

Objectives

- **RQ1:** Which life cycle costing (LCC) approaches are used in the context of LCA or circular economy (CE) in construction?
- **RQ2:** Does EoL play a role in LCC?
- **RQ3:** Are policies considered to promote CE?

Method | Materials

- Systematic literature review on “LCC and LCA” and “LCC and CE”, 1999 to 2024
- State of the art/state of research: Conventional (LCC/cLCC), environmental LCC (eLCC) and societal LCC (sLCC)
- Static and dynamic LCC approaches

Quantitative results

- Of 233 records, **60 publications** deal with **construction**
- Only **7 publications** address **explicitly CE**
- **LCC/cLCC is mostly applied**, eLCC and sLCC is of less interest
- Dynamic methods that use **NPV and PC** as **indicators dominate in LCC**

Qualitative results

- **EoL costs/benefits** play a **minor role** in LCC
- **Few studies** show that **CE** (refurbishment, reuse, dismantling and recycling) **pay off in LCC** [1, 2]
- **Policies** that can support the **transition through CE** are **not analyzed in LCC**

Conclusions

- LCC has gained **importance in construction** focusing on **dynamic methods**
- **NPV** is the most popular **indicator**
- Few research shows that **CE can outweigh higher initial costs over lifetime**
- Further **research is needed** to compare **linear economy versus CE in LCC**
- **Policies to compensate higher costs** for CE or to **incentivize CE** need to be investigated

References

- [1] Rajagopalan N, Brancart S, Regel S de, Paduart A, Temmerman N de, Debacker W (2021) Multi-Criteria Decision Analysis Using Life Cycle Assessment and Life Cycle Costing in Circular Building Design: A Case Study for Wall Partitioning Systems in the Circular Retrofit Lab. Sustainability 13 9, 5124. 10.3390/su13095124.
- [2] Wouterszoon Jansen B, van Stijn A, Gruis V, van Bortel G (2020) A circular economy life cycle costing model (CE-LCC) for building components. Resources, Conservation and Recycling 161, 104857.10.1016/j.resconrec.2020.104857.

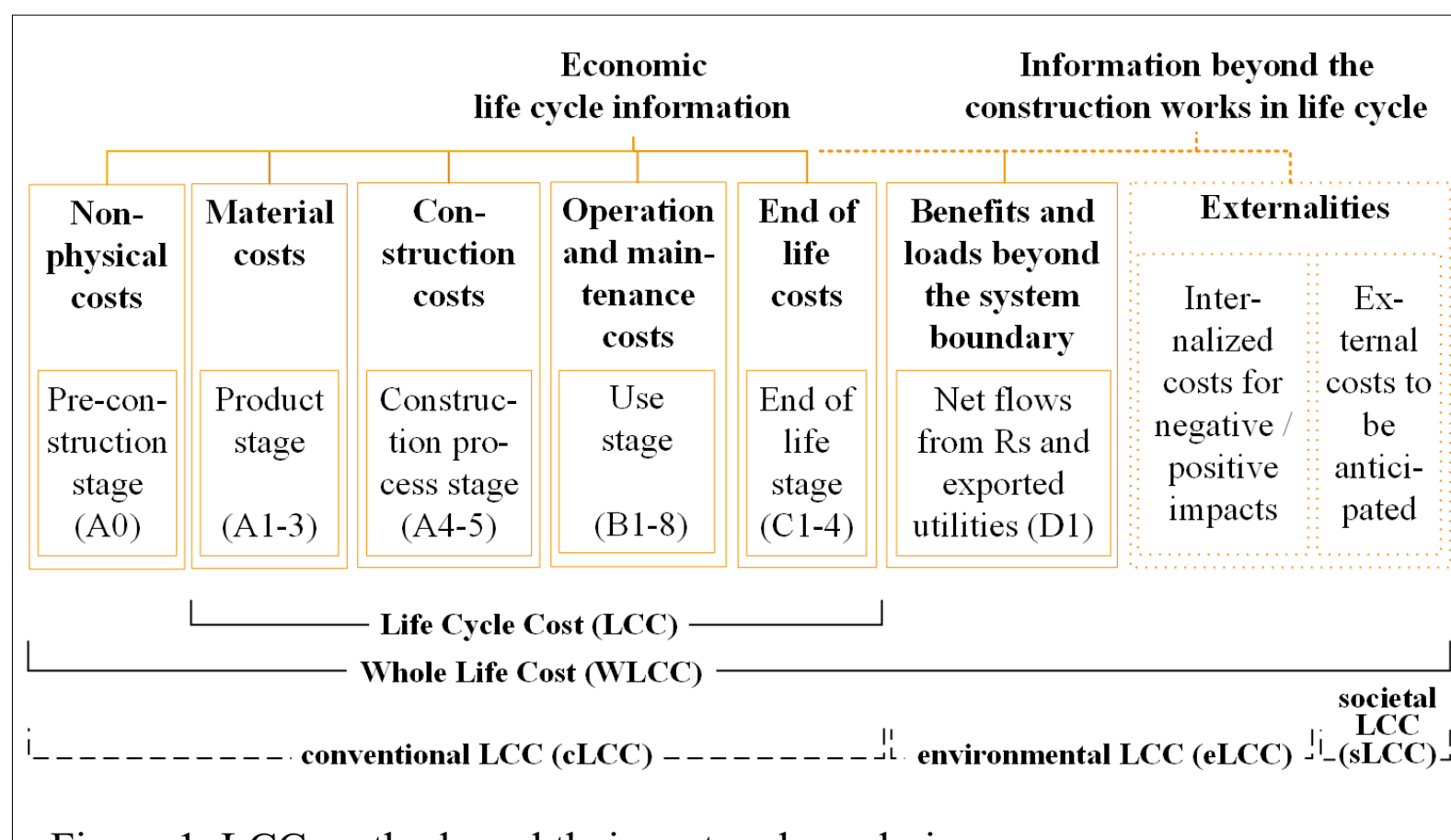


Figure 1. LCC methods and their system boundaries

	Static methods (not discounted)	Dynamic methods (discounted)
Taking into account costs (negative CF) (costs with residual value)	Total undiscounted cost (Net undiscounted cost)	Present cost (Net present cost)
Taking into account costs and revenues (negative and positive CF)	Total undiscounted value (Net undiscounted value)	Net present value (NPV)

CF: cash flow

Table 1. Calculation method and indicator of LCC

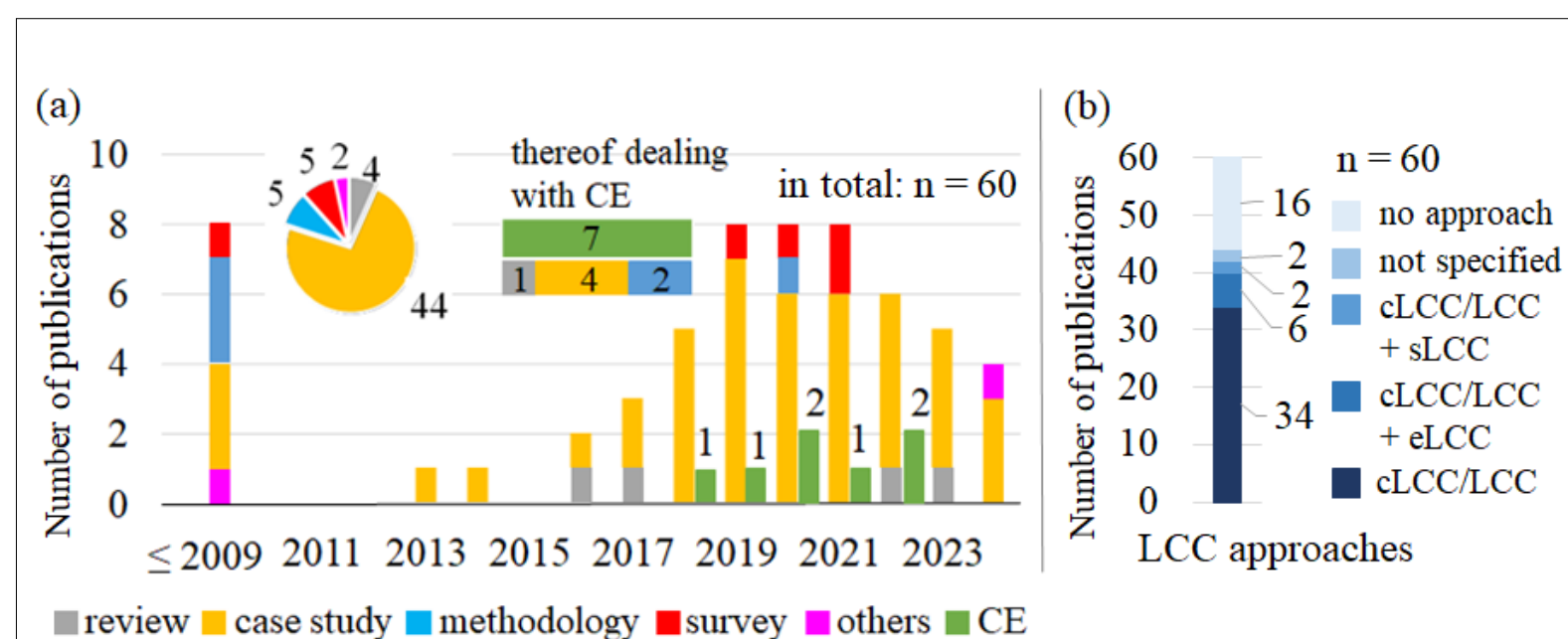


Figure 2. (a) Publications dealing with LCC in construction, (b) LCC approach

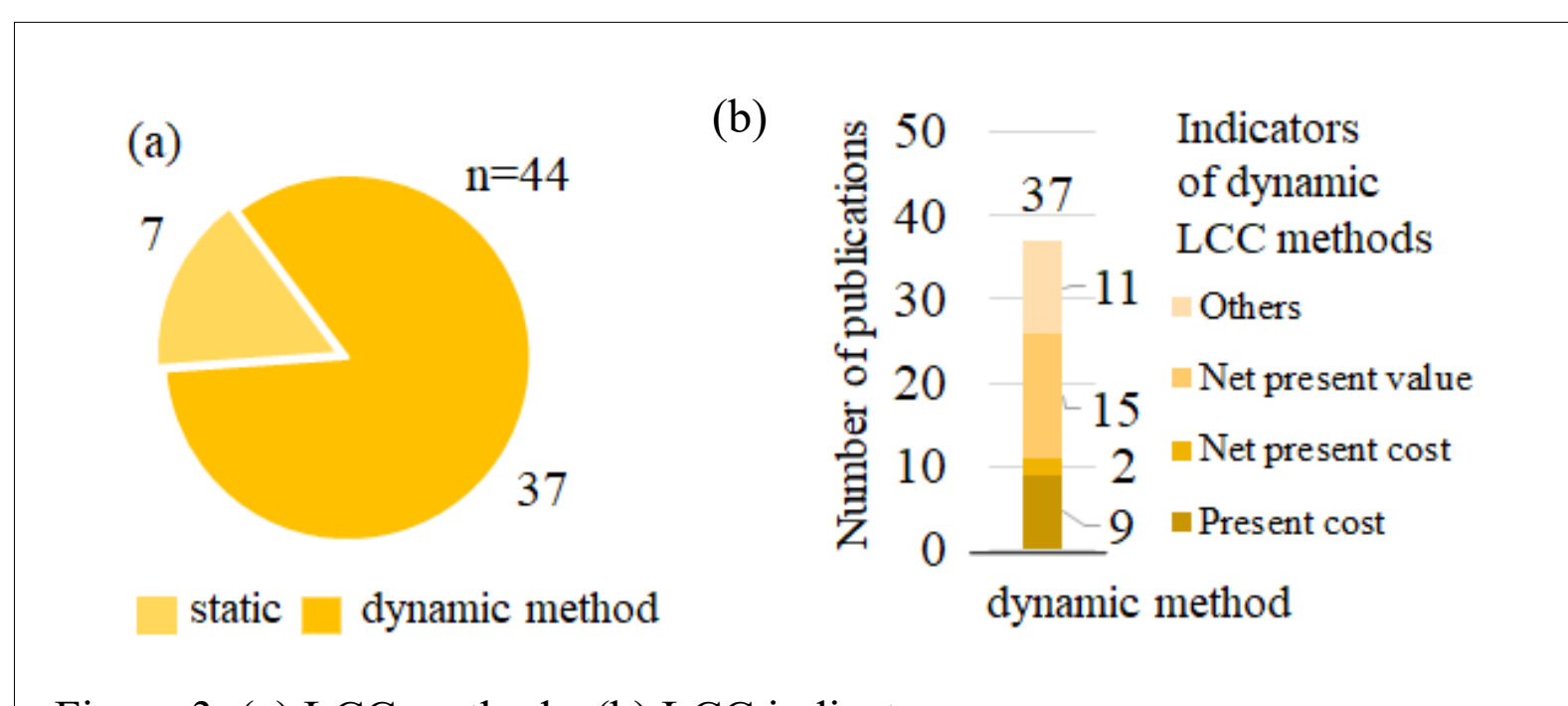


Figure 3. (a) LCC methods, (b) LCC indicators

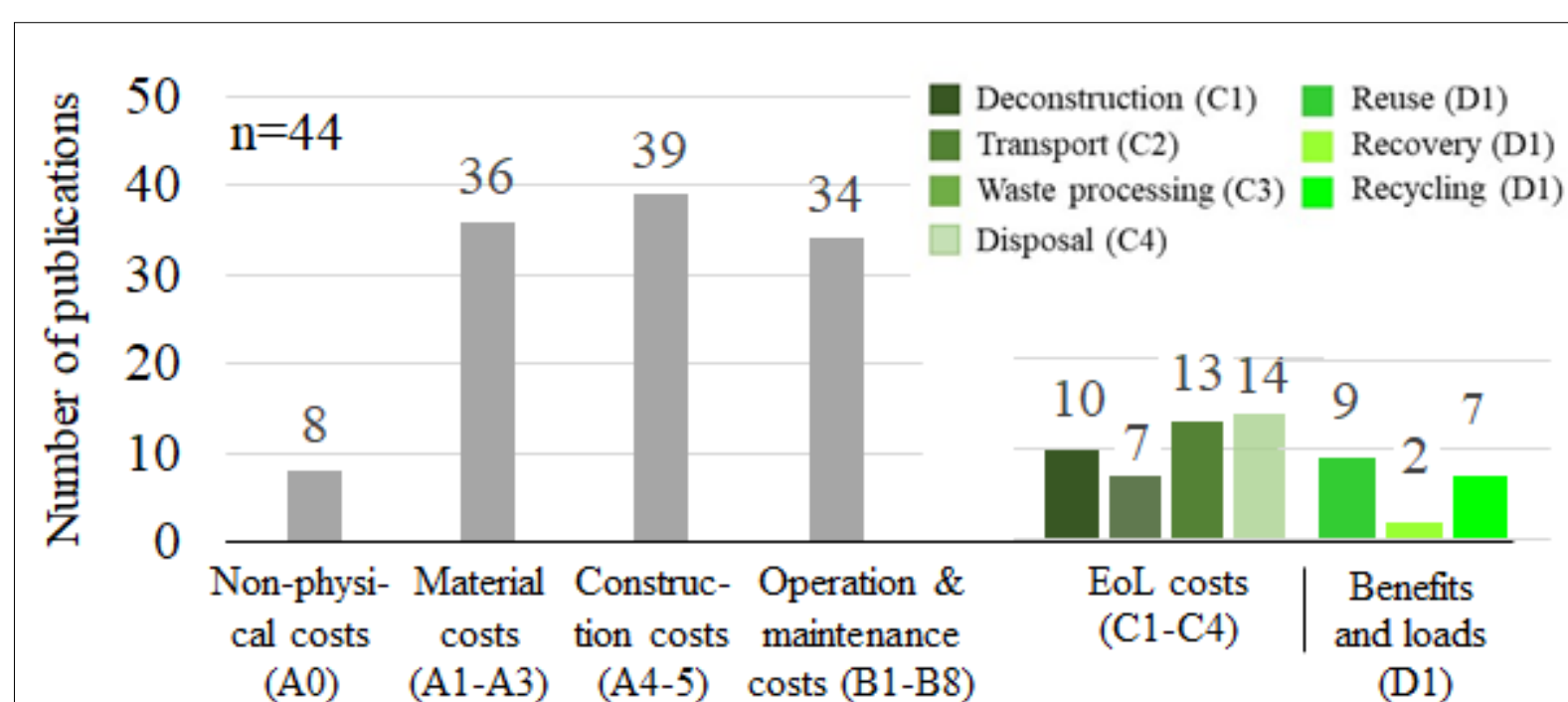


Figure 4. Cost and revenue types over the life cycle stages in case studies according to EN DIN 15643