



PRESS START

An aerial photograph of a suburban neighborhood. The houses are mostly two-story brick or stone buildings with gabled roofs. There are many trees, some with green leaves and some without. A road runs through the middle of the neighborhood. The overall scene is bright and clear.

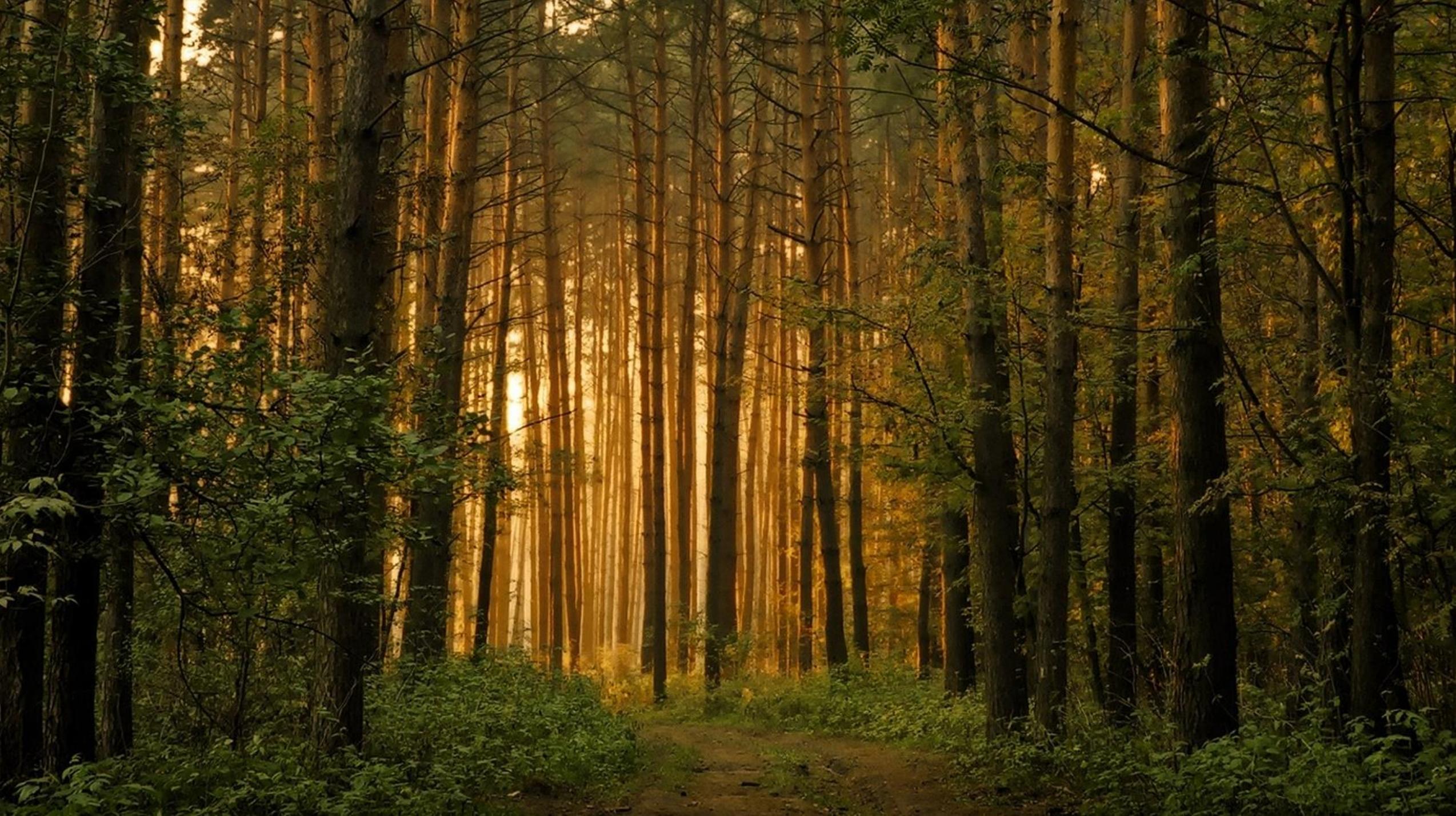
**WELCOME +
INTRODUCTIONS**



Kyle J Ritchie

LEED AP BD+C, ID+C, WELL AP, TRUE Advisor

CANNONDESIGN



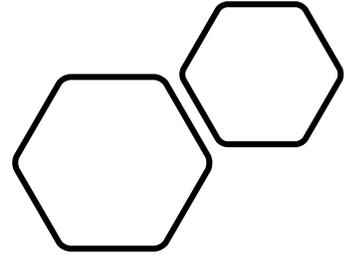




this is an opportunity







**browning
day**



AYERS
SAINT
GROSS

CANNONDESIGN



ENR THE TOP 100

GREEN DESIGN FIRMS AND CONTRACTORS

HEALTH CARE

RANK	FIRM	\$ MIL. REVENUE
1	HDR	90.52
2	CANNONDESIGN	90.00
3	HKS	83.03
4	HOK	80.40
5	BR+A CONSULTING ENGINEERS	69.74

EDUCATIONAL FACILITIES

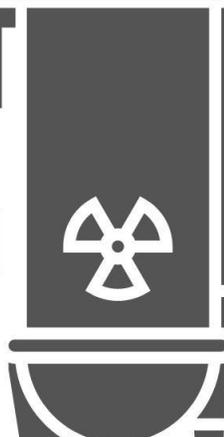
RANK	FIRM	\$ MIL. REVENUE
1	DLR GROUP	78.22
2	STANTEC INC.	57.53
3	CANNONDESIGN	55.00
4	AECOM	40.00
5	GENSLER	39.63

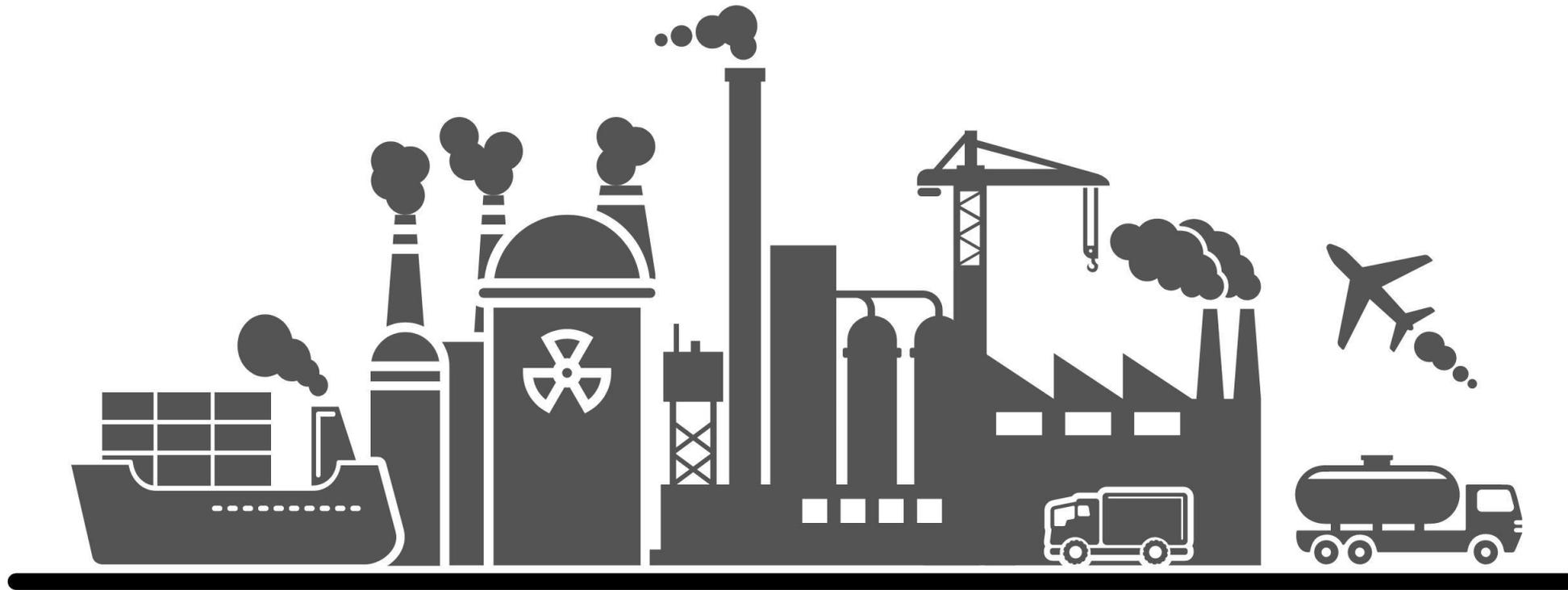


THE ISSUE:

WE FAILED.









5 weeks

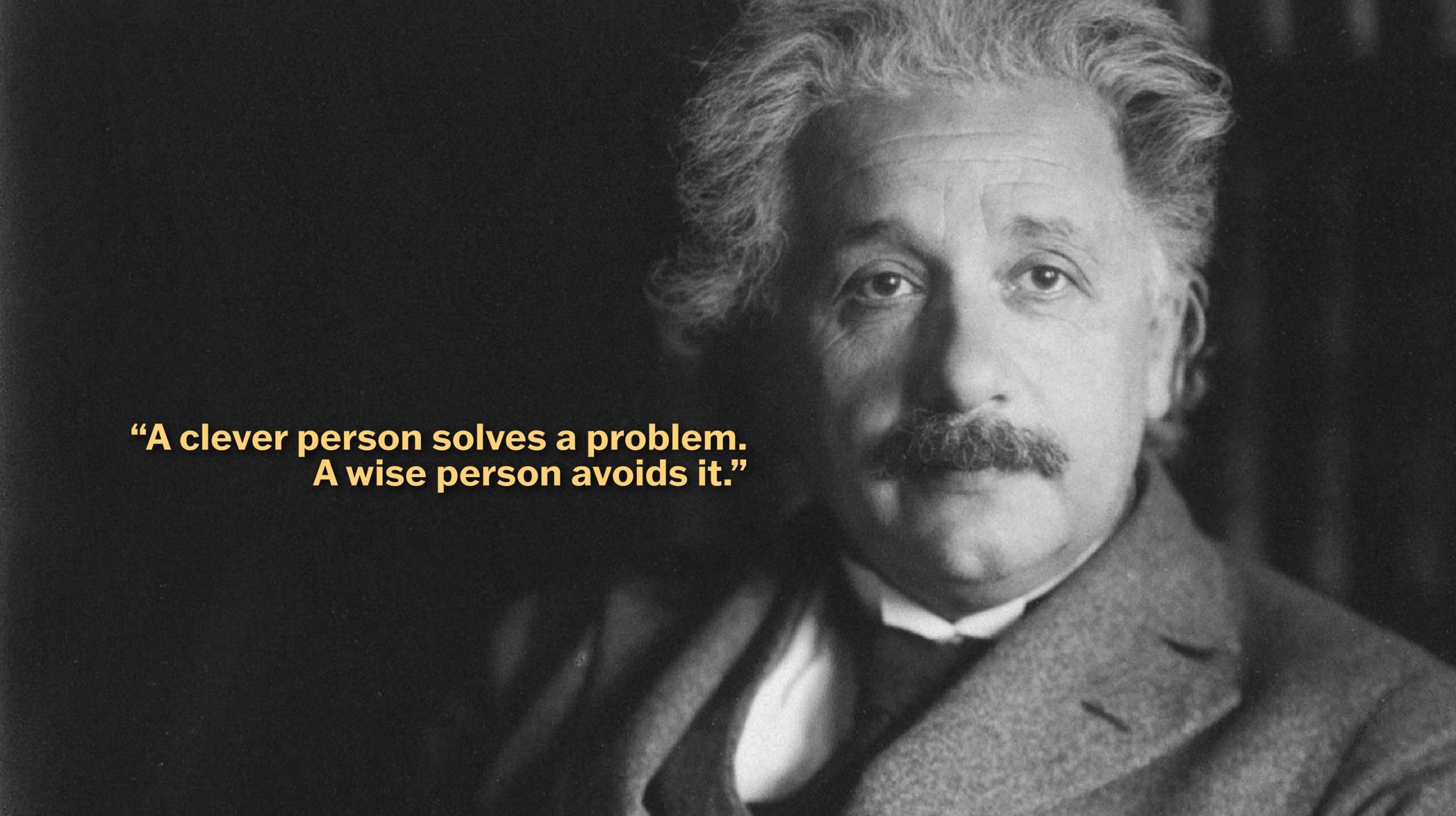
40 years



37%

waste factor

DRYWALL

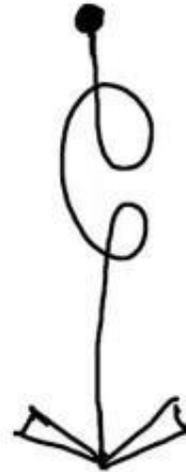
A black and white portrait of Albert Einstein, showing his characteristic wild, wavy hair and mustache. He is wearing a dark suit jacket over a white shirt and a dark tie. The background is dark and out of focus.

**“A clever person solves a problem.
A wise person avoids it.”**

LINEAR ECONOMY
"Take-Make-Waste"



RECYCLING ECONOMY
"Take-Make-Reuse-Waste"



Annual construction waste is expected to reach **2.2 BILLION TONS** globally by 2025.





X 2,400



X 20,000

X 14.5 M



Sep 27, 2021, 07:15am EDT | 9,492 views

Time And Time Again, Solving Supply Chain Issues Circles Back To One Thing



Jennifer Castenson Contributor

Real Estate

I focus on innovation in the built environment.

Forbes

2022 industry forecast: A familiar tune

rebuilding drops, construction backlog surges as conditions worsen



REUTERS®

Constructi
chain issu

Amanda Peacher

Heard on:



The Dotted Line: Supply chain woes lead to possible breach, defect claims

Protecting yourself during trying times comes down to specific contract language, and not cutting corners.

Published Nov. 30, 2021



CONSTRUCTION DIVE

LINEAR ECONOMY
"Take-Make-Waste"

RECYCLING ECONOMY
"Take-Make-Reuse-Waste"



**DON'T GIVE UP
ON YOUR DREAMS.
WE STARTED WITH DVDS.**

N

NETFLIX

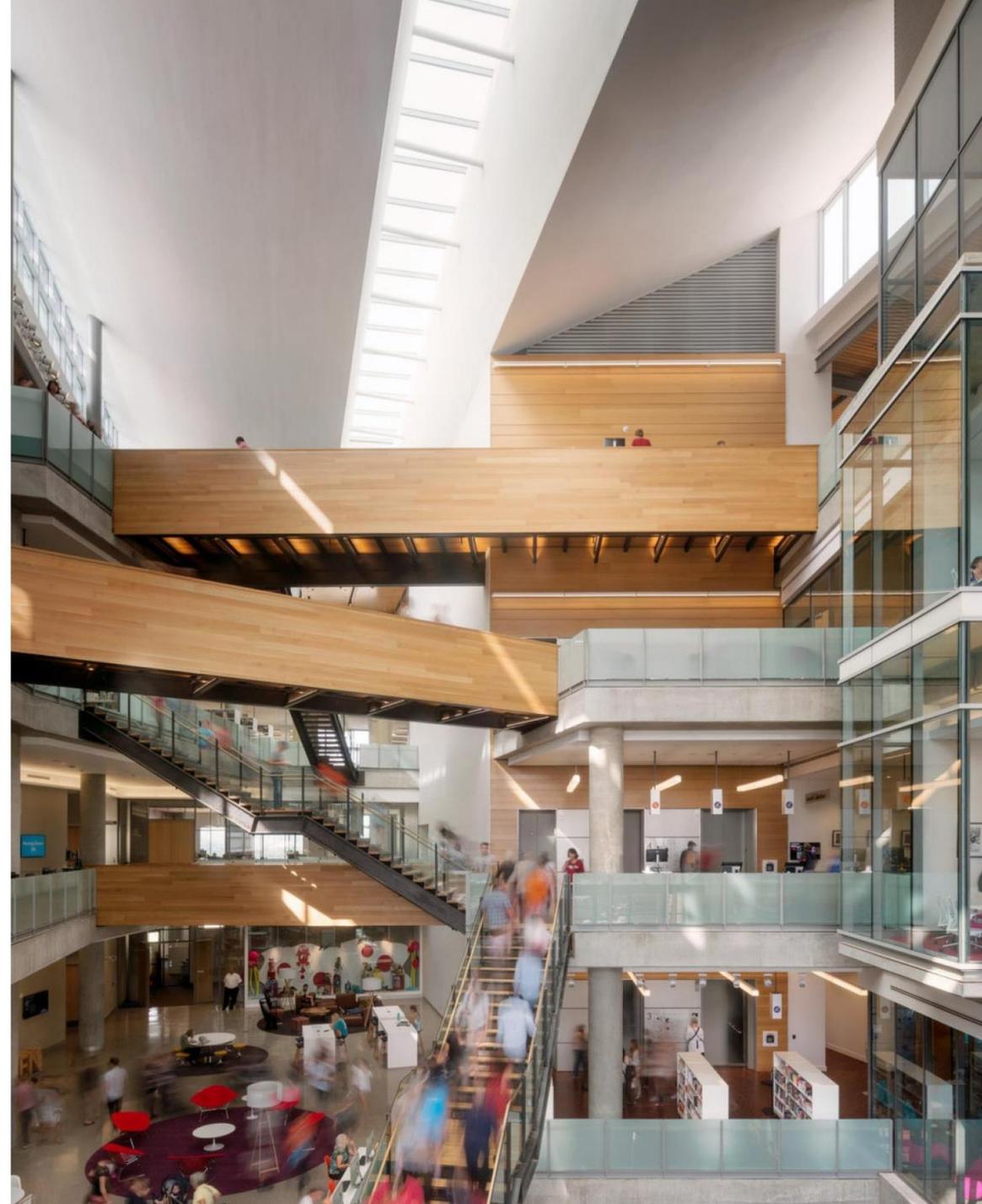
10

**We Only Fail...
from a
Lack of Imagination**



A&D Materials Pledge

90 firms & have signed onto the **A&D Materials Pledge** responding to the LP50 LETTER.



AA Access|Architecture Ankrom Moisan ARCH|NEXUS ARROWSTREET ARUP AYERS SAINT GROSS bassetti architects Bruner/Cott ARCHITECTS BECK Bergmeyer bnim BORA BRIGHTWORKS SUSTAINABILITY

B|W|B|R CALLISONRTKL™ CHRISTOPHER CARVELL ARCHITECTS CANNONDESIGN CARLETON HART ARCHITECTURE CMTA Cushing Terrell. dasso Global Innovator of Bamboo DIALOG® DIMELLA SHAFER

EWING COLE EMERSON DESIGN ESG GBD GOODYCLANCY ARCHITECTURE / PLANNING / PRESERVATION GCI GENERAL CONTRACTORS GG-loop HACKER Hennebery Eddy Architects HR hellmuth+bicknese architects HKS

HMC Architects HMFH ARCHITECTS h+k integrated ecostrategy mh MORRISON HERSHFIELD IA INTERIOR ARCHITECTS JSA LORD AECK SARGENT A KATERRA COMPANY LAKE | FLATO

Kirksey ARCHITECTURE Long Green Specs LINNEAN Solutions LMN LEDDY MAYTUM STACY ARCHITECTS VICTOR MONTERO ARQUITECTOS & ASOCIADOS LPA LRS ARCHITECTS LSW ARCHITECTS

m.thrailkill architect.llc ma architects M1 Real Estate An M1 Group Company mahlum MDS MG2 MILLER HULL MITHŪN MOODY•NOLAN

Moore Architecture + Design, LLC Mayer/Reed MSRDesign New Frameworks Low Impact. High Performance. opsis OTJ ARCHITECTS OVERLAND

PAE PAYETTE PCA PERKINS — EASTMAN QUINN EVANS REI DESIGN CO. Re:Vision SPECTOR ASSOCIATES INCORPORATED FOR THE BEST IDEAS TO LAST SIEGEL & STRAIN Architects | SCB S|E A

SRG stök unabridged Architecture VMDO WATER SHED WRNSSTUDIO Wight YOST GRUBE HALL ARCHITECTURE ZGF

We responded with a pledge to support holistically responsible materials that enhance

Human Health,
Climate Health,
Ecosystem Health, and
Social Health and Equity
in a **Circular Economy**

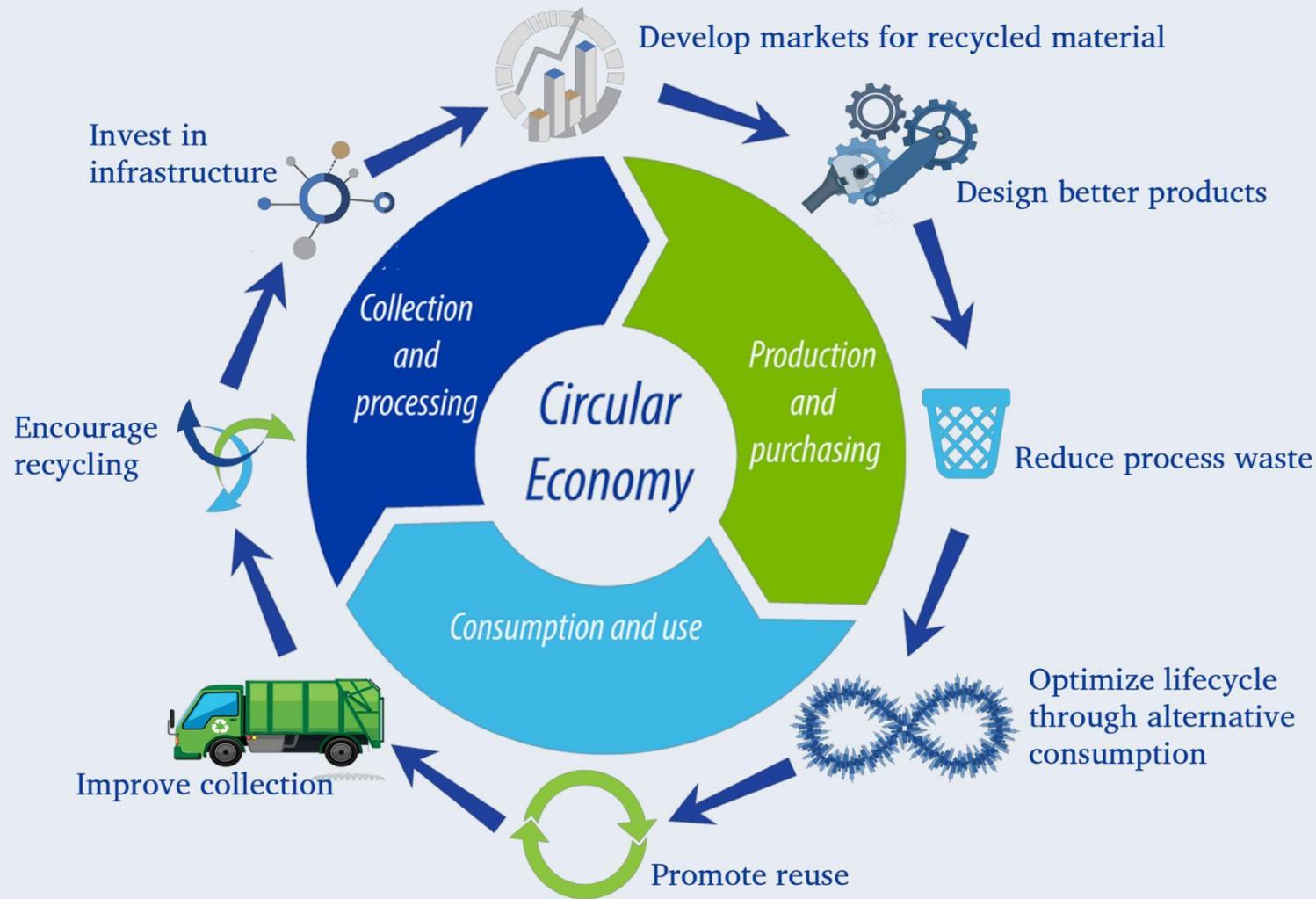


Image: Sustainable Global Resources Ltd.
Recycling Council of Ontario

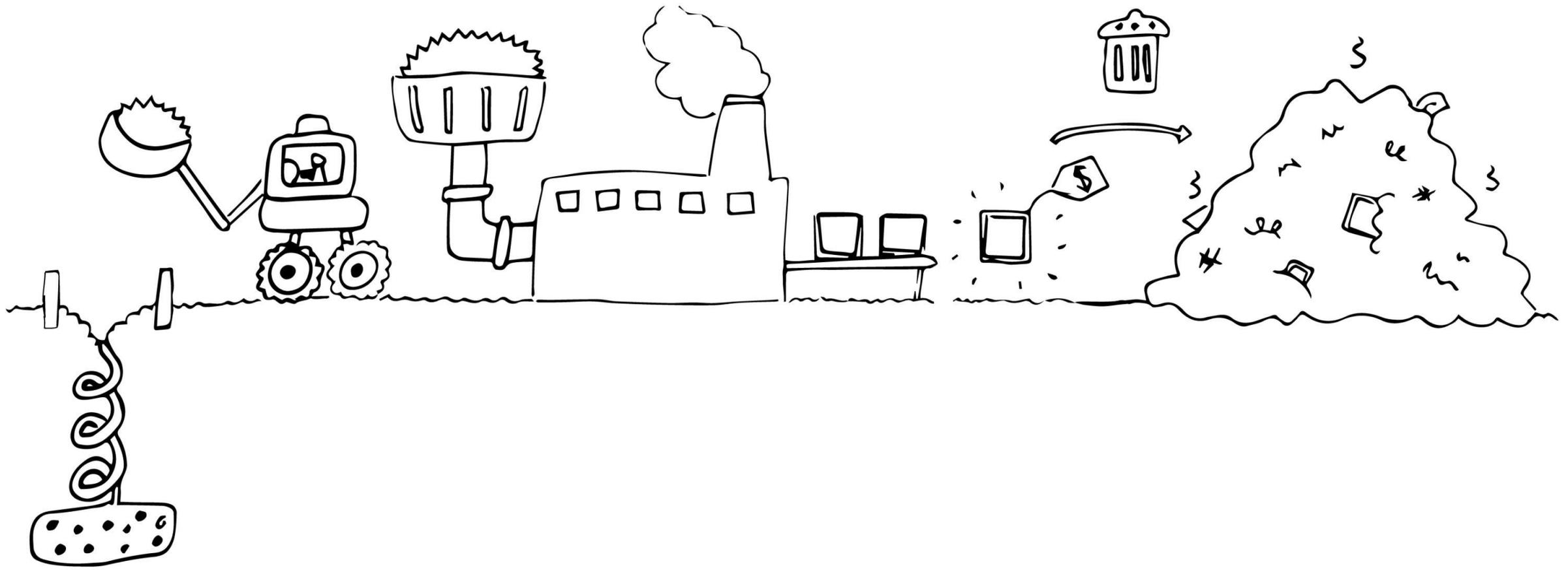
A&D Materials Pledge Climate Health

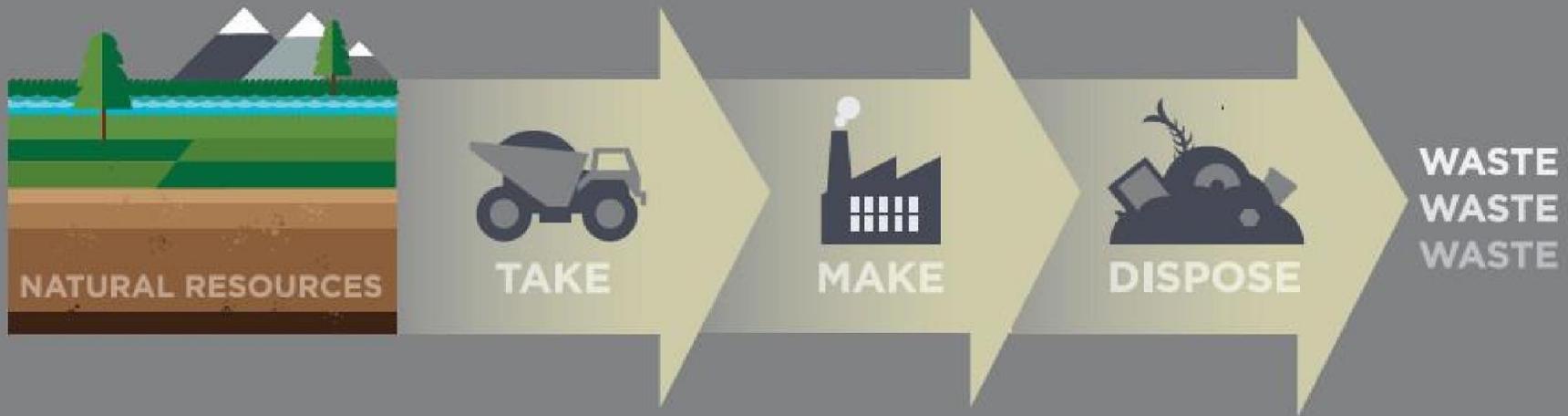
Support a **Circular Economy** by reusing buildings and materials; and by designing for material efficiency, long life and reuse.



OUR SOLUTION:

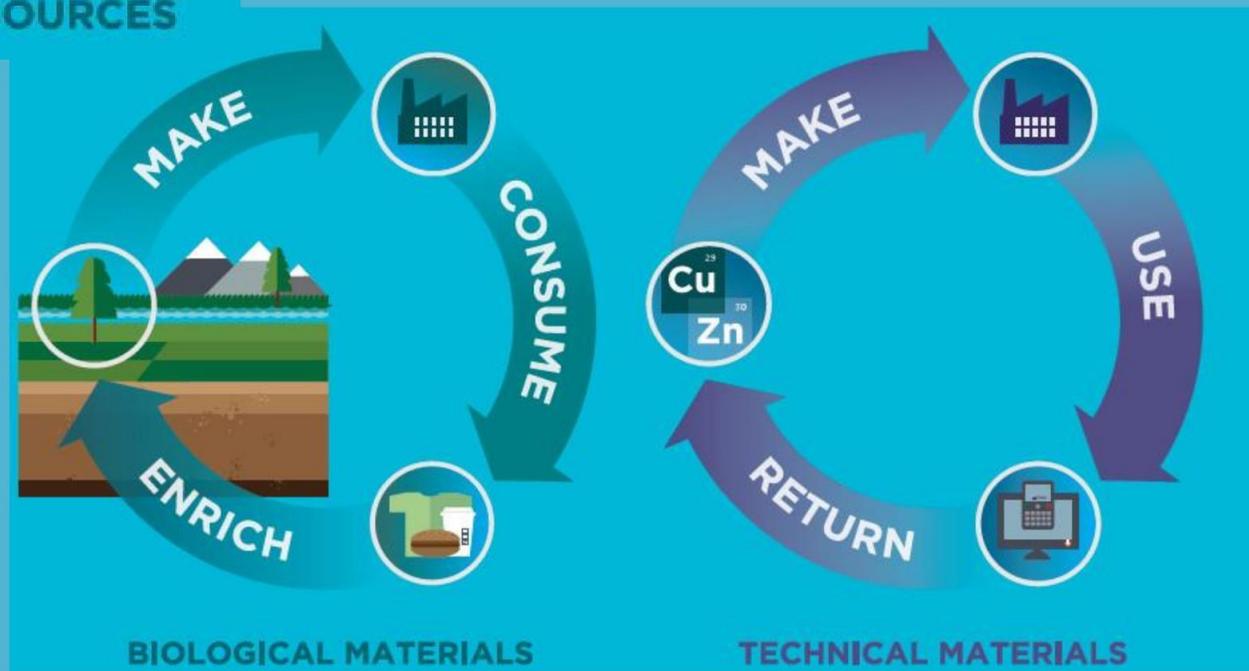
DESIGN OUT WASTE

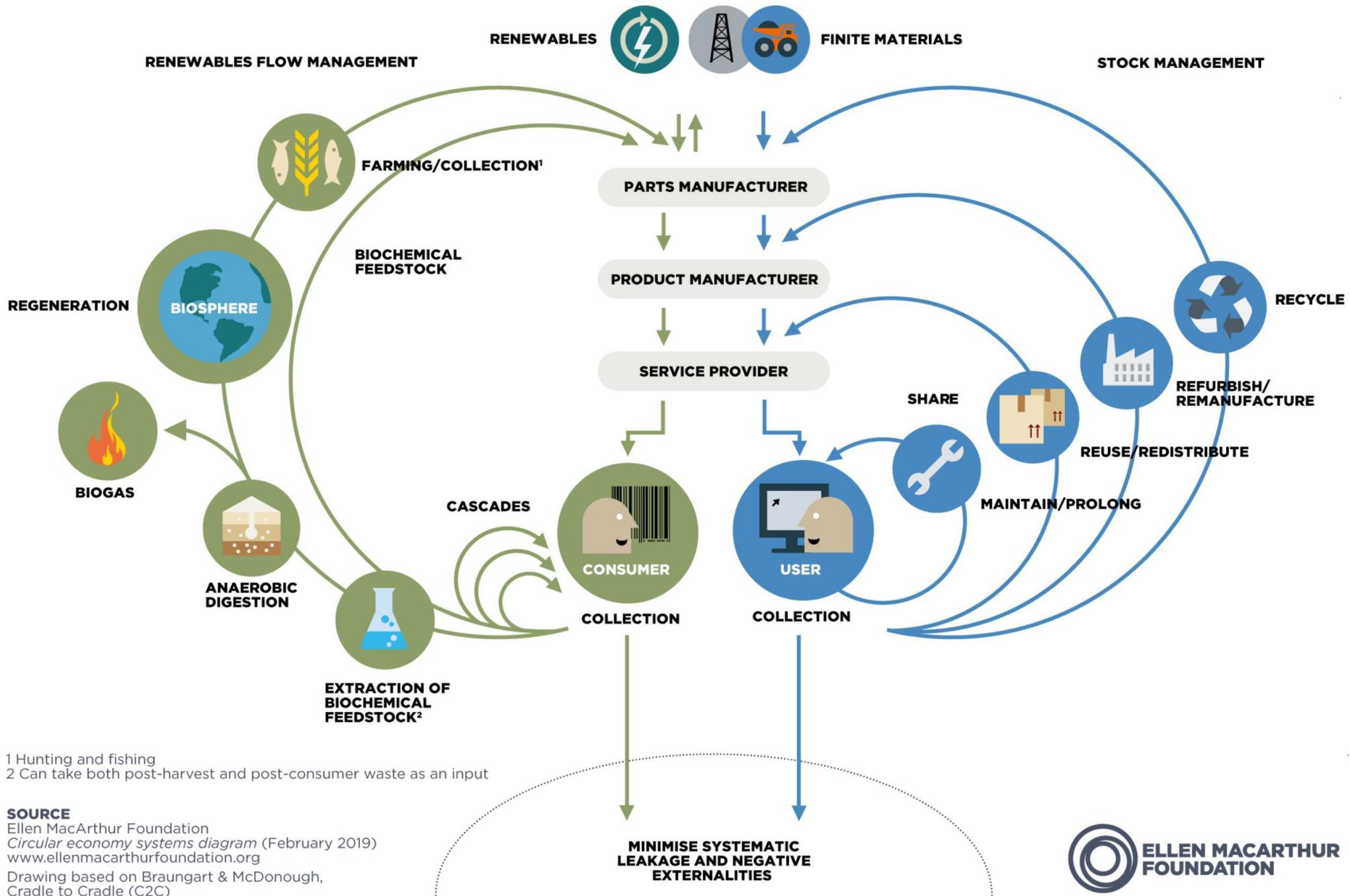




ENERGY FROM FINITE SOURCES

ENERGY FROM RENEWABLE SOURCES



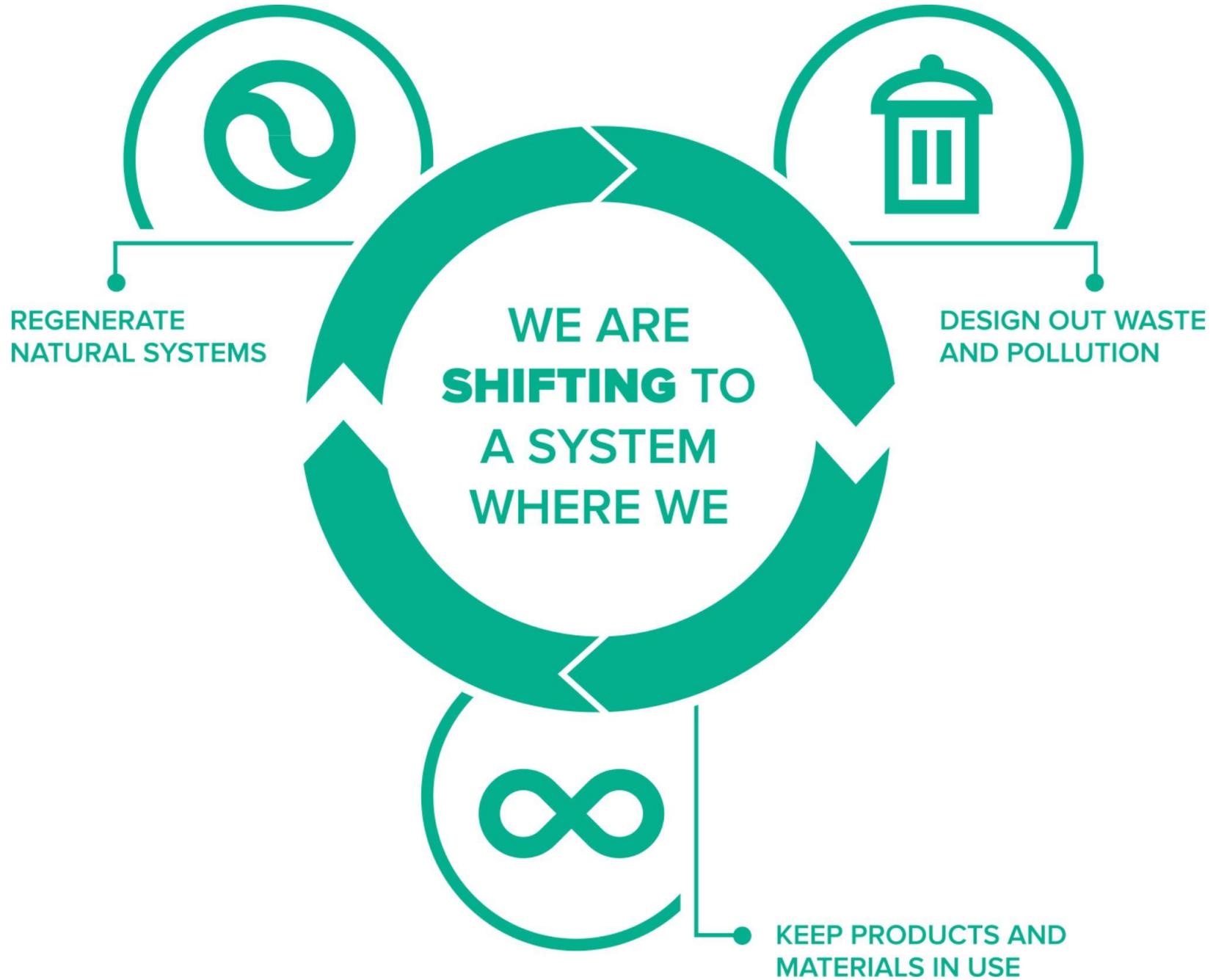


1 Hunting and fishing
 2 Can take both post-harvest and post-consumer waste as an input

SOURCE
 Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
 Drawing based on Braungart & McDonough,
 Cradle to Cradle (C2C)









1. Circular Supply

Replace virgin raw materials with materials that are renewable or bio-degradable.



2. Resource Recovery

Recover discarded products or by-products to recycle or upcycle the materials.



3. Life Extension

Extend the life cycle of a product, or parts of a product, while preserving the original function.



4. Sharing Platforms

Increase the use of a product through new models for sharing, accessibility, and ownership.



5. Product as Service

Optimise productivity of a resource or product while maintaining ownership of the product.

[All Categories](#)

Join the Building Reuse Revolution

Be a part of Markit Zero

[Become a Vendor](#)

Login

Username or email address *

Password *

Remember me

Log in

[Lost your password?](#)

or

Register

Email address *

Password *

I am a customer

I am a vendor

Register

Categories

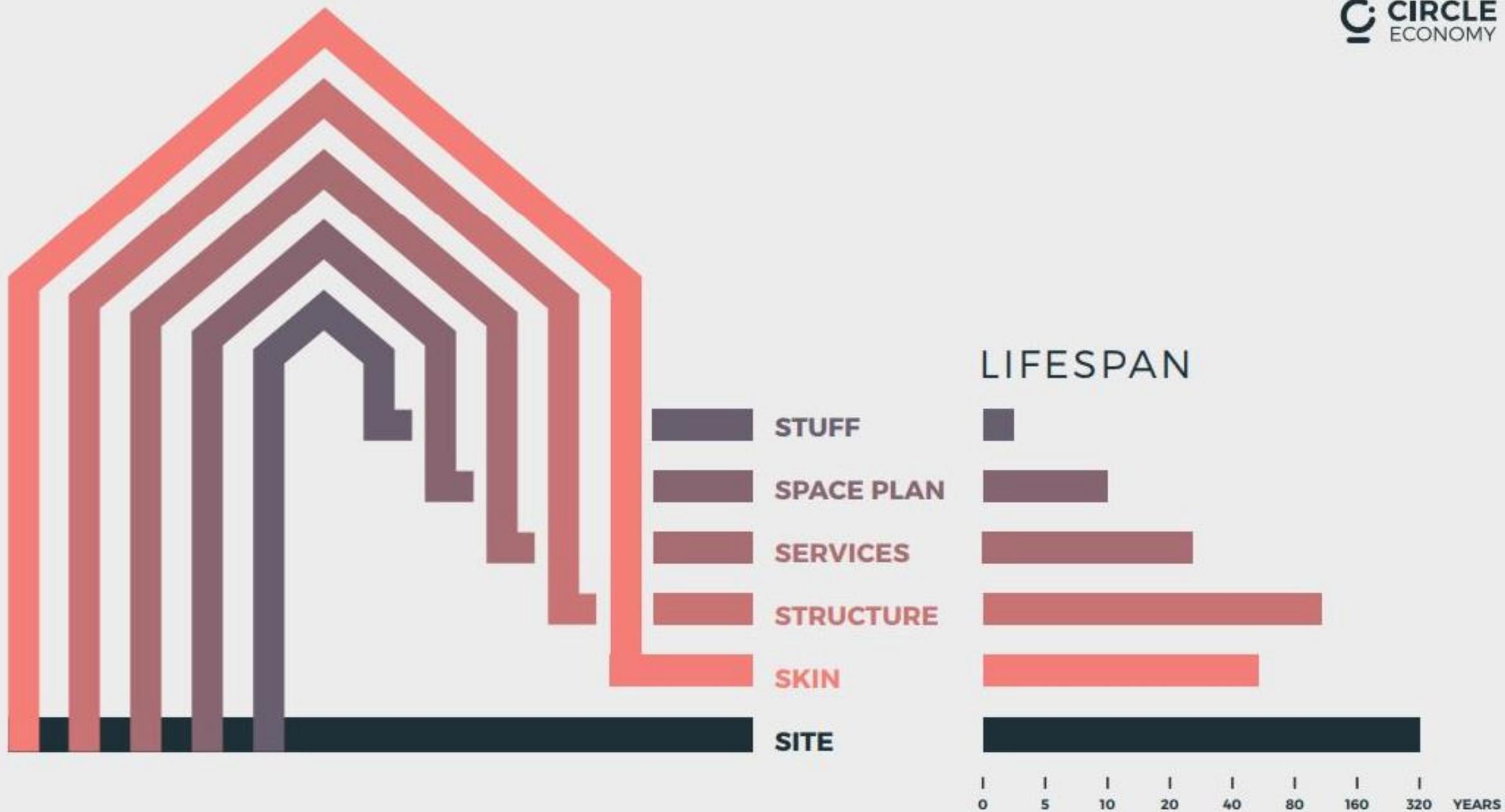


[All Categories](#)

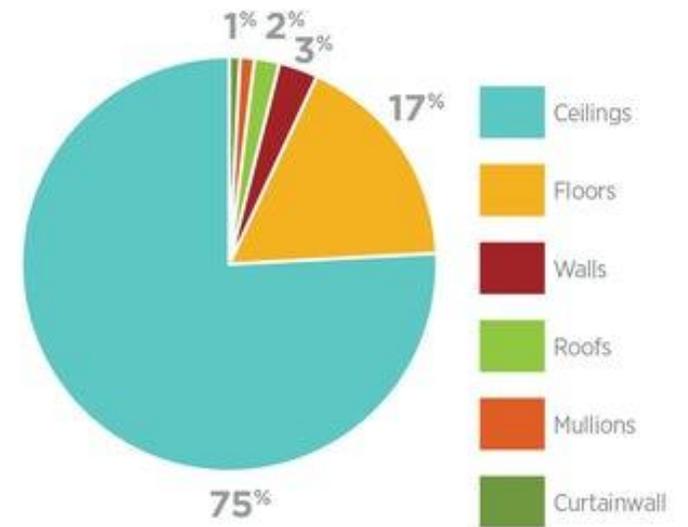
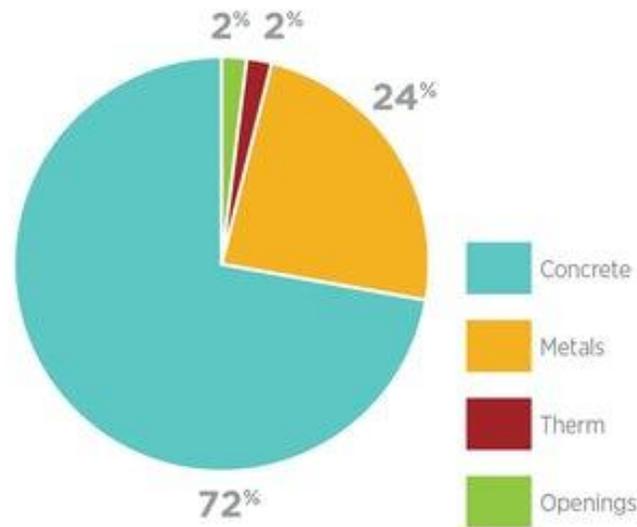
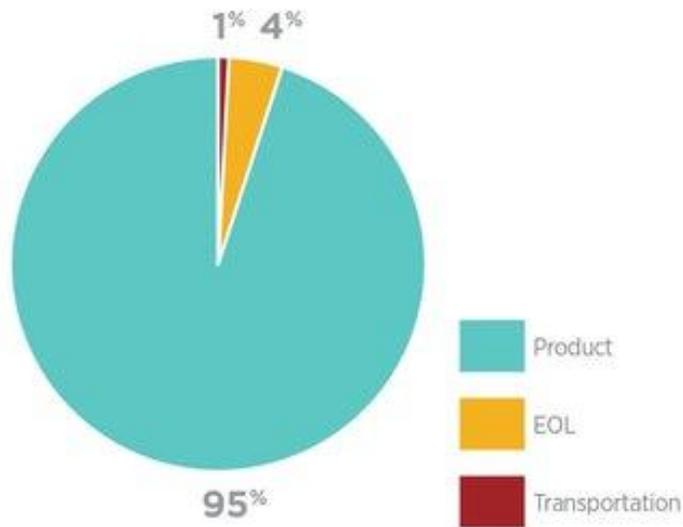
Join the Building Reuse Revolution

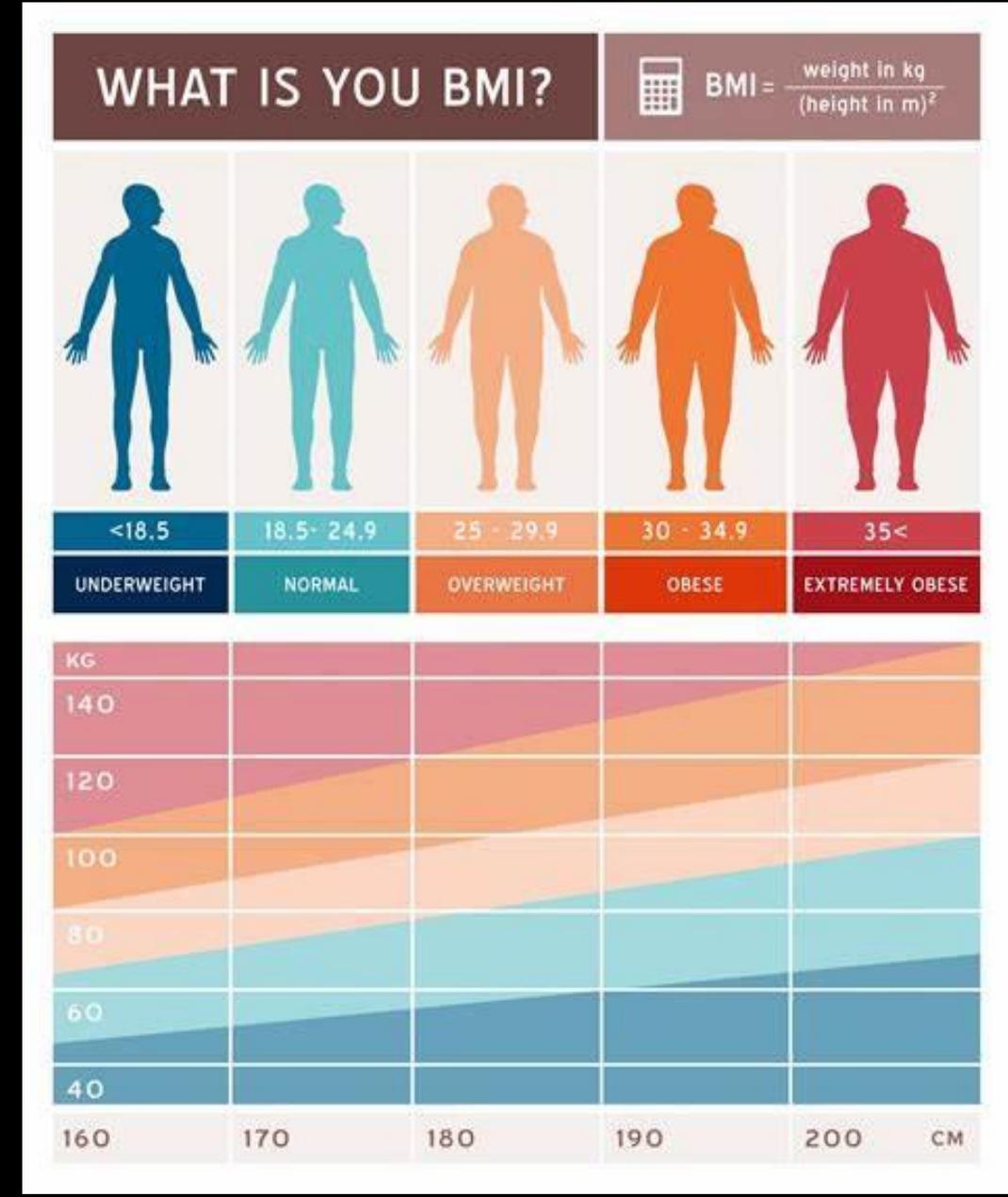
Be a part of Markit Zero

[Become a Vendor](#)



Putting a Number on EMBODIED CARBON











MATERIALS



Rammed Earth
48 kgCO₂e/m³



Softwood Lumber
110 kgCO₂e/m³



Cross Laminated Timber
219 kgCO₂e/m³



Stone
237 kgCO₂e/m³

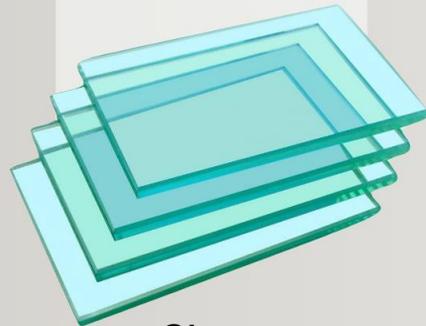


Brick
345 kgCO₂e/m³



1370

Concrete
1,370 kgCO₂e/m³



3600

Glass
3,600 kgCO₂e/m³



12100

Steel
12,100 kgCO₂e/m³



18000

Aluminum
18,000 kgCO₂e/m³



Cellulose
Plant Fibers



Collagen
Structural Protein



Pectin
Fruit + Vegetable Fibers



Lignin
Wood Structure



Agarose
Red Seaweed



Alginate
Algae



Chitosan
Exoskeleton of Crustaceans



Mucilage
Adhesive Membrane



Starch
Soluble Sugar



Calcium Carbonate
Eggshells + Seashells



Silk
Worm + Spider Fibers



Mycelium
Fungal Spore



Cellulose
= STRUCTURE



Collagen
= STRUCTURE



Pectin
= STRUCTURE



Lignin
= STRUCTURE



Agarose
= EPOXY



Alginate
= WATERPROOFING



Chitosan
= CONCRETE



Mucilage
= ADHESIVES



Starch
= PLASTIC



Calcium Carbonate
= CONCRETE



Silk
= TENSILE CABLES



Mycelium
= INSULATION + FOAM



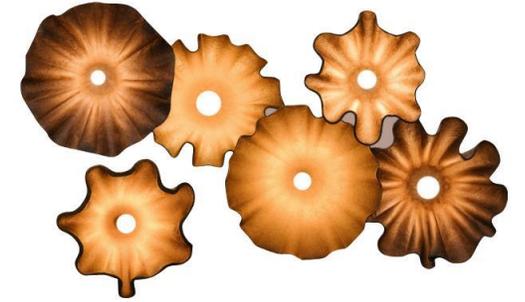
Mycofoam
Ecovative



Reishi
MycoWorks



Bioplastics
Biome



Orb Mycellium
Biohm



Bacterial Concrete
BioMason



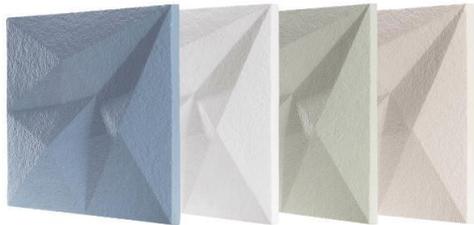
Bacterial Cellulose
Textiles



Pineapple Leaf Fiber
Ananas Anam



AgWaste Panels
Ottan Studio



Mycelium Wall Panels
Mogu



Brewed Protein
Spiber



Ekoa Composite
Lingrove



Novatein
Aduro Biopolymers

[VIEW
SOURCE](#)



OCT 7, 2021

Your next house could be insulated by mushrooms

**FAST
COMPANY**



LignoSphere™



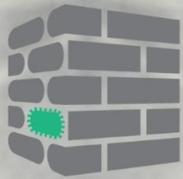
CRUZ FOAM



cruzfoam.com

BIOHM





bioMASON[®]
building with nature



aggregate
waste aggregate
(85% by volume)

+



biologics
bM natural bacteria,
nutrient

+



solution
water,
calcium source

=



product
reaches full strength in less
than 72 hours of production,
same composition as natural
stone





Adaptavate

GLAVEL
FOAM GLASS GRAVEL





Mycelium



Jute Fiber



Coconut Coir



Biohm



AirCarbon



Timber (sustainably harvested)



Wood fiber board



Hemp hurd & fiber



Cork



Rice hulls (& coconut, palm kernel, etc)



Cellulose (waste paper fiber)



Waste textiles



Straw (waste ag fiber)



Bamboo

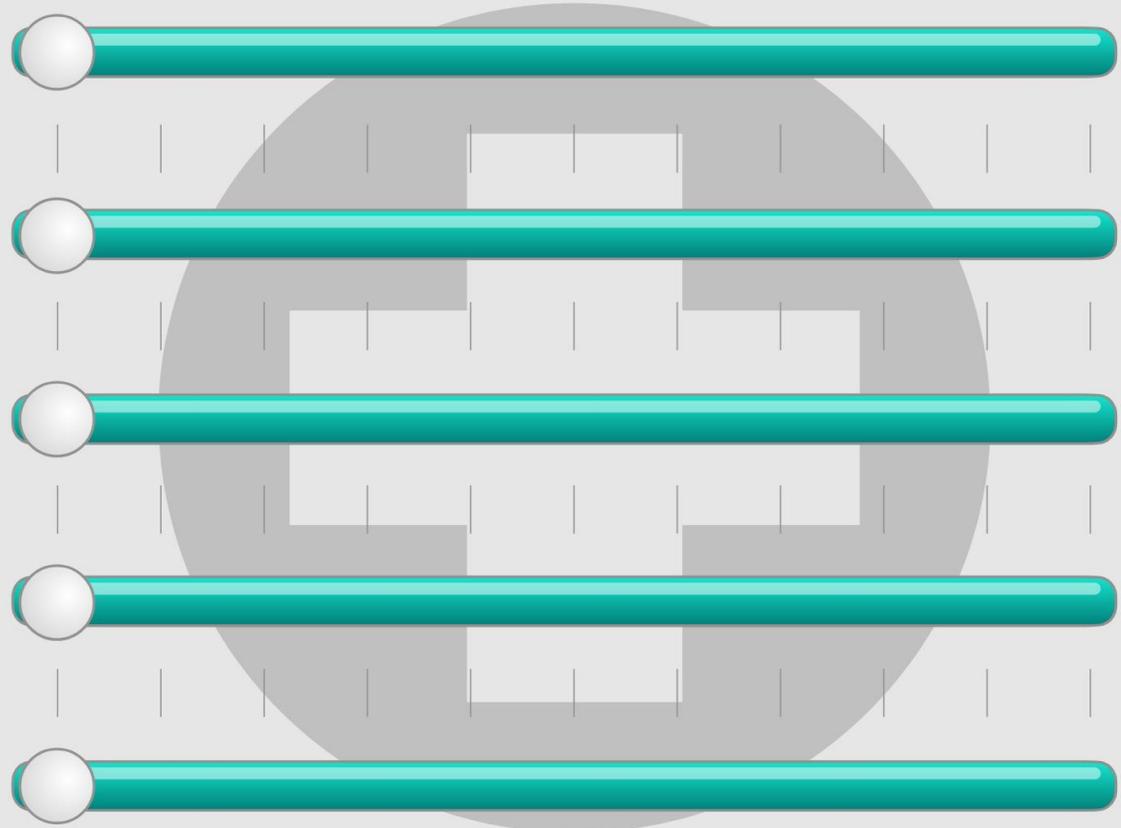


ReWall



0 50 100

AMOUNT OF WASTE



Outdated Infrastructure

Legacy Systems

Campus Heating Loops

Unused Food

Unoccupied Spaces

0 50 100

WHERE ARE YOU BURNING MONEY?

REGENERATE

Renewable and restorative



SHARE

Reuse, extend life, sharing, time shifting, upgradable



OPTIMIZE

Performance, efficiency, design out waste



LOOP

Remanufacture, recycle, extract valuable resources



VIRTUALIZE

Dematerialize and remove the physical



EXCHANGE

Replace old with advanced materials or new services



REGENERATE

Net Zero Energy, maximize building life



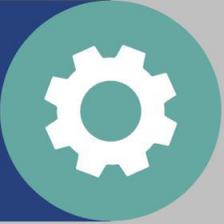
SHARE

Design for multi-function, future forward, collaboration



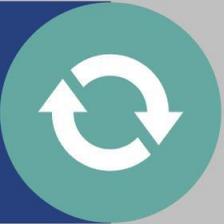
OPTIMIZE

High-performance systems
Maximize usability and flexibility of space



LOOP

Design for Disassembly (DfD)
Deconstruction not demolition



VIRTUALIZE

Time shifting, function shifting, community as partner
Satellite education for cross-campus collaboration



EXCHANGE

Modularity, campus as a living laboratory
Renovation with efficiency upgrades



CAMPUS BUILDINGS

REGENERATE

Add functionality (stormwater, heat island, food)



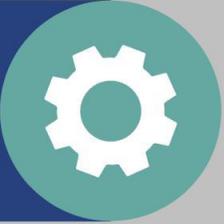
SHARE

Distribute savings obtained from ecosystem services



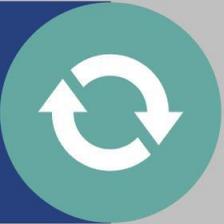
OPTIMIZE

No-mow campuses, stormwater harvesting, habitat creation, service density



LOOP

Compost/mulch from vegetation litter



VIRTUALIZE

Generate and display carbon sequestration and stormwater data



EXCHANGE

Replace turf grass with carbon-capturing vegetation



CAMPUS LANDSCAPE

REGENERATE

bicycle exchange, walkability, signage



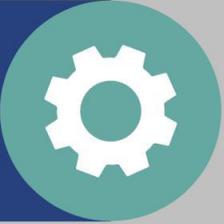
SHARE

scooters, ride share, carpool program



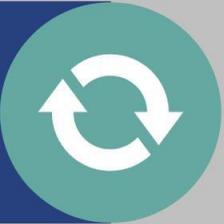
OPTIMIZE

linkages (desire paths), shuttles, networks,
coordinated class schedules



LOOP

robust reuse programs, composting,
bike parts/repair, gardens CSA



VIRTUALIZE

remote/hybrid/open texts, external classes,
online library



EXCHANGE

satellite campus for core, textbook exchange,
design things to last



TRANSPORTATION



IDEAS!

PRODUCT AS SERVICE

SHARING ECONOMY

REDESIGN FOR REUSE

USE A DEPOSIT SYSTEM

TRASH INTO TREASURE

MAP INPUTS AND OUTPUTS

RESULT-ORIENTED CONTRACTS

PERFORMANCE-BASED CONTRACTS

NEW OWNERSHIP MODELS

TIME SHIFTING

ASSUMPTIONS MAPPING

UNREALISTIC EXPECTATIONS

EQUITABLE DISTRIBUTION

CREATING ATTACHMENT AND TRUST

**DESIGNING FOR STANDARDIZATION
AND COMPATIBILITY**

GUARANTEE FOR LIFE

CLOSE LOOPS WITH STAKEHOLDERS

USE CONSISTENT TOOLS

AVOID PLANNED OBSOLESCENCE

CREATE THE MARKET

SWITCH TO A NATURAL SOLUTION

MAKE PRODUCT REDUNDANT

MAKE PRODUCT USE MORE INTENSIVE

**INCREASE MATERIAL + RESOURCE
EFFICIENCY**

REPAIR TO EXTEND ITS USEFUL LIFE

REPAIR TO ADD FUTURE FUNCTIONS

RESTORE AND BRING IT UP TO DATE

**USE DISCARDED PARTS TO REMAKE
INTO NEW**

**USE DISCARDED TO MAKE INTO
SOMETHING ELSE**

**RECYCLE MATERIALS TO RETAIN SOME
VALUE**

**INCINERATE MATERIAL FOR ENERGY
RECOVERY (LAST RESORT)**

SWITCH TO BIO-BASED CHEMISTRY

**PACKAGING BECOMES BUILDING
BLOCK**

RETOOLING FOR STANDARDIZATION

**ELIMINATE PRE-PLANNED
OBSOLESCENCE**

**USER CAN REPAIR WITH COMMON
MATERIALS**



Kyle J Ritchie

LEED AP BD+C, ID+C, WELL AP, TRUE Advisor

CANNONDESIGN