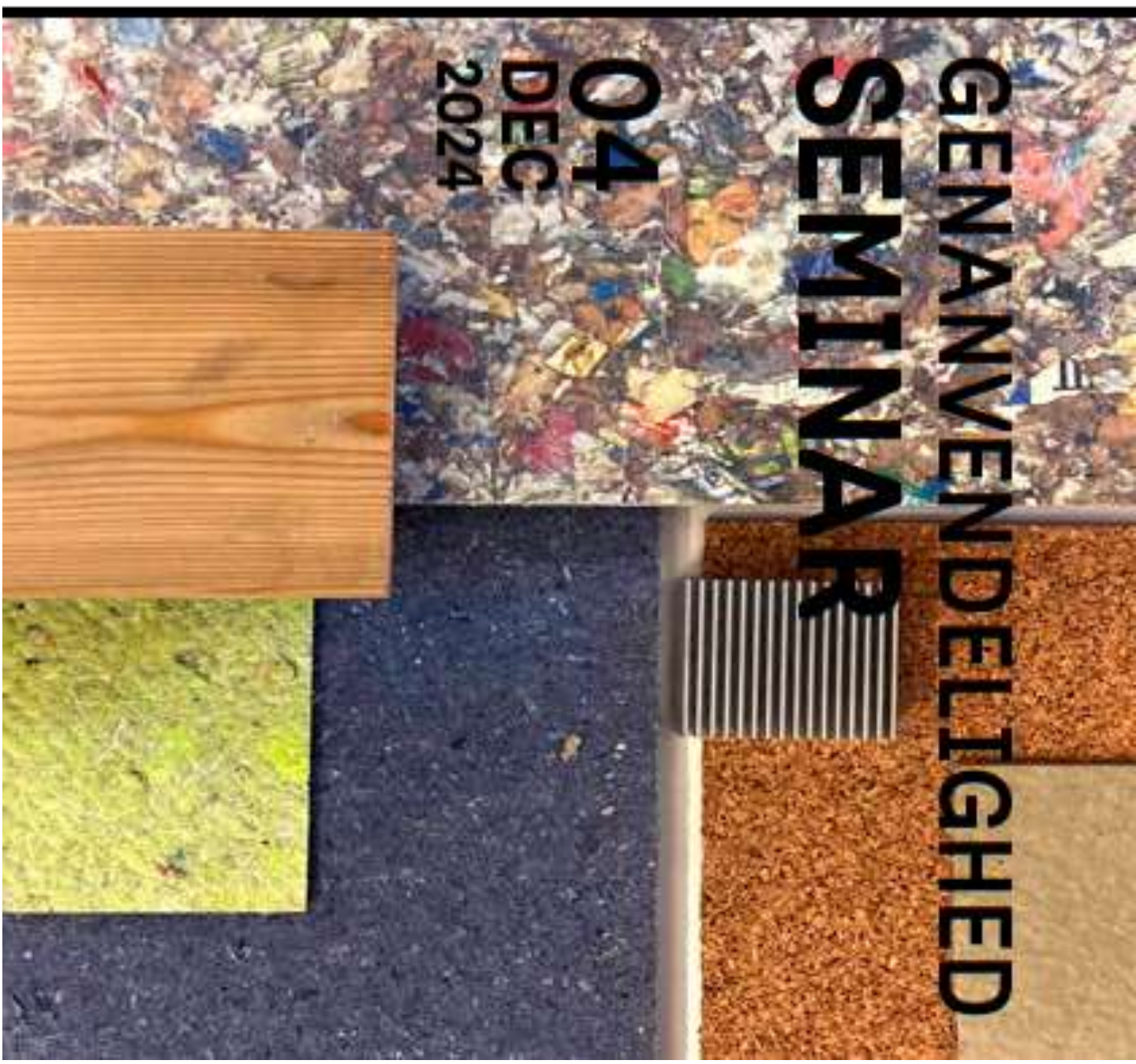
GENANVENDELIGE MATERIALER

SPOR 1



KOLDING SCHOOL OF DESIGN

kea COPENHAGEN SCHOOL OF DESIGN AND TECHNOLOGY

VIA University College

Det Kongelige Akademi

Lifestyle & Design Cluster.

Uddannelses- og Forskningsstyrelsen

TEKNOLOGISK INSTITUT

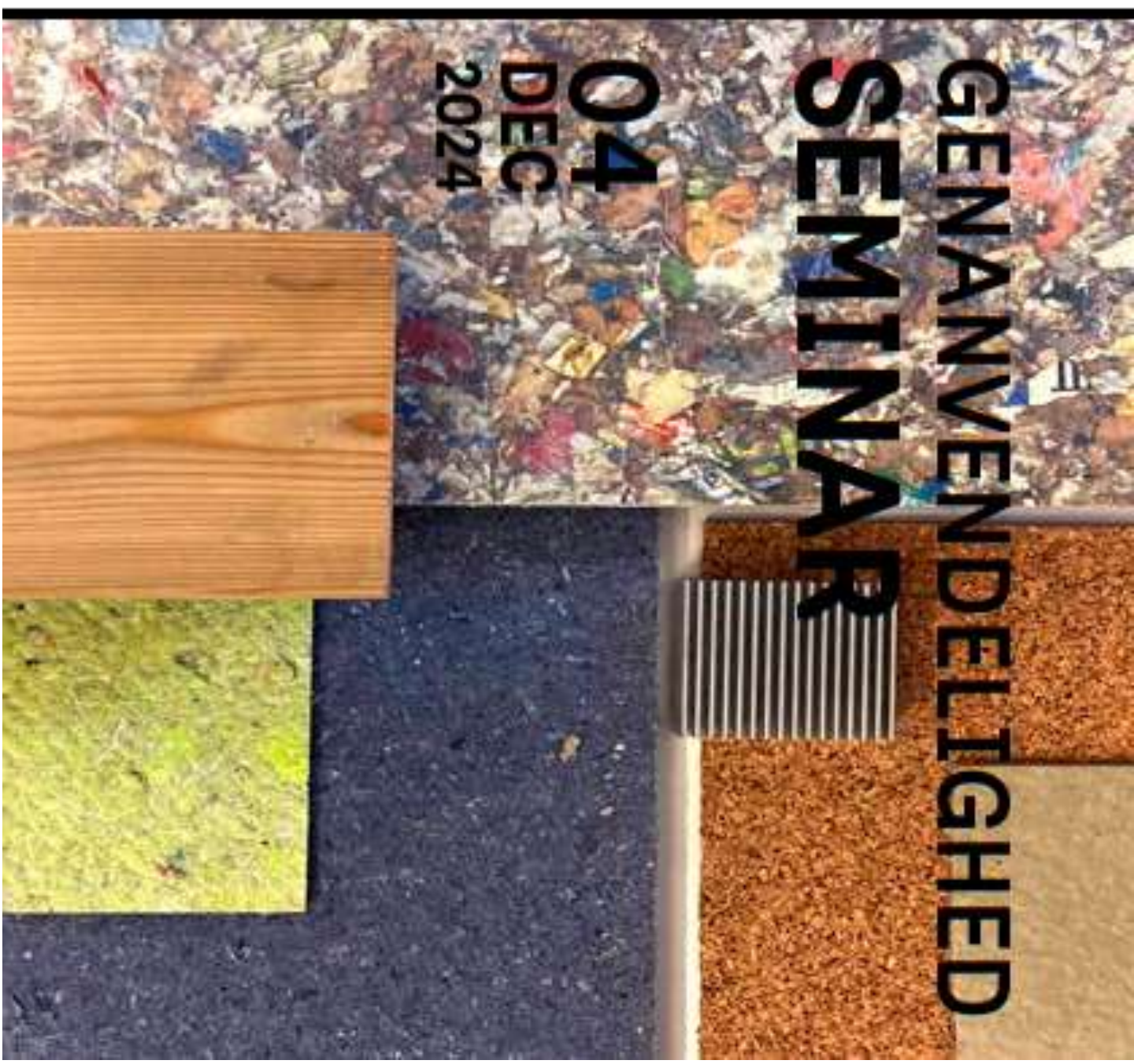
* Konferencen er en aktivitet i Lifestyle & Design Cluster og er medfinansieret af Uddannelses- og Forskningsstyrelsen.

PROGRAM

	SPOR 1 - Materialer	Aud. 5
11.20	**Genanvendelige materialer** Karen Marie Hasling / Designskole Kolding	
11.35	**Genanvendte Materialer & Waste anvendelse / Shaping Shells** Lotte Jørgsholm Nerup / KEA Jakob Bladt Jensen / Designskolen Kolding	
12.00	**FROKOST / Networking**	
13.00	**Wood waste - Rewood** Namurol Charoencharatkun / Det Kongelige Akademi	
13.20	**Paper waste** Spriha Chokhani / Det Kongelige Akademi	
13.40	**Rockfon** Henriette Nielsen og Bo Jørgensen / Rockfon	

GENANVENDELIGE MATERIALER

SPOR 1



Genanvendelige materialer

Karen Marie Hasling / Designskole Kolding

Genanvendelige materialer 2024

KOLDING SCHOOL OF DESIGN

Det Kongelige Akademi
Arkitektur Design Konservering

VIA University College

TEKNOLOGISK INSTITUT

INDLEDNING

Genanvendelighed handler om mere end blot at mindske spild – det handler om at se **potentialet** i det, vi allerede har. Om at **udnytte** de ressourcer der allerede er udvundet og **mindske udvindingen** af nye virgin materialer for derved at udtømme eksisterende ressourcestrømme. Materialer, der engang var slutpunktet i en cyklus, kan med de rette teknologier og tilgange blive begyndelsen på noget nyt.

Tanken bag dette katalog er at **styrke** tekstil-, møbel-, mode- & livsstilsbranchens **viden** om genanvendelige materialer, samt give **ideer og inspiration** til at indtænke materialer som genanvendelige og dermed som ressource i en fortløbende værdikæde og produktion.

Der er forsøgt en **kortlægning** over de mest gængse materialer med potentiale for genanvendelse og kompendiet definerer et **repræsentativt udvalg** af eksisterende genanvendelige materialer, herunder også de genanvendte materialer, som kan **erstatte** de nuværende mest anvendte virgine materialer.

GENANVENDT VERSUS GENANVENDELIG

Design til genanvendelse

”Designing af **recyclable product** and using **recycled material** to replace virgin materials”

(Maris, Froelich, Aoussat & Naffrechoux 2014)

Genanvendt materiale

”Et materiale, der består **helt eller delvist** af materialer, som **har været** en del af et eller flere materialers og produkters tidligere livscyklus.”

Fra LDC projektet. Genanvendte materialer 2023

Genanvendeligt materiale

”Et materiale, der **kan indgå i en ny livscyklus** efter afslutningen af sin nuværende livscyklus, kaldes genanvendeligt.”

Fra LDC projektet. Genanvendte materialer 2023

Bring ideas to life
VIA University College

Lifestyle & Design Cluster

MATERIALER & BÆREDYGTIGHED

KOMPENDIUM

METODISK TILGANG

Hvad skulle vi spørge om?

Konkretisere perspektiver på genanvendelighed, cirkularitet, levetid
Indsamle generel information, brugsfase, styrker/svagheder

Hvem skulle vi spørge?

Identificere relevante danske brancheorganisationer og materialeproducerende og/eller anvendende virksomheder*

Hvordan skulle vi spørge?

Udvikle en fælles spørgeramme med spørgeskema og/eller interview

GENERISKE MATERIALER

PRODUKTEKSEMPLER

CASEEKSEMPLER

ALUMINIUM

Aluminium støbning, Hydro.

GENERELT

Beskrivelse af materialet
Aluminium er et let og stærkt metal, kendt for sin korrosionsbestandighed og lave vægt. Det anvendes bredt i byggeri, transport og emballage. Aluminium kan genanvendes uendeligt uden kvalitetstab og kræver kun en brøkdel af energien sammenlignet med produktion af jomfrueligt aluminium. Det kan anodiseres i mange farver, hvilket gør det attraktivt i design.

Materialeingredienser
Aluminium består hovedsageligt af aluminiumoxid, udvundet fra bauxit. Det kan også indeholde legeringsmetaller som kobber og magnesium m.m for forbedrede egenskaber.

Fremstillingsproces
Aluminium fremstilles ved elektrolyse af aluminiumoxid, der udvindes fra bauxit. Først raffineres bauxitten til alumina, hvorefter den omdannes til flydende aluminium i en elektrolysecelle. Den elektriske strøm får aluminium til at aflejre sig på katoden, hvorefter det opsamles, formes og kan derefter bearbejdes yderligere.

EGENSKABER OG ANVENDELSE

Fysiske egenskaber
Aluminium er et let og holdbart metal med en høj styrke-til-vægt-forhold. Det er korrosionsbestandigt og har en fremragende elektrisk og termisk ledningsevne. Aluminium er også genanvendeligt uden at miste sine egenskaber. Det kan anodiseres for at forbedre slidstyrken og modstandsdygtigheden over for korrosion. Desuden er det let at forme og bearbejde, hvilket gør det ideelt til mange anvendelser.

Anvendelse
Aluminium anvendes bredt i transportindustrien til fly, biler og tog, da det reducerer vægt og øger brændstofeffektiviteten. Det bruges også i byggeri til vinduer, døre og facader for sin holdbarhed og lav vægt. Derudover anvendes aluminium i emballage, elektriske komponenter og inden for møbeldesign.

STYRKER OG UDFORDRINGER

Styrker
Aluminium er et let, stærkt og korrosionsbestandigt materiale, der er ideelt til mange applikationer. Det er meget formbart og kan anvendes til komplekse designs. Aluminium har fremragende varme- og elektrisk ledningsevne. Det er genanvendeligt uden tab af kvalitet, hvilket gør det til et bæredygtigt valg. Genanvendelse kræver kun 5% af den energi, der bruges ved primær produktion, hvilket reducerer CO2-udledningen betydeligt. Desuden kan aluminium anodiseres i mange farver, hvilket giver mulighed for æstetisk tilpasning til forskellige designprojekter.

Udfordringer
Aluminiumproduktion er energikrævende og medfører høje CO2-udledninger. Selvom genanvendelse er effektiv, kræver det stadig energi, og det er vigtigt at overveje energikilden. Derudover kan der opstå udfordringer med affaldshåndtering af aluminiumprodukter, især hvis de er forurenet med andre materialer. Produktionsprocessen kan også involvere brug af kemikalier, der kan have negative miljøpåvirkninger, hvis de ikke håndteres korrekt. Endelig er markedet for aluminium følsomt over for prisudsving, hvilket kan påvirke tilgængeligheden og omkostningerne ved materialet.

Faktorer som påvirker genanvendelighed
Aluminiums genanvendelighed påvirkes af forurening fra andre materialer, som kan forringe kvaliteten af det genanvendte aluminium. Desuden kræver genanvendelsesprocessen præcise temperaturer for effektiv smeltning og formning. Det er vigtigt at sikre, at aluminium er fri for kemiske stoffer, der kan hindre genanvendelse, og at der tages hensyn til dets oprindelse og tidligere anvendelser for at bevare kvaliteten.

Aluminium støbelegeringer, Hydro

GENANVENDELSE, LEVETID OG CIRKULARITET

Genanvendelighedspotentiale
Aluminium har et højt genanvendelsespotentiale og kan recirkuleres uendeligt uden at miste kvalitet. Både primære og sekundære aluminiumprodukter kan genanvendes, hvilket sparer op til 95% energi sammenlignet med produktion af ny aluminium. Genanvendelsen omfatter alt fra dåser til byggematerialer. Alle former for aluminium er genanvendelige, men blanding med visse metaller kan påvirke kvaliteten. Materialet kan genanvendes i nye produkter, såsom bildele, bygningselementer og emballage. Processen kræver mindre energi og reducerer CO2-udledningen betydeligt.

Genanvendelsesproces
Aluminium genanvendes ved at indsamle, rengøre og smelte det ned. Processen kræver ikke tilsætning af virgin materiale, men kan inkludere små mængder legeringsmetaller for at forbedre egenskaberne. Smeltning sker ved høj temperatur, hvilket kræver energi, men er langt mindre end ved primær produktion. Granulering kan også anvendes til specifikke applikationer.

Levetid
Aluminium har en fremragende holdbarhed og kan vare op til 50 år eller mere, afhængigt af anvendelsen og miljøet. Det er korrosionsbestandigt og kræver minimal vedligeholdelse.

Vedligehold og pleje
Aluminium kræver minimal vedligeholdelse; rengøring med mild sæbe og vand anbefales for at bevare udseendet og forhindre korrosion. Anodisering kan forbedre beskyttelsen.

Bortskaffelse
Aluminium kan bortskaffes gennem genbrugsprogrammer, da det er 100 % genanvendeligt uden kvalitetstab. Der er ikke kemisk affald fra aluminium i ren form, og skrot kan recirkuleres til nye produkter i forskellige industrier, hvilket understøtter cirkularitet og reducerer ressourceforbruget.

Certificeringer / mærkninger
Aluminium kan certificeres under ASI (Aluminium Stewardship Initiative) for bæredygtig produktion og ansvarlig sourcing.

Kategori for genanvendelse
Aluminium kan genanvendes uendeligt uden kvalitetstab, hvilket gør det muligt at recirkulere i samme produktion eller anvende i andre industrier. Genanvendt aluminium kræver kun en brøkdel af den energi, der bruges til at producere virginmateriale.

Link(s)
aluminium.org
Aluminium Europe
Hydro.com

BLANKA & COLOR-ALL


Rockfon

PRODUKTEKSEMPEL

Virksomhed
Rockfon

Virkefelt
Rockfon udvikler og sælger indendørs akustikløsninger til væg, loft og zoneopdeling i stenuld.

Materiale
Stenuld udvundet af basalt.

Materialebeskrivelse
Color-all® og Blanca® leveres som modulplader med en tykkelse fra 15-40 mm.

Materialeingredienser
Stenuld, genanvendt stenuld binder. Produktet består altid af 29-64% genanvendt stenuld, afhængigt af hvor meget genanvendt stenuld virksomheden har tilgængeligt.

Udviklingsstadie
Materialet er tilgængeligt og der videreudvikles løbende på produktsortimentet.

Geografisk oprindelse og produktionssted
Basalt fra et stenbrud i Polen. Produktion i Polen, Frankrig, Belgien og en mindre andel i Danmark.

Fremstillingsproces
Basalt smeltes ved op til 1500°C. Det smeltede materiale løber over på et spindehjul. Herfra trækker en luftstrøm fibrene fra spindehjulene ind i spindekamre. Bindemiddel og kølevand tilsættes. Afstøvningsmiddel påføres for vandafvisende egenskab og mindskning af støv under skæring. Herefter hærdes materialet i en hærdeovn.

Kategori for genanvendelighed
Materialet består af post-consumer- og post-industrial waste. Materialet kan genanvendes i samme produktion.

Link(s)
www.rockfon.dk
Datablad, Rockfon Color All
Datablad, Rockfon Bianka

EGENSKABER OG ANVENDELSE

Fysiske egenskaber
Stenuldspladerne er fugtresistente og der dannes dermed ikke bakterier i stenulden. Pladerne har desuden gode brandhæmmende egenskaber foruden de akustiske fordele. Blanca® pladerne har særligt lysreflekterende egenskaber.

Æstetiske egenskaber
Blanca® er en glat, helmat og ekstrahvid plade.
Color-all® findes i 34 forskellige farver. Pladerne er glatte og har et mat fleece udtryk.

Anvendelse
Stenuldspladerne anvendes særligt i større byggerier og kun en lille andel til det private marked. De anvendes særligt til regulering af lyd og til optimering af arbejdsmiljøet.
Eksempler på steder er kontorer, uddannelser, detailhandel, fritid og sport samt indenfor sundhed og pleje.

GENANVENDELSE, LEVETID OG CIRKULARITET

Genanvendelighed
Materialet kan recirkuleres i samme type produktion, et ukendt antal cyklusser, uden at kvaliteten forringes. Dette gælder hele materialet.

Genanvendelsesproces
Rockfons egen genanvendelsesordning - RockCycle sker gennem en specialiseret tredjepart for at sikre et højt kvalitetsniveau i processen. Deres samarbejdspartner, RGS Nordic, kvalitetstjekker og sorterer materialerne inden de granulerer det og sender det videre til Rockfons egne fabrikker. Den genanvendte stenuld blandes med nyt stenuldsmateriale og binder og bliver herefter til ny produktion.

Levetid
Hvis produkterne vedligeholdes og plejes korrekt, er udgangspunktet en levetid på 60 år.

Vedligehold og pleje
Almindelig rengøring i form af støvsugning og aftørring med en fugtig klud.

Bortskaffelse
Anden form for bortskaffelse skal ske i henhold til vejledende sortering på genbrugspladser.

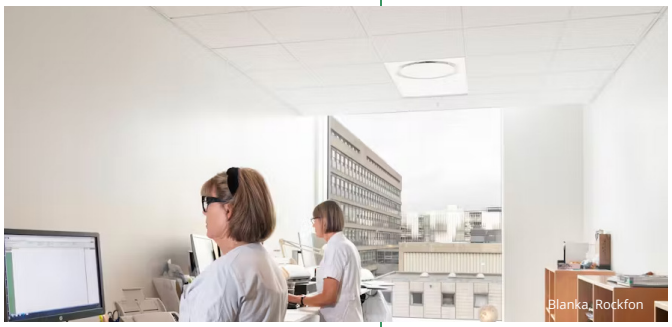
Certificeringer / mærkninger
Cradle to Cradle® Sølv certificeret, M1 – Emission Classification of Building Materials, The Indoor Climate Label.

STYRKER OG UDFORDRINGER

Styrker
Stenuldsprodukterne har en lang holdbarhed, samt gode akustiske, fugtafvisende og brandhæmmende egenskaber. Derudover kan materialet granuleres og indgå i ny produktion af samme type produkter. Dermed er materialet genanvendeligt.

Udfordringer
For at omdanne basalt stenen til stenuld kræver det et smeltningspunkt på op imod 1500 grader. Rockfon arbejder med forskellige muligheder for at optimere dette.

Faktorer som påvirker genanvendelighed
Der er umiddelbart ikke nogen kendte faktorer som påvirker muligheden for genanvendelse.


Blanka, Rockfon


Color-All, Rockfon

REWOOD. FRA TRÆAFFALD TIL NY ANVENDELSE

Uddrag af kandidatspeciale fra Det Kongelige Akademi.
Af: Cand. Arkitektur, Narumol Charoencharatkun.

Træ anvendes til alt fra møbler til byggeri. Projektet Rewood handler om at genanvende træaffald fra savværker til nye formål, så det kan reintegreres i værdikæden, skabe højere værdi og blive et salgbart, brugbart materiale. Projektet tager afsæt i træets livscyklus, træindustrien og sporbarheden på produkter, før de når forbrugeren. Træindustrien starter i skoven, hvor de første 45% af træet sendes til papirindustrien, 10% udgør spild ved fældning af træet, og yderligere 45% allokeres til savværket, som sender træet videre til forarbejdelse i møbelindustrien, laminatindustrien og byggeindustrien.

Det er denne etape af træets cyklus – ved savværket – som dette projekt fokuserer på.
Det meste træaffald genereres i savværket, hvor op til 50% af træstammerne ender som affald svarende til cirka 260.000 tons affald om året i Danmark. Træ skæres flere gange under produktionsprocessen, hvilket resulterer i forskellige former og størrelser af træaffald, der ophobes i savværket.

Byggeindustrien, især, er i stigende grad afhængig af træ, hvilket afspejler mængden af træaffald, der vil blive skabt i fremtiden. "Det, vi drømmer om, er, at det kunne bruges til noget, der var mere genialt, som man kunne få en højere værdi for, så det blev en mere værdifuld ressource – den udvikling går lidt langsomt." (Træ- og Møbelindustrien & NIRAS, 2023).

Projektets fokus har været at bevare træmaterialets komposterbarhed og samtidig opnå fuld genanvendelighed. I de nuværende industripraksisser findes der få produkter på markedet, der er genanvendelige, og endnu færre, der er komposterbare. Dette projekt arbejder for at imødekomme denne mangel og sikre, at materialet forbliver miljøvenligt og naturligt kan nedbrydes. Træaffald har stort potentiale, da dets egenskaber og styrke minder meget om nyt træ, men form og størrelse gør det vanskeligt at genanvende materialet i sin nuværende form. Derfor skal det innoveres.

Projektet er udviklet gennem en materialedrevne proces. Først handler det om at forstå træaffaldets egenskaber, dernæst følger materialeeksperimenterne. Her anvendte vi et biobaseret bindemiddel for at bevare materialets komposterbarhed. Dette eksperiment førte til flere analyser og eksperimenter, hvor hver materialetest fremviste forskellige egenskaber og styrker. Processen resulterede i flere mulige materialeanvendelser og et nyt materiale, kaldet Rewood. Rewood består af mere træ end bindemiddel, hvilket giver materialet fordelagtige egenskaber som evnen til at modstå vægt uden at kollapse – og desuden bevarer sin komposterbarhed.

Rewood er bemærkelsesværdigt i holdbarhed og evne til at bevare sin form under pres. Materialet kan fremstilles både luftigt og let, og i forskellige kombinationer af det overskydende træaffald. Overfladen er udviklet gennem forsøg med gelatine, hvor overfladen skiftede fra ru til glat, indtil vi opnåede en balance i kompositionen, hvor overfladen fremstår blød, men fast.

Emballagematerialer er designet til at beskytte produkter mod skader under forsendelse og opbevaring. EPS-emballage (ekspanderes polystyren) bruges ofte til at sikre genstande under transport og oplagring, især til tunge, skrøbelige eller uregelmæssigt formede varer. EPS er et almindeligt anvendt materiale til packaging, der øger en sikker produktlevering. Selvom materialet er 100% genanvendeligt, bliver kun 35% genanvendt, mens resten ender som restaffald. Ved at erstatte EPS med Rewood tilbyder vi et bæredygtigt alternativ. Træaffaldet bruges normalt til biomasse, mens Rewood forlænger træaffaldets livscyklus i form af packaging. Når et givent produkt er nået sikkert frem til kunden, pakket i Rewood emballage, kan Rewood vende tilbage som biomasse til energiproduktion. En fremtidig model kunne være at udvikle et affaldsindsamlingssystem for at genanvende materialet til nye produkter eller ny emballage. Som det er nu, kan Rewoods komposteres i naturen som træflis eller i en biobeholder og således vende tilbage til naturen.

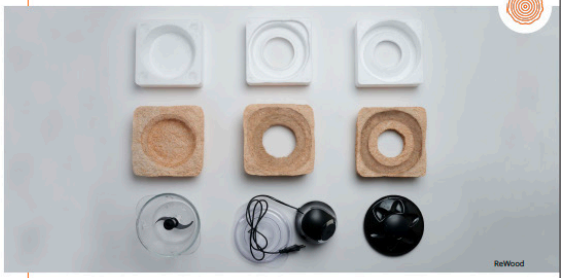
Som emballage har Rewood en rundet bund for at forhindre, at emballagen sætter sig fast i kassen, ligesom udskæringer i emballagen reducerer materialeforbruget og letter bortskaffelsen. Derudover gør emballagens afrundede kanter det mere behageligt at håndtere. Det naturlige trælignende materiale giver en mere stoflig fornemmelse, når man pakker produktet ud. Rewood forbedrer således ikke kun kundetilfredsheden og taktiliteten, men giver også miljømæssige fordele.

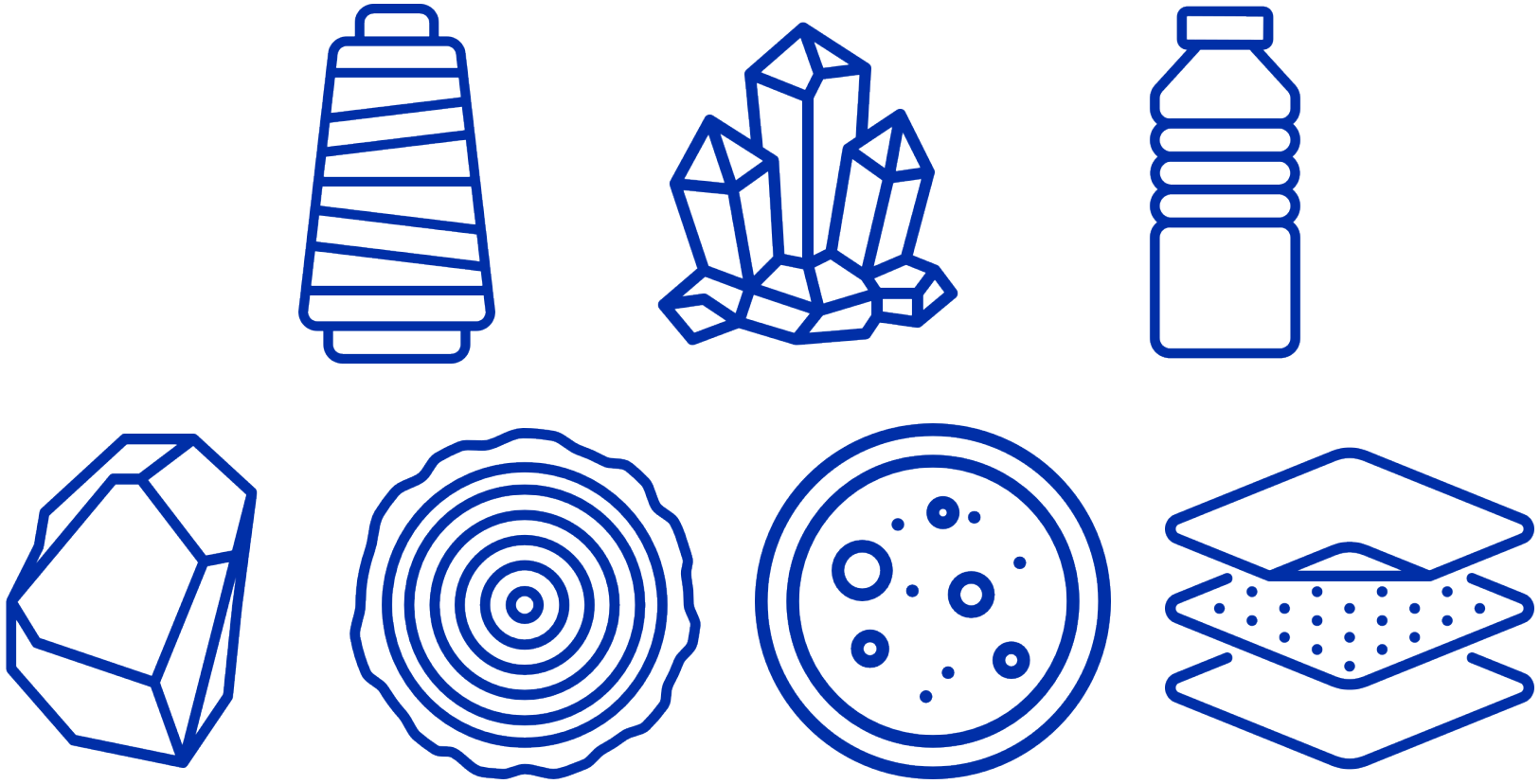
Rewood er med andre ord en bæredygtig løsning til komposterbar og genanvendelig emballage. Materialet indtænker problemet med affald efter forbrug, så både producent og forbruger kan træffe ansvarlige valg, reducere affald og forhindre miljøproblemer forårsaget af forkert bortskaffelse.

Tak til
Projektet er inspireret af både Træ- og Møbelindustrien (TMI), Grønagergård Savværk og PA Savværk, som har leveret materialer, stået til rådighed i forbindelse med besøg og indsigt i deres produktion, samt muliggjort direkte kontakt med eksperter. Gennem hele processen har Grønagergård Savværk hjulpet med at udvikle det nye materiale ud af deres træaffald, baseret på en dyb forståelse af markedet, materialets egenskaber og dets fremtidige potentiale.

Links
Instagram: @naru.work
LinkedIn: Narumol Charoencharatkun
Email: narumol.chr@gmail.com
REWOOD på Det Kongelige Akademi

www.groenagergaard.dk
www.pasavvaerk.dk





DERUDOVER...

Genanvendte materialer versus bæredygtighed
Anders Kofoed, Målbar

Sektorspecifikke genanvendelsesstrømme og 'teknologier
Plast
Rasmus Grusgaard, Plastikindustrien

Træ
Tanja Blindbæk Olsen, Træ- og Møbelindustrien

Stål
Jørn Nielsen, Dansk Stålinstitut

Tekstil
Mette Lindgaard, Dansk Mode & Tekstil

EFTERREFLEKSION

Hvad sker der i genanvendelsesprocessen?

Hvor meget og hvordan nedbrydes og efterfølgende opbygges materialet?

Hvor meget 'nyt' materiale tilføjes og hvornår?

Hvornår defineres det genanvendte materiale?

Hvor/hvordan indgår det genanvendte materiale?

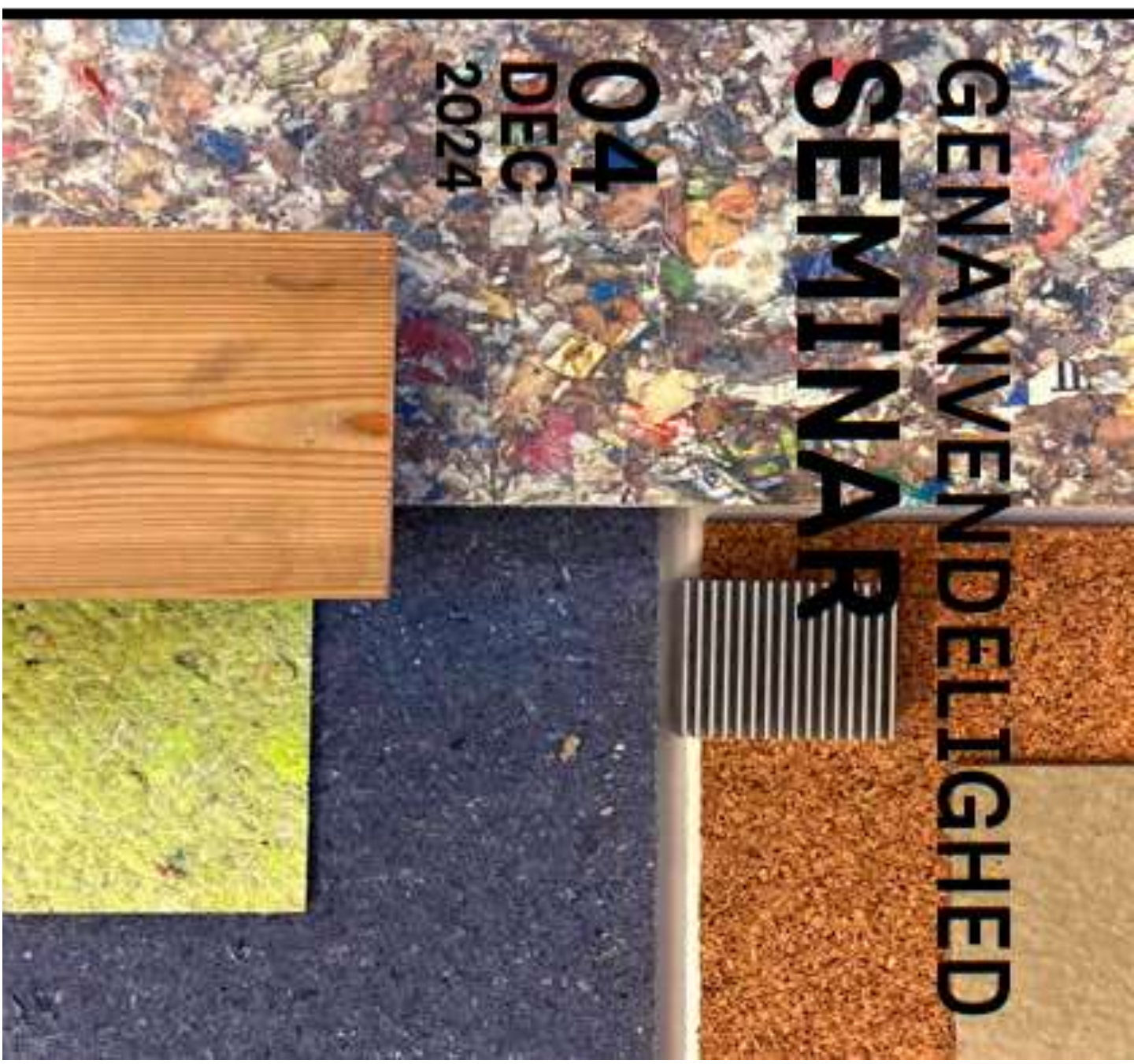
Hvordan kan det visualiseres?

Få adgang til publikationen **Genanvendelige Materialer** ved at tilmelde dig her.

Når den samlede publikation ligger færdig udsendes den i en digital version via mail.

GENANVENDELIGE MATERIALER

SPOR 1



Genanvendte Materialer &
Waste anvendelse / Shaping Shells

Lotte Jørgsholm Nerup / KEA
Jakob Bladt Jensen / Designskolen Kolding

LDC PROJEKT
GENANVENDTE MATERIALER

LDC PROJEKT
GENANVENDTE MATERIALER

PROJEKTSTRUKTUR

PROJEKTDESIGN

PARTNERE

FINDINGS & INDSIGTER

ANBEFALINGER

LDC PROJEKT GENANVENDTE MATERIALER

PROJEKTSTRUKTUR

PROJEKTNAVN & PERIODE
Genanvendte Materialer 2023-24

PROJEKTEJER
Lifestyle & Design Cluster

FINANSERING
Medfinansieret af Den Europæiske Union

Danmarks Erhvervsfremmebestyrelse

PROJEKTGRUPPE
Det Kongelige Akademi – Arkitektur Design Konservering

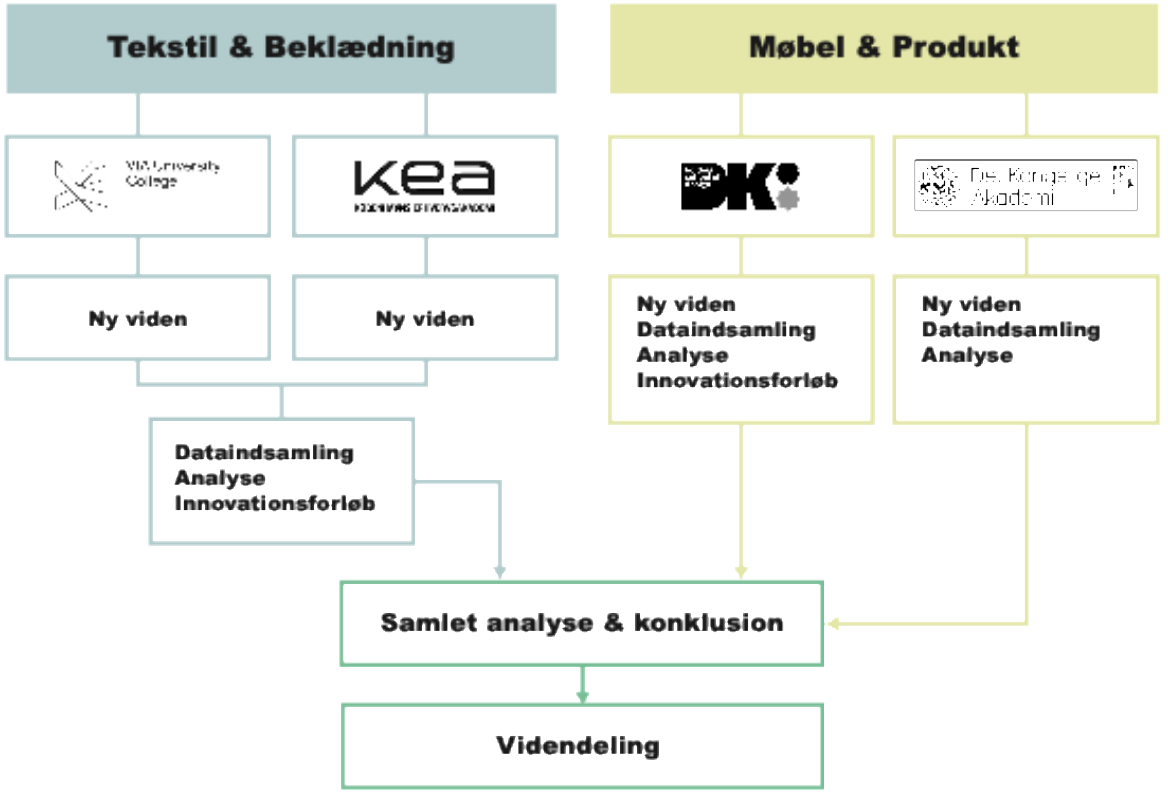
kolding school of design

kea – KØBENHAVNS ERHVERVSAKADEMI

VIA University College

LDC PROJEKT
GENANVENDTE MATERIALER

PROJEKTDESIGN



LDC PROJEKT
GENANVENDTE MATERIALER

PARTNERE

Bacher
WORK WEAR SINCE 1897

SOYACONCEPT

A CIRCULAR DESIGN STUDIO
by Andreas Zacho

ege

Re Match
TURF RECYCLING

green COMFORT

OUR UNITS

&Tradition

flock

Søuld

MYBELLY
ACTIVEWEAR FOR PREGNANCY

VER de TERRE

BY VENO

HANS THYGE & CO

TARPREC

DANSK ALGE PLAST

HAACK RECYCLING
SHRED RETHINK REUSE

wehlers
Furniture - for good

DanskTANG
– SEAWEED

BERGS
POTTER

LDC PROJEKT
GENANVENDTE
MATERIALER

FINDINGS & INDSIGTER
VIRKSOMHEDSERFARINGER

VIRKSOMHEDEN

DNA

USIKKERHED

TILFÆLDIGHEDSPRINCIPPET

STØRRELSE

LDC PROJEKT
GENANVENDTE MATERIALER

FINDINGS & INDSIGTER
VIRKSOMHEDSERFARINGER

MATERIALET

PRODUKTION

SOURCING

CERTIFICERINGER

KOMPLEKSITET

Lifestyle&DesignCluster. Medfinansieret af Den Europæiske Union Danmarks Erhvervsfremmebestyrelse

LDC PROJEKT
GENANVENDTE MATERIALER

FINDINGS & INDSIGTER
ANBEFALINGER

Genanvendte materialer er nye materialer

Tænk nyt og anderledes

Sporbarhed kan sikre kvalitet

Deltag i udviklingen

HØNEN

eller

ÆGGET

Hvad har vi opnået?
Hvad kan der videre undersøges?

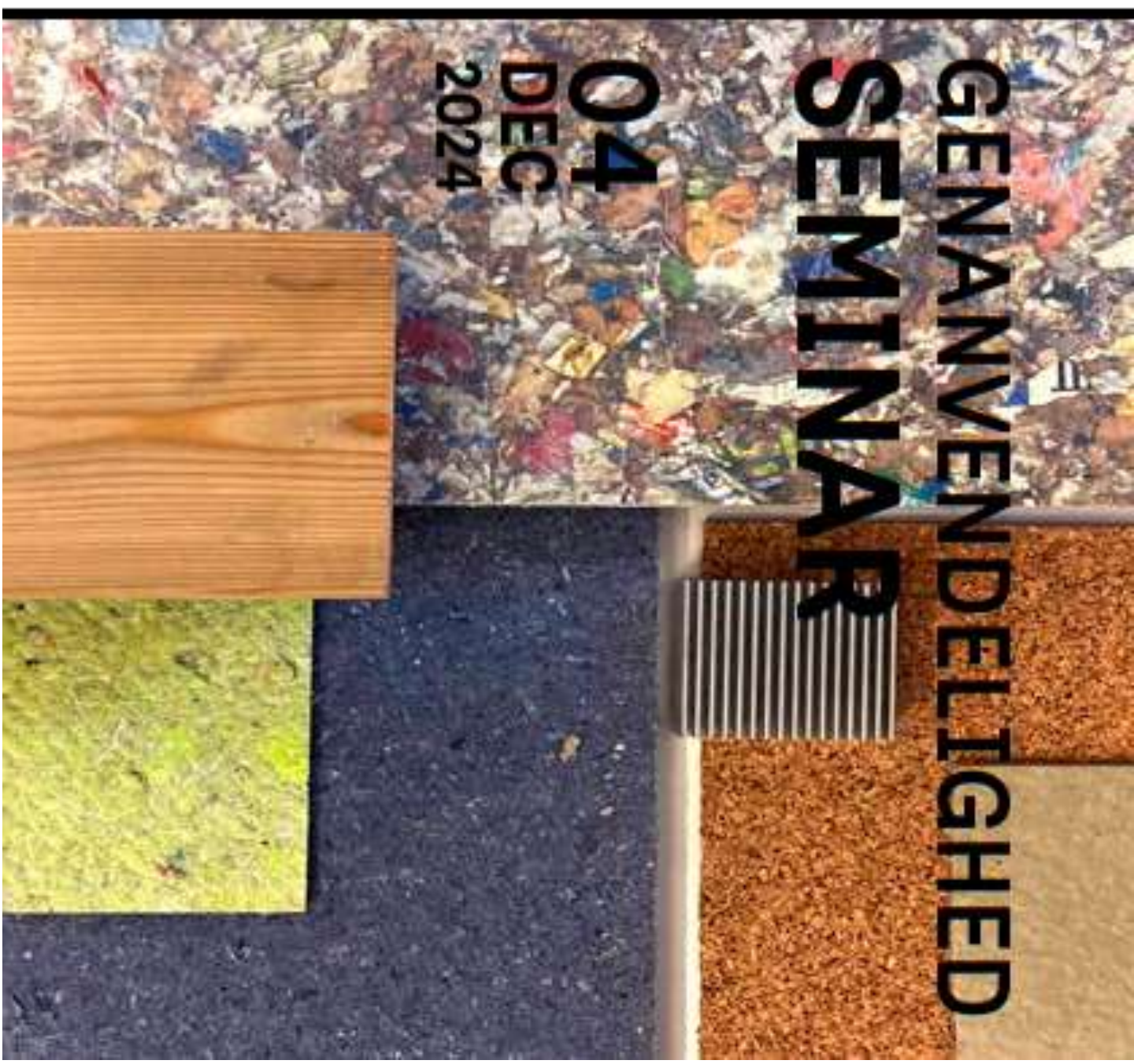
TAK

Projektskriv klar i slutningen af december.
Kan findes på LDC projektsiden

KONTAKT
Lotte Nerup, lotn@kea.dk

GENANVENDELIGE MATERIALER

SPOR 1



Wood waste - Rewood

Namurol Charoencharatkun / Det Kongelige Akademi

rewood

from wood waste to new use

GENANVENDELIGHED SEMINAR
04.12.2024

Narumol Charoencharatkun

Afgangsprojekt
Spring Semester 2024

Strategic Design and Entrepreneurship
Institute of Architecture and Design
Royal Danish Academy - Architecture, Design, Conservation

Royal Danish Academy
Architecture
Design
Conservation

AGENDA

BACKGROUND

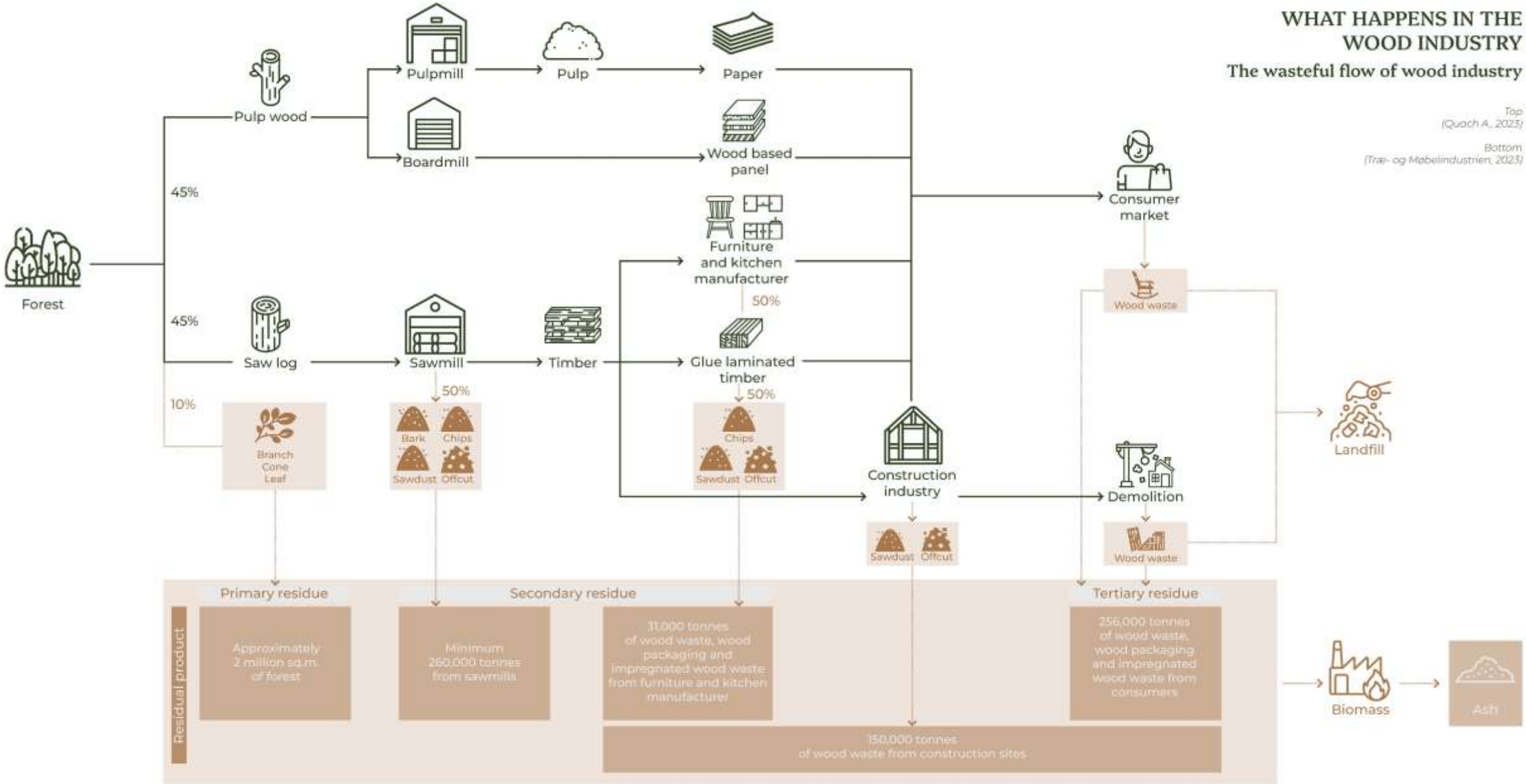
Wood is a versatile material with exceptional qualities, making it essential for many uses. The construction industry is increasingly relying on wood, leading to a detailed review of the wood industry and its challenges.

WHAT HAPPENS IN THE WOOD INDUSTRY

The wasteful flow of wood industry

Top
(Quach A., 2023)

Bottom
(Træ- og Møbelindustrien, 2023)



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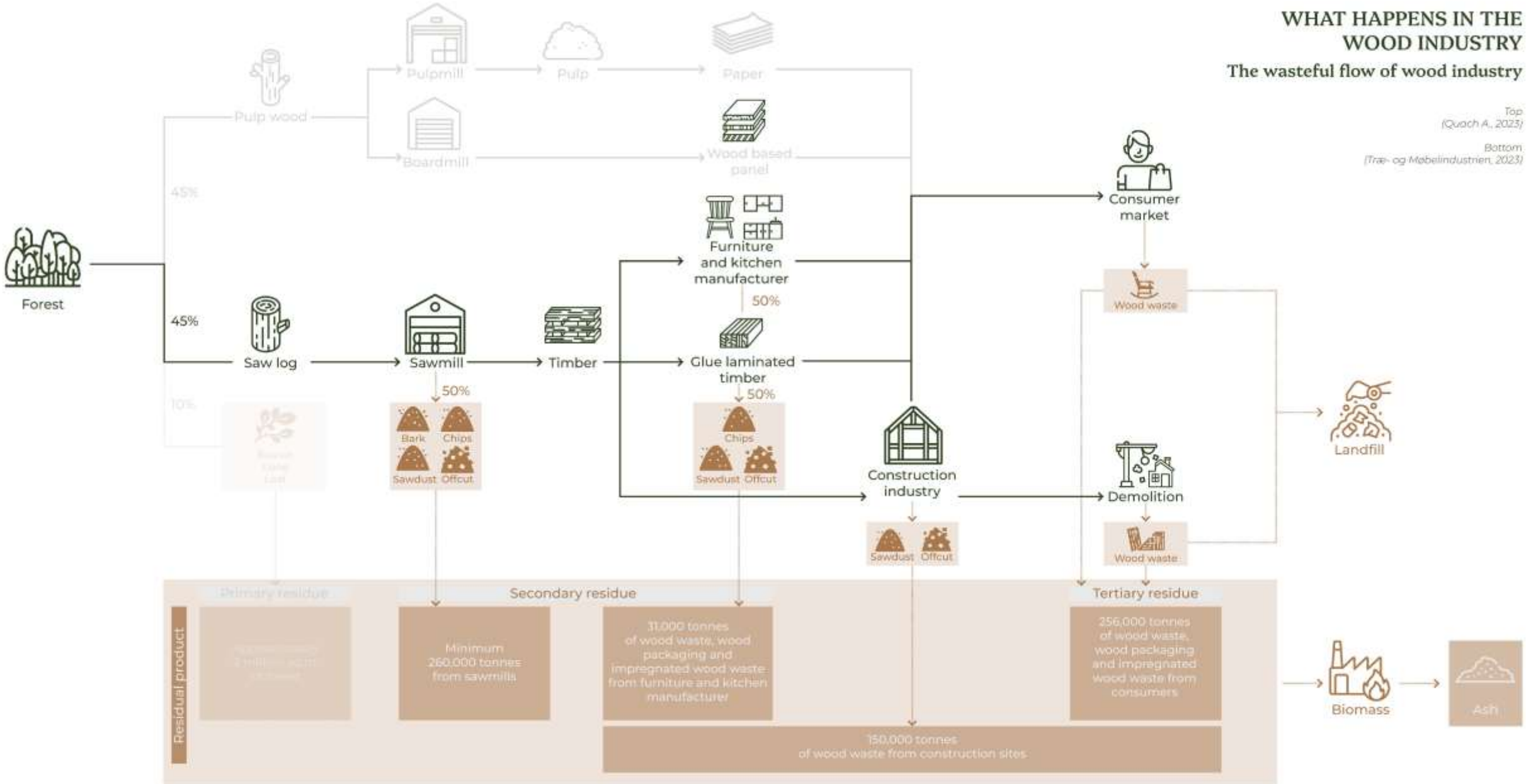

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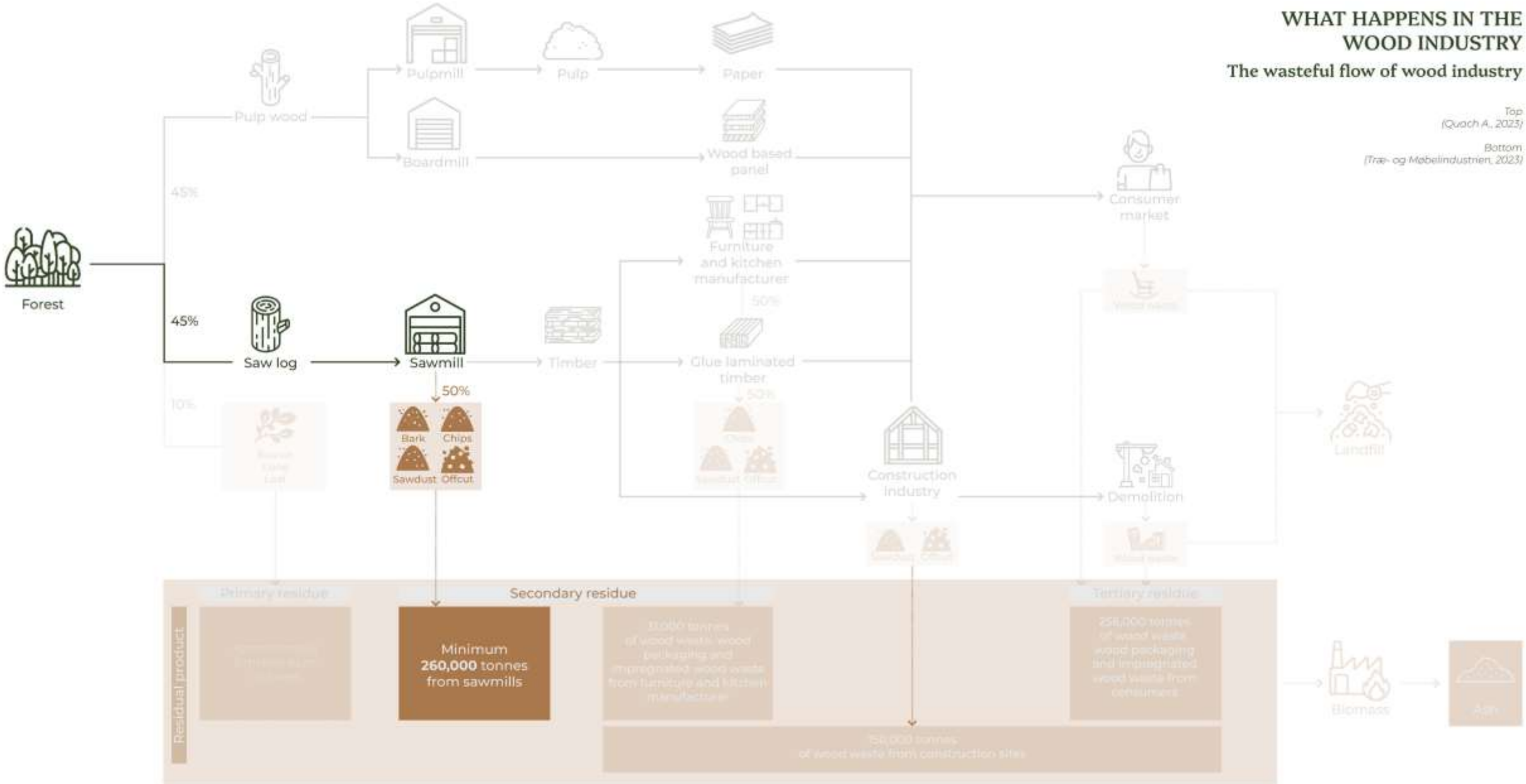


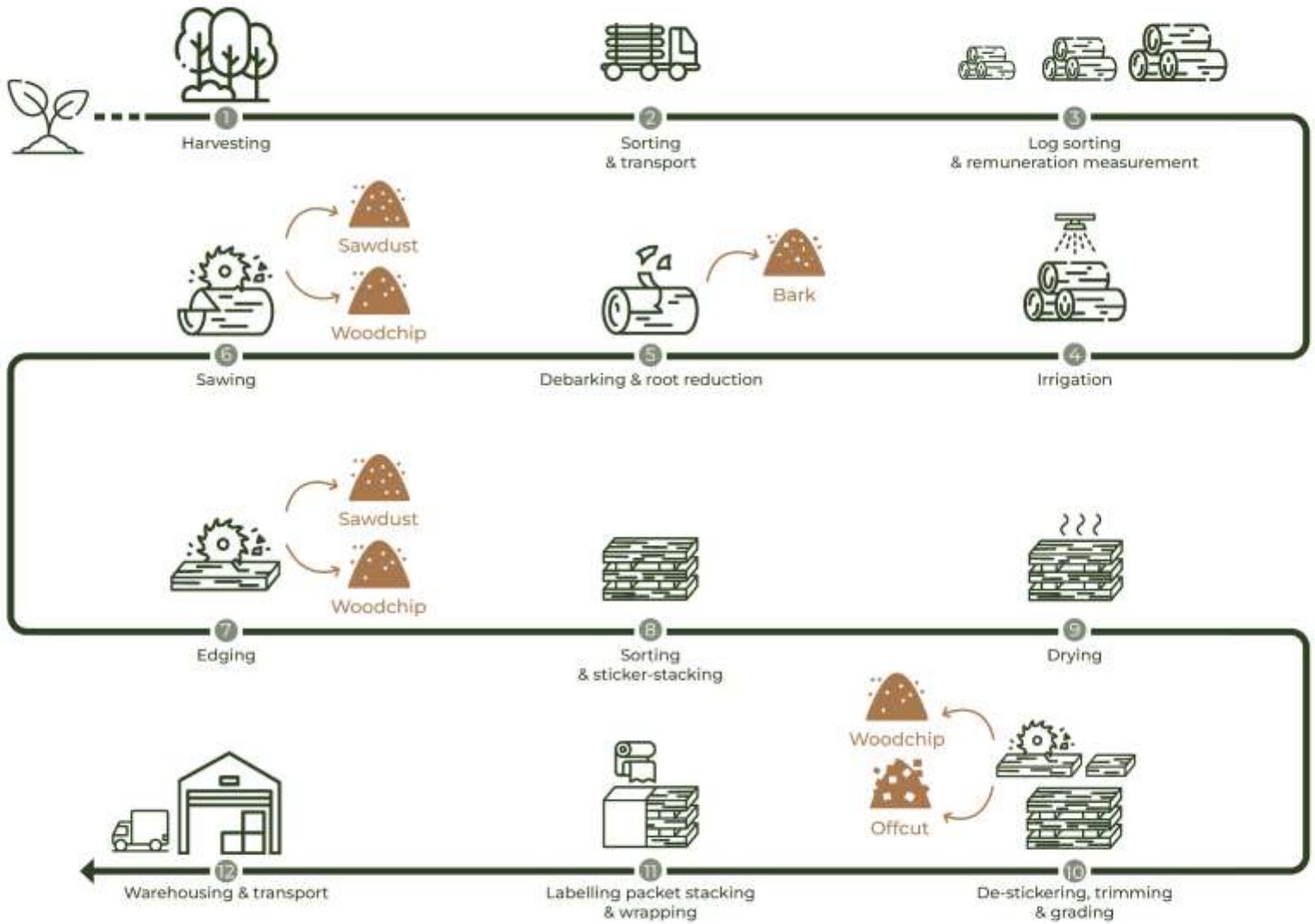

In Denmark, wood residues are commonly
used in biomass for energy production.


" What we dream of is that
wood residue could be used for
something more ingenious, that
you could get a **higher value**
for, so that it becomes a more
valuable resource.
That development is a bit slow. "
(Træ- og Møbelindustrien, 2023)

HOW WOOD RESIDUE IS GENERATED

The production flow in the sawmill

(Swedish Forum for Wood Technology, 2023)



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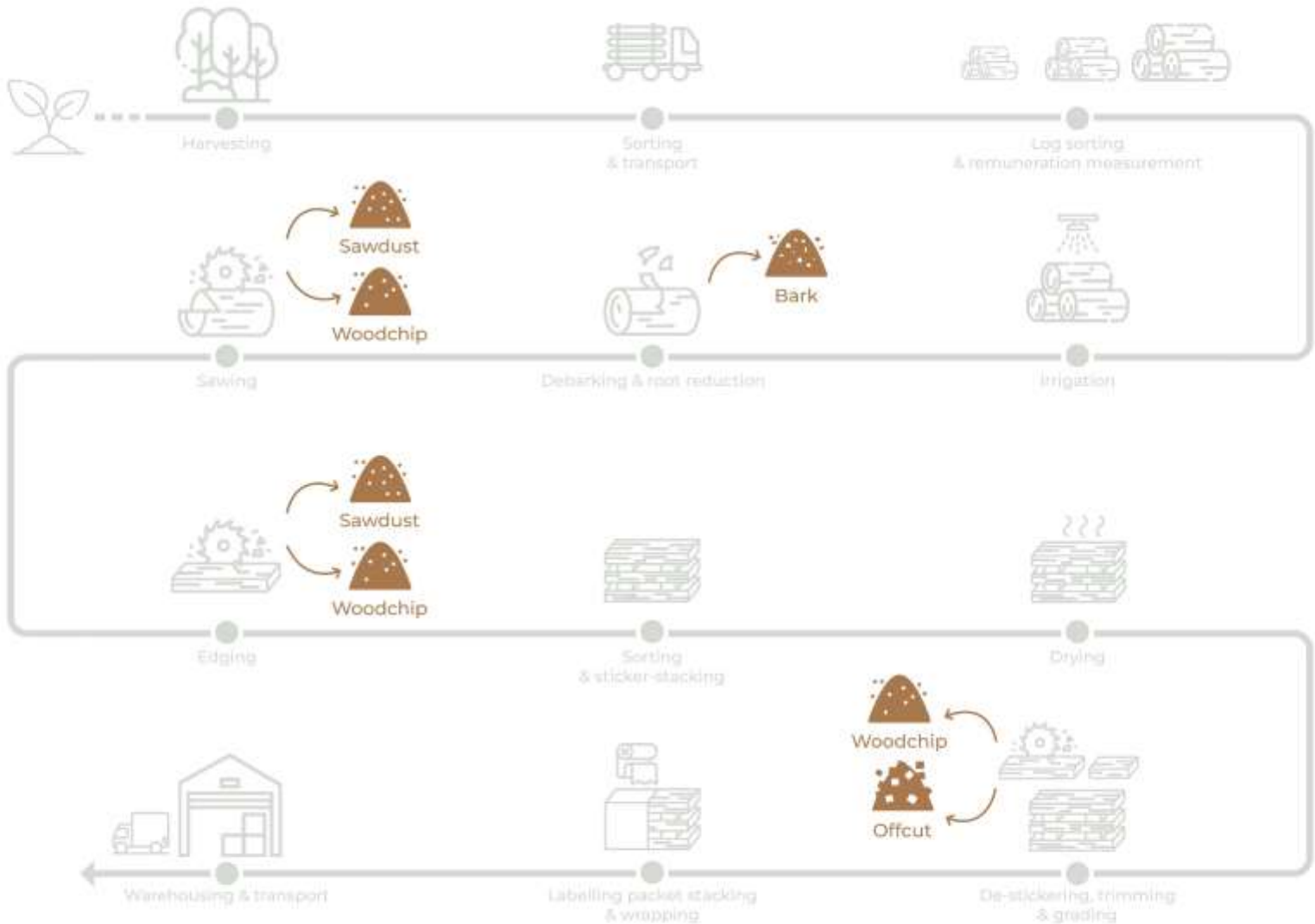
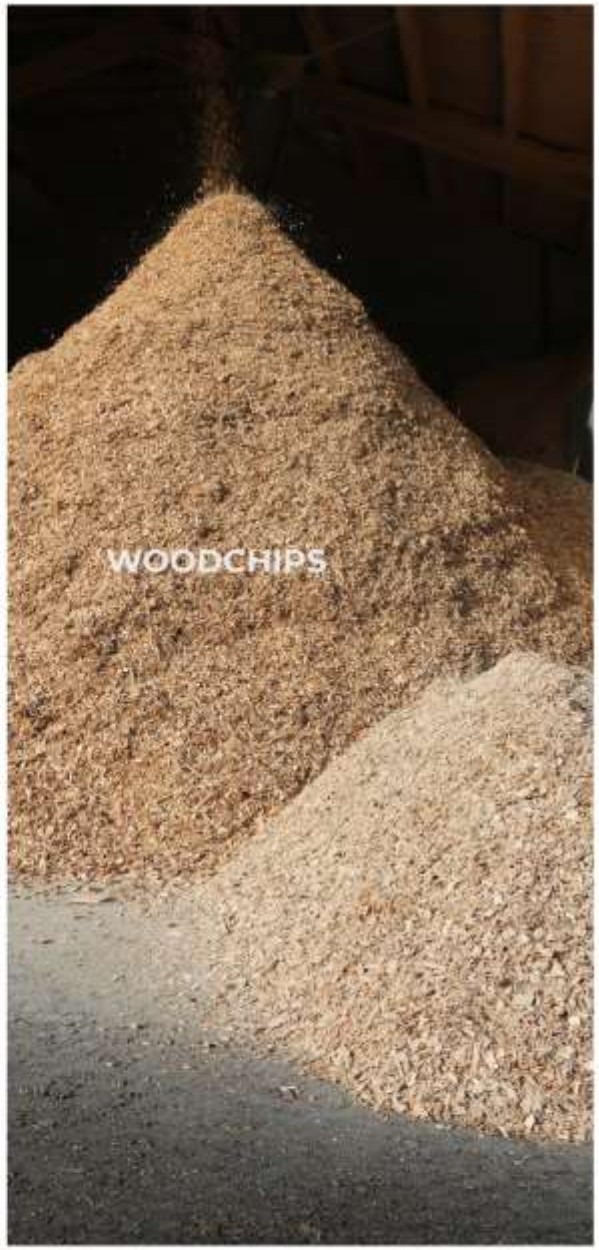
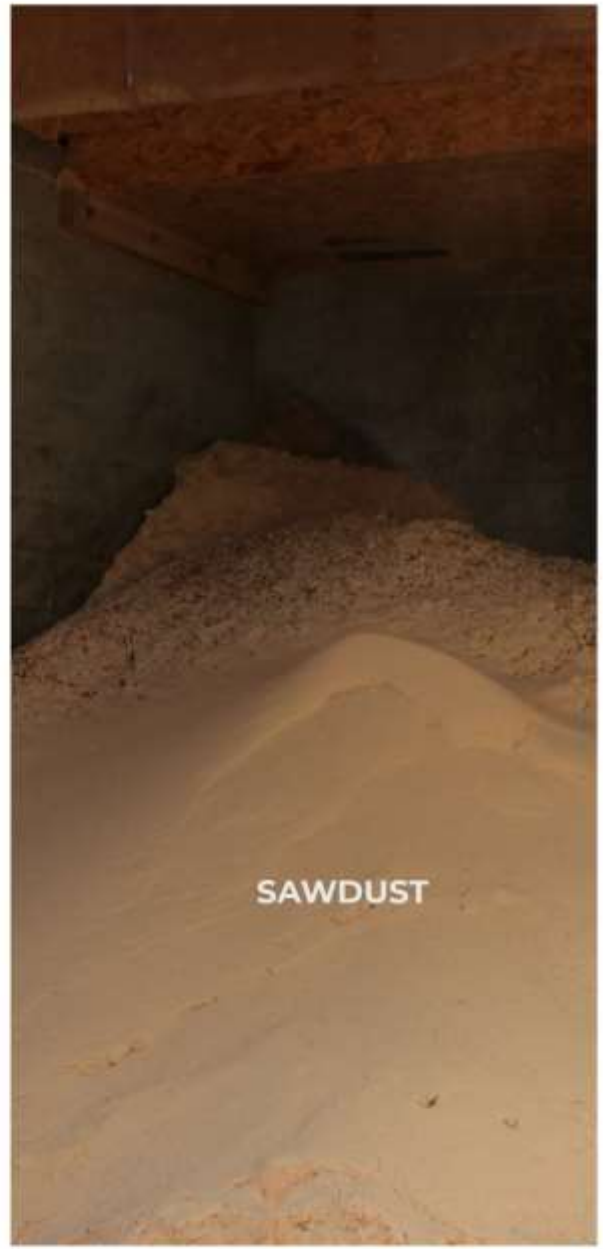



50%
of raw wood ends up as residue from the production process.


BARK

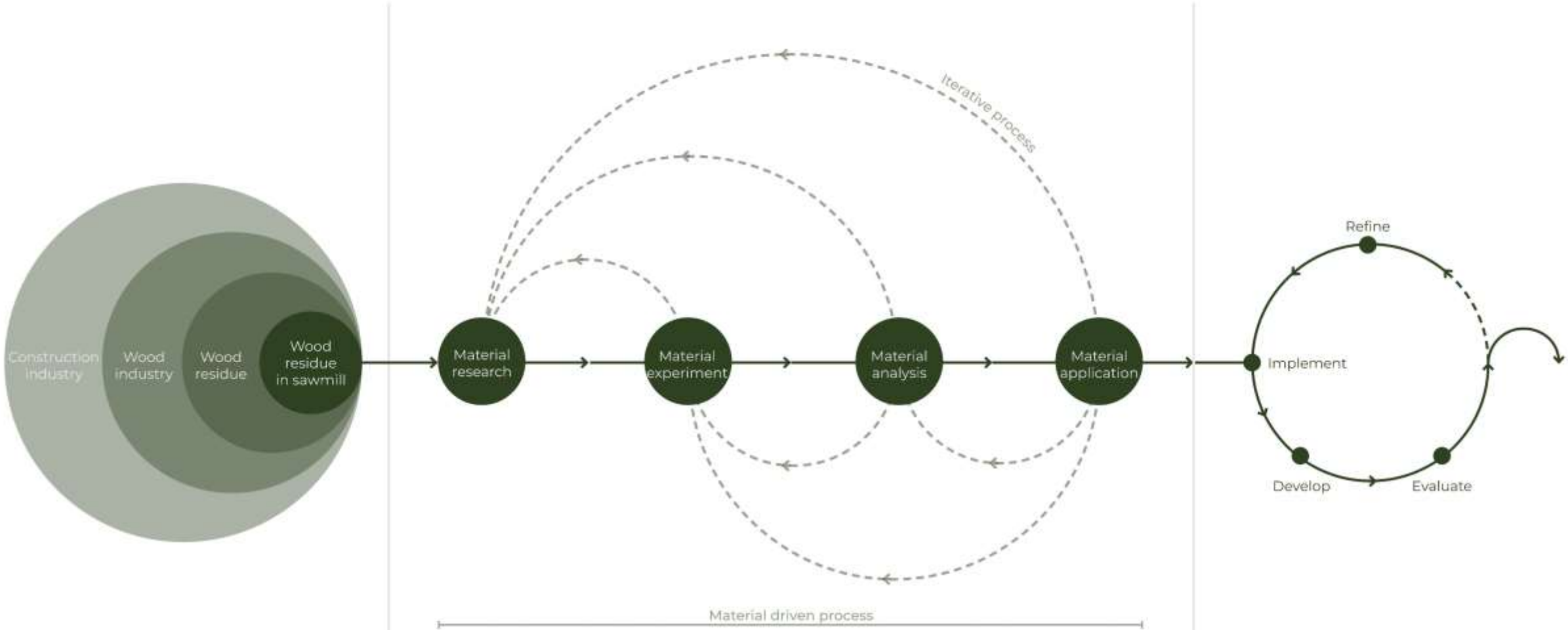

WOODCHIPS


SHAVING


SAWDUST

“ HOW CAN I REPURPOSE WOOD RESIDUE FROM SAWMILLS FOR ”
APPLICATIONS IN DESIGN OR ARCHITECTURE ?

PROJECT APPROACH

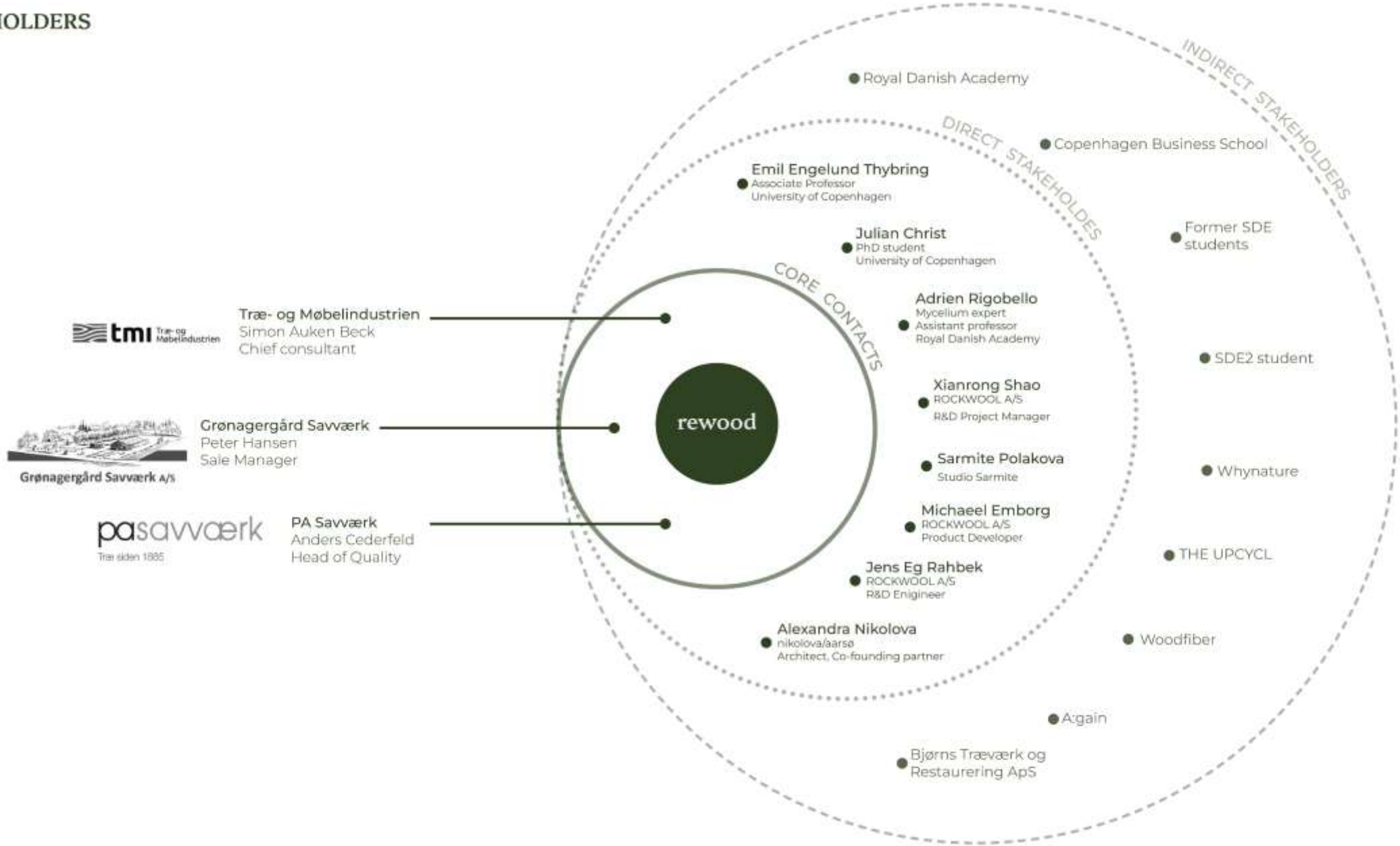


Discover & Define the Problem

Develop & Design the Solution

Refine the Solution

STAKEHOLDERS



MATERIAL RESEARCH


BARK
SAP WOOD
HEART WOOD
RAYS
PITH


BARK
SAP WOOD

size of flake

Big

Small

wood layer

Outer layer
Bark

Inner layer
Sap wood

Preserve the interior of wood

Bark hardens significantly when dried

Capable of withstanding substantial pressure

Remarkably lightweight and thin

Absorbs liquids readily, transforming into mud like

Extremely lightweight and fluffy

Flexibility to curve when exposed to moisture

Exhibits distinct textures on its front and back sides

Has the ability to absorb and release moisture efficiently

Thick and hard

Rapidly absorbs liquids

Texture can vary between fibrous or dusty, depend on the cutting machinery used on the wood.

PRODUCTS IN THE MARKET

OSB
Kronospan

MDF
Sonae Arauco, S.A.

Wood shaving board
HavnensHænder

Cement chipboard
FALCO

Cork board
HavnensHænder

Insulation panel
Woodfiber

Acoustic board
Troldtekt

Clay panel
Lemix

Loose wool Insulation
Woodfiber

Wood concrete
Isospan

Floor covering
Uniquefloor

Composite sheet
Viaplant

Insulation panel
Mykor

Corrugated sheet
Margent farm

Laminate
HuisVeendam

RESEARCH PROJECTS

Composite sheet
Basse Stitten

Pin needle composite
Gauray MK Wali

Leather-like
Sarmite Polakova

Ramp wall
Re-claim

Polymer clay
Basse Stitten

Product
Julia Steketee

Sugarcrete
UEL


Oxo-Biodegradable
Take a long time to break down and may never completely biodegrade
Biodegradable
Break down in curtain environment
Compostable
Break down within 180 days
Decomposition


Flexible
Characteristic
Hard
Oxo-Biodegradable
Take a long time to break down and may never completely biodegrade
Biodegradable
Break down in curtain environment
Compostable
Break down within 180 days
Decomposition


Flexible
Hard
Characteristic
Loose wool insulation
Leather-like sheet
Insulation panel
Acoustic board
Laminate
Composite sheet
Floor covering
Corrugate sheet
Sugarcane composite
Ramp wall
Cork board
Cement chipboard
MDF
Wood shaving board
Composite sheet
Insulation panel
Wood concrete
Clay board
OSB
Pine needle composite
Sugarcrete
Polymer clay
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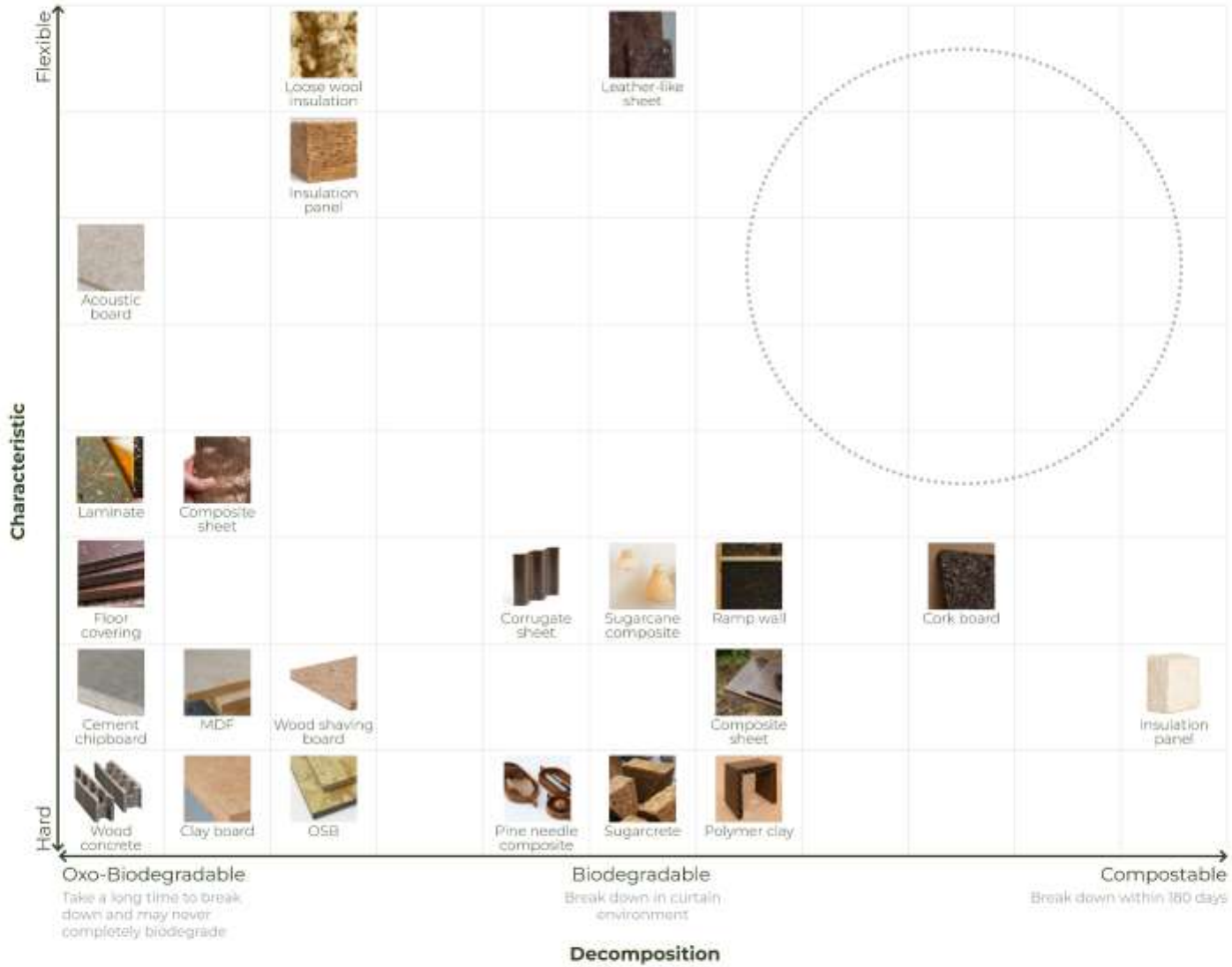
Flexible
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MATERIAL EXPERIMENT

EXPERIMENTAL METHOD

FIBER

Bark

Woodchip

Shaving

Sawdust

ADD BINDER

Flour
Starch

Harelim

Mycelium

Clay

Gelatin

CURING

Airdry

Hot air dry

Dehydration

Cooling

PROPERTIES CHECK

Hard

Semi-flexible

Flexible

EXPERIMENTS

01
break down the wood

02
starch & chip

04
flour & wood

06
harelim & wood

08
clay

09
gelatin & wood

11
gelatin, flour & wood

13
more wood than binder

03
starch & dust

05
flour,
gelatin & wood

07
mycelium

10
gelatin, flour & dust

12
effect of glycerin

14
surface test

EXPERIMENTS

01
break down the wood

A
Break down the wood

02
starch & chip

03
starch & dust

04
flour & wood

05
flour,
gelatin & wood

B
Starch & flour

06
harelim & wood

07
mycelium

08
clay

C
Mix of binder

09
gelatin & wood

10
gelatin, flour & dust

11
gelatin, flour & wood

12
effect of glycerin

D
Gelatin

13
more wood than binder

14
surface test

E
More wood than binder

01
break down the wood

- The wood residue received from the sawmill comes in various sizes.
- The experiment aims to find a way to break it down in large quantities in a short amount of time.

- Simply grinding wood chips with water and letting them air dry overnight reduces the wood particles to a size suitable for further experiments.
- Grinding shavings with water makes them powdery and lightweight when dry.

- Following the paper-making method, boil the wood with soda ash. It takes a long time for wood chips to become softer.
- For bark, the boiling time is shorter, but it needs to be ground again into small particles.

02
starch & chip

- After drying, the material becomes hard but remains very fragile.
- Upon removal from the mold, it breaks easily.

03
starch & dust

- Exceptionally hard
- Heavier than only starch and chips
- Can withstand pressure from various angles
- Over time, it can start molding if they are exposed to moisture.

04
flour & wood

- Exceptionally hard
- Sawdust helps bind wood chips together
- Cannot bend

05
flour, gelatin & wood

- Its strength is similar to starch and dust.
- It molds easily because the gelatin retains moisture within the starch, making it hard to dry.

06
harelim & wood

- Harelim is made from rabbit skin and needs to be soaked in cold water overnight and applied while hot.
- The material is sturdy and resilient.
- Difficult to break.

07
mycelium

- Wood used for mixing with mycelium must be very clean and dry.
- Extensive research is needed due to the many steps and complexities involved.

C
Mix of binder

08
clay

- Clay can mix well with woodchips and sawdust.
- Incorporating woodchips and sawdust into clay causes them to combust during firing, making the clay lighter.

09
gelatin & wood

- Gelatin is frequently used in recipes for creating bio-based materials.
- The combination of sawdust and gelatin results in a material that holds together more effectively than other binders.
- Molds are crucial in this process because the material can either bend away from the mold or stick to it and pull it away.

10
gelatin, flour & dust

- Pouring the mixture thinly into the mold allows it to become a flat, thin sheet when it dries.
- Due to its thinness, the material can be translucent and stretchy.
- However, if stretched too hard, it will not return to its original shape.

D
Gelatin

11
gelatin, flour & wood

- The addition of flour makes the material flexible while maintaining its translucent quality.

12
effect of glycerin

- The softness or hardness of the material is determined by the amount of glycerin.
  More glycerin results in a softer material, but it also extends the curing period.

E
More wood than binder

13
more wood than binder

- Develop further from the gelatin mixture by reversing the recipe to use more wood than binder.
- The result is that wood residues still stick together well, even when combining more than one type of wood residue.

14
surface test

- Using more wood than binder in the experiment enhances the wood texture of the surface layer.
- This approach refines the surface layer from previous experiments, eliminating roughness and improving material application.

“HOW CAN I UTILIZE REWOOD IN A MANNER THAT MAXIMIZES ITS STRENGTH WHILE ENSURING ENVIRONMENTAL SUSTAINABILITY ?”

MATERIAL ANALYSIS

Brittle

Hard

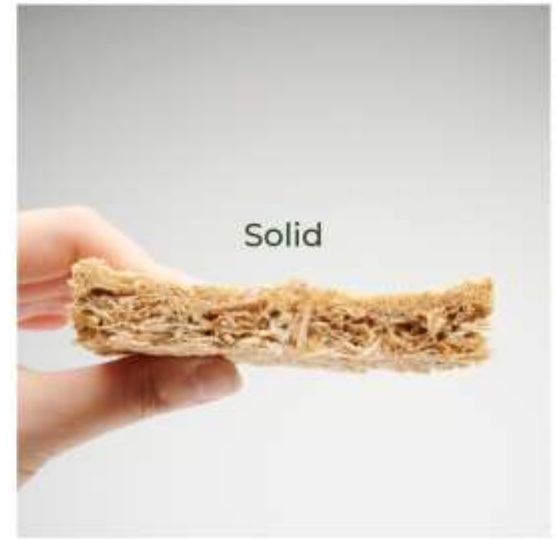
Flexible

Brittle

Hard

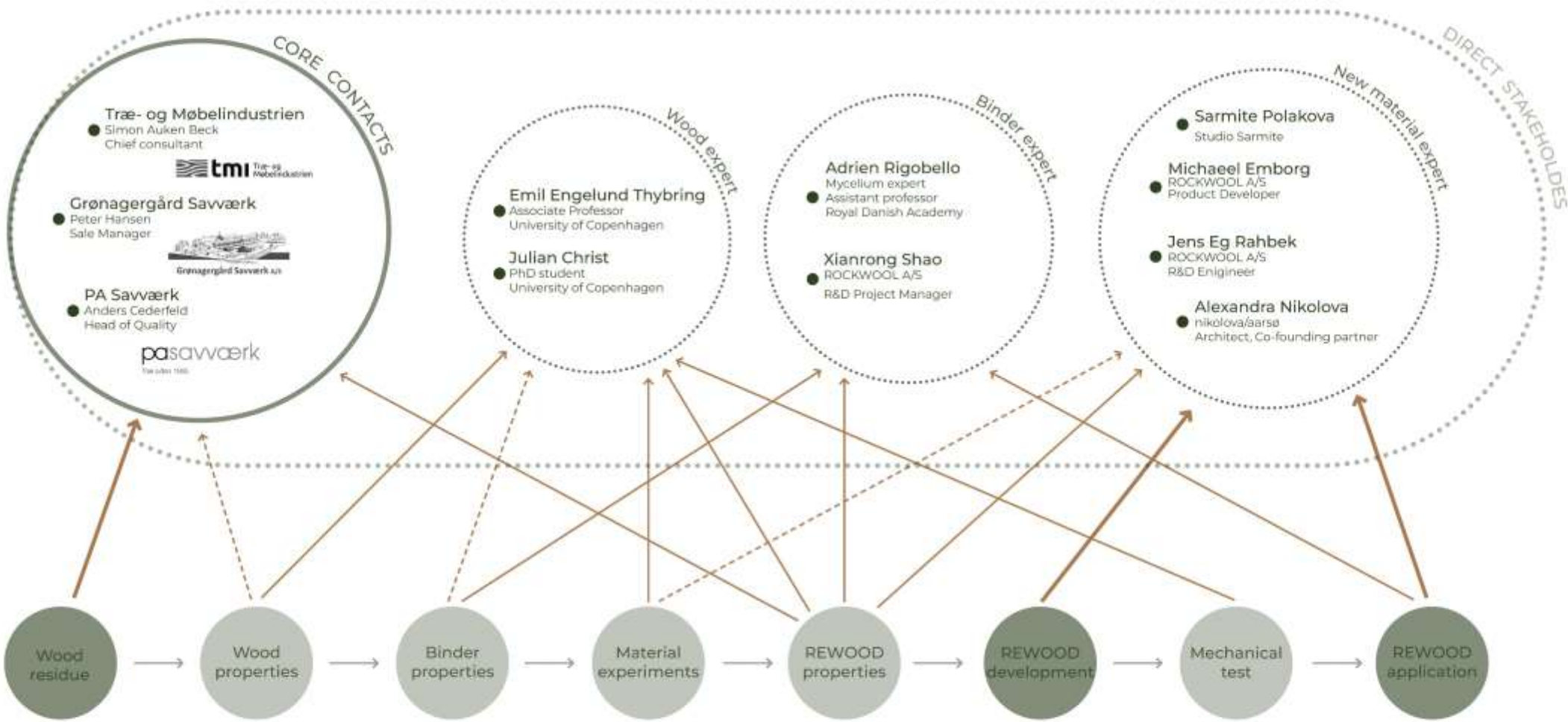
Flexible

REWOOD PROPERTIES



STAKEHOLDERS ANALYSIS

STAKEHOLDERS ANALYSIS



MATERIAL APPLICATION

TREE OF CHOICES

Wood residue

→ Chemical binder

Bio-based binder → 

→ Compostable

→ Biodegradable

→ Oxo-Biodegradable

→ Short term usage

→ Packaging

→ Pouch

→ Bottle

→ Protective packaging

→ Box

→ Bag

→ Object

→ Long term usage

→ Furniture

→ Object

→ Architecture element

WHY PACKAGING ?

Most goods require packaging at several stages of their product life. Packaging is defined in the current Packaging and Packaging Waste Directive as 'products made of any materials of any nature to be used for **the containment, protection, handling, delivery and presentation of goods**, from raw materials to processed goods, **from the producer to the user or the consumer**'.

The Packaging and Packaing Waste Directive (PPWD)

(European Parliament and Council, 2024)

- In 2021, the EU generated 84.3 million tonnes of packaging waste, averaging 188.7 kg per person – an increase of 11 kg per person compared to 2020.
- From 2010 to 2021, packaging waste per inhabitant rose by 22.5%.
- The PPWD outlines measures to prevent packaging waste, promote packaging reuse, and enhance recycling and recovery of packaging materials.
- By 2030, all packaging in the EU must be reusable or economically recyclable.
- Starting January 1, 2030, all packaging sold in the EU must be recyclable, except for those made from lightweight wood, cork, textiles, rubber, ceramics, porcelain, or wax.
- The EU's chemical policy aims to establish non-toxic material cycles and reduce the presence of hazardous substances in products, including packaging and food packaging.

Nordic Bioplastic Conference 2024

(11th April 2024)

- Extended Producer Responsibility (EPR) in Denmark will take effect in July 2025.
- The challenge with packaging lies in consumer behavior, making recycling rate lower than it should be.
- Bioplastics can serve as an alternative material to traditional plastic for packaging.
- However, bioplastics often resemble regular plastic, leading to consumer confusion and incorrect disposal.

March 2024: Provisional Agreement Reached between Council and Parliament.

2024 → 2025 → 2026 → 2029 → 2030 → 2035 → 2040

- Extended Producer Responsability (EPR) in Denmark comes into force
- Recycling target set in PPWD for all packaging waste at 65%

- All packaging designed for recyclability
- Recycled Content Target in packaging at 35%
- Recycling target set in PPWD for all packaging waste at 70%

Recycled Content Target in packaging at 65%

All Packaging recyclable at scale

WHY PROTECTIVE PACKAGING ?

Materials are designed to protect and buffer products from potential harm or destruction during shipping or warehousing. There are various types of protective packaging, including inflatable air pillows, bubble wrap, and polyurethane packaging. Paper dunnage and void fill systems, along with corrugated die cut inserts and corrugated boxes or other shipping containers, provide additional protection. For palletizing or unitizing, stretch wrap and strapping are commonly used. **EPS packaging (Expanded Polystyrene)** is also frequently employed to ensure products remain secure during transit and storage.

Example products that still use EPS as protective packaging:

- TVs and computers
- White goods
- Household appliances
- Furniture
- Glassware
- Heavy-duty machinery

HEAVY MERCHANDISE

FRAGILE MERCHANDISE

COMPLICATED OBJECTS WITH NON-FLAT SURFACES

only **35%**

post- consumer EPS packaging go to recycle

(EPS branchen, 2022)

Københavns Kommunes mark packaging fillers as residual waste which go to incineration

(Område for Affald og Ressourcer, 2024)

only **58%**

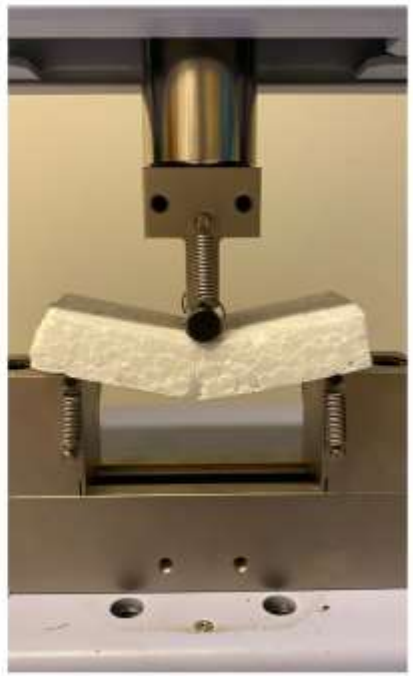
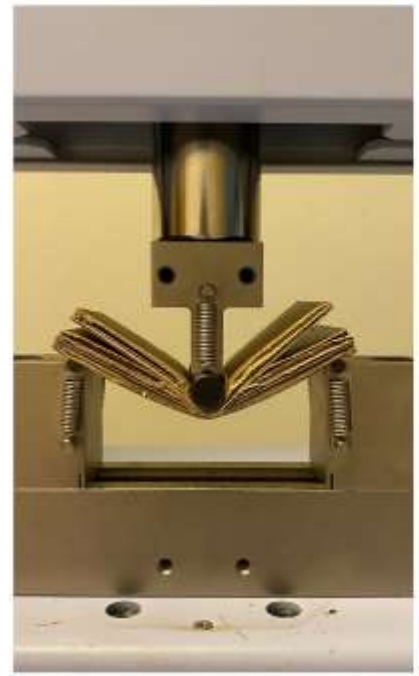
of the danish municipalities collect EPS via recycling sites

(Heide-Anderson C., 2021)

MATERIAL COMPARISON

	EPS (Expanded Polystyrene)	Corrugated cardboard	Rewood
			
Weight	30 kg/m³	689 kg/m³	350 kg/m³
Recyclability	100% infinitely	100% 7 times	100%
Post-consumer packaging recycling rate	35 %	60 %	
Compostability	500 year to break down and may never disappear	60 days to decompose	180 days to decompose
Global Warming Potentail (GWP) *Characterization factors according to EN15804+A2:2019*	2.268 kg. CO_2eq. *1 kg of material*	0.268 kg. CO_2eq. *1 kg of material*	0.009 kg. CO2eq. *1 kg of material (before the rewood process)*
Use of fresh water *Characterization factors according to EN15804+A2:2019*	0.008 m³ *1 kg of material*	0.003 m³ *1 kg of material*	0.00008 m³ *1 kg of material (before the rewood process)*
Dissolve test	 EPS does not dissolve in water.	 After one hour, corrugated cardboard becomes softer.	 After one hour, rewood breaks down into small pieces.

MATERIAL COMPARISON

	EPS (Expanded Polystyrene)	Corrugated cardboard	Rewood
			
Mechanical test (3 point bend)			
	The maximum bending strength of EPS is approximately 18 kg before it breaks.	The maximum bending strength of corrugated cardboard is approximately 95 kg before it breaks.	The maximum bending strength of REWOOD is approximately 40 kg before it breaks.

DESIGN DEVELOPMENT


1 Woodchip & shaving

Ingredients (Ratio)

Woodchip	20
Shaving	40
Gelatin	3
Glycerin	1
Vinegar	1
Water	20


2 Grinded woodchip & shaving

Ingredients (Ratio)

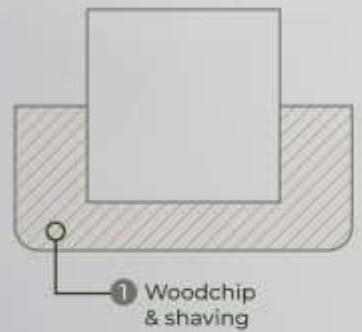
Grinded woodchip	20
Shaving	20
Gelatin	3
Glycerin	1
Vinegar	1
Water	20

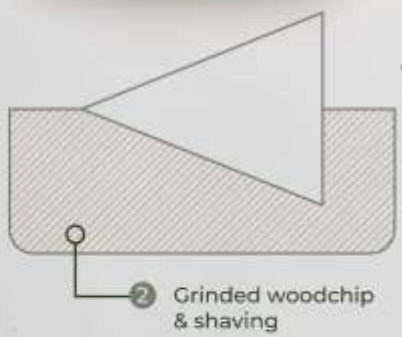

3 Grinded shaving & sawdust

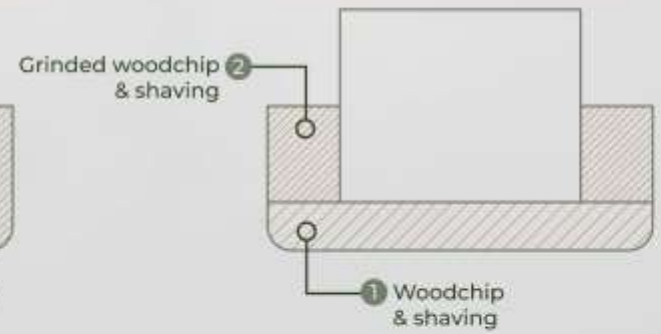
Ingredients (Ratio)

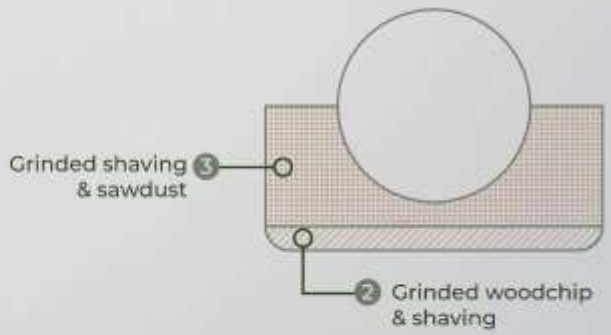
Grinded shaving	20
Sawdust	40
Gelatin	3
Glycerin	1
Vinegar	1
Water	20

SHAPE & LAYER DEVELOPMENT









SHAPE & LAYER DEVELOPMENT

Using woodchips as they are allows the material to **withstand the weight of the product**.

Experimenting with grinded woodchips using the same method as the previous experiment, allows the material to **capture product details** and **provide better protection.**

Combining two layers from the first and second experiments enables the material to **withstand significant pressure** while **capturing fine product details.**

Changing the top layer to a more refined mix of sawdust and grinded shavings allows it to **take the perfect shape of the product**, but it takes longer to dry.

SURFACE DEVELOPMENT

Smooth

Rough

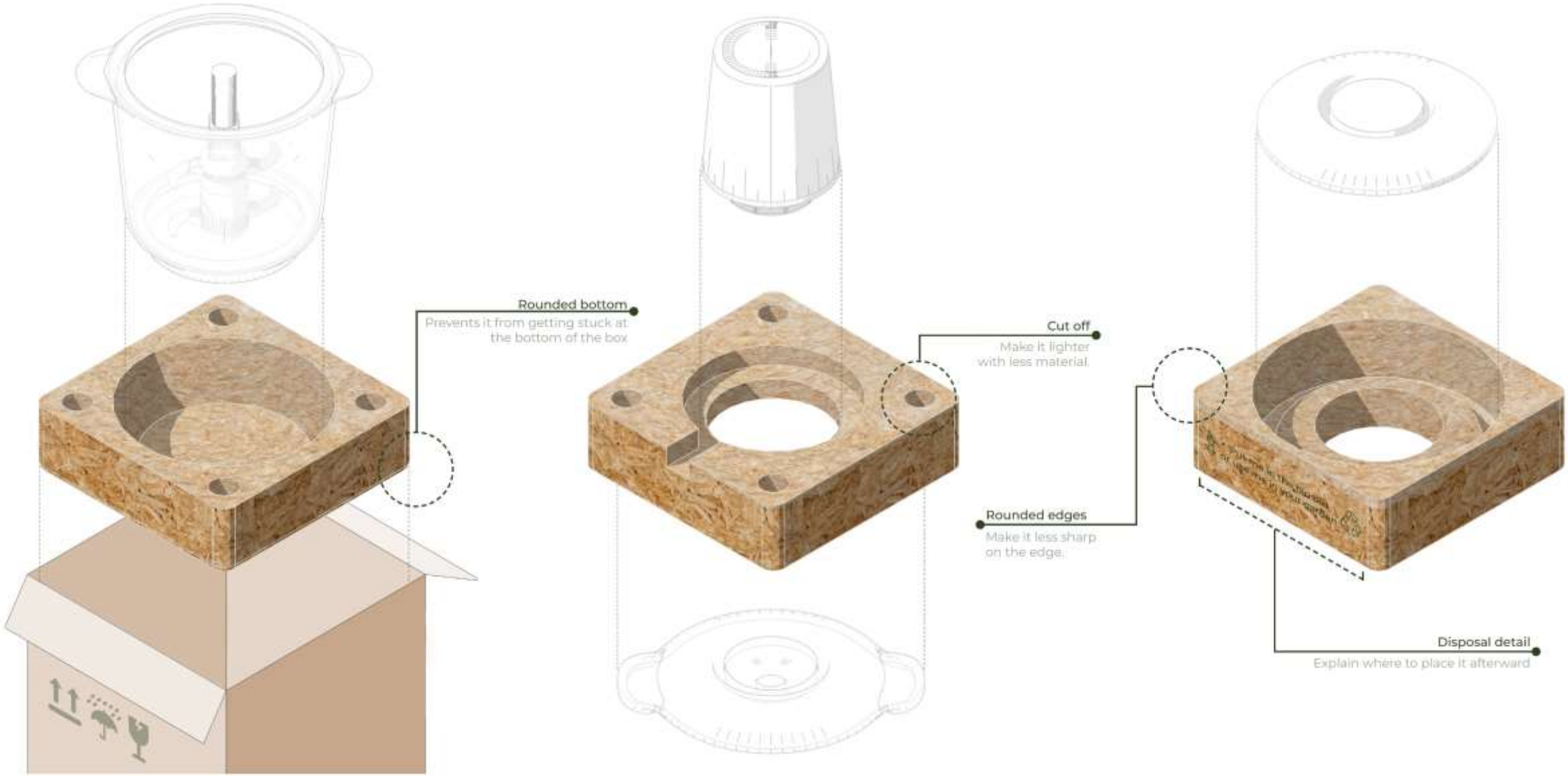
Soft yet firm surface to the touch.

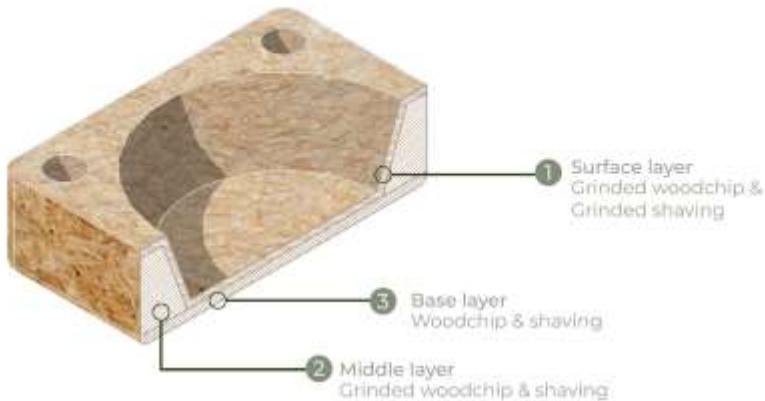
The refined surface allows it to **capture fine details of the product**.

The **combination of wood residues depends on the purpose** and the weight of the product it will support, enabling further material development.

Without the surface layer, the material can be used for **products that require strength** rather than a fine surface.

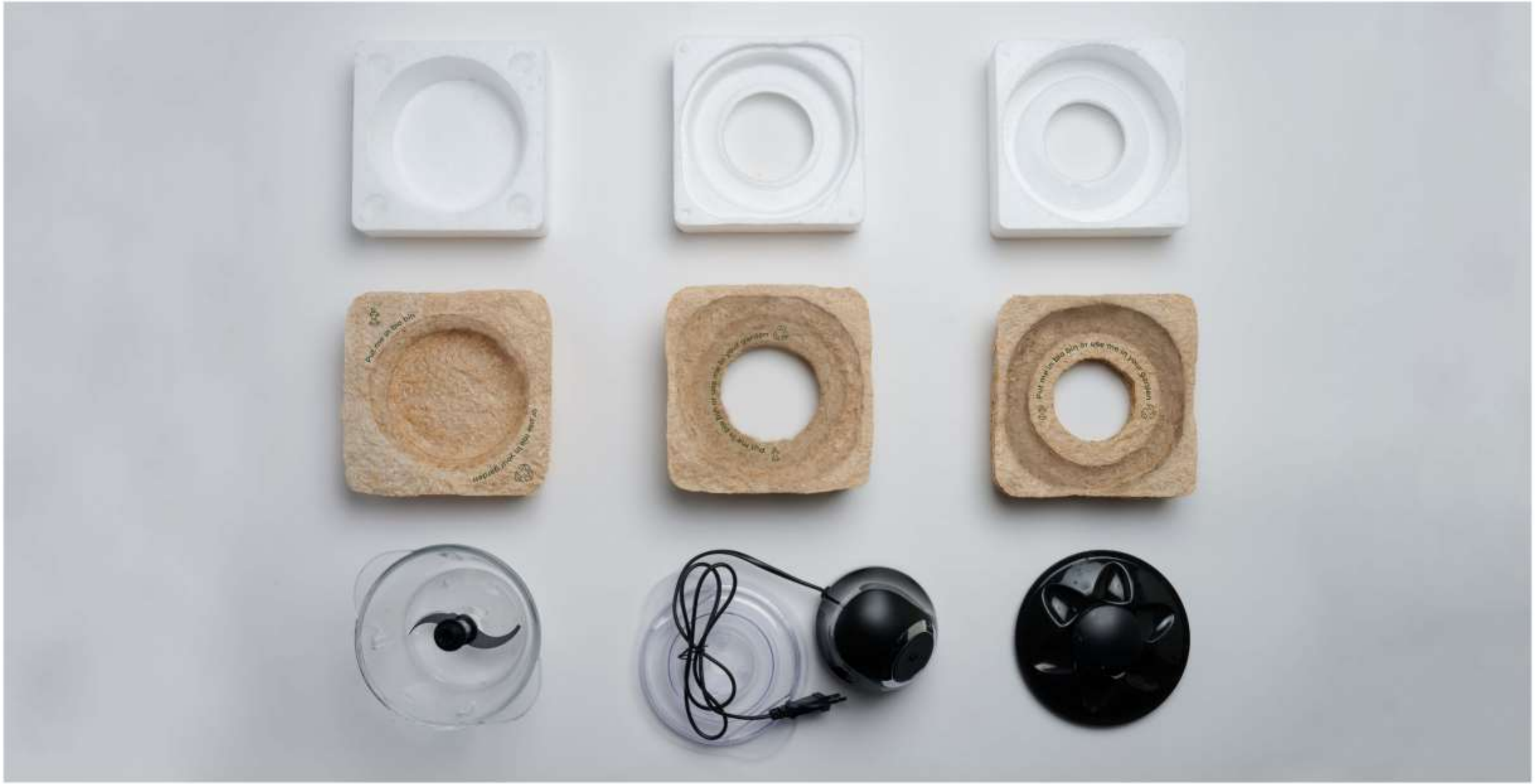
DESIGN PROPOSAL


Rounded bottom
Prevents it from getting stuck at the bottom of the box
Cut off
Make it lighter with less material.
Rounded edges
Make it less sharp on the edge.
Disposal detail
Explain where to place it afterward


1 Surface layer
Grinded woodchip &
Grinded shaving
3 Base layer
Woodchip & shaving
2 Middle layer
Grinded woodchip & shaving


2 Middle layer
Grinded woodchip & shaving
1 Surface layer
Grinded woodchip & Grinded shaving

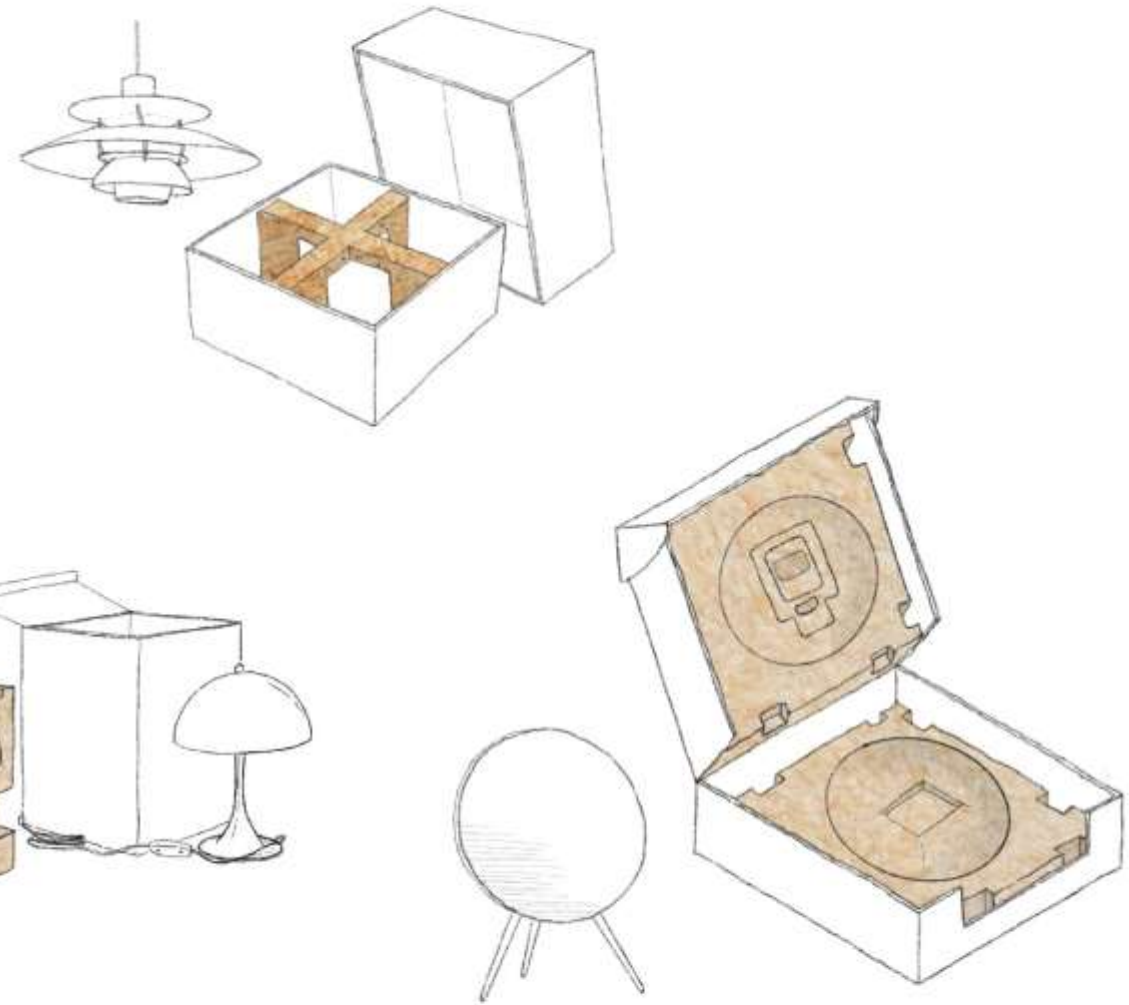

1 Surface layer
Grinded woodchip &
Grinded shaving
2 Middle layer
Grinded woodchip &
shaving



Using *Rewood* as a material for protective packaging has the potential to alter the customer's perception

Denmark is renowned for its design objects, and some products still utilize EPS foam in their packaging.

Rewood offers a solution to improve the customer experience when receiving these products, particularly for luxury brands with heavy and delicate items.

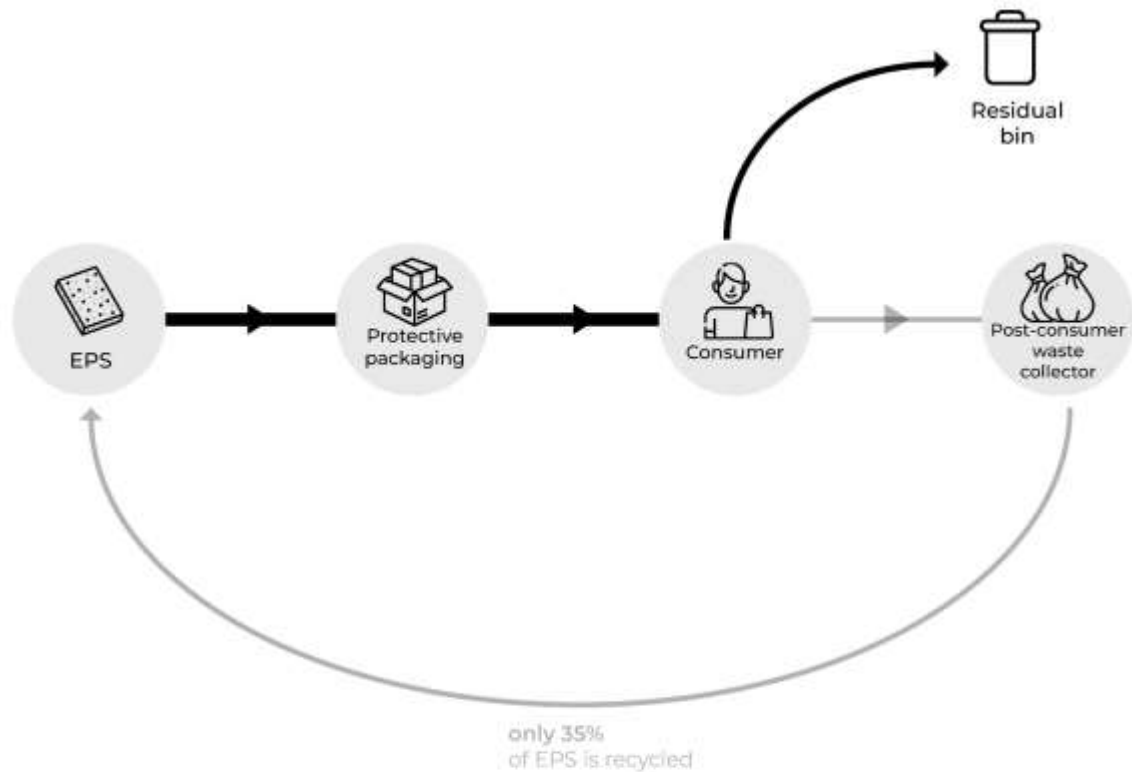


REWOOD STRATEGY


EPS


EPS
Protective packaging
Consumer


EPS
Protective packaging
Consumer
Post-consumer waste collector
only 35%
of EPS is recycled

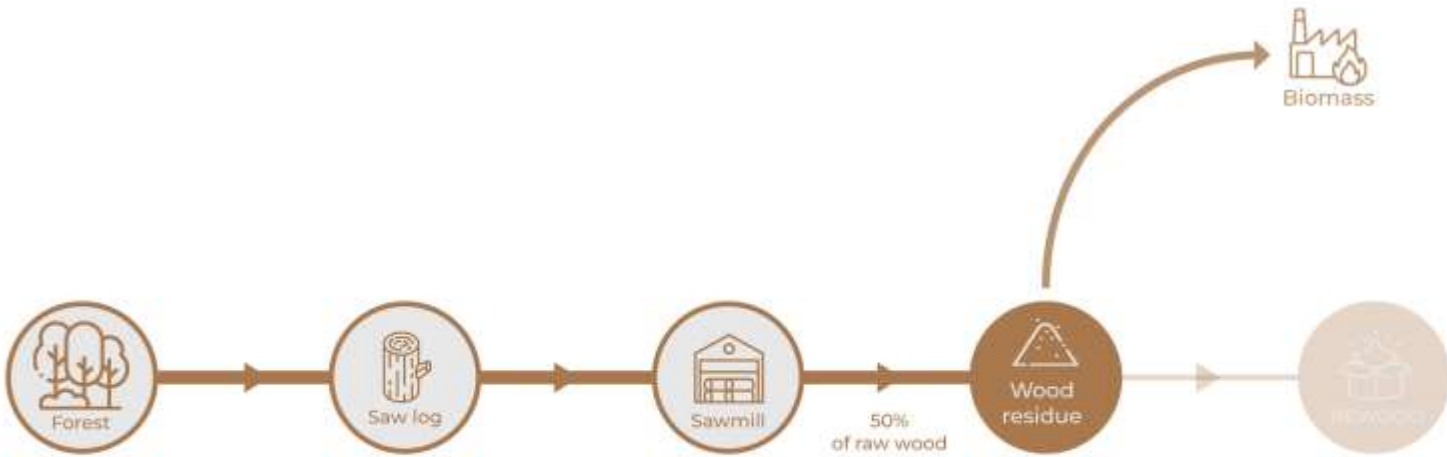

Residual
bin
EPS
Protective
packaging
Consumer
Post-consumer
waste
collector
only 35%
of EPS is recycled


EPS


REWOOD

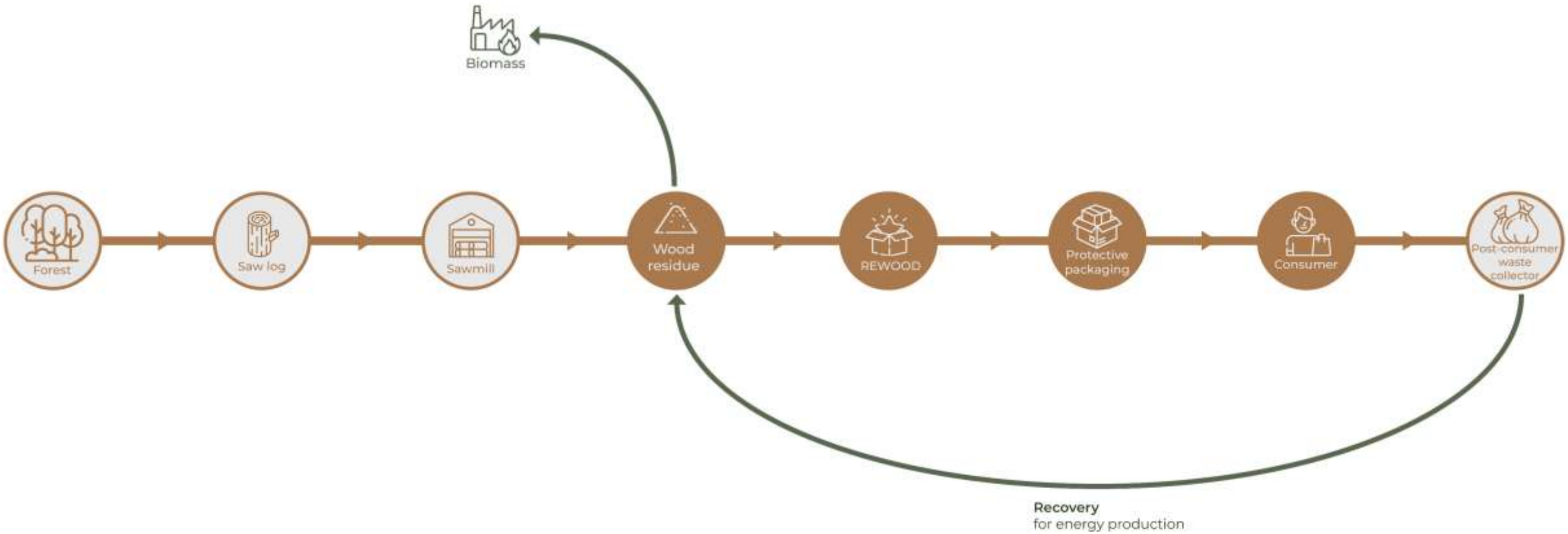

Wood
residue
REWOOD

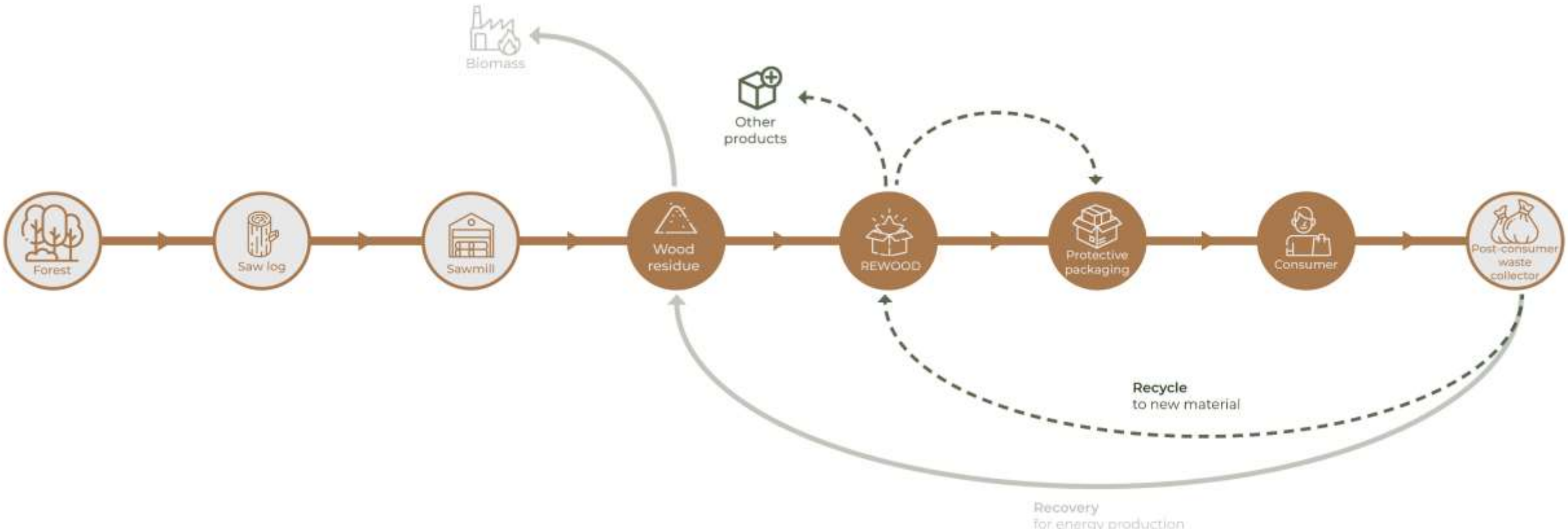

Forest
Saw log
Sawmill
50%
of raw wood
Wood
residue
REWOOD

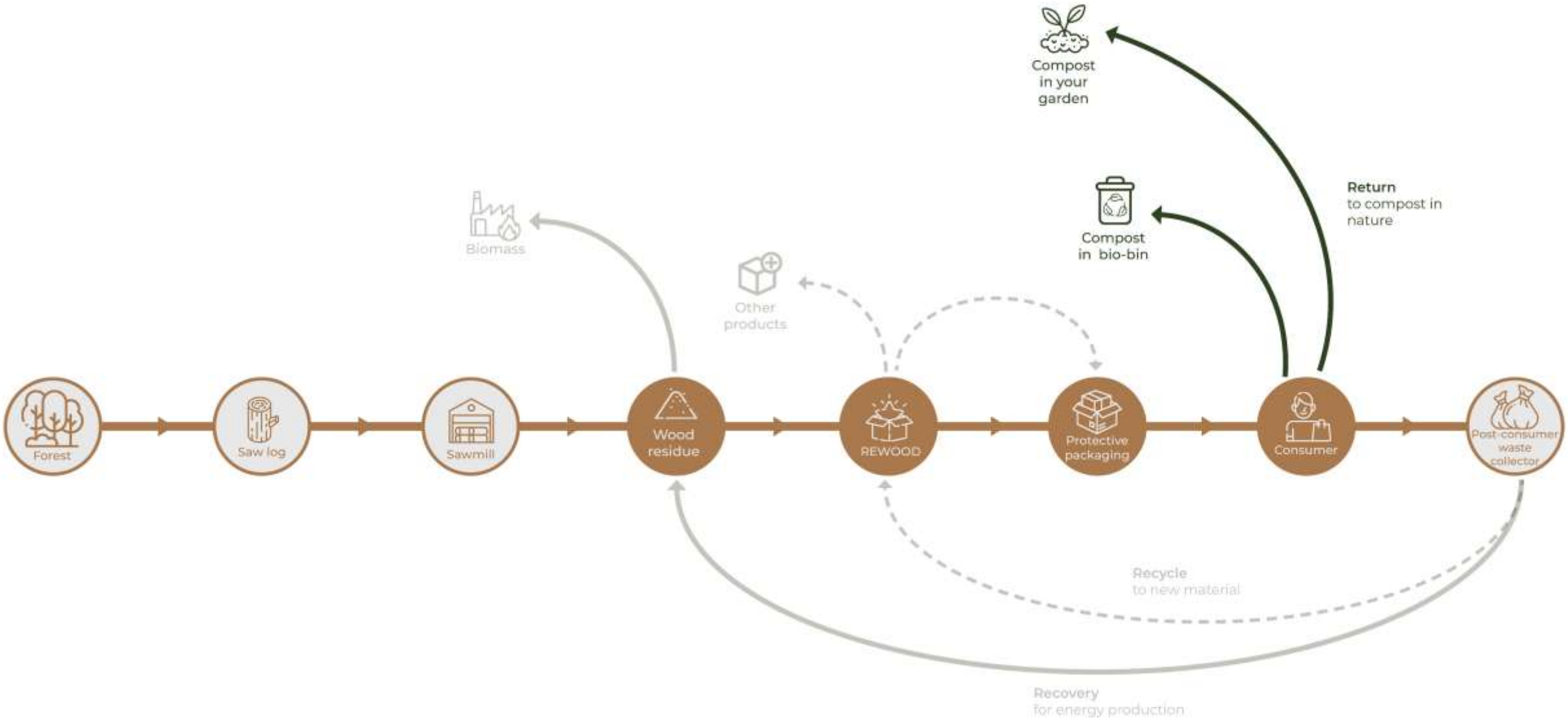

Biomass
Forest
Saw log
Sawmill
50%
of raw wood
Wood
residue


Forest
Saw log
Sawmill
50%
of raw wood
Wood
residue
REWOOD


Forest
Saw log
Sawmill
Wood residue
REWOOD
Protective packaging
Consumer


Biomass
Forest
Saw log
Sawmill
Wood residue
REWOOD
Protective packaging
Consumer
Post-consumer waste collector
Recovery
for energy production


Biomass
Other products
Forest
Saw log
Sawmill
Wood residue
REWOOD
Protective packaging
Consumer
Post-consumer waste collector
Recycle
to new material
Recovery
for energy production

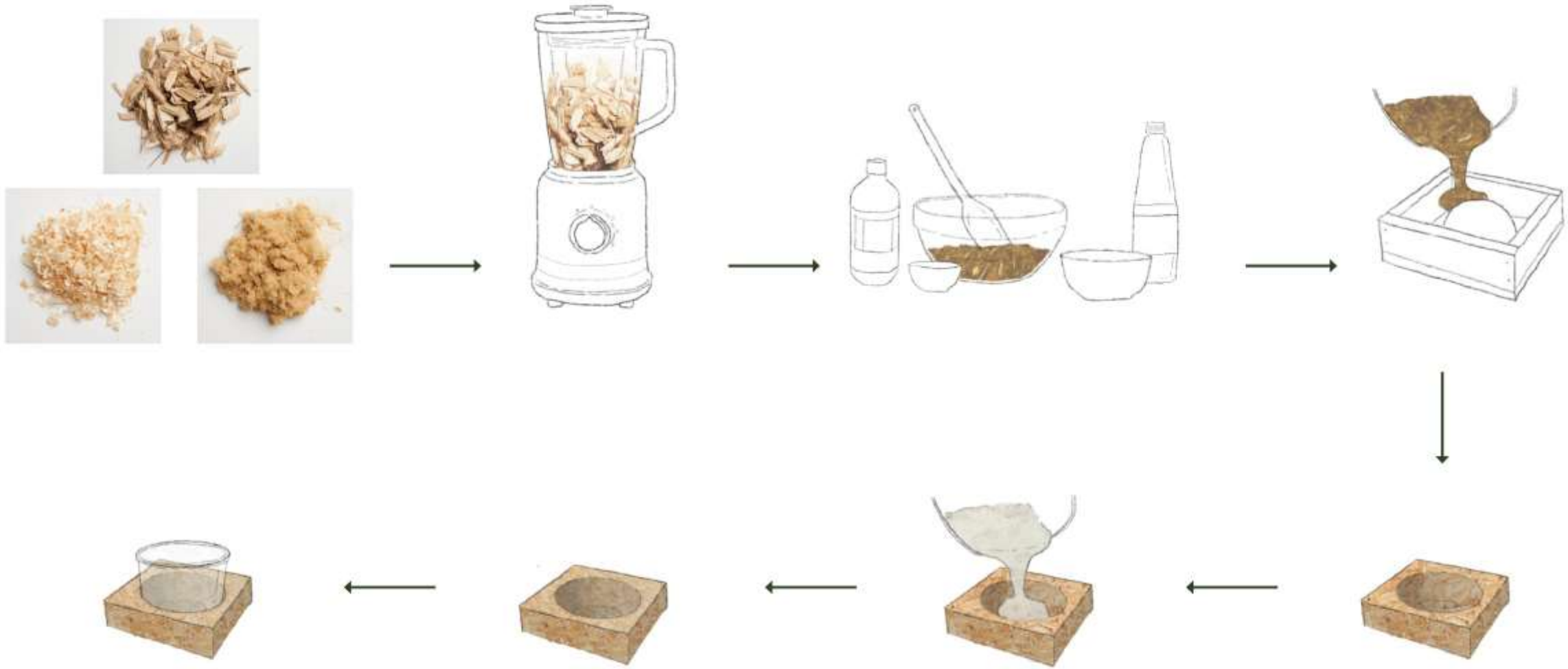

Compost
in your
garden
Compost
in bio-bin
Return
to compost in
nature
Biomass
Other
products
Forest
Saw log
Sawmill
Wood
residue
REWOOD
Protective
packaging
Consumer
Post-consumer
waste
collector
Recycle
to new material
Recovery
for energy production

Rewood offers a potential solution for protective packaging by tackling the problem of customer behavior related to post-consumer waste that often evades the recycling process. This packaging can decompose naturally, allowing both producers and consumers to make responsible choices, reduce waste, and prevent environmental issues caused by improper disposal.

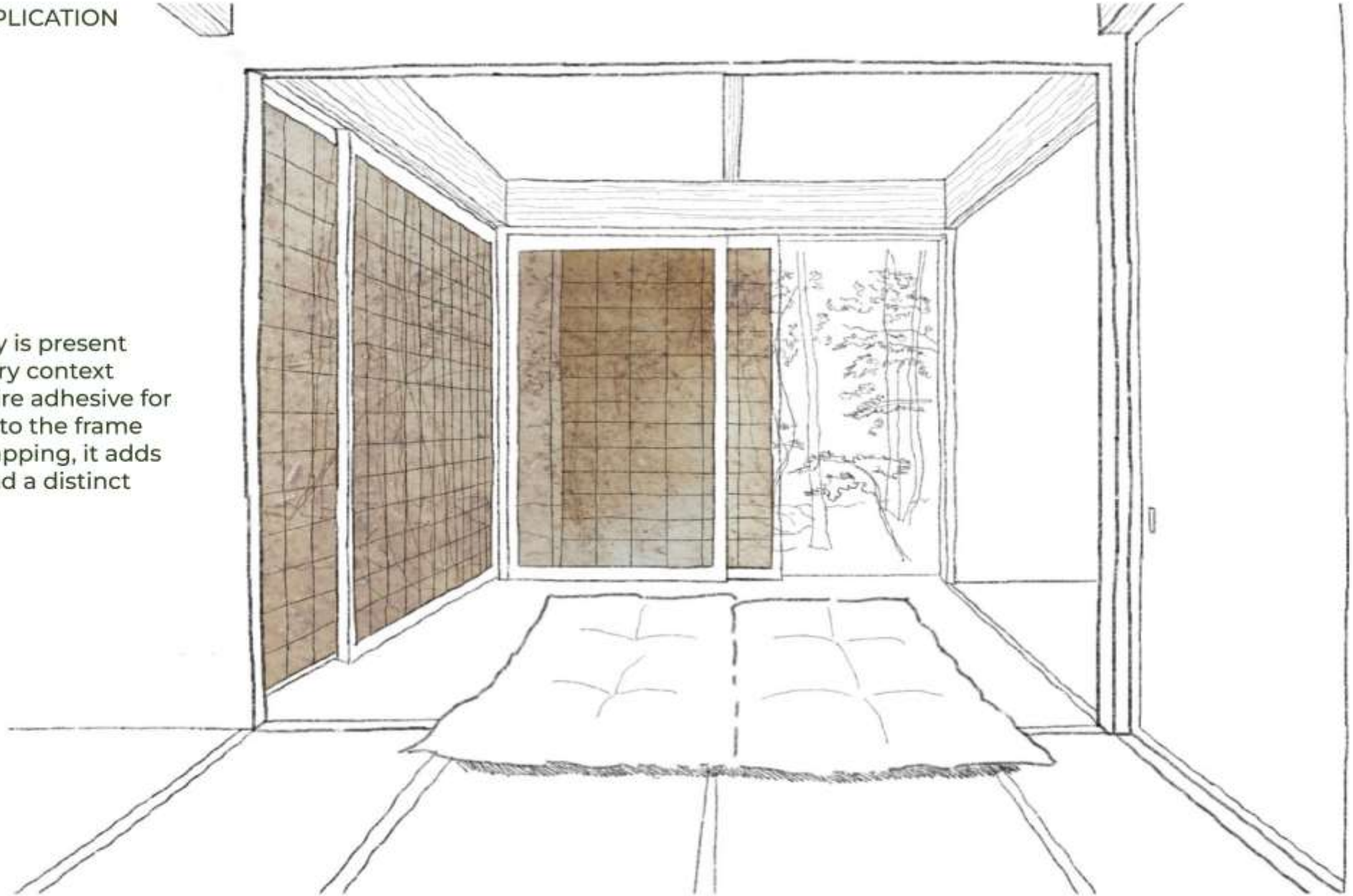
CONCLUSION

REFLECTION

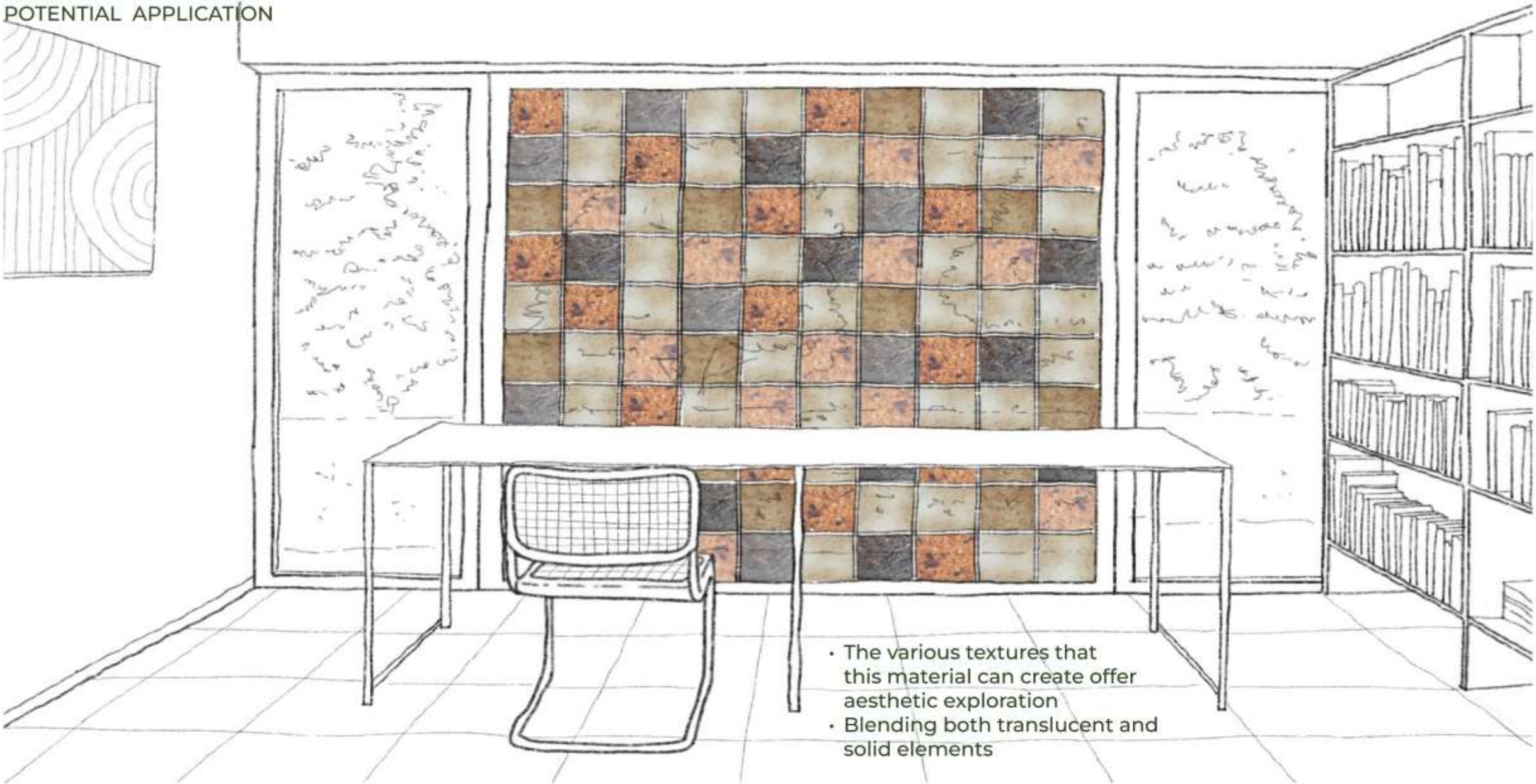
THANK YOU ☺



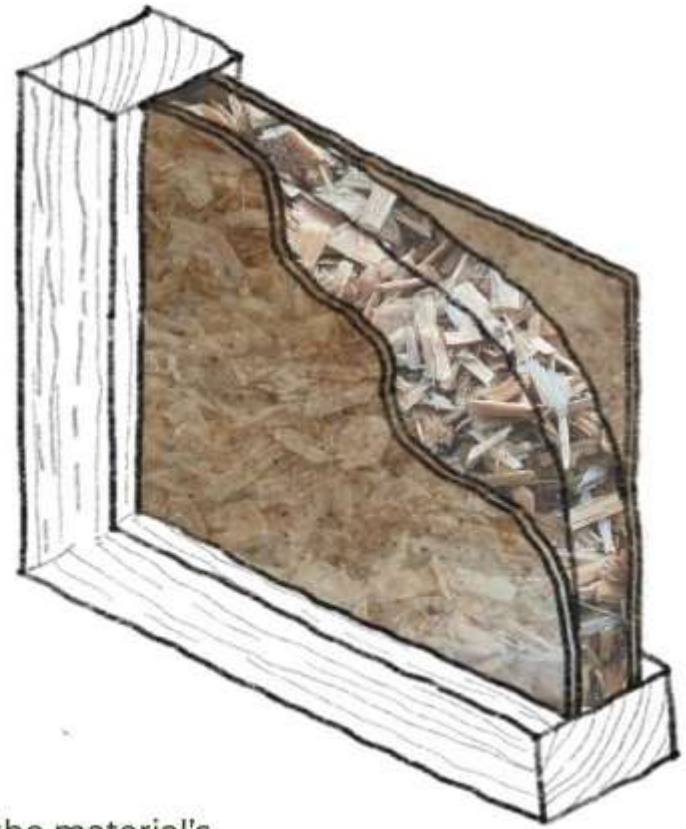
- Translucency is present
- Durable in dry context
- Do not require adhesive for attachment to the frame
- When overlapping, it adds thickness and a distinct aesthetic.



POTENTIAL APPLICATION

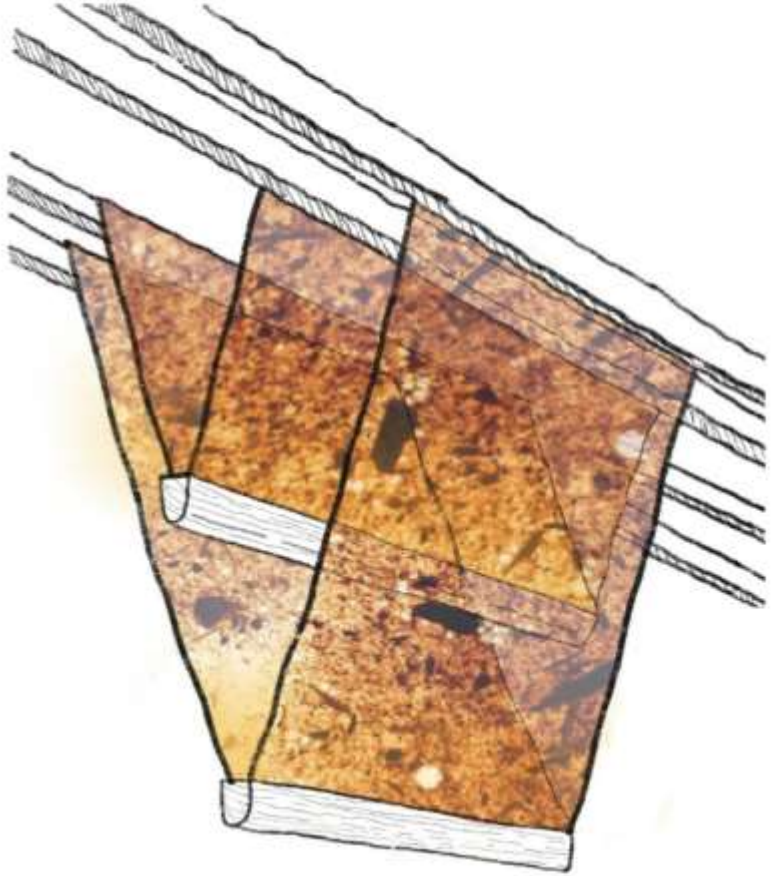


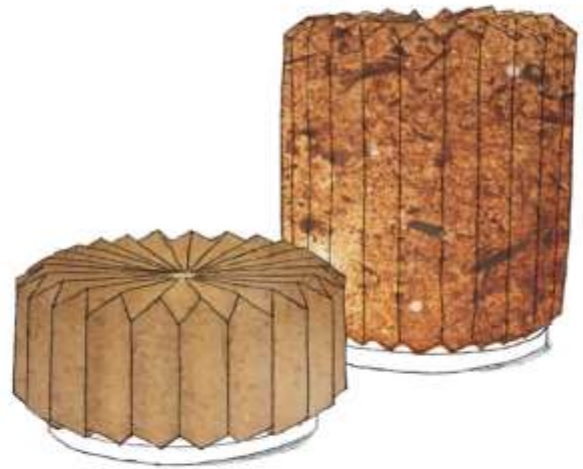
- The various textures that this material can create offer aesthetic exploration
- Blending both translucent and solid elements



- Layering can enhance the material's capabilities, augmenting not only its visual appeal but also its technical properties.

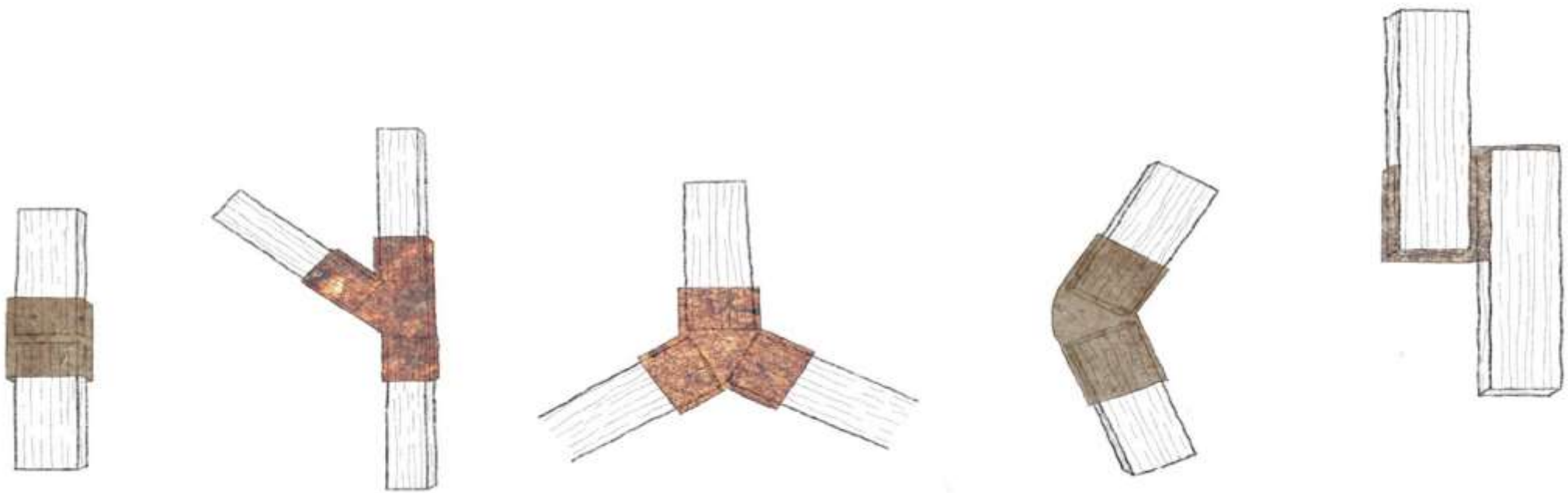
POTENTIAL APPLICATION





- The combination of translucency and solidity becomes even more intriguing when tested with light, enhancing its visual appeal.

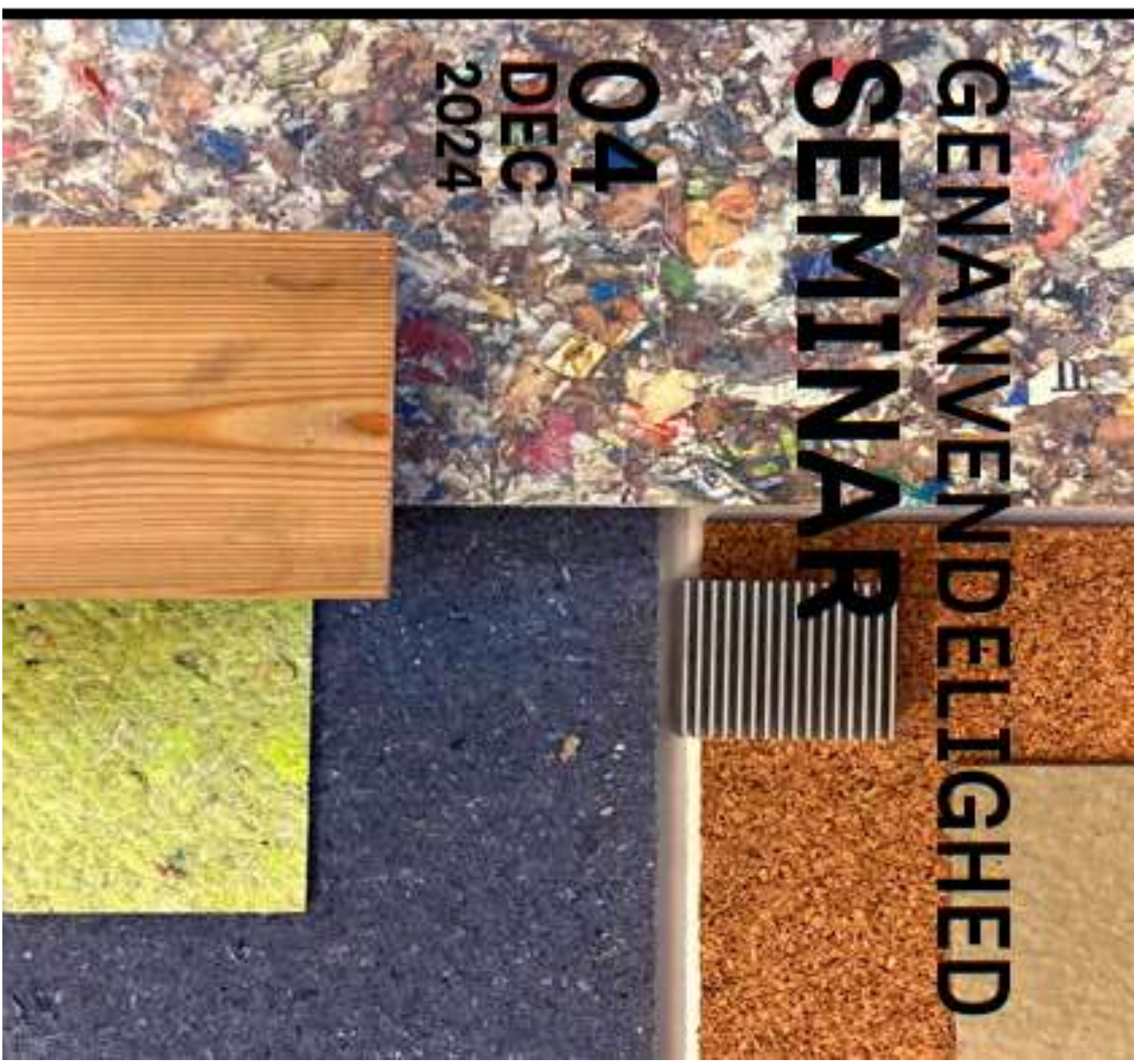
- Due to its ability to become thick and flexibly conform to frames while also exerting force on other materials.
- It can potentially serve as a substitute for other materials with similar quality.



- Given its capacity to stick to other materials before drying, this material could be employed in designs for disassembly.
- Facilitating the addition of new layers without the need for cutting the material. This feature allows for reuse and repurposing the material for other functions.

GENANVENDELIGE MATERIALER

SPOR 1



Paper waste

Spriha Chokhani / Det Kongelige Akademi

Royal Danish Academy
Architecture Design Conservation

Terra Pulp

From Pulp to Plant

Spriha Chokhani

About Me

Agenda

Introduction

Method and Process

Strategy Design Concept

Design Proposal

Introduction

What is Paper?

Environmental Impact of Pulp & Paper Industry

2% Direct Industrial CO^2 Emission

Equivalent to Aviation, Marine Shipping,Internet Datacentre Energy

6% Global Industrial Energy Consumption

40 % Global Industrial Waste Water

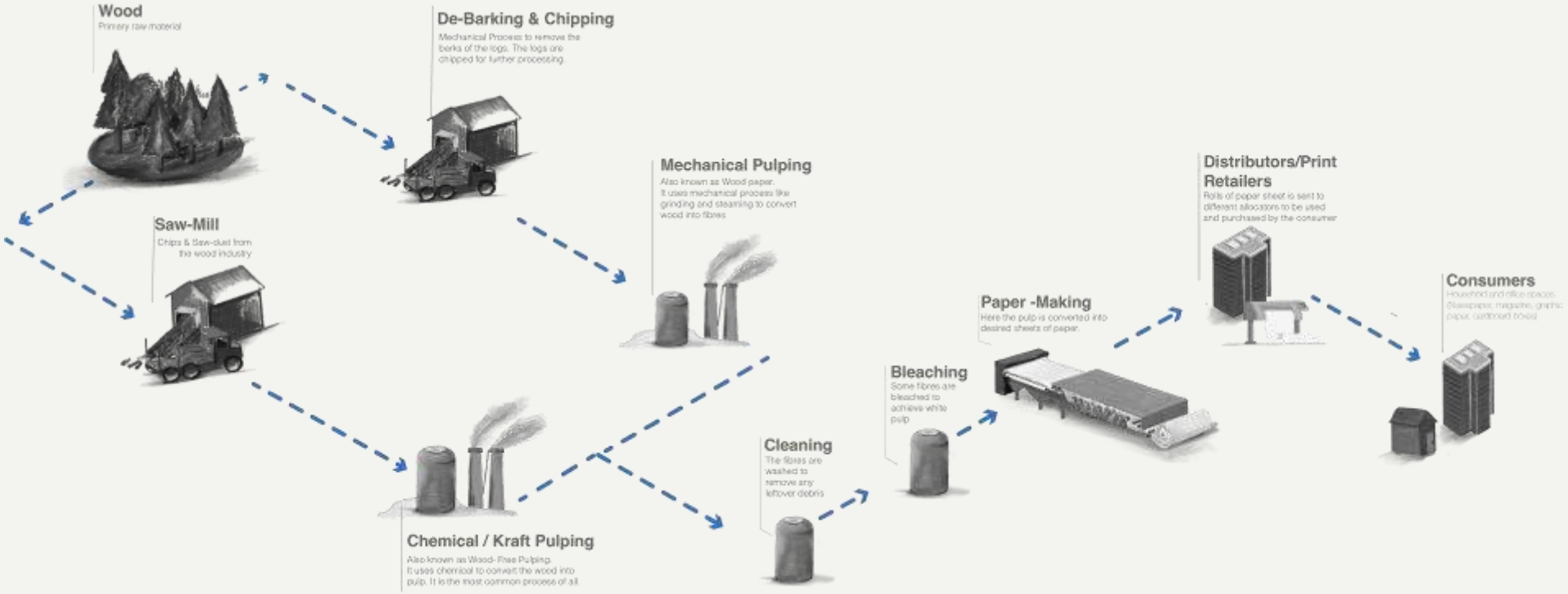
More than 47,000-60000 gallons of wastewater is produced from one ton of paper product.

4.1 Million hectres uprooted yearly

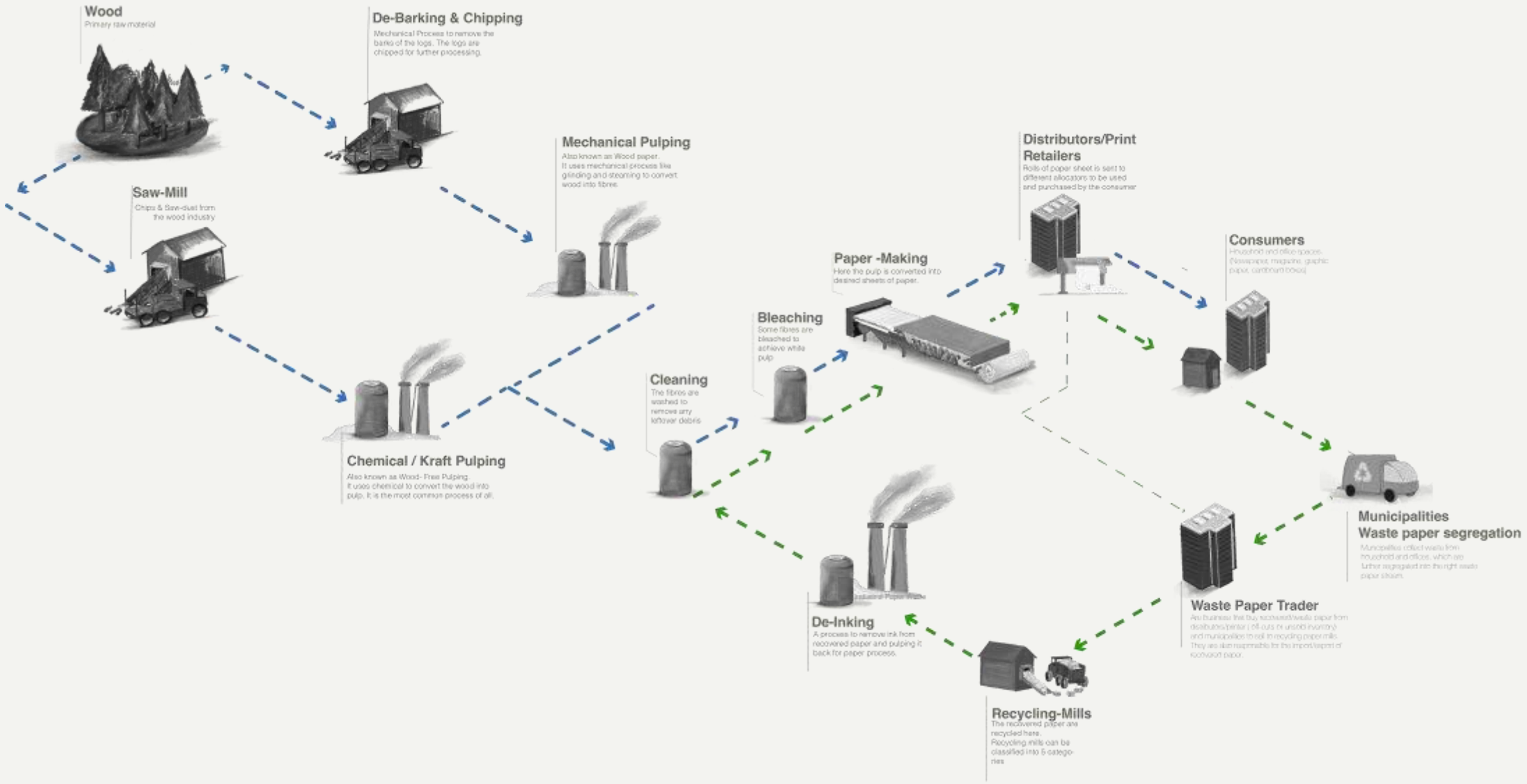
The area size of The Netherlands.

Largest user and producer of Biomaterial and Bioenergy

Industrial Value-Chain of Pulp & Paper Industry

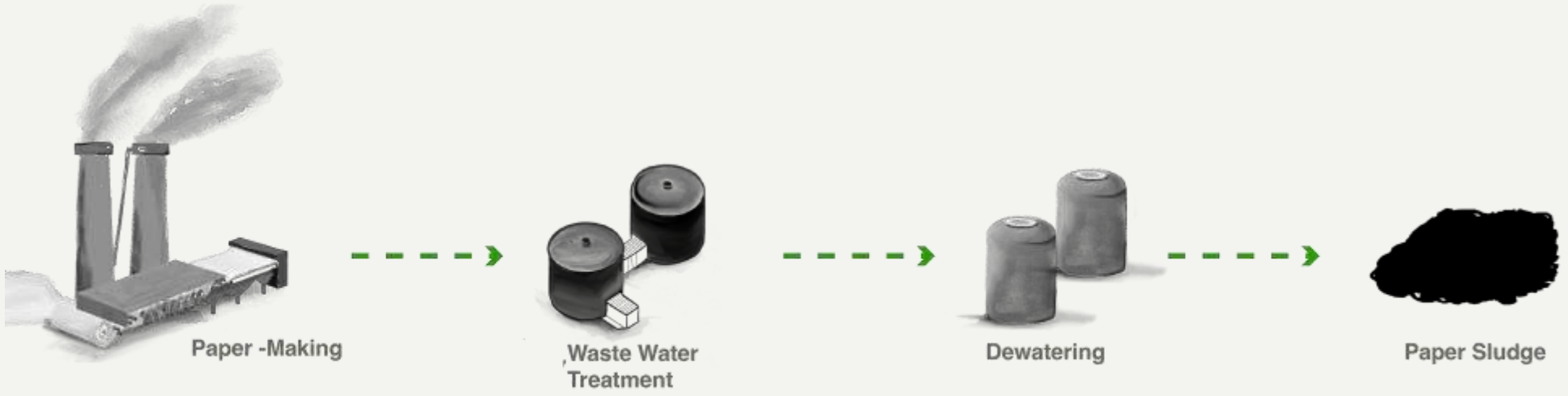


Industrial value chain of Pulp & Paper Industry

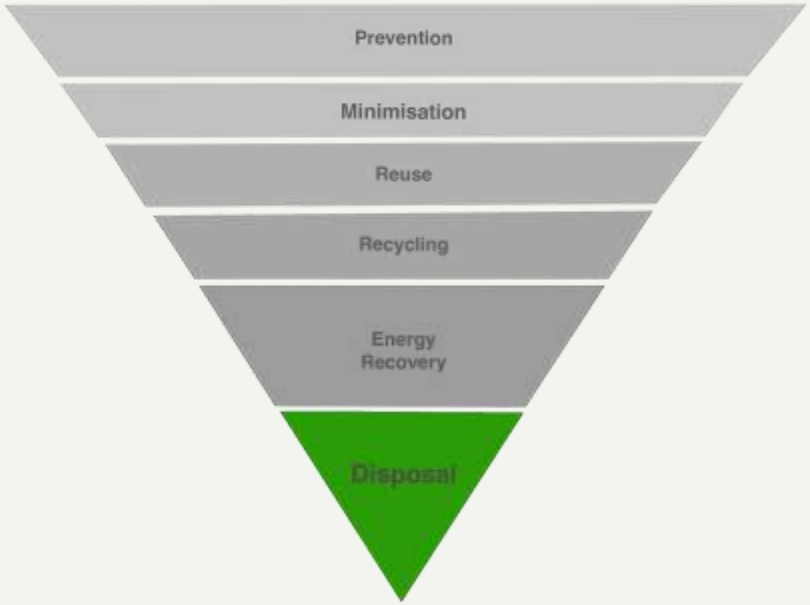


What happens to paper after it is **recycled 5-7 times?**

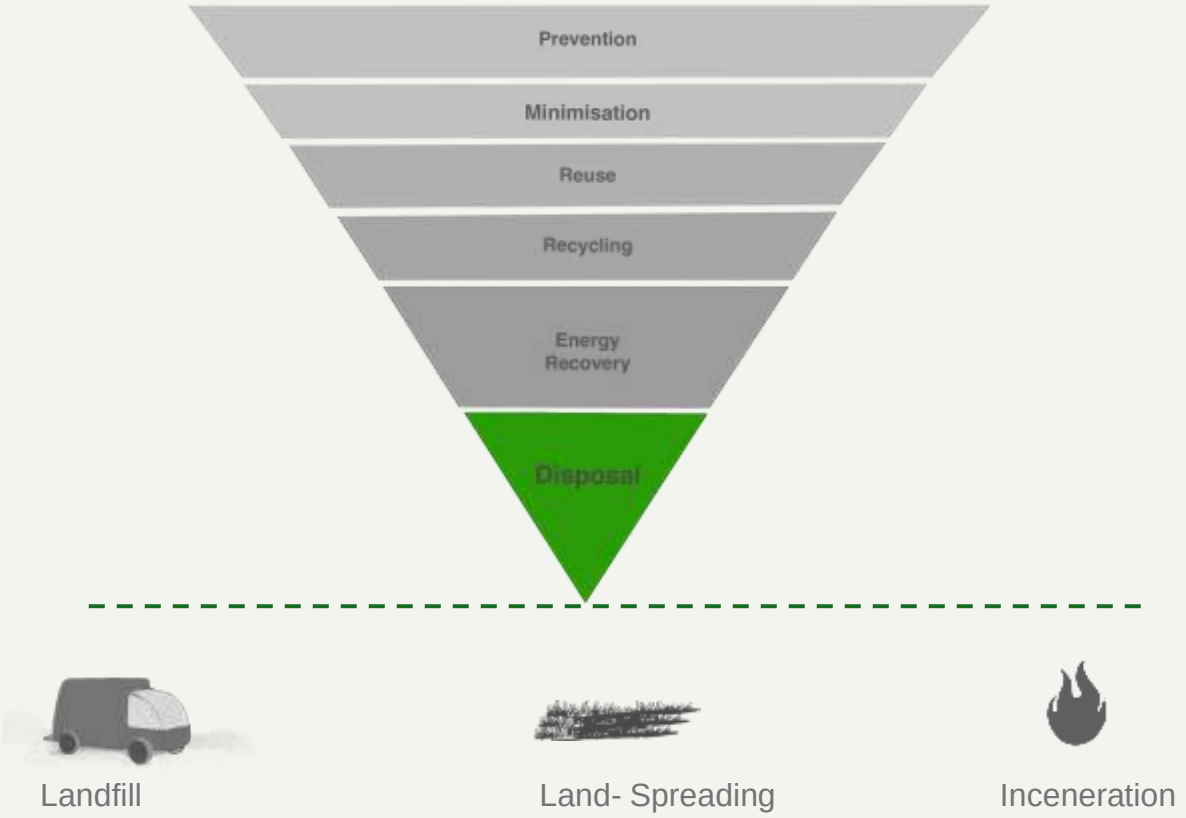
Paper Sludge



Value chain of Paper Sludge.



Value chain of Paper Sludge.



Approximate Production of Paper Sludge Yearly

40-50 kg
of sludge is created with
every ton of paper

12 tons per 405 Ha
can be spread on the land

16-20 million tons
of paper sludge was produced
in 2020

Equivalent to size of France

Collaborating Partner

Collaborating Partner


"We want to **get rid of this waste and bring it up in the value chain**"

Research Question

Research Question

How might we design a **bio-based material** from waste paper sludge?

Sub- Questions

. What **industrial production technique** might be suitable **for scaling it up**?

. What **strategies can be developed** to utilize this waste for **economic as well as environmental benefit?**

State of Art

Bio-marble is a bio-based material research by Hannah. The main material for the research is waste paper.

Location: United Kingdom

Terroir chair.is a prototype made from recycled paper and Danish algae - fucus.
The aim of the exploration is to show the use of minimal materials in order to create a simple and functional

Location: Denmark

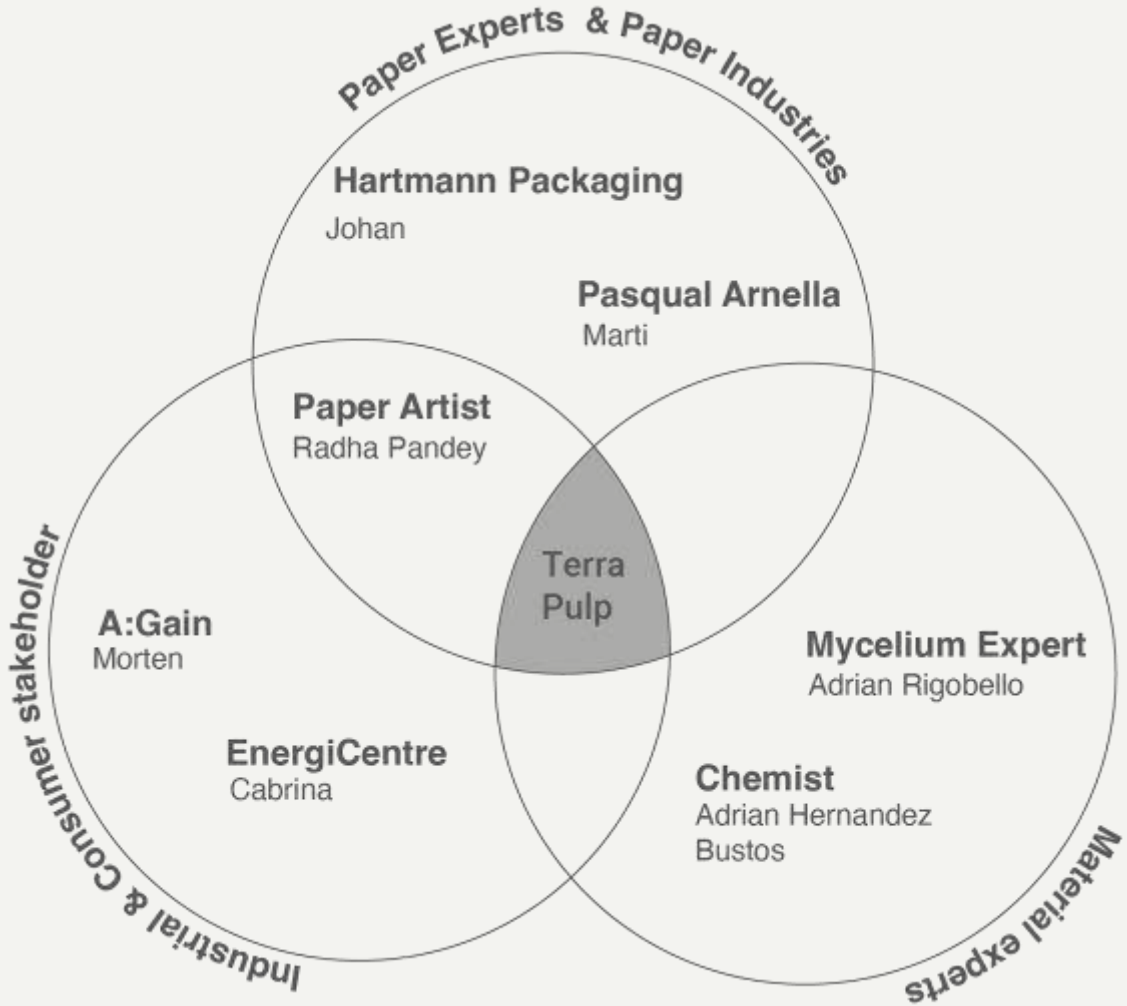
Honext is a nontoxic recyclable boards made from up-cycling industrial paper sludge. recycled paper into a healthy and sustainable building material.

Location: Spain

The table by Pulp Factory is made from post-consumer and post-industrial paper waste and plant based additives.

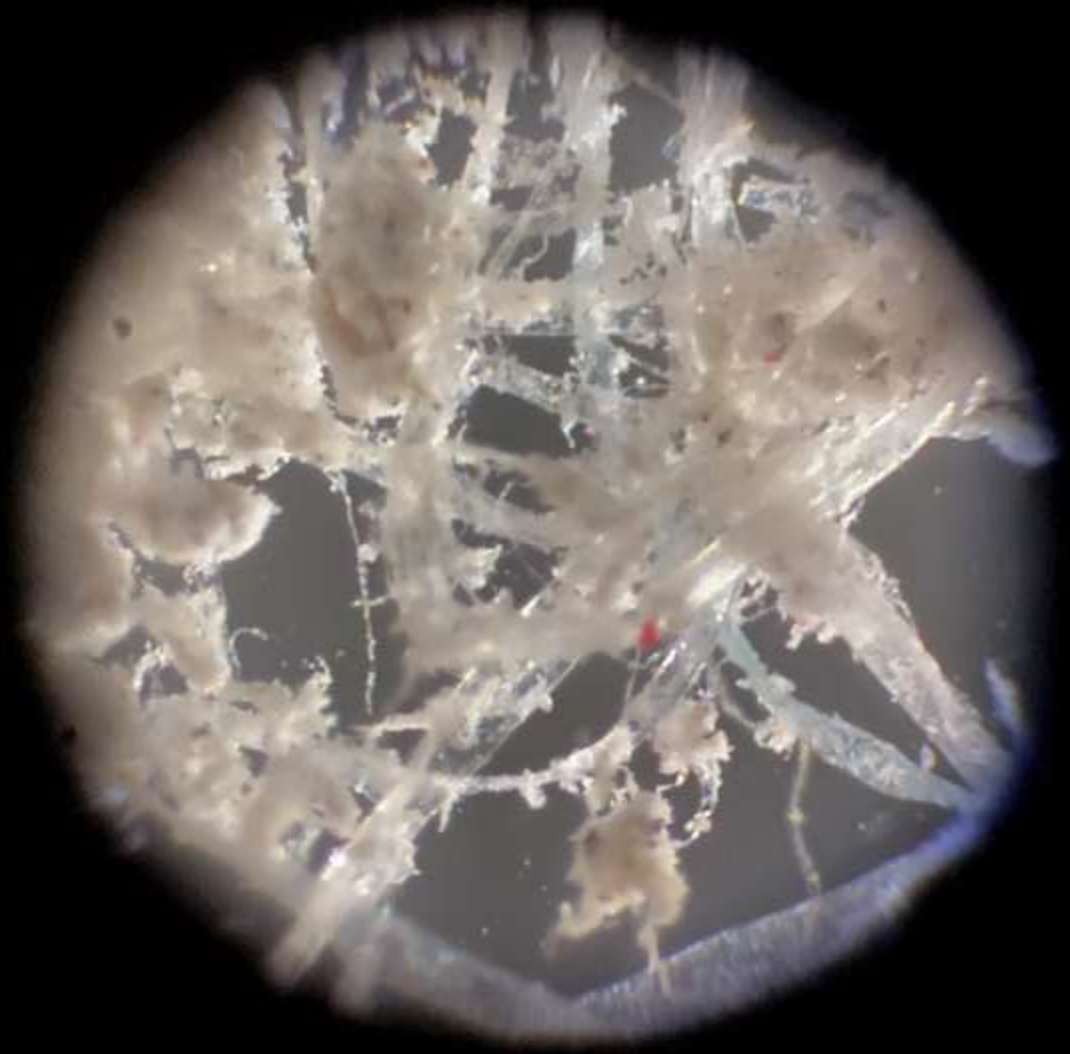
Location: India

Stakeholder Map




Method & Process

Molecular Perspective



Narrowing it down to **Hemp shives , hay , recyclable paper, Hemicellulose pulp, and polypore mushroom.**

These materials are **easily available in different parts of the world,** where Hartmann has there factories. Thereby **promoting a chance for possible scale-up**.

Narrowing it down to **Hemp shives , hay , recyclable paper, Hemicellulose pulp, and polypore mushroom.**

These materials are **easily available in different parts of the world,** where Hartmann has there factories. Thereby **promoting a chance for possible scale-up**.

Mono Materials - for easy decomposition and material separation.

Cellulose with long fibres

Manufacturing Perspective

Manufacturing Perspective

Plaster moulds were inspired by **pottery industry**

Positive & Negative moulds was inspired by **plywood industry**

3-part 3d printed moulds was a inspired by **the pulp industry**

Deckle & Mould from **Paper Making technique**

Plaster moulds were inspired by **pottery industry**

Positive & Negative moulds was inspired by **plywood industry**

3-part 3d printed moulds was a inspired by **the pulp industry**

Deckle & Mould from **Paper Making technique**

Properties

Easily **mouldable**.

Strong when mixed **with other celluloses like recyclable paper or natural resin**.

Capture **Mould Texture**

Lightweight

Compostable

Continues to **store Carbon**

Constraints

Needs support from other fibers or binders for strength.

Requires **certain thickness for durability.**

The manufacturing process is water and heat-intensive.

Not water-resistant, needs external surface texturing

Is creating bio-based material enough?

“I wanted to create **a vision** where the material made from **paper sludge becomes a catalyst that shifts the focus from the product to practice.**”

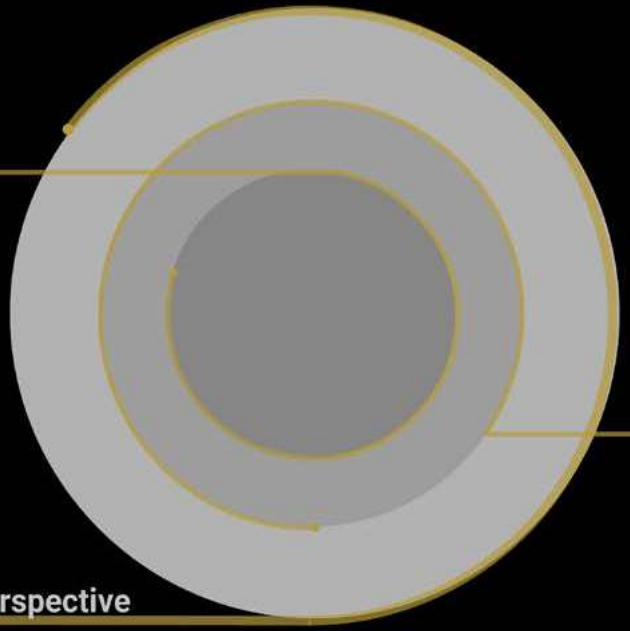
Material Application

Historical Timeline

Paper as a material used in Furniture Industry

Strategy Design Concept

Strategy Design Proposal



Material Perspective

Addition of Seed

Decomposable Material

Carbon Sequestration

Mono-Material - all cellulose based industrial by-product

Industrial Perspective

Local Economy

Bio- Circular economy

Industrial Manufacturing with existing machineries

Mono- Material

Re-use of Industrial Waste

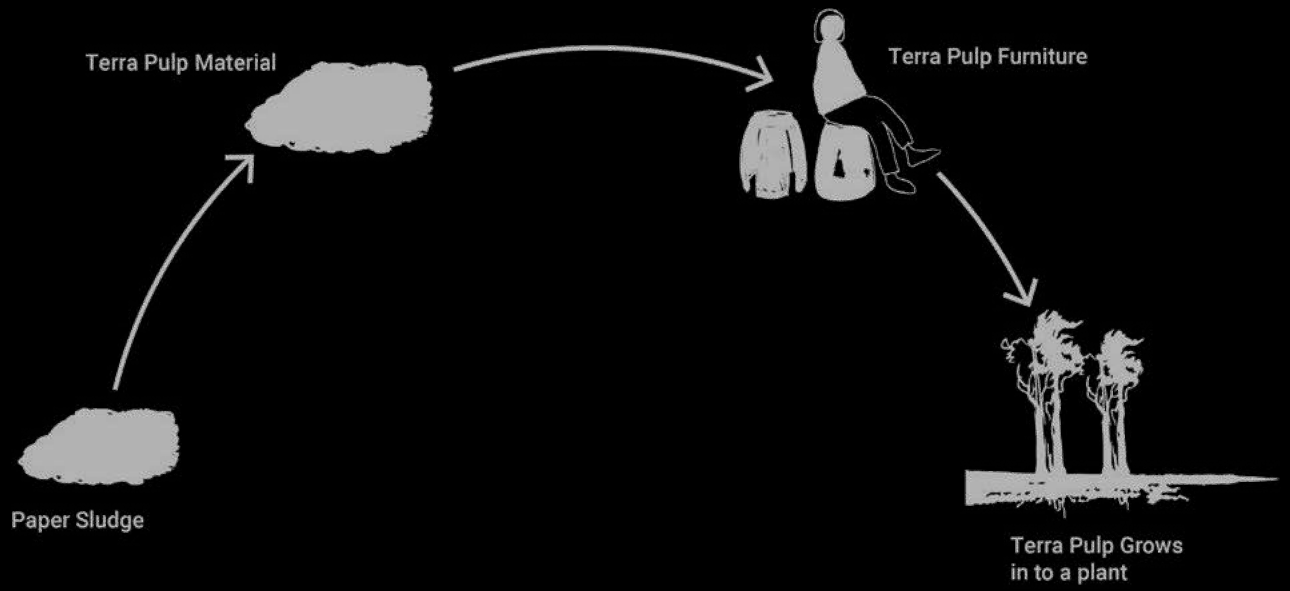
Customer Perspective

Rights to Decision Making

Learning by Doing

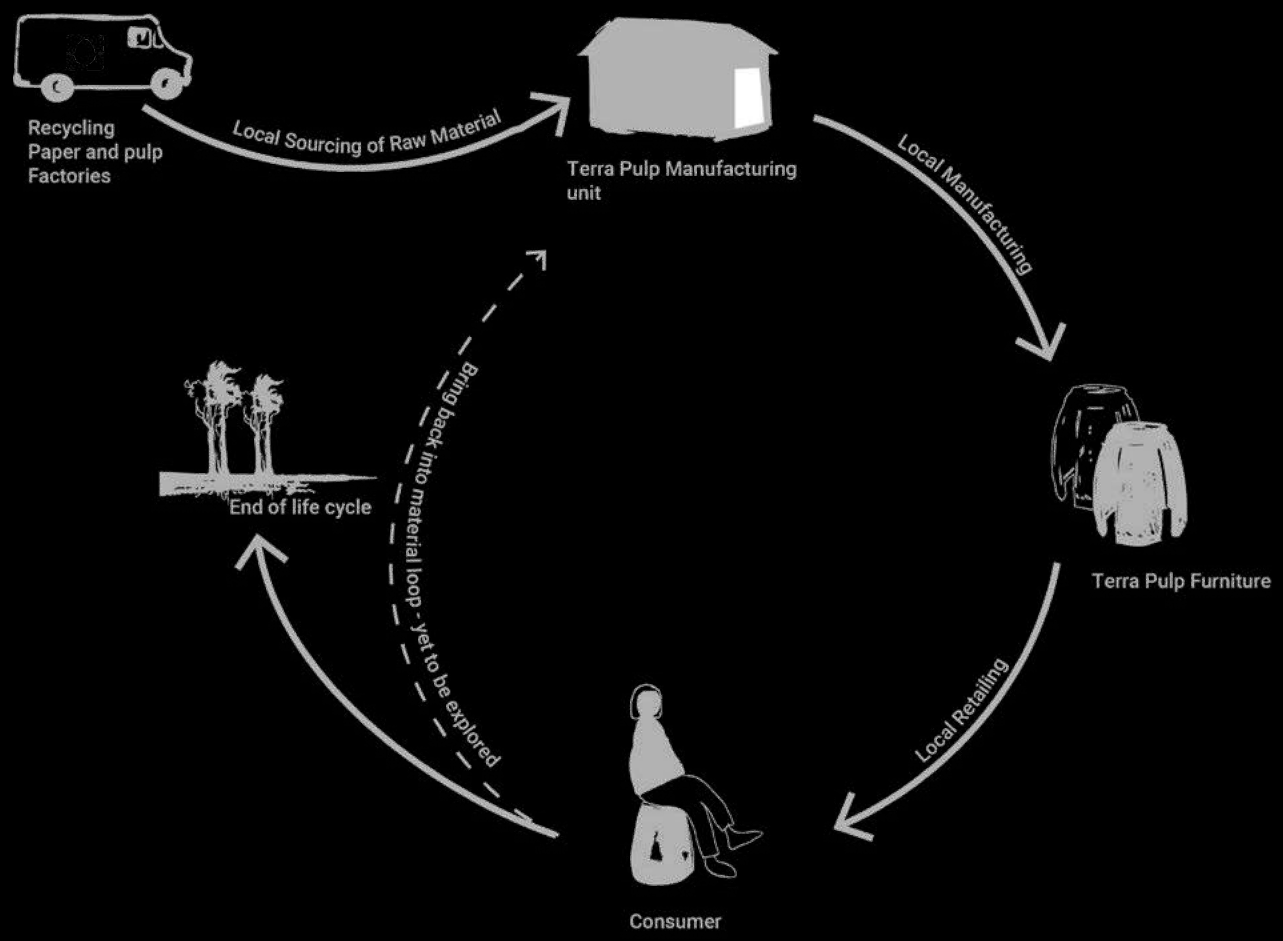
Visual & Experientially Transformation

Material Perspective



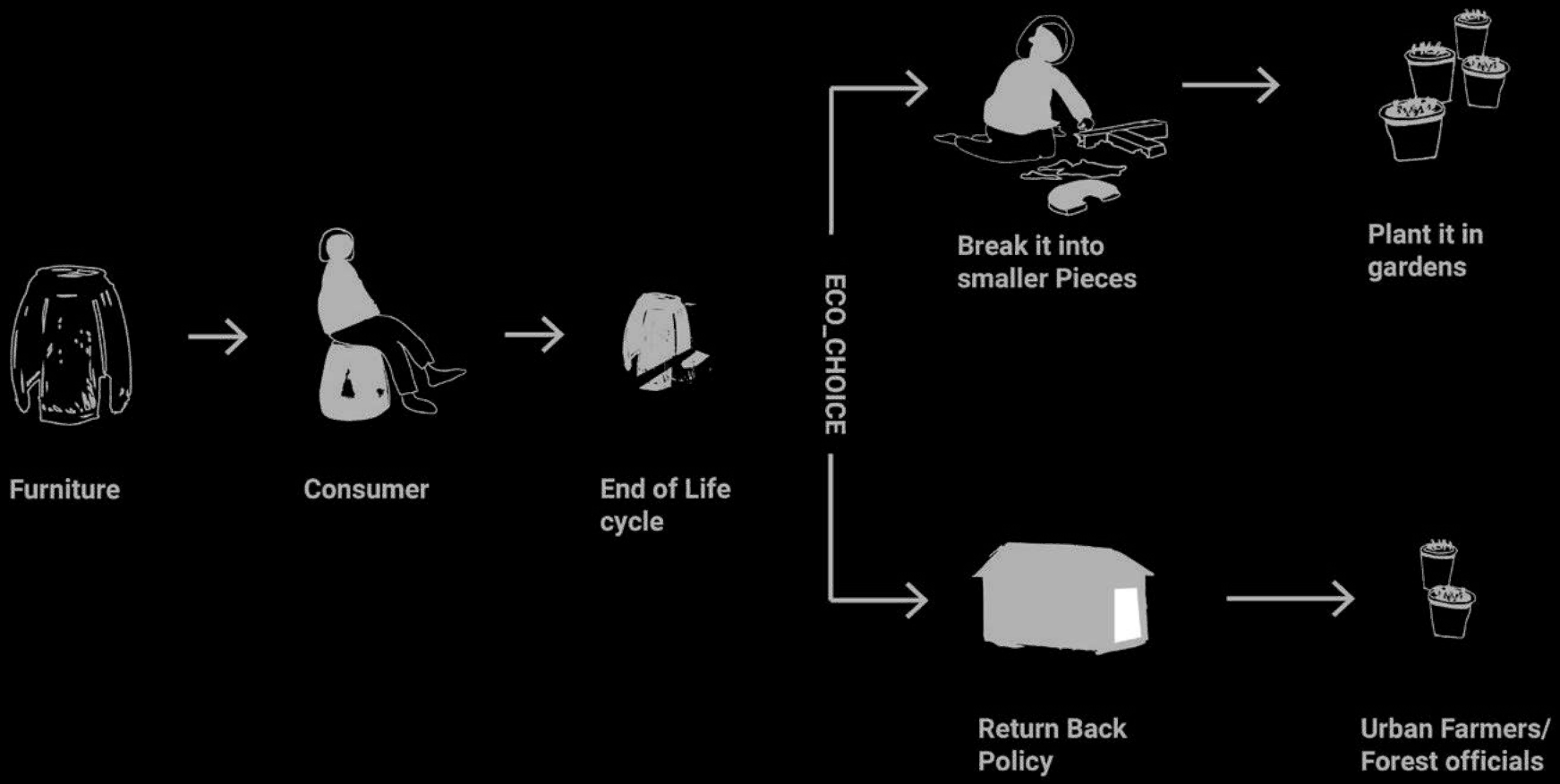
Illustrated by Author

Industrial Perspective



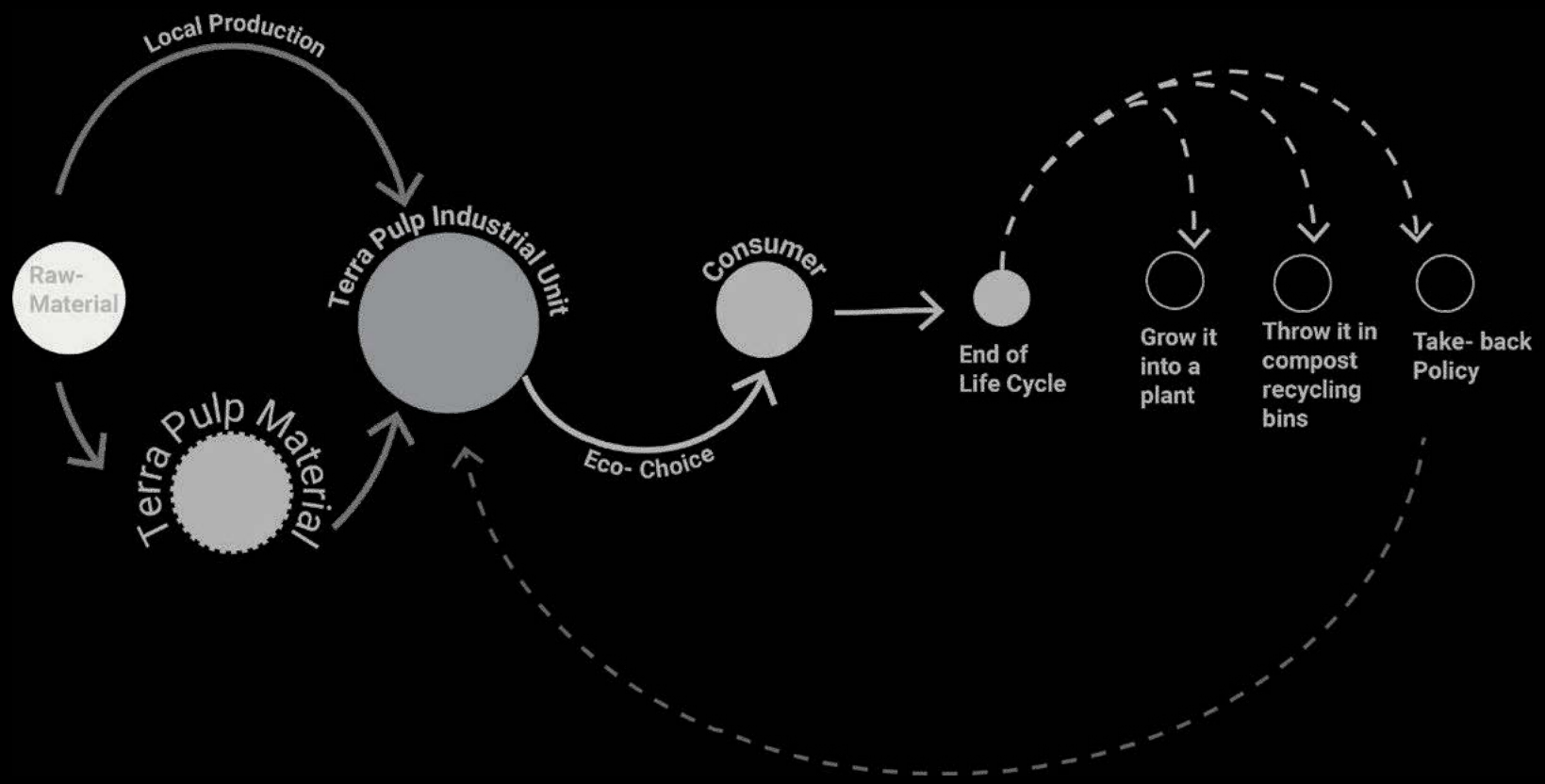
Illustrated by Author

Consumer Perspective



Illustrated by Author

Overview of the Strategy



Illustrated by Author

Design Proposal

Is to develop stools for kindergarten using Terra Pulp material, that will encourage a “ **use and grow” habits in children.**

Why Kindergarten

Children learn by **Doing, Seeing & Playing**.

It is at a **young age habits are formed.**

Kindergarten **serves as a platform** to introduce children to **different life values including recycling and sustainability.**

Concept

Teachers at kindergarten find this stool the most convenient because of its different foot rest.

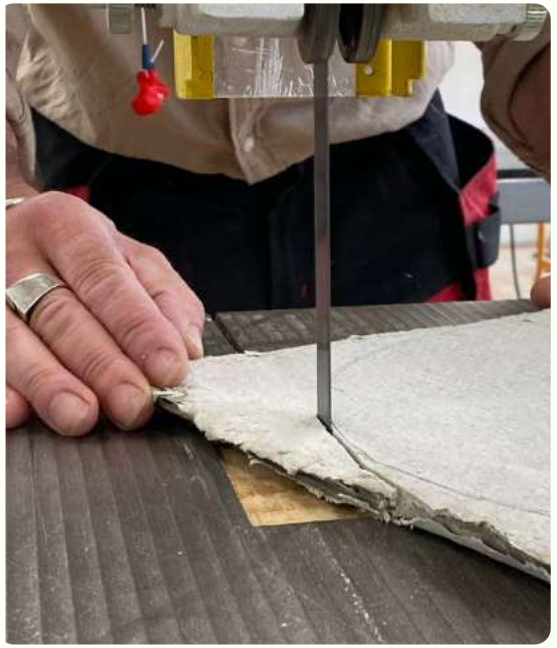
The stool can be moved according to children’s height

It is at adult height- so it enables the teachers to sit comfortably

Prototype I

Paper-Ply Technique

Change the top plate of the stool with Terra Pulp Material



Findings

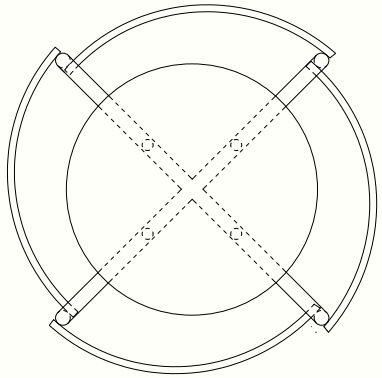
Would require **approximately 50 sheets to reach 21mm thickness**

Drying time - 4 days

Total water Consumption: 30 L

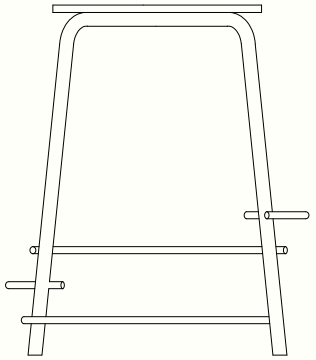
Approximate **water that could be recycled - 28 L**

Approximate **Water lost through evaporation process- 2 L**

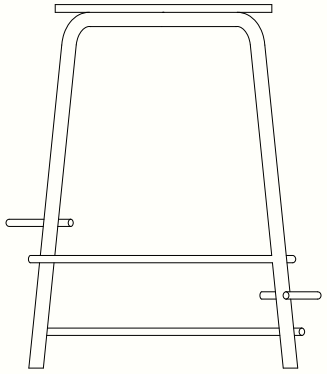


Top

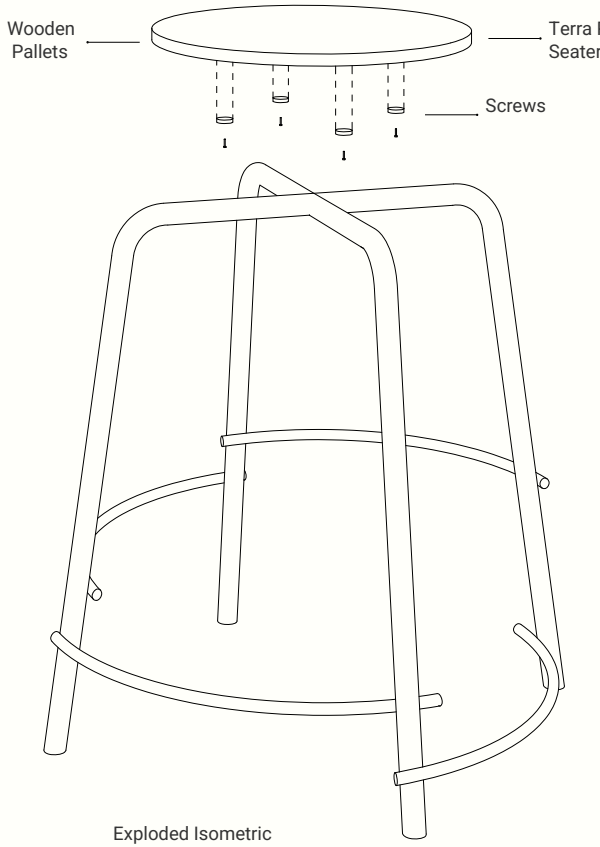
Rendered Isometric



Front



Side



Exploded Isometric

Prototype II

Pottery Technique

Re-imagined the stool

Findings

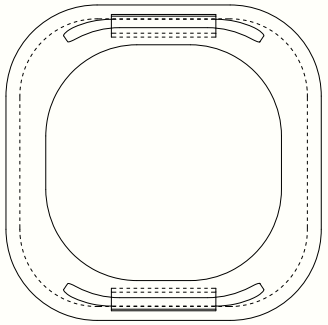
Shrunk by 5 %

Drying time : 4 days

Total **water Consumption: 10 L**

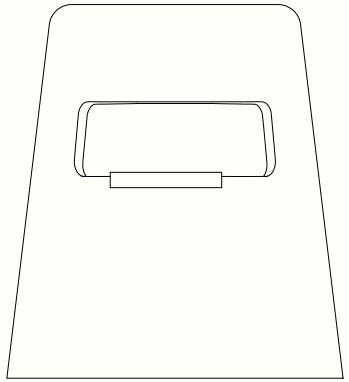
Approximate **water that could be recycled - 8 L**

Approximate **Water lost through evaporation process- 2 L**

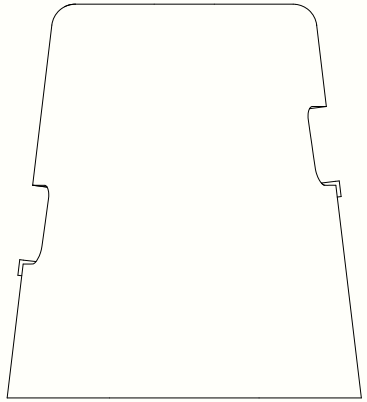


Top

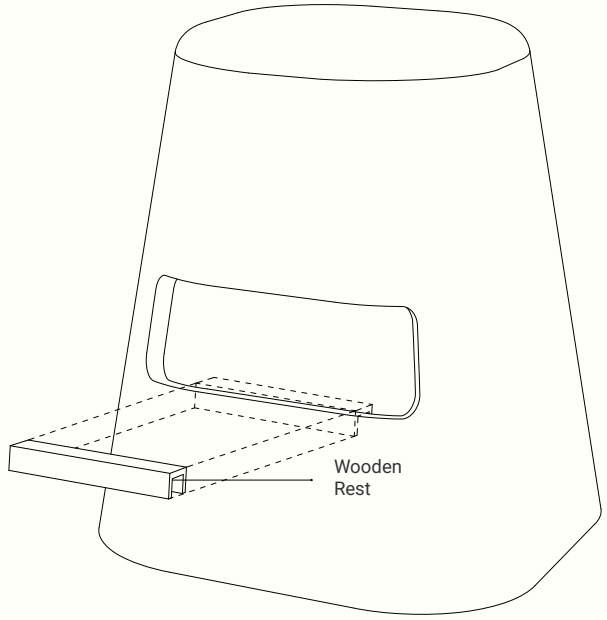
Rendered Isometric



Front



Side

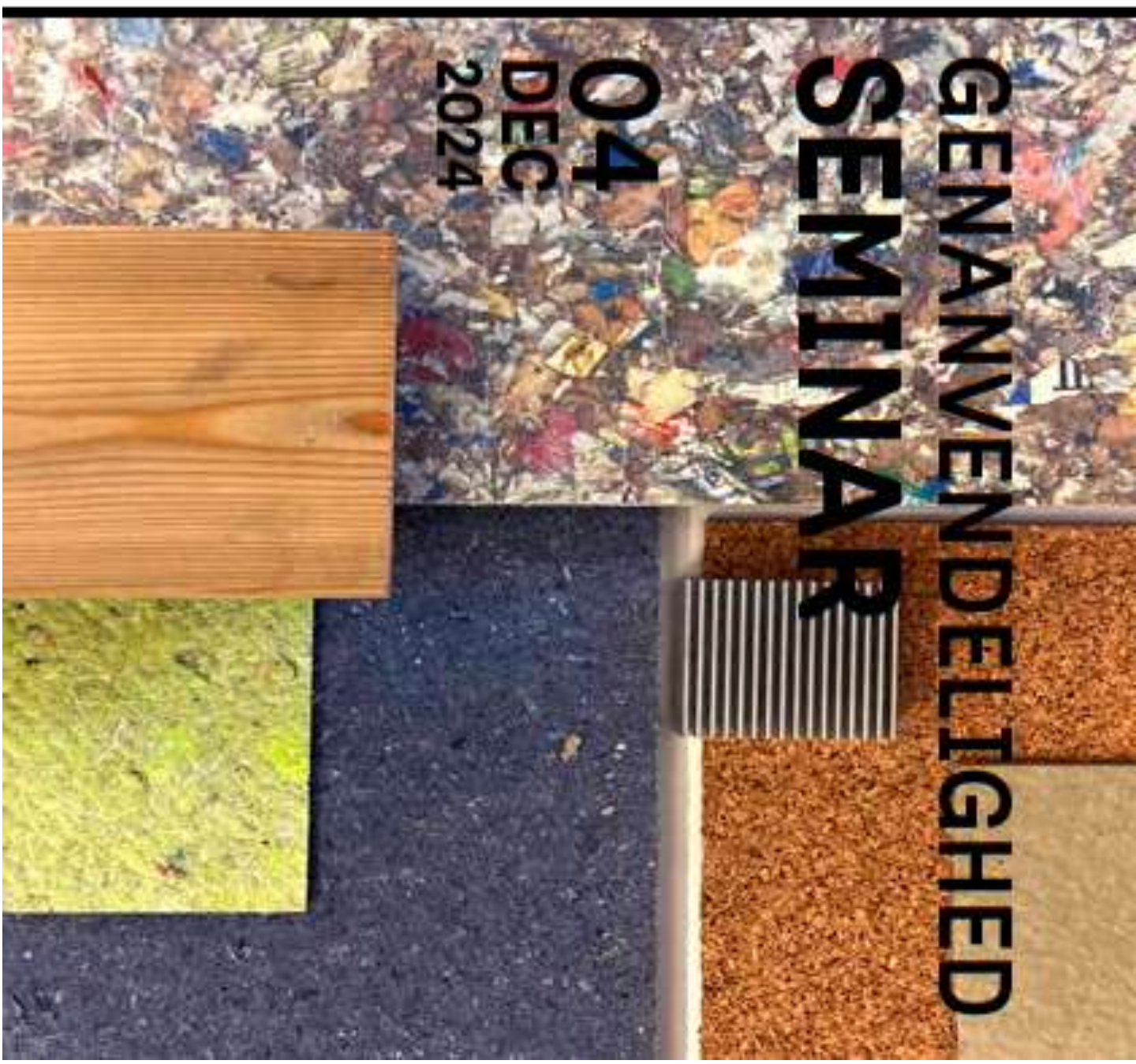


Exploded Isometric

Future Context

GENANVENDELIGE MATERIALER

SPOR 1



Rockfon
Henriette Nielsen og Bo Jørgensen / Rockfon

Circularity, Reuse & Recycle

Anna Joy Thompson

Circularity Project Manager at Rockfon

Rockfon

60 years experience

Bringing our expertise and knowledge to play

Made from abundant resource

Our stone wool is made from Basalt,

9 factories in Europe, North America & Asia

Enabling the production of acoustic solutions close to different markets

Serving various segments with excellent acoustic solutions

We serve solutions for Education, Healthcare, Office, Leisure, Retail and Production

Rockfon Sustainability

LEVELS	PRODUCT	COMPANY	INDUSTRY
PILLARS	Circularity	Employee Engagement	Public Affairs
	In-use Health & Safety	Operational Impact	
	Transparency & Declarations		

The ‘Circularity Gap’

3X

The circular economy has reached megatrend status.
The volume of discussions, debates and articles on the concept has almost tripled over the past five years.

-21%

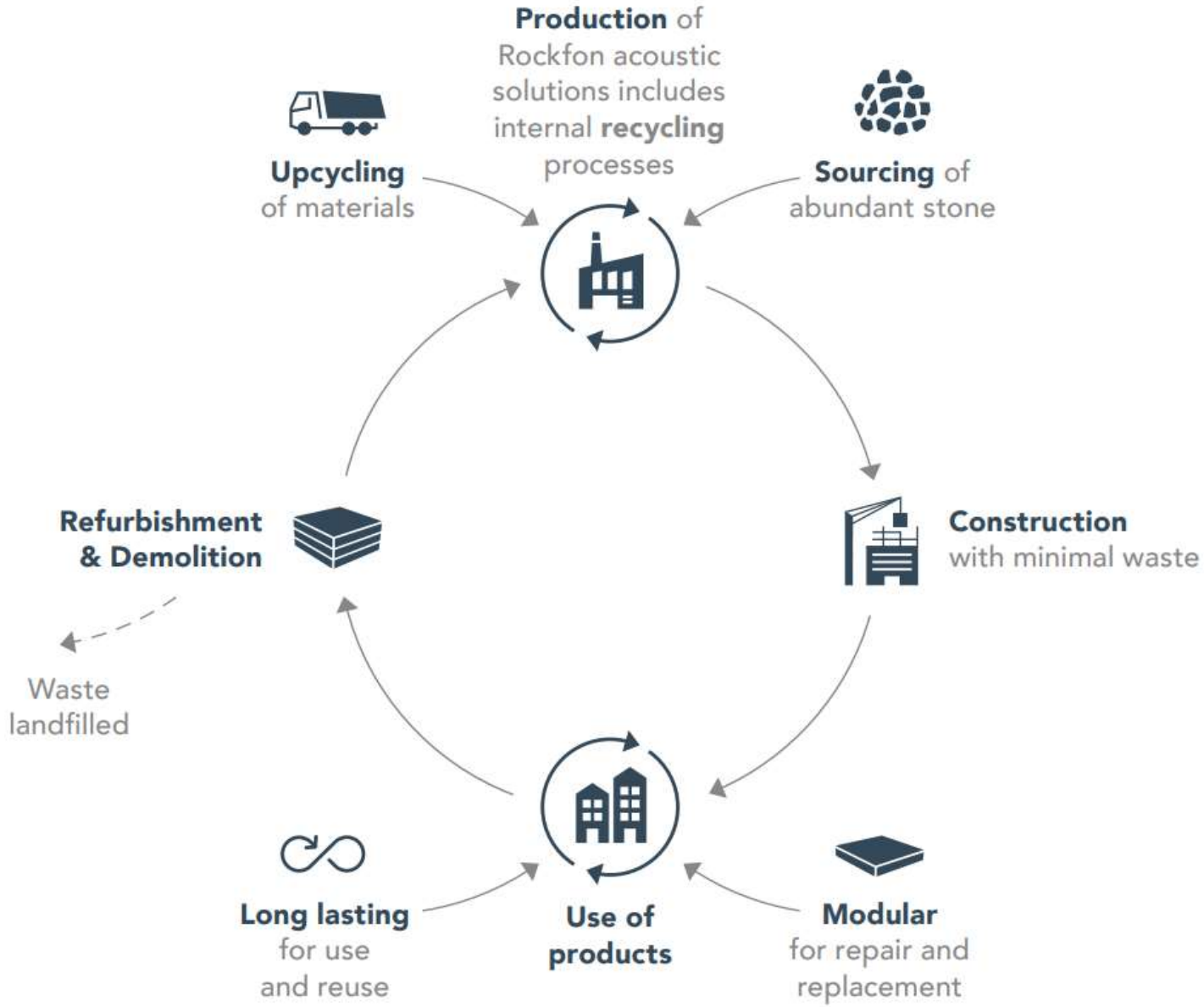
But global circularity is still in decline.
The share of secondary materials consumed by the global economy has decreased from 9.1% in 2018 to 7.2% in 2023 – a 21% drop over the course of five years.

28%

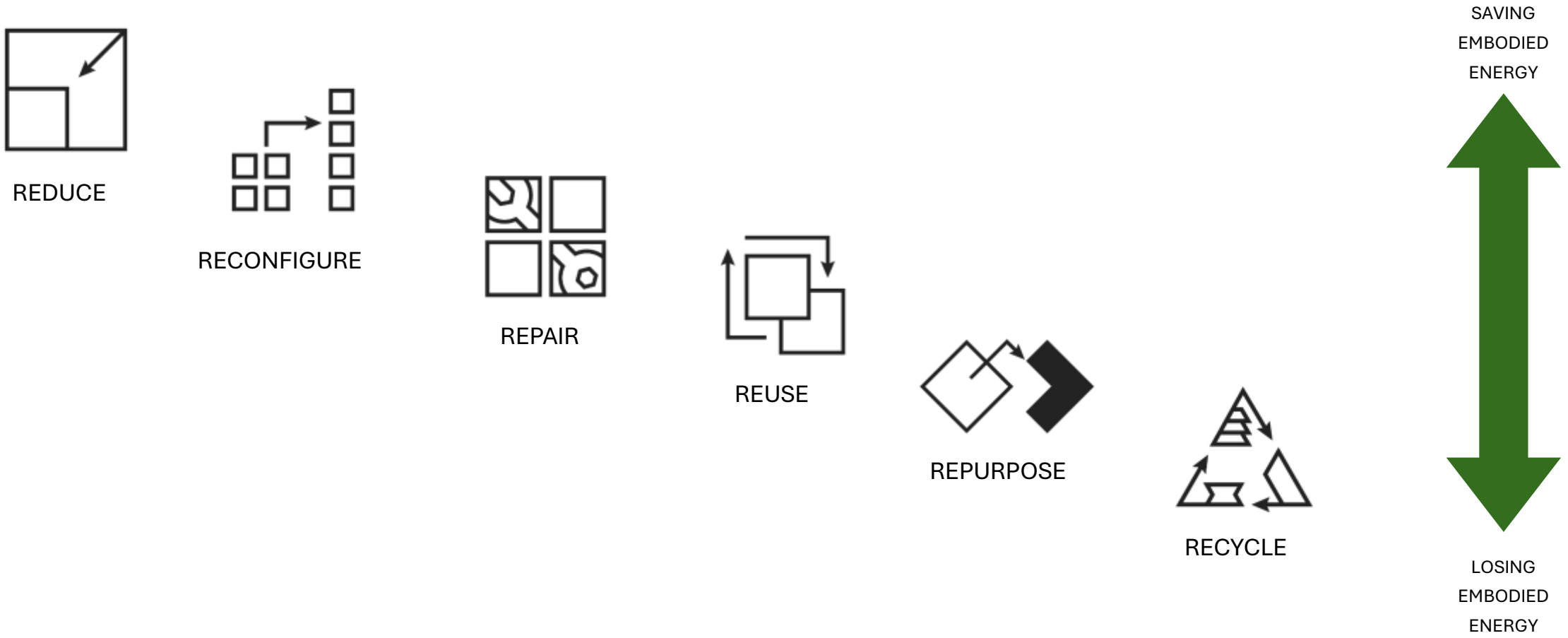
And consumption continues to accelerate.
In the same period, we have consumed over 500 gigatonnes. That's 28% of all the materials humanity has consumed since 1900.

Source: Circle Economy CGR 2024 (circularity-gap.world)

Life Cycle of a Ceiling Panel



The cascade hierarchy of circularity



Current Rockfon Circularity Focus

REDUCE

RECONFIGURE

REPAIR

ROCKFON (REUSE)

REPURPOSE

ROCKCYCLE (RECYCLE)

Rockcycle Case

Harvesting & Reuse Case

Questions?

Thank you!

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anna.joy.thompson@rockfon.com

Henriette Nielsen
Marketing Manager Denmark
henriette.nielsen@rockfon.com

Rockfon

Sounds Beautiful