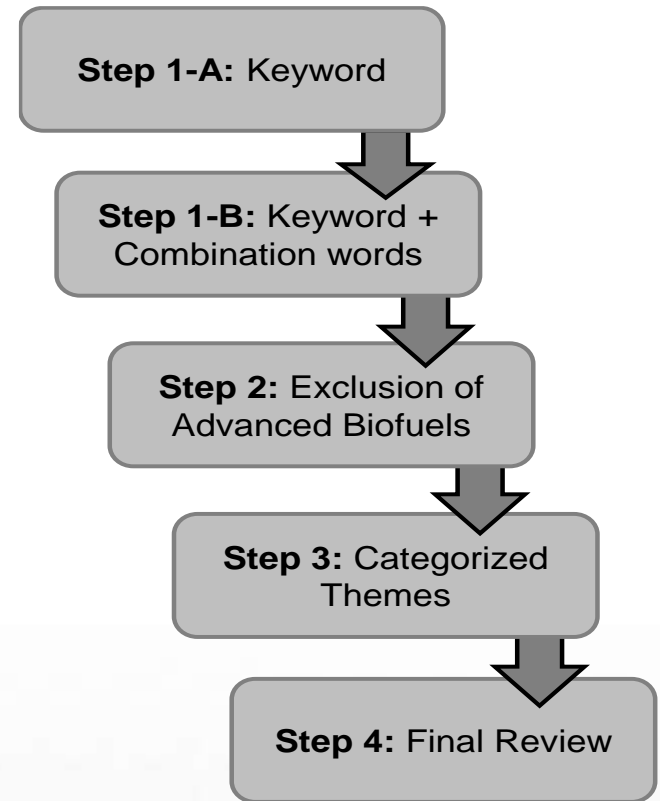
Why?

- Sweden
- Large biomass reserves
- Bio-based economy
 - Economic growth, Jobs, High value products and innovations
- Sustainability of the transition
- **Aim:**
 - Highlight the use of LCSA for bio-based products in the published scientific literature,
 - Contribute to the knowledge, development and increased use of the LCSA framework.



Method

- Systematic Literature review
- 2000-2015
- Life cycle of biomass/bio-based products
- Relevant for Swedish conditions
 - Import and Export
- LCA, LCC, SLCA and LCSA
- Required modifications for aforementioned methods (i.e. LCA, LCC, etc.)
- Selection Criteria/Abstracts

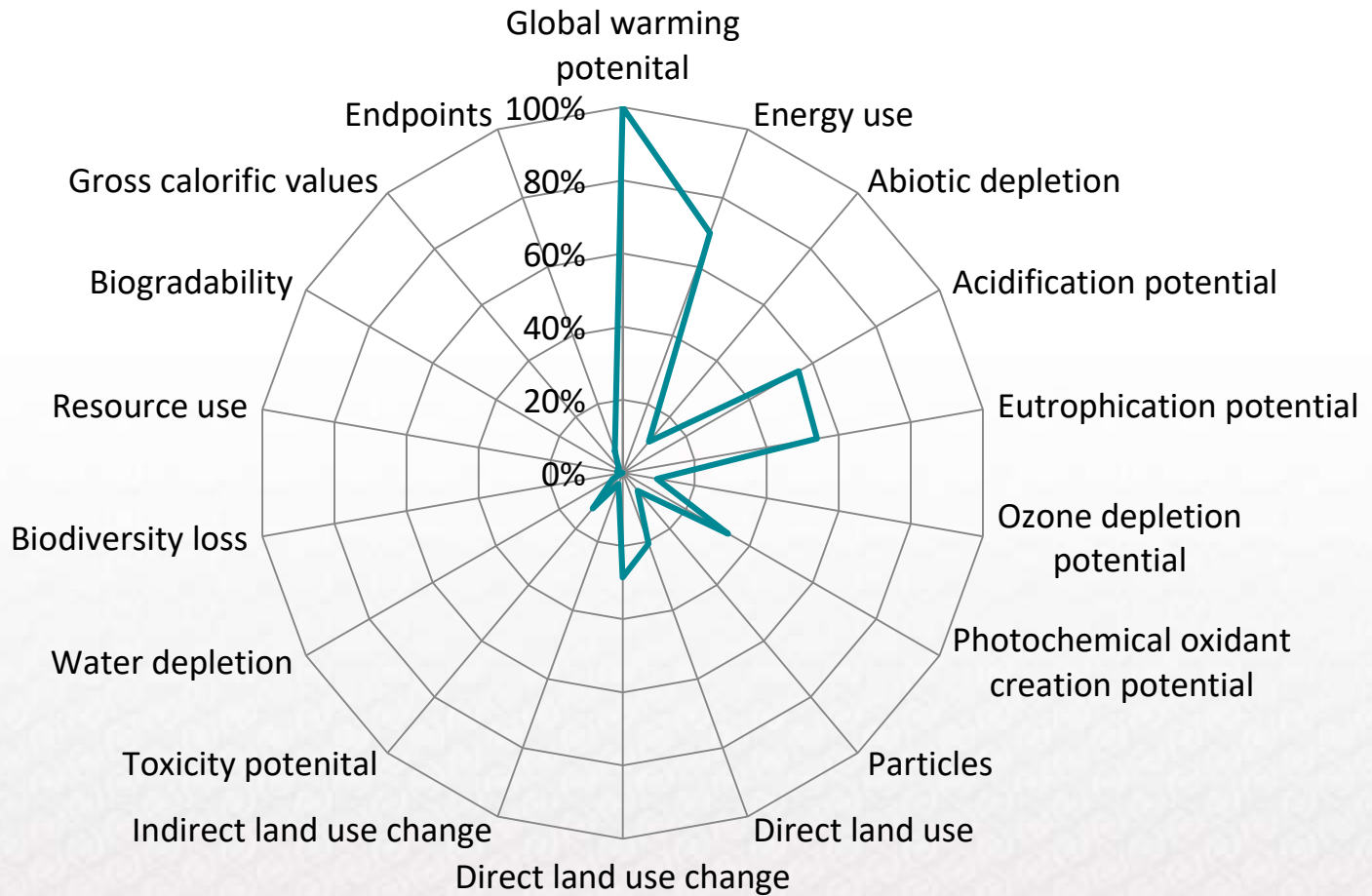


Results

Product type	LCSA	LCA	LCC	SLCA	Total
Energy	2	37	21	7	67
Construction	0	5	3	0	8
Commodity	3	19	5	0	27
Mixed	1	2	2	0	5

- Primarily Energy and Commodities
- LCSA-6 articles (Reviewed 8-29 indicators/aspects)
- LCA-63 articles (Reviewed 2-18 indicators)
- SLCA-7 articles (large number of aspects)
- LCC-30 articles (several monetary indicators)

LCA-Impact Categories Assessed (A sneak peak)

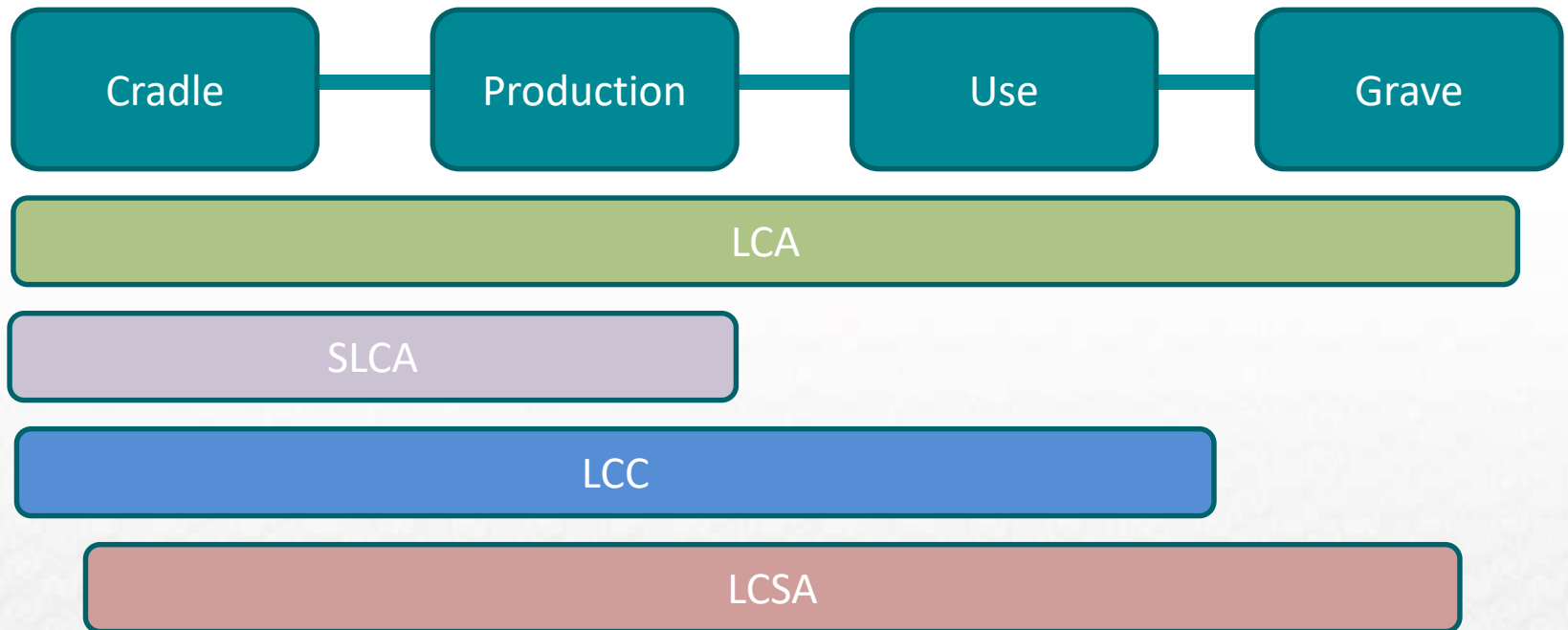


Similar to results of Lazarevic and Martin (2016)

Indicator Selection

- Very few motivations for indicator/aspect selection
- Blend of quantitative and qualitative indicators/aspects
- LCA-CML, RECIPE (most, no motivation)
- SLCA-UNEP-SETAC (most used this)
- LCC-ASTM and other LCC standards
- LCSA (MCD based on abovementioned and even stakeholder involvement)

What did they cover?



- Covering different breadth
- SLCA-Production/Extraction, LCC- Consumer or Producer Perspective

Context/Study dependent

- Issues dissimilar in raw material and production regions
- Sweden vs. Other countries
- Project, Product, Decision?



Choosing Relevant/Appropriate Indicators

➔ Multi-criteria approaches

- Some recommended a large suite of indicators
- Others, 1 single score...

➔ Stakeholder input

- Interviews/Meetings/Questionnaires
- Addresses the context dependency of the system analyzed
- Open Space addressed in our study

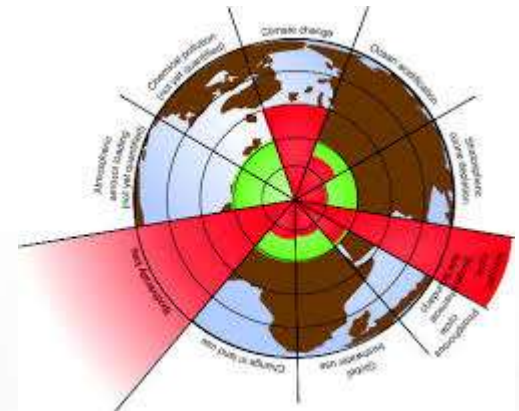
Importance/Relevance of Indicators/Aspects

→ Overall

- SDG
- Planetary Boundaries

→ Regional

- Swedish Environmental Objectives



Conclusions

- More examples/research are needed (**Beyond Energy**)
- Context dependent
- Extend the use of stakeholder involvement in LCSA
- Many challenges yet remain:
 - Combining Quantitative and Qualitative indicators
 - Methodological Development (SLCA and LCSA)
 - Flexibility vs Standardization
 - User friendliness of the methods to allow for application
 - Make use of LCA community and developments

Thank You

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