LCM 2021 | Session: Tools, Metrics and Labels for a Circular Economy

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Incorporating circularity in LCA tools

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Circular economy

Going **from linear to circular** economy and decoupling economic growth from consumption of finite resource.

Reduce

Re-use

Recycle

Material Circularity Indicator (MCI)

- Ellen McArthur Foundation (2015)

- Based on:
  - Use of virgin materials
  - Use of re-used or recycled materials
  - Recycling efficiency
  - Waste treatment
  - Utility factor with duration and intensity of use

- Score between **0 (linear) and 1 (circular)**

High MCI = Environmentally friendly?

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MCI and LCA

- MCI focuses only on **material use;** does **not** include other flows (transport, electricity, water).
- Life Cycle Assessment (LCA) includes **all flows** throughout the life cycle.
- Combining MCI and LCA provides a holistic overview of environmental impact.

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Example: P-ACT

Packaging Assessment and Comparison Tool, powered by SimaPro

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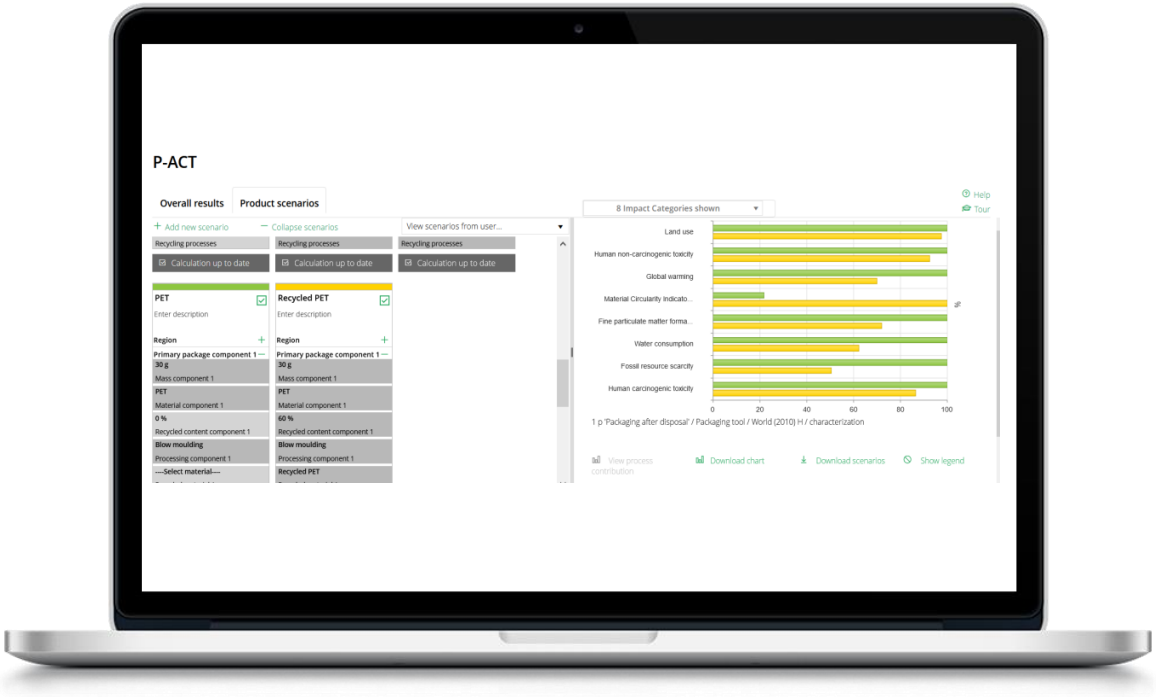
What is P-ACT?



- Web-based tool for packaging engineers
- Based on an LCA model, including MCI parameters
- Built in the SimaPro online platform (Flow & Share modules)

Learn more: simapro.com/products/p-act-tool/

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How does it work?

Define the package | Set EoL parameters | Calculate results | Compare & export

STEP 1

Select per component:

- Mass
- Material
- Recycled content
- Processing
- Recycled material

STEP 2

Select for end-of-life:

- Recycling rate
- Incineration/ landfill rate
- Recycling efficiency
- Recycling process

STEP 3

Select the impact categories (incl. **MCI**) and calculate the results.

STEP 4

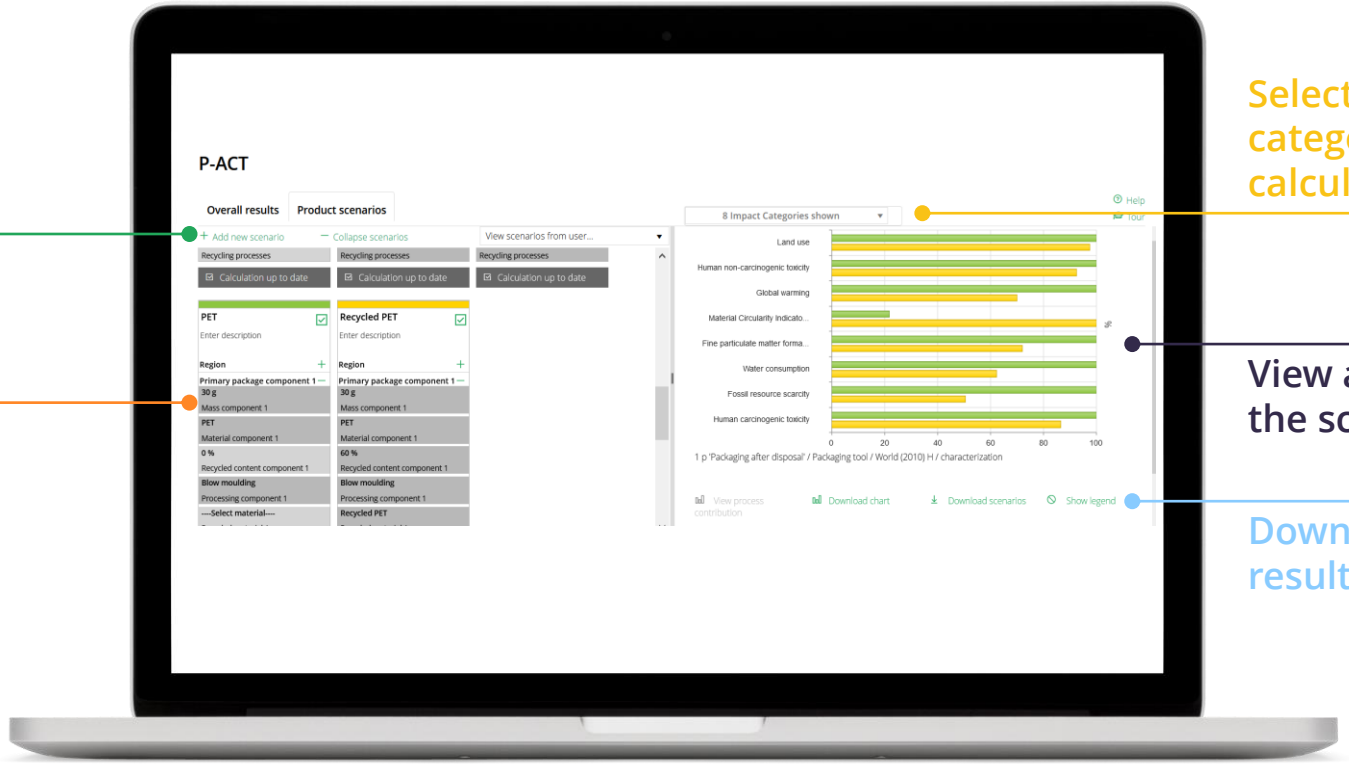
Compare the different scenarios using the results visualization or download the results.

- Expressed in % of maximum scenario or absolute values
- Main contributing process per impact category

How does it look?

Add new scenarios

Define the package



Select impact categories and calculate the results

View and compare the scenarios

Download the results

Which PET package is the most environmentally friendly?

30 g PET, blow moulded

Virgin PET	rPET	rPET + recycling
0% recycled content	**100%** recycled content	**100%** recycled content
0% recycling	**0%** recycling	**29%** recycling (default PET-EU)

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Comparing 3 PET scenarios

	Virgin PET	rPET	rPET + recycling
MCI	0.1	0.52	0.62
Global warming (kg CO_2 eq)	0.19	0.13	0.11
Land use (m2yr crop eq)	0.0091	0.0090	0.0088
Human non-carcinogenic toxicity (kg 1,4-DCB)	0.26	0.29	0.25
Fine particulate matter formation (kg PM2.5 eq)	0.00024	0.00015	0.00014
Water consumption (m3)	0.0018	0.0010	0.0008
Fossil resource scarcity (kg oil eq)	0.074	0.036	0.022
Human carcinogenic toxicity (kg 1,4-DCB)	0.0071	0.0062	0.0058

Calculated with P-ACT, method: ReCiPe midpoint 2016 (H) + MCI

Toxicity of the process to generate rPET leads to a higher human non-carcinogenic toxicity for rPET than for virgin PET.

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Conclusions

Interest in circularity increases, but circular is not always better for the environment
MCI alone does not give the complete picture, but can be a stepping stone into LCA

LCA can show potential trade-offs of circularity

Incorporating MCI in LCA tools gives a complete picture
However, calculating the MCI requires some new parameters

Engineers can make informed decisions

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Do you have any questions

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Thank you!

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