THE INTERSECTION BETWEEN CIRCULARITY AND CHEMISTRY

GC3 Roundtable 2019

Cincinnati OH

What is the Circular Economy?

A circular economy is an industrial system that is restorative or regenerative by intention and design.

It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy and eliminates the use of toxic chemicals, which impair reuse and return to the biosphere

A circular economy aims for the elimination of waste through the superior design of materials, products, systems and business models.

It is based on 3 principles

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems

Courtesy of Ellen MacArthur Foundation definition and image

Material Selection

Material choices play a fundamental role in a circular economy. Safe and circular materials are safer to humans and the environment, which means they can be reused without causing contamination.

Transparency of chemical composition of materials is complex, but critical and requires more than just reviewing SDS. Screening systems are common

Feedstock's should be selected from recycled, reused or properly managed renewable resources.

Circular Design considerations

- Will the material be combined with other materials and can it be separated?
- What is the expected lifetime of the product containing the material? Will it be repaired?
- How can the value of the material be recovered after the use phase of the product?

After Use Phase

- What is needed to recover the material if it is “technical”?
- Is the material designed so that it can biodegrade safely?

Our Panel

- Serena Pozza: Manager Healthy Materials and Strategy at DSM-Niaga
- Tammy Ayers: Manager Global Sustainable Design and Development at Steelcase
- Druvh Raina: Director Sustainability at Tarkett

They will share

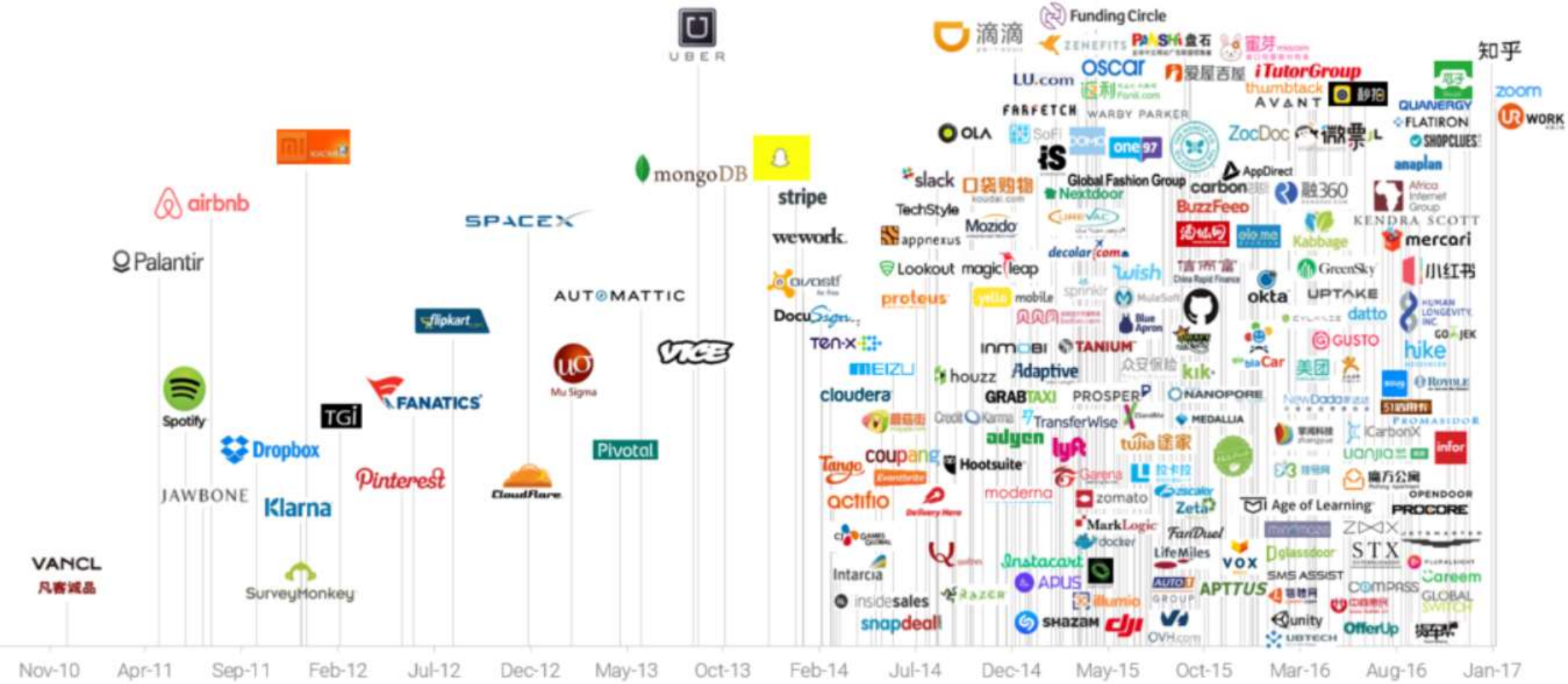
- What they are doing in terms of material health and the circular economy
- How are they doing it
- Enablers for success and challenges

Circular Economy & Green Chemistry

Tammy Ayers, Global Sustainability
May 9, 2019

Steelcase

WHAT MIGHT BE YOUR NEXT DISRUPTOR?



CBINSIGHTS
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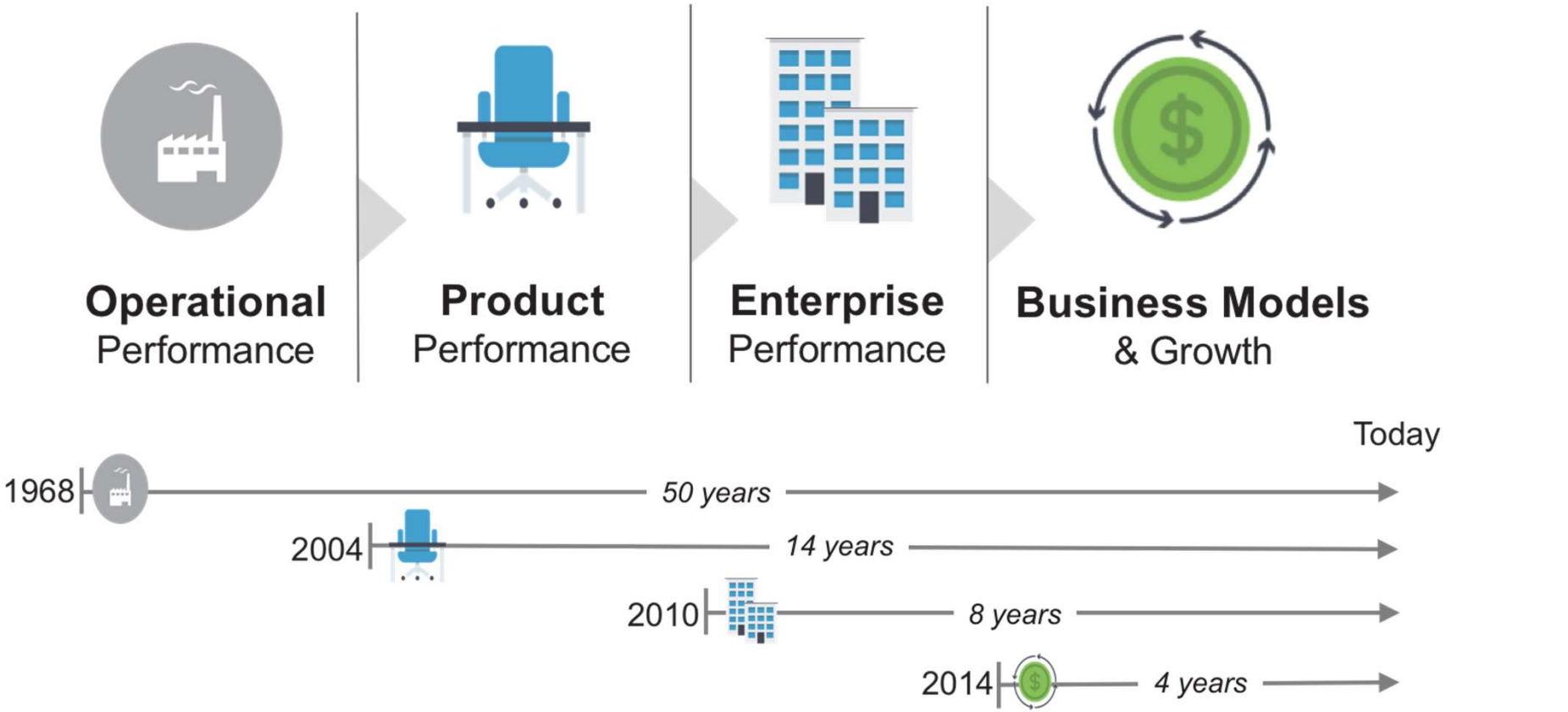
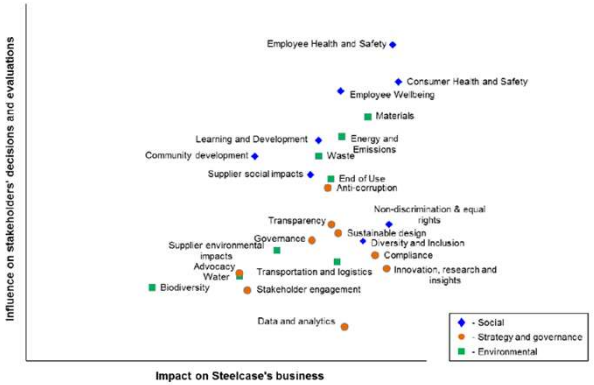
THE SUSTAINABILITY JOURNEY



Steelcase

NEW BUSINESS MODELS - CONNECTING THE “ANDS”

Materiality Assessment

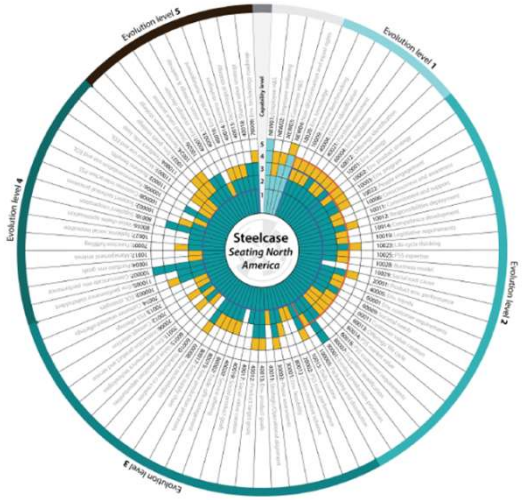


What is important to our stakeholders?

What is important to our company?

+

Maturity Profile

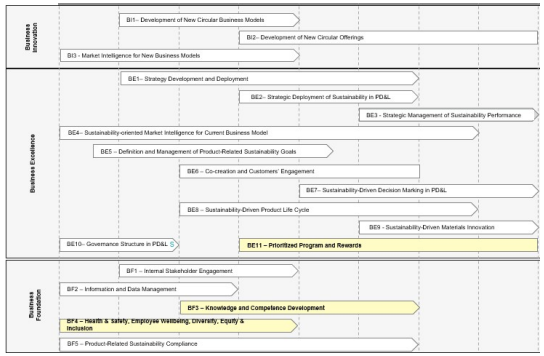


How mature is our company?

How mature do we want to be?

=

CE Roadmap & Action



How will we get there?

How do we measure progress and evolution?

PRODUCT PERFORMANCE IS FOUNDATIONAL

Three Pillars

Materials Chemistry

Life cycle Thinking

End of use Strategies

From Compliance to Innovation

- Materials chemistry
- Indoor Air Quality
- Materials Innovation
- Sustainably Sourced Materials
- Renewable Energy
- Environmental Management Systems
- Life cycle Assessment
- Recycled Materials
- Design for Disassembly and Recycling
- Maintenance & End-of-Life Guidelines

Certifications

100% RECs

EPD

SUSTAINABLE INNOVATION - STRATEGIES & KEY PERFORMANCE INDICATORS

Part of Tool

Portfolio Dashboard

Benchmarking Dashboard

Project Dashboard

Strategy Setting

KPI/Target Setting

Project Dashboard

KPI/Target Measurement

Project Dashboard

Portfolio Dashboard

Design for Healthy/Safe Materials Choices

Design for Innovative Material Solutions

Priority Substances of Concern

Materials Health Evaluation 1

Compete
Lead
Innovate

Metrics Tracking

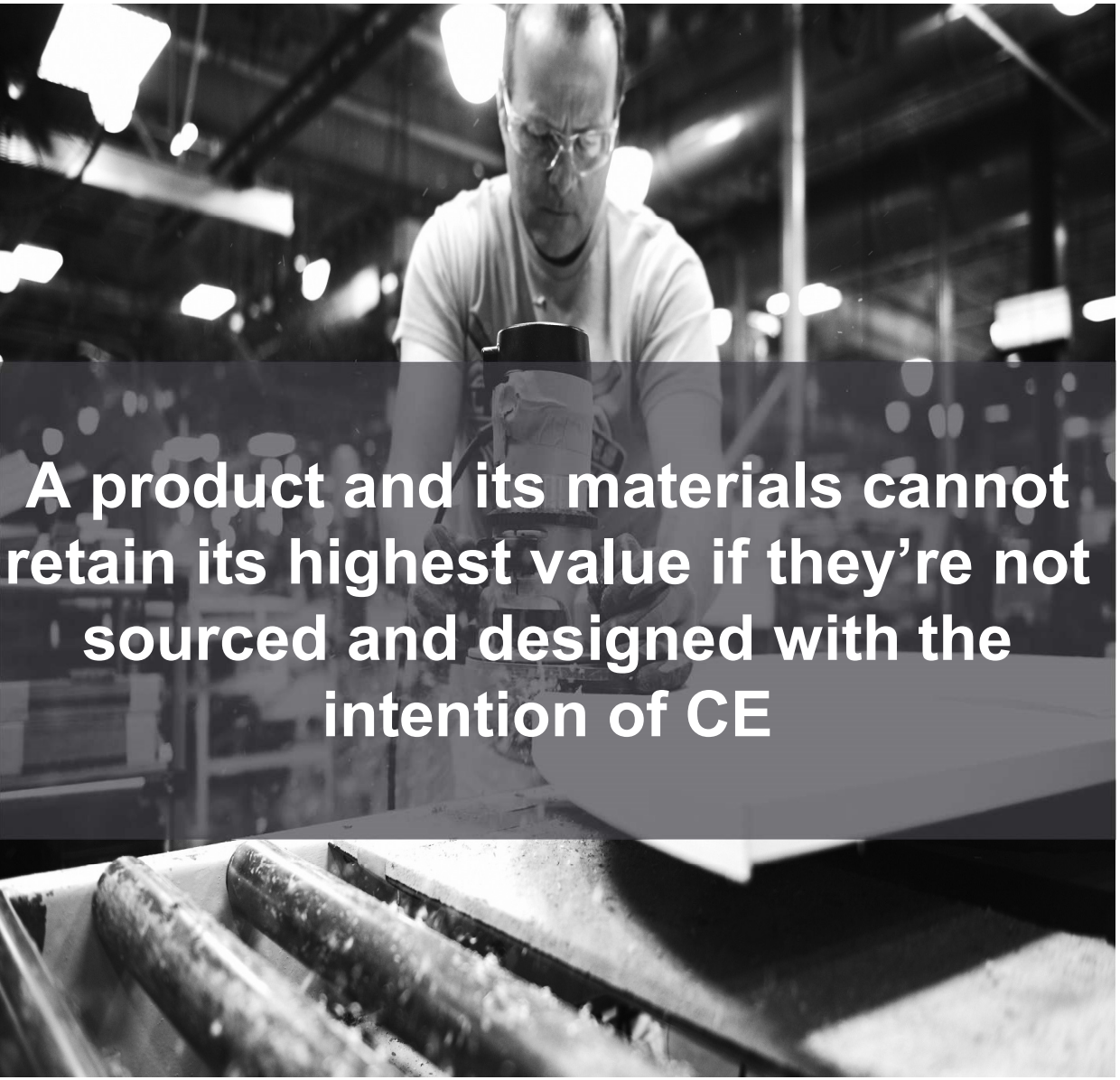
What Tool Does

- Portfolio Positioning
- Benchmarking
- Initiate Project

- Snapshot of performance
- Strategy setting
- Target setting

- Snapshot of performance
- Measurement/ Tracking
- Guidance

- Final Performance
- Lessons Learned



Divisio Frameless Screen

Steelcase

niag6®

Pretty simple, simply better.

GC3 Roundtable

Cincinnati,
USA

May 9th 2019

DSM-Niaga

driven by passion & experienced to scale

niaga

Innovation driven start-up

home furnishing products expertise

patent protected

technologies proven

in market testing

DSM

Global life & material science company

~ $10 billion revenue, ~ 25.000 employees

over 100 years young

Dow Jones Sustainability Index leader

niaga

a Circular Adhesive Innovation Center
Zwolle, The Netherlands

a Niaga® Innovation Center
Geleen, The Netherlands

a Engineered Adhesive Production
Meppen, Germany

a Regional Sales Office
Wilmington, Delaware, U.S.

The problem with home furniture

Home furniture: #1 least recycled item

Among largest landfill contributor

~48 bn square ft of carpet to landfi

10,000 mattresses to landfill day in

REUTERS

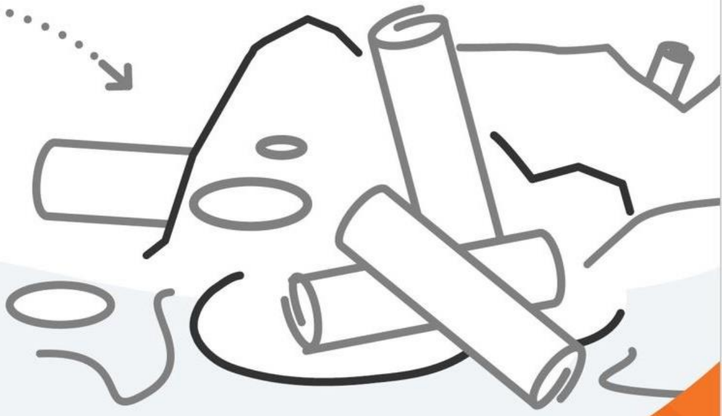
Business Markets World Politics TV More

BUSINESS OF GREEN ENERGY MAY 6, 2011 / 8:50 PM / 8 YEARS AGO

EPA Reports 9.8 Million Tons Per Year in Furniture Waste

Joanna 3 MIN READ

In 2009, U.S. EPA reported that furniture accounted for 9.8 million tons (4.1 percent) of household waste. Furniture is the number one least-recycled item in a household, and it was only up until 2008 that there was a recovery (materials used for recycling) greater than 0.05 percent since the 1960s - 0.1 percent. And by 2015, it is estimated that



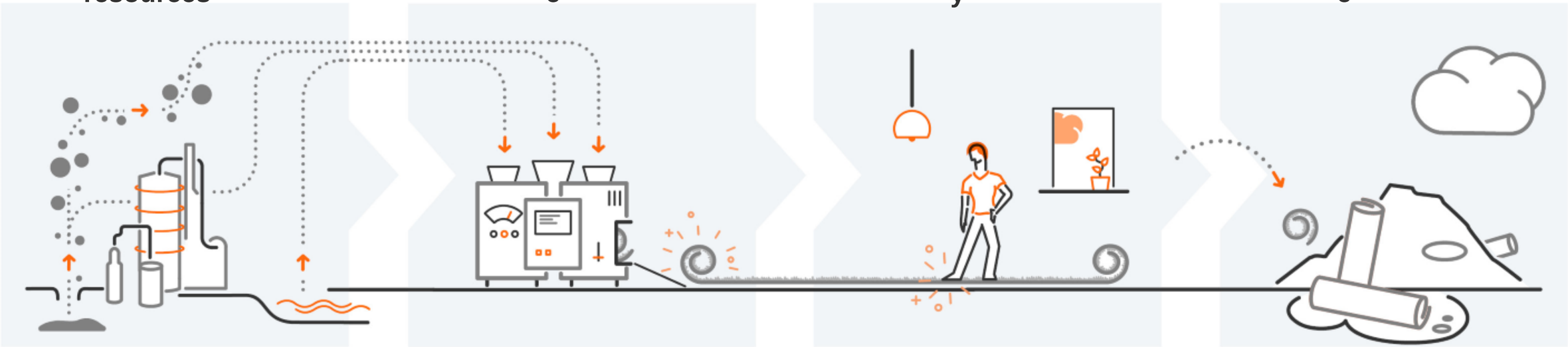
Because of our linear economy

take resources

make

enjoy

dispose



Niaga’s product design philosophy

1. Keep it **simple**

Ask yourself if adding more ingredients is really necessary.

2. **‘Clean’ materials** only

Only use materials that have been tested for their impact on our health and the environment.

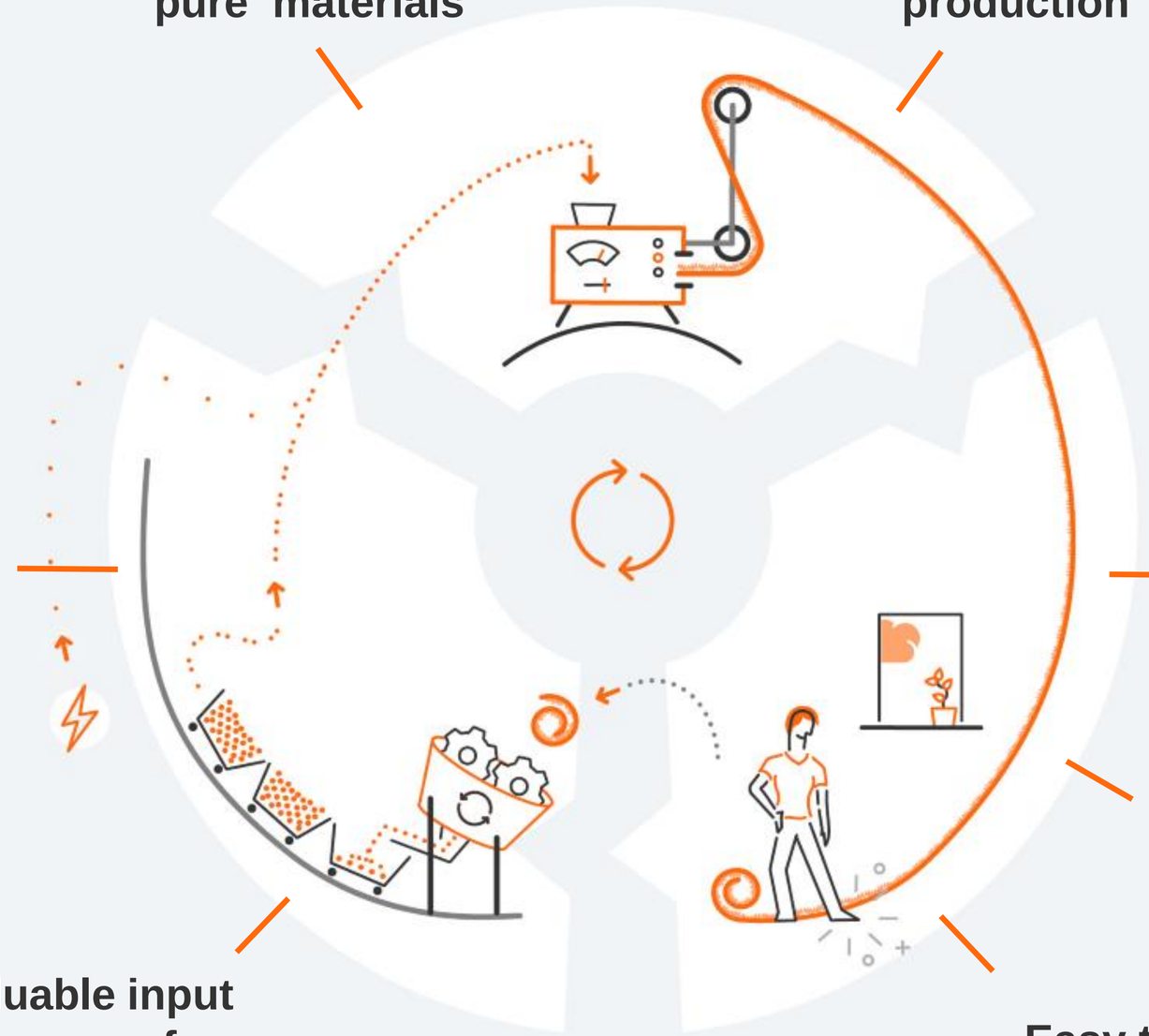
3. Use **reversible connections**

Connect different materials only in ways it can be decoupled after use.

Circular at Niaga

Simple set of pure materials

Resource-lean production



No waste and no virgin materials

Easy to install and use

Odorless

Valuable input for re-use of materials

Easy to clean

5 years of Niaga

Ambition to make 100% circular products using recycled inputs

Redesigned products with simpler materials or one material to enhance quality and performance of recyclability

Our circular products in the market today:

- Carpet manufacturing technology (US, EU)

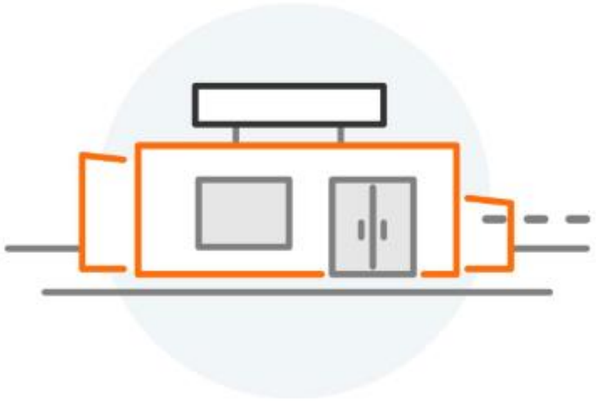
- Mattress that can be re-made and recycled

- Furniture from cellulose and food waste

Additional benefits from circular design:

- Better indoor air quality
- Safer in case of fire with no flame retardants use
- Lighter and easier to install/use
- Less energy and water use in production for carpet

Transparency at Niaga



- Lab tests (materials, performance)
- Blockchain
- Product passport
- Track and Trace
- Crowd Auditing
- SDS, MDS etc.

Companies have ambition

- Canary: detoxing living spaces
- Niaga®: designing products with a business case for recycling

Products have a promise

- Washable
- Soft
- Recyclable
- Safe

External forces judge

- External experts
- NGOs
- Consumers
- Policy makers

Materials info and tests

- **Documents from suppliers:**
  - MDS/SDSs
  - Certifications from recyclers (e.g. EUCertPlast)
  - Certifications from suppliers (e.g. OekoText, Ecolabels)

- **Incoming good screening + batch tests**
  - Inorganics
  - Organics of concern
  - Other potential Non Intended Added Substances (NIAS)/Contaminants

- **Product tests (external/internal)**
  - VOCs/sVOCs
  - Flammability panel
  - Organics of concern
  - NIAS/Contaminants

Pros and Cons:

✓ Full picture (or almost) of materials!

✓ Support partners with knowledge

✗ Difficult to know everything

✗ It can become costly…

Our Assessment

- Hazard-based approach for materials of concern:

Flame retardants Latex Formaldehyde Phthalates

BPA PFCs BPS PVC etc.

- Assessment by toxicologist for products:

Risk = Exposure × Hazard

Exposure path
How do we absorb it?
(e.g. skin, ingestion, respiration)

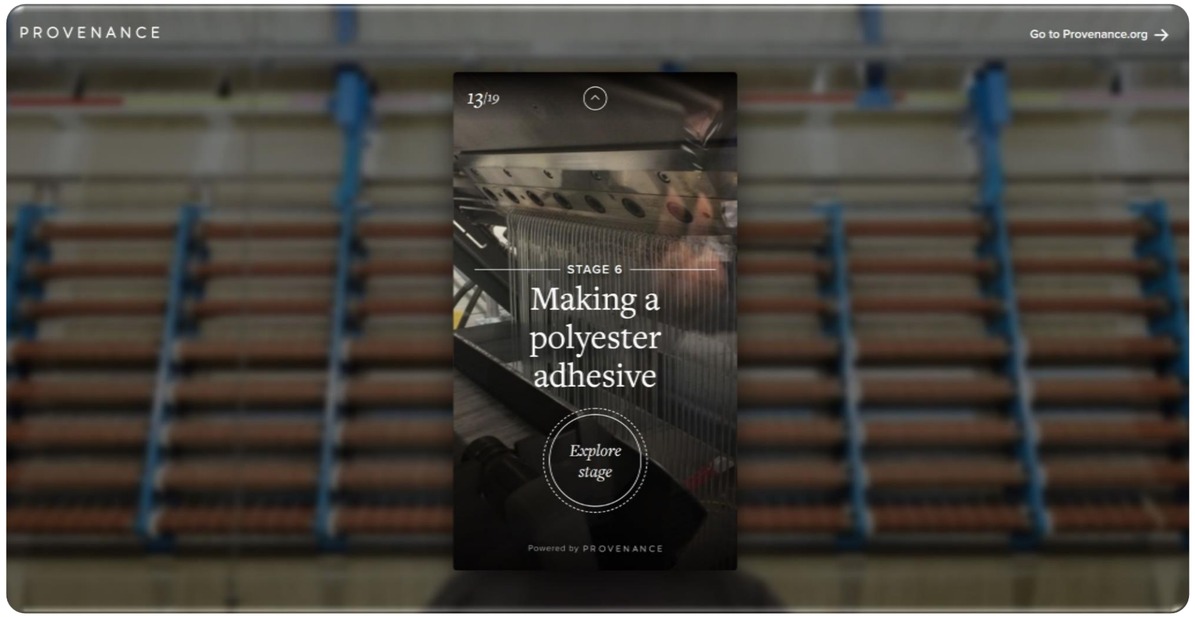
Dose
How much do we absorb
in a given time?

Potency
What are the inherent properties of the
compound and potential adverse effects?

Bioavailability
Can the compound enter the bloodstream
and have an effect on the body?

Bioaccumulation
How much of it is stored in fat cells?

Blockchain and Product Passport technologies



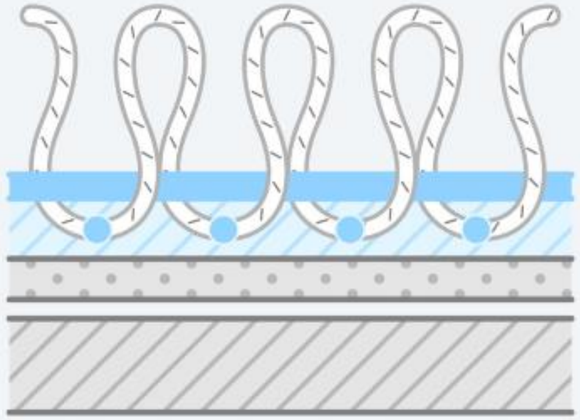
Some of our Products and Experiments

canary

Carpet and Rugs

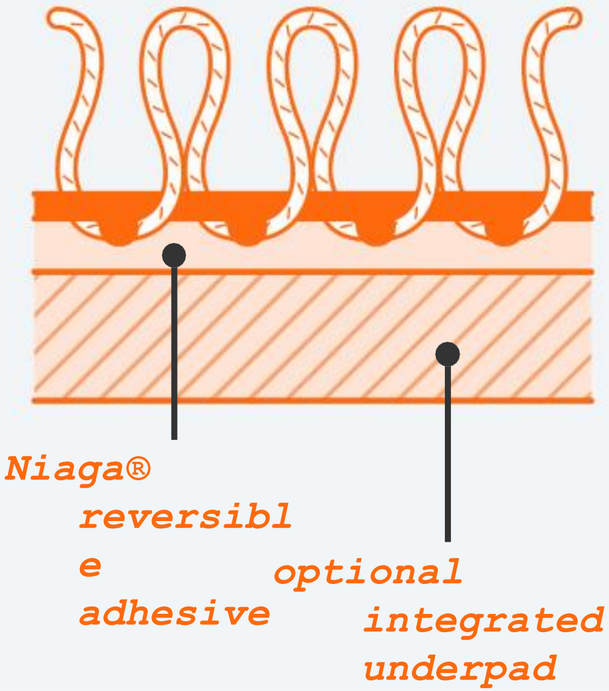
Current Standard

Latex, $CaCO_3$, fillers, PP, bitumen, PVC, PA6, PET, wool and others.



Niaga® Mono

PEs only.

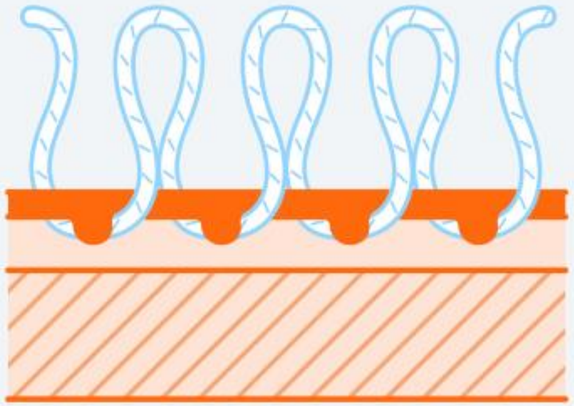


Niaga® Duo

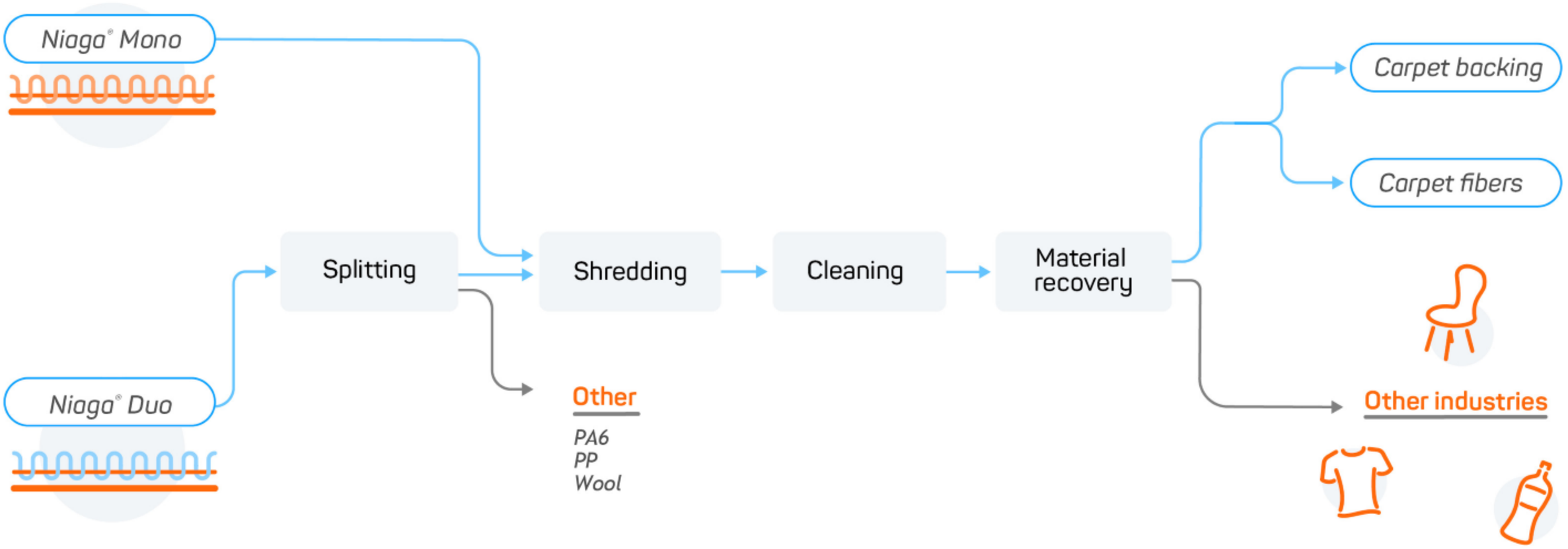
Choice of PA6, wool, PTT or PP for the face fiber.

PET and/or PA6 for the primary backing.

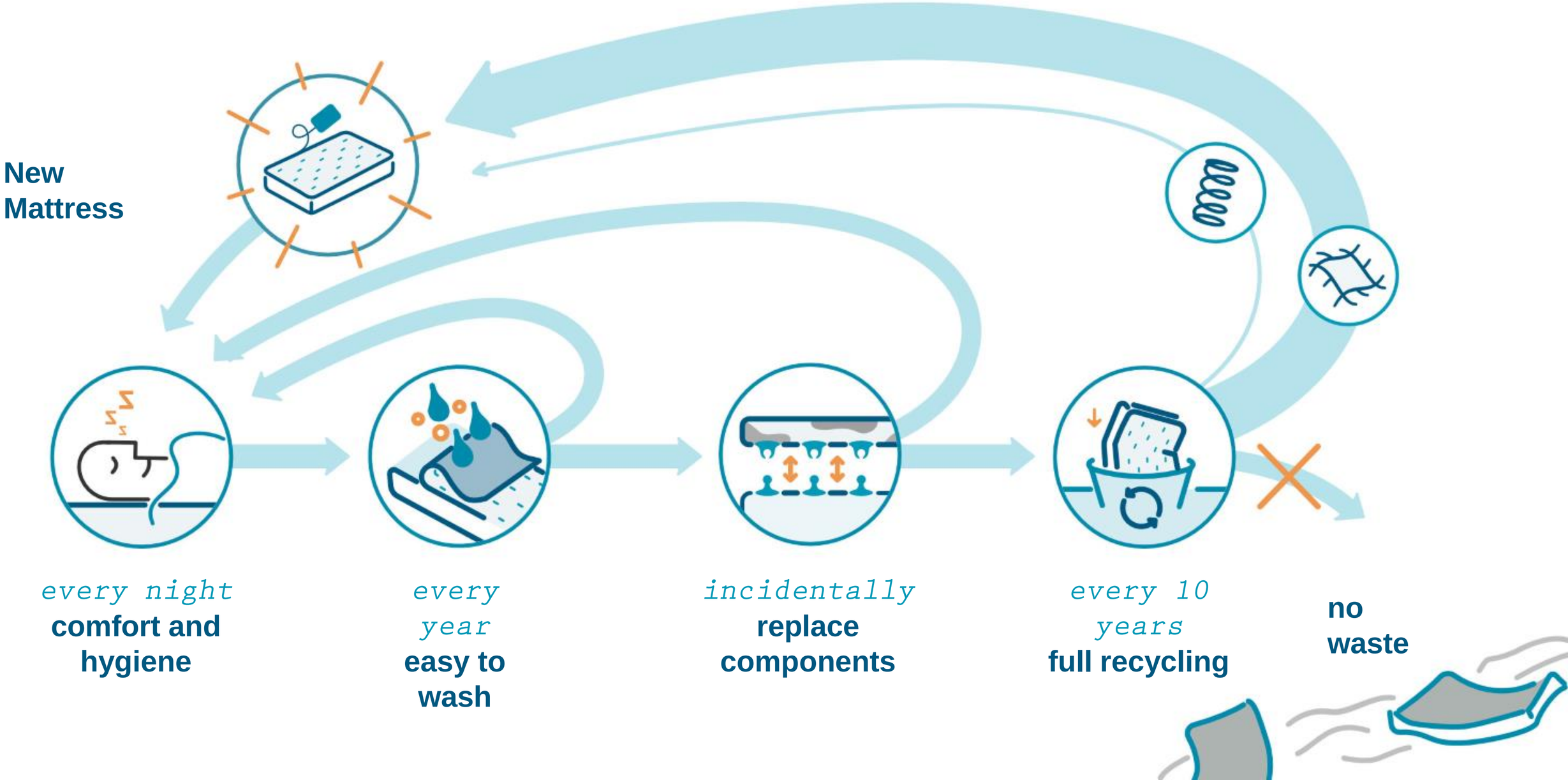
PET for the coating and secondary backing



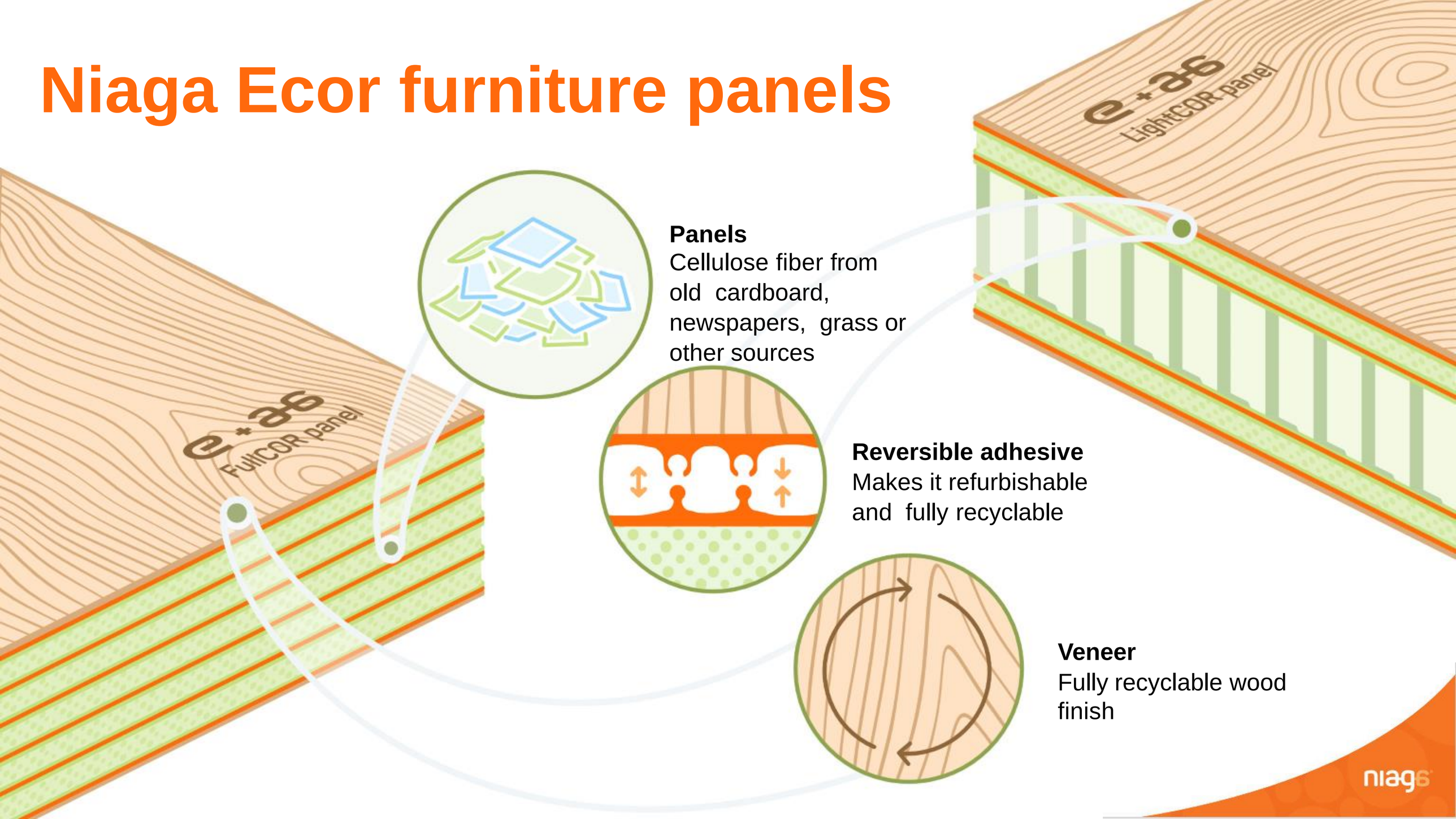
Niaga carpet recycling



Niaga Auping Circular Mattress

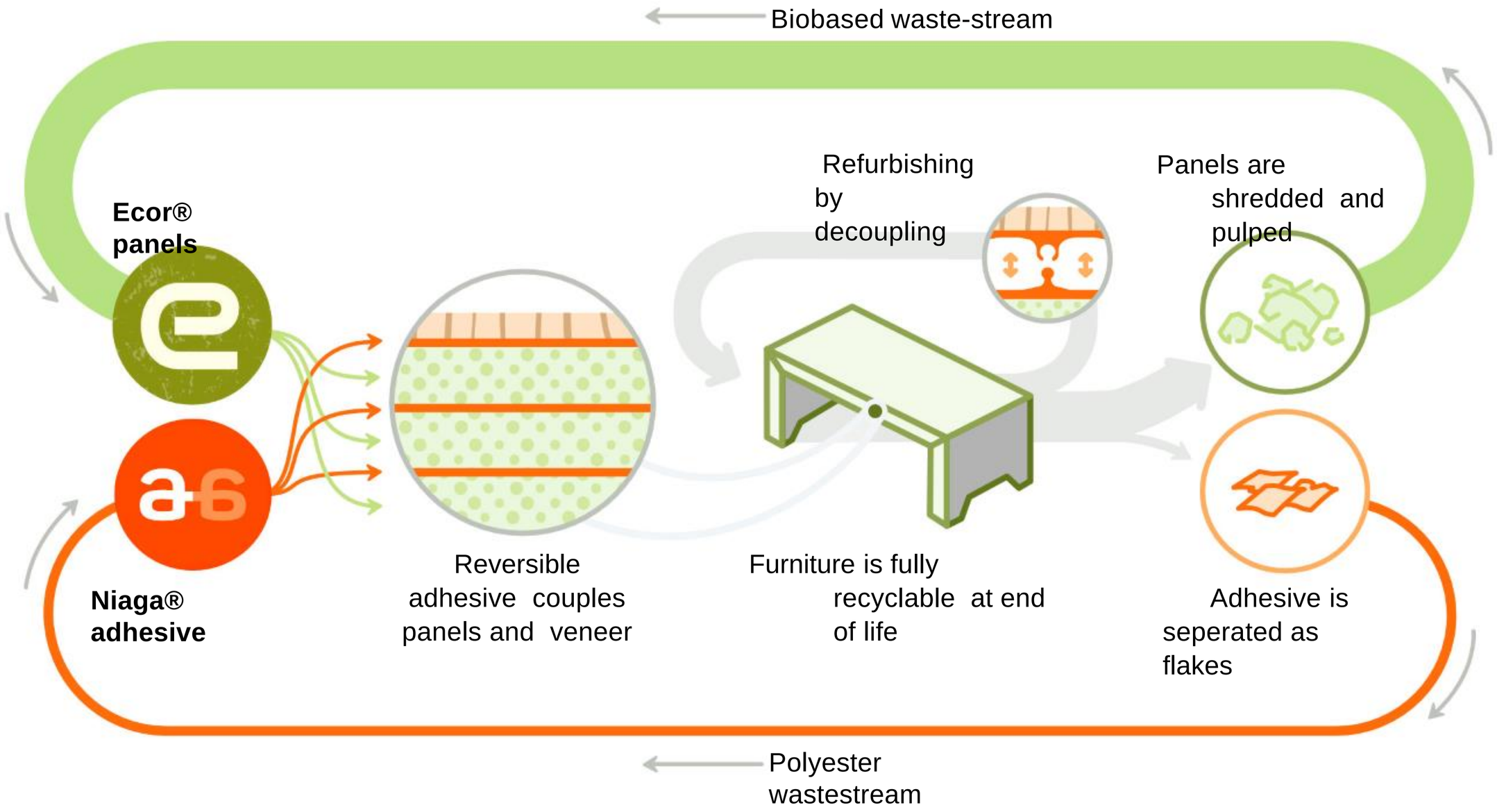


Niaga Ecor furniture panels

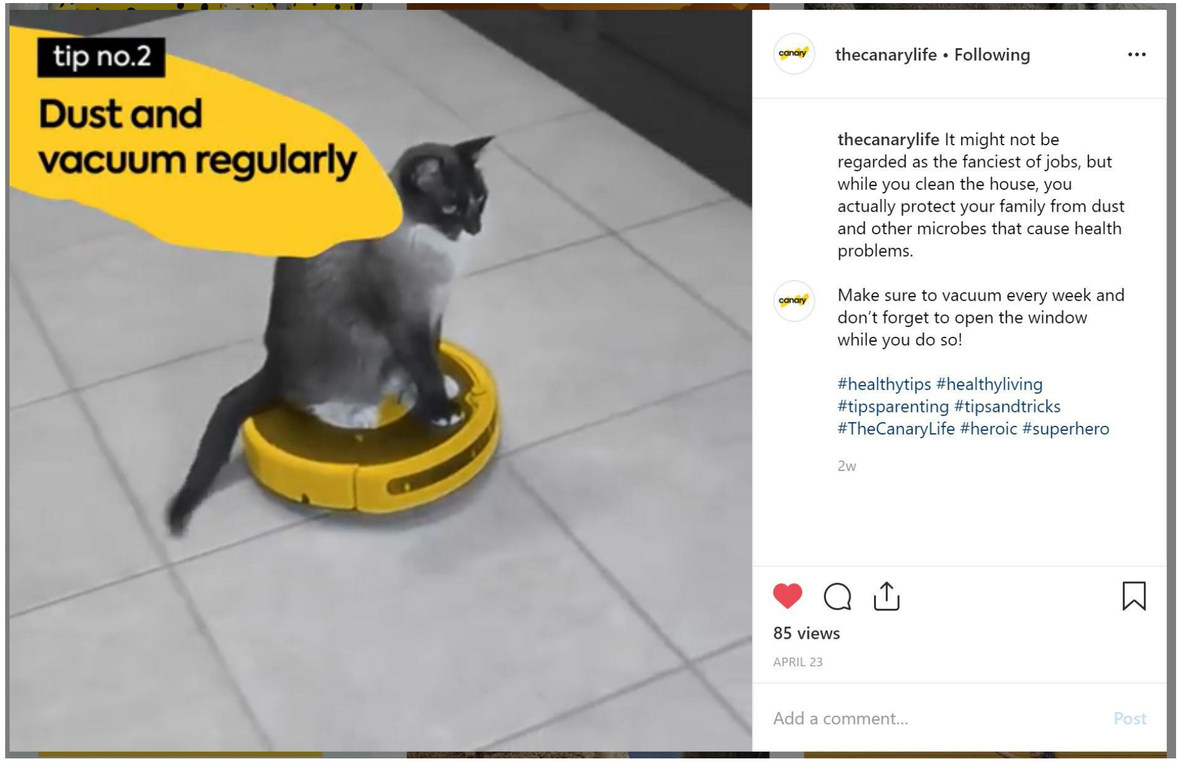


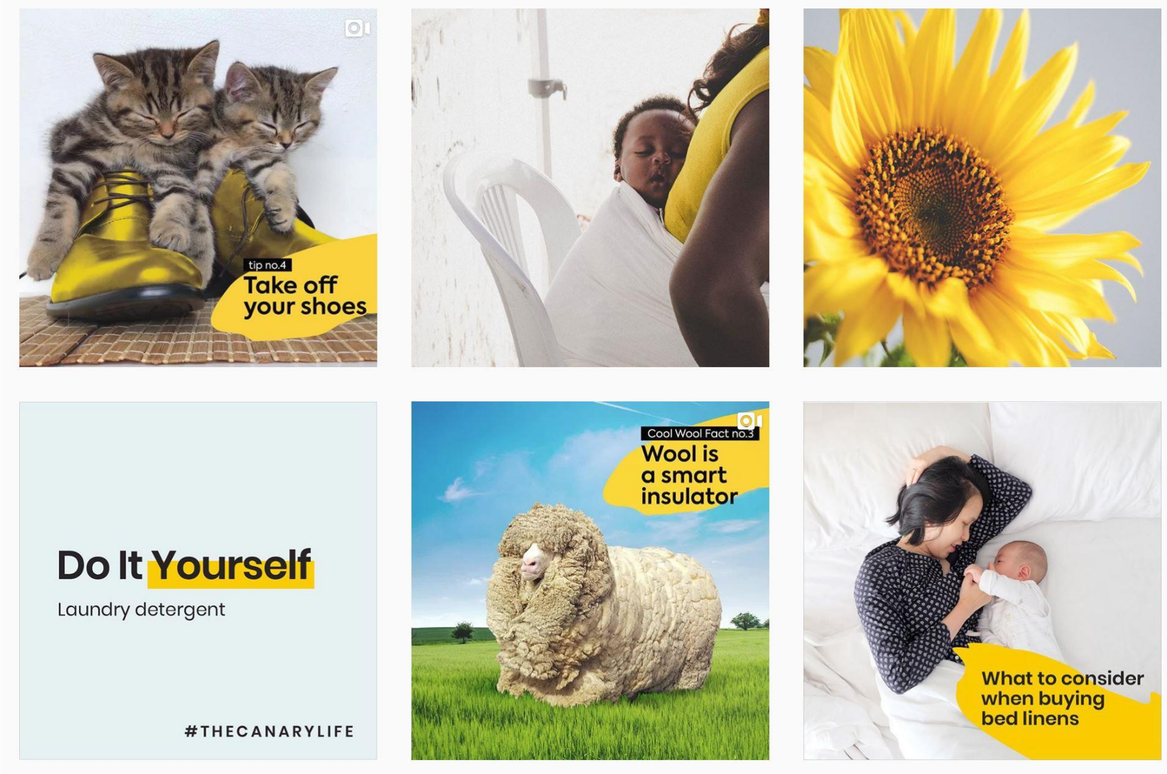

ABUS 20t

Furniture materials redesigned



Canary startup


tip no.2
Dust and vacuum regularly
thecanarylife • Following
thecanarylife It might not be regarded as the fanciest of jobs, but while you clean the house, you actually protect your family from dust and other microbes that cause health problems.
Make sure to vacuum every week and don't forget to open the window while you do so!
#healthytips #healthyliving #tipsparenting #tipsandtricks #TheCanaryLife #heroic #superhero
2w
85 views
APRIL 23
Add a comment...
Post

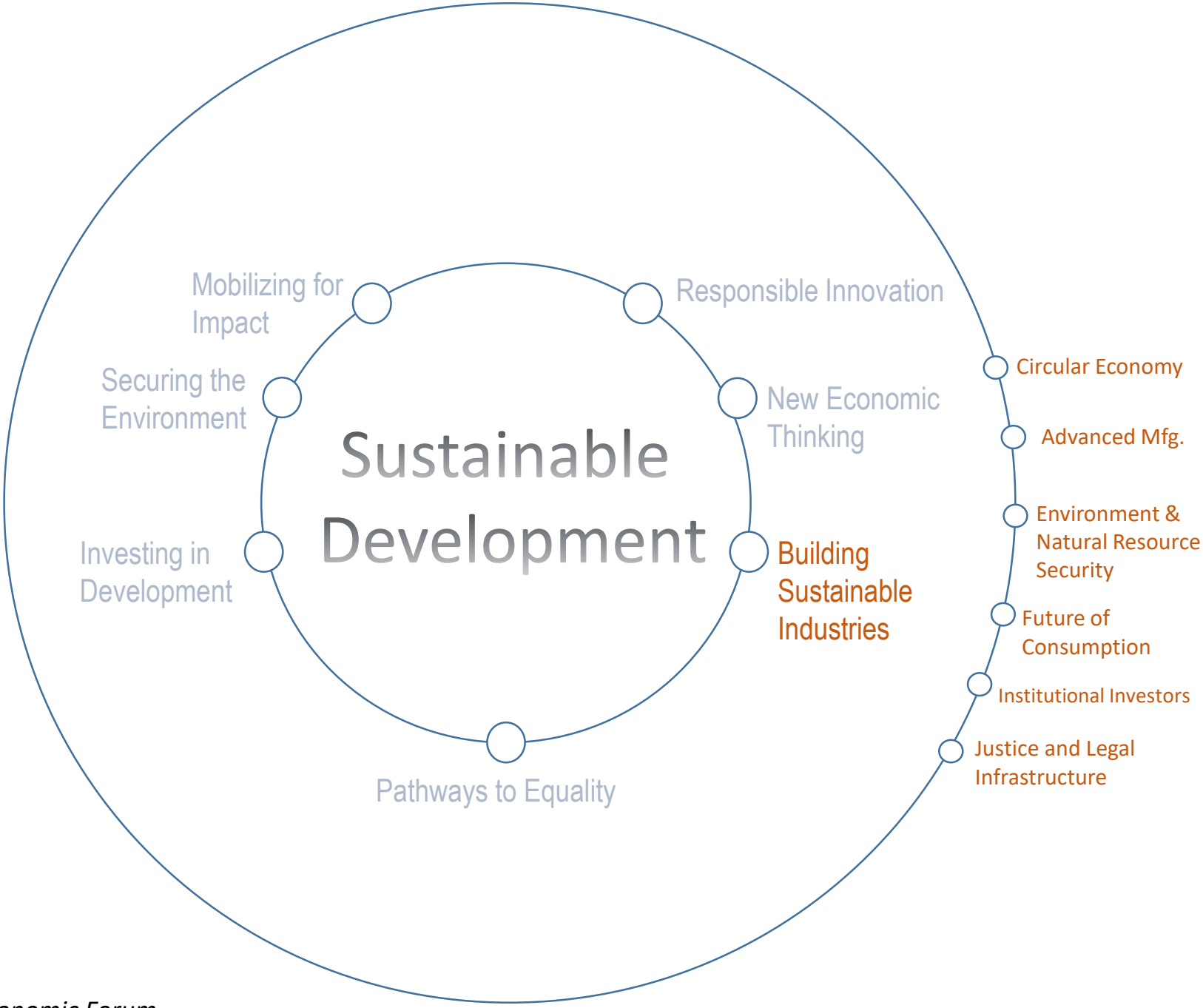

tip no.4
Take off your shoes
Do It Yourself
Laundry detergent
#THECANARYLIFE
Cool Wool Fact no.3
Wool is a smart insulator
What to consider when buying bed linens

Circular Economy+Green Chemistry

Tarkett Perspective

Dhruv Raina

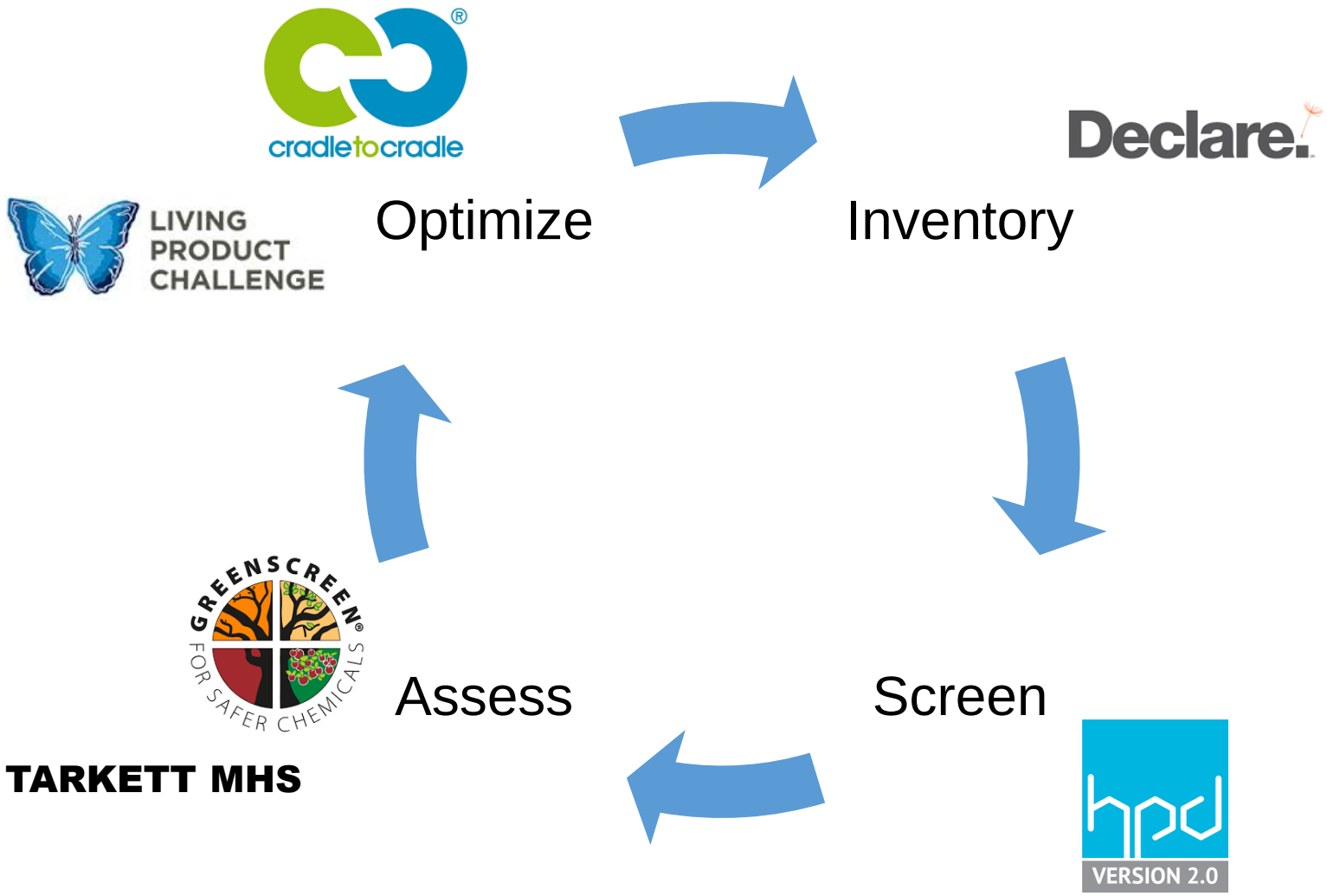
Director of Product Stewardship & Sustainability – Tarkett USA Inc.



Source: World Economic Forum


DOING GOOD. TOGETHER.
DESIGN FOR LIFE
PRESERVE BIODIVERSITY
ACT UPON CLIMATE CHANGE
ZERO WASTE TO LANDFILL
100% OF MATERIALS POSITIVELY DEFINED
DRIVE COLLABORATION
&
MANAGE END-OF-USE
USE ONLY HEALTHY MATERIALS
100.000 TONS TAKEN BACK
75%
OF RECYCLED MATERIALS CONTENT
CLOSE THE LOOP

Critical steps to Optimized Material Health



Optimization & Cradle to Cradle

Optimization outcome

NO C2C BANNED LIST CHEMICALS

NO EXPOSURE FROM CARCINOGENS, MUTAGENS, OR REPRODUCTIVE TOXICANTS

SAFE FOR HUMANS & THE ENVIRONMENT, FULLY OPTIMIZED

PROCESS CHEMICALS ALSO MEET GOLD REQUIREMENTS

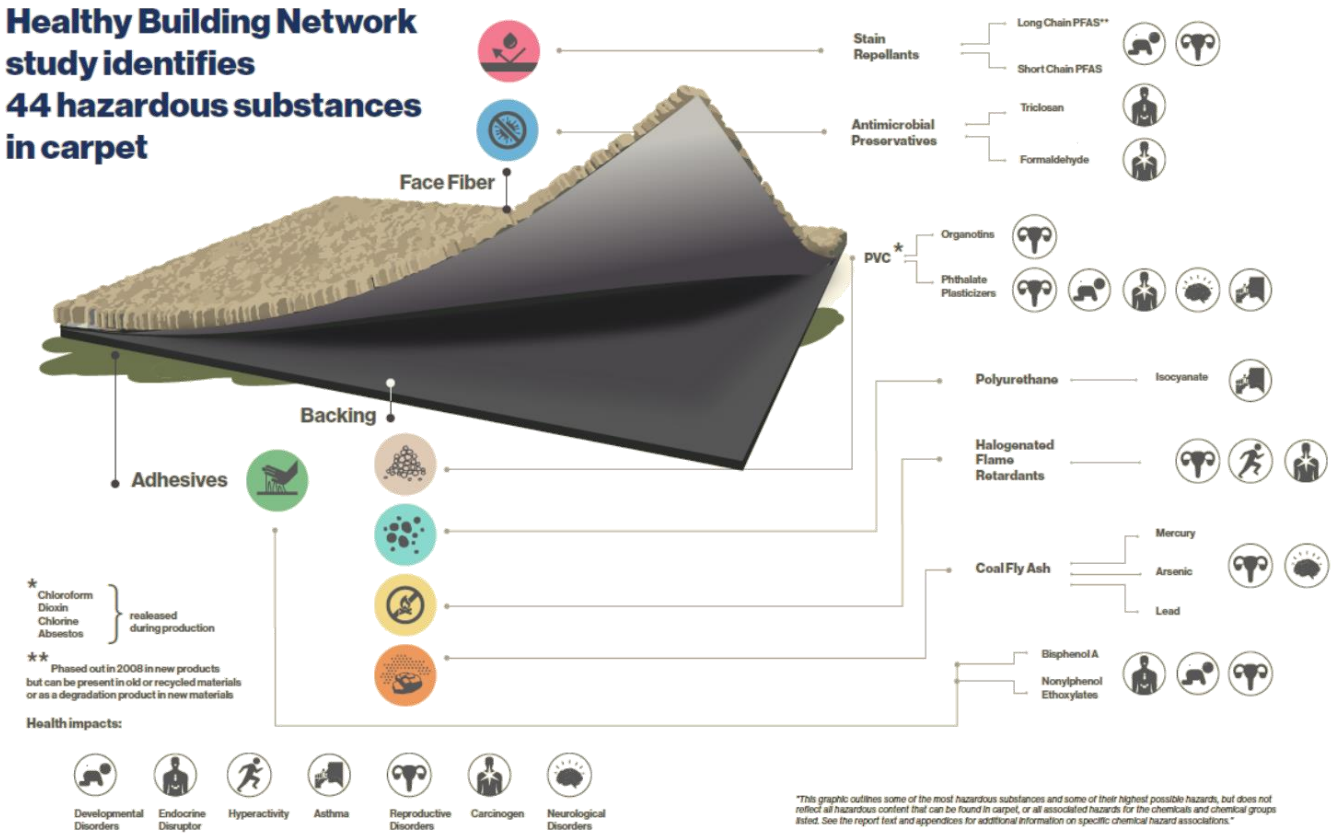
What does optimization look like?

Cradle to Cradle Certified Product Scorecard – iQ One	
MATERIAL HEALTH	Platinum
MATERIAL REUTILIZATION	Gold
RENEWABLE ENERGY & CARBON MANAGEMENT	Gold
WATER STEWARDSHIP	Platinum
SOCIAL FAIRNESS	Gold
OVERALL CERTIFICATION LEVEL	Gold

What does optimization look like?

Cradle to Cradle Certified Product Scorecard – Ethos Modular Carpet Tile	
MATERIAL HEALTH	Silver
MATERIAL REUTILIZATION	Gold
RENEWABLE ENERGY & CARBON MANAGEMENT	Gold
WATER STEWARDSHIP	Silver
SOCIAL FAIRNESS	Silver
OVERALL CERTIFICATION LEVEL	Silver

What does optimization look like?



Circular by Design

Cradle to Cradle Certified Product Scorecard – iD Revolution	
MATERIAL HEALTH	Platinum
MATERIAL REUTILIZATION	Gold
RENEWABLE ENERGY & CARBON MANAGEMENT	Gold
WATER STEWARDSHIP	Gold
SOCIAL FAIRNESS	Gold
OVERALL CERTIFICATION LEVEL	Gold

TOGETHER, WE WILL HAVE A POSITIVE IMPACT

ON PEOPLE AND THE PLANET

People's health

Planet Natural Capital

Today and Future generations