Space capacity allocation for the sustainability of space activities Workshop
Politecnico di Milano, 3-5 June 2026

Towards integrated ecodesign of space launch systems: A digital LCA tool for early-stage decision-making

Enrique Moliner – ARRIBES ENLIGHTENMENT

emoliner@arrib.es

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POLITECNICO MILANO 1863 | COMPASS | DEPARTMENT OF AEROSPACE SCIENCE AND TECHNOLOGY

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ARRIBES in a nutshell

We **empower space companies** to adopt breakthrough digital technologies, reduce project complexity, and align their operations for sustainable growth

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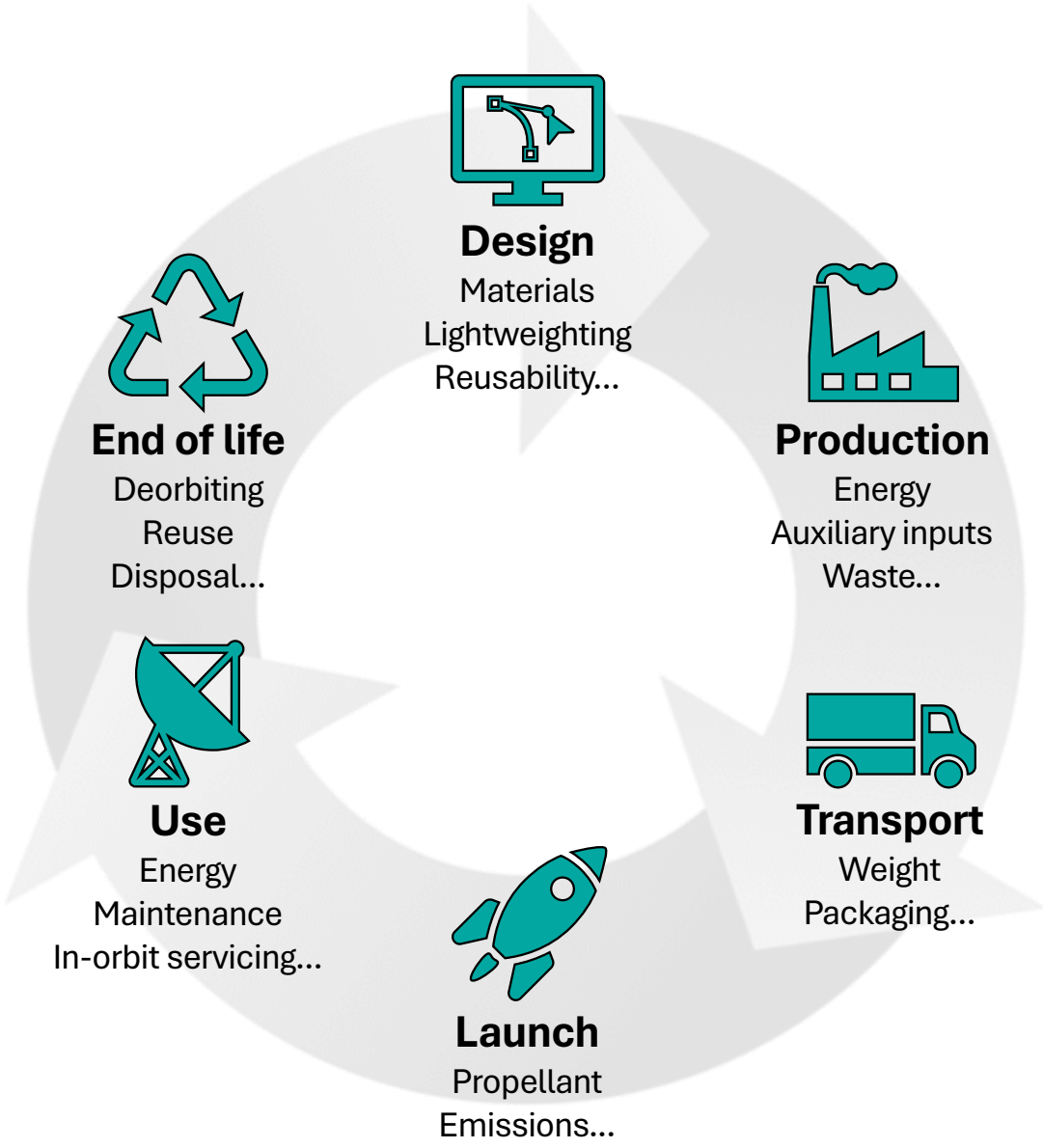
Our digital LCA tool

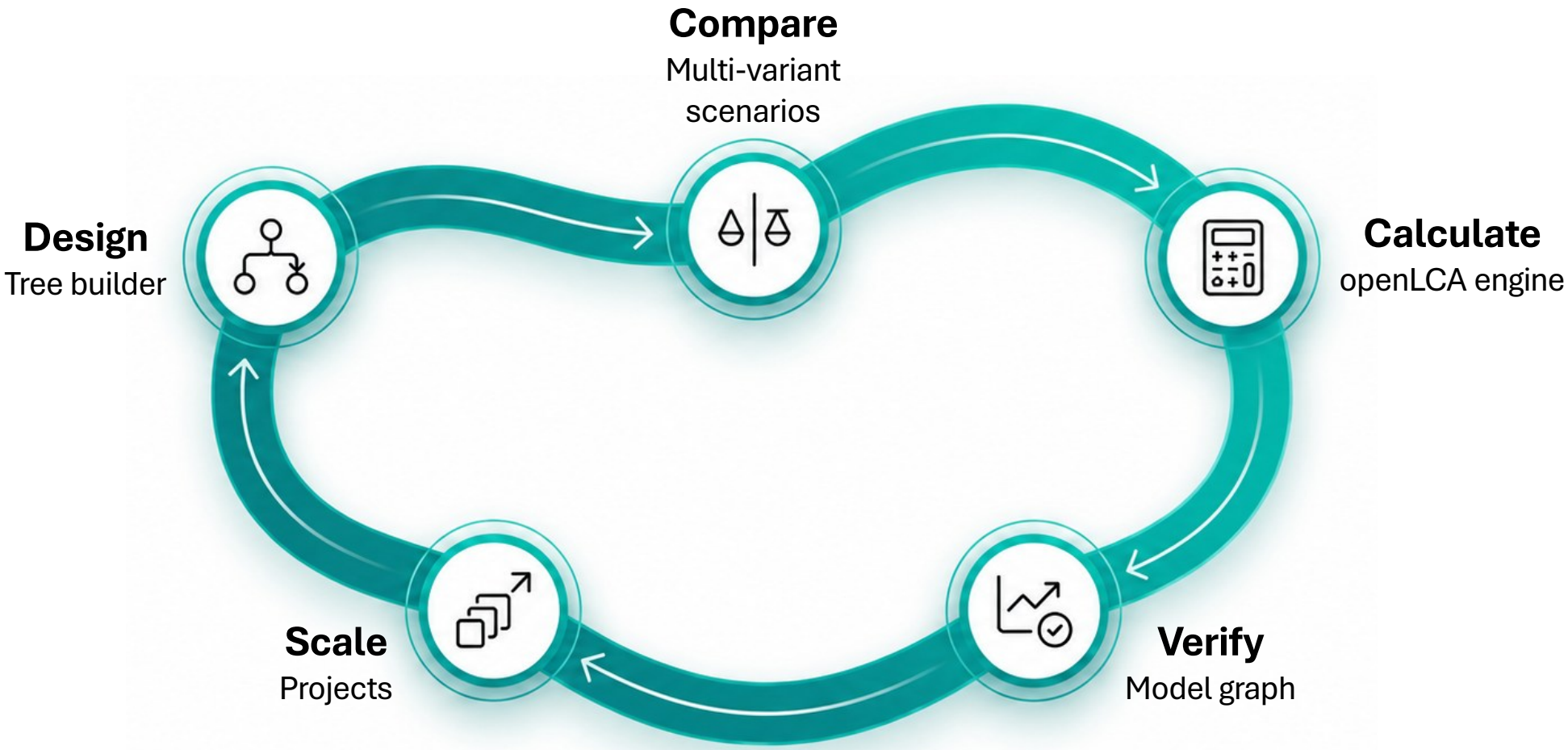
Aimed to **evaluate the environmental impacts of a space system** across its entire life cycle

- Built on **ESA-standardized LCA framework** and specialized datasets (**ESA LCA DB and Ecoinvent**)
- Calculation engine relying on **openLCA**
- Integration of **complementary models** and flow indicators (atmospheric emissions, CRM use…)
- Assessment of **mission-critical impacts** (launch emissions, reentry, debris…)
- Cloud-native SaaS platform **connecting all space system actors**
- **Multi-criteria decision** support integrated directly **into design workflows**



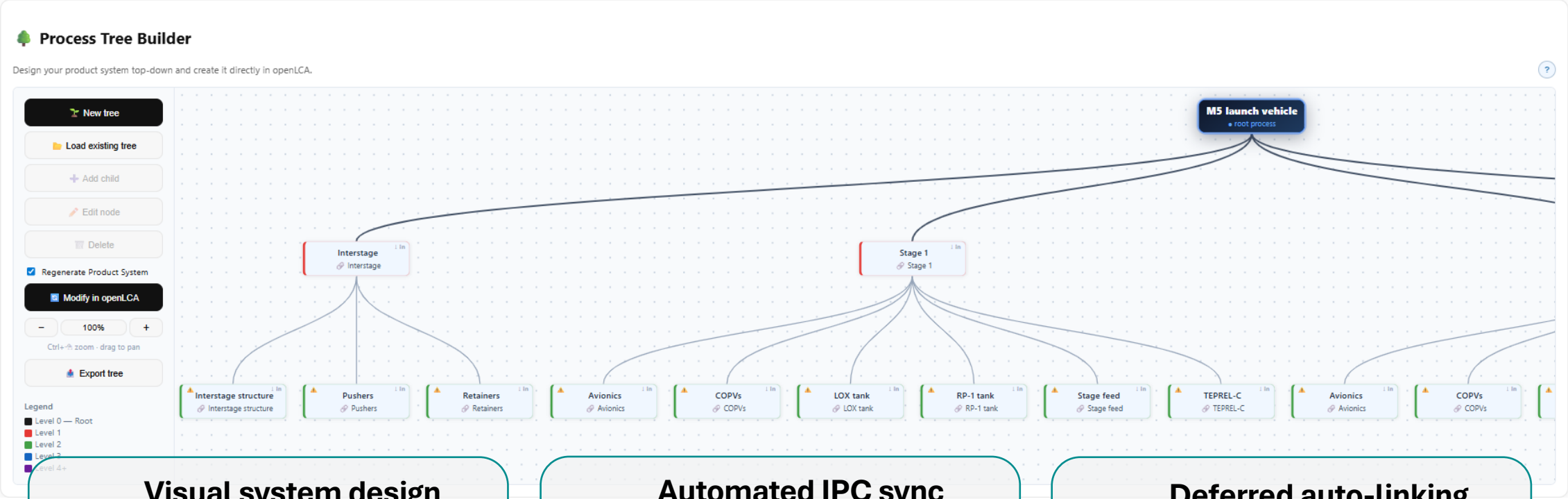
Our digital LCA tool

Eliminating data-entry bottlenecks, allowing sustainability teams **to spend less time building models** and more time engineering better solutions



Process tree builder

Visual and simplified **product-tree-based data entry** approach aligned with ECSS standards



Visual system design

Build entire supply chains starting from the final product and working downwards

Automated IPC sync

Push complete multi-tiered architectures directly to your LCA database with one click

Deferred auto-linking

The platform intelligently defers product-system generation until all leaf nodes are fully defined

Deep-dive environmental intelligence

Intuitive interface and **multifunctional dashboard** for faster and more efficient results analysis

4 interactive views

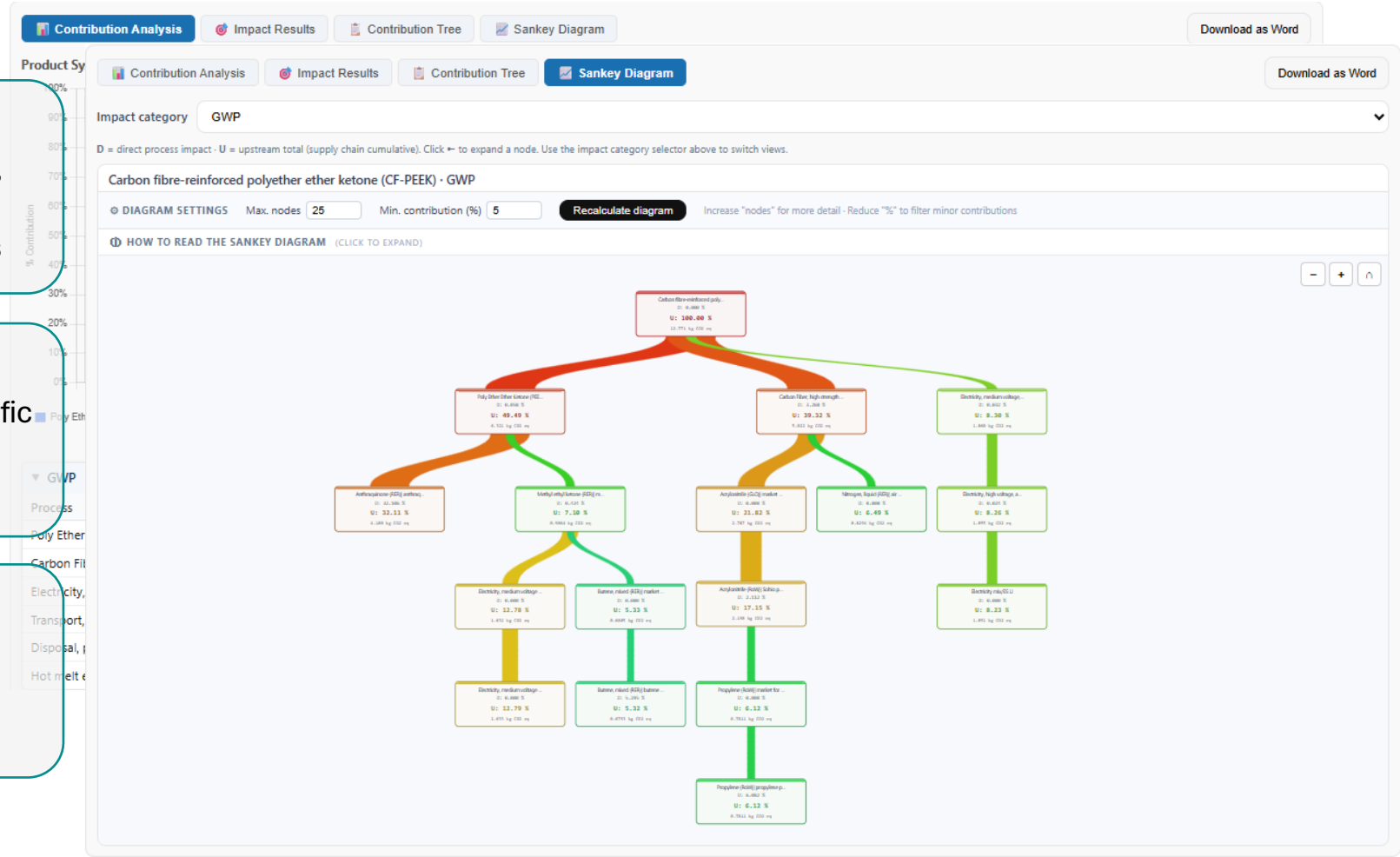
Toggle between impact tables, bar charts, contribution trees and dynamic Sankey diagrams

Instant hotspots

Immediately identify the specific processes dominating your impact categories

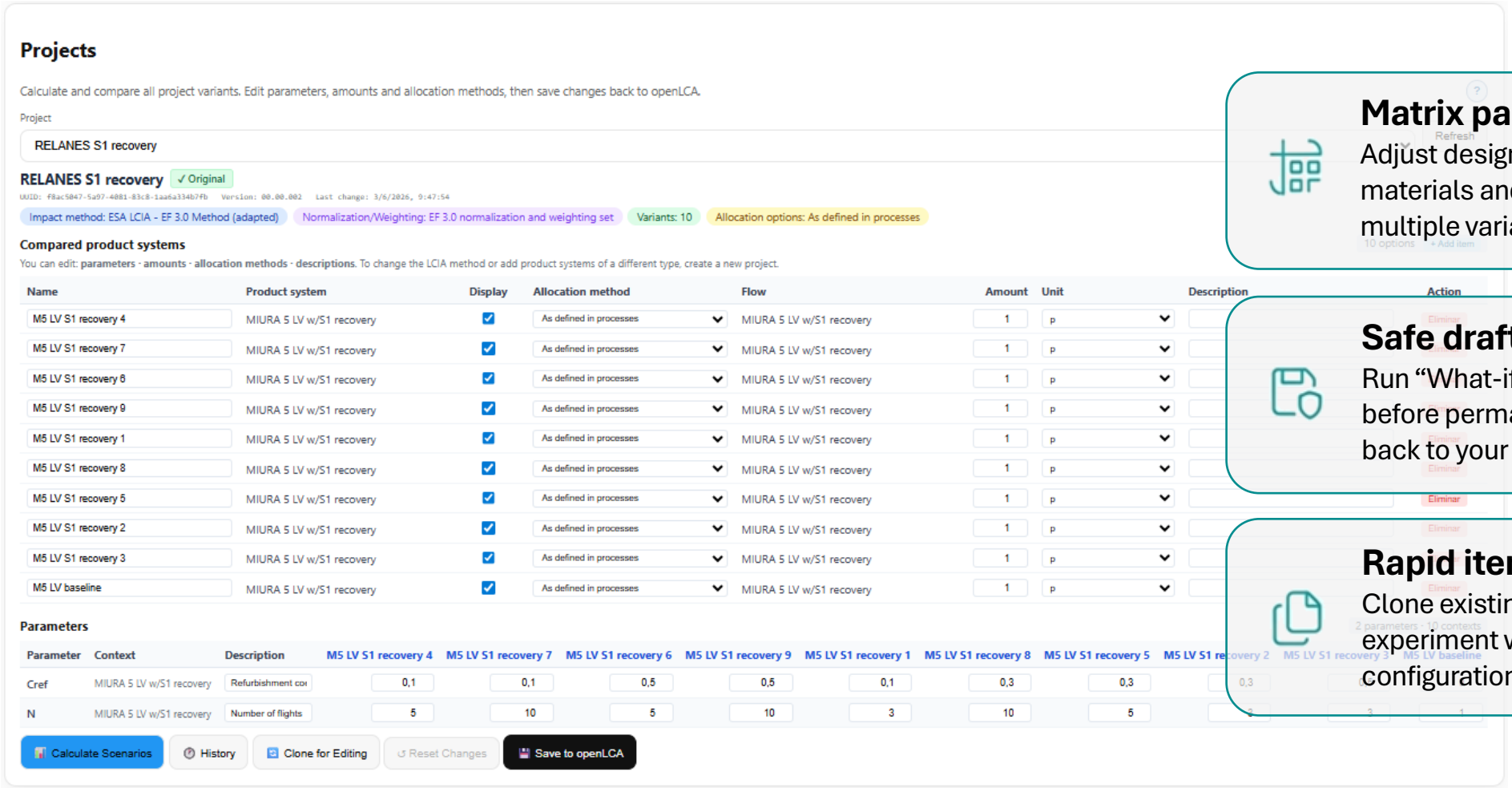
One-click export

Download fully formatted Word (.docx) reports instantly



Multi-variant scenario analysis

Evaluate design alternatives and **support early-stage decisions**



Matrix parameter editing

Adjust design & operating factors, materials and inputs across multiple variants simultaneously

Safe draft mode

Run “What-if” preview calculations before permanently saving changes back to your LCA database

Rapid iteration

Clone existing projects to experiment with radically different configurations

Use case – RELANES project

R&D of a new renewable fuel for the reduction of GHG emissions in space launches

Budget: 3.19 M€

Duration: Jul 24 – Dec 26

Coordinator

PLDSPACE

Partners

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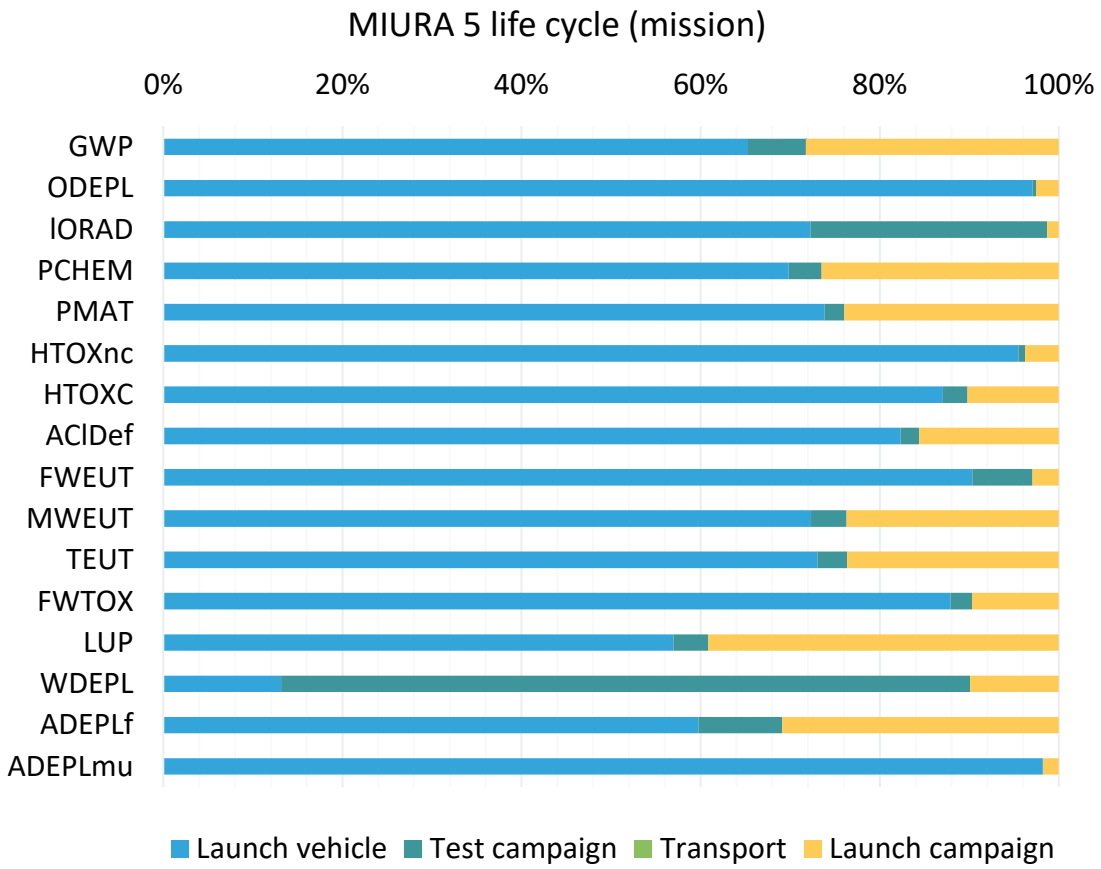
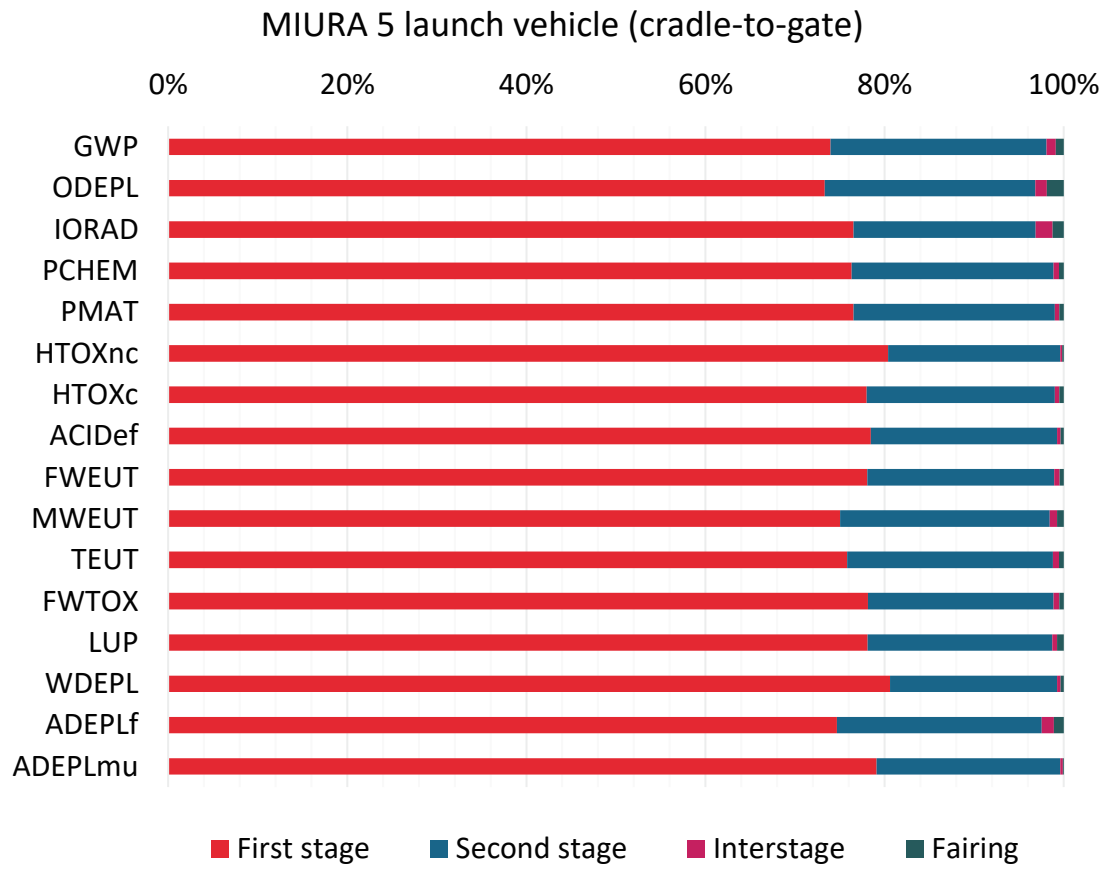
Use case – RELANES project

Identification of environmental hotspots of MIURA 5 life cycle

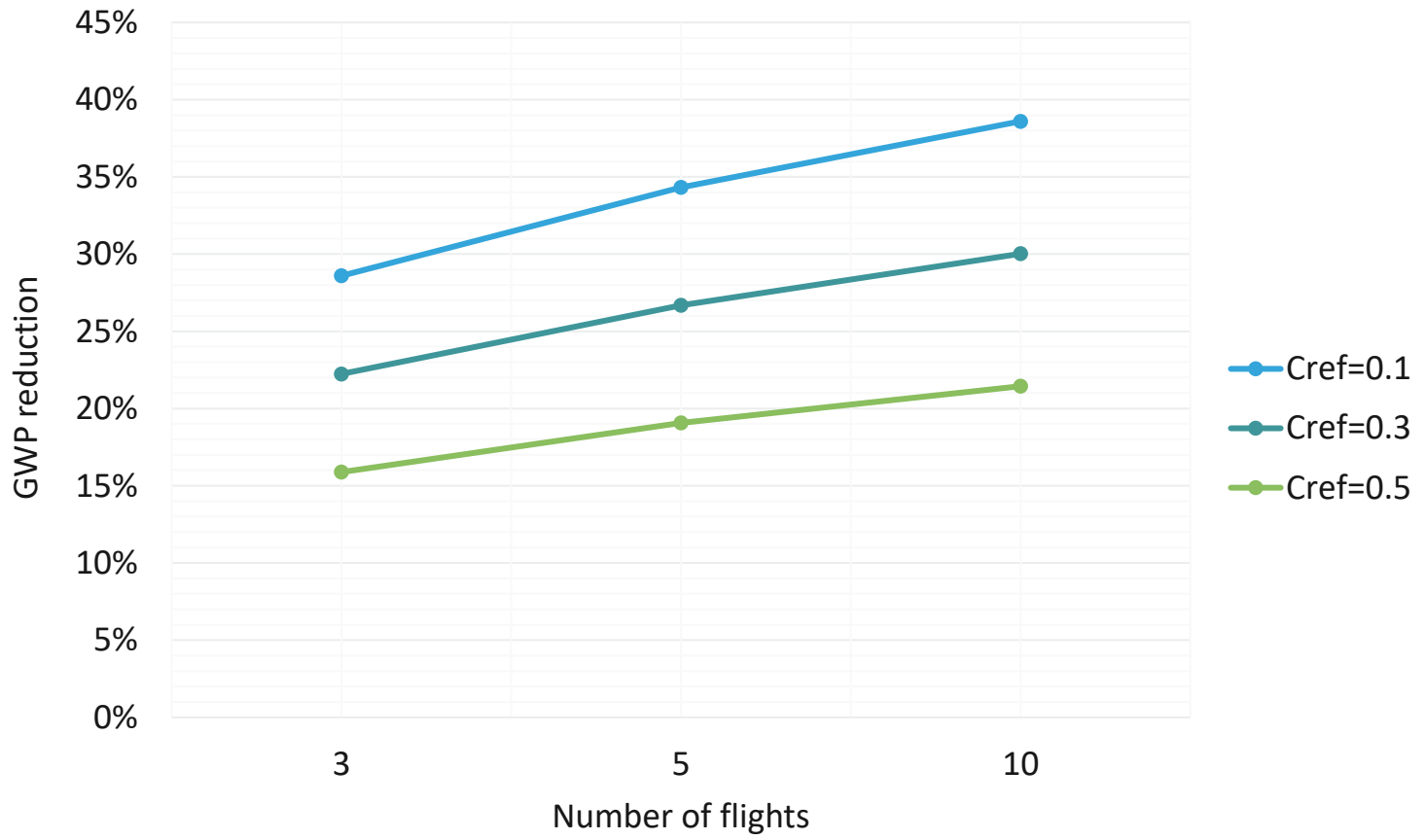




Use case – RELANES project

Scenario analysis of first-stage recovery: reduction of global warming impact as a function of the number of flights and refurbishment efforts

Cref: Refurbishment coefficient
Dimensionless coefficient representing the environmental impacts of refurbishing a first stage after a mission, expressed relative to the impacts of manufacturing a new first stage



Use case – DISAPPEAR project

Designed to disappear: thermoplastic composites for clean atmospheric re-entry

Budget: 0.5 M€

Duration: Dec 25 – Nov 26

Coordinator

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Partners

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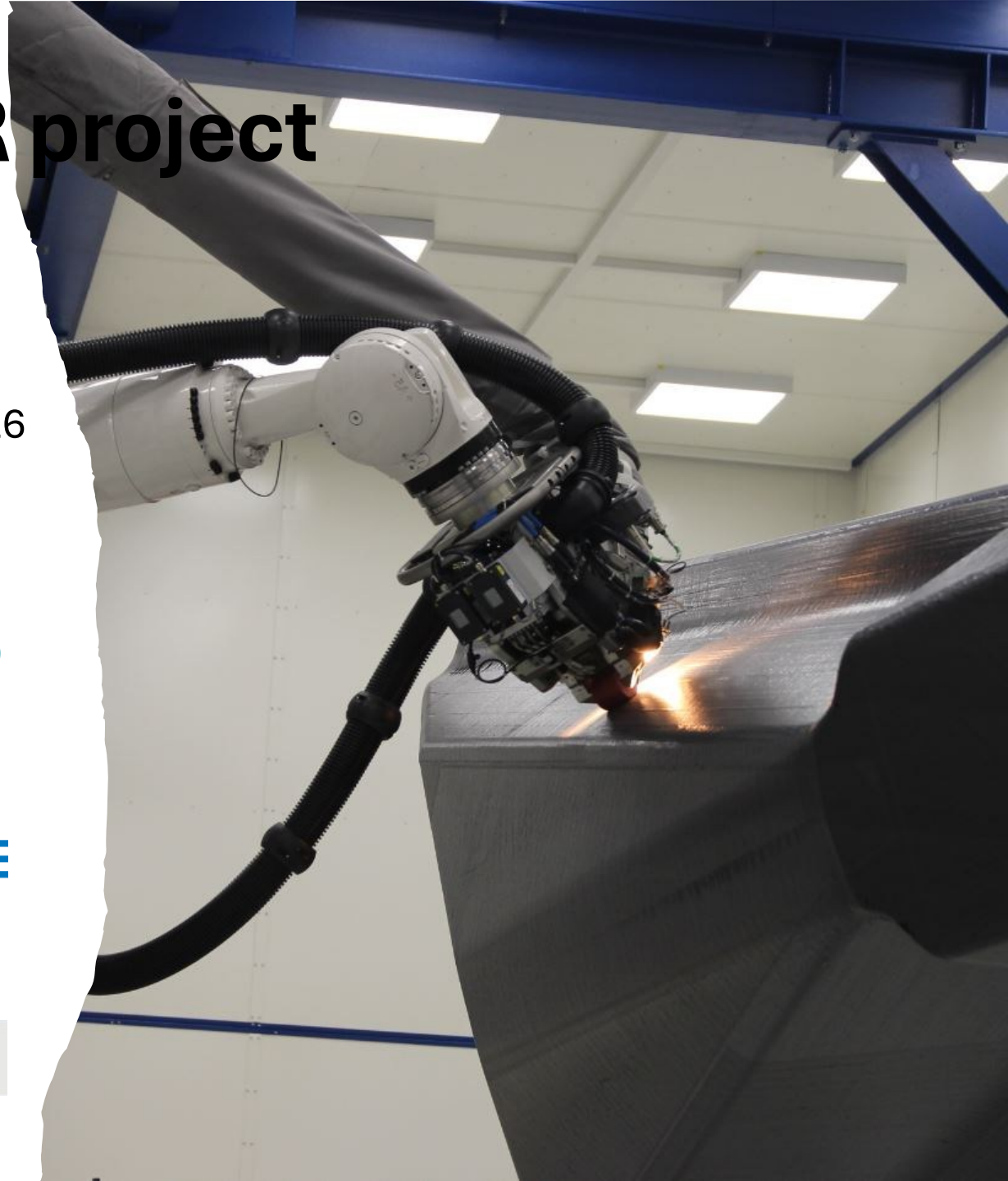
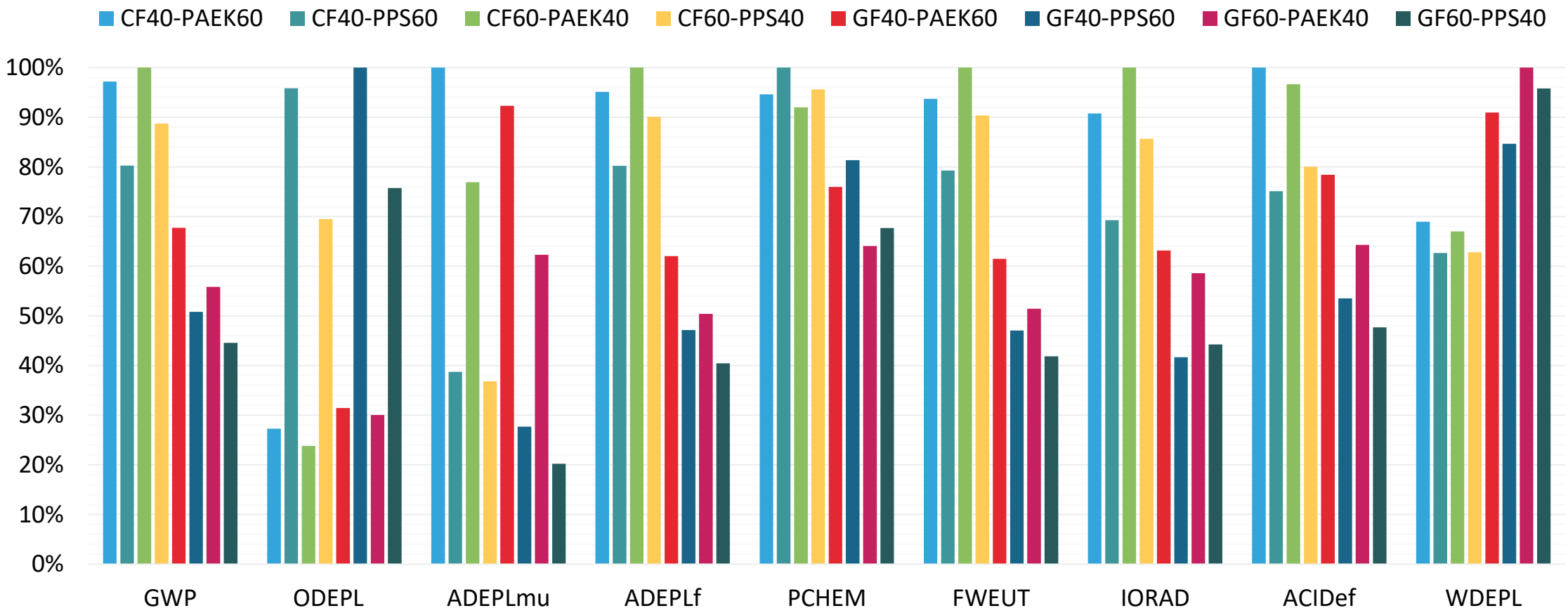


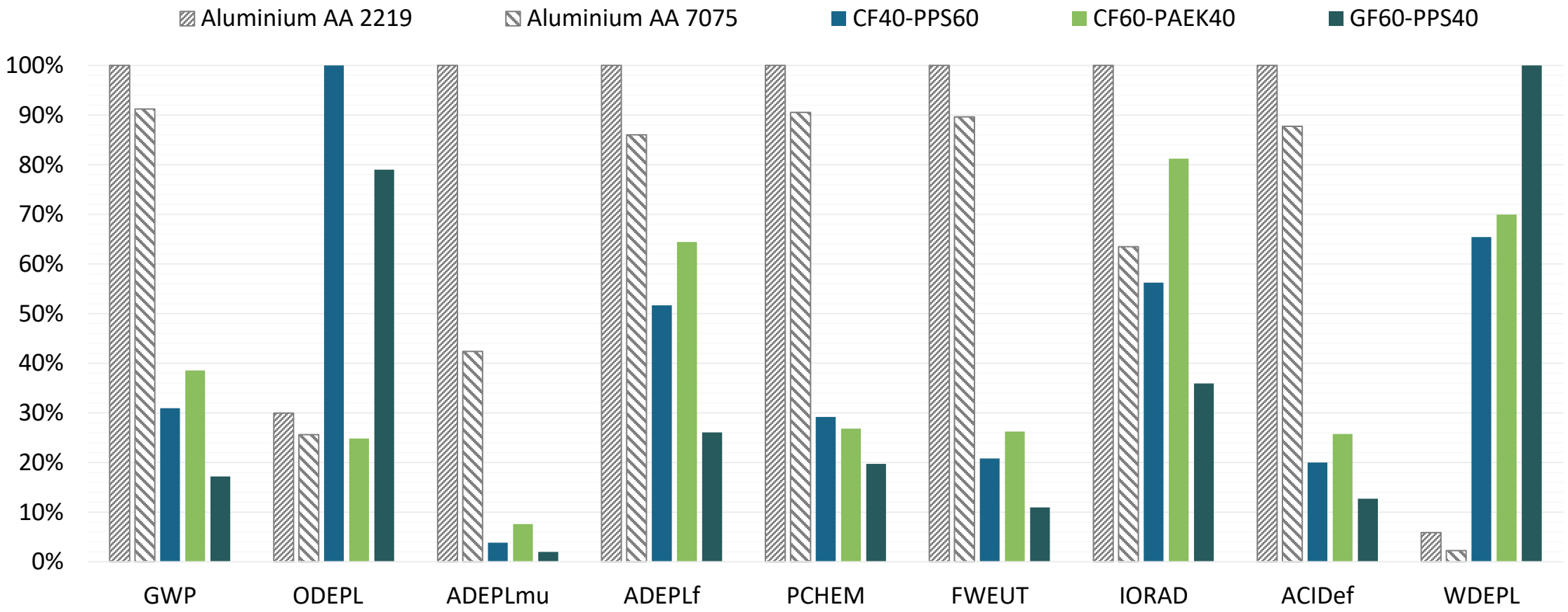
Use case – DISAPPEAR project

Environmental impacts of FRTP composites: cradle-to-gate impacts per kg of material



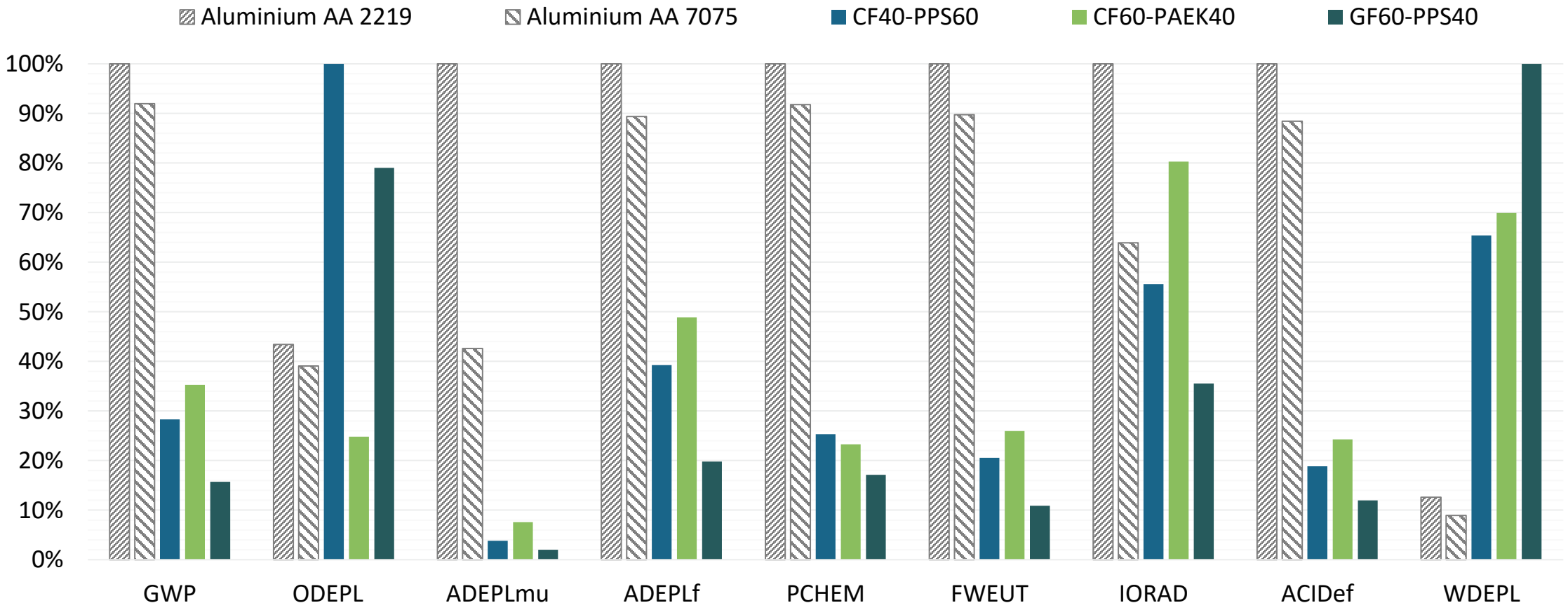
Use case – DISAPPEAR project

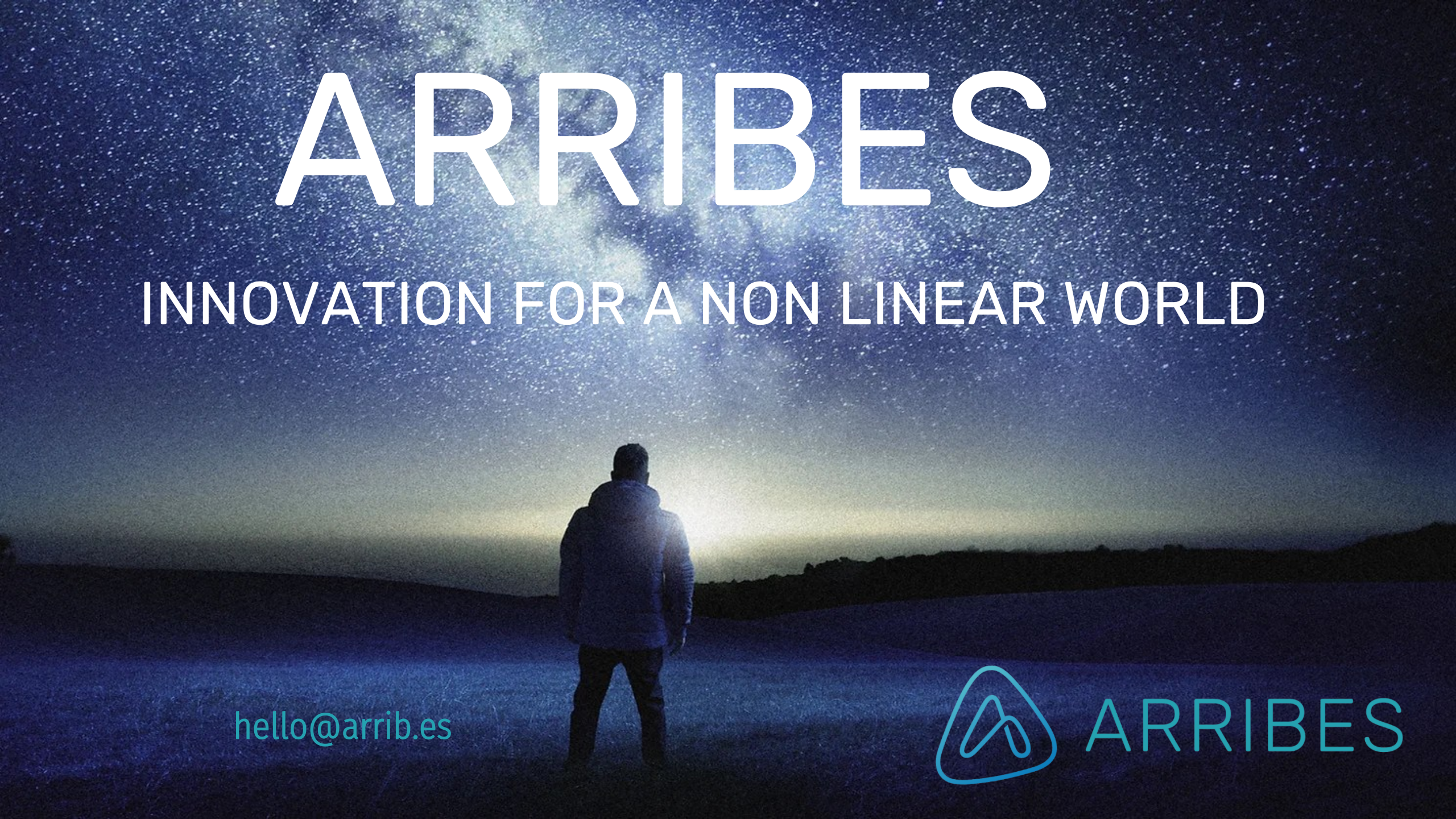
FRTP composites vs aluminium alloys: cradle-to-gate impacts per kg of material



Use case – DISAPPEAR project

FRTP composites vs aluminium alloys: impacts per kg of FRTP, assuming 30% mass reduction and 5.86 kg propellant saving per kg of FRTP used

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