

BUILDING IN TIMBER WITHIN NATURE'S LIMITS

Funded by

BUILT BY NATURE

CHANGE BUILDING

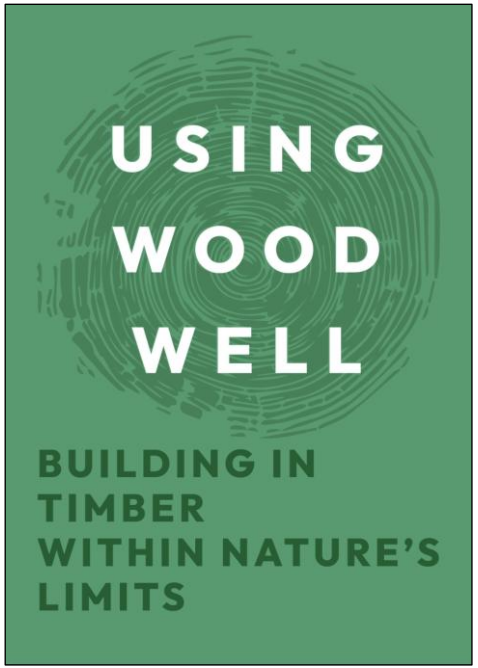
University of Stuttgart

ICD Institute for Computational Design and Construction

WAUGH THISTLETON ARCHITECTS

RESEARCH OUTPUT

PROJECT REPORT



STA – STRUCTRAL TIMBER CONFERENCE – NEC OCTOBER 2026

PLANETARY BOUNDARIES

HOW DO WE DESIGN TO THEM ON PROJECTS?

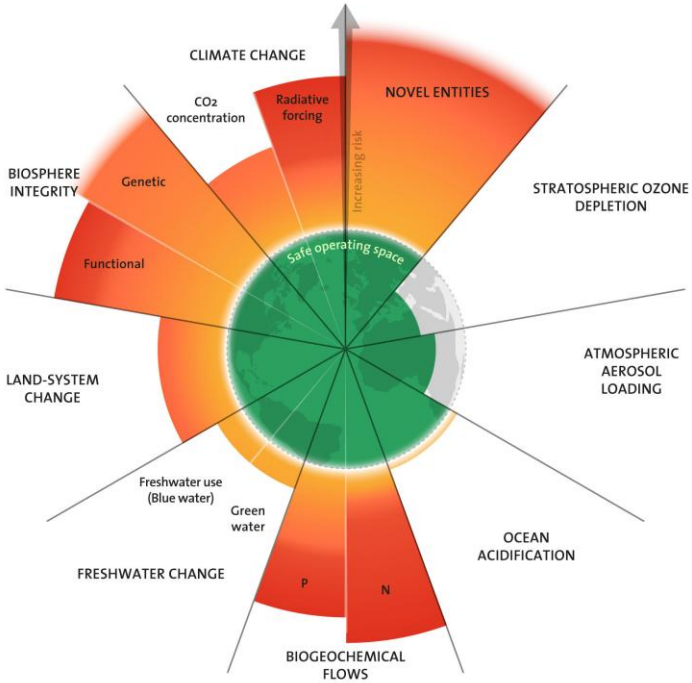


IMAGE: JOHAN LUNDEBERG, STOCKHOLM UNIVERSITY

P I K

Planetary Health Check 2026

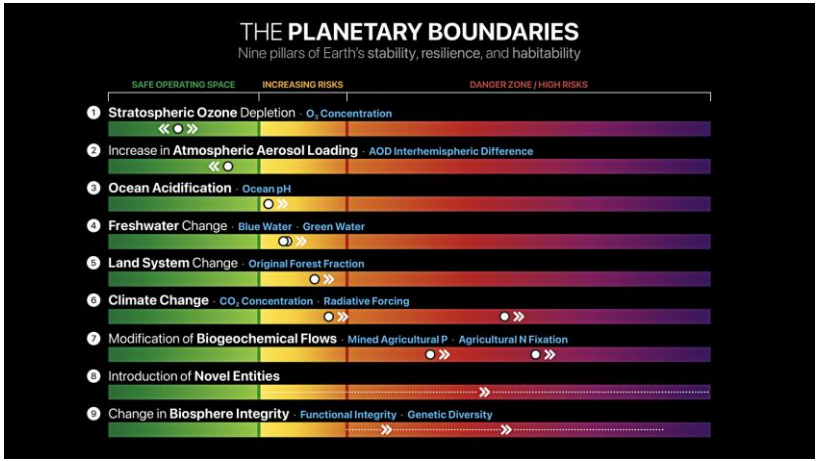
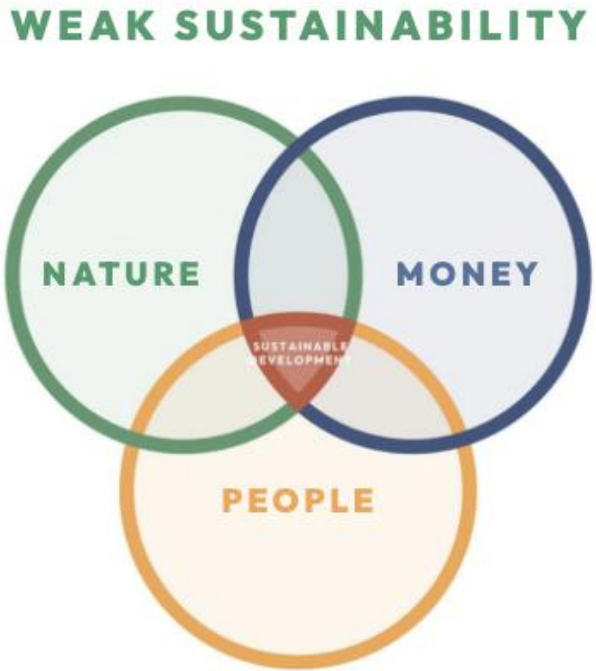


IMAGE: IMAGE PBSCIENCE PIK-POTSDAM

USING WOOD WELL

WEAK VS STRONG SUSTAINABILITY

METRIC BASED ON THE BELIEF THERE ARE LIMITS

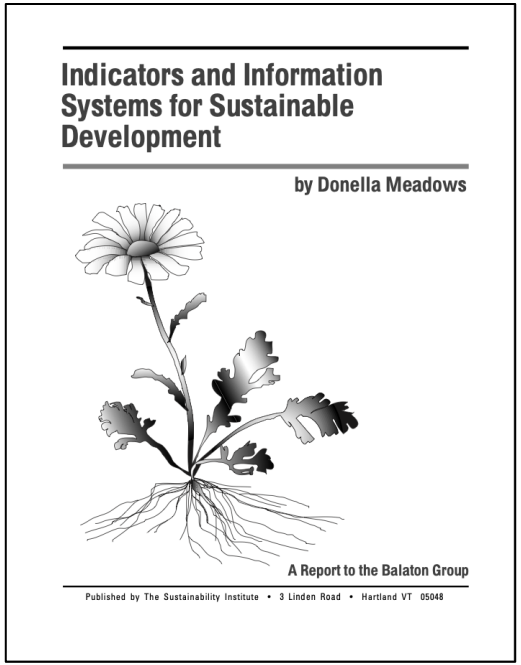




WHY METRICS MATTER

QUANTIFYING NEW VALUE AND INFORMING DECISION MAKING

Indicators arise from values (we measure what we care about), and they create values (we care about what we measure).



THREE SIMPLE METRICS

EFFICIENCY, CONSISTENCY & SUFFICIENCY

WUI

m^3/m^2



OF BUILDING, FLOOR & FRAME

BIO

%



OF BUILDING, FLOOR & FRAME

URR

ratio years



FOR MATERIALS OR BUILDINGS

USING WOOD WELL

ALIGNMENT TO DECARBONISATION

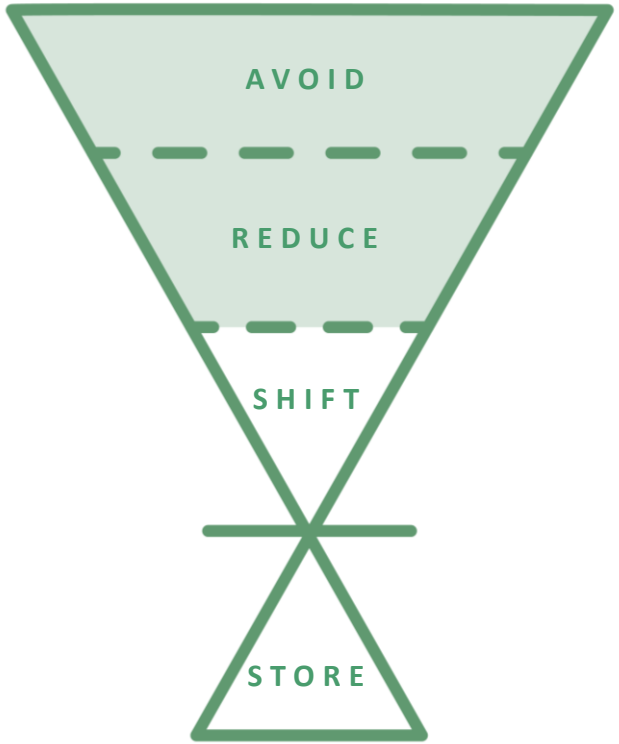
RESOURCE EFFICIENCY AND CARBON STORAGE

SUFFICIENCY
(URR)

EFFICIENCY (WUI)

CONSISTENCY
(BIO)

BIOGENIC STORAGE
(URR / BIO)

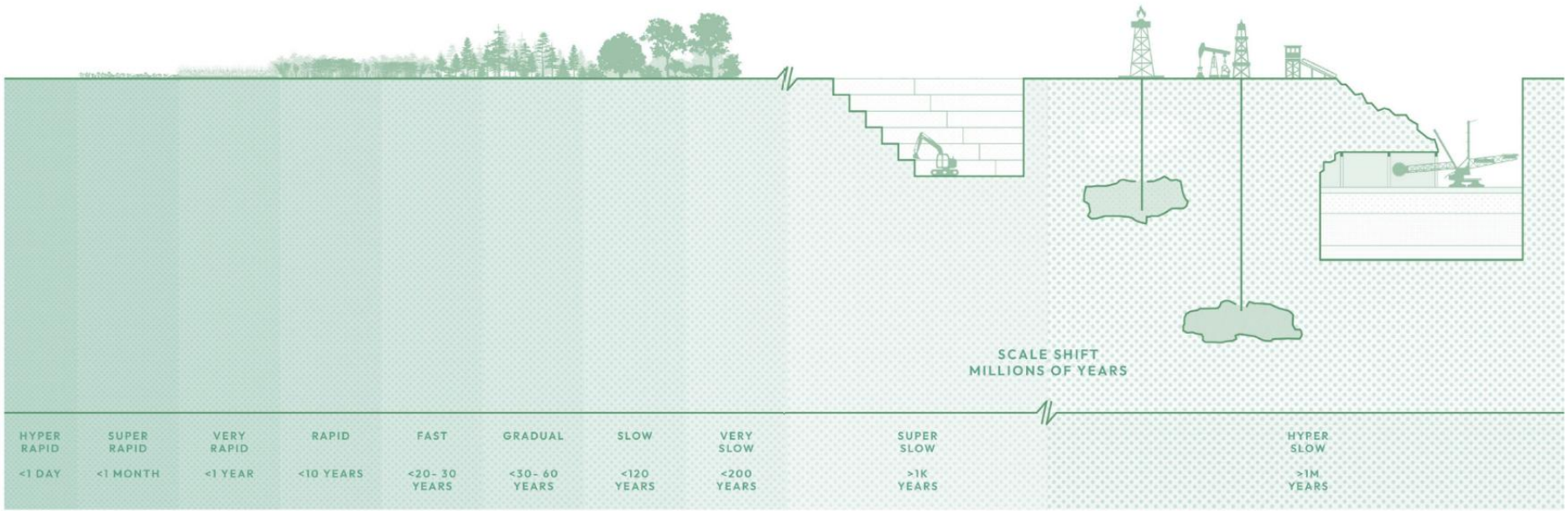


USING WOOD WELL

A PERIODISATION OF RENEWABILITY

DIFFERENTIATING BETWEEN HUMAN AND PLANETARY TIMESCALES

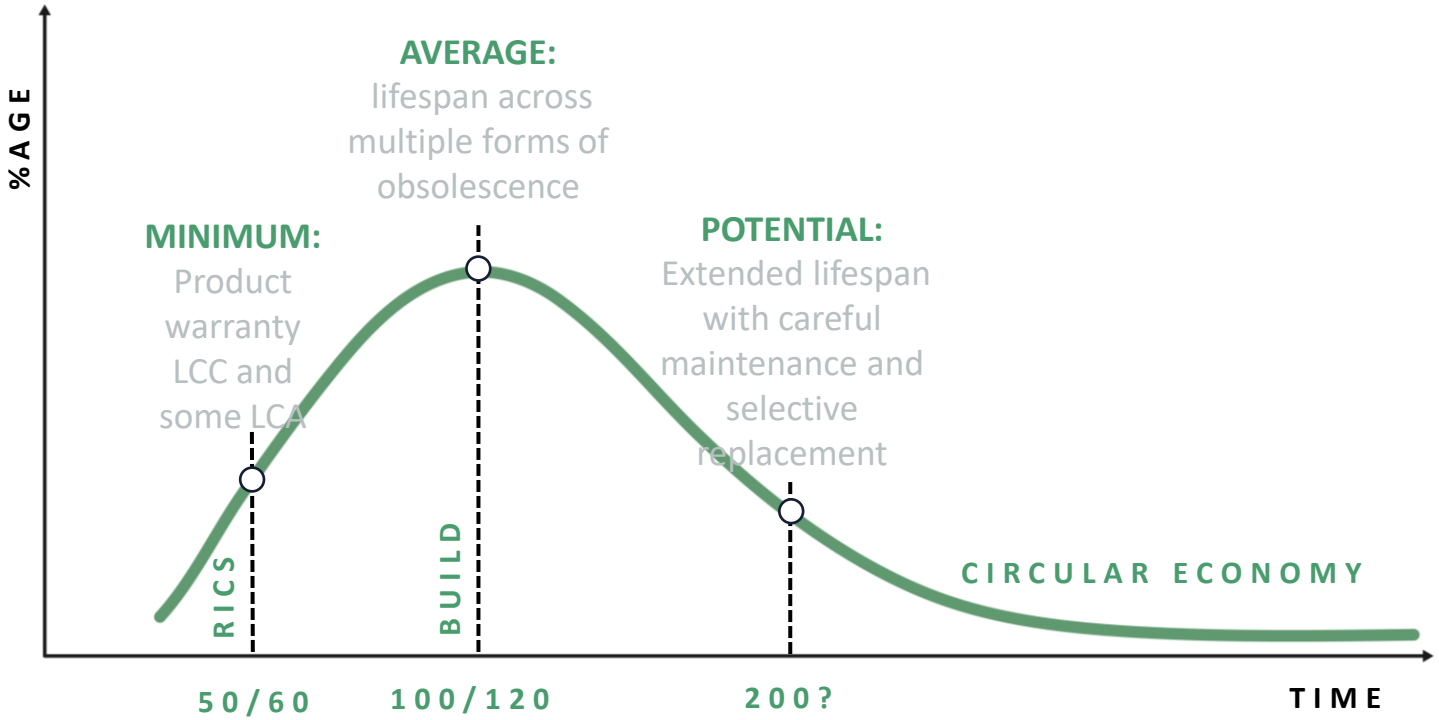
FUNGHI	CROPS	COPPICE	SOFTWOOD	HARDWOOD	ROCK & SEDIMENT	OIL & GAS	ORE & MINERAL ROCK
WEEKS	1 YEAR	3 - 15 YEARS	20 - 80 YEARS	50 - 150 YEARS	10 - 100Ma	60 - 300Ma	1.8 - 3.0Ga



HYPER RAPID	SUPER RAPID	VERY RAPID	RAPID	FAST	GRADUAL	SLOW	VERY SLOW	SUPER SLOW	HYPER SLOW
<1 DAY	<1 MONTH	<1 YEAR	<10 YEARS	<20- 30 YEARS	<30- 60 YEARS	<120 YEARS	<200 YEARS	>1K YEARS	>1M YEARS

HOW LONG DOES A BUILDING LAST?

ESTIMATION BASIS



TIMBER BUILDING TYPES

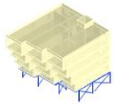
WHAT SCOPE OF ELEMENTS SHOULD BE INCLUDED?


Immanuelkirchstraße Remise

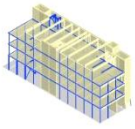

Hotel Katharinenhof

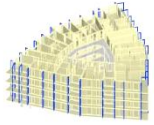

bouweel demontabel


2104 social housing


Workstack

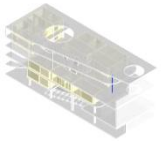

Hyogo

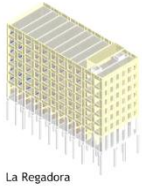

Fast Epp Home Office

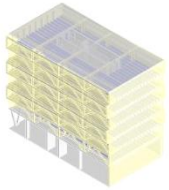

Aigner Rollet


Holzstudent Sieben

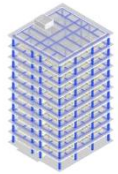

Social Housing Ibiza

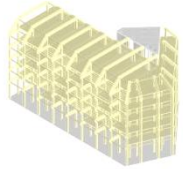

Kiubo

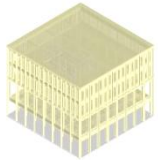

La Regadora

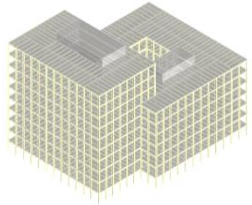

Patch 22

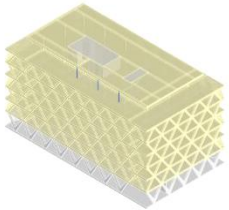

PortPlus

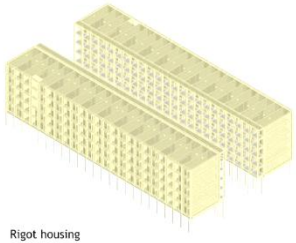

Parkwood Takamori

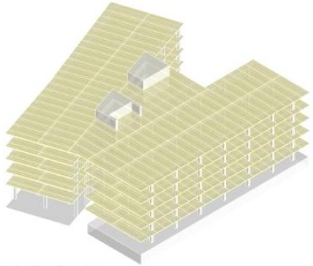

Tamedia

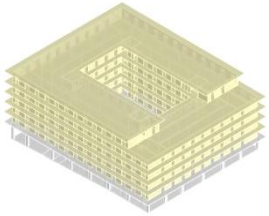

BOKU

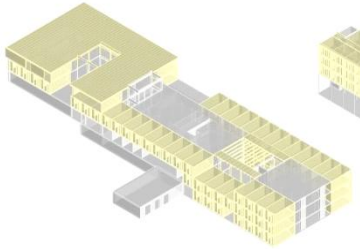

Suurstoffi 22

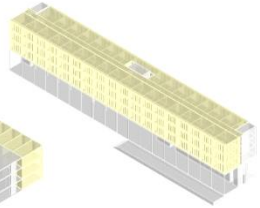

Cradle (D)


Rigot housing


Adidas Headquarters


Cornella de Llobregat housing


Fieberbrunn Care Home


Hotel Ammerwald

ICD IntCDC Universität Stuttgart

BUILDING DATA

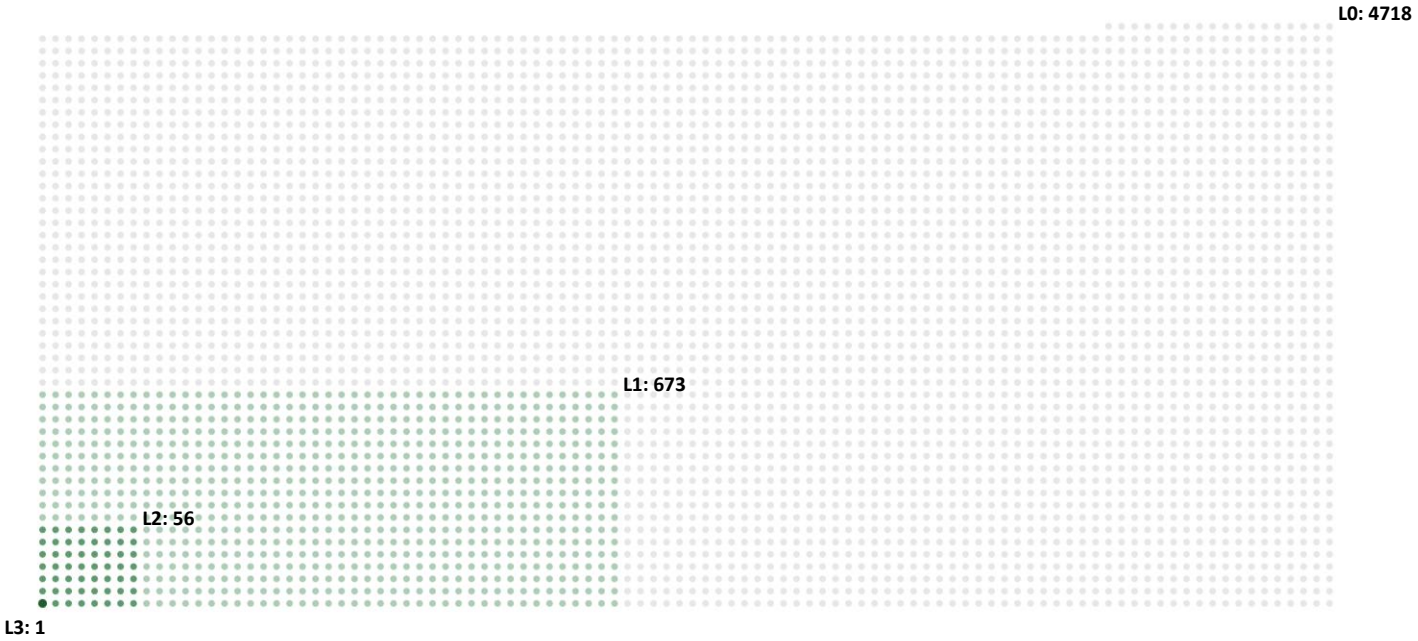
HOW ARE VALUES USED?

L0: INSUFFICIENT TO ASSESS TIMBER USE

L1: GENERAL PROJECT DATA

L2: FRAME DATA

L3: DETAILED DATA



DATA & THE EXPLORER

VISUALISATION TOOLS



WHAT IS A TIMBER BUILDING?

CATAGORIES RELATED TO WOOD %

NOT TIMBER



BIO% <20% DRY MASS

0.00 - 0.12 WUI

SOME TIMBER



BIO% 20 - 95% DRY MASS

0.07 - 0.25 WUI

MOSTLY TIMBER



BIO% 50 - 95% DRY MASS

0.15 - 0.35 WUI

ALL TIMBER



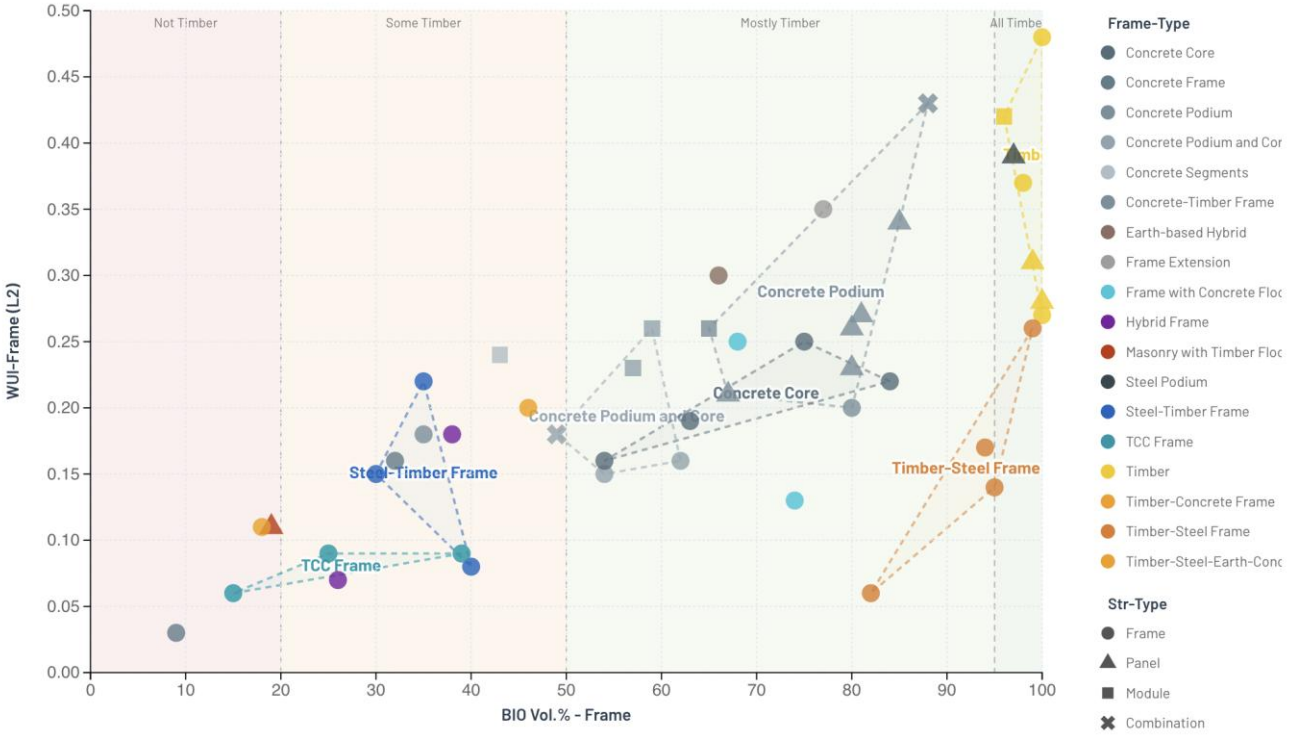
BIO% >95% DRY MASS

0.25 - 0.45 WUI

USING WOOD WELL

INTENSITY BY FRAME TYPE

L2: WUI FRAME X BIO VOL



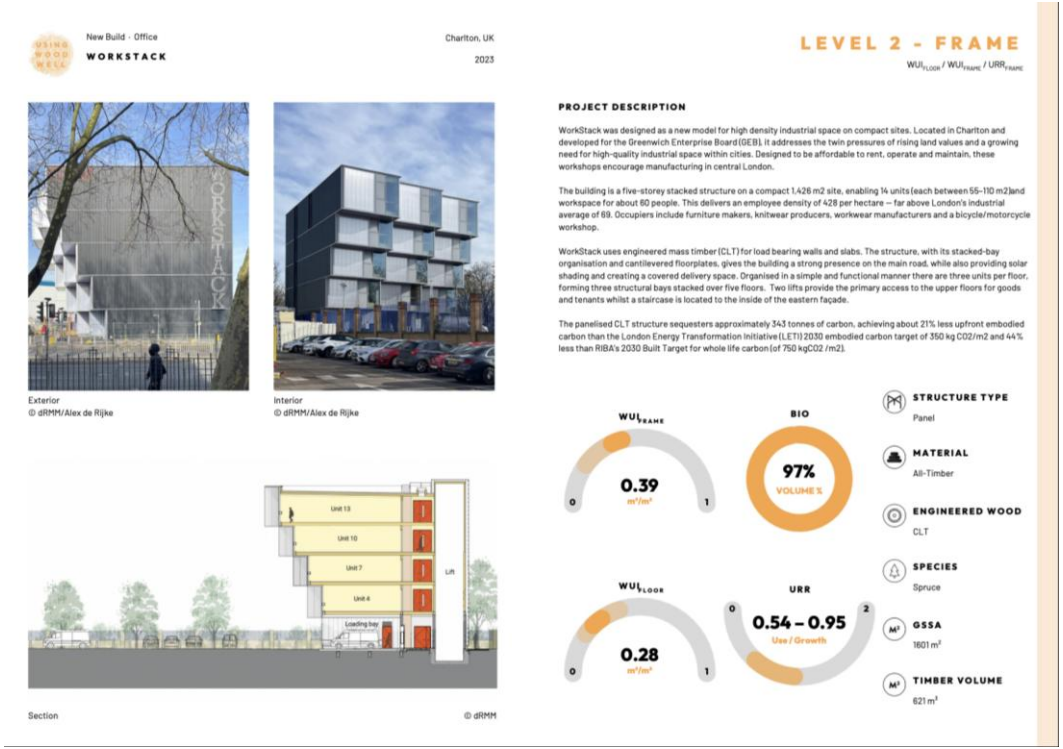
WORKED EXAMPLE

CHARLTON WORKSTACK

USING WOOD WELL

WORKED EXAMPLE
LEVEL 2 FRAME
SUPERSTRUCTURE FRAME
WUI AND URR CALCULATION

CHANGE BUILDING | ICD University of Stuttgart | WAUGH THISTLETON ARCHITECTS | Funded by BUILT BY NATURE



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USING WOOD WELL

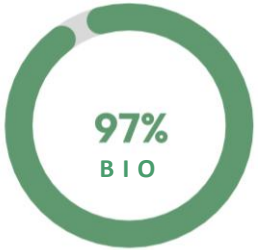
WORKSTACK

CLT FRAME ON A STEEL PODIUM



CREDIT: DRMM ARCHITECTS / FRED HOWARD







STRUCTURE TYPE
CLT - Steel Frame

MATERIAL
All Timber

ENGINEERED WOOD
CLT

SPECIES
Spruce

GSSA
1601m²

TIMBER VOLUME
621m³

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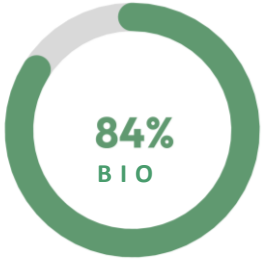
USING WOOD WELL

MAIDENHEAD

GLULAM AND CLT FRAME









STRUCTURE TYPE
Frame: Post & Beam
Concrete Core

MATERIAL
All Timber

ENGINEERED WOOD
CLT, LVL, Softwood
Plywood

SPECIES
Spruce/Beech
Okoume

GSSA
7131m²

TIMBER VOLUME
1558m³

USING WOOD WELL

STRUCTURAL MATERIALS

URR RANGES FOR KEY PRODUCTS



CLT

CARBON: 0.12kgco2e/m³

STORED CARBON:

USE LOWER: 60 YEARS

USE UPPER: 120 YEARS

SPECIES: NORWEGIAN SPRUCE

RENEWAL TIME: 90 YEARS

URR RANGE:
0.60 - 1.33 WUI



GLULAM

CARBON: 0.12kgco2e/m³

STORED CARBON:

USE LOWER: 60 YEARS

USE UPPER: 120 YEARS

SPECIES: NORWEGIAN SPRUCE

RENEWAL TIME: 90 YEARS

URR RANGE:
0.60 - 1.33 WUI



LVL

CARBON: 0.12kgco2e/m³

STORED CARBON:

USE LOWER: 60 YEARS

USE UPPER: 120 YEARS

SPECIES: BEECH

RENEWAL TIME: 120 YEARS

URR RANGE:
0.50 - 1.00 WUI



SAWN TIMBER

CARBON: 0.12kgco2e/m³

STORED CARBON:

USE LOWER: 60 YEARS

USE UPPER: 120 YEARS

SPECIES: SKIA SPRUCE

RENEWAL TIME: 45 YEARS

URR RANGE:
1.50 - 2.67 WUI

USING WOOD WELL

SUSTAINABLE USE CERTIFICATION

NEW SUFFICIENCY STANDARDS

URRgent

IMPORTANT IDEAS FROM THE RESEARCH

SOME KEY TAKE AWAYS



NATURE'S LIMITS RELATED TO PROJECTS

SIGNIFICANCE OF WOOD IN BUILDINGS

LONGER BUILDING LIFESPANS

LONG-LIVED BIO-BASED PRODUCTS

USING WOOD WELL

REPORTS

REPORTS : OPUS

DATA

DATA : DARUS

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CHANGE BUILDING

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