

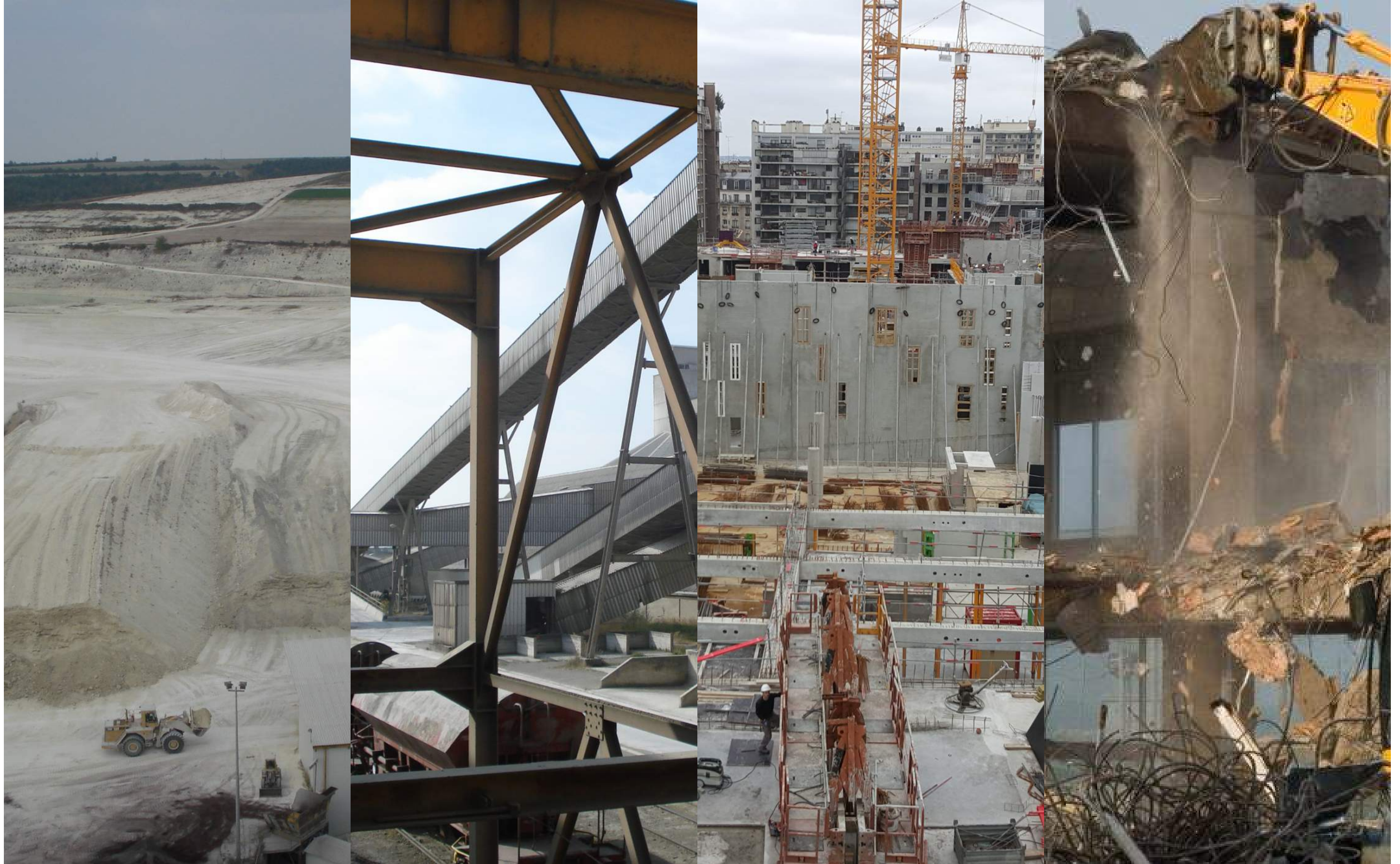
IS THE BUILDING WORLD READY FOR THE CIRCULAR ECONOMY ?

CIRCULAR ECONOMY WORKING GROUP

JOËL ONORATO

SEPTEMBER 09, 2020

ENTANGLED IN A LINEAR ECONOMY



Framework where materials are perpetually kept in use to achieve 3 goals:

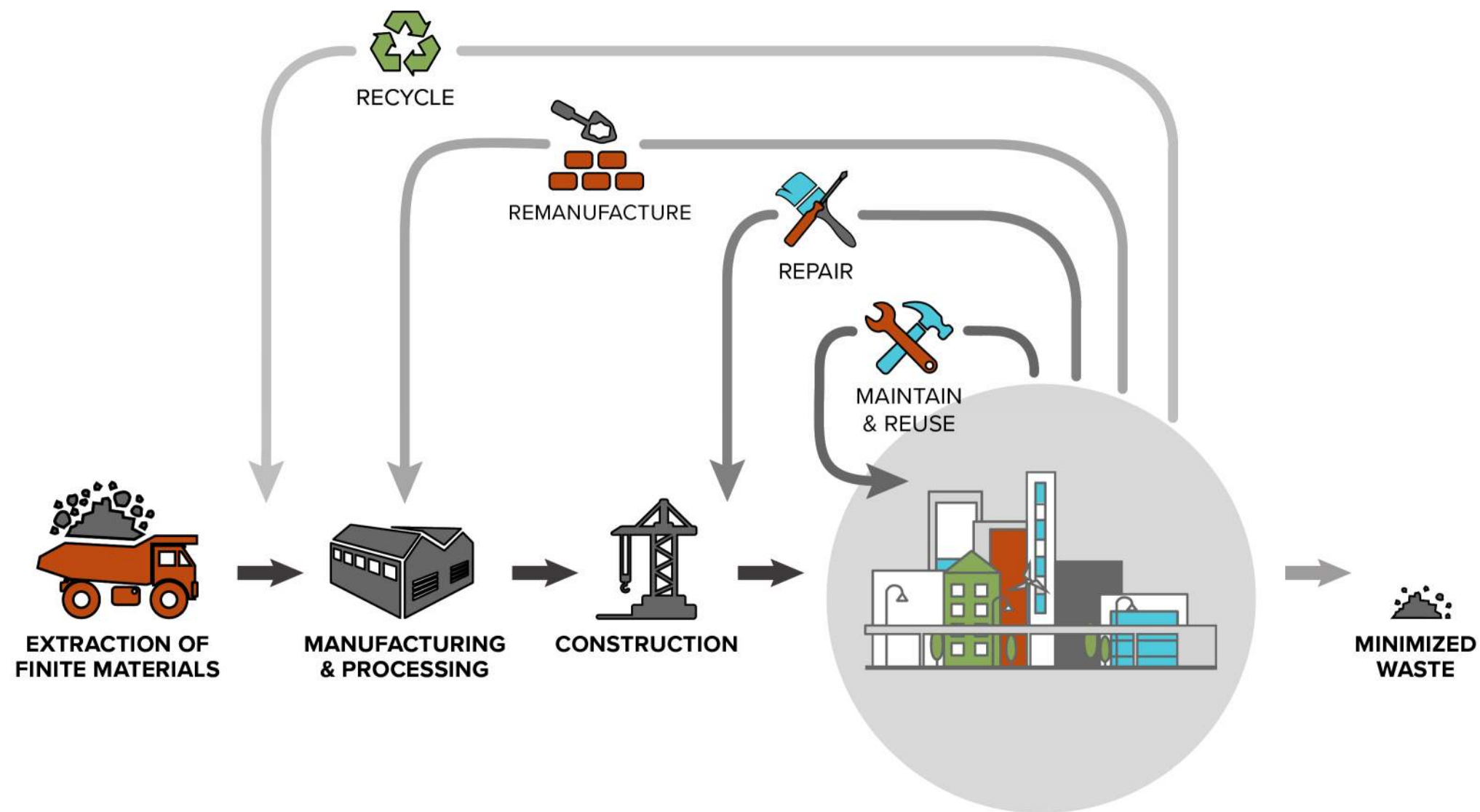
- minimizing extraction of finite natural resources
- eliminating negative environmental and health impacts / having positive ones
- eliminating waste



3 Principles (Ellen McArthur Foundation):

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

REUSE, REPAIR, REMANUFACTURE, RECYCLE ... : MAXIMIZE VALUE



DEPLETION OF FINITE NATURAL
RESOURCES



PEOPLE'S INCREASING
COMMITMENT TO
SUSTAINABILITY

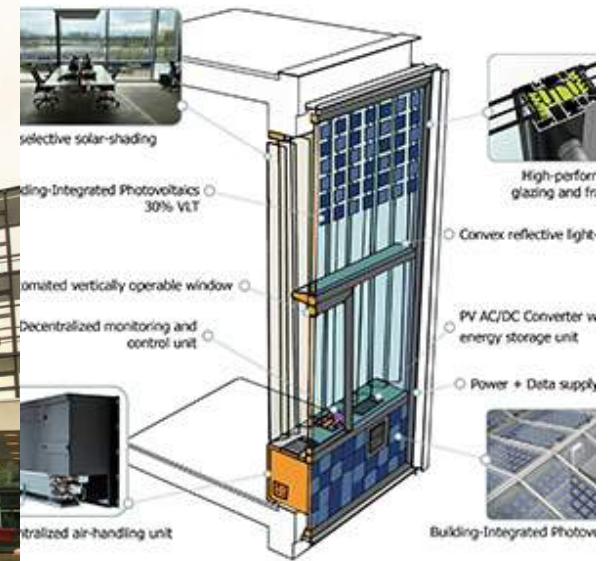
NEW BUSINESS MODELS

KEEPING OWNERSHIP

+

SELLING EXPERIENCE/SERVICE

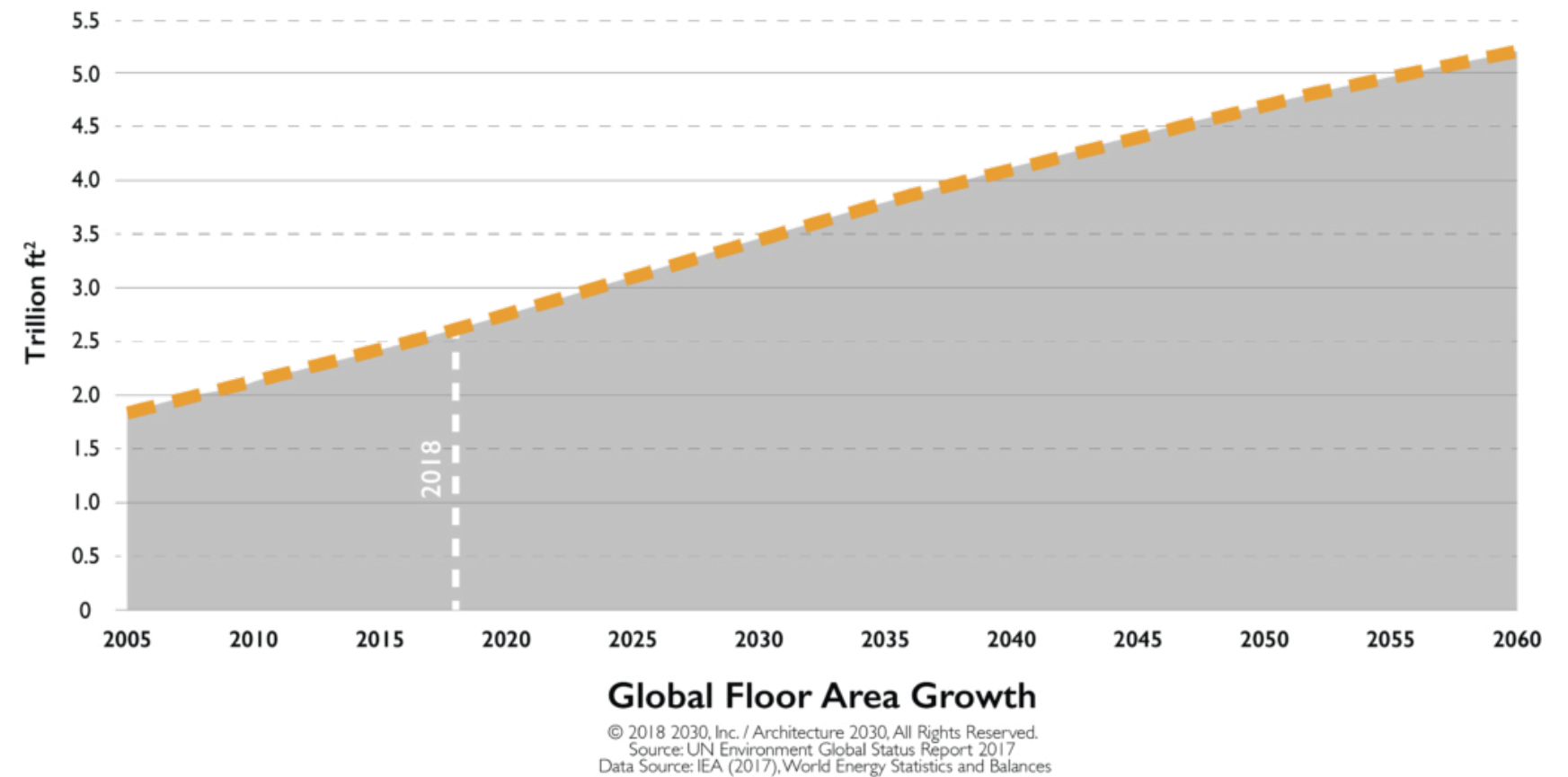
INTENSIFICATION OF
MANUFACTURER'S
RELATIONSHIP WITH THEIR
CONSUMERS



WHAT IS THE BUILDING INDUSTRY DOING?

INCREASE OF CONSTRUCTION

“adding an entire New York City every month for 40 years” - Architecture 2030



LARGE VARIETY OF PRODUCTS AND SCALES

CONTRIBUTION TO WASTE 548 million tons in 2015, US = 2 x Municipal Solid Waste (EPA)
(169 million for buildings alone)

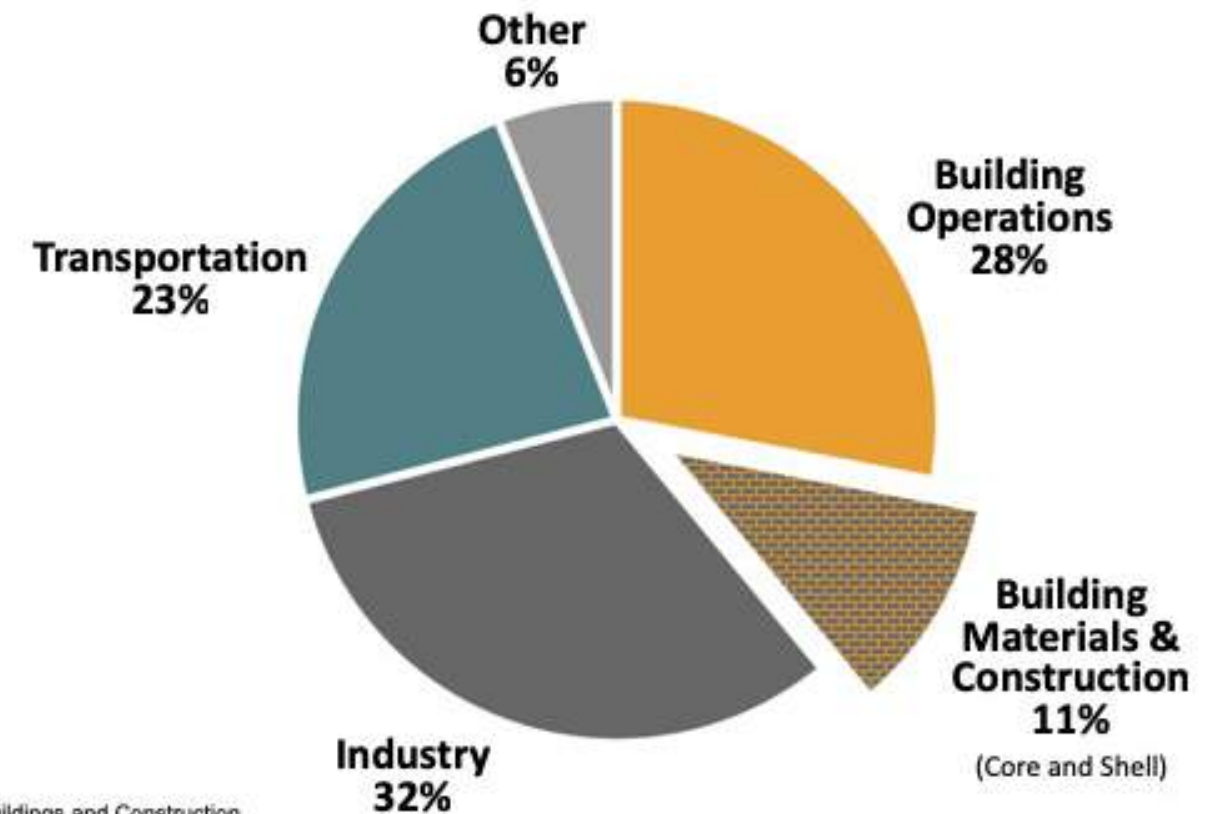


THE MATERIAL ASPECT IS AS IMPORTANT AS ENERGY EFFICIENCY

CONTRIBUTION TO GhG EMISSIONS

11% of Global GHG emissions

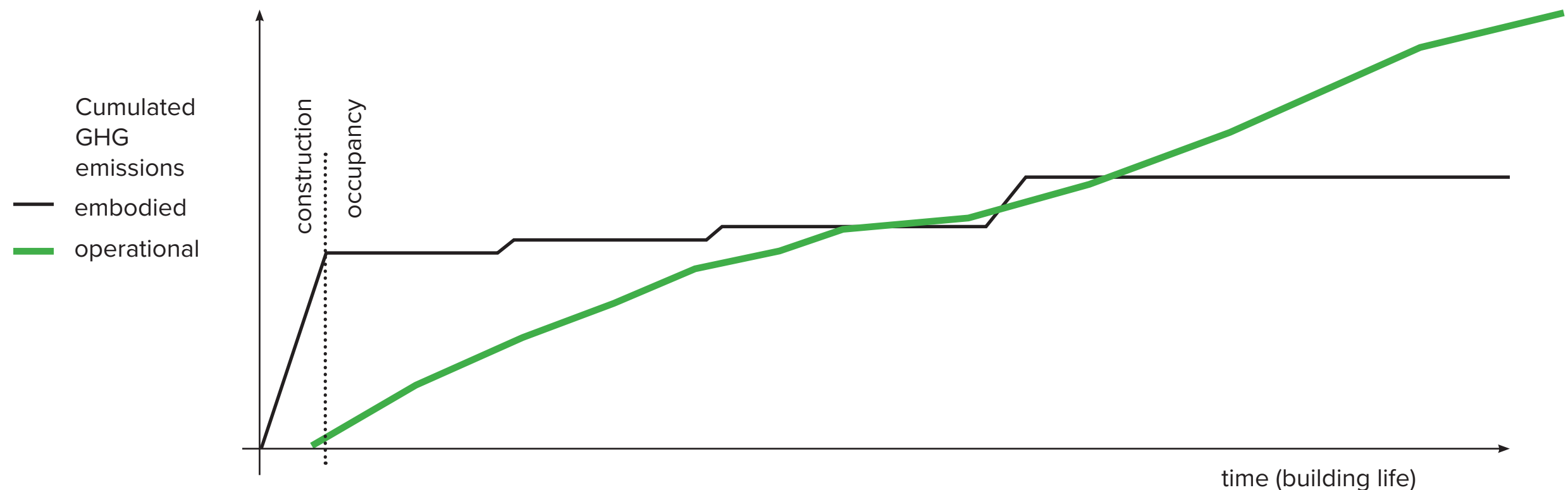
(Other impacts to be considered as well)



Source:
Global Alliance for Buildings and Construction.
2018 GLOBAL STATUS REPORT.

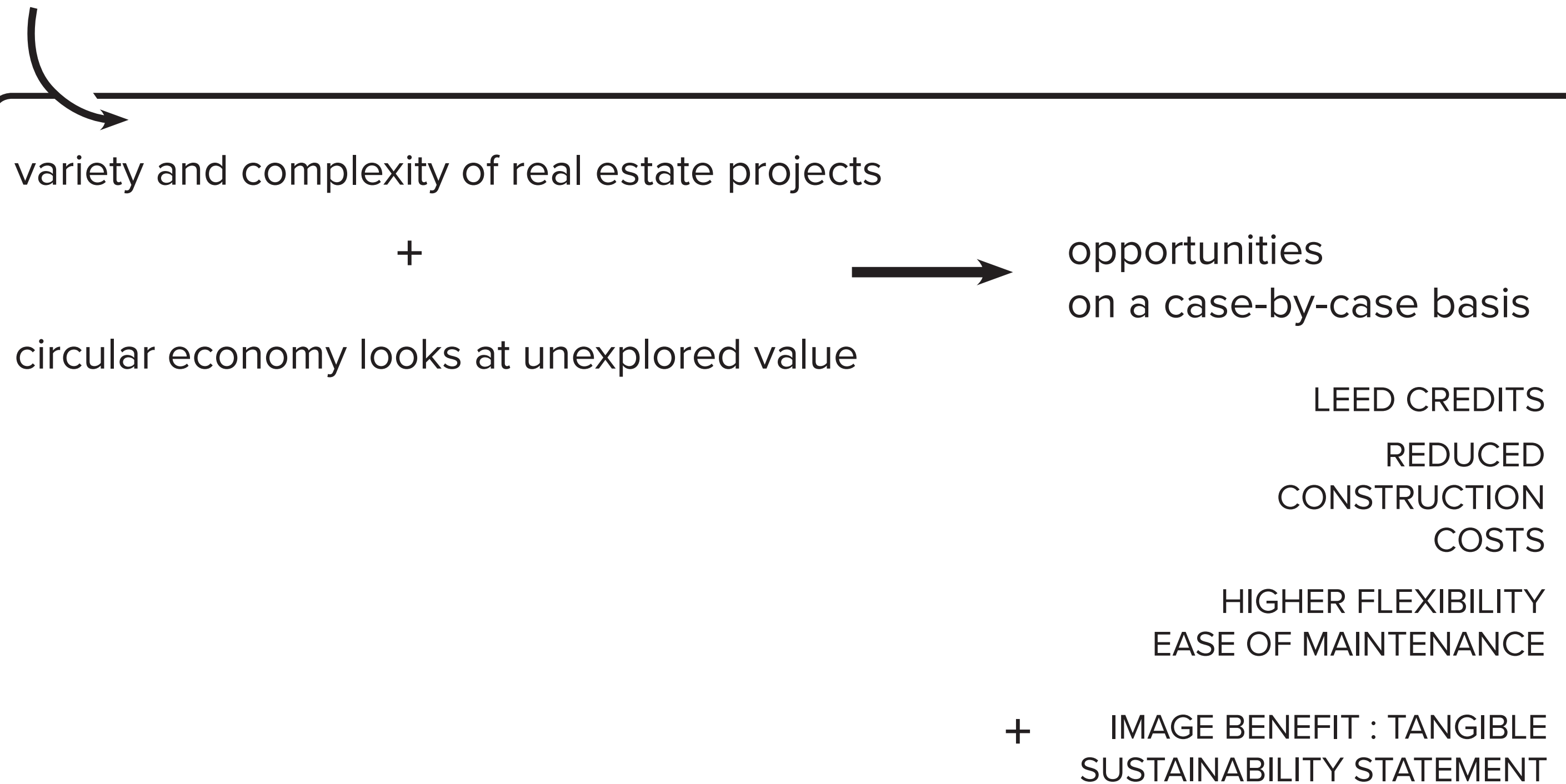
Global GHG emissions by sector. Source: Architecture 2030

EMBODIED CARBON : THE SAVINGS ARE NOW - “TIME VALUE OF CARBON”



WHY THEN IS CIRCULARITY NOT IN PLACE?

deviation from the dominant linear model → increase in risk and cost



BUILDING CHOICES - PRINCIPLES

CIRCULAR COMPONENTS ATTITUDE

-DISPOSING - CONSIDER DECONSTRUCTION

REUSE /
DONATE > REPAIR > REMANUFACTURE > RECYCLE
COMPOST > WASTE TO
ENERGY

-SOURCING CRITERIA-

EXISTING > SALVAGED > REPAIRED/
REMANUFACTURED > RECYCLED
RENEWABLE > MADE WITH
VIRGIN RAW
MATERIALS

-SOURCING CRITERIA - END-OF-LIFE-

DURABLE + REUSABLE + REPAIRABLE + TRULY RECYCLABLE
UPGRADABLE COMPOSTABLE

DESIGN FOR ADAPTABILITY

CHANGES REQUIRE MINIMAL MODIFICATIONS

EASY TO DISASSEMBLE TO ALLOW COST-EFFECTIVE CIRCULARITY

KEEP IT SIMPLE

WHEN POSSIBLE AVOID COMPOSITES, COATINGS, FINISHES

LIMIT THE NUMBER OF DIFFERENT MATERIALS

PRIVILEGE LOW TECH AND PASSIVE SYSTEMS

CERTIFICATIONS

-TRANSPARENCY-
DECLARATIONS

EPD



-RATING-
CERTIFICATIONS



CRADLE TO CRADLE CERTIFIED ^{CM} PRODUCT SCORECARD					
BRONZE					
QUALITY CATEGORY	BASIC	BRONZE	SILVER	GOLD	PLATINUM
MATERIAL HEALTH				✓	
MATERIAL REUTILIZATION			✓		
RENEWABLE ENERGY & CARBON MANAGEMENT		✓			
WATER STEWARDSHIP			✓		
SOCIAL FAIRNESS				✓	
OVERALL CERTIFICATION LEVEL		✓			

“CRADLE TO CRADLE” AS A TOOL TO
REACH TRUE CRADLE TO CRADLE

-BROWSING-
DATABASE

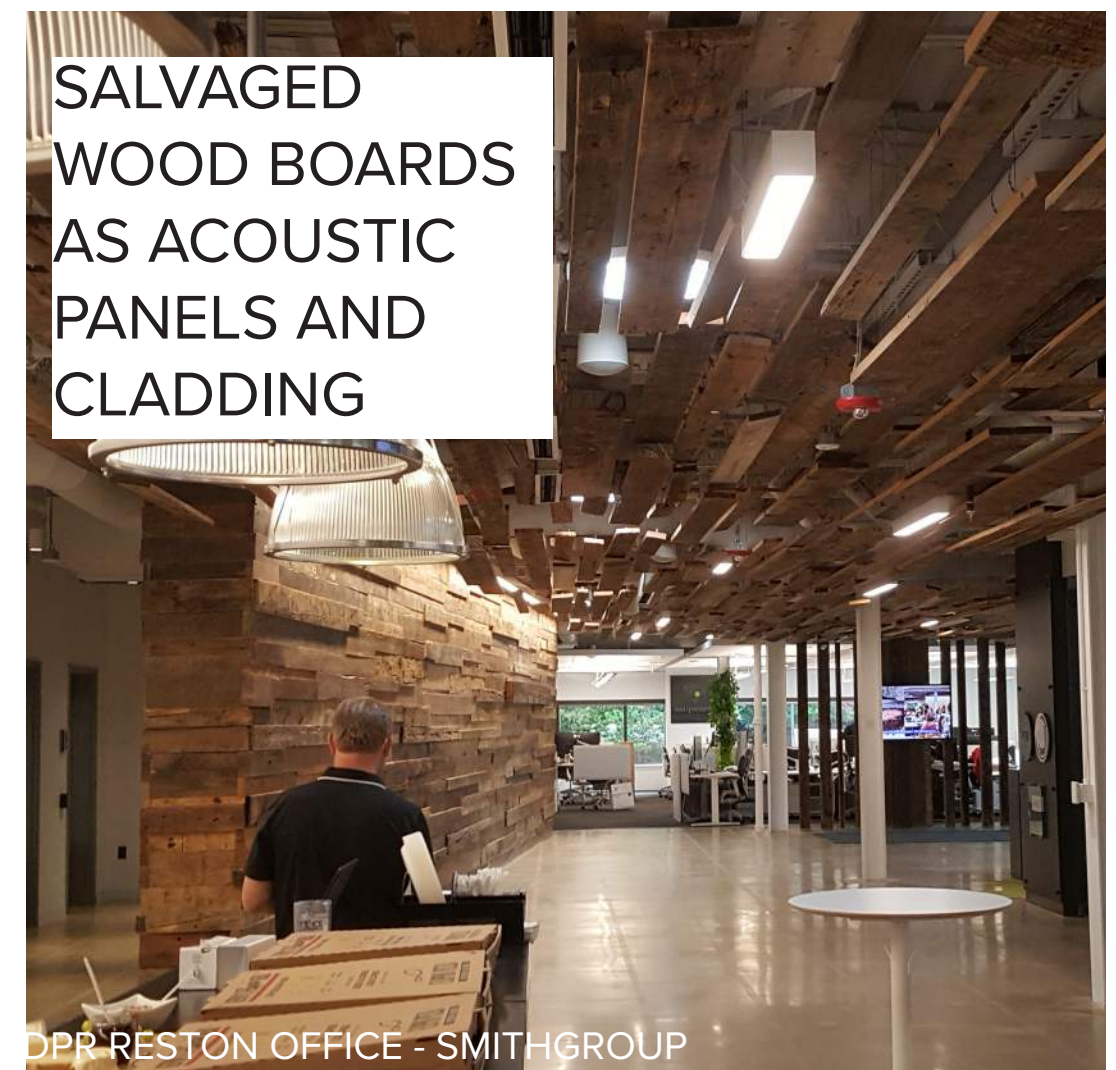


WOOD

REUSE

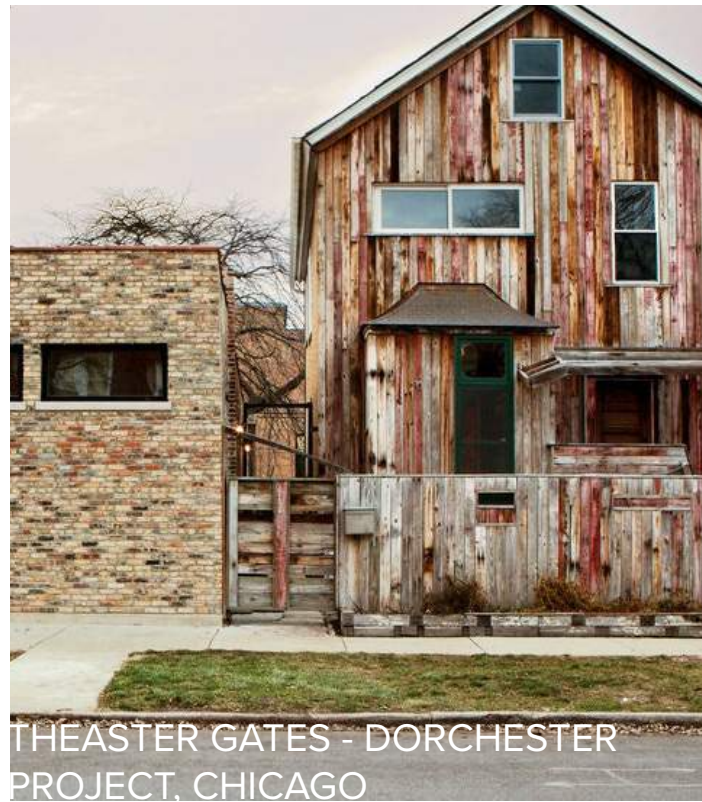
HIGH QUALITY OLD TIMBER

CARBON STORAGE EXTENDED



WOOD

REUSE



STEEL

REUSE

REUSED STEEL COMPONENTS HAVE “LESS THAN A QUARTER THAN THE [CARBON] IMPACT OF NEW MATERIALS (EVEN FROM RECYCLED SOURCES)”

STRUCTURE AND CARBON, ASCE, 2012

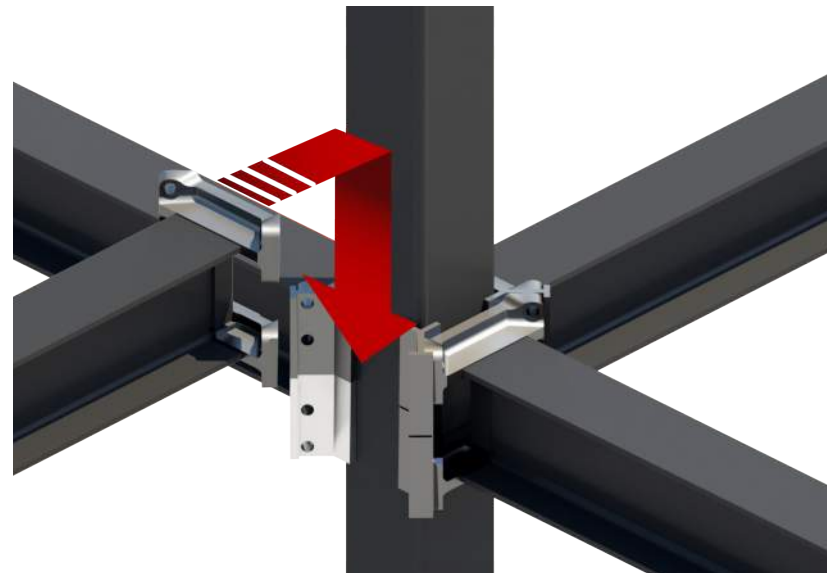
ASSEMBLY: NOT JUST BOLTS...

CLAMPING CONNECTIONS



LINDAPTER CLAMPING SYSTEM AT AMERICAN COPPER BUILDING, SHOP ARCHITECTS

REVERSIBLE MOMENT FRAMES



CONXTECH - CONXL 300 SYSTEM



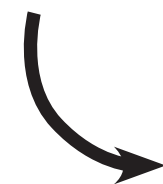
CBU ENGINEERING FACILITY STRUCTURE - CONXTECH, GENSLER

RECYCLE



85%

RECYCLING RATE (BUILDING STEEL)



SPECIFY THIS RATE?

ROLLED SHAPES

>

HSS

DESIGN - CONCRETE

REUSE

REUSE EXISTING STRUCTURES



RECYCLE

CRUSHED AND:

- USED IN SITE/ROAD FILL
- USED AS RECYCLED AGGREGATES IN ROAD CONSTRUCTION (UP TO 30 %)
- NOT YET IN REINFORCED CONCRETE



REDUCE - EMBODIED CARBON

REDUCE CEMENT CONTENT:

- BY DESIGN
- BY PERFORMANCE BASED SPECIFICATIONS
- BY PARTLY REPLACING WITH SCMs
- BY USING PORTLAND-LIMESTONE CEMENT

CARBON CAPTURE TECHNOLOGIES

- CARBON CURE
- SOLIDIA (ONLY PRECAST ELEMENTS)
- ...

ENVELOPE

FACADE GLASS

REUSE

THERMAL PERFORMANCES

THINK REUSE:

- AS INTERIOR ELEMENTS
- AS OUTDOOR GLASS

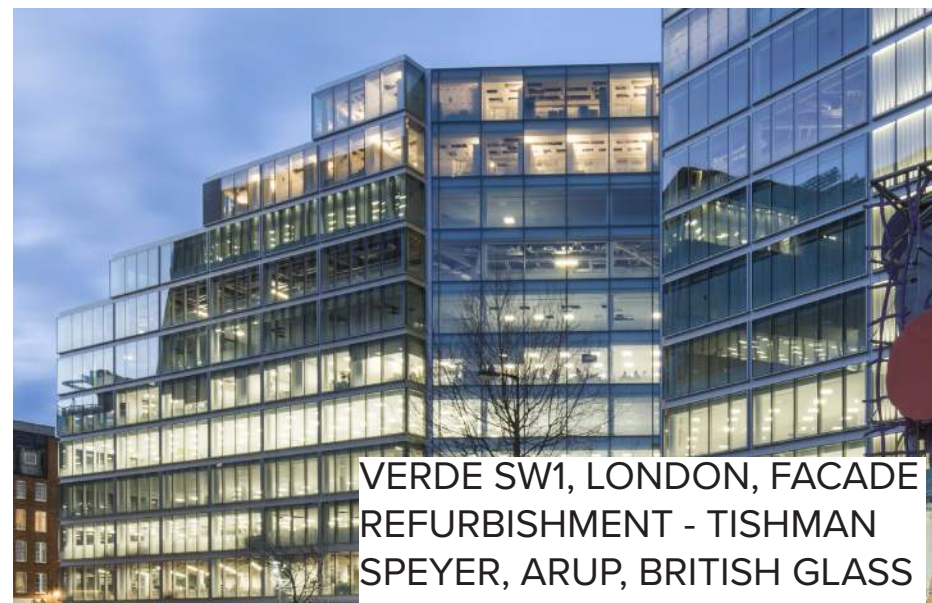


RURAL STUDIO - GLASS CHAPEL, AL, 2000

RECYCLE

RECYCLED CHEAPER THAN
RAW MATERIALS

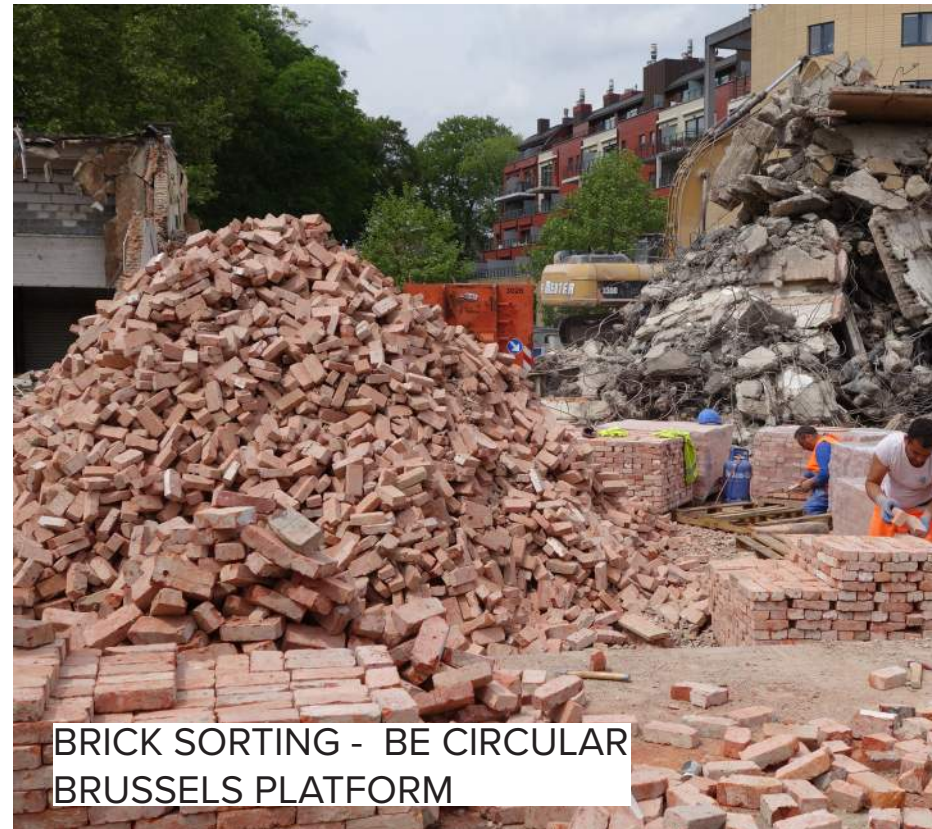
AVOID CONTAMINATION OF
GLASS IN THE RECYCLING
STREAM



VERDE SW1, LONDON, FACADE
REFURBISHMENT - TISHMAN
SPEYER, ARUP, BRITISH GLASS

BRICKS

REUSE

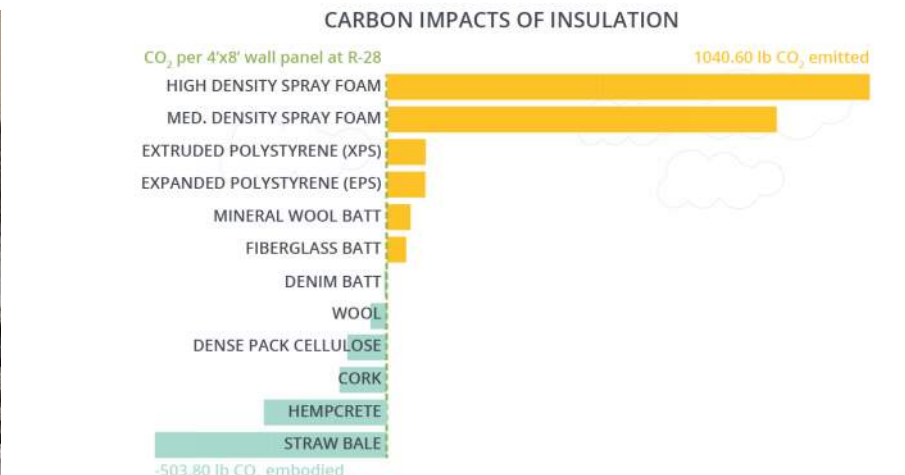


RECYCLE



INSULATION

COMPOST - RENEWABLE

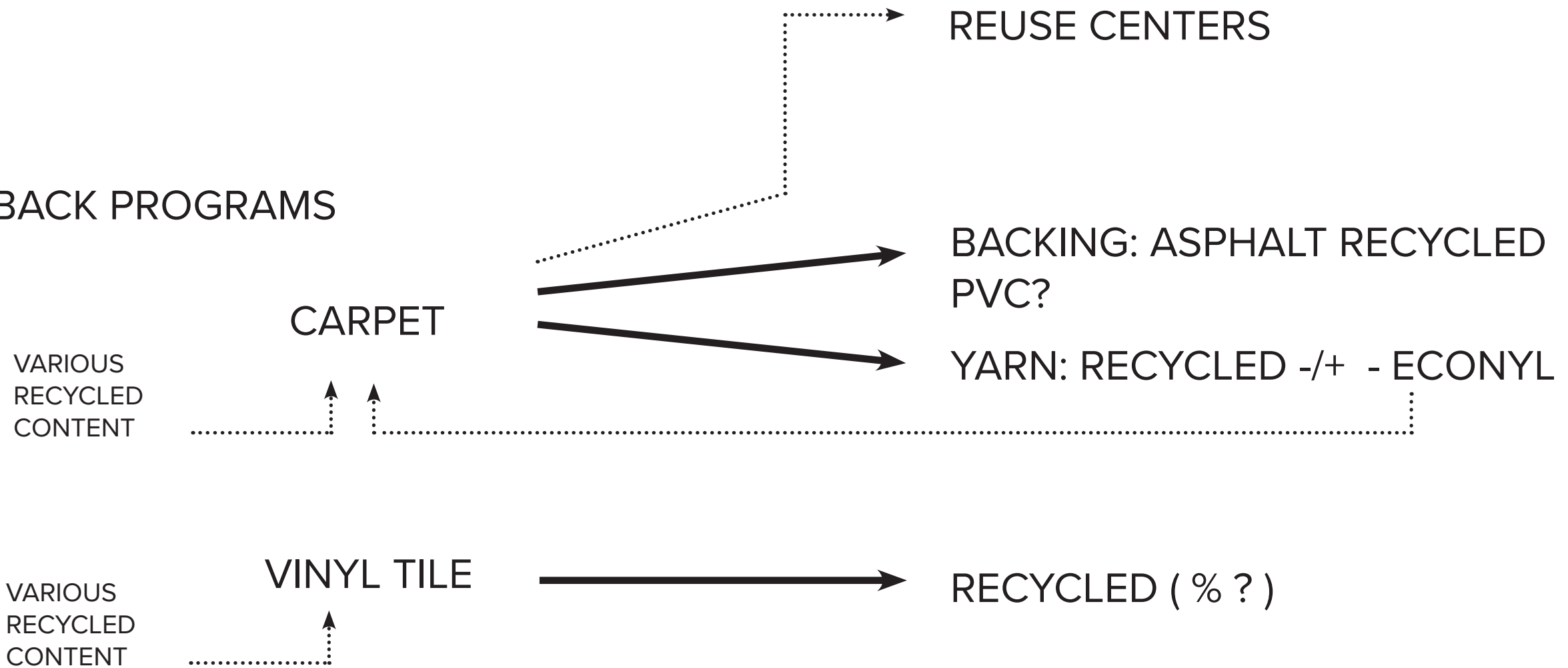


FLOORING

REUSE

RECYCLE

TAKE-BACK PROGRAMS



BENTLEY
Interface[®] **ege**[®]
shaw contract[®]
 Tandus | Centiva
DESSO **MOHAWK**

Armstrong[®]
FLOORING
ROPPE.



PARTITION WALLS

MODULAR WALLS

REFUSE

REPAIR

REMANUFACTURE

RECYCLE

?

DOORS: DOORS
UNHINGED

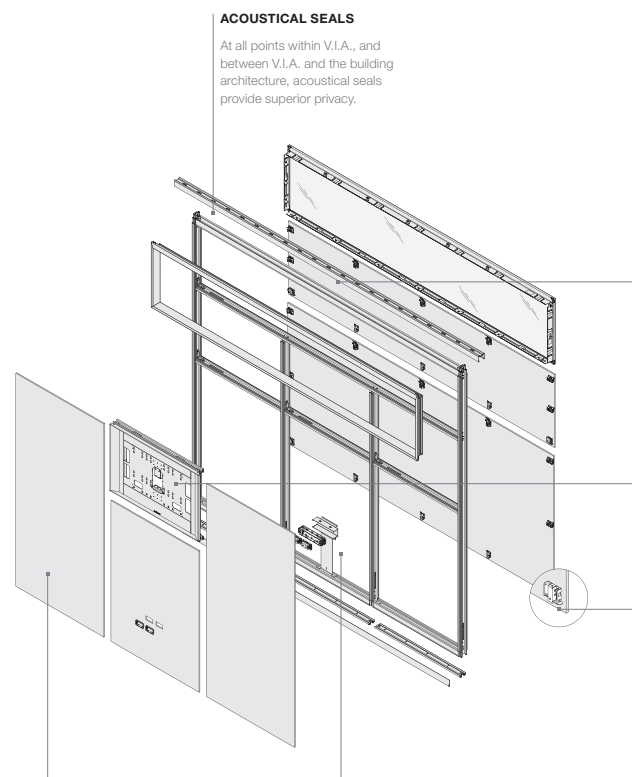
DRYWALL

RECYCLE

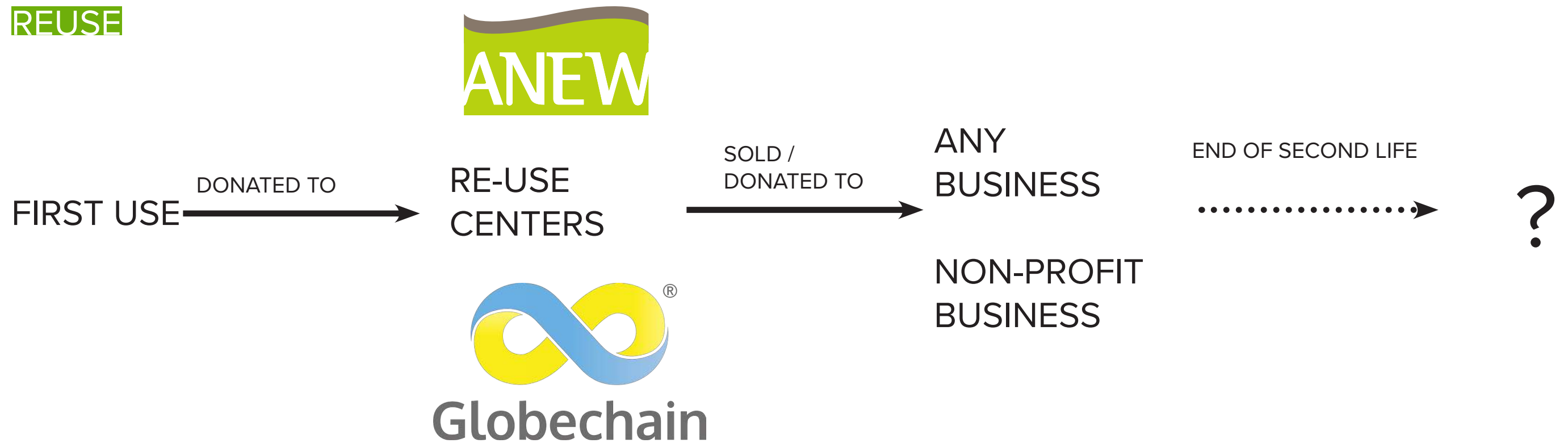
CONTAMINATION (PAPER, PAINT, NAILS, TAPE,
PLASTER...)



LOW RECYCLING RATES



REUSE



REPAIR

REMANUFACTURE

RECYCLE

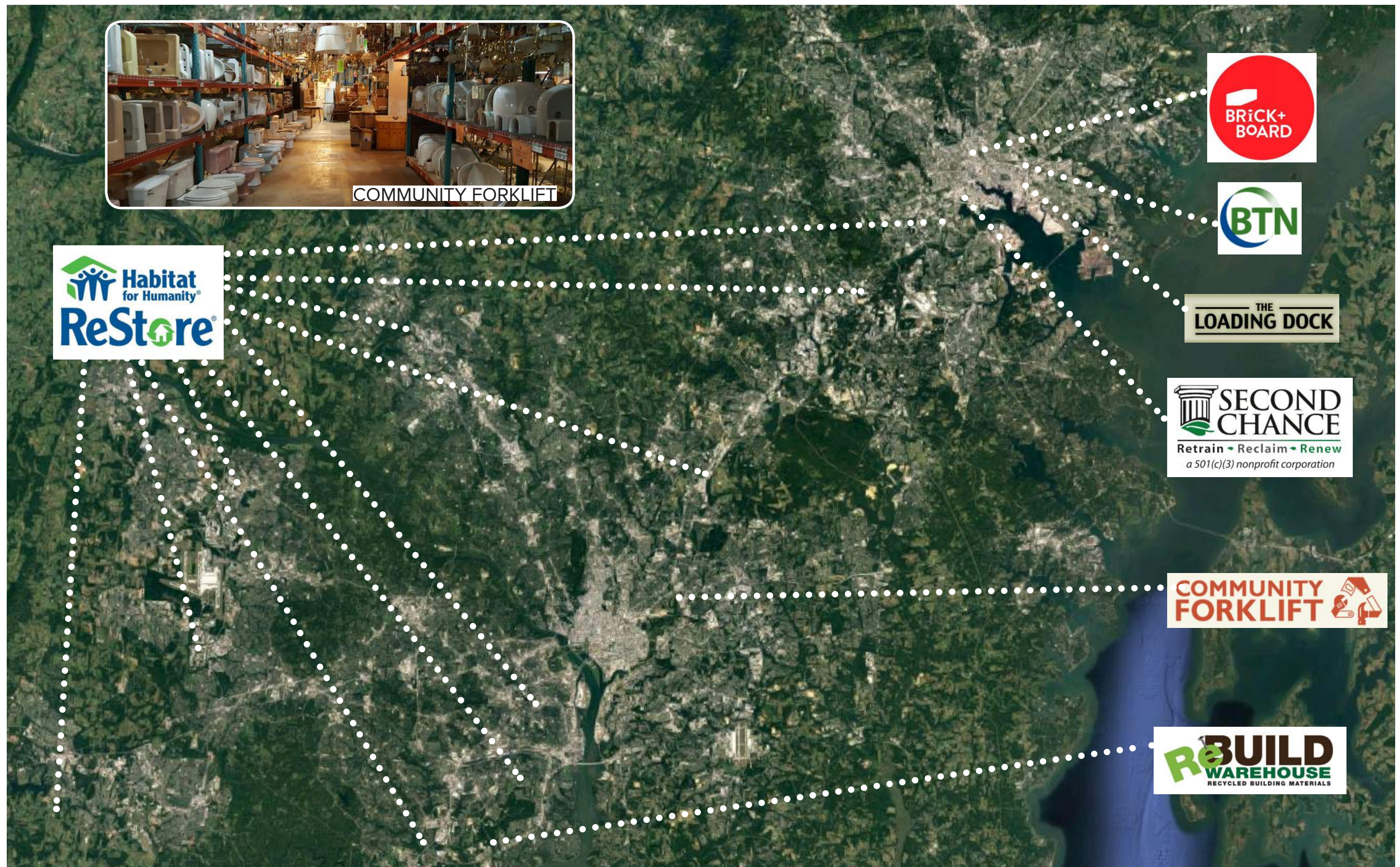
DAVIES
OFFICE

TYPICAL MANUFACTURERS

ON A PRODUCT BY
PRODUCT BASIS:

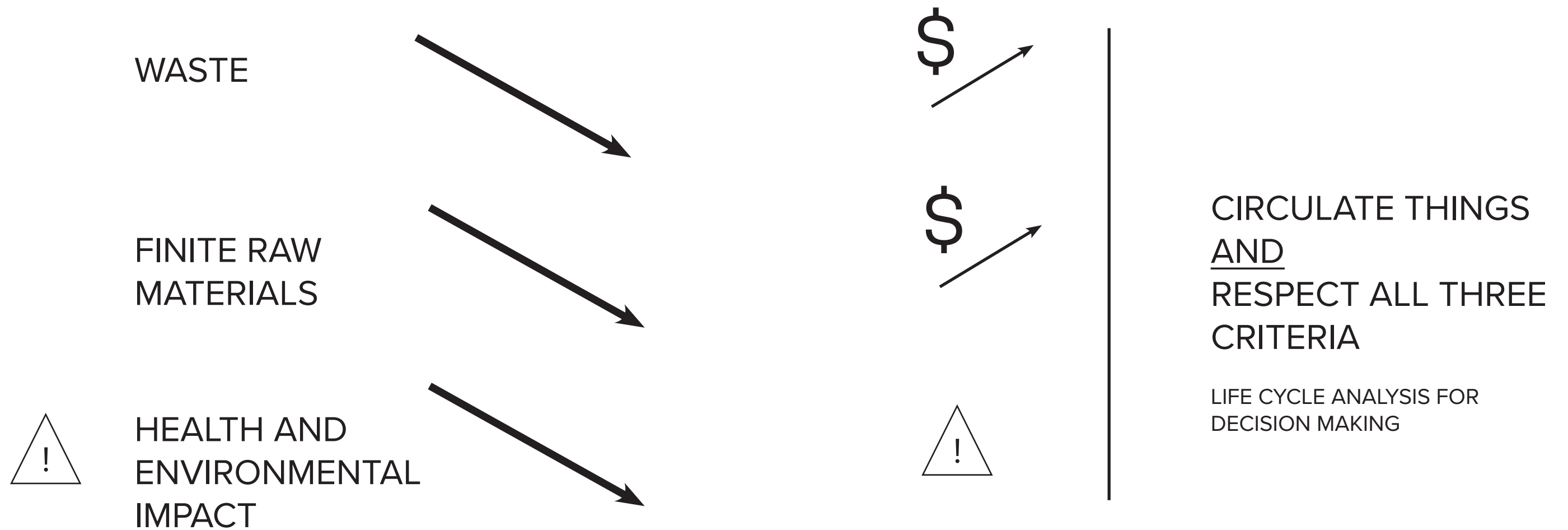
- RECYCLED CONTENT
- PARTLY RECYCLABLE
- REPAIR-
REMANUFACTURE
PROGRAMS
- TAKE-BACK PROGRAMS
- ...

SOURCING (AND GIVING) - SALVAGED MATERIALS



- [PVIPVI.COM/USED-OFFICE-FURNITURE](https://pvipvi.com/used-office-furniture)
- [ETHOSOURCE/WASHINGTON-DC-USED-OFFICE-FURNITURE](https://ethosource.com/washington-dc-used-office-furniture)
- [GERSTELOFFICEFURNITURE.COM](https://gersteofficefurniture.com)
- [MAMMOTHOFFICEFURNITURE.COM/WAREHOUSE-NORTHERN-VIRGINIA](https://mammothofficefurniture.com/warehouse-northern-virginia)
- [FURNITUREFINDERS.COM/OFFICE/STATES/OFFICE-FURNITURE-DISTRICT-OF-COLUMBIA.HTML](https://furniturefinders.com/office/states/office-furniture-district-of-columbia.html)
- [RE-FORM.COM/ABOUT/](https://re-form.com/about/)
- [ANDYSTERNS.COM/FAIRFAX-USED-OFFICE-FURNITURE](https://andysterns.com/fairfax-used-office-furniture)

AVOID THE USUAL PITFALL



CIRCULATING IS NOT ENOUGH: REDUCE IMPACT IN THE FIRST PLACE

EMBODIED CARBON,



UNDERSTANDING, BEING AWARE OF THE
ISSUE, AND MOTIVATED TO ACT

LIGHT CHANGES IN DAILY OPERATIONS

EXPERIMENT CIRCULARITY IN PROJECTS

DEMONSTRATE THE
POSSIBILITY AND BENEFITS
OF CIRCULAR BUILDING

DEVELOP AWARENESS
AND COMMITMENT IN THE
PROFESSION

INNOVATE: IMPLEMENT FULLER CIRCULARITY



POLICIES TO GET THERE FAST ENOUGH

QUESTIONS?

BRICKS?

RENEWABLE BETTER THAN TECHNOLOGICAL CYCLE?

COST PREMIUM ?

THAT'S TOO EXPENSIVE!

STOP BEING LESS BAD?

CASE STUDIES?

EUROPE?

WHAT WOULD YOU LIKE TO KNOW MORE ABOUT?

POSSIBLE POLICIES?

WOOD END OF LIFE?

IS RECYCLING NOT ENOUGH?

WHAT'S NEXT?

REFERENCES

- Ellen McArthur Foundation
- Peter Lacy, Jakob Rutqvist, *Waste to Wealth: The Circular Economy Advantage*, Palgrave Macmillan UK, 2015
- Public Architecture, *Design for Reuse Primer 2.0.*, 2010
- B. Guy, G. Ciarimboli, *Design for Disassembly in the built environment: a guide to closed-loop design and building*, prepared for King County, WA., available online
- Webster, Mark D., Helena Meryman, Adam Slivers, Tonatiuh Rodriguez-Nikl, Lionel Lemay, Kathrina Simonen, Harinee Trivedi, Lindsey Maclise, Dirk Kestner, Kenneth Bland, Won Lee and Emily Lorenz. “*Structure and Carbon – How Materials Affect the Climate.*” SEI Sustainability Committee; Carbon Working Group, November 2012. ASCE.
- Arup, Graeme DeBrincat, Eva Babic, *Re-thinking the life-cycle of architectural glass*

GOOD FOR THE BOTTOM LINE - COMMUNITY OUTREACH

REDUCTION OF NOISE AND DUST FROM CONSTRUCTION SITE

INVITING THE COMMUNITY TO PARTICIPATE IN THE TRANSFORMATION OF THE URBAN FABRIC

- TRAINING LOCAL WORKFORCE IN DECONSTRUCTION
- CATALYZING THE CREATION OF A REUSE CENTER
- INVOLVING THE COMMUNITY IN REUSE STRATEGIES



RURAL STUDIO - GLASS CHAPEL, AL, 2000

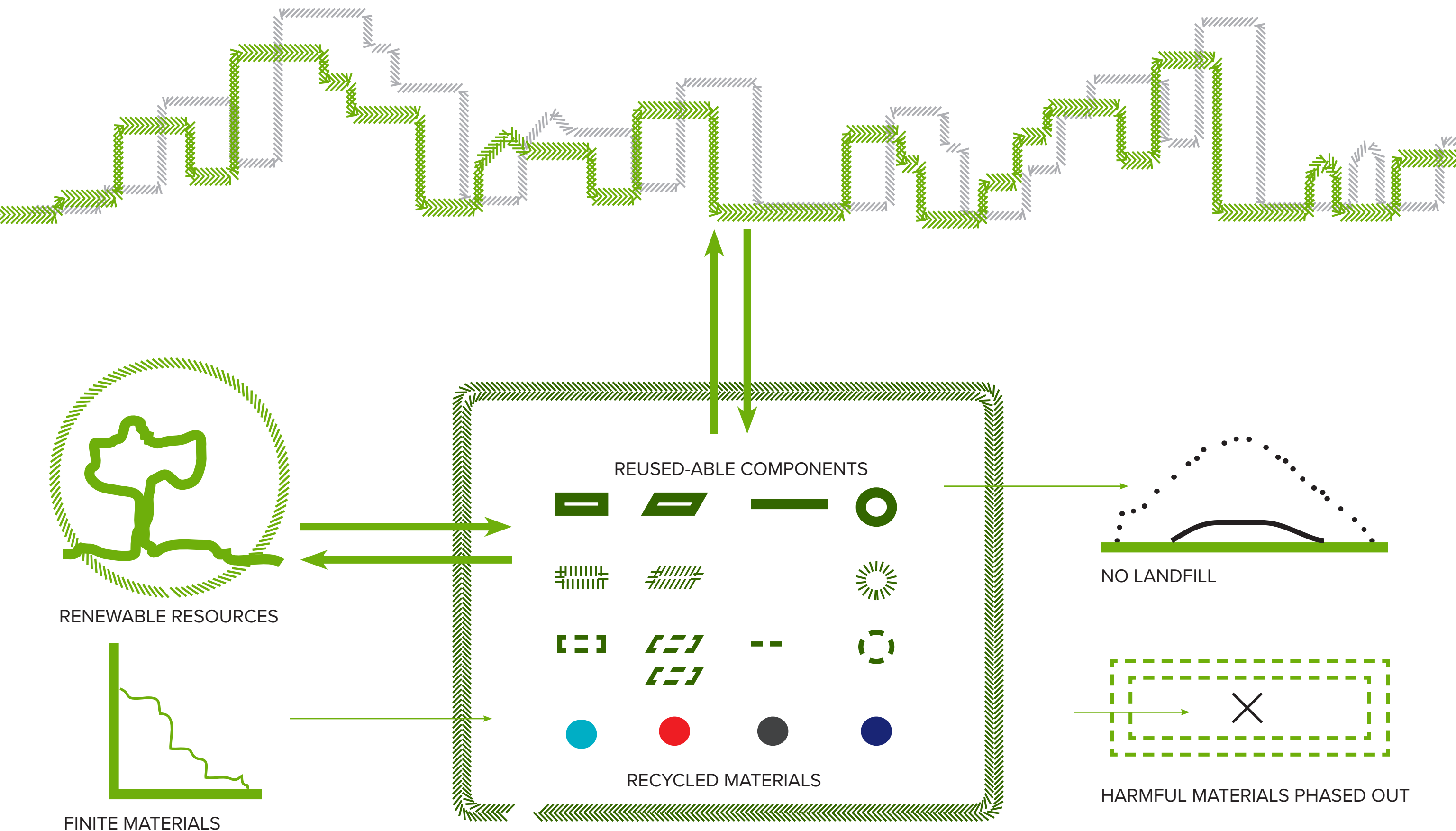


THEASTER GATES - DORCHESTER PROJECT, CHICAGO



THEASTER GATES - SANCTUM, BRISTOL 2015

THE CIRCULAR CITIES OF TOMORROW



BUILD IT CIRCULAR

CONSIDER REUSING EXISTING
PROJECT SCHEDULE: FACTOR IN TIME
IDENTIFY CIRCULAR GOALS

SPECIFICATIONS: BE PRECISE AND FLEXIBLE
ABOUT DECONSTRUCTION, REUSE, TAKE BACK
PROGRAMS, RECYCLING

DESIGN

TEAM ON BOARD
CIRCULAR CHAMPION

CHOOSE 'CIRCULAR'
MATERIALS
DESIGN FOR FLEXIBILITY
DESIGN FOR
DISASSEMBLY

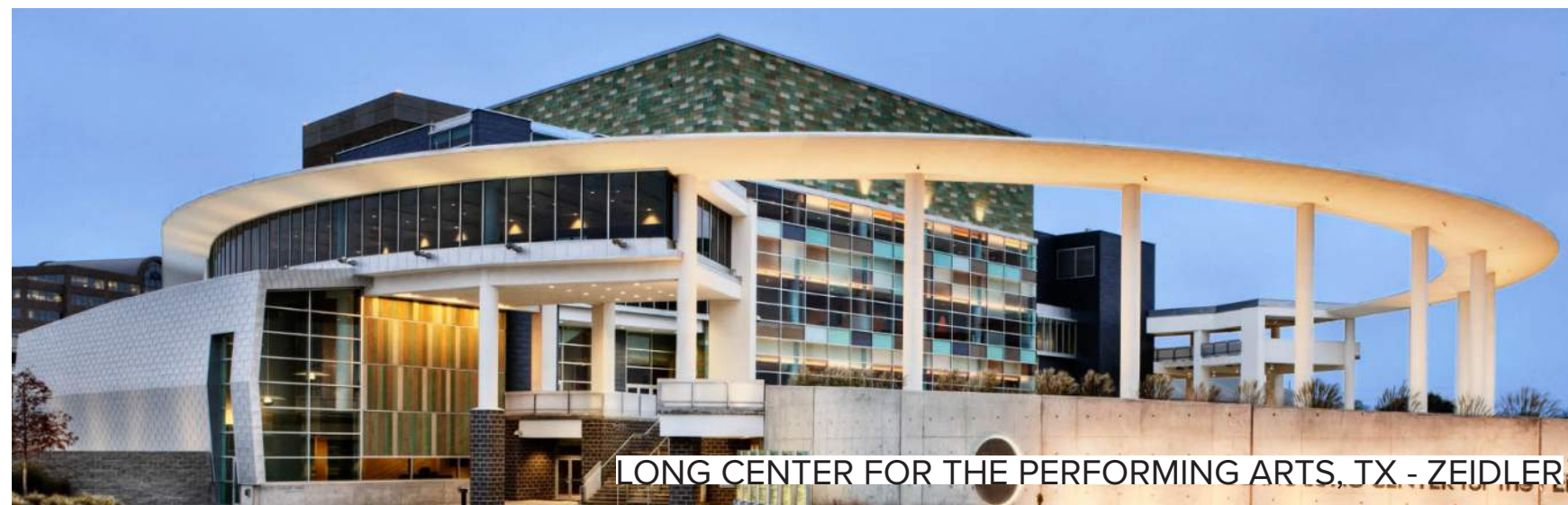
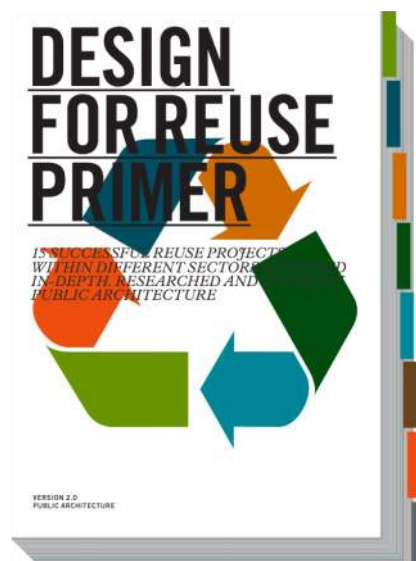
CONSTRUCTION

COMMUNICATE AND
MONITOR

CONTRACT STRATEGY:
FIXED TENDER / MULTIPLE
PRIME CONTRACTS

USE

SHARE THE
STORY
SHOW IT
OFF

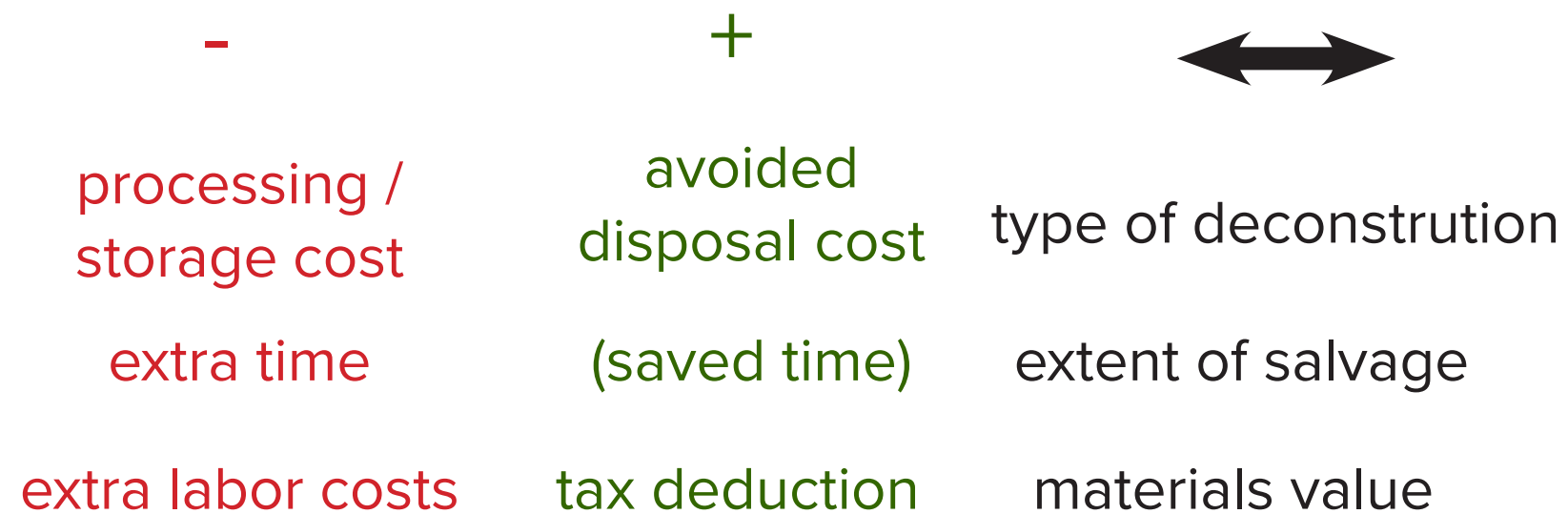


LONG CENTER FOR THE PERFORMING ARTS, TX - ZEIDLER



AGU, DC - HICKOK COLE

GOOD FOR THE BOTTOM LINE - DECONSTRUCTION



RESIDENTIAL

DONATION

Tax deduction for a
Non Cash Charitable
Contribution to non-
profit Reuse Centers
1,200 sf deconstructed
house:
130 k\$ fair market value
51 k\$ tax benefits

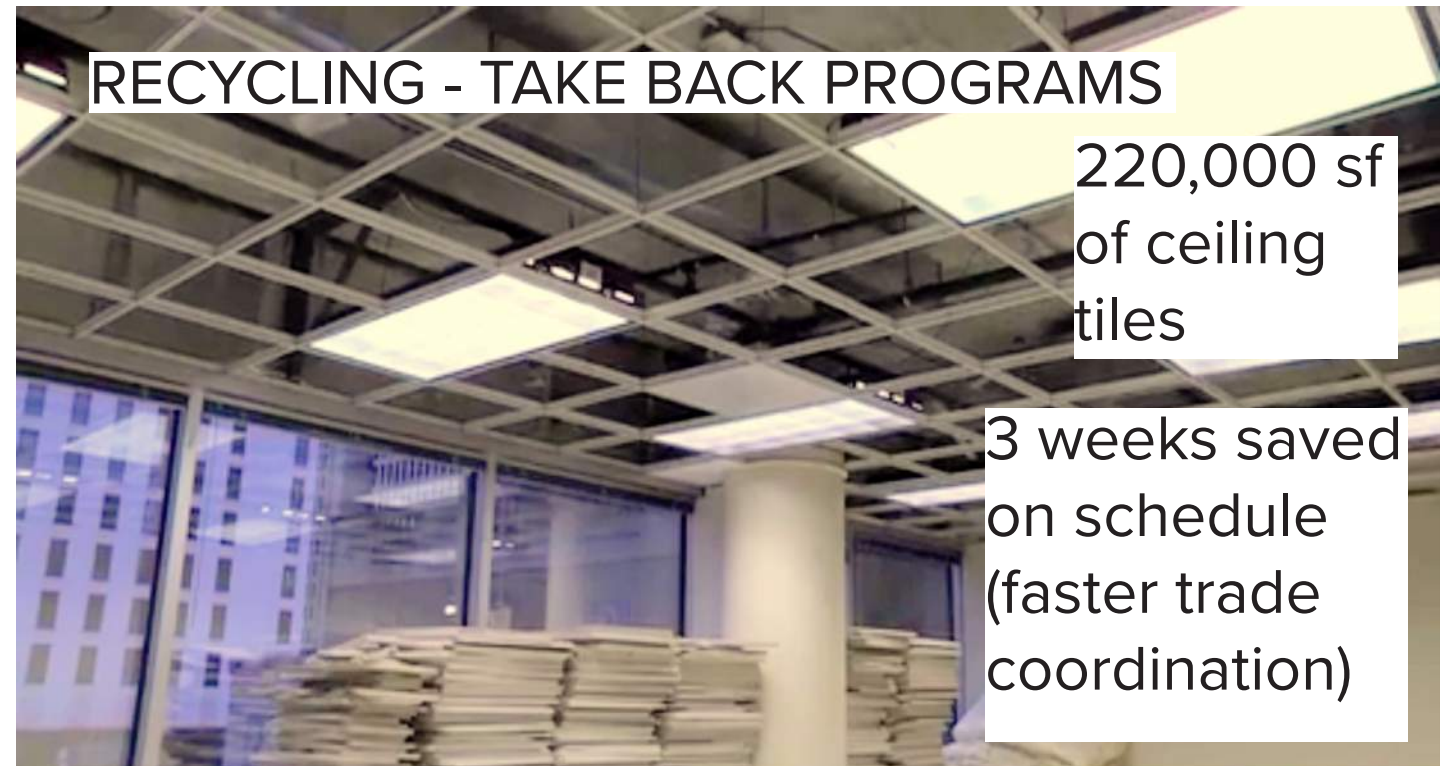


COMMERCIAL INTERIORS REFURBISHMENT

RECYCLING - TAKE BACK PROGRAMS

220,000 sf
of ceiling
tiles

3 weeks saved
on schedule
(faster trade
coordination)



'DECONSTRUCTION CAN BE A TAX-SAVY ALTERNATIVE TO DEMOLITION',
WASHINGTON POST - 8/25/2016, HUMANIM, DOUG KAPUSTIN PH.

101 EAST ERIE STREET, CHICAGO - OFFICE INTO HOTEL CONVERSION
PROJECT, 2016 - CBRE, CLAYCO, ARMSTRONG CEILING