



A solution by
DB E&C

BIM4LCA

Model-Based
Lifecycle Assessment of
Buildings and Infrastructure



Future-oriented design of buildings and infrastructure



Challenges in design projects

„How can I take the **entire lifecycle** of my future infrastructure into account already during the design?”

„How can I improve **design quality** and **decision-making** in my project?”

„How can I quantify and reduce **environmental impacts** in my project already in the **early design stages**?”

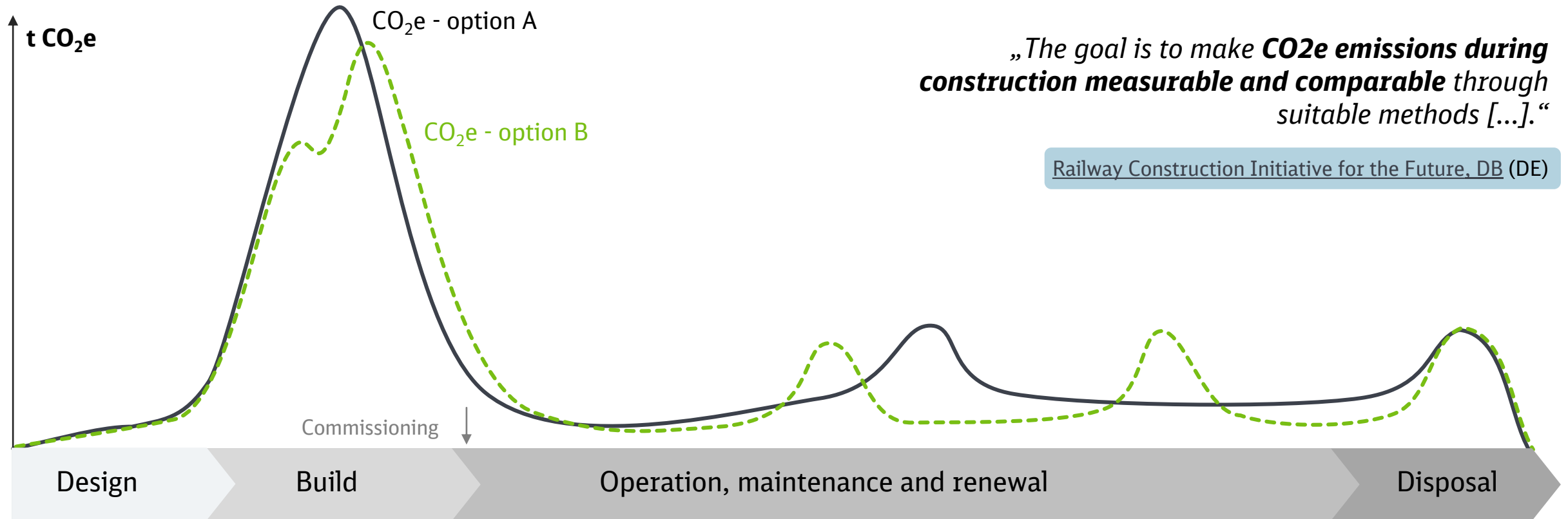
„How can I address sustainability in my project without adding to my **design team's workload**?”

„How can I consistently apply the **BIM method** in my project to represent ecological aspects efficiently and transparently?”

BIM4LCA

Model-based lifecycle assessment of buildings and infrastructure.

Lifecycle assessment according to DIN EN ISO 14040 and ISO 14044



Vision – Determine emissions and costs over the entire lifecycle and use them as a criterion for well-founded, holistic decisions in the design.

Environmental Product Declarations (EPD)

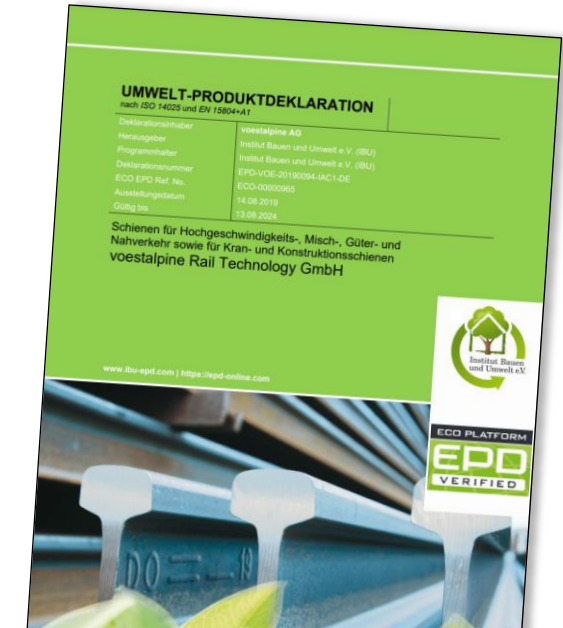


The basis for a lifecycle assessment are so-called **Environmental Product Declarations (EPDs)**.

Standards: ISO 14025 and EN 15804

The evaluation is carried out on the basis of indicators such as **Global warming potential, eutrophication potential or hazardous waste generation to landfill**.

The quantification of the indicators is carried out according to the **lifecycle stages A-D**.



LCA Results – Environmental influences						
Indicator		Unit	A1-A3*	C3*	C4*	D*
GWP	Global warming potential	kg CO ₂ Eq	2.626E+03	0.000E+00	2.423E+00	-1.284E+03
ODP	Depletion potential of the stratospheric ozone layer	kg CFC11 Eq	7.183E-09	0.000E+00	6.338E-13	7.119E-06
POCP	Formation potential of tropospheric ozone	kg Ethen Eq	1.168E+00	0.000E+00	5.987E-04	-5.894E-01
AP	Acidification potential of soil and water	kg SO ₂ Eq	6.734E+00	0.000E+00	6.738E-03	-2.506E+00
EP	Eutrophication potential	kg (PO ₄) ³ Eq	7.957E-01	0.000E+00	8.538E-04	-1.872E-01
ADPE	Abiotic depletion potential for non fossil resources	kg Sb Eq	2.889E-02	0.000E+00	5.111E-07	-3.689E-03
ADPF	Abiotic depletion potential for fossil resources	MJ	2.135E+04	0.000E+00	3.469E+01	-1.239E+04

*A1: Raw material supply
A2: Transport
A3: Manufacturing/production

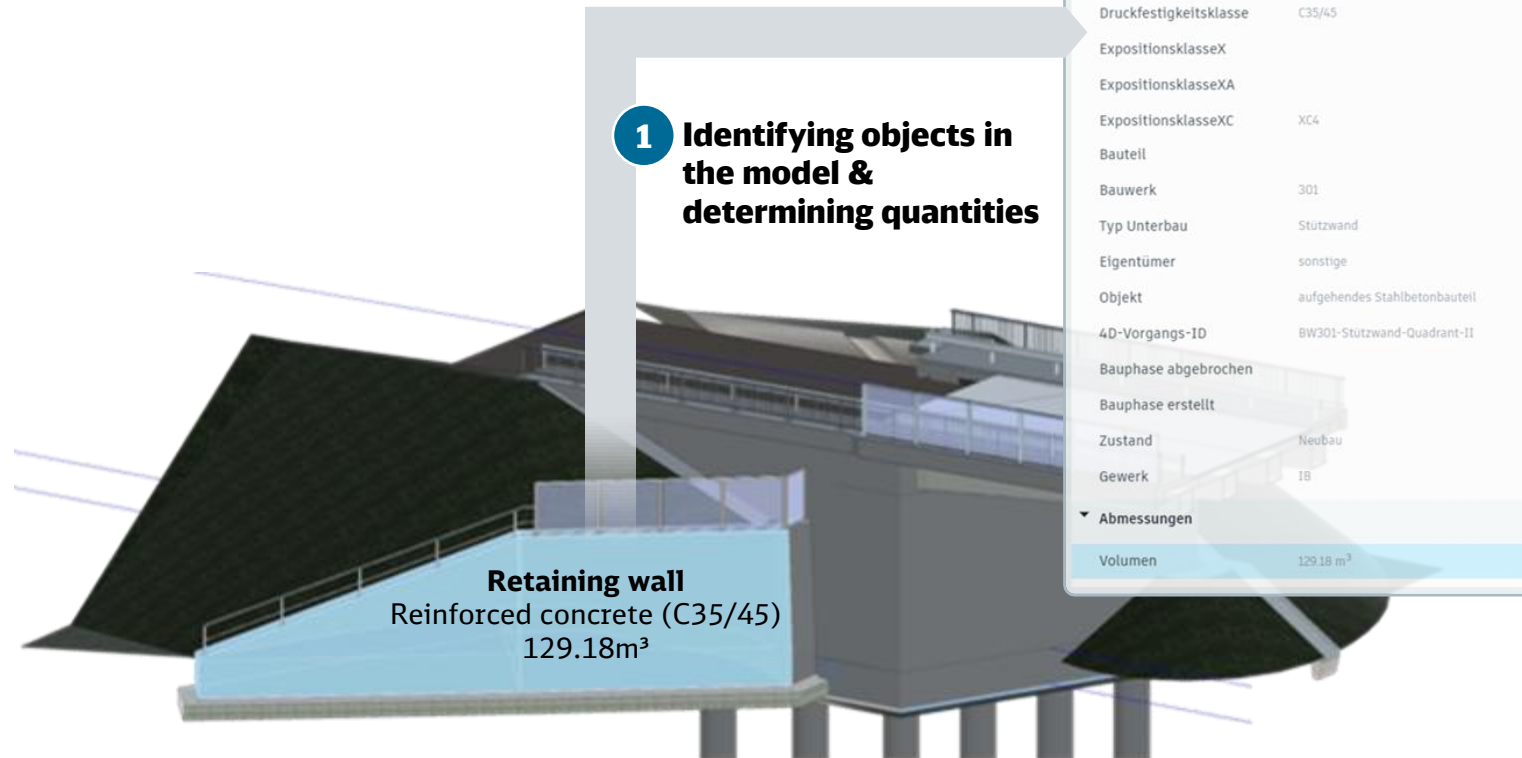
*C3: Waste treatment
C4: Disposal

*D: Reuse, recovery & recycling

Source: OEKOBAU.DAT

Lifecycle assessment as a BIM use case

At DB E&C, **BIM models** are an **essential design component** – they contain essential information required for a lifecycle assessment.



2 Assign EPD

EPD

1m³ Unreinforced structural concrete C35/45 (Source: epd-online.com)

Indicator	Unit	A1-A3
GWP	kg CO ₂ Eq	244.00
ODP	kg CFC11 Eq	6.81E-8
POCP	kg Ethen Eq	2.98E-2
AP	kg SO ₂ Eq	3.48E-1
EP	kg (PO ₄) ³ Eq	6.55E-2
ADPE	kg Sb Eq	8.22E-4
ADPF	MJ	1,080.00

3 Calculate emissions

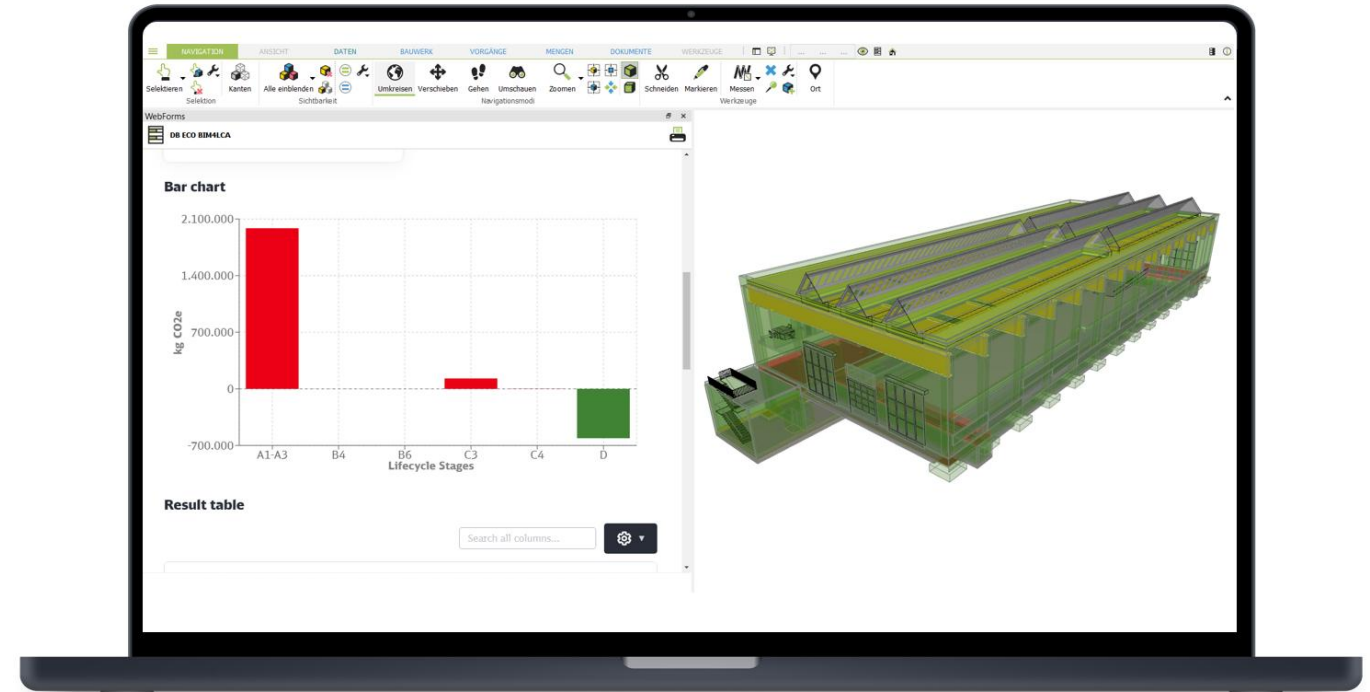
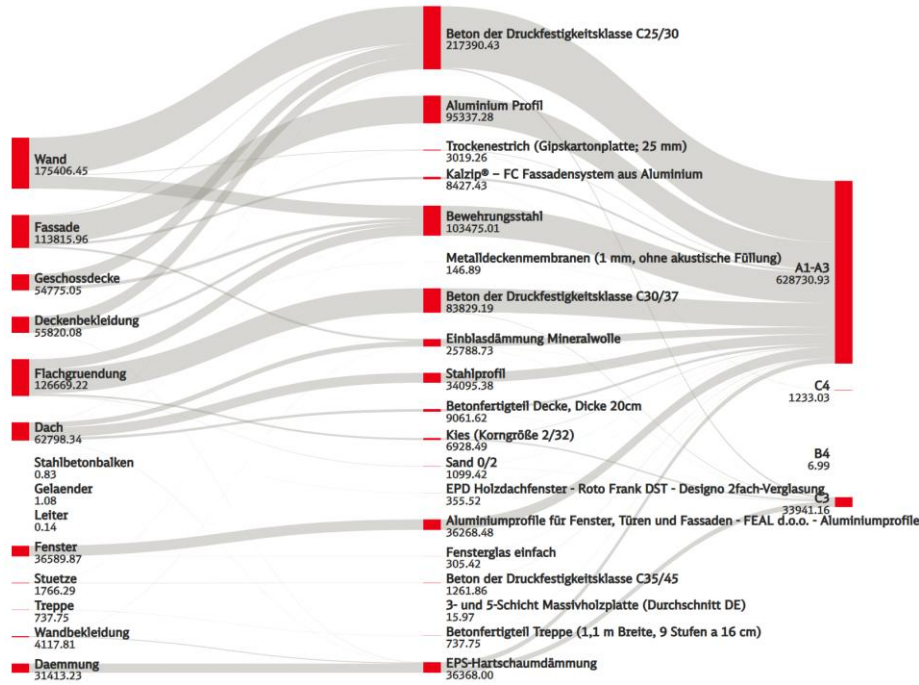
$$\text{GWP}_{\text{Gew,A1-A3}} = 129.18 \text{ m}^3 \times 244 \text{ kgCO}_2\text{e/m}^3 = 31.5 \text{ tCO}_2\text{e}$$

4 Rate results

BIM4LCA for dynamic LCA in response to design changes



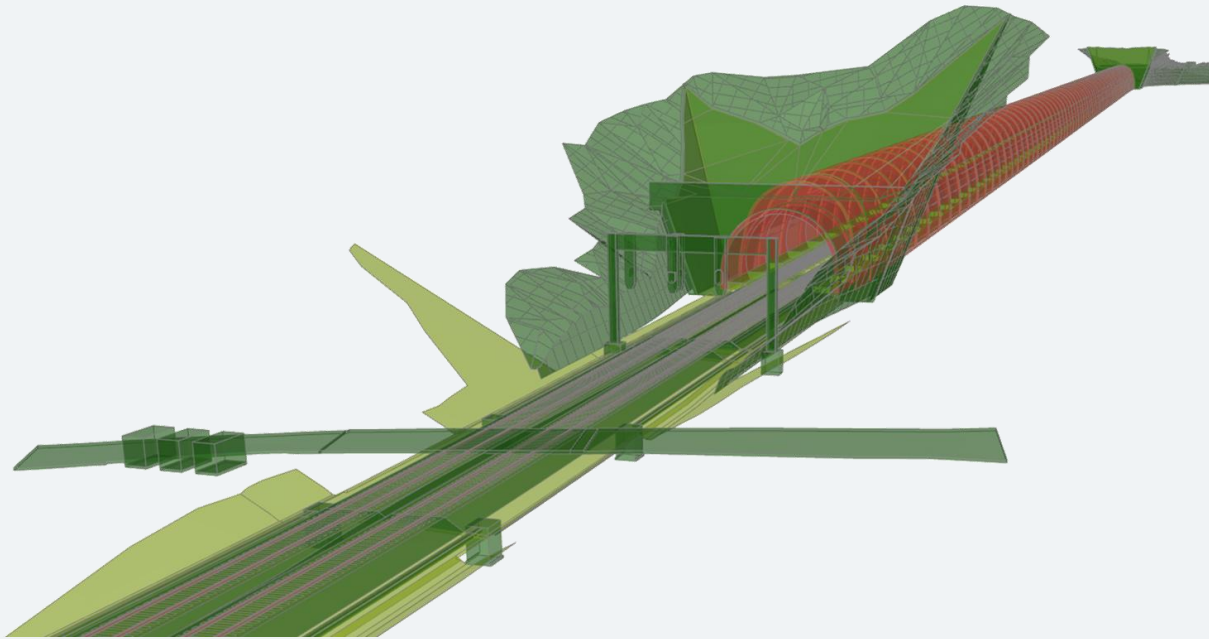
The **BIM4LCA tool**, developed by DB E&C, enables the direct calculation and visualization of emissions within the BIM model using a fully model-based approach. Its high level of automation allows for fast **LCA iterations**, while the life cycle assessment is carried out alongside the **design process**.



Advantages of lifecycle assessment using BIM4LCA



BIM4LCA as a key component of the digital and responsible design of tomorrow's railway infrastructure.



- + Determining emission and cost hotspots**
Consultation on design alternatives in early stages
- + Speed through automation**
Quick iterations along the entire design process
- + Lifecycle Assessment**
BIM4LCA addresses the whole infrastructure lifecycle
- + Making environmental impacts measurable**
Quantifying emissions as a decision criterion
- + Quick comparison of design variants**
Data can support the decision for a preferred design
- + High degree of standardization**
Lifecycle assessment according to ISO 14040 & ISO 14044

Your contacts for BIM4LCA



Manuel Kretlow

[E-mail](#)



Maria Fernanda Guajardo

[E-mail](#)