



HOW TO IDENTIFY SUSTAINABLE PACKAGING SOLUTIONS: A PRAGMATIC APPROACH SUPPORTING COMPLEX DECISION MAKING

November 8, 2018

Cecile Querleu
Consultant

A high-angle, close-up photograph of a group of people in a meeting. They are gathered around a table, looking at a laptop and several sheets of paper. The laptop screen displays a colorful dashboard with various charts and graphs. The papers on the table contain handwritten notes and diagrams. The people are wearing casual business attire, and the overall atmosphere is collaborative and focused.

A few thoughts on the dynamics surrounding packaging

Take, Make, Waste

- 5 millions of tons of household packaging per year in France
- A French household = 10 packaging thrown away per day on average**
- Packaging waste = 30% in weight, 50% in volume of the total quantity of household waste

(CNIID)



thinkstep

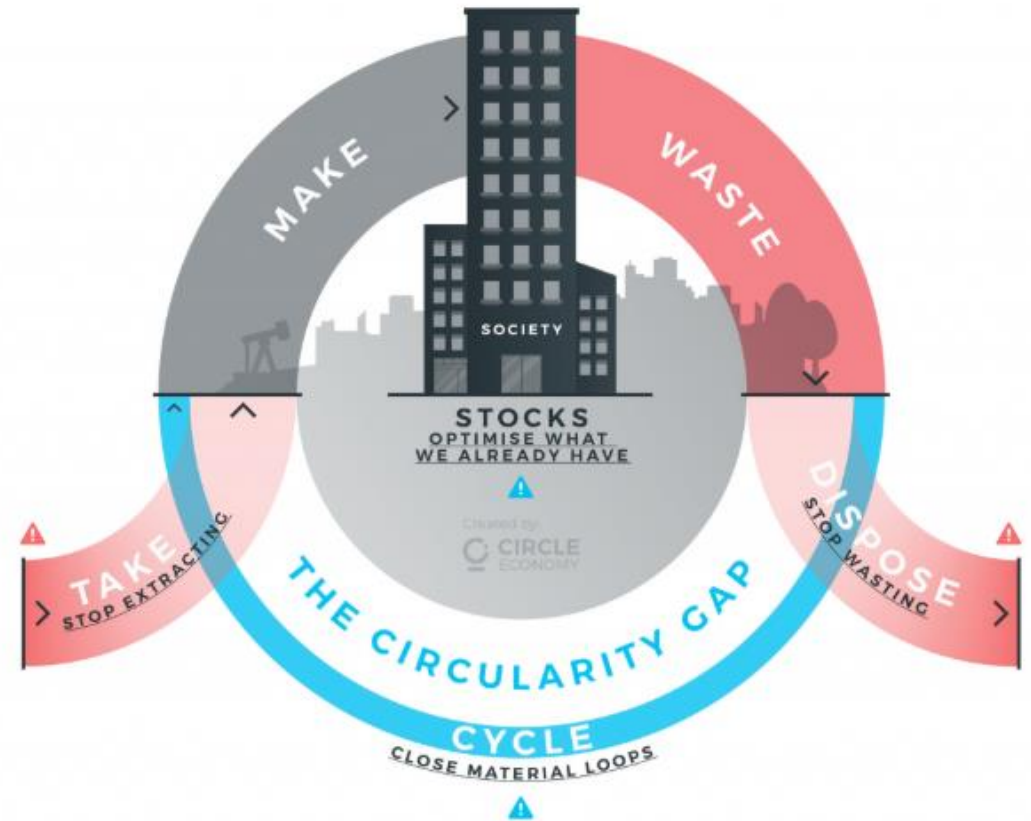
Current status

- Today: packaging is a growing market
- Recycling: up to 80% for glass but not more than 22% for plastics
- The rest: burnt, landfilled

(CNIID)

TO BRIDGE **THE CIRCULARITY GAP** WE NEED TO:

- ▲ Stop extracting
- ▲ Stop wasting
- ▲ Optimise what we already have
- ▲ Cycle more and better



Rising public demand for sustainable packaging



- **46% of French people find their packaging invasive** (compared to 23% in 2000)
- And 34% think that we could do without it (3 times more than in 2000)

(CNIID)



Packaging under pressure



thinkstep



EU Goals & Targets for the CE



Common EU target for recycling (by 2030):

- 65% of municipal
- 75% of packaging waste
- Simplified definitions & harmonized calculation methods for EU recycling rates



Binding landfill target (by 2030): to reduce landfill to max. of 10% of municipal waste



Ban on landfilling of separately collected waste

Source:



Trends for the Packaging sector

Where things become complex



thinkstep

- First: lightweighting (bottles, cans, etc.)
- But when not possible anymore (technical limit): simplification of packaging, optimization of volume, use of refills
- Changing materials: integration of recycled or biodegradable material, working on recyclability or biodegradability
- Rethinking the couple product / packaging (packaging functionality) to reduce environmental footprint (concentrated laundry, compressed deodorant)

(ADEME)

The 7 functions of Food Packaging

Where things become complex



thinkstep

- Preserve the quality of the food
- Prevent microbiological risk
- Prevent chemical risk
- Preserve the integrity of the packaging and his content
- Preserve the environment
- Meet the processability requirements of materials
- Communicate with the consumer


Packaging under pressure

Summary



thinkstep

- Function is priority
- There is no „one-fits-all“ solution regarding sustainability
- New designs and new ideas are needed
- **How can we tell what is more sustainable?**



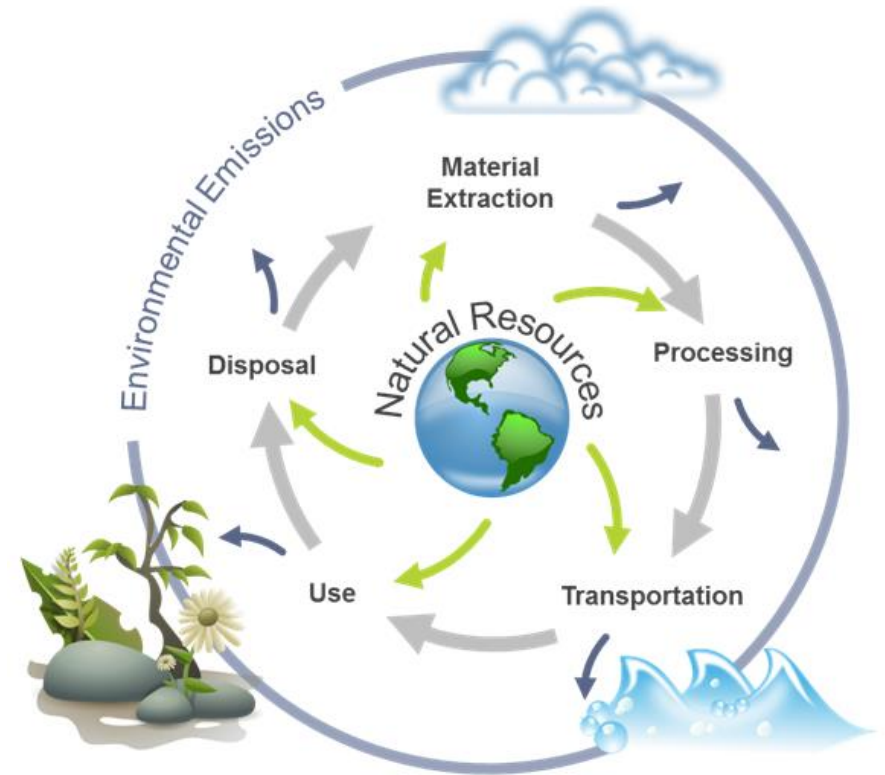
Simply calculate your
packaging's sustainability!

Life Cycle Assessment (LCA)



thinkstep

- Considers raw materials, production, distribution, use, and end of life
- Based on internationally established, scientific approach



Life Cycle Assessment (LCA)

Environmental impacts such as:

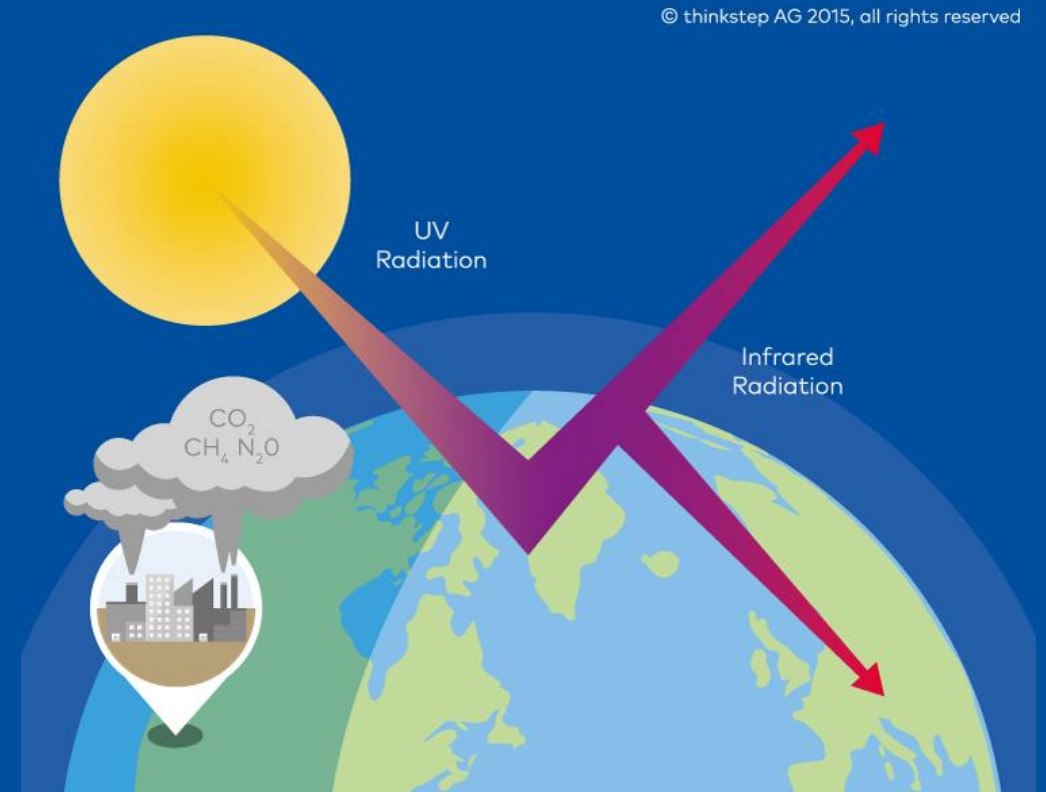
Carbon footprint

Photochemical Ozone depletion potential

Primary energy demand from fossil fuels

Water consumption

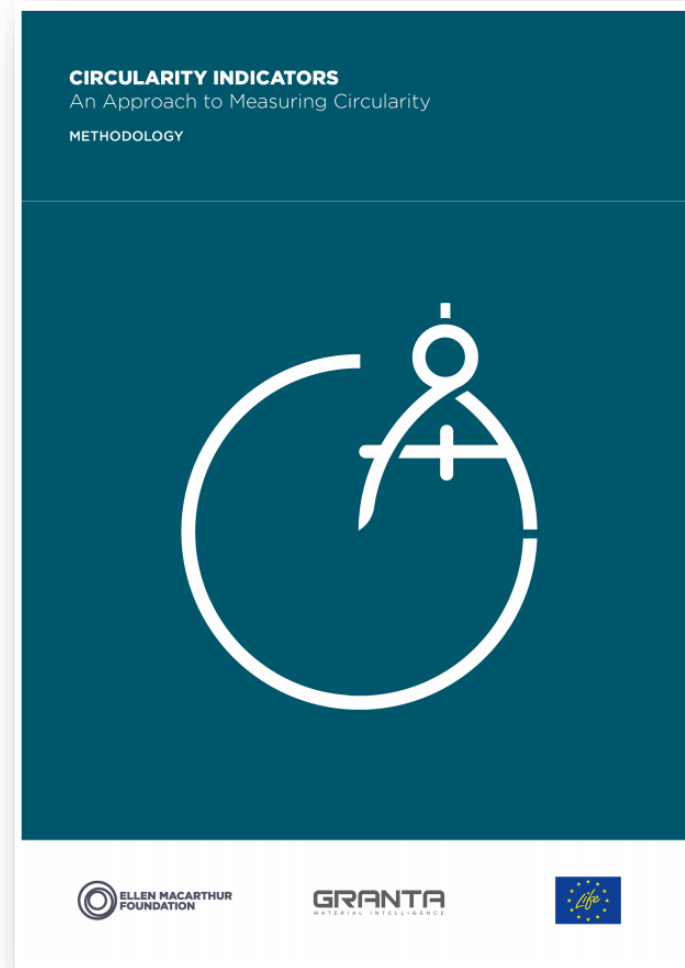
...



Material Circularity Indicator (MCI)

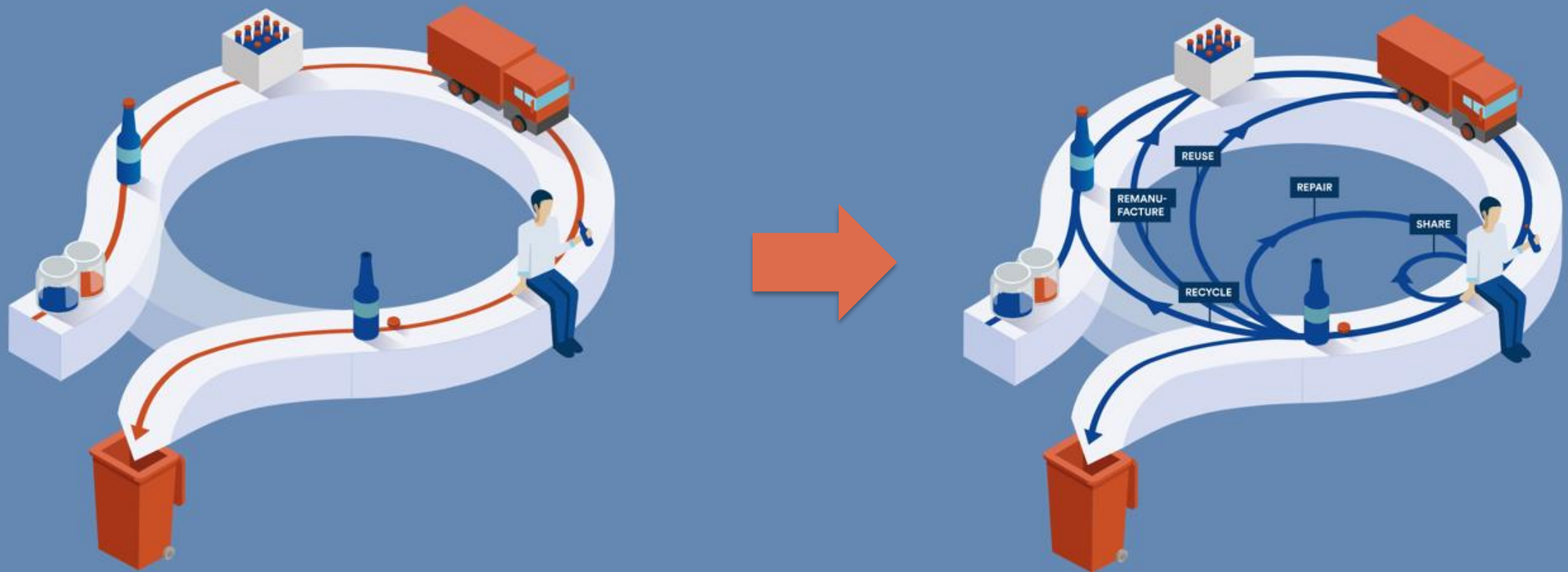


thinkstep



https://www.ellenmacarthurfoundation.org/assets/downloads/insight/Circularity-Indicators_Methodology_May2015.pdf

Material Circularity Indicator (MCI)



How?

GaBi Packaging Calculator



thinkstep

- Based on **GaBi Envision Web platform** (standard web browser, high quality LCA models, GaBi database).
- Allows the **comparison of different scenarios** and provides **immediate results** (PDF report).
- Covers the complete life-cycle of packaging solutions.**
- It supports the evaluation of activities about the “**extended producer responsibility**” such as take-back systems (not cradle-to-gate but cradle-to-grave).



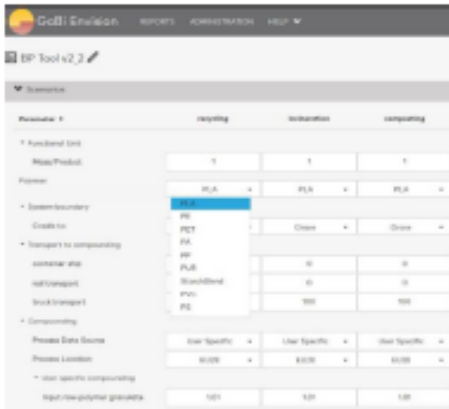
thinkstep
GaBi

Our answer

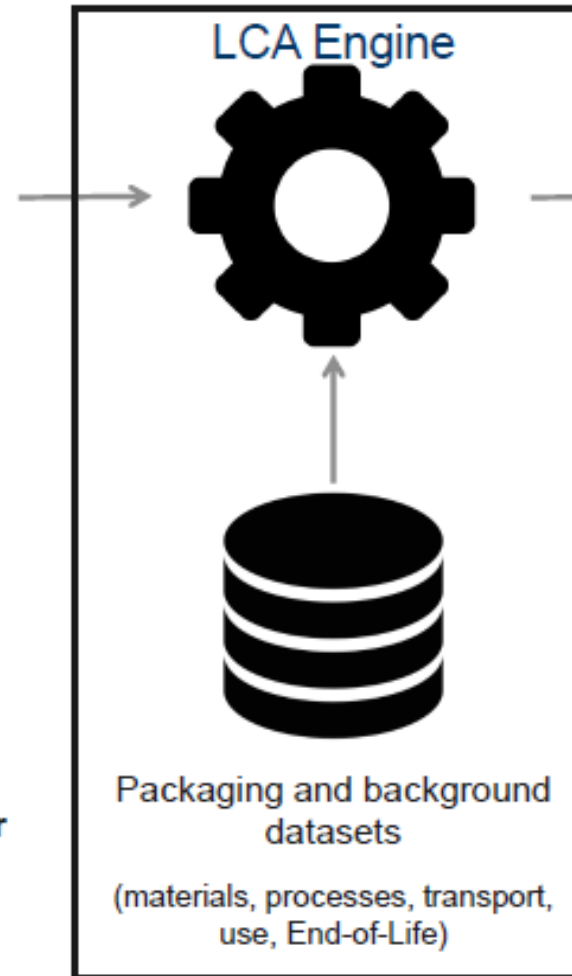
GaBi Packaging Calculator



thinkstep



- Manual entry of parameter values
- Comparison of alternatives
- Inclusion of further materials and processes possible
- **Company-specific solution**
- **Shared platform with confidential access area for each company**



- **Fully customizable report (pdf)**
- Set-up as datasheet possible
- Automatic calculation of results
- Result display as graphs and/or tables
- Background information
- Company logo








Our answer

GaBi Packaging Calculator




thinkstep

GaBi Envision REPORTS ADMINISTRATION HELP ▾ Flora D'Souza ▾





GLO_ Life Cycle of Packa...       



Calculation status: **finished**

Text Variables


Scenarios 

Parameter ▾	Baseline	Alternative
General overview		
Consumer packaging		
Display packaging		
Shipment packaging		
Packaging & filling		
Product distribution		

Tables and Charts   Resize / Close  

1 / 36  

GaBi Packaging Calculator
- a thinkstep solution
thinkstep Packaging Calculator



thinkstep

Characteristics

Full LCA Model built using the latest GaBi Databases

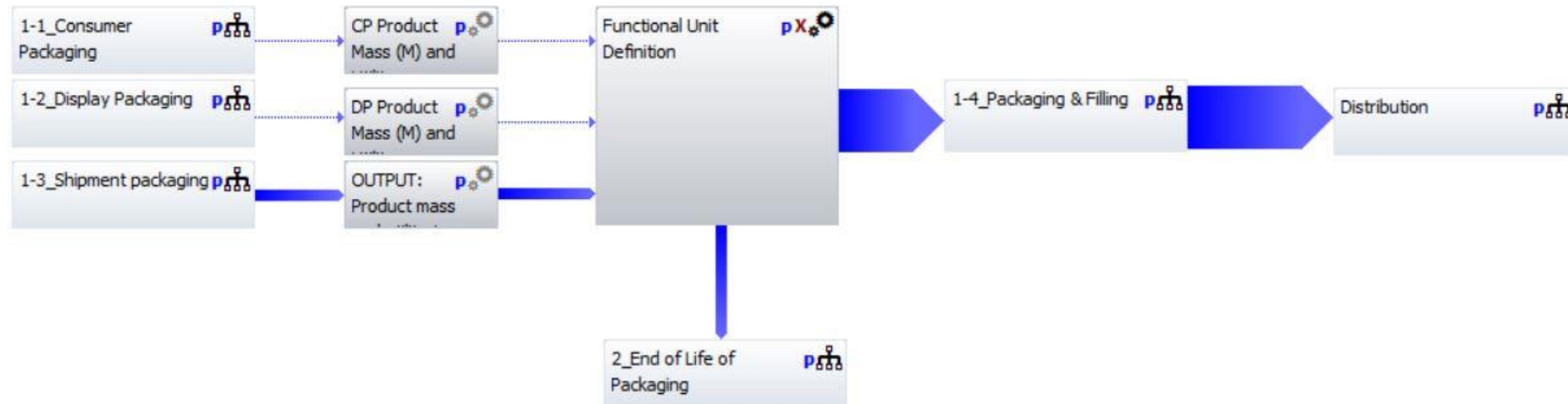


Life Cycle of Packaging 2018

GaBi Prozess-Plan: Mass [kg]

p

Selection: Life C



Online packaging calculator



thinkstep

GaBi Envision REPORTS ADMINISTRATION HELP ▾ Sophie Kieselbach ▾

Packaging Calculator_ts_Version1... [Icons]

Global Settings
Text Variables
Scenarios

Parameter ▾	Baseline	Alternative	Comment
General overview			
Consumer packaging			
Display packaging			
Shipment packaging			
Packaging & filling			
Product distribution			
End-of-life of packaging			

1 / 33

Packaging Sustainability Calculator

A thinkstep Solution

Comparison of two packaging alternatives

= Report =

< Inputs and results >
side by side

Out-of-the-box tool today

OR

*Customized tool tomorrow**

**Delivery timing a function of project scope :-)*

Comprehensive parameter choices

42 raw materials, 16 manufacturing processes, 7 geographic regions, EoL



thinkstep

Plastic: EVOH

Manufacturing: EVOH, HDPE, LDPE, PA (nylon), PET, PP, PP oriented, PS, PU, PVC

Recycled content: 50

Plastic: PET

Manufacturing: Injection moulding

Recycled content: Blow moulding, Extrusion, Film uncoated, Film thermoformed, Film metalised, Injection moulding

Transport to pack site: Air, Rail

Shipment packaging: Region of manufacturing: EU28

- Plastics
- Bioplastics
- Foams
- Natural materials
- Metals

EU28, United States, China, Japan, South America, Australia, India

End-of-life of packaging: Region of EoL treatment: EU28, EU28. Select location for end-of-life treatment

End-of-life plastics: EoL EVOH

Landfill	0	0	[0-100%] Plastics to landfill
Recovery	50	50	[0-100%] Plastics to incineration with energy recovery
Recycling	50	50	[0-100%] Plastics to recycling

Dynamic results analysis



GaBi Envision REPORTS ADMINISTRATION HELP Sophie Kieselbach

Packaging Calculator_ts_Version 1...

Scenarios

Parameter	Baseline	Alternative	Comment
Region of manufacturing	EU28	EU28	Select manu
Plastics			
HDPE part (crate, tray etc.)			
Mass of part	0	0	[g] Mass of
Recycled content	0	0	[%] Recycle
Use cycles	1	1	Number of u
Transport to pack site			
Air	0	0	[km] Transp
Rail	0	0	[km] Transp
Road	0	0	[km] Transp
Sea	0	0	[km] Transp
LDPE film			
PET film			

2.2.1 Equivalency Calculator

Impact Category	Equivalency in each Impact Category	Baseline	Alternative
Climate change [kg CO2 eq.]	driving a passenger car for [km] ^{a)}	0.298	0.412
Acidification [moles H+ eq.]	quantity of emissions is sufficient to damage [kg] of calcium carbonate-based minerals (used for construction of historical monuments or present in coral reefs)	0.000219	0.000551
Eutrophication freshwater [kg P eq.]	emissions could make [L] of natural spring drinking water unhealthy to drink ^{b)}	0.00243	0.00447
Photochemical ozone formation [kg NMVOC eq.]	emissions value reported could bring this amount of [m3] of air from the safe level to dangerous level of air quality for outdoor sports ^{c)}	0.188	0.224
Primary energy demand, total [MJ]	amount of energy with which you could power a laptop for this many hours [h] ^{d)}	0.27	0.572

a) Assuming that car complies with EURO6 emission standard and has engine size between 1.4 and 2 liters. Gasoline use for one km is 0.0505 kg gasoline.
 b) Maximum value for phosphate in drinking-water in order to be still considered healthy is 5 mg/liter, according to German Water Regulation act (2001).
 c) Ozone concentration limit is 100 µg/m3 for 8-hour mean, according to the WHO (2011).
 d) The model in consideration is Dell XPS 14 Laptop with 69 Watt of active mode power, reported by the producer.

The equivalency calculator represents the values that are converted from the environmental impact categories into relative situations known to a user. In each category, it is seen how the amount of environmental impact is translated into different units.

2.2.2 Material Circularity Indicator

A circular economy aims to maintain the value of products, materials and resources for as long as possible by returning them into the product cycle at the end of their use, while minimizing the generation of waste. The fewer products we discard, the less materials we extract, the better for our environment. This process starts at the very beginning of a product's lifecycle: smart product design and production processes can help save resources, avoid inefficient waste management and create new business opportunities. The Circularity Indicator shows how circular your product is, where 0,1 means that your product is completely linear and a number close to 1 means that you have a circular product. The methodology used in this report is based on the Ellen MacArthur Foundation's methodology published in "Circularity Indicators: An Approach to Measuring Circularity, Ellen MacArthur Foundation and Granta Design, 2015."

	Baseline	Alternative
Material Circularity Indicator	0.595	0.499

Put things in perspective with **equivalencies** („same as driving X miles“)

Track how **circular** your solutions are

■ **The complexity of the decision making process is not eliminated with this tool:** the user still needs to decide which environmental criteria are most relevant in the context of his packaging solution.

■ **But this tool provides a platform which is easy-to-use** (no more than 30min introduction on functionalities required) and is:

- based on high-quality LCA data,
- extendable to individual (e.g. company-specific) needs,
- flexible with the application of numerous parameters (which support e.g. sensitivity analyses),
- flexible in the selection of result indicators,
- and provides a report template for communication purposes.

Summary

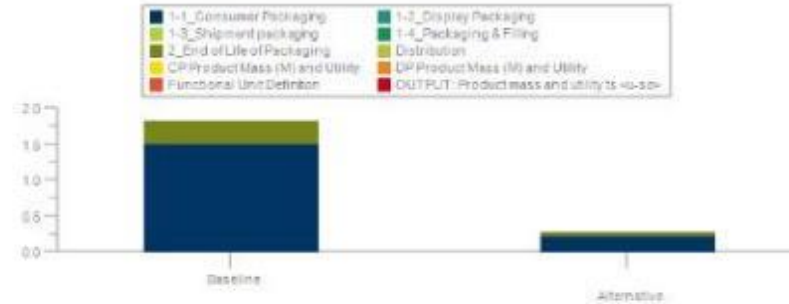
- Assess existing product portfolio
- Inform R&D, prototyping
- Respond to stakeholder inquiries
- Measure, manage, improve your product environmental impacts

Rapid sustainability assessment for everyone on your team!



2.2 Scenario Overview

Climate change midpoint excl. biogenic carbon (CO2 eq)



	Baseline	Alternative
Acidification midpoint (v1.09) [Mole of H+ eq.]	0.00205	0.000908
Climate change midpoint, excl. biogenic carbon (v1.09) [kg CO2 eq.]	1.87	0.38
Climate change midpoint, incl. biogenic carbon (v1.09) [kg CO2 eq.]	1.87	0.38
Eutrophication freshwater midpoint (v1.09) [kg P eq.]	1.81E-005	3.72E-006
Eutrophication marine midpoint (v1.09) [kg N eq.]	0.000678	0.000302
Eutrophication terrestrial midpoint (v1.09) [kg N eq.]	0.00648	0.000973
Ionising radiation [kg U235 eq.]	0.0917	0.0137
Particulate matter [kg PM2.5 eq.]	8.36E-005	1.32E-006
Photochemical ozone formation midpoint, human health (v1.09) [kg NRVOC eq.]	0.00262	0.000993
Resource depletion, mineral, fossil and renewables, midpoint (v1.09) [kg \$ eq.]	1.76E-006	3.84E-007
Primary Energy Demand, Non-Renewable [MJ]	34.2	5.13
Primary Energy Demand, Renewable [MJ]	2.13	0.319
Primary Energy Demand, Total [MJ]	36.3	5.44
AWARE, OECD-BRIC average for unspoiled water [m³ world equiv.]	0.558	0.0817
Blue water consumption [kg]	17.4	2.81

The fields in the above table are coloured in GREEN when an alternative has a value that is 20% lower than that of the product in the first column, and are coloured in RED when an alternative has a value that is 20% higher than that of the first product.

2.2.1 Equivalency Calculator

Impact Category	Equivalency in each Impact Category	Baseline	Alternative
GWP(100) [kg CO2 eq.]	driving a passenger car for [km] ^{a)}	0.63	1.44
Acidification Potential [kg SO2 eq.]	quantity of emissions is sufficient to damage [kg] of calcium carbonate-based minerals (used for construction of historical monuments or present in coral reefs)	0.00267	0.0004
Eutrophication Potential [kg Phosphate eq.]	emissions could make [l] of natural spring drinking water unhealthy to drink ^{b)}	66.7	10
POCP [kg Ethene eq.]	emissions value reported could bring this amount of [m³] of air from the safe level to dangerous level of air quality for outdoor sports ^{c)}	4.29E03	643
Primary Energy Demand, Total [MJ]	amount of energy with which you could power a laptop for this many hours [h] ^{c)}	14	2.59

a) Assuming that car complies with EURO6 emission standard and has engine size between 1.4 and 2 liters. Gasoline use for one km is 0.0505 kg gasoline.
 b) Maximum value for phosphate in drinking water in order to be still considered healthy is 5 mg/liter, according to German Water
 c) Maximum value for ozone in air is 120 µg/m³

Future-Proof Your Business.

thinkstep AG

Hauptstrasse 111-113
70771 Leinfelden-Echterdingen
Germany

Phone: +49 711 341817-0

Fax: +49 711 341817-25

info@thinkstep.com

www.thinkstep.com

Cécile Querleu



Lyon, France

cecile.querleu@thinkstep.com

06 37 54 59 07

Copyright

All the strategies, models, concepts, ideas, calculations and conclusions incorporated into this documentation are, except explicitly stated otherwise, the exclusive intellectual property of thinkstep AG and are protected by copyright.

They have been turned over to the client/user exclusively for his own use for an unspecified time period. All included information is to be kept confidential and is intended for the user's eyes only. The client/user is not authorized to modify this documentation or to publish, reproduce or distribute it in whole or in part outside his own company.

This provision may only be amended or revoked with the express written consent of thinkstep AG. Verbal agreements shall not be deemed valid. thinkstep AG does not assume liability for the accuracy, completeness and up-to-dateness of the provided content.

© thinkstep AG [2018] – All rights reserved

