GaBi Circularity Tool

Take your LCA to the next step

Peter Shonfield, thinkstep

Amy Stockwell, Jacobs Douwe Egberts

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Setting the scene

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The Circular Economy

Photo by Thomas Lambert on Unsplash

http://www.europarl.europa.eu/thinktank/infographics/circulareconomy/public/index.html

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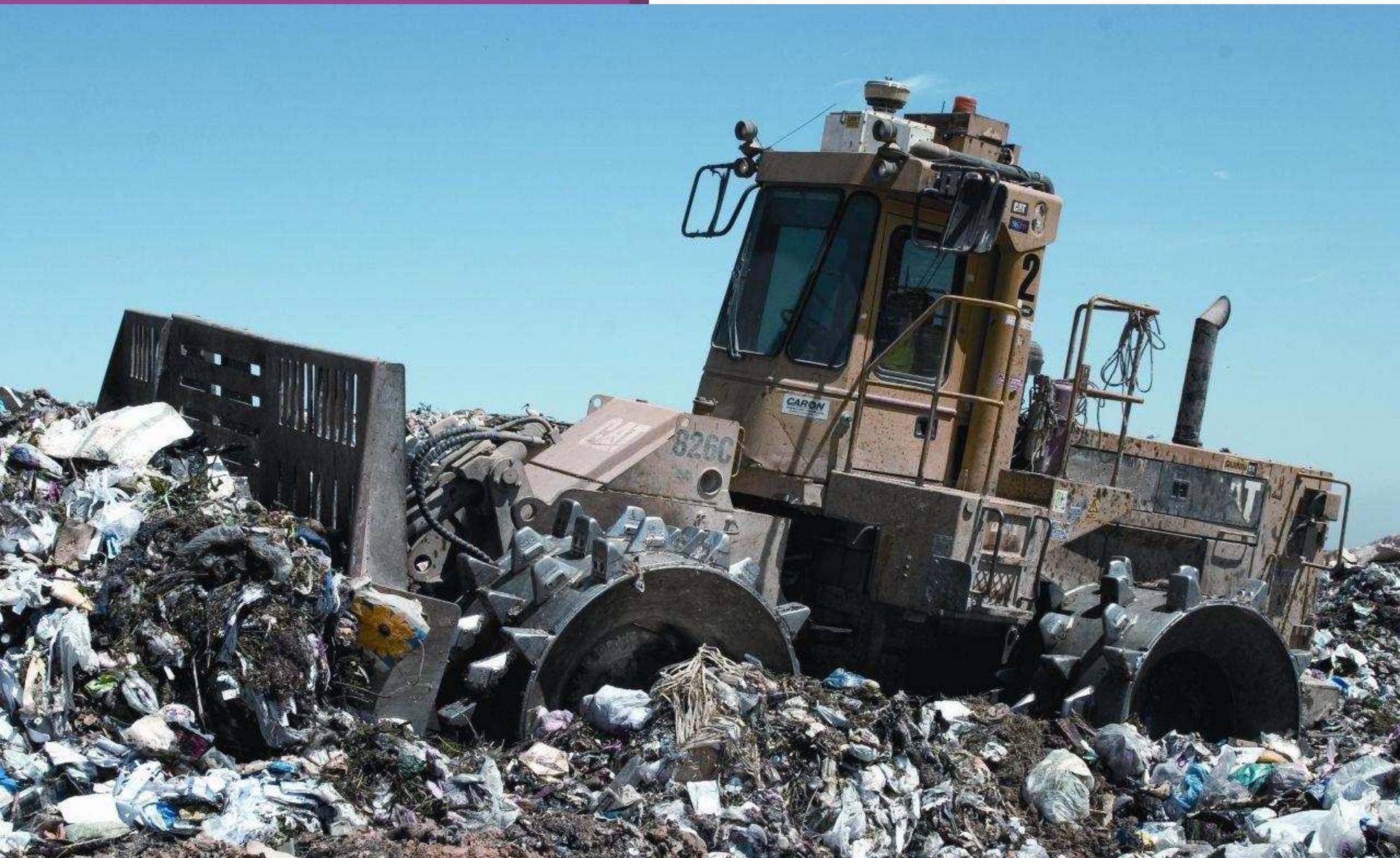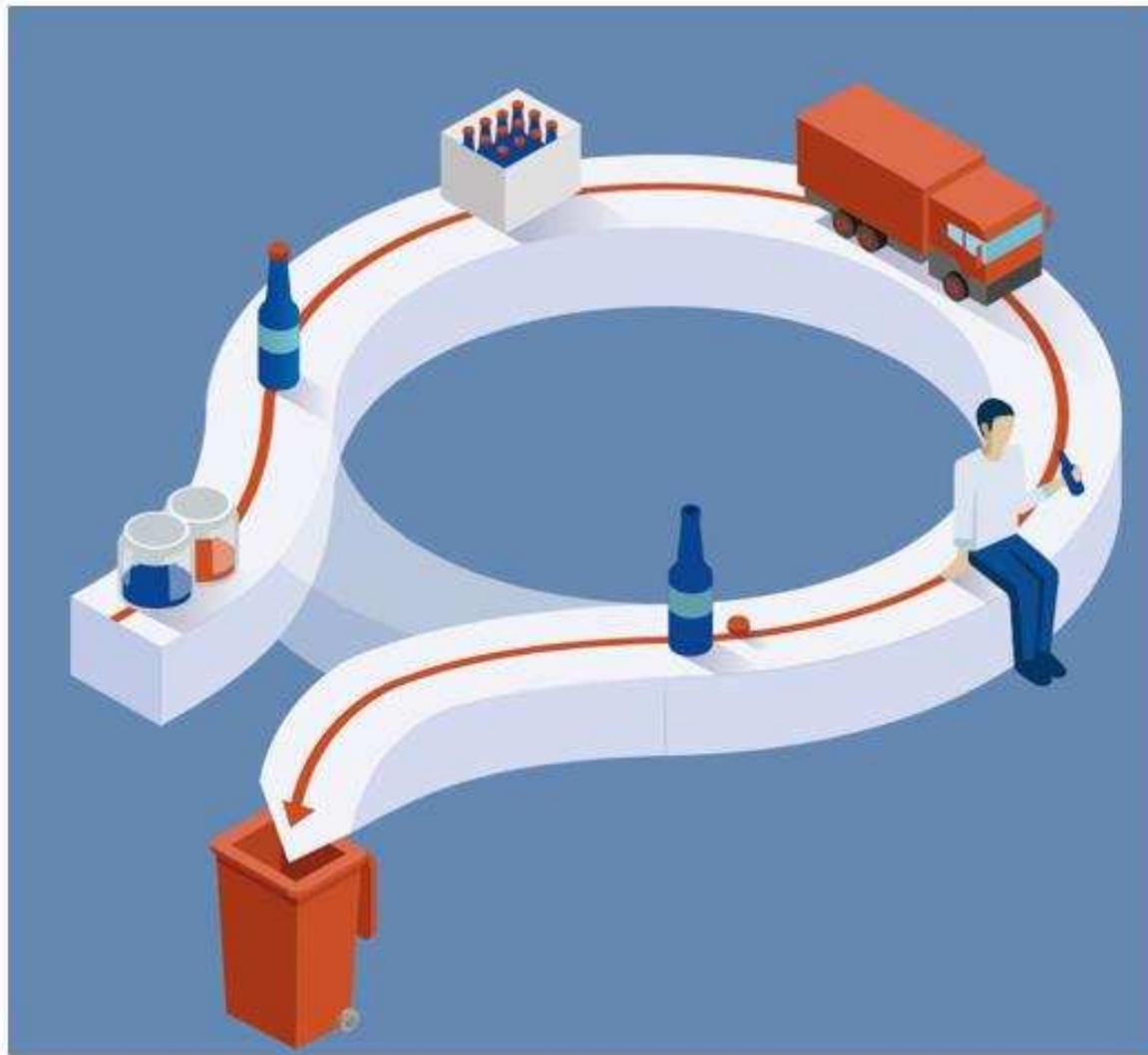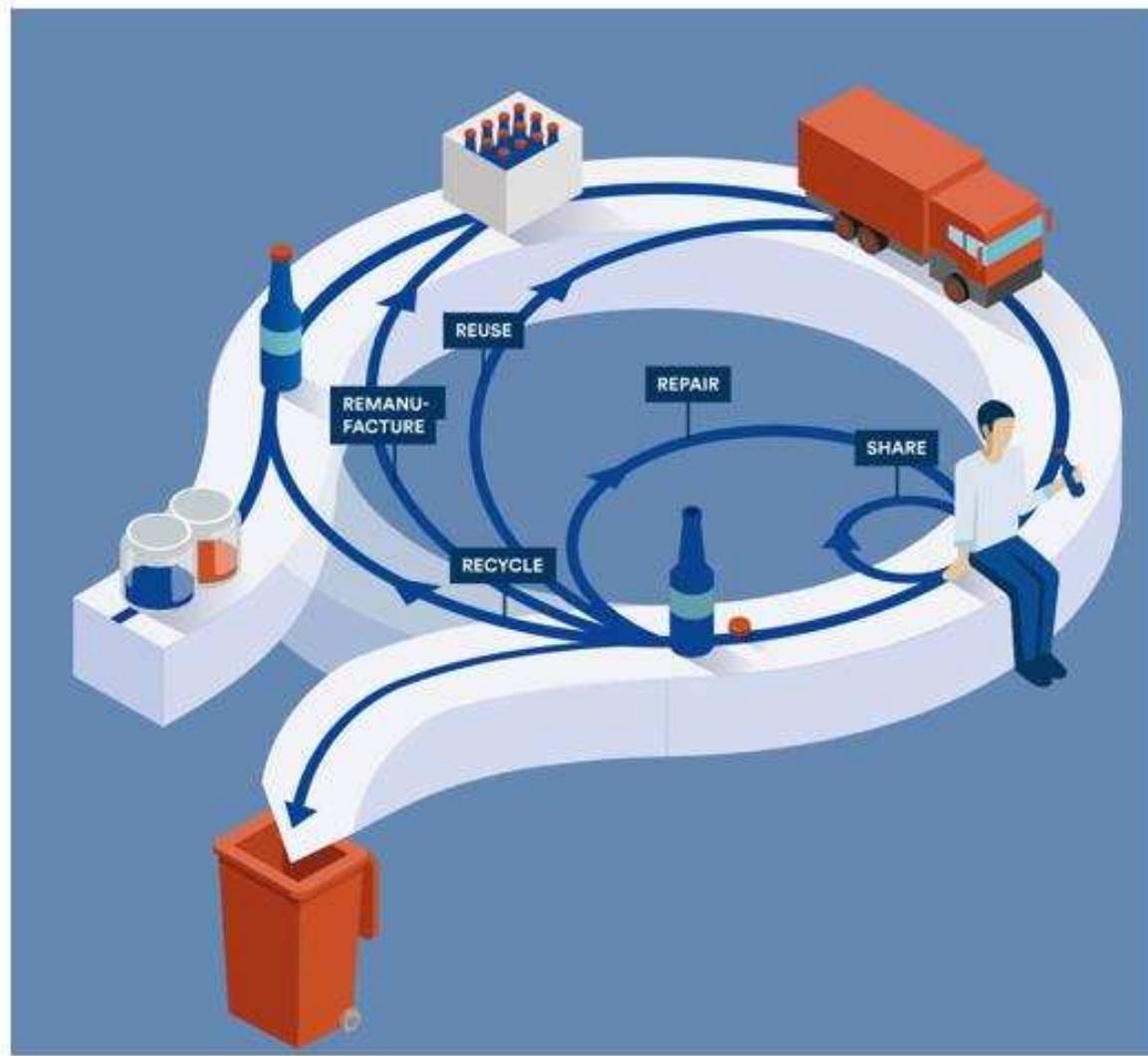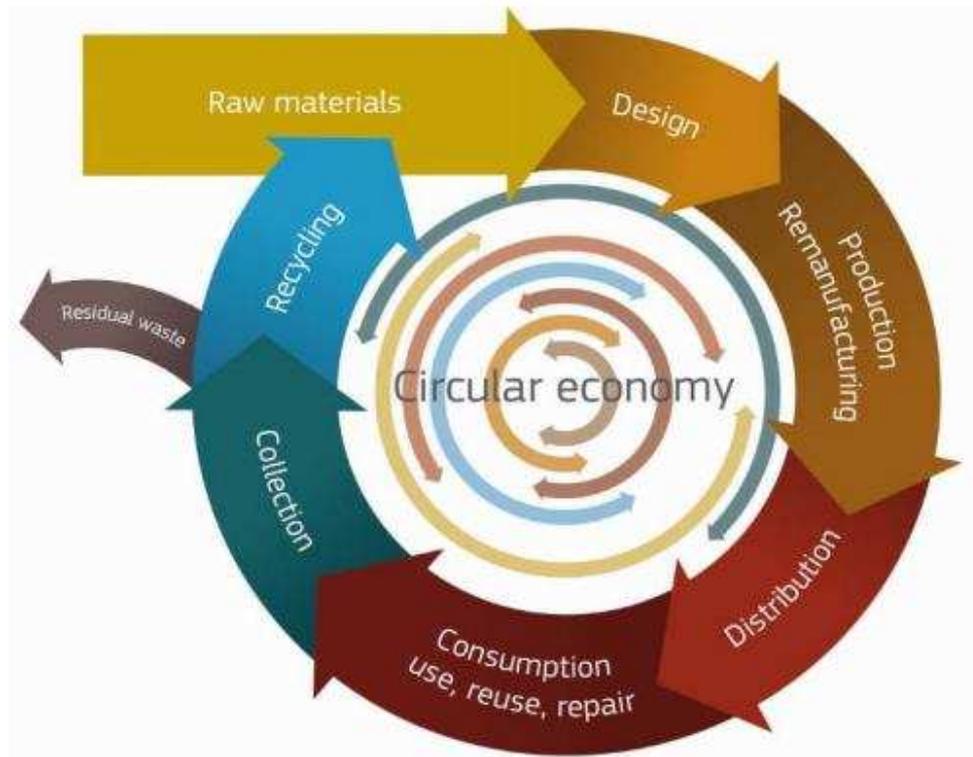
Circular Design

Innovative Business Models

Reverse Cycles

Enabling Conditions

Source: https://www.ellenmacarthurfoundation.org/circular-economy/building-blocks

Quantifying Circularity

$$X = (L/L_{av}) \cdot (U/U_{av})$$
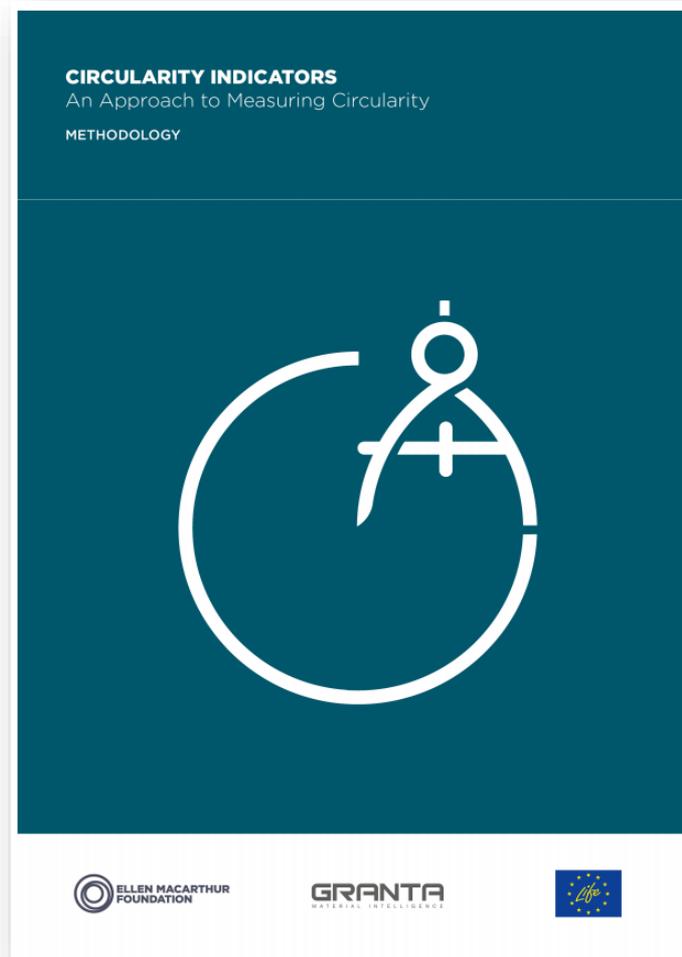
From: *Circularity Indicators: An Approach to Measuring Circularity – Methodology* by the Ellen MacArthur Foundation and Granta Design

MCI is measured on a scale from 0 to 1
(higher score = more circular)

1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

MCI = 1
Completely circular material flows

MCI = 0.1
Completely linear material flows

MCI < 0.1
Linear or near linear material flows and product has
shorter lifetime or less utility than an "average" product
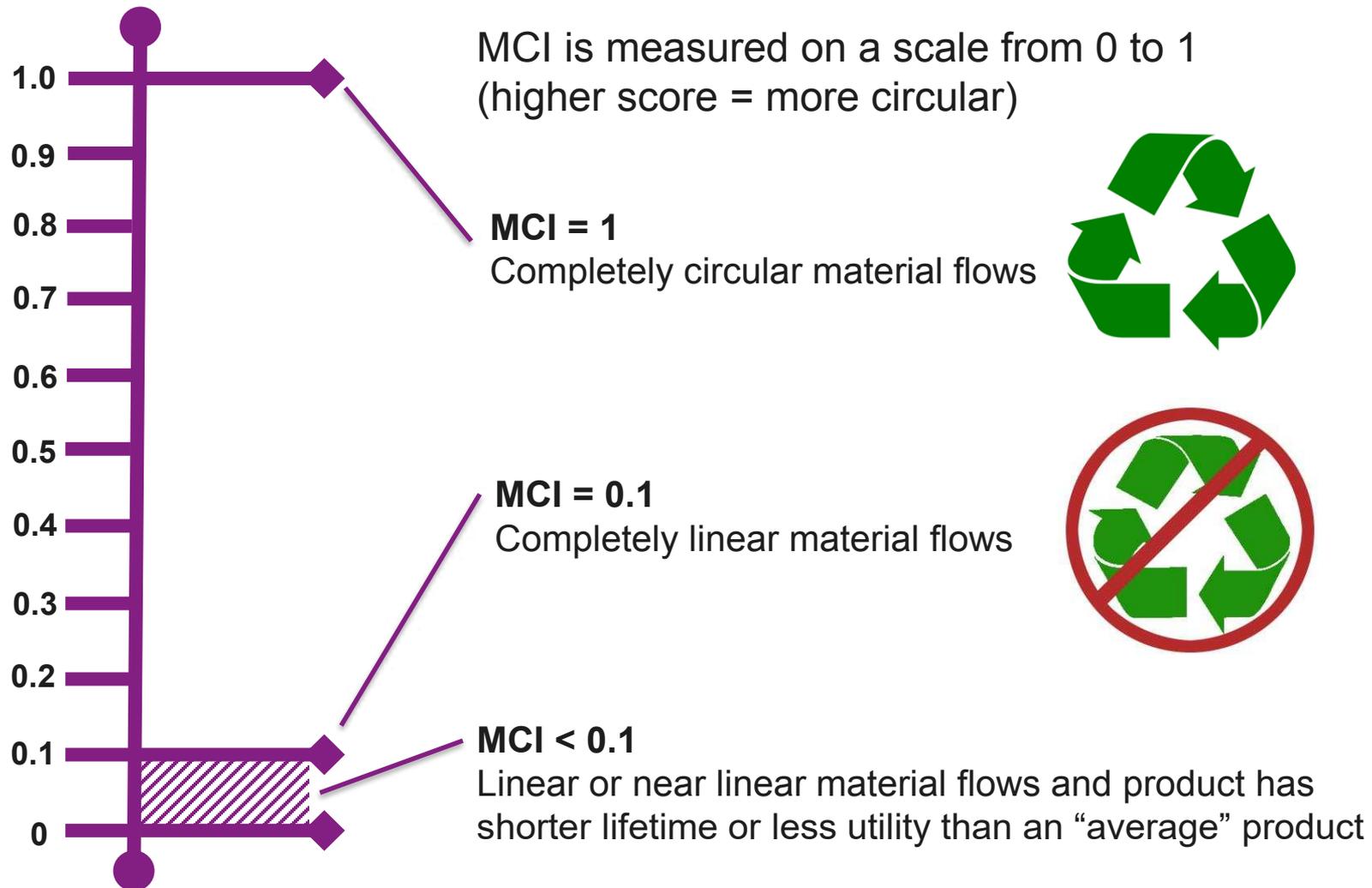
$$W'_C = (M' - M)(1 - E'_C)P'_R$$

$$MCI'_P = max\left(0, 1 - \frac{W' + V'}{2M' + \frac{W_F - W_C}{2} + \frac{W'_F - W'_C}{2}} F(X)\right)$$

$$V' = M'(1 - F_R - F_U)$$

$$W'_0 = (M' - M)(1 - P_R' - P_U')$$

$$W'_F = (M' - M)\frac{(1 - E_F)F_R}{E_F}$$

$$\ldots + W'_0 + \frac{W'_F + W'_C}{2}$$
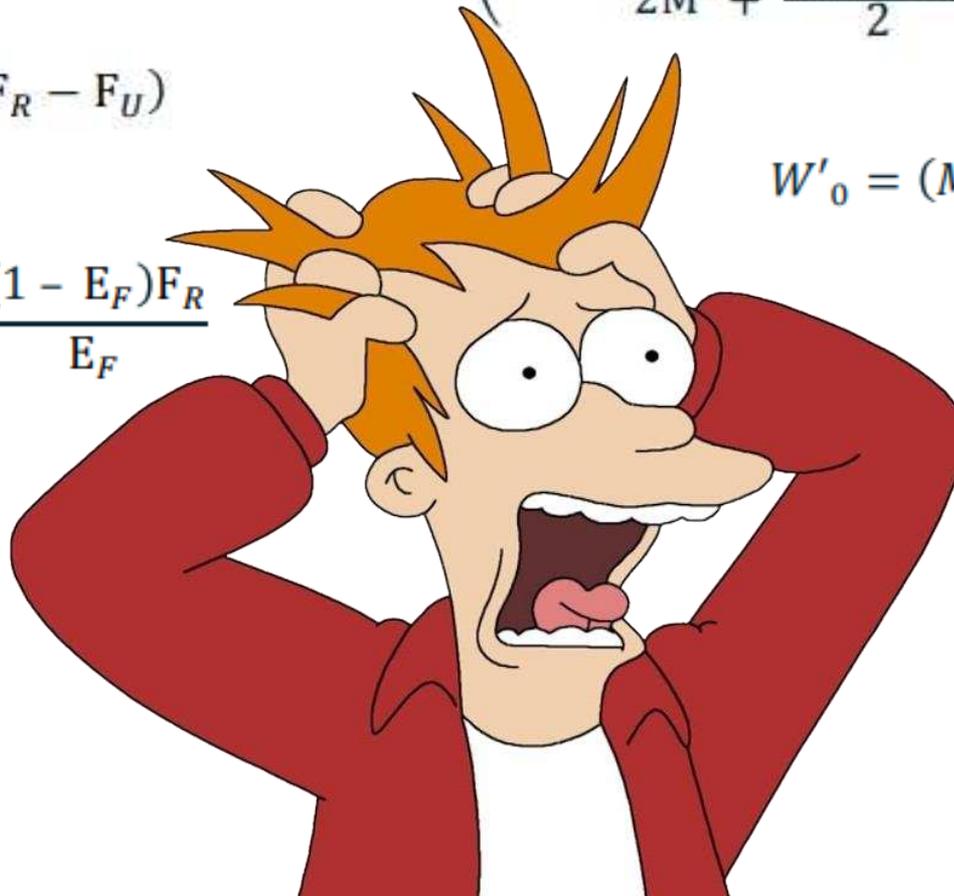
Calculating Circularity in GaBi

Photo by Martin Reisch on Unsplash

MCI data requirements

Type of data required	MCI	LCA
Material source (virgin/recycled/reused)	✓	
Losses from manufacturing process	✓	
Treatment of manufacturing losses	✓	
Treatment of waste product at end of life	✓	
Efficiency of recycling processes	✓	
Product mass	✓	
Product lifetime	✓	
Product use intensity	✓	
Lifetime of average product	✓	
Use intensity of average product	✓	

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Treatment of waste product at end of life	✓	✓
Efficiency of recycling processes	✓	✓
Product mass	✓	✓
Product lifetime	✓	(✓)
Product use intensity	✓	(✓)
Lifetime of average product	✓	
Use intensity of average product	✓	

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A GaBi LCA model:
quantifies raw material
inputs and waste outputs

LCA model

…but to calculate the MCI more
information is needed (e.g. on
recycled content, recycling efficiency)

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Adapt LCA model by adding "shadow processes" for GaBi to determine the input values for the MCI calculation.

LCA model

Modify

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LCA model

Modify

Calculate

The final MCI calculated using an i-report template or included in a GaBi Envision model.

GaBi Circularity Tool Demonstration

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Example:
WINCER Project

Photo by Mads Schmidt Rasmussen on Unsplash

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Porcelain Stoneware tiles

containing 85% of

recycled materials

WINCER project: **W**aste synergy in the production of **IN**novative **CER**amic tiles

Goal: to develop innovative ceramic tiles containing >80% recycled material from urban and industrial wastes

MARAZZI GROUP

CENTRO CERAMICO
Bologna

Co-funded by the Eco-innovation
Initiative of the European Union

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Traditional ceramic tile average composition

Figure 1

WINCER tile composition

Figure 2

Raw materials *Secondary materials*

Clay
Glass wastes (SM)

Raw ceramic scraps
Transport
Transport

Internal recovery

Milling

Atomization

Pressing & Drying

Glazing

Conventional Tile, MCI = 0.60

Firing

WINCER Tile, MCI = 0.86

Cutting & Packaging
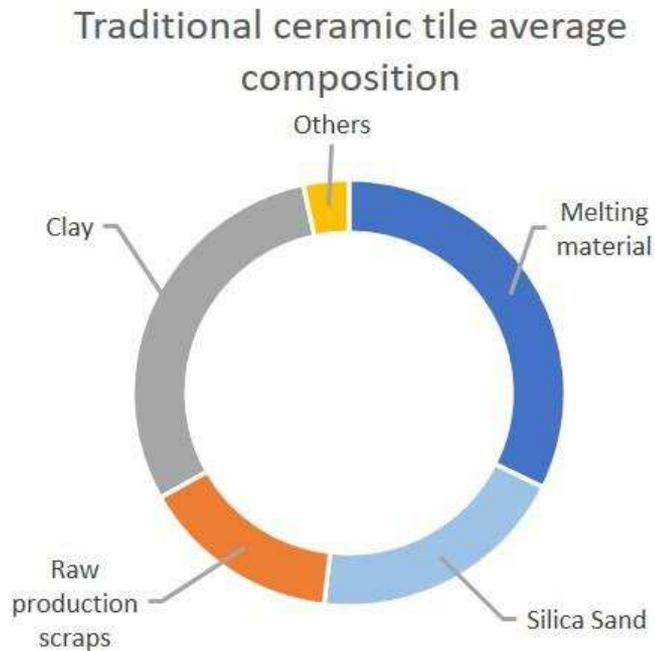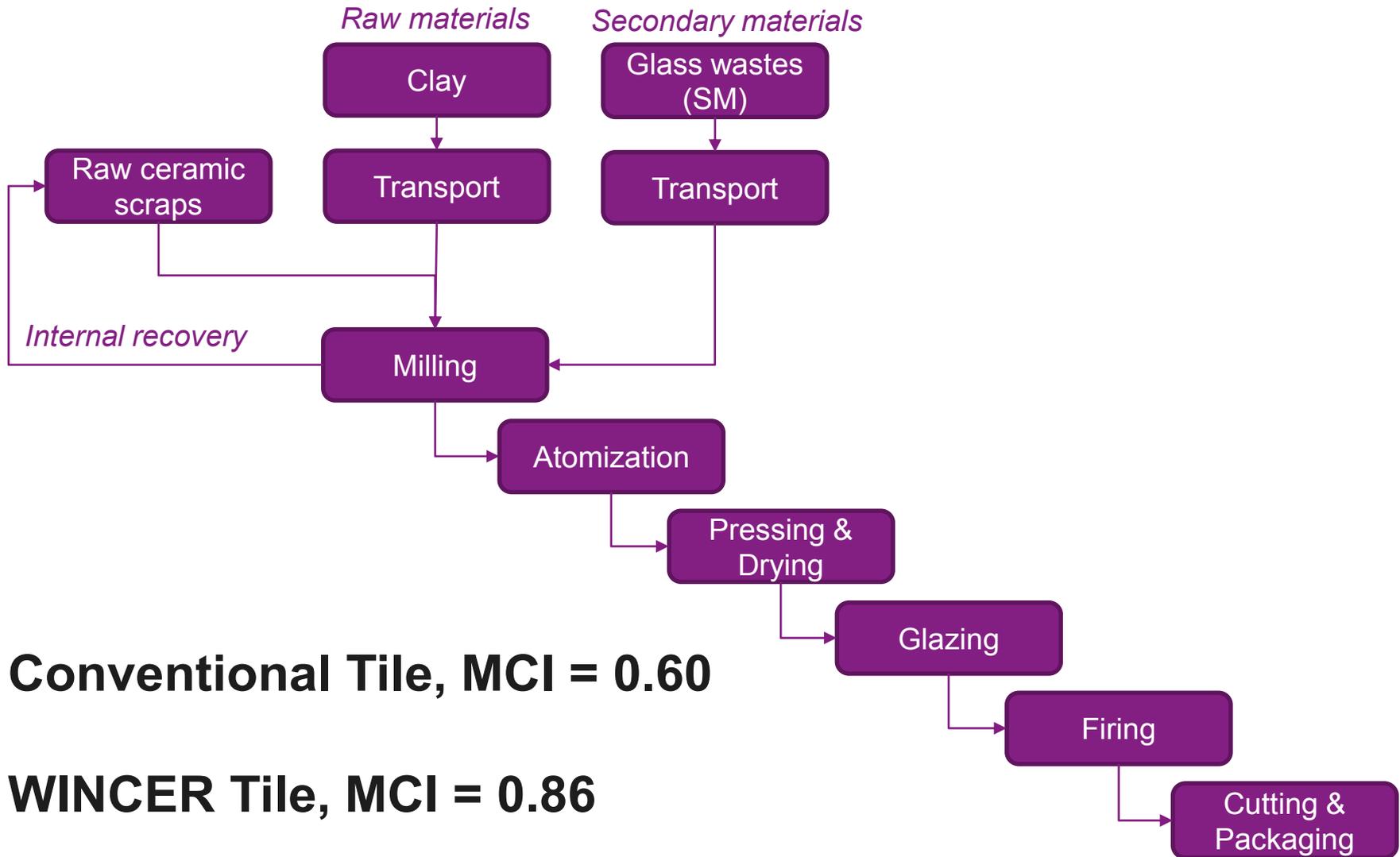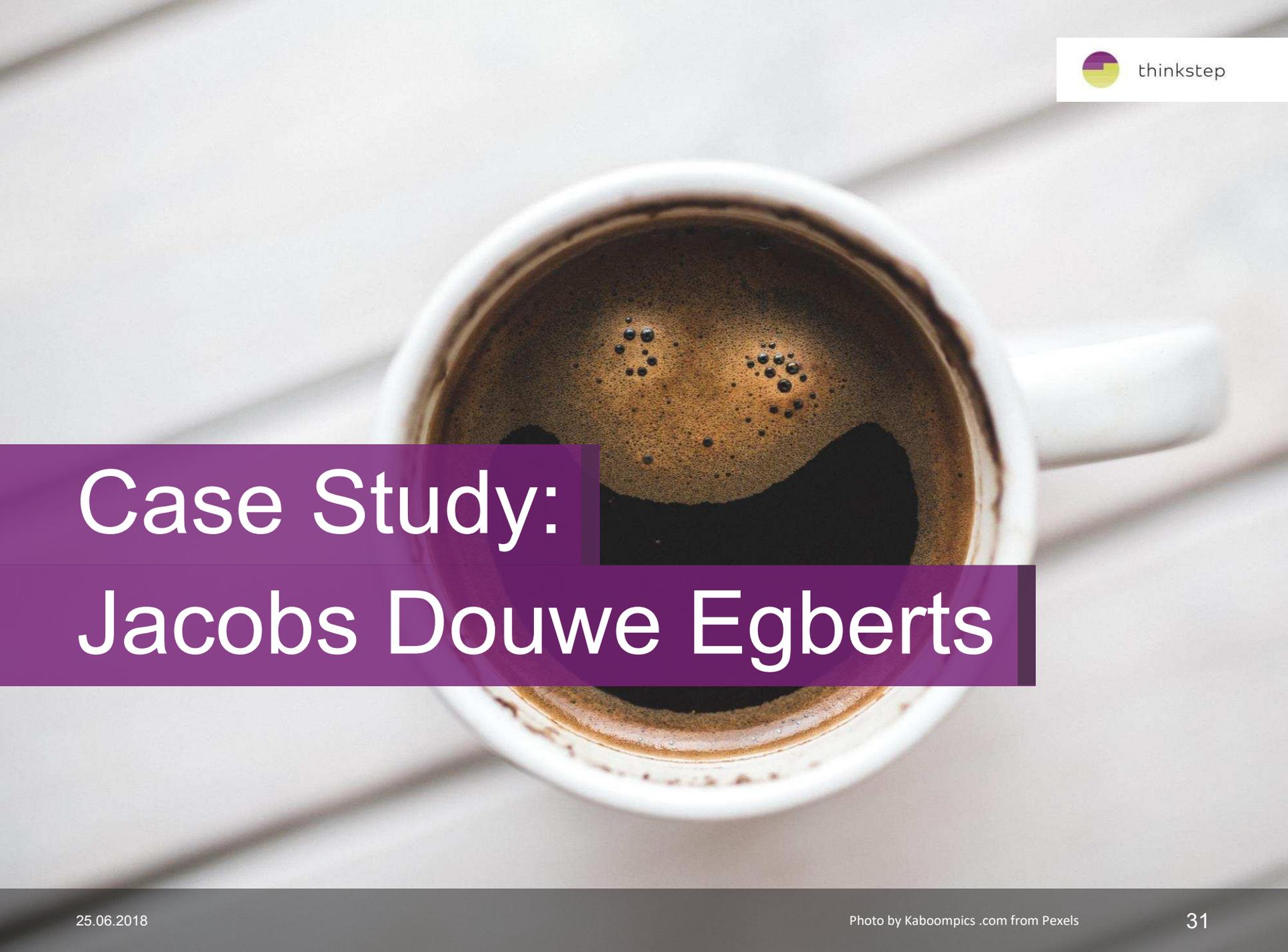
Case Study:
Jacobs Douwe Egberts

Photo by Kaboompics .com from Pexels

Conclusions

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With the GaBi Circularity Tool you can simply and easily apply the MCI approach to product assessments

GaBi does the "heavy lifting"	Available supporting information
Apply to existing models	Complements LCA metrics

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Options include…

LCA consulting project

GaBi Envision project

Workshop/training and MCI toolkit

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Thank you
for your attention!