N°123
June 2025

Newsletter
Life Cycle Assessment

SCORE LCA

Scientific publications

Material Stories: Assessing Sustainability of Digital Fabrication with Bio-Based Materials Through LCA

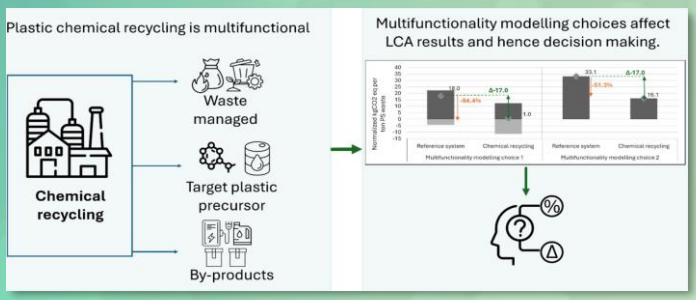
LCA stands as a vital tool in gauging the environmental impacts of building endeavors. Extending LCA to emerging research practices like **advanced digital manufacturing of bio-based materials** becomes pivotal for refining materials, appraising outcomes, and steering architecture toward sustainable development and circularity goals. To outline the **main obstacles** and to provide a **potential methodology**, the chapter presents two cases of application of LCA to **digital fabrication with bio-based materials in experimental research practice.** The application is framed within the ISO and EU standards for LCA and is tested through an ex-post "**cradle to construction**" analysis of two European Research Council (ERC) funded projects developed by the Center for Information Technology in Architecture (CITA) at the Royal Danish Academy.

Specifically, a product LCA is performed for **bio-polymeric composited 3D robotic fabrication** using a novel collagen-based 3D print material, and a comparative LCA is carried out for **Glulam manufacturing optimization connecting data from the timbers source in the forest and sawmill** with its design and fabrication.

In both cases, the prototypes assembly and exhibition are covered by the analysis. The **unavailability of data**, **difficulties in standard protocols adaptation**, and **material and energy flows tracing** in the research process emerge as the main barriers and contribute to aggravate the analysis's uncertainty. The study shows how to manage such uncertainties via **sensitivity analysis** to evaluate design options according to different impact scenarios. The knowledge established and the methodology outlined in this research could be useful for researchers, designers and industry in the **implementation of sustainable digital fabrication processes** and **new construction materials**.

Finally, LCA allows for deeper reflections on sustainability of Digital Fabrication and questions the **upscale** and **replication of experimental manufacturing research projects** in different contexts. If applied at the very early stage of the process, LCA can serve as a design and research decision support system in the laboratory.

How multifunctionality modelling in LCA affects decision-making: the case of chemical recycling of plastic waste



Chemical recycling (CR) holds promise for closing the **plastic loop**, but demonstrating its environmental benefits is crucial for policy and economic support.
LCA assesses environmental sustainability, yet **variations in modelling**, such as **multifunctionality**, **complicate decision-making**.
This study contributes to LCA multifunctionality modelling theory by examining its effects on LCA outcomes. Using two CR plastic waste case studies, **seven modelling approaches** were analysed, varying:

- **functional unit** (product/waste perspective),
- **co-product** multifunctionality (substitution (Sub)/basket of products (BoP)),
- **end-of-life** (EoL) multifunctionality (cut-off/circular footprint formula (CFF)).

Results showed **consistent impact deltas for BoP and Sub** with well-defined boundaries and cut-off EoL when comparing CR's impact with conventional waste management and production systems. However, differences in absolute results and comparative metrics for Sub and BoP highlight the **risk of misinterpretations**.
By demonstrating the influence of modelling choices, this study provides actionable insights for policymakers, industry, and researchers, enhancing informed LCA-based decision-making.

« LCA & CSRD » call for tender attributed to the consortium

BL évolution

RDC environment
Research Development & Consulting Environment

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Upcoming events

SEMINAR : Rethinking design and consumption - The challenge of strong sustainability

In a context where the planet's limits have been largely exceeded, it is becoming essential to rethink our production and consumption models. Today, strong sustainability appears to be a necessity to go beyond the limits of our models, techno-centric approaches and a reflection on our consumption behaviour.

This seminar, organised as part of the **D-TechnoSS project** funded by **ANR** (ANR-20-CE10-0006), aims to **explore the levers of strong sustainability**, by fully integrating the **human and behavioural dimensions of sustainable design**. It will bring together researchers, professionals and the general public to discuss these key issues:

- Has the consumer changed? Can they **adapt to new challenges**? Is sustainable consumption an oxymoron?
- How can designers and/or engineers come up with g?
- Can we effectively integrate **user behaviour into sustainable design** to ensure real systemic change?

Program:

I. A round table **combining academic and field expertise** with Philippe MOATI ([Professor of Economics, Université Paris Cité, co-founder of Obsoco, Flore VALLET (User-centred design, eco-design and sustainability, Université de Technologie de Compiègne), Alexandre ZENON (neurosciences, sustainability Bordeaux Neurocampus, co-founder Oasis du coq à l'âme] and Mathilde POUSSEO (Social and Solidarity Economy, "Ethique sur l'Étiquette" Collective)

II. **Methodological workshop to explore new approaches to sustainability** by Melissa ESCOBAR (Design for strong sustainability), Ulysse GIRARD (Low-Tech Ingenuity), Nicole Sofia ROHSIG LOPEZ (Circular economic models) and Alexandre HUBERT (Stories for sustainable transformation)

III. Collaborative "fishbowl" **debate to open up new perspectives** ➡ Register for free and share!

📅 **Tuesday 8 July 2025 | 🕘 9am - 5pm at Université Paris Nanterre**

Program of SCORE LCA session at MCV2025 : The benefits of collaborative research in environmental analysis

1. Joint application of life cycle assessment and **criticality** assessment (WeLoop/CyVism/BRGM)
2. Life cycle thinking and **mineral resources** at BRGM: 30 years of collaborative research and prospects for the future (BRGM)
3. The **dynamic** dimension in Life Cycle Assessment (RDC Environment)
4. Developing and **monitoring socio-environmental indicators** for the INOV.AM Consortium: a baseline approach. (*PIEP, CENTIMFE, CDRSP/ESTG)*
5. **InterScore** collaborative approach for robust, transparent and comparable scoring (*Escp business school ; i4pat ; Ecoefflab)*
6. Combining LCA and social assessment to guide and validate **functionality and cooperation economy** strategies (*Gingko 21, ESSEC, ADEME)*

MCV

Final deadline for early-bird registrations: **register before 31 july!**

📣 ***Full program available here.***

8 July	9-12 sept	30 sept - 2Oct	18-19 Nov 2025	19 March 2026
Seminar, (University Paris Nanterre)	**LCM 2025 (Palermo, Italia)**	**From less bad to good enough (Helsingor, Denmark)**	**Second edition of MCV (Bordeaux)**	**SCORE LA seminar (PARIS)**