



**CIRCULAR  
DESIGN  
FORUM**

Circular, together!



# Sustainable Materials Knowledge Stream

Session report out. 26<sup>th</sup> April 2023

Hosted by Furnify  
Supported by Circu Leren

**CIRCULAR  
DESIGN  
FORUM**

# The Team



Circular Consultant & Designer

**Janina Nieper**

Furnify



Circular Accelerator

**Clarice van den Berg**

Furnify



Managing Director

**Sabrina van Dongen**

Furnify



Founder

**Marije Remigius**

Circu Leren

# Furnify. Main organisers

## Janina Nieper

Circular Consultant, Designer & Business Developer

Janina Nieper is an Architect and Designer passionate about concepts promoting the well-being of the planet and its habitants, such as Donut Economics by Kate Raworth. She endorses the Circular Economy as a means to stay within planetary boundaries. Driven by her passion for the circular economy, Janina has actively pursued knowledge and expertise in the field. She has completed various certifications and participated in workshops accredited by institutions such as TU Delft, the Circular Economy Institution, the Ellen MacArthur Foundation, and Cambridge University.

With an effective altruistic mindset, Janina truly believes in looking for leverage points. One of the reasons she has deep-dived into the materials that we choose as Architects and Designers. Eager to accelerate the Circular Economy through connecting, collaboration, and sharing she founded the Circular Economy Club in Amsterdam, a non-profit focusing on creating a network of Circular Pioneers through regular events. [Linkedin](#)

## Clarice van den Berg

Circular Project Manager

Clarice van den Berg is an experienced interior designer and project manager with a passion for making a positive impact through sustainable spatial design. With a background in interior design, she has expanded her expertise to include project management, allowing her to oversee the entire process from start to finish.

Clarice has developed a keen interest in sustainable materials and circularity throughout her journey. She believes that circularity is the pinnacle of creativity and is constantly on the lookout for innovative and eco-friendly materials. Clarice strives to set a new standard where circularity is both environmentally friendly, aesthetically pleasing, and of high quality. [Linkedin](#)

## Sabrina van Dongen

Managing Director

Sabrina van Dongen is a versatile professional with over 15 years of experience in various fields. Her career started as an interior designer, where her design approach was rooted in a love for raw materials, craftsmanship, and drawing inspiration from the past.

Driven by a desire to ensure her designs were brought to life as intended, Sabrina ventured into project management. This allowed her to oversee and ensure the successful execution of her design visions. Along the way, she became intrigued by PR & Marketing, realizing the importance of conveying the underlying thoughts behind designs, effectively managing projects, and communicating the company's values.

Sabrina's diverse experiences have culminated in her current focus on accelerating circularity through design and action. She believes that creativity is a powerful tool for driving change and aims to make circularity the new norm. Sabrina is enthusiastic about meeting others, listening to their ideas, and collaborating on projects that contribute to a circular future.

[Linkedin](#)



# Circu Leren. Support team.

## Marije Remigius Founder

Marije Remigius is the founder of Circu Leren. With over twenty years of experience as a creator, engineer, and project manager for the interior construction company Fiction Factory, she has devoted her relentless energy in recent years to advancing the sustainability of interiors. In addition to her involvement in exhibitions, international retail and hotel chains, and pavilions, she is actively engaged in various research projects to accelerate the circular economy. Marije is also working on Intermatter, a tool to facilitate the faster selection of sustainable materials.

Marije's mission is to inspire, educate, and provide practical guidance to everyone, leveraging her enthusiastic approach and expertise, to foster a creative mindset towards the sustainable transformation of all interiors. Recognizing that circular construction cannot be achieved alone, Circu Leren operates as a vast network of individuals whom Marije collaborates with, seeking their expertise and energy to accelerate the circular transition together. Thanks to these collaborations, numerous projects have already embraced the principles of Circu Leren. [Linkedin](#)

# Why we organised this session?

The materials we choose represent one of the leverage points of a circular economy. Knowing the impact of a material, and the best use case for it is crucial for a transition. They actively impact the nine planetary boundaries. From Novel Entities (most overshoot) to Climate Change, materials are an important aspect for change.

We believe that creating the KS on Sustainable Knowledge will help us to foster knowledge and transparency. By exploring different methodologies, participants can gain a deeper understanding of sustainable material choices, evaluation criteria, and measurement techniques, enabling informed decision-making whilst navigating the complexities of material selection.

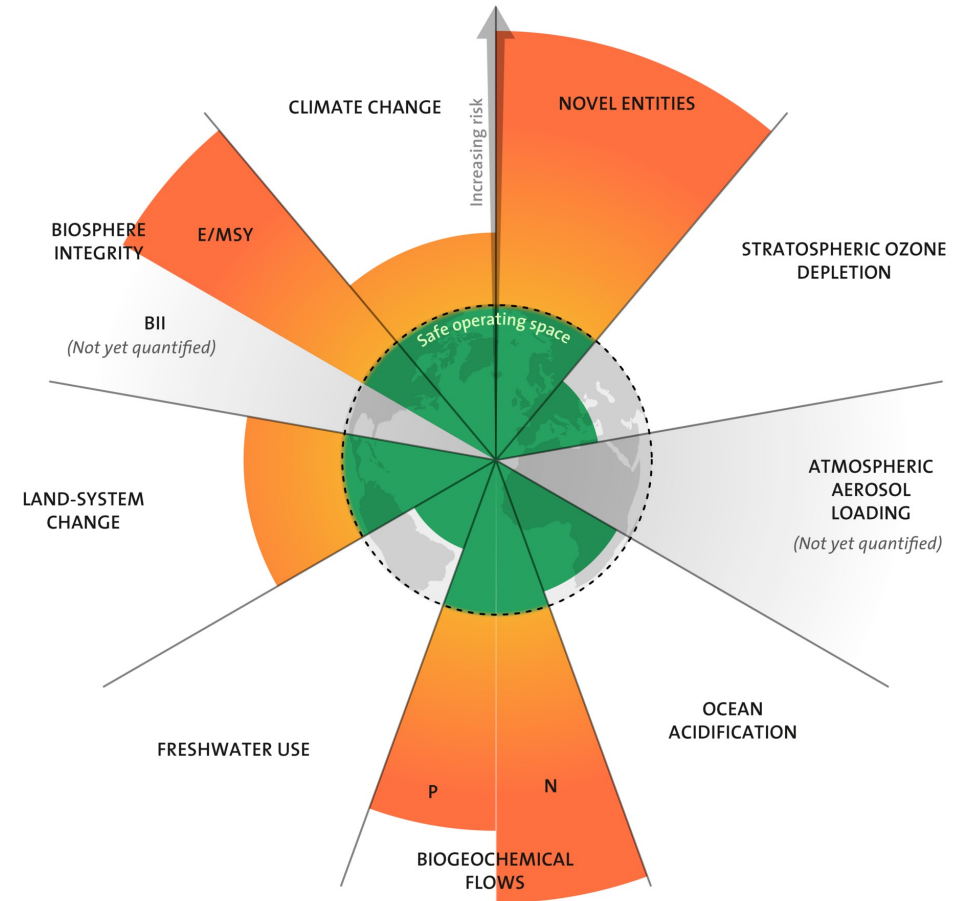


Image credits: Stockholm Resilience Center

# Goals of the session

## The goal

The goal of this Knowledge Stream was to delve deep into materials and their evaluation methodologies, focusing on understanding what makes a material sustainable and what different methodologies are out there. The session aimed to provide valuable insights into material choices, tools, and methodologies for individuals involved in various fields, such as product design and spatial design. By inviting three different experts in the field we wanted to dive deeper into three different methodologies of accessing a material as 'sustainable'.

## The impact

Hosting keynotes and panel discussions aimed to create an overview of how different organisations approach the topic of materials. The idea was to create an understanding of the complexity behind the materials we choose and allow participants to gain insights into different approaches and evaluation methodologies, enabling them to broaden their perspective on the materials one chooses. A deep-dive on 'What is the best material?' for Metabolic, 2050 Materials, and Circu Leren.

# Session setup

The session consisted of an introduction round and three deep dives into methodologies and a final discussion. It was a hybrid setup that was additionally recorded. One screen served to show the presentation, another the online participants. One camera portrayed the speaker and another the room.

## *The outline*

- A brief introduction round with your favorite material
- 3 different methodologies for looking at materials: System thinking by Metabolic, LCA by 2050 Materials, and Intermatter by Circu Leren
- Discussions



# Introduction round and your sustainable material

The session started with a brief introduction to designing within planetary boundaries. As a next step, a short introduction round was held where participants presented their favorite material and why. A brief selection and reasons.



**Human hair**  
Abundant,  
regenerative,  
and cleans up  
oil spills  
Yumiko Henneberry,  
TU Delft



**Recycled fishing nets**  
From the deep sea: reused, chopped, and 3D printed  
Henry Jagt, Signify



**Notpla**  
A packaging made from seaweed: digestible, biodegradable, and regenerative  
Janina Nieper, Furnify



→ KEY LEARNINGS



**Banana leaf**  
Multiple purposes, waterproof, regarded as 'waste', alternative for takeaway containers in a local context  
Theresa Aigner, Fraunhofer IZM



**Alpaca fiber**  
Softer than cashmere, but more sustainable as Alpacas don't eat the root of the grass, naturally in 24 colors  
Dora Xu, Metabolic



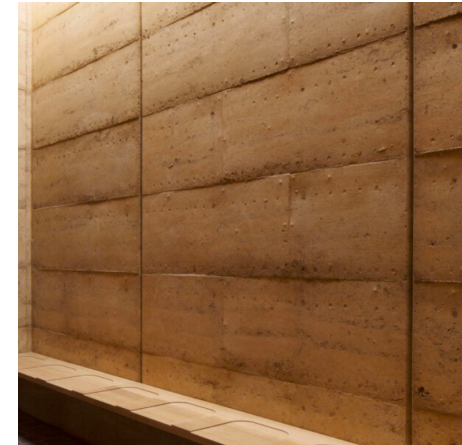
**Pinatex**  
Waste material of pineapples and used as a leather substitute. A multi-purpose material.  
Naomi Atmopawiro, Pezy Group



**Paper pulp**  
Possibilities and aesthetic aspects of paper pulp  
Irene Verduijn, Van Berlo



**Søuld**  
Acoustic material made from eelgrass, a sea plant that binds CO2. No additional binders are needed.  
Lizzy Stuyfzand, Ahrend



**Rammed Earth**  
Abundant and local. It can be fully circular and create a healthy environment.  
Phanos Hadjikyriakou, 2050 Materials

# Talk 1: Applying system thinking to the materials we choose

By Dora Xu

Senior Consultant at Metabolic

Dora is a senior sustainability consultant in the circular materials and products team at Metabolic, a consulting firm specializing in circular economy. She has an MA in Environmental Management from Yale University and training in fashion design. Using system thinking and material flow analysis, she is adept at translating environmental data into clear, actionable insights for business decision-making. When she is not helping companies to reimagine circular designs, source regenerative materials, or engage suppliers, you can find her running a repair cafe in Amsterdam Noord and upcycling damaged clothing.

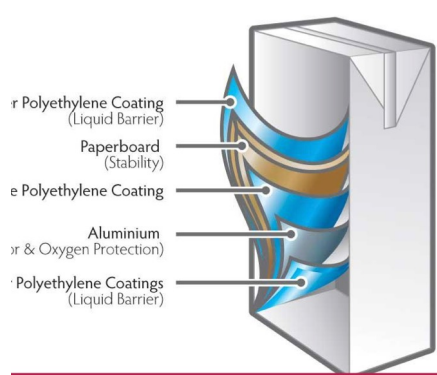


**“The most sustainable material minimizes harm across its lifecycle and fits within the circular systems of its intended market.**



# System thinking with the materials we choose

Dora started off by explaining the benefits of thinking in systems. From understanding trade-offs to avoiding unintended consequences, system thinking is about tackling the root cause instead of symptoms and finding high-impact points for change. Three examples of materials that were well-intended, whilst causing problems in the system they were in.



**TETRA PACK**

**Intended:**

- + Cheap
- + Lightweight
- + Alternative to plastic bottles
- + Improved strength

**Causing:**

- chemical pollution
- Difficulties to recycle in the current system



**BIODEGRADABLE PLASTIC**

**Intended:**

- + Replace petroleum-based plastics
- + Reduce emissions
- + Reduce energy use
- + Reduce toxic chemicals

**Causing:**

- Pressure on land use
- Complicate recycling
- Releases methane on landfill



**COPENHILL**

**Intended:**

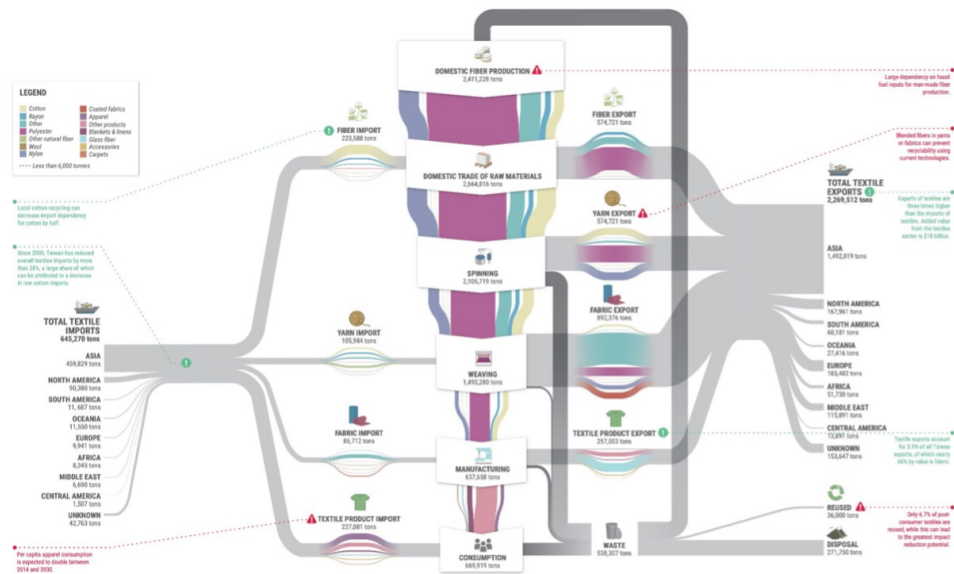
- + Solve the waste problem by providing heat and electricity by burning waste

**Causing:**

- Heavy dependence on waste for electricity and heat
- Less incentive for reuse and recycling
- System lock-in as Denmark now imports waste

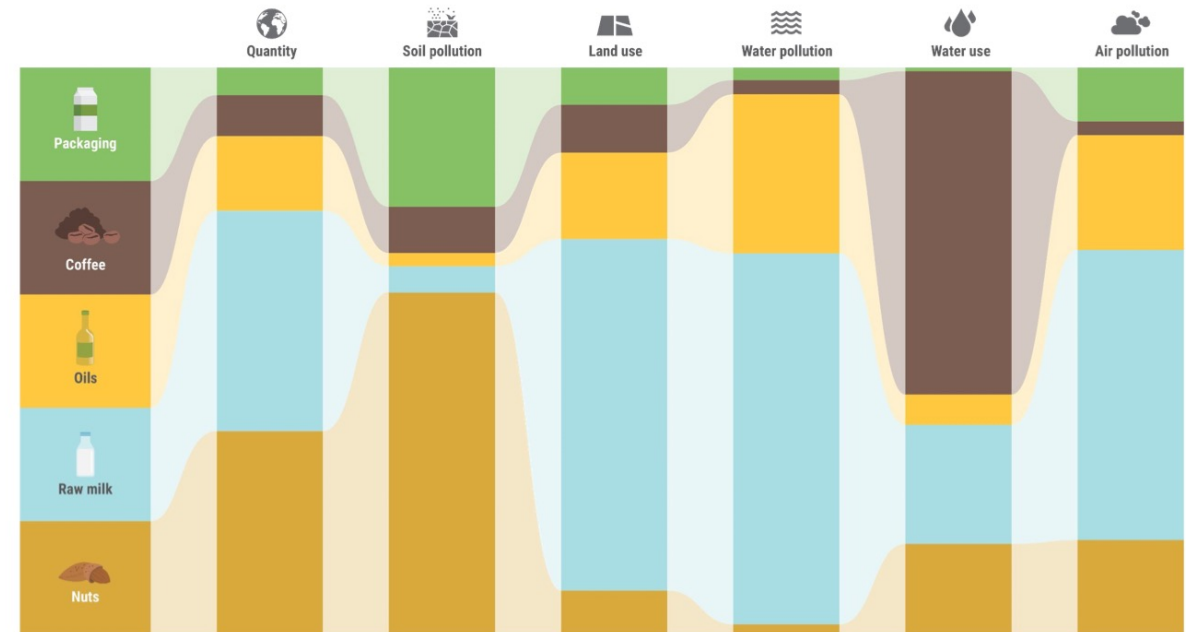
# Metabolic's approach to materials

1) First step, doing a Material flow chart to identify hot-spots.



E.g. a textile company in Taiwan, the flow-chart shows that the highest leverage point for impact is the domestic fiber production of polyester

2) Together with identifying hotspots, the next step is prioritizing. Metabolic differentiates between soil pollution, land use, water pollution, water use, and air pollution.



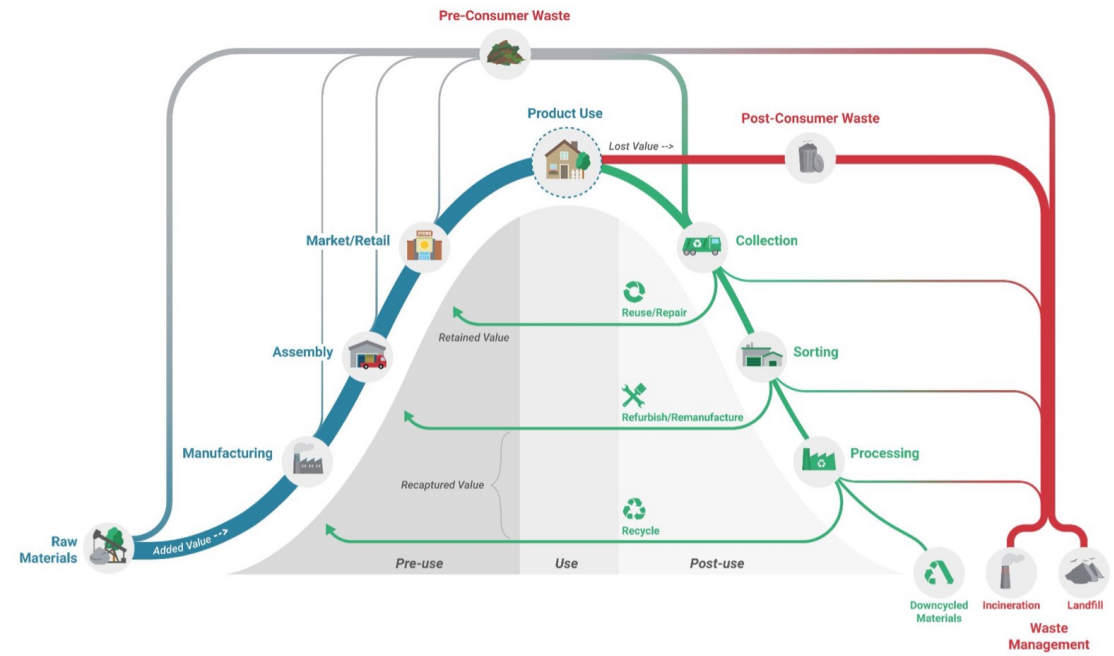
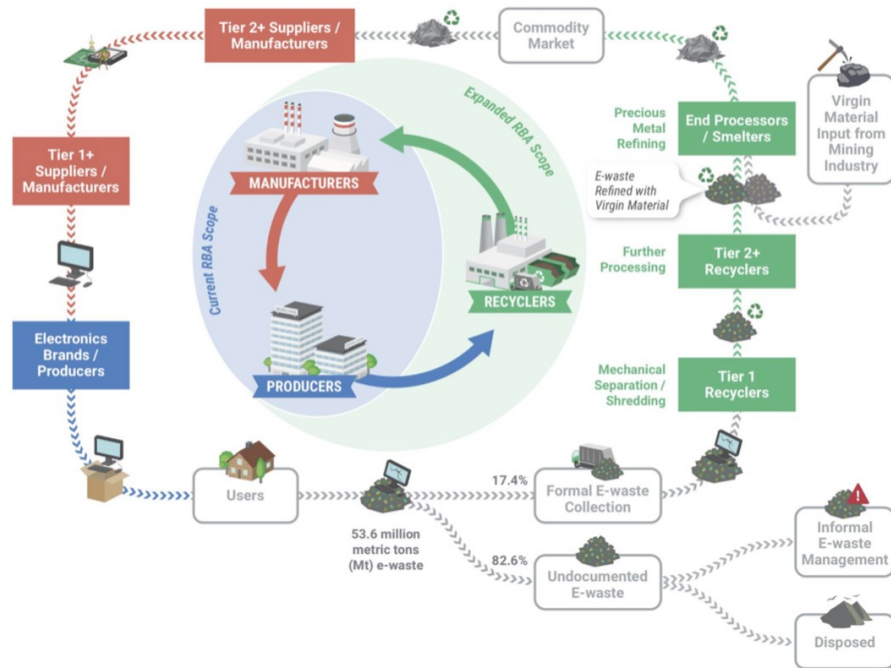
Overlay of high-level lists of materials with a ray of impact categories. This overlay helps prioritize impact depending on the region (e.g. water in water-stressed regions).

# Metabolic's approach to materials

3) Match material traits with value chain dynamics., matching a material life span with its intended use. An example is disposable packaging: Plastic lasts 1000 years for something that should last only a few weeks.

Goal: Slowing down going downhill as much as possible.

For recyclability consider: Does the intended market know how to process them? Does the consumer know how to dispose of them? What material characteristics are needed for it to work? How does the material fit within the broader material strategy?



# Alternative Materials Tool

Metabolic works with a tool that recommends materials depending on the client's criteria. Functional requirements are inserted (e.g. rigid, waterproof, transparent, ...) and the tool recommends materials based on impact using LCA and end-of-life data of the intended countries. The framework intends to incorporate all planetary boundaries if the related data is available.

This tool is especially handy for packaging companies.

The screenshot displays the 'Alternative Materials Tool' interface. It is divided into three main sections: 'Material requirements', 'Recommended Materials', and 'Material Comparison'.

**Material requirements:** This section allows users to specify their needs. It includes options for packaging type (Rigid container, Flexible container, Bag), packaging size (500 mL), and country (Singapore). There are also checkboxes for various functions: Safe for contact with food, Transparent, Shielding user from hot/cold content, Waterproof, Shatterproof, and Reusable.

**Recommended Materials:** This section lists three materials based on their impact scores: 1. Recycled Glass (Score: 78), 2. Glass (Score: 66), and 3. Wood (Score: 51). Each material has a 'Compare' checkbox.

**Material Comparison:** This section provides a detailed comparison of the three materials across various categories. It includes three circular gauges for overall scores (78 for Recycled Glass, 66 for Glass, 51 for Wood) and a table of scores for specific categories.

	r-Glass	Glass	Wood
Overall	78	66	51
Production	100	60	20
Toxicity	100	87	73
Circularity	58	52	37
Littering	70	70	60
End of Life	73	73	73

# Talk 2: Going beyond LCA. What LCA can and can't.

By Phanos Hadjikyriakou

CEO and Founder of 2050 Materials

Phanos leads [2050 Materials](#), a technology company offering a library of sustainable materials and tools for the design and construction industry globally. In the past, he led a global team of climate researchers who advised real estate investors on how to manage the climate risks and opportunities related to their portfolios, as well as how to align their investment strategies with global climate targets.



**“The best material is one that’s transparent about what it’s made of and what its impacts on our climate and health are.”**

## Pro and Con of LCA

### What is Life-Cycle Assessment (LCA)?

Methodology of drawing boundaries around systems based on assumptions, used to understand how materials impact the environment taking the carbon footprint and its source along the process into account.

The problem we face: At the beginning of a project, we have little data and a lot of impact. That's a problem that is currently still difficult, as LCA works best in retrospect.

### Benefits of LCA:

- detailed carbon modeling (based on assumptions, not actual measurement)
- Hotspot analysis (retrospectively)
- Learning how to do better next time

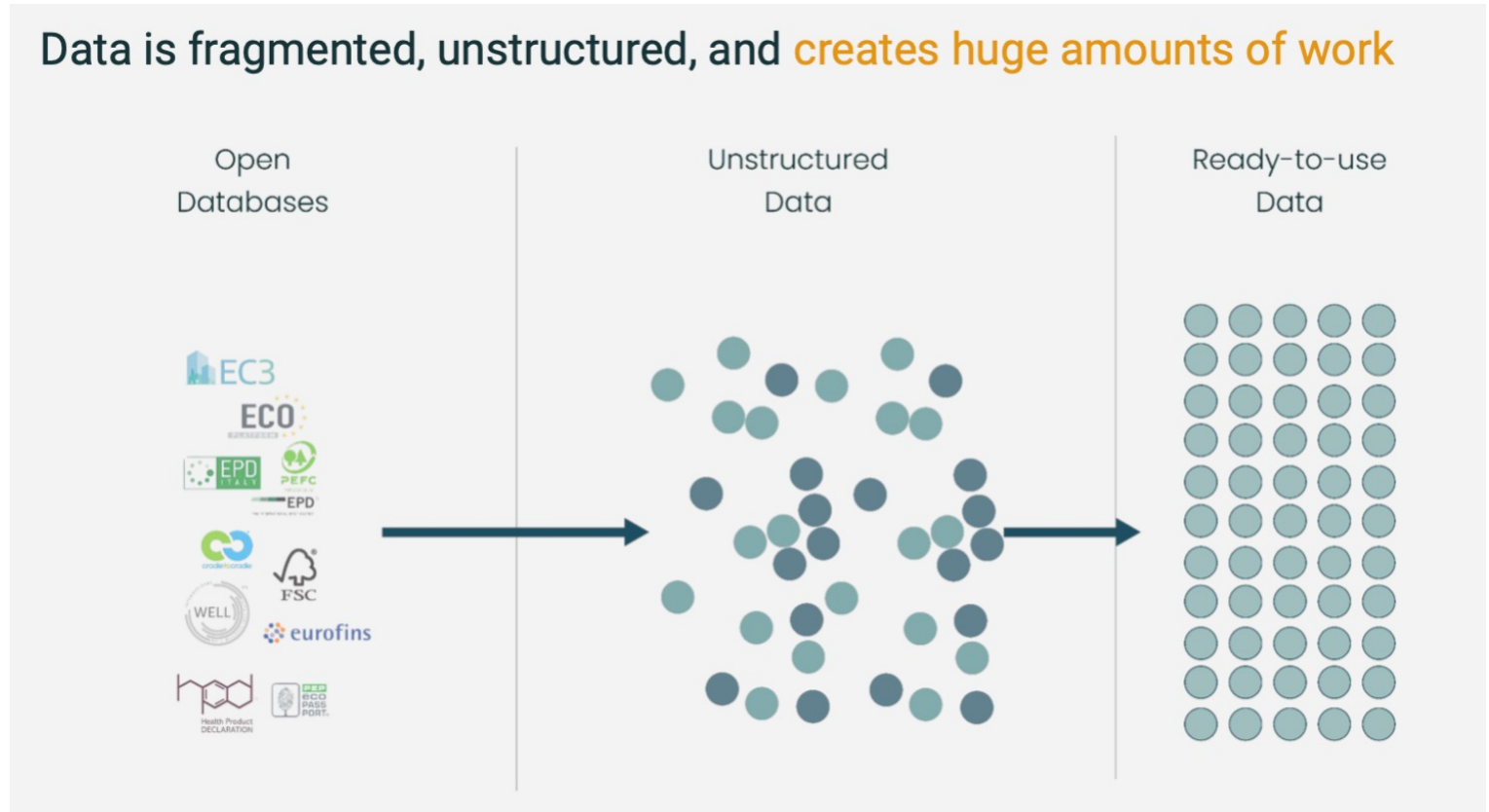
### Limits:

- Circularity consideration missing, it has a carbon tunnel focus
- The lengthy and costly process with variability in outcomes (accuracy only possible at late stages)
- Data availability and quality (not up-to-date) with an additional high barrier to entry and low adoption



## Important step: Structuring data

LCA assessments are currently available in approximately 25 different databases. The struggle companies are currently facing, is an unstructured and not-easily comparable availability of data. What is a necessary next step is to simplify the available data by structuring it and making it comparable. 2050 Materials is a platform working on exactly that: Centralizing to structure data that enables informed decision-making. The platform they created is free of use for Architects and Designers and shows an overview of different materials. It is also possible to team up with 2050 Materials for your data base.





# Talk 3: Assessing materials through the lens of the donut.

By Marije Remigius

Founder of Intermatter

Marije Remigius is the founder of Circu Ieren, a company focused on sustainable interior design. With over twenty years of experience in interior construction, Marije is dedicated to making interiors more sustainable. She collaborates with experts to accelerate the circular transition and has completed many successful projects. Marije's mission is to inspire and teach others to transform interiors into sustainable spaces.

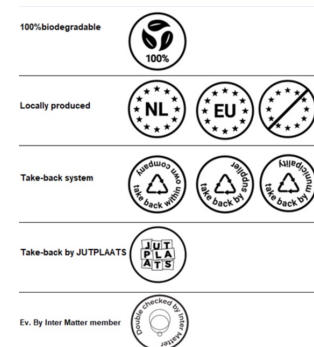
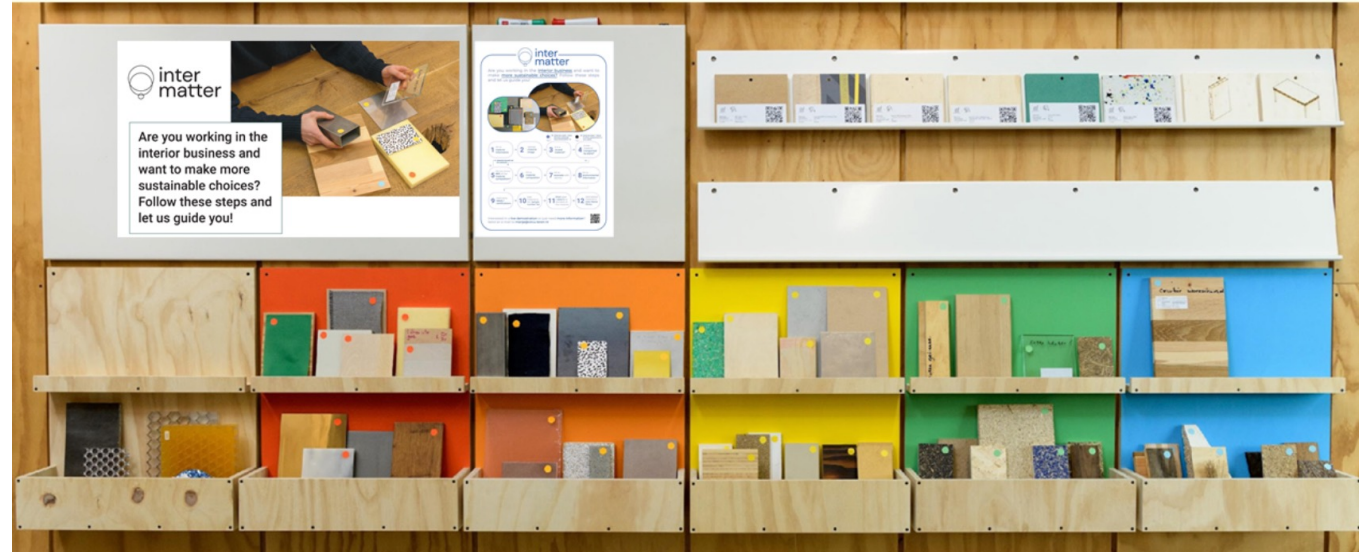


**"The best material is one that harmoniously balances the needs of our planet and the well-being of society, bridging the gap between environmental sustainability and social responsibility."**

## Important step: Simplifying LCA

Intermatter was founded to deliver a direct answer to the question: What is the best material in the Interior Industry? The tool was developed to create a simplified Life-Cycle-Assessment (LCA) together with Idemat (open-source LCA assessments) by TU Delft.

The platform is open source. To allow for the complexity of the materials we choose, additional labels are integrated, such as biodegradability, locality, and take-back systems.



Category	Ecocosts (€) / m2	Color
A+	<0.25	#1155CC
A	0.25-0.5	#00B050
B	0.5-1.0	#33CC33
C	1.0-2.0	#66FF66
D	2.0-4.0	#FFFF00
E	4.0-6.0	#FFCC00
F	6.0-10.0	#FF0000
G	>10.0	#000000

# Key conclusions and discussions

We dived into three different methodologies and got an insight into the approach of 3 different companies on the topic of materials. We managed to gain insights into system thinking approach to materials, LCA, and Intermatter which helped to understand different frameworks companies apply to choosing materials.

There was also acknowledged discussion that not all materials have currently available data, yet need to be assessed for impact. A further discussion point was the different narratives and needs each industry faces. A tool that works well for the Built Environment might not work as well for Packaging Design or the Interior Design world.

Whilst it allowed for the intended overview, we had the feeling that the complexity of the topic also added a bit confusion. What companies, consultants and clients are often asked is the questions “What is the best material?” to which ideally we would find more simple and accessible answers. Currently many companies find their own answer to this question, whilst there could be a common approach. Whilst that question poses for simplicity, there is also the danger of simplifying the complex impacts at hand.

This is a need that we would like to deep-dive into next. If you are equally eager to simplify the decision behind materials, feel free to reach out.

→ NEXT

## What's next?

**We connect** via the LinkedIn Group 'Circular Design Forum'

**Report** Sharing a summary of the KS with the Circular Design Forum

**Share** Sharing new developments of materials through the LinkedIn Group

**Feedback** We would like to hear from you about how to keep shaping this KS to deliver the most value to the community



<https://www.linkedin.com/groups/14153401/>

→ NEXT

# If you have specific questions, reach out to us



**Janina Nieper**

Furnify

Consultant and Designer  
Organiser KS Materials

[j.nieper@furnify.nl](mailto:j.nieper@furnify.nl)



**Dora Xu**

Metabolic

Senior Consultant

[dora@metabolic.nl](mailto:dora@metabolic.nl)



**Phanos Hadjikyriakou**

2050 Materials

Co-Founder & CEO

[phanos@2050-materials.com](mailto:phanos@2050-materials.com)



**Marije Remigius**

Circu Leren

Founder

[marije@circu-leren.nl](mailto:marije@circu-leren.nl)



Circular,  
together!

CIRCULAR  
DESIGN  
FORUM