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MANAGEMENT



TransZeroWaste project: Decision support tool providing LCA, LCC and Circularity Indicators to support the transition towards green steel



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Introduction



[Introduction](#)[LCA](#)[LCC](#)[Circularity](#)[Comparison](#)

Support the transition to sustainable steel.

A web-based decision support tool designed to help your company assess sustainability indicators and circularity aspects within trans-zero-waste pathways.

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Disclaimer*

INSTITUT FÜR SYSTEME UND TECHNOLOGIE LIST FUNDING BY THE EUROPEAN UNION

Reducing CO₂ emissions from steelmaking is essential to achieving the EU's goal of carbon neutrality by 2050. This work of TransZeroWaste-project presents a first draft layout for a novel decision-support tool for the steel industry, featuring dedicated sections for Life Cycle Assessment (LCA), Life Cycle Costing (LCC), and Circularity Assessment, along with a final section for cross-indicator comparison to support informed decision-making into a single, unified platform.

Thanks to its flexibility and ease of use, the platform will be suitable for a broad range of users, including research and development institutes as well as universities, providing general understanding of potential effects of different scenarios. When used by non-professionals, the risk of entering inaccurate data arises and may lead to more imprecise results.

Methodology

Developed in Python with libraries such as Brightway, the platform integrates the ecoinvent database to ensure consistent and reliable background calculations.

The platform features a user-friendly interface that helps users define system boundaries and inventory data for each assessment. Dedicated input fields ensure that necessary information is included, and local conditions are specified to tailor the analysis. Users can personalize case studies by adding site-specific parameters, making results directly relevant to the defined production route, which varies between sites.

System boundaries definition

Define the process steps at your production site

What type of steel do you produce? Template

Where is the plant located? Germany

Steel production route -- **BF/BOF** DRI/EA

Select the production steps at your site:

☒ Sintering ☒ Pelletizing ☒ Coking

☒ Blast Furnace ☒ Blast Oxygen Furnace ☒ Reheating

☒ Ladle Furnace ☒ Continuous casting

☒ Hot rolling ☒ Cold rolling

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Inventory per process

Coking Pelletizing Sintering **Blast furnace**

Material Inputs

Iron ores Amount ton / year

Pellets Amount ton / year

Anthracite Amount ton / year

Coke Amount ton / year

Outputs

Pig iron Amount ton / year

Slag Amount ton / year

Energy Inputs

Electricity Amount ton / year

Natural gas Amount ton / year

Results

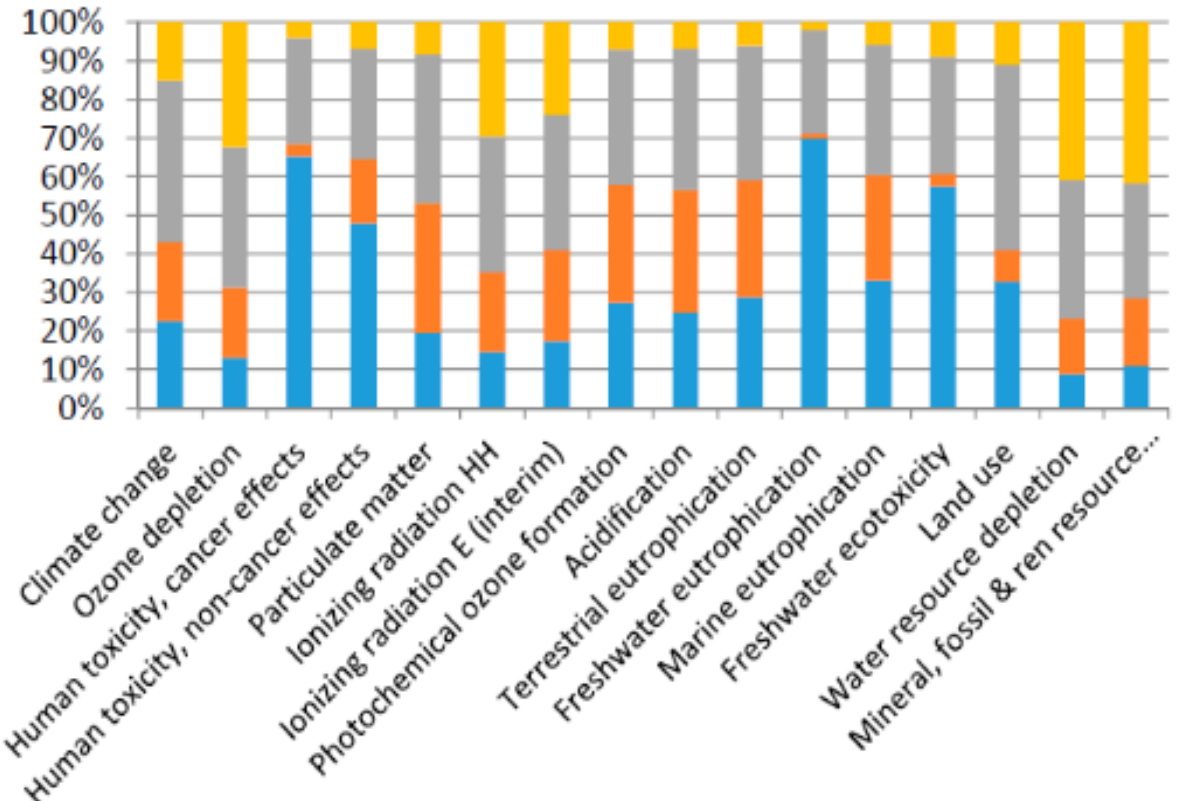
Impact categories

☐ Acidification

☒ Climate change

☒ Ozone depletion

[CANCEL](#) [OK](#)



Absolute score per impact category			
Acidification	score	mol H+	
Climate change	score	kg CO2 equivalent	
Ecotoxicity	score	CTUe	
Human Health	score	CTUh	

Disclaimer*

*Disclaimer: The accuracy and validity of the received modelling result is based on the user's choice regarding completeness and validity of scope, parameters and data

Results are shown in graphical and tabular form, accompanied by explanatory text. Their **consistency depends on the validity of user-selected parameters and the quality of the provided data**. High-quality, site-specific data are essential, as each simulation performed with different **input conditions may lead to significantly different results**.

Environmental impacts are calculated using the Environmental Footprint (EF v3.1) method across 16 impact categories. Economic assessment, based on Life Cycle Costing, accounts for investment, operating and maintenance costs, end-of-life, and residual value. Circularity indicators offer insights into resources, energy, and water circularity.

Scenario analysis is a key feature of the platform, allowing comparisons between alternative steel production routes. Additionally, the prospective LCA module projects the evolution of environmental burdens over time, highlighting long-term sustainability trends within the selected scope.

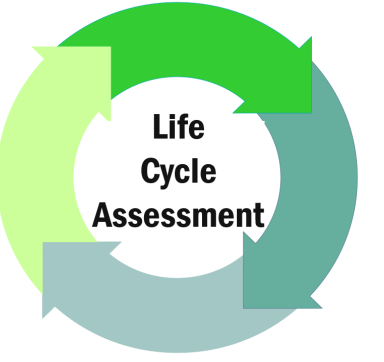
Conclusion

This integrated platform supports the investigation of environmental, economic, and circularity aspects of steel production in a unified and user-friendly environment.

Each assessment section can be explored independently, and a dedicated comparison module allows users to view different indicators such as Global Warming Potential, LCC, or resource consumption side by side. This supports balanced conclusions based on the completeness and validity of the chosen scope, parameters, and data. The uncertainty of results depends on the quality of data and the accuracy of the system boundaries defined by the user.

By combining different assessment methodologies, scenario analysis, and prospective LCA, the tool delivers forward-looking insights for strategic thinking toward carbon neutrality. While it offers a general overview of process impacts under transparent conditions, **site-specific adaptations are required for detailed evaluations**.

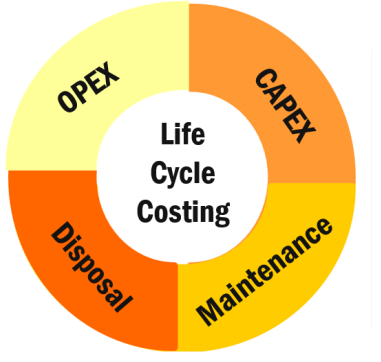
See the Impact. Shape the Future.



Life Cycle Assessment (LCA)

Environmental Impacts with LCA.

LCA shows the environmental cost of steel, from ore to final product. Track every stage of steel production and uncover where the potential opportunities lie.



Life Cycle Costing (LCC)

Estimate the overall cost

Life Cycle Costing (LCC) goes beyond upfront prices estimating the potential cost of steel over its entire life-cycle.



Circularity Indicators (CI)

Close the Loop, Measure the Impact.

Circularity indicators show how well steel products stay in the loop, reducing waste and maximizing value.

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