LOW ENERGY MATERIALS FOR INTERIORS

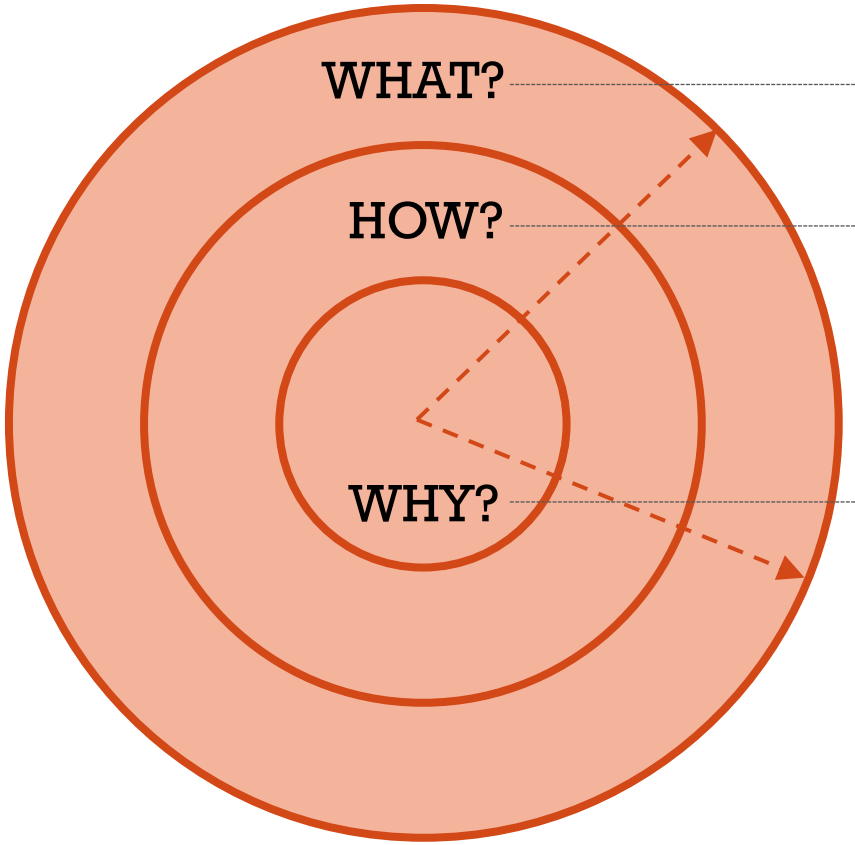
EVENT The 8th Regional GRIHA Summit

THEME Choosing sustainable, building sustainable

Nidhi Gupta

AurovilleConsulting

CONTENT



5 action-ables

Tools / Standards

Are green materials really green?
Performance Matrix
Existing Standards, Labelling and Tools.

Why Interior Materials & why "GREEN" interior materials?

Environmental & Human Impact.
Embodied Energy

Adapted from Simon Sinek

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WHY ?
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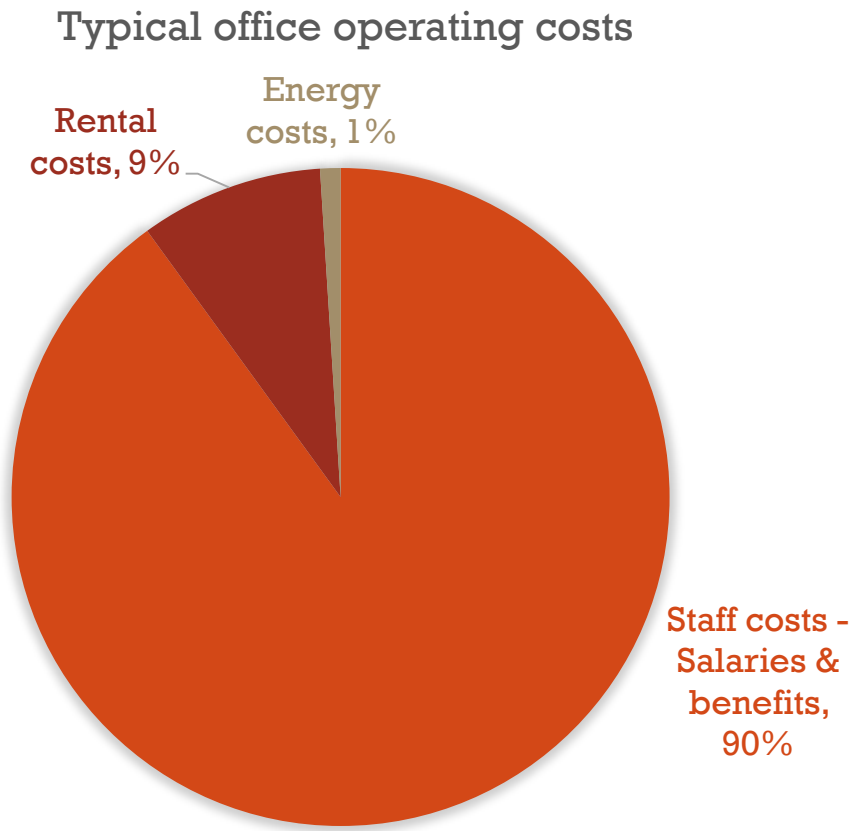
WHY INTERIOR MATERIALS ?

- We spend 90% of our time indoors. Interior spaces have an effect on our health & wellbeing.
- 90% of the operating costs over a lifetime of a building are related to human resources.
- Interior woks are carried out in approx. every 7-10 years. Sometimes even in shorter periods of time, resulting in high recurring embodied energy.



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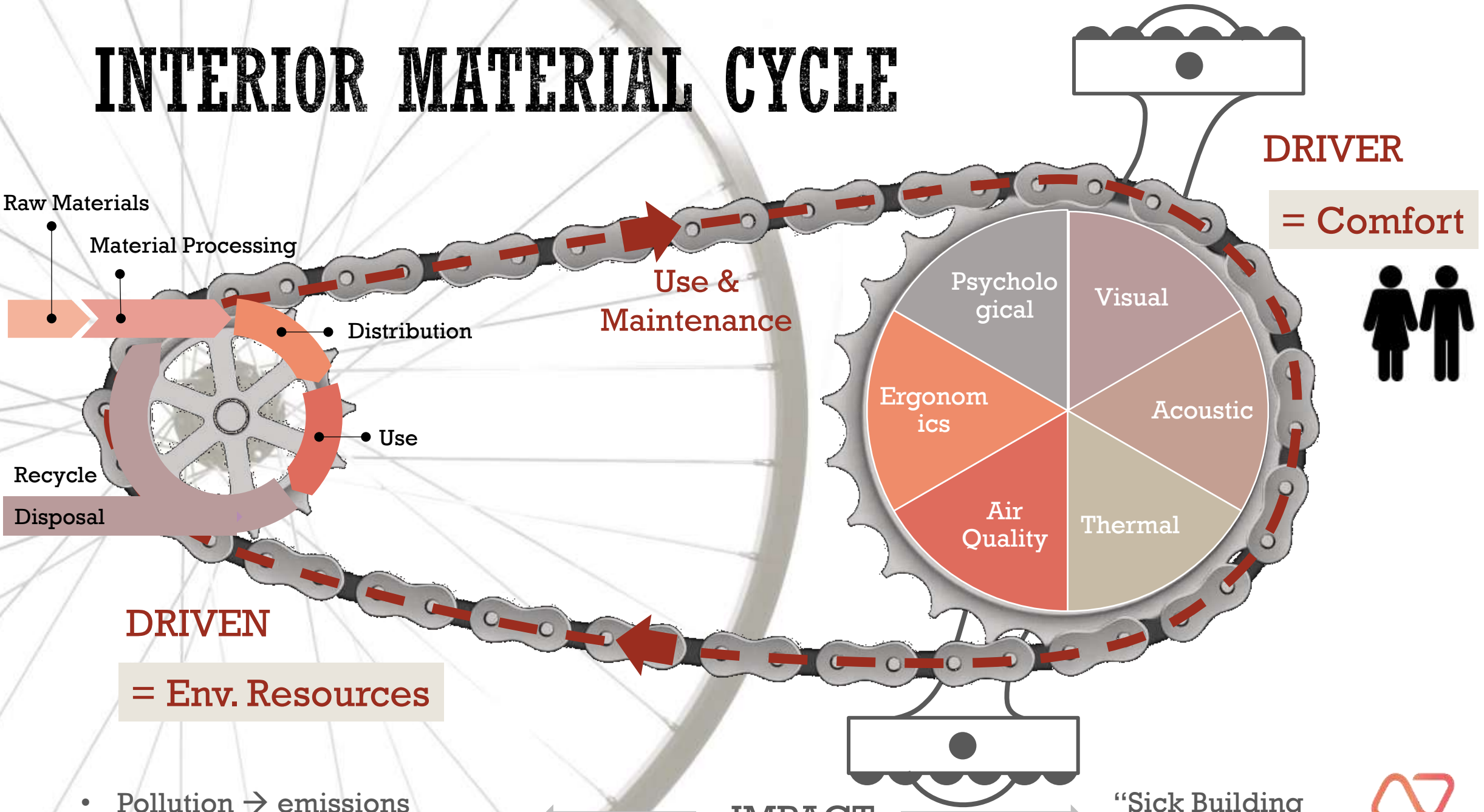
INTERIOR MATERIAL CYCLE



- Pollution → emissions
- Depletion of natural resources

IMPACT

"Sick Building Syndrome"

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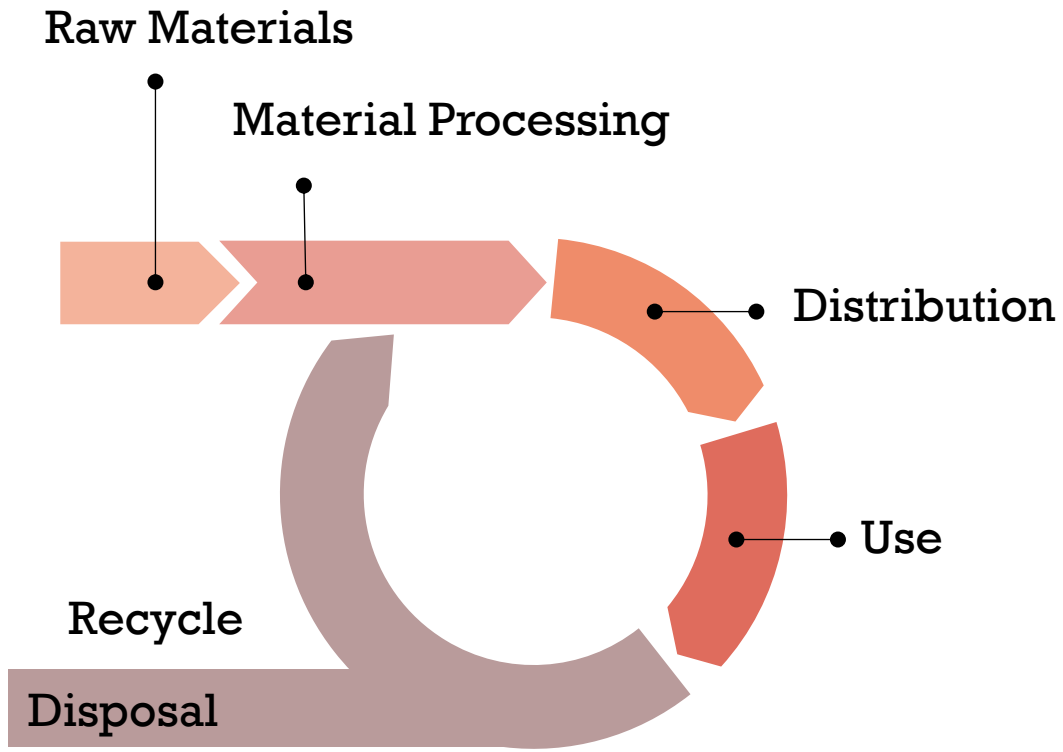
WHAT IS EMBODIED ENERGY ?

Energy is embodied in everything we use and depend on. Often Embodied Energy is ignored because it is not "visible" or as easy to track as operational energy.

Embodied energy = the sum of energy inputs to make a product.



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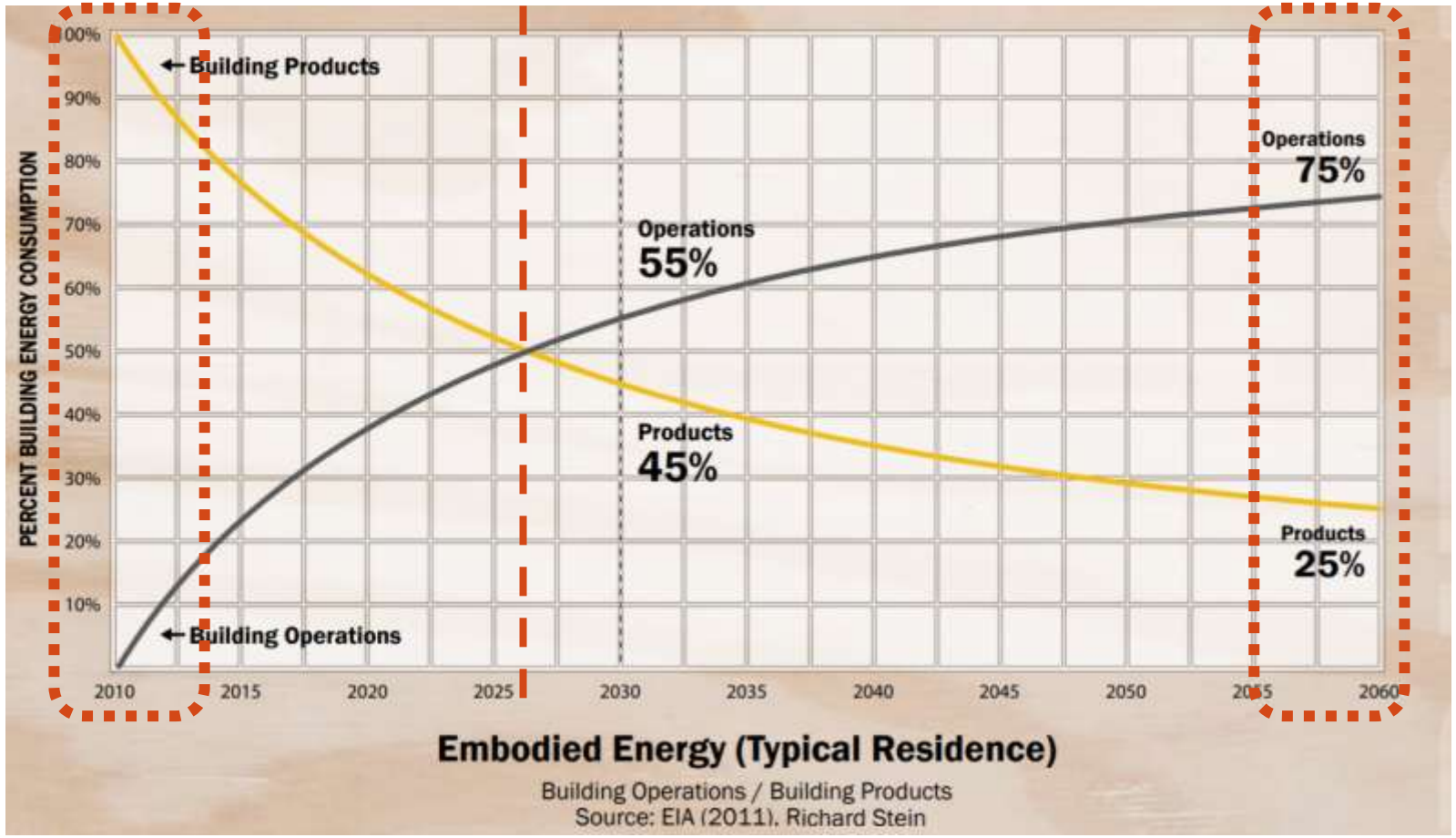
WHY EMBODIED ENERGY ?



At beginning of building life, embodied energy = 100% of building's energy

At end of life-cycle (yr 50), operational energy = 75% and embodied energy =25%

Embodied Energy = Operational Energy around year 15-20.

Source : 2030, Inc. / Architecture 2030.

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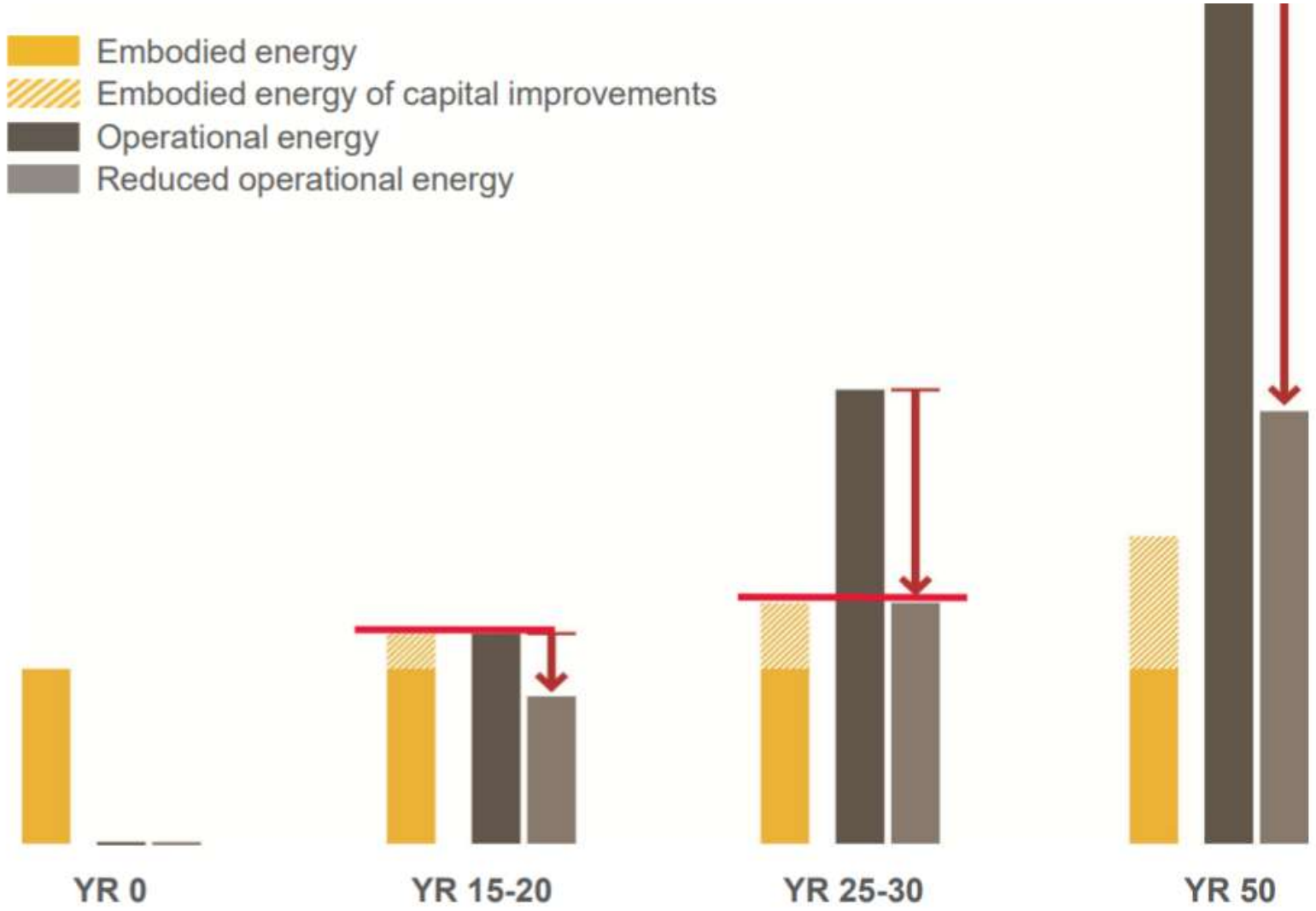
WHY EMBODIED ENERGY

As operational energy reduces, the impact of embodied energy increases.



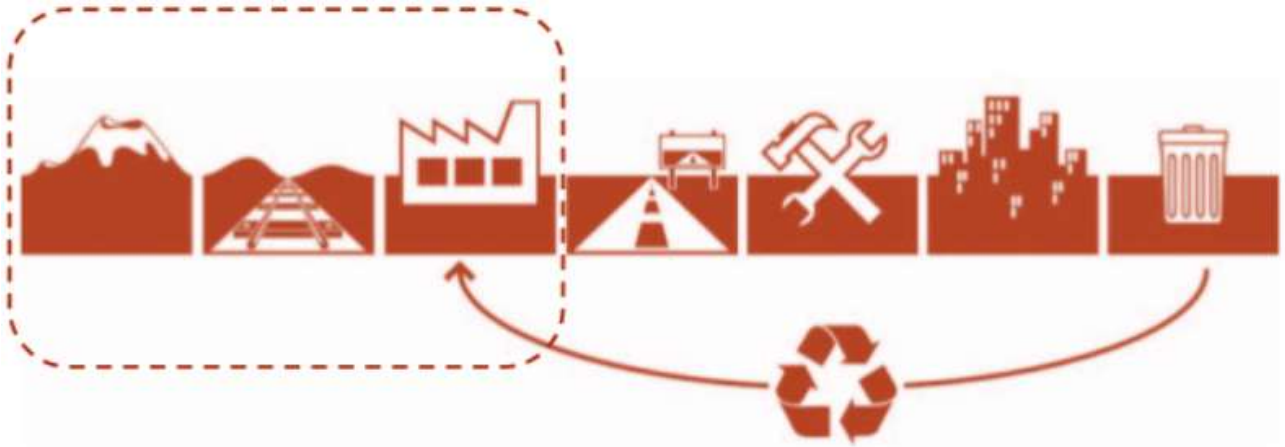
Source : Cannon Design, Presentation on Material Life

LCA FOR EE: CRADLE TO GATE ~~(TO GRAVE)~~

Embodied energy = the sum of energy inputs to make a product.

For the full cradle to grave cycle, energy inputs from:

- Extraction of raw materials
- Transportation to factory
- Manufacture of product/ components
- Assembly of product / system
- Transportation to site / point of sale
- Installation / construction
- Maintenance
- Replacement
- Disposal / re-purposing / recycling



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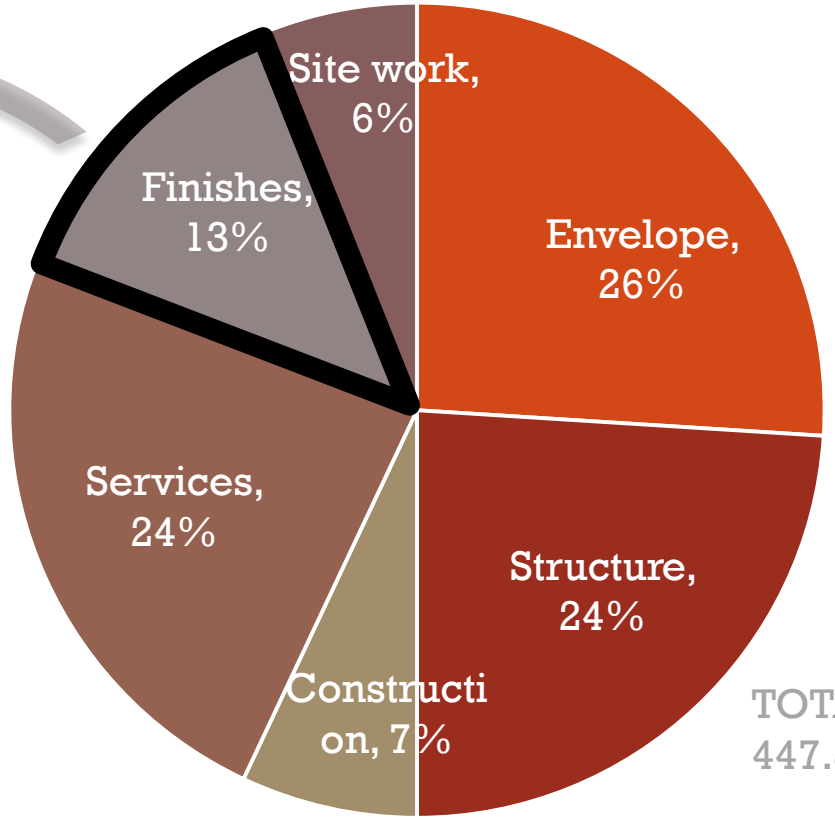
EMBODIED ENERGY

INTERIOR APPLICATIONS

?

APPROX.
60-80 MJ/ft²

Breakdown of initial embodied energy for typical office building



TOTAL
447.8 MJ/ft²

Source: Cole and Kernan, 1996

False ceiling

Workstations
Seating
Storage

WALL CEILING FLOOR FURNITURE

Partitions
Paints
Wallpaper
Acoustic Panels

False flooring
Carpeting
Stone / Tiles

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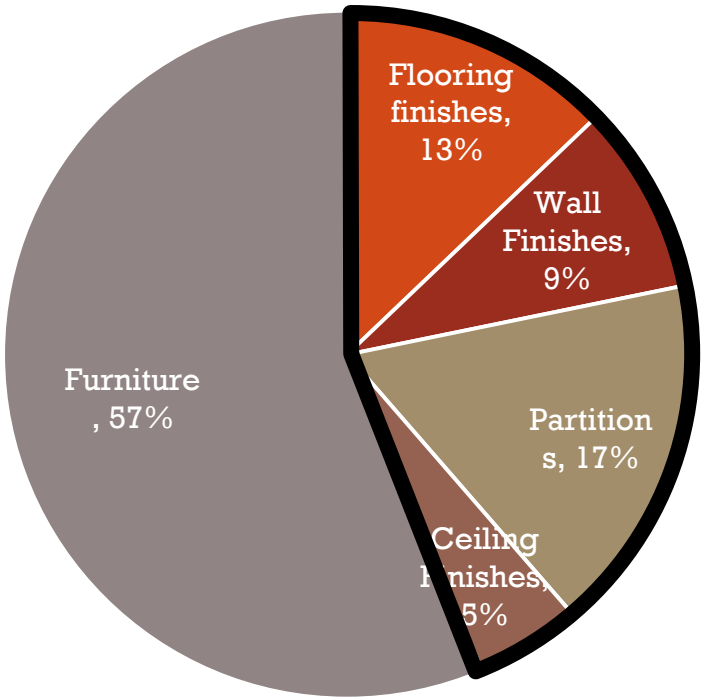
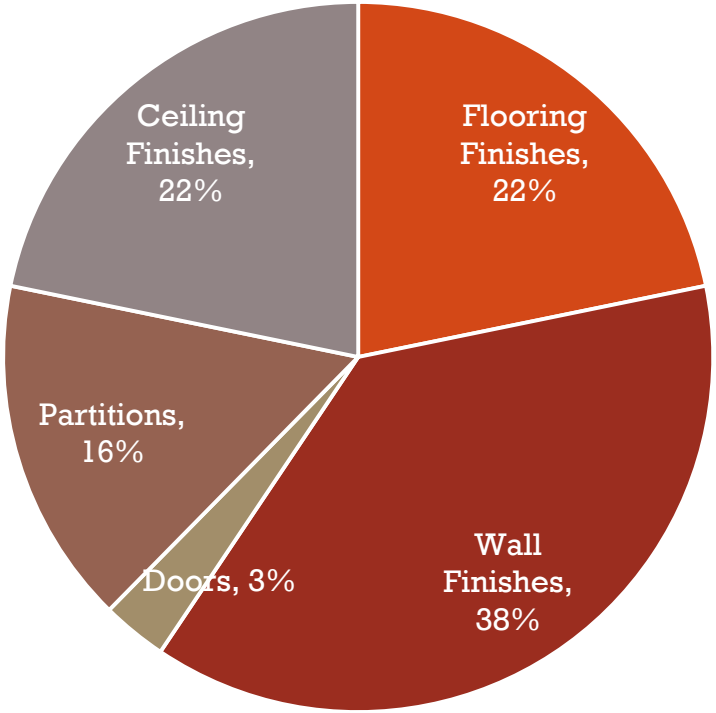
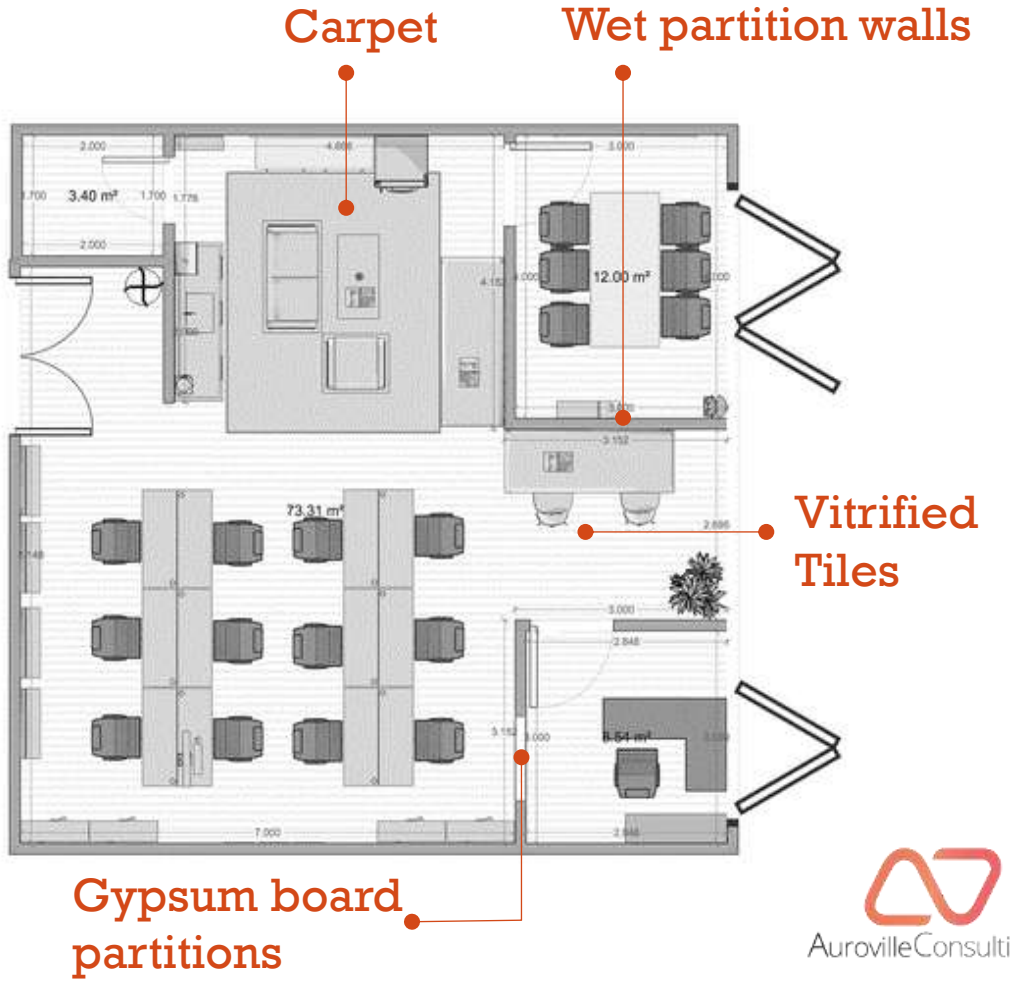
EMBODIED ENERGY (1000 FT^2 OFFICE)

Initial Cost Breakup



Surface Areas of Material Applications





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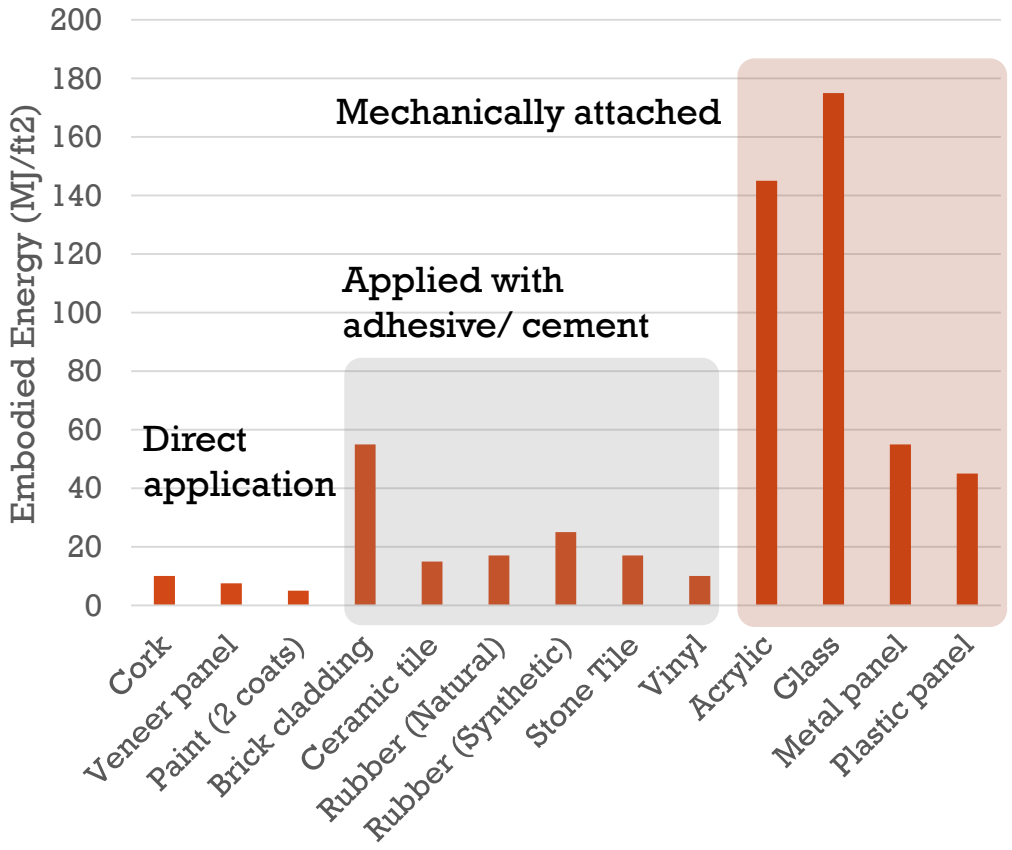
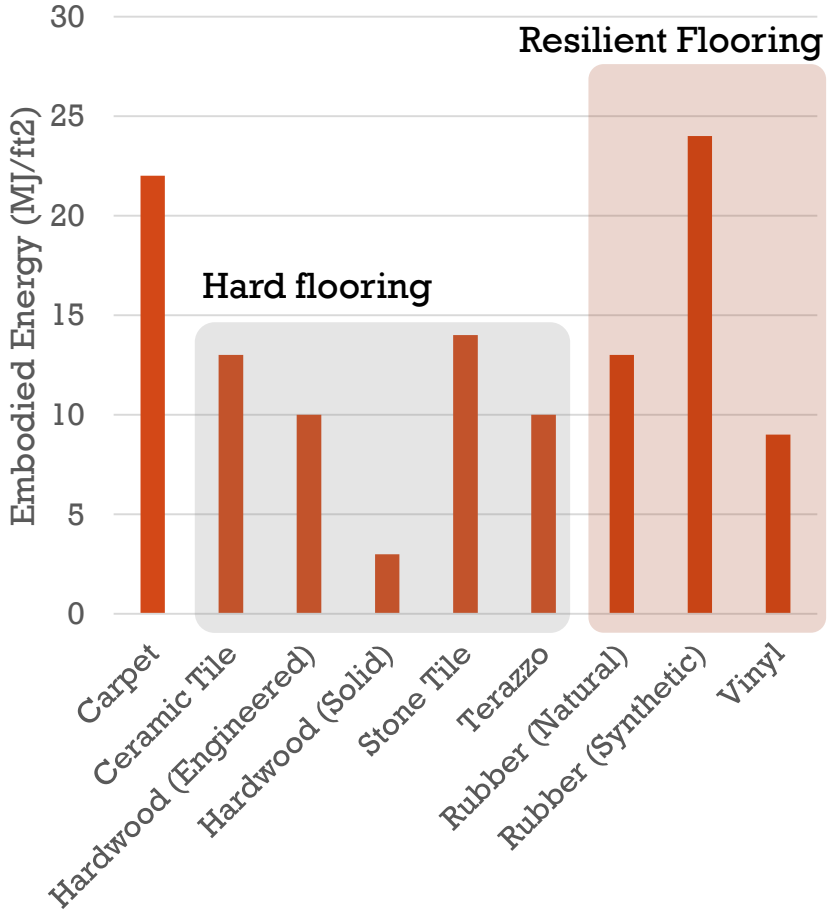
MATERIAL EVALUATION (SAMPLE)

Wall Finishes



Flooring



Source : Cannon Design, Presentation on Material Life

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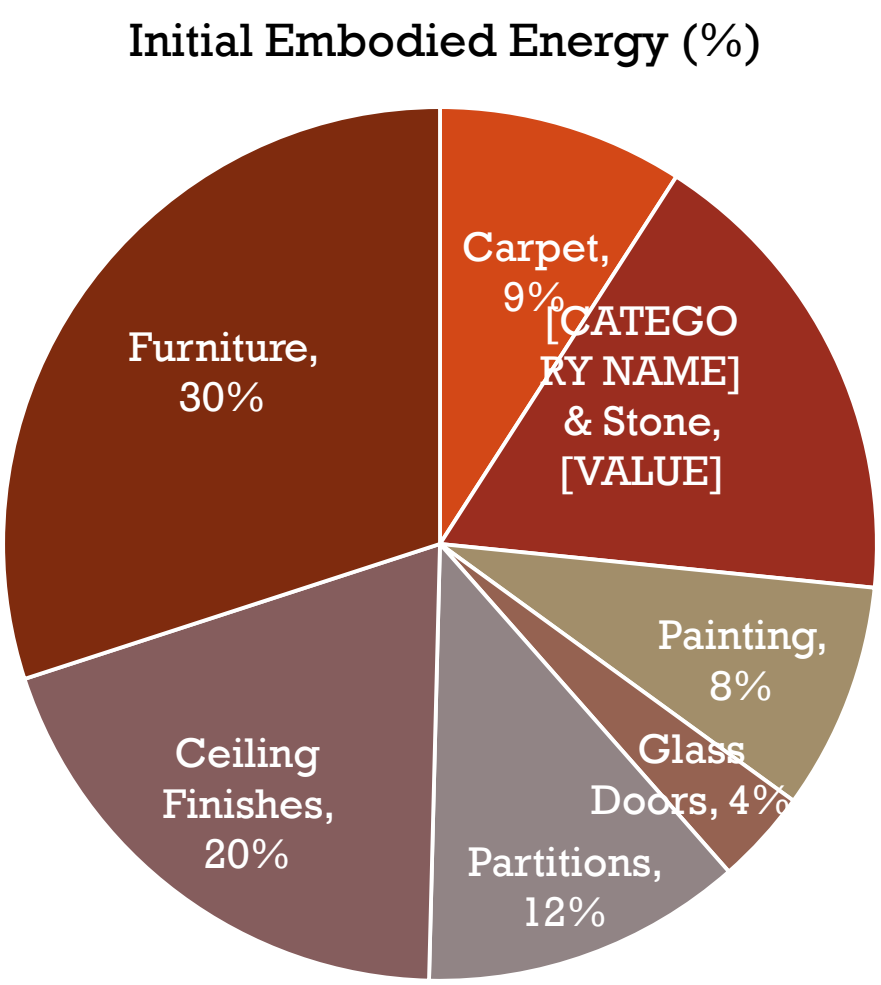
EMBODIED ENERGY (1000 FT^2 OFFICE)



- The Embodied energy in items like furniture & natural stone is more due to the transportation energy.
- Paints have lesser embodied energy than carpets, but comparatively much more surface area.
- Reducing False ceiling can bring the Embodied energy down by at-least 10-15%.
- Life expectancy & durability of the material plays an important role in overall embodied energy.
  - Paint = 5-7 years
  - Carpets = 10 years OR stone/ tile = 20 years
  - Gypsum boards/ ceiling = 8 years
  - Glass = 10 years

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ARE "GREEN MATERIALS" REALLY "GREEN"?

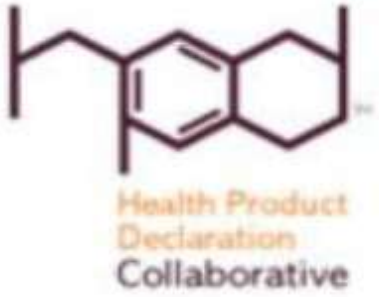
ISSUES :

- Plethora of options.
- Reliability of self declarations.
- "Greenwash" → What determines green?

COMMON TERMINOLOGIES:

- Recycled versus recyclable
- Biodegradable
- Low VOC
- Rapidly Renewable
- Sustainable Forestry
- Free of Urea Formaldehyde

SINGLE ATTRIBUTE CERTIFICATIONS



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GRIHA CRITERIA 21

Use of low-environmental impact materials in building interiors.

- At least **25%** of all materials meets the criterion **– 1 point**
- At least **50%** of all materials meets the criterion **– 2 points**
- At least **75%** of all materials meets the criterion **– 4 points**

} Surface area

Following materials will be accepted as low-environmental impact:

- Stones from India
- Composite wood based products
- FSC Chain of Custody certified products
- Manufactured products with at least 5% recycled content
- Products with EPD (cradle to gate) analyzed and published as per ISO 14025 / ISO 21930
- Products with water footprint (cradle to gate) analyzed and published as per ISO 14046

false ceilings/internal partitions/panelling/in-built furniture/flooring/internal door & window panels & frames

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GRIHA CRITERIA 13

Use of low-VOC paints and other compounds in building interiors.

- Ensure that all interior paints are low-VOC and lead-free **– 1 point**
- Ensure that all adhesives and sealants used shall be low-VOC & that interior composite wood products do not use urea-formaldehyde as a bonding resin **– 1 point**

Paint applications	VOC limits (grams of VOC per litre)	
Interior coatings	Flat	<50
	Non-flat	<150
Exterior coatings	Flat	<200
	Non-flat	<100
Anti corrosive	Gloss/ semi gloss/ flat	<250

Architectural adhesive application	VOC content limit (g of VOC/litre)
Wood Flooring	100
Industrial/rubber flooring	60
Ceramic tile	65
Structural glazing	100
Multi-purpose construction	70
Sub-floor	50
Wall boards/panel	50
PVC welding	285
Adhesive primer for plastic	250
Structural wood member	140
Sub-specific use metal to metal	30
Wood	30
Fibre glass	80
Plastic foams/porous materials (except wood)	50

Sealant Application	VOC Content limit (grams of VOC per litre)
Architectural/roadways	250
Single-ply roof material installation/repair	450
Others	420
Sealant Primer applications architectural non-porous	250
Sealant Primer applications architectural porous	775
Other sealant primer applications architectural	750

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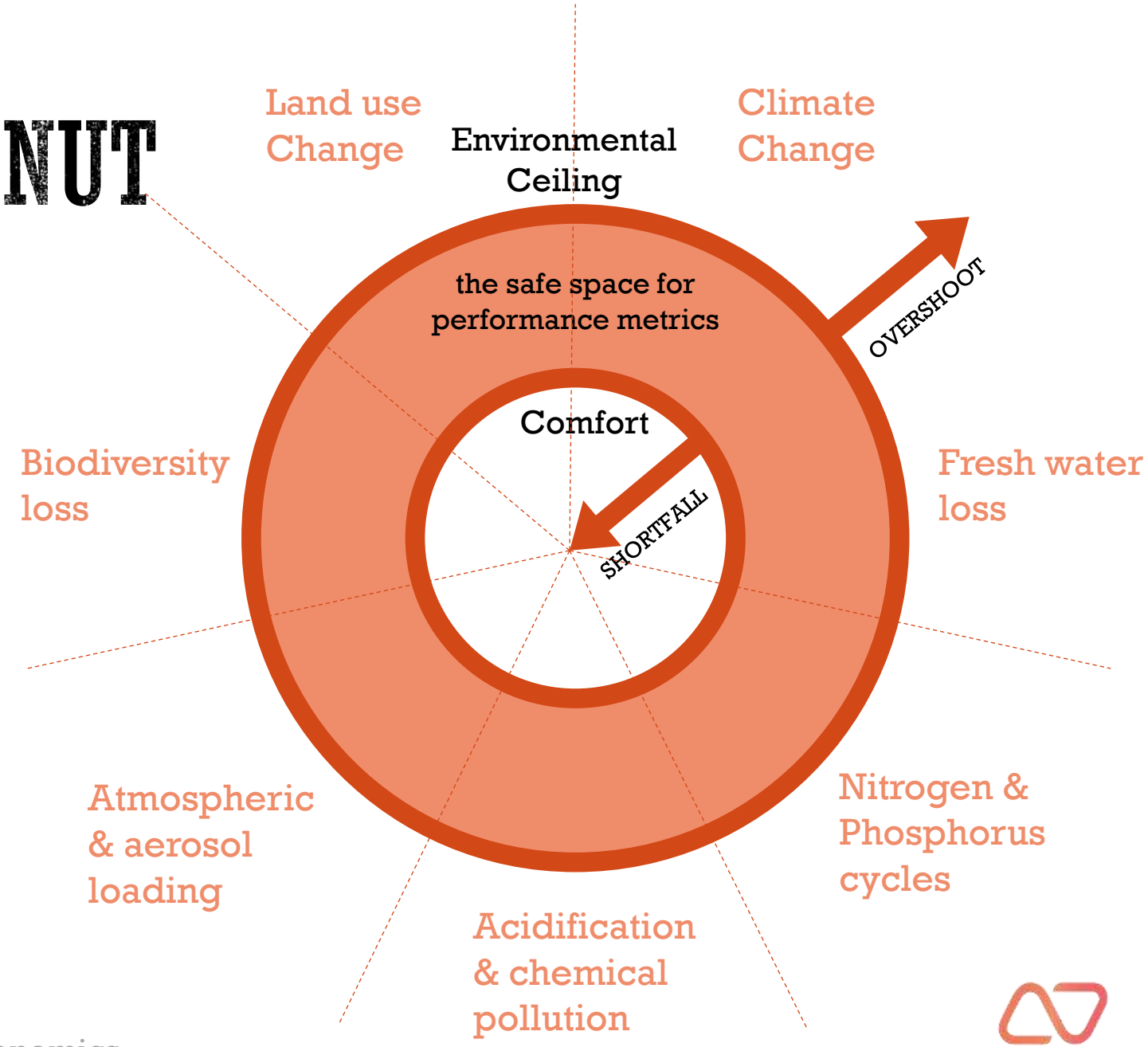
MATERIAL DOUGHNUT

Safe space between the overshoot limit / ceiling of the environmental impacts and the shortfall in human comfort.



Adapted from Kate Raworth's Doughnut Economics

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EXAMPLE : PAINTS

Surface Area application in an interior project = 40-45%

Embodied Energy:

- Solvent based paint 98.1 MJ/kg
- Water based paint 88.5 MJ/kg

OR

VOC content:

- Solvent-based coatings contain between 30 and 70% VOC's by weight
- Most water-based coatings contain approximately 6% VOC.

Source : Dulux Paints, R. Reddy Embodied Energy Coefficients

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WHAT ?
TOP 5 POINTS FOR "GREEN INTERIORS"
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1.

USE ONLY FURNITURE THAT IS SOURCED REGIONALLY & WITH HIGH RECYCLED CONTENT.

"The details are not the details. They make the design."
– Charles Eames

2.

USE LOCAL, NATURAL & RESILIENT FLOORING. USE CARPETS SPARINGLY. (REGIONALLY SOURCED, WITH HIGH RECYCLED CONTENT)

"There is no better designer than nature."
– Alexander McQueen

3.

AVOID FALSE CEILINGS

“Less is More.”
– Ludwig Mies van der Rohe

4.

USE WATER BASED PAINTS

“Be water, my friend.”
– Bruce Lee

5.

ELIMINATE WASTE (PACKAGING)

“Instead of thinking out the box, get rid of the box.”
– Deepak Chopra

THANK YOU

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