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From LCA to Action: A Decision Framework for Improving Environmental Performance in Special-Purpose Vehicles

Introduction

- Companies are required to **report** environmental impacts of business activities
- Various **direct** (e.g., emissions to the air) and **indirect** (e.g., suppliers, customers) **environmental impacts** are caused along the entire **value chain** of companies
- Life cycle assessments (LCAs)** for analysing environmental impacts
- Contribution presents a novel type of **multi-stage modelling framework** including an **environmental decision matrix (EDM)** linked with an LCA to flexibly assess various LCA-based environmental impacts
- Framework enables an **assessment** of the **activities**, along the **activity chains**

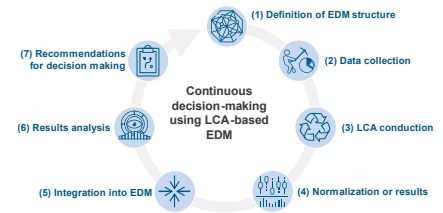


Figure 1: Proposed multi-stage framework.

Methodological Approach

- Multi-level modelling **framework** considering **EDM** and **LCA**
- Environmental aspects** are assessed using a **4-point scale** between 0 (not relevant) and 3 (very relevant)
- Weighting score** for each environmental aspect reflects the environmental **vulnerability** (local, regional, global)
- Controllability** and **optimization potential of processes** are assessed using a scale between 1 (low) and 3 (high)
- Linking** requires a **normalization procedure** to convert the LCA results to the necessary scale (0 to 3)

Figure 2: Schematic illustration of an environmental decision matrix (EDM) with five input areas (I to V) and two output areas (VI, VII). The processes are listed in rows (area I), the environmental aspects in columns (II), the relevance of a process with respect to the environmental aspect (III), the environmental impact of the environmental aspect (IV), the controllability and optimisation potential (V), the rating and materiality of the environmental aspect (VI), and the environmental impact and priority of (VII).

Relevance of environmental aspect	local (0.1)					regional (0.2)					global (0.3)				
	Weightings by relevance														
	1	2	3	2	1	1	2	3	2	1	1	2	3	2	1
Process	Life Cycle Phase														
	Direct environmental impact														
	Indirect environmental impact														
	Thermal energy use														
	Electrical energy use														
	Fuel consumption														
	Raw material and resource consumption														
	Non-hazardous waste														
	Hazardous waste														
	Emissions to air														
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	Emissions to intragenerational equity														
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