RESEARCH GROUP

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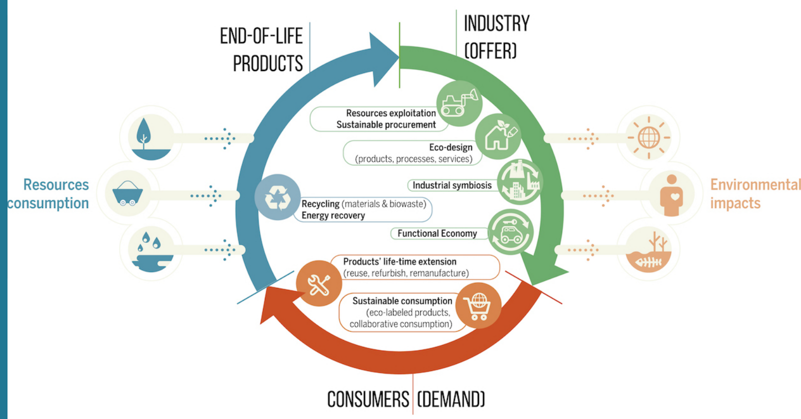
Life Cycle Sustainability Analysis



The Life Cycle Sustainability Analysis group focuses on the development of science-based indicators and tools to assess holistically the sustainability performance of products, technologies and policies to respond to the needs of industry and policy makers. Historically research has focused mainly on environmental sustainability metrics, however our group is currently enlarging its scope of activities to social and economic sustainability assessment.
Quantitative sustainability assessment requires a highly transversal and interdisciplinary research focus, including stakeholders' participatory techniques. The distinctive approach of our group, and its main research strength, lies in the integration of new knowledge with computational sustainability models, driven by the users' needs.

MAIN EXPERTISE FIELDS

Environmental Life Cycle Assessment (LCA) is our core expertise. Depending on the decision-making context, different LCA approaches are developed: attributional, consequential, input-output, or hybrid.
To enlarge the scope to Life Cycle Sustainability Analysis, further expertise is mobilised in:

- Circular Economy best practices (e.g. eco-design, industrial symbiosis, remanufacturing, recycling)
- Eco-system services valuation
- (Dynamic) Material Flow Analysis (MFA)
- Agent-Based Modelling (ABM)
- Social LCA
- Life-Cycle Costing (LCC)
- Sustainable Finance
- Mathematical and resource optimisation methods
- System dynamics and process modelling

Our group includes experienced software developers and principal investigators with strong programming skills (in Python and Java among other programming language), fostering the development of customised software tools.

Research challenges

- Environmental and social metrics for sustainable finance
- Integrated multi-scale assessment of ecosystem services
- Prospective LCA of technologies and policies
- IoT enabled life cycle assessment
- Integration of well-being into sustainability assessment
- Material and energy valorisation in Circular Economy

Application areas

- Manufacturing industry
- Process industry
- Mobility
- Urban and land planning
- Supply chains and logistics
- Buildings and construction

Main assets

- Assess future scenarios of H2 fueled mobility (HERMES)
- Lifecycle-based metrics for sustainable finance (REFUND)
- Assess circular economy business models in the floor covering sector (FLOREC)
- Assess technologies to promote circularity of industrial wastewater (SPOTVIEW)
- Decision-making regarding buildings refurbishment at urban scale for energy efficiency (DAEDALUS)
- Generate optimal waste heat recovery solutions within complex systems (OptiHEAT
- Tools for ecosystem services valuation in forest management scenarios (MULTISILVA)
- Assessing nature-based solutions for renaturing cities (NATURE4CITIES)
- Provide accurate and realistic LCA results considering dynamic inventories (DyPLCA)

SELECTED PUBLICATIONS

- Nexus between nature-based solutions, ecosystem services and urban challenges. Babí Almenar J, Elliot T, Rugani B., Bodénan P., Navarrete Gutierrez T., Sonnemann G., Geneletti D., 2021. Land Use Policy, 100, 104898
- Shades of green: Life cycle assessment of renewable energy projects financed through green bonds. Gibon T, Popescu I.S., Hitaj C., Petucco C., Benetto E., 2020. Environ. Res. Lett., 15 (10), 104045.
- A spatio-temporal life cycle assessment framework for building renovation scenarios at the urban scale. Mastrucci, A., Marvuglia, A., Benetto, E. and Leopold, U., 2020. Renewable and Sustainable Energy Reviews, 126, article 109834.
- A tool to operationalize dynamic LCA, including time differentiation on the complete background database. Pigné, Y., Gutiérrez, T.N., Gibon, T., Schaubroeck, T., Popovici, E., Shimako, A.H., Benetto, E., Tiruta-Barna, L., 2020. Int J LCA, 25(2), pp. 267-279
- Life cycle assessment of plasma-assisted ethylene production from rich-in-methane gas streams. Delikonstantis, E., Igos, E., Augustinus, M., Benetto, E. and Stefanidis, G.D., 2020. Sustainable Energy & Fuels, 4, 1351-1362.
- When to replace a product to decrease environmental impact?- a consequential LCA framework and case study on car replacement. Schaubroeck, S., Schaubroeck, T., Baustert, P., Gibon, T., Benetto, E., 2020. International Journal of Life Cycle Assessment, 25, 1500–1521.
- Evaluate impact also per stakeholder in sustainability assessment, especially for financial analysis of circular economy initiatives. Schaubroeck, T., Petucco, C., Benetto, E., 2019. Resources, Conservation and Recycling, 150,104411

Partenaires

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