TOMORROW'S TIMBER

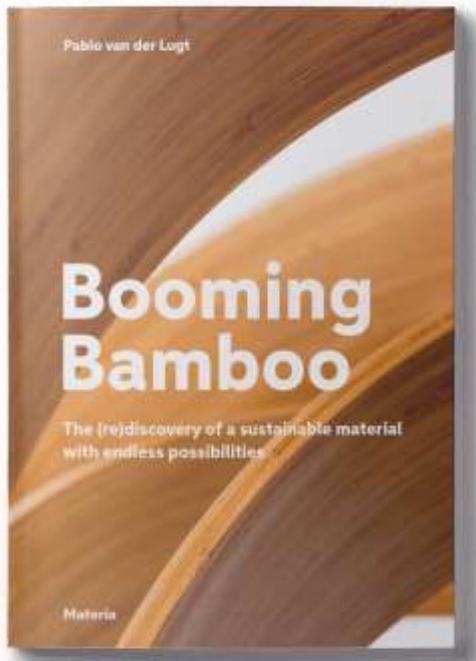
BUILDING IN UNISON WITH NATURE

Dr. ir. Pablo van der Lugt
Delft University of Technology I Green Matters Consultancy
Author Tomorrow's Timber & Booming Bamboo
Board member Built by Nature

Price – I am Material, 8 Mei 2025

Faelledby neighbourhood development Copenhagen I Henning Larsen

Credit: Henning Larsen


Pablo van der Lugt
Booming Bamboo
The (re)discovery of a sustainable material with endless possibilities
Materia

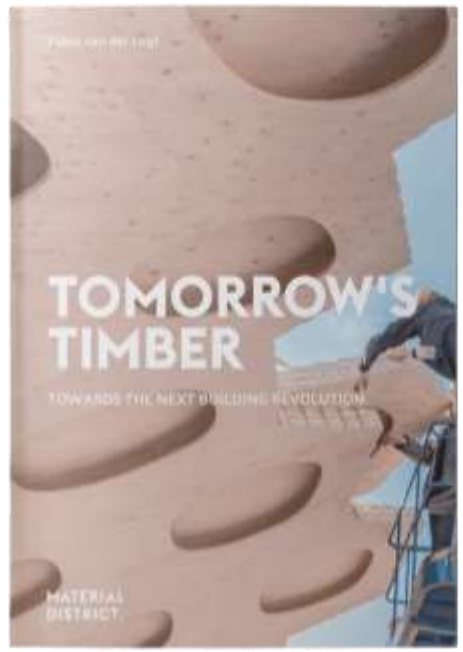

TOMORROW'S TIMBER
MATERIAL DISTRICT.





Photo: Bart van der Lugt




Housing Funbambu, Costa Rica



Photo: Guillaume Bonnefont



Panyaden Secondary School I Chiang Mai, Thailand I Chiang Mai Life Architects

Photo: Markus Roselieb



Panyaden Secondary School I Chiang Mai, Thailand I Chiang Mai Life Architects

Photo: Markus Roselieb



The Green Village l Bali Indonesia l IBUKU

Photo: Rio Helmi



The Green Village l Bali Indonesia l IBUKU

Photo: Rio Helmi

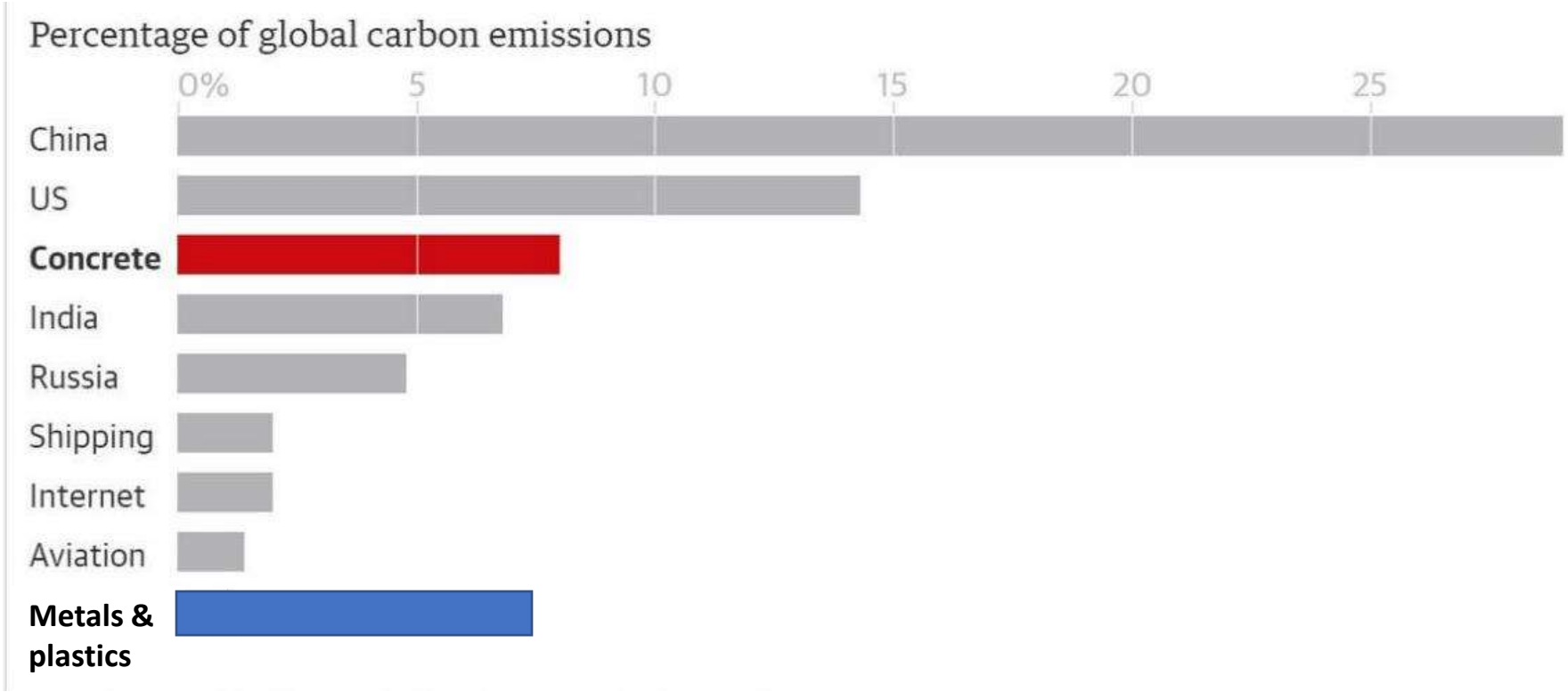


Source: IEA & UNEP (2019). 2019 global status report for buildings and construction. IEA & UNEP



Source: IEA & UNEP (2019). 2019 global status report for buildings and construction. IEA & UNEP

IF CONCRETE & STEEL WERE COUNTRIES...



Credit: the Guardian (source: UNEP, Chatham house),
figures for metals & plastics from Ellen MacArthur Foundation (2019)



TED2013 • veljača 2013. | 1.4M views

Like (43K) Share Add

Why we should build wooden skyscrapers

Read transcript

Building a skyscraper? Forget about steel and concrete, says architect Michael Green, and build it out of ... wood. As he details in this intriguing talk, it's not only possible to build safe wooden structures up to 30 stories tall (and, he hopes, higher), it's necessary.



Sara Cultural Center | Skelleftea, Sweden | White Arkitekter

Photo: Patrick Degerman courtesy of White Arkitekter



Sara Cultural Center | Skelleftea, Sweden | White Arkitekter

Photo: White Arkitekter



Sara Cultural Center I Skelleftea, Sweden I White Arkitekter

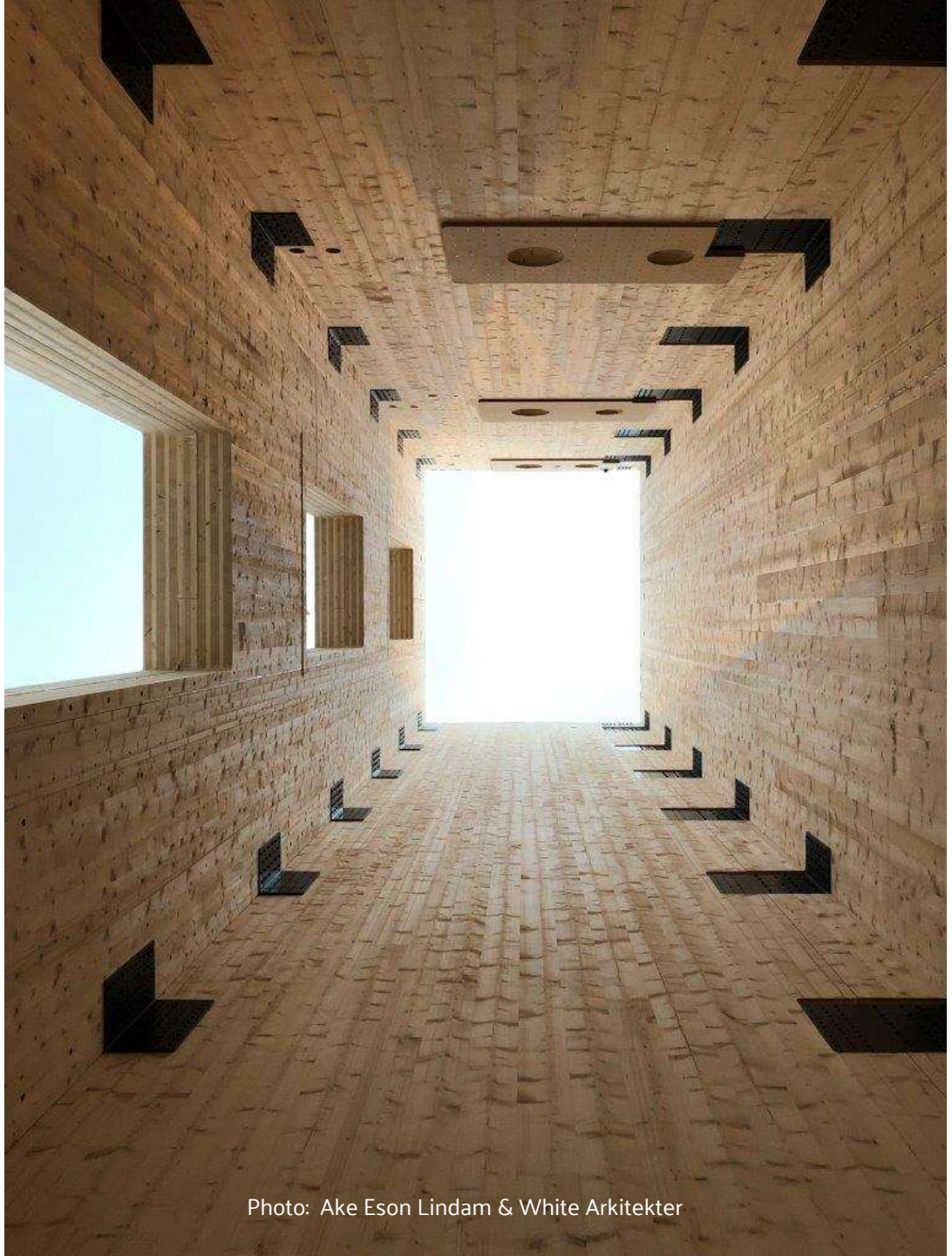
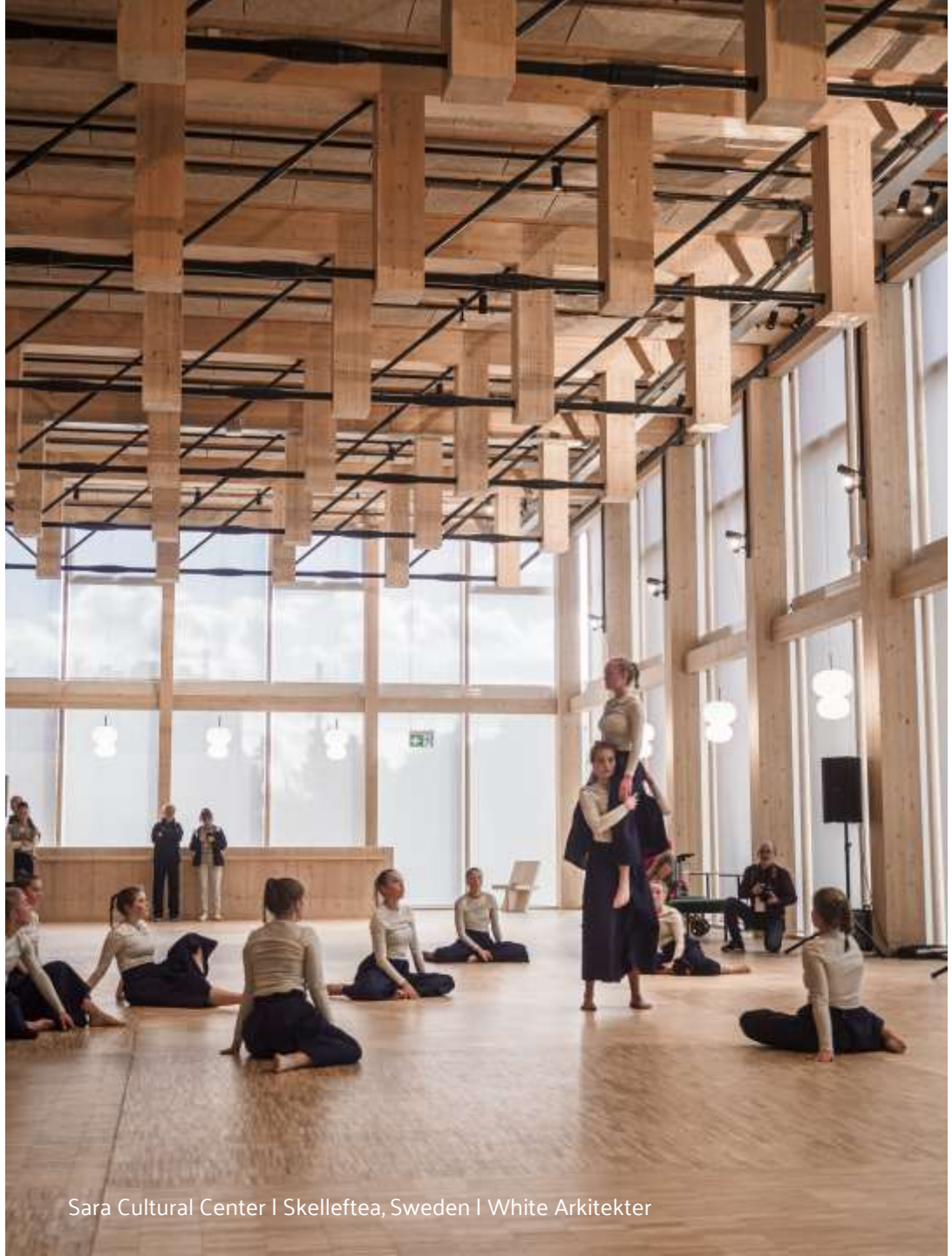


Photo: Ake Eson Lindam & White Arkitekter



Sara Cultural Center I Skelleftea, Sweden I White Arkitekter

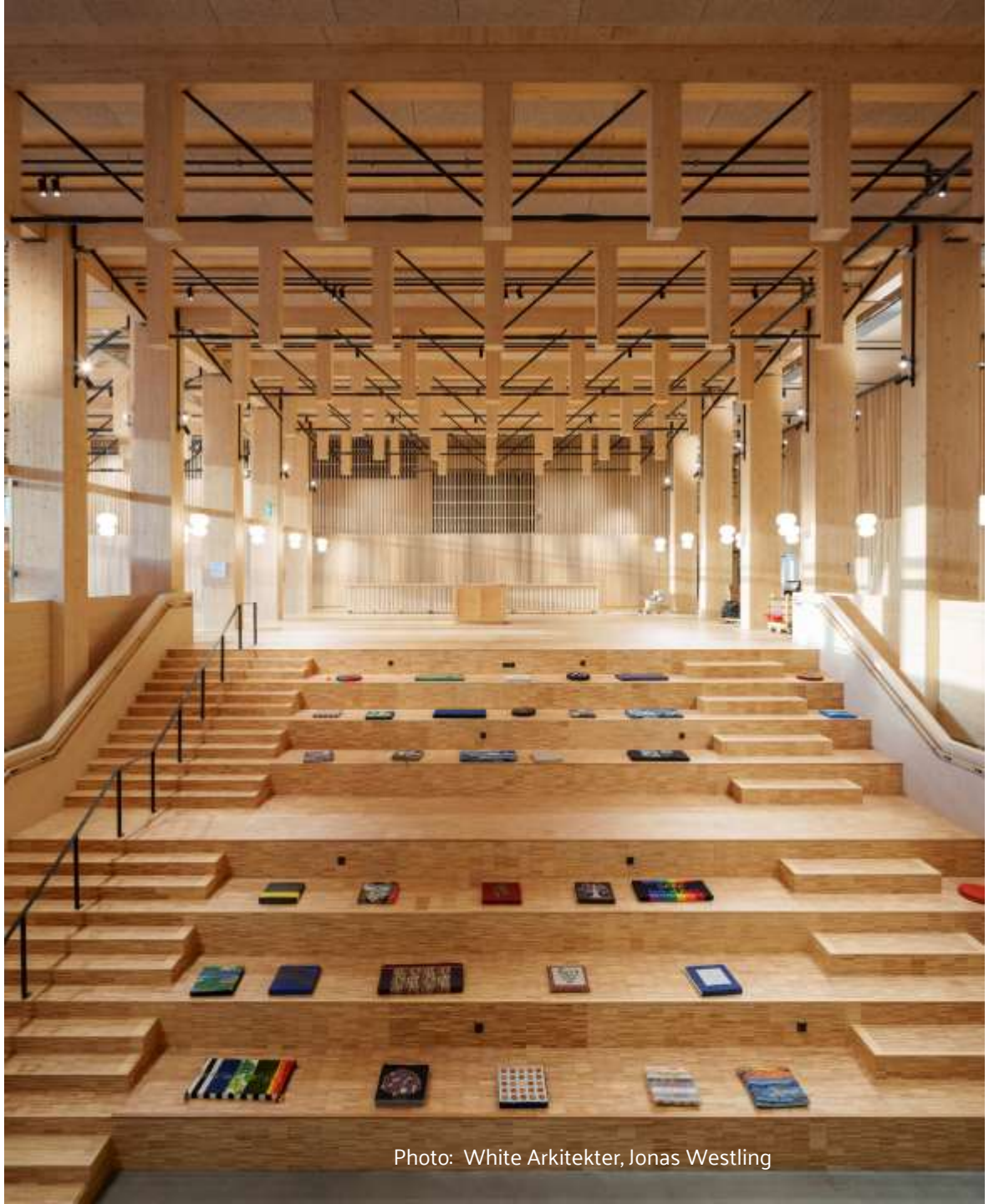


Photo: White Arkitekter, Jonas Westling



Sara Cultural Center I Skelleftea, Sweden I White Arkitekter

Photo: White Arkitekter


Google Earth
Airbus, Vexcel Imaging US, Inc.



Hotel Jakarta I Amsterdam, the Netherlands I SeArch

Photo: Lior Teitler for MOSO International



Hotel Jakarta | Amsterdam, the Netherlands | SeARCH

Photo: DERIX group

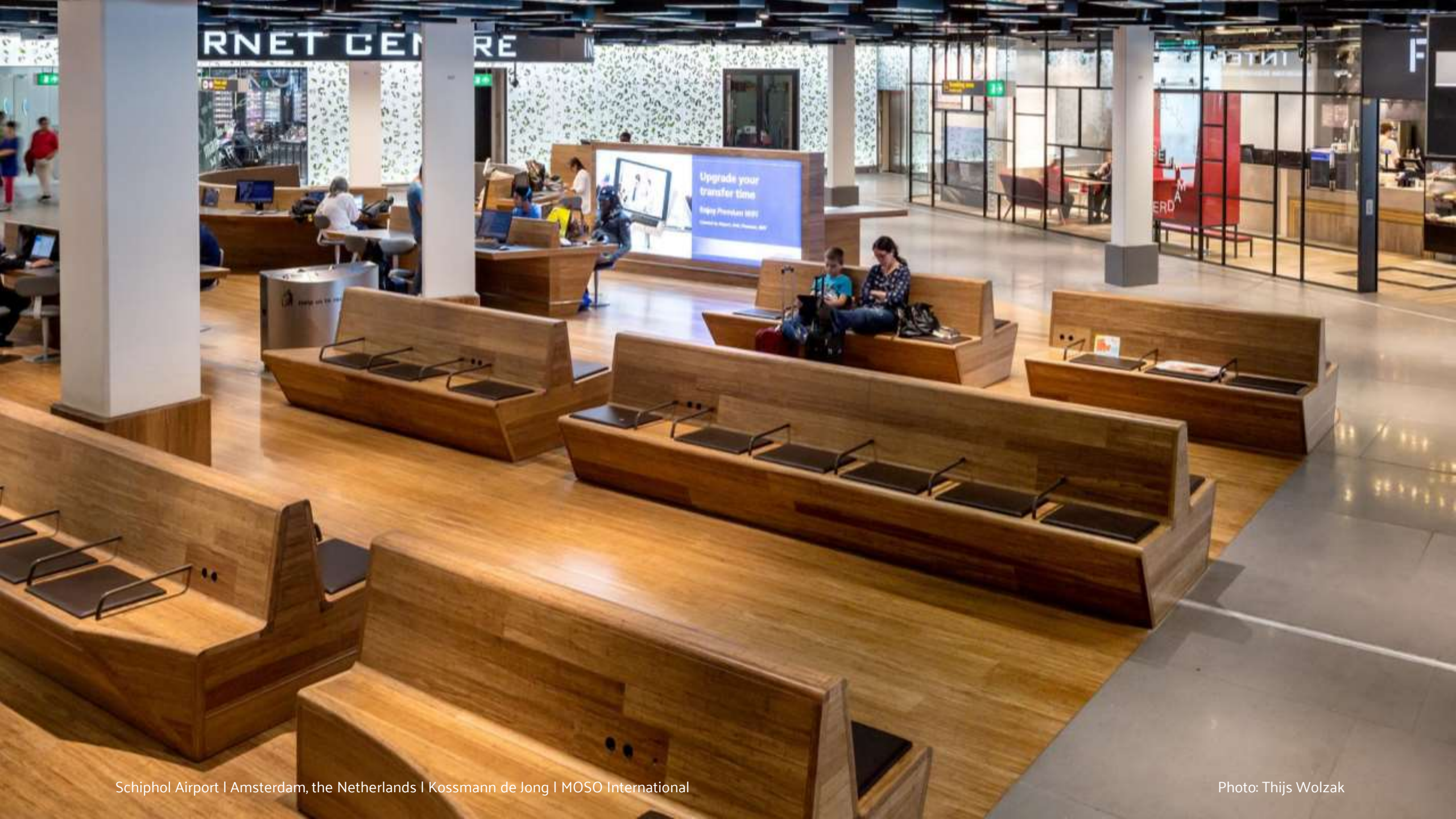


Hotel Jakarta | Amsterdam, the Netherlands | SeARCH

Photo: Lior Teitler for Moso International



Photo: Moso International



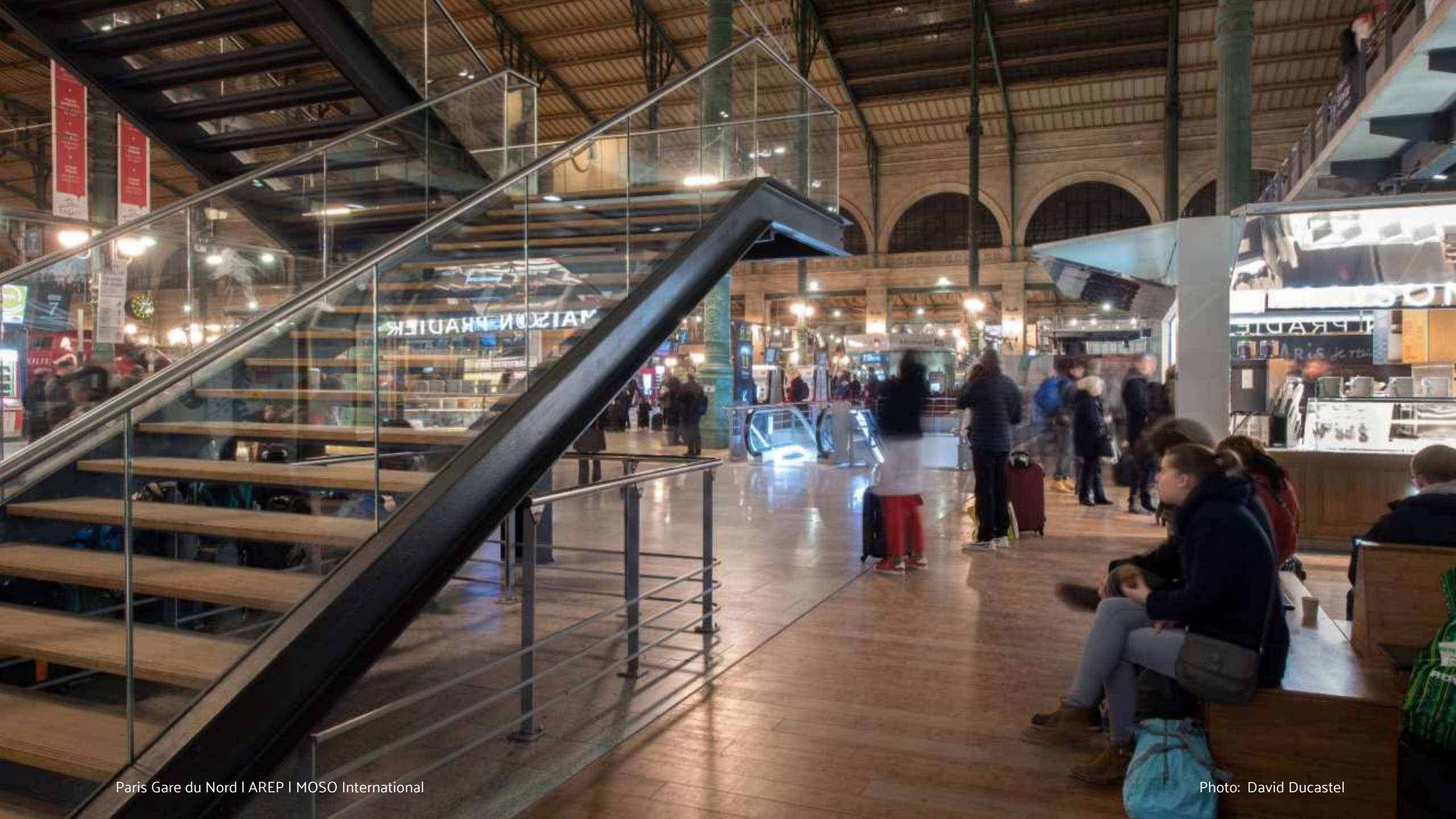
Schiphol Airport | Amsterdam, the Netherlands | Kossmann de Jong | MOSO International

Photo: Thijs Wolzak



Paris Gare du Nord l AREP l MOSO International

Photo: David Ducastel



Paris Gare du Nord l AREP l MOSO International

Photo: David Ducastel



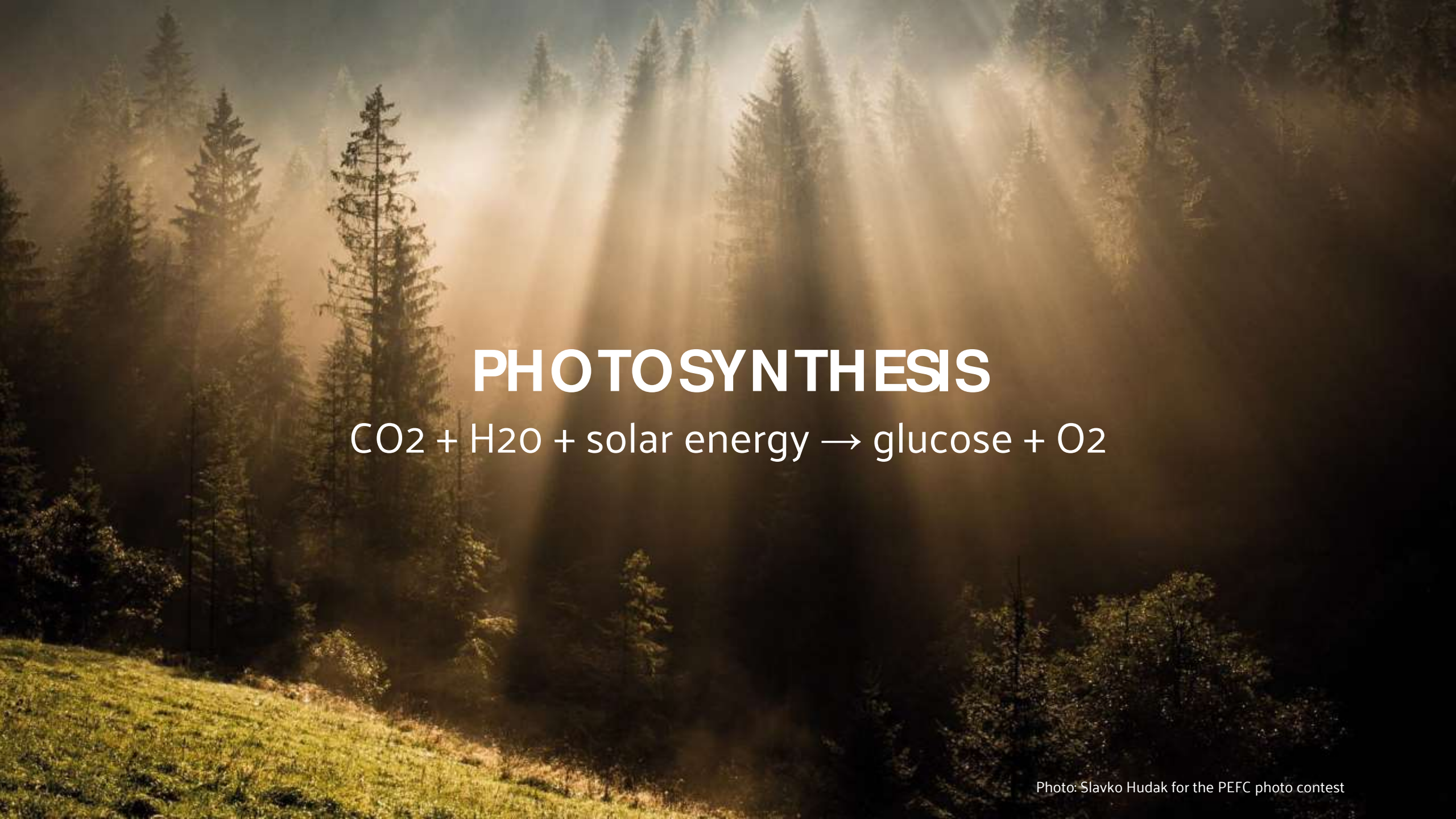
Bamboo plantation (1 years old), Alcoutim, Portugal

Photo: BambooLogic

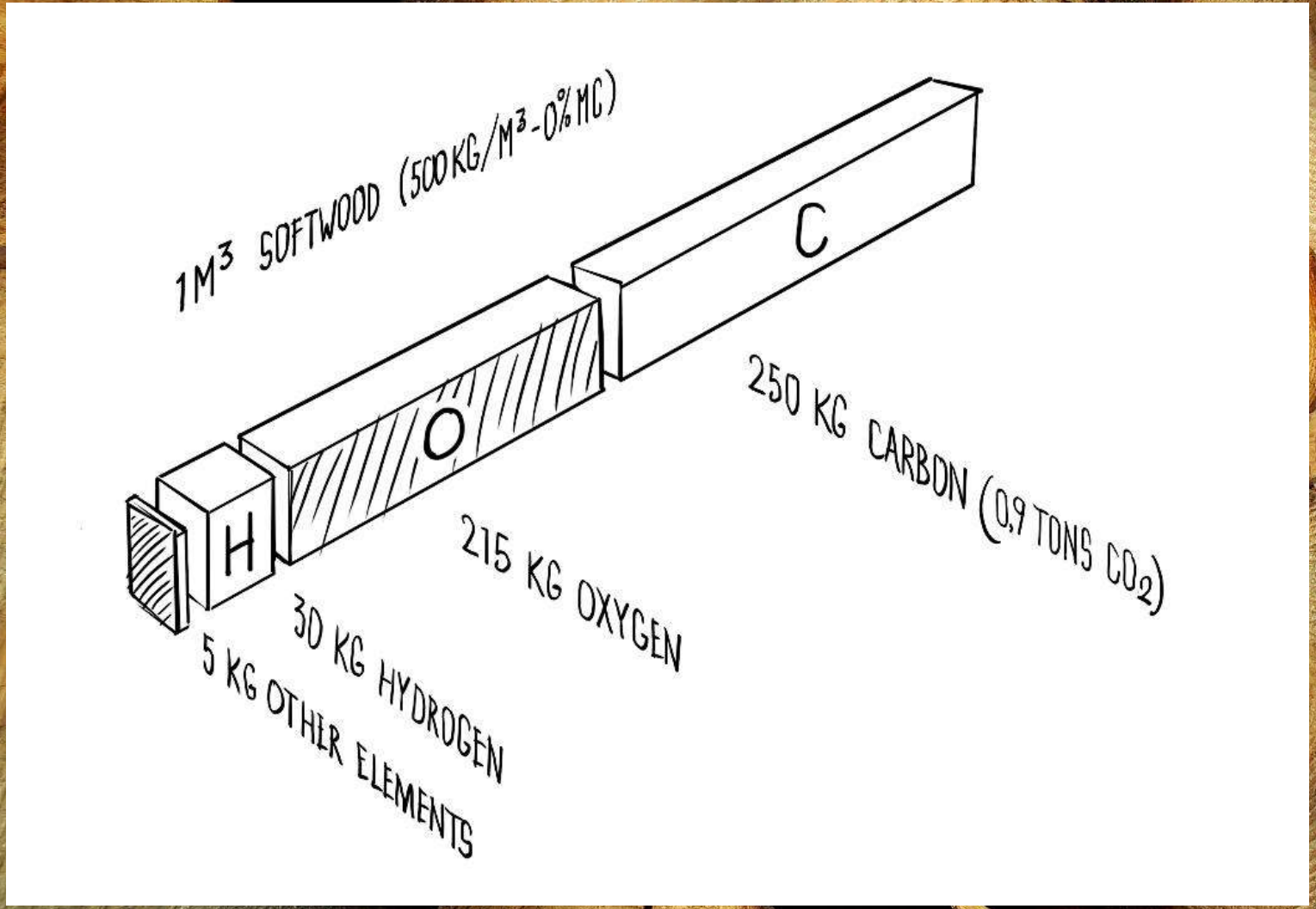


Bamboo plantation (4 years old), Videguira, Portugal




PHOTOSYNTHESIS
CO2 + H2O + solar energy → glucose + O2
Photo: Slavko Hudak for the PEFC photo contest

CARBON STORE



Credit: MaterialDistrict (Tomorrow's Timber)



MEDIEVAL HOUSES

Location
Strassbourg, France

Photo: Pablo van der Lugt



STAVE CHURCH

12TH CENTURY

Location
Norway

Photo: Micha L. Rieser

BUILDING AS CARBON STORE



Sara Cultural Center I Skelleftea, Sweden I White Arkitekter

Photo: White Arkitekter



SARA CULTURAL CENTER

Location
Skelleftea, Sweden

Architect
White Arkitekter

Mass timber volume
10700 m3 CLT + 2600 m3 glulam (total 13300 m3)

Photo: Sven Burman, courtesy of White Arkitekter



SARA CULTURAL CENTER

Location
Skelleftea, Sweden

Architect
White Arkitekter

Mass timber volume
10700 m3 CLT + 2600 m3 glulam (total 13300 m3)

CO_2 stored for lifetime
10640 tons

Photo: Sven Burman, courtesy of White Arkitekter



SARA CULTURAL CENTER

Location
Skelleftea, Sweden

Architect
White Arkitekter

Mass timber volume
10700 m3 CLT + 2600 m3 glulam
(total 13300 m3)

CO_2 stored for lifetime
10640 tons

5320 flights AMS – NY
2436 times driving round globe
2800 energy European households

Photo: Sven Burman, courtesy of White Arkitekter



SAWA I Rotterdam, the Netherlands I Mei architects and planners + NICE developers



Credit: Mei architects & planners



SAWAI Rotterdam, the Netherlands I Mei architects and planners + NICE developers

Credit: Mei architects & planners



Photo: PEFC Austria

CLT PRODUCTION



Credit: DERIX group

TRANSPORT



Credit: DERIX group, Pablo van der Lugt

ASSEMBLY



SAWA I Rotterdam, the Netherlands I Mei architects and planners I NICE developers I ERA contour

Credit: NICE developers I AMMO – Amber Heij



SAWA I Rotterdam, the Netherlands I Mei architects and planners I NICE developers I ERA contour

Photo: Ossip van Duivenbode



SAWA I Rotterdam, the Netherlands I Mei architects and planners I NICE developers I ERA contour

Photo: Ossip van Duivenbode

Circularity

Maximum flexibiltiy & circular | Removable construction system without concrete and glue





SAWA I Rotterdam, the Netherlands I Mei architecten + NICE developers



SAWA | Rotterdam, the Netherlands | Mei architecten + NICE developers



SAWA | Rotterdam, the Netherlands | Mei architecten + NICE developers

TIME LAPSE (25 WEEKS)



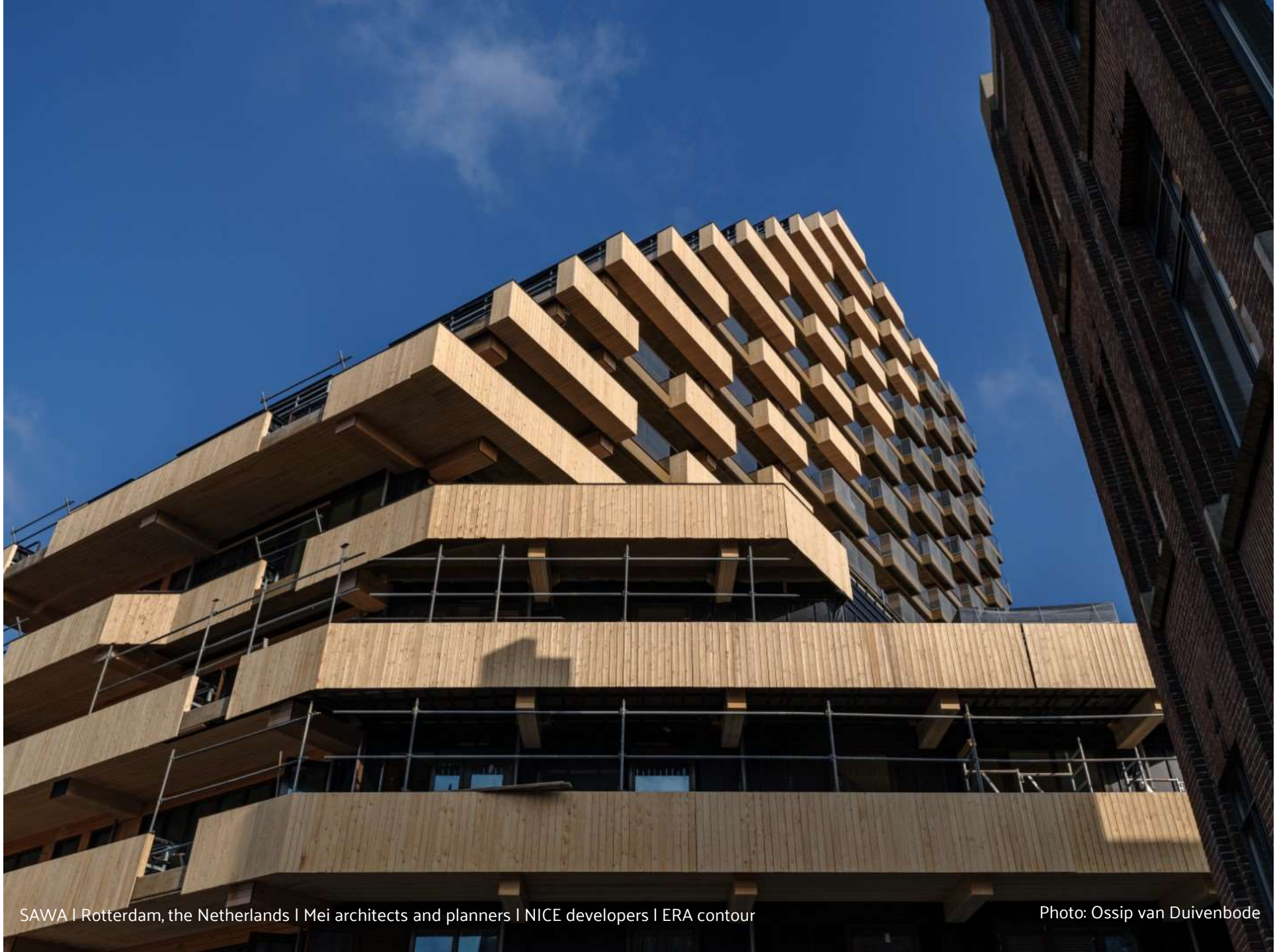
SAWA I Rotterdam, the Netherlands I Mei architecten and planners I NICE developers I ERA contour

Credit: NICE developers I AMMO – Amber Heij I Marten Multimedia



SAWA I Rotterdam, the Netherlands I Mei architects and planners + NICE developers

Photo: Ossip van Duivenbode

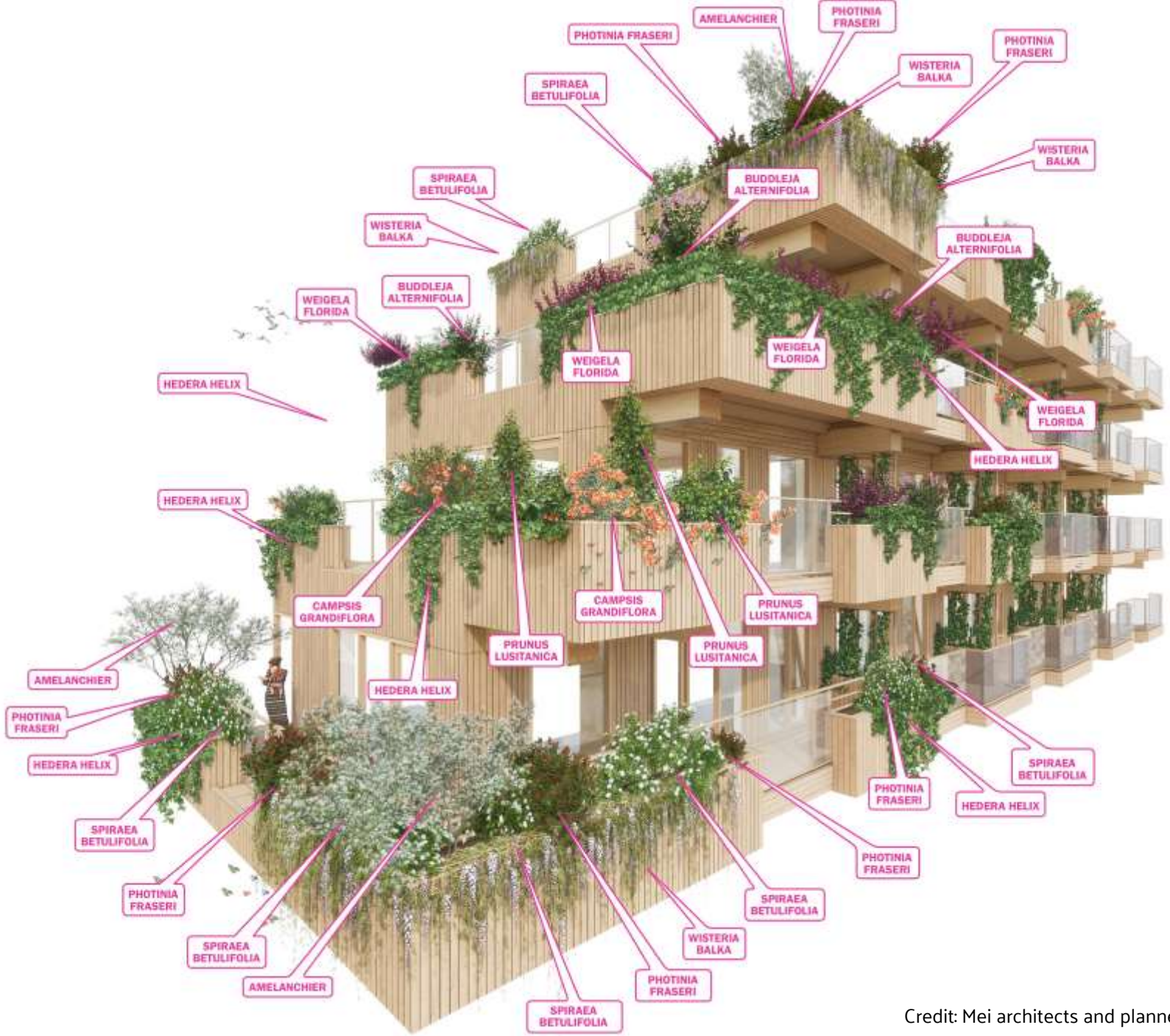


SAWA I Rotterdam, the Netherlands I Mei architects and planners I NICE developers I ERA contour

Photo: Ossip van Duivenbode



Credit: Mei architects and planners



Credit: Mei architects and planners



SAWA I Rotterdam, the Netherlands I Mei architects and planners I NICE developers I ERA contour

Photo: Ossip van Duivenbode

PENTHOUSE (PEREGRINE FALCON)



SAWA I Rotterdam, the Netherlands I Mei architects and planners + NICE developers

Credit: NICE developers I AMMO – Amber Heij



SAWA I Rotterdam, the Netherlands I Mei architecten I NICE developers I ERA contour

Photo: Robert Platje – Mei architects and planners



SAWA I Rotterdam, the Netherlands I Mei architecten I NICE developers I ERA contour

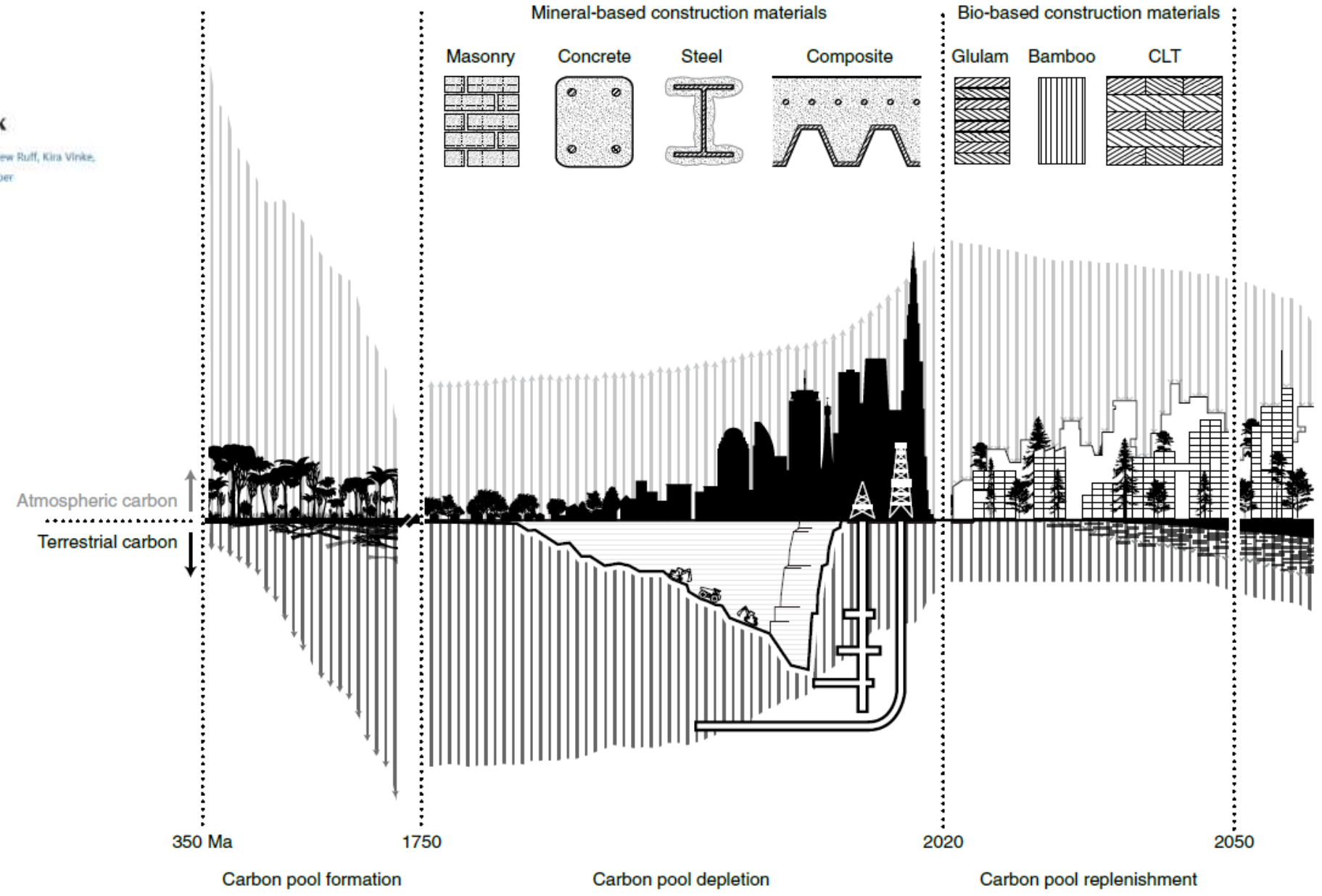
Credit: Beeldenfabriek, NICE developers

nature sustainability

Perspective | Published: 27 January 2020

Buildings as a global carbon sink

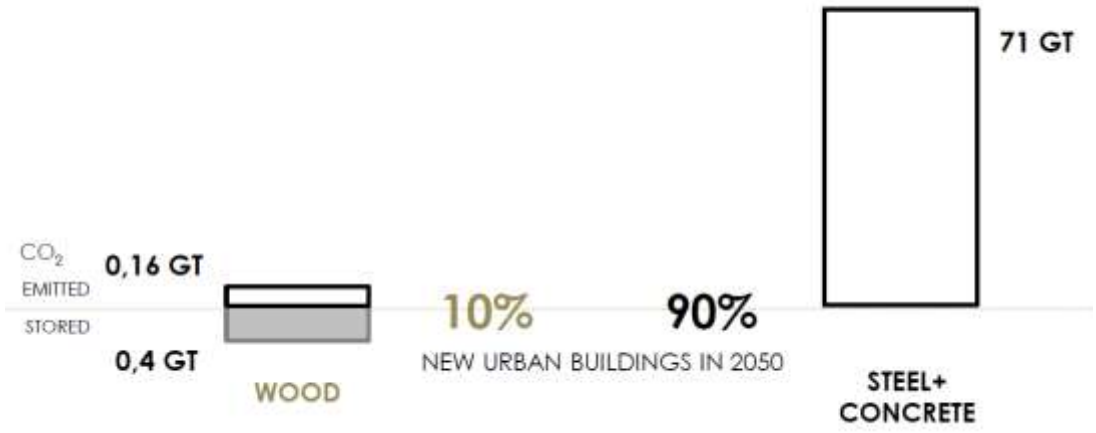
Galina Churkina, Alan Organschi, Christopher P. O. Reyer, Andrew Ruff, Kira Vinke, Zhu Liu, Barbara K. Reck, T. E. Graedel & Hans Joachim Schellnhuber



Source: Churkina, G., Organschi, A., Reyer, C.P.O., Ruff, A., Vinke, K., Liu, Z., Reck, B.K., Graedel, T.E., Schellnhuber, H.J. (2020) Buildings as a global carbon sink. Nature Sustainability 3, 269-276.

BUILDINGS AS A GLOBAL CARBON SINK

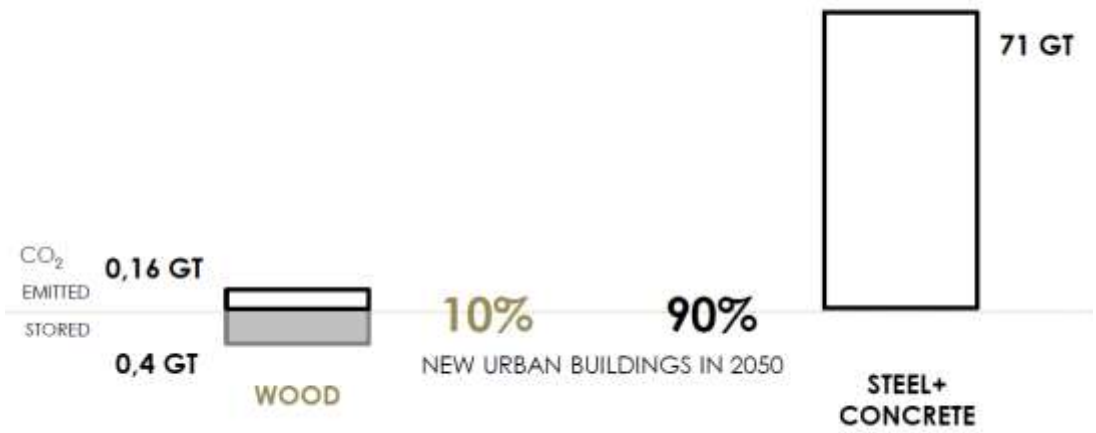
10% wood



Source: Churkina, G., Organschi, A., Reyer, C.P.O., Ruff, A., Vinke, K., Liu, Z., Reck, B.K., Graedel, T.E., Schellnhuber, H.J. (2020) Buildings as a global carbon sink. Nature Sustainability 3, 269-276.

BUILDINGS AS A GLOBAL CARBON SINK

10% wood



90% wood



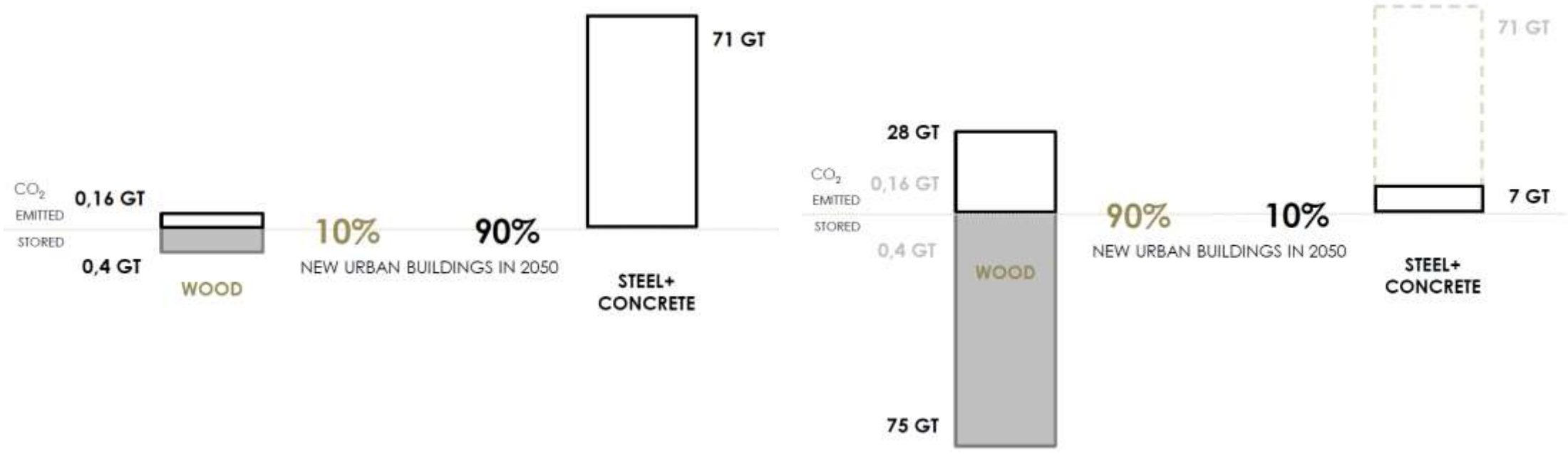
Source: Churkina, G., Organschi, A., Reyer, C.P.O., Ruff, A., Vinke, K., Liu, Z., Reck, B.K., Graedel, T.E., Schellnhuber, H.J. (2020) Buildings as a global carbon sink. Nature Sustainability 3, 269-276.

BUILDINGS AS A GLOBAL CARBON SINK

10% wood

< 100 Gtons difference >

90% wood



Source: Churkina, G., Organschi, A., Reyer, C.P.O., Ruff, A., Vinke, K., Liu, Z., Reck, B.K., Graedel, T.E., Schellnhuber, H.J. (2020) Buildings as a global carbon sink. Nature Sustainability 3, 269-276.

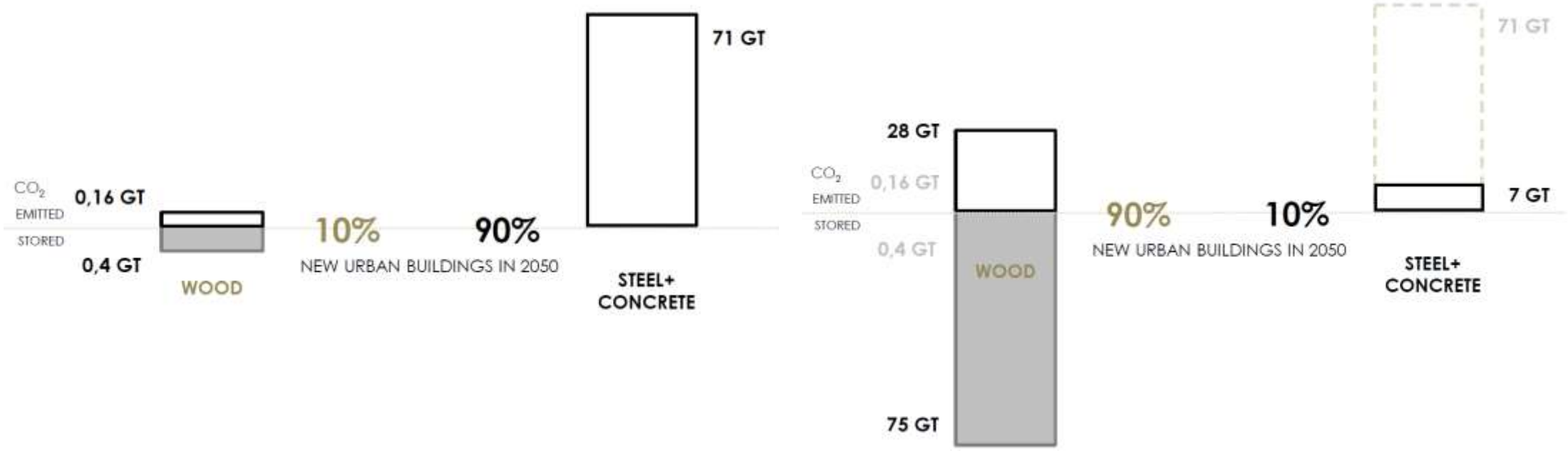
BUILDINGS AS A GLOBAL CARBON SINK

10% wood

< 100 Gtons difference >

90% wood

25% of carbon budget
1.5 degrees Celsius temperature rise



Source: Churkina, G., Organschi, A., Reyer, C.P.O., Ruff, A., Vinke, K., Liu, Z., Reck, B.K., Graedel, T.E., Schellnhuber, H.J. (2020) Buildings as a global carbon sink. Nature Sustainability 3, 269-276.


“IS THERE ENOUGH WOOD?”

FOREST MAP OF EUROPE

(geographical Europe and Turkey)

Proportion of forest from land area
(% at 1km x 1km resolution)

- 0 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- Water
- No data

0 250 500 750 Kilometers

ETRS89 Lambert Azimuthal Equal Area projection

Data sources

Earth observation data:

EU27, AL, BA, CH, HR, ME, MK, NO, RS, TR: Forest/non-forest map 2006 (beta version) developed by the EC Joint Research Centre, aggregated to 1km resolution. Based on IRS-P6 LISS-III, SPOT4 (HRVIR) and SPOT5 HRG satellite data of 2006.

Belarus, Moldova, Ukraine, Russian Federation: Forest share estimates based on AVHRR NOAA satellite data of 1998-1998.

Statistical data:
National forest inventory statistics
State of Europe's Forests country statistics 2011

Method

Two different earth-observation products (Kempeneers et al. 2011, Pilvinen et al. 2001/Schuck et al. 2002) have been combined with statistical data to produce a pan-European forest map that corresponds to the official forest inventory statistics at national and/or regional level. The satellite-based forest cover data was first calibrated to sum up to the forest area statistics within a given administrative region. For 18 countries (including the Russian Federation) regional statistics were utilized during the calibration, while for the other countries statistics at national level have been applied. In a second calibration run, the map was adjusted to the internationally harmonized statistics by Forest Europe 2011 at national level, to allow for comparability between the countries.

Further details:
www.efi.int/portal/virtual_library/information_services/mapping_services/forest_map_of_europe

References

Kempeneers, P., Sedano, F., Seebach, L., Strobl, P., San-Miguel-Ayanz, J. 2011. Data fusion of different spatial resolution remote sensing images applied to forest type mapping. IEEE Transactions on Geoscience and Remote Sensing, in press.

Pilvinen, R., Lehikoinen, M., Schuck, A., Häme, T., Väätäinen, S., Kennedy, P. and Folving, S. 2001. Combining Earth Observation Data and Forest Statistics. EFI Research Report 14, European Forest Institute and Joint Research Centre - European Commission.

Schuck, A., Van Brusselen, J., Pilvinen, R., Häme, T., Kennedy, P. and Folving, S. 2002. Compilation of a calibrated European forest map derived from NOAA-AVHRR data. EFI Technical Report 13, European Forest Institute

Contact: ofalec@efi.int

European Forest Institute / EC Joint Research Centre
September 2011

Source: Metabolic (2023). Impact scan for timber construction in Europe

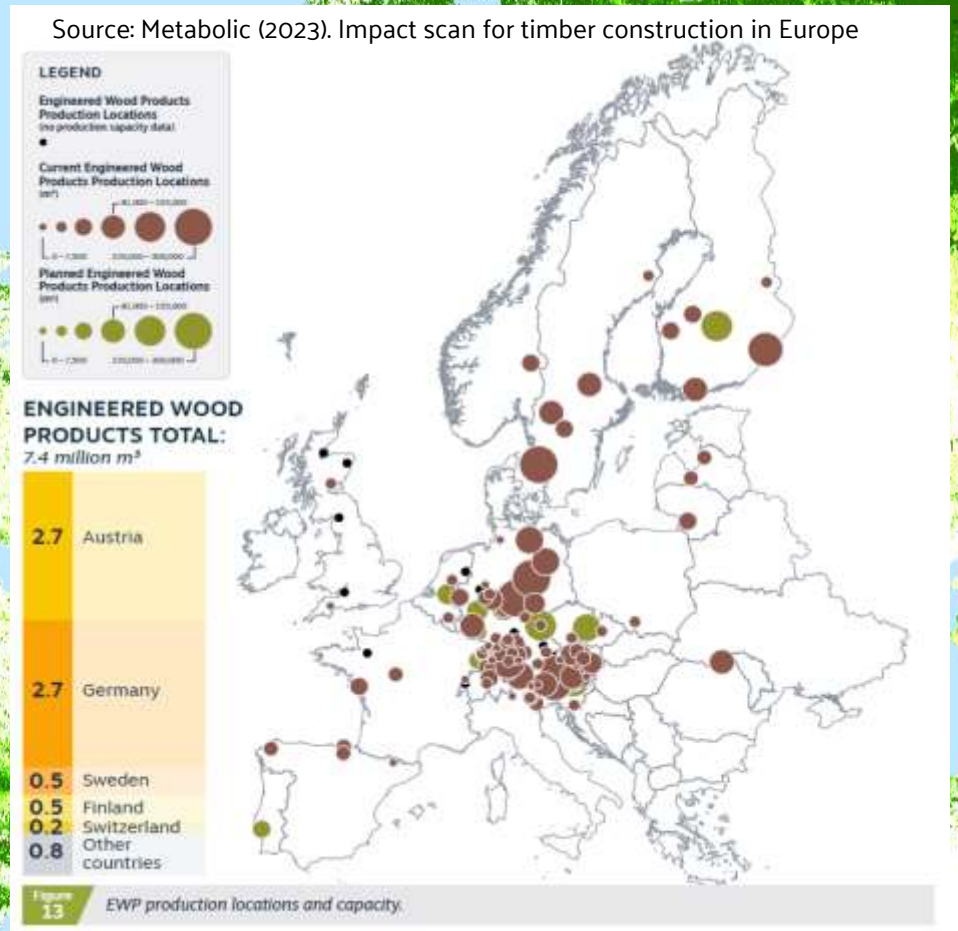
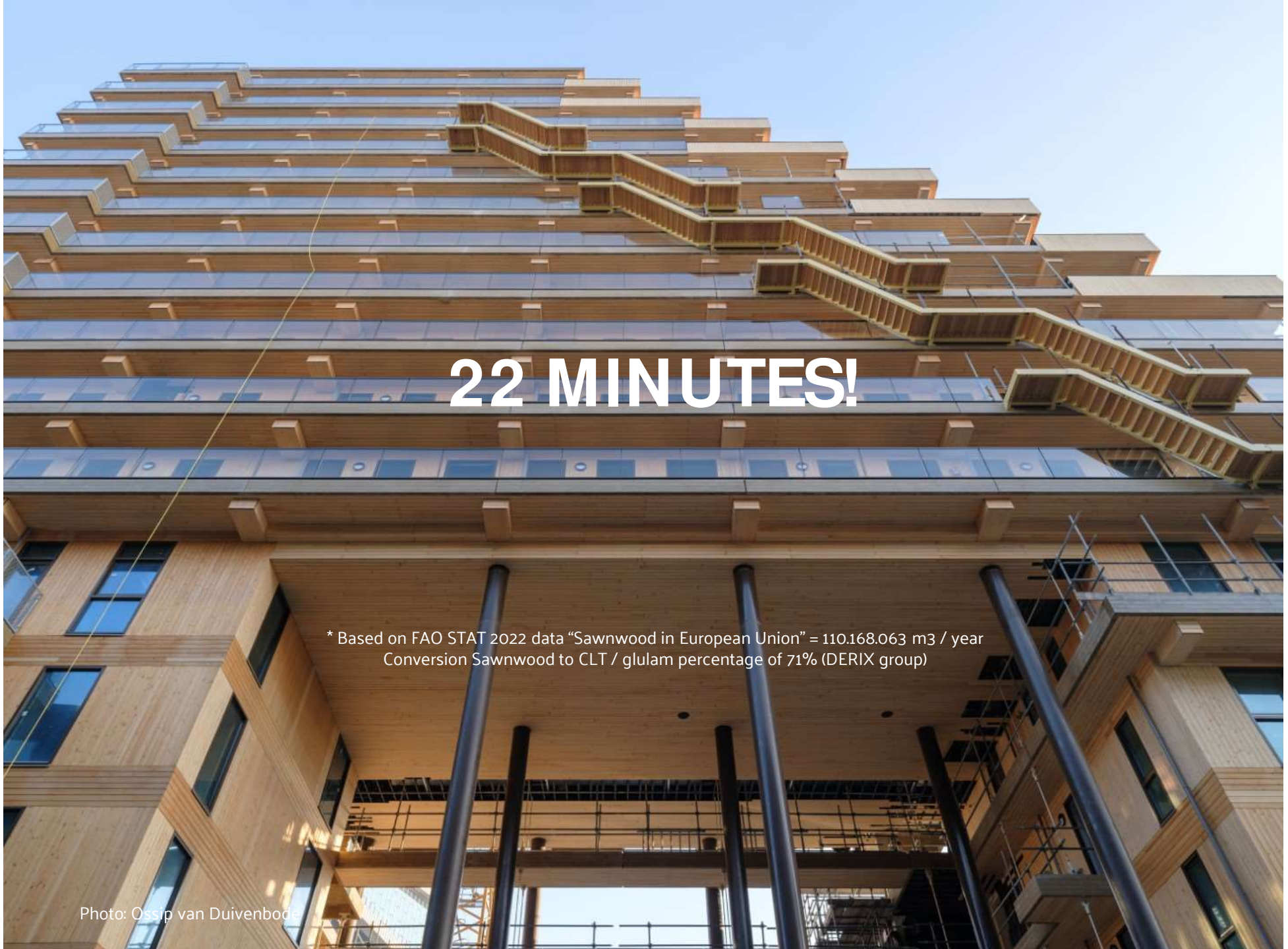


Figure 13 *EWP production locations and capacity.*

WOOD FOR THOUGHT

How long does the European forestry industry require to sustainably produce the timber required to build Sawa?

(3300 m3 wood)



22 MINUTES!

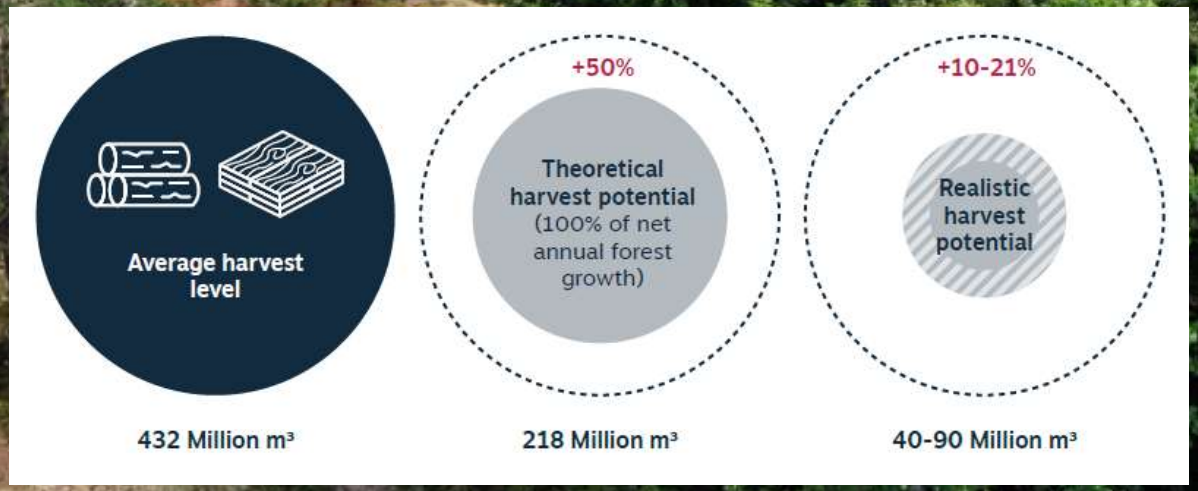
* Based on FAO STAT 2022 data “Sawnwood in European Union” = 110.168.063 m3 / year
Conversion Sawnwood to CLT / glulam percentage of 71% (DERIX group)

Photo: Ossip van Duivenbode

SUSTAINABLE FOREST MANAGEMENT

Forests remain forests

Harvest less than regrowth



Source: Metabolic (2023). Impact scan for timber construction in Europe

Photo: Kjell Wiklund for the PEFC photo contest

Annual additional capacity EU forests



40 mio m3 roundwood
20 mio m3 sawn timber



Private house - 40 m3
(appartment 20 m3)



Means:

500.000 houses / year
(1 mio appartments)

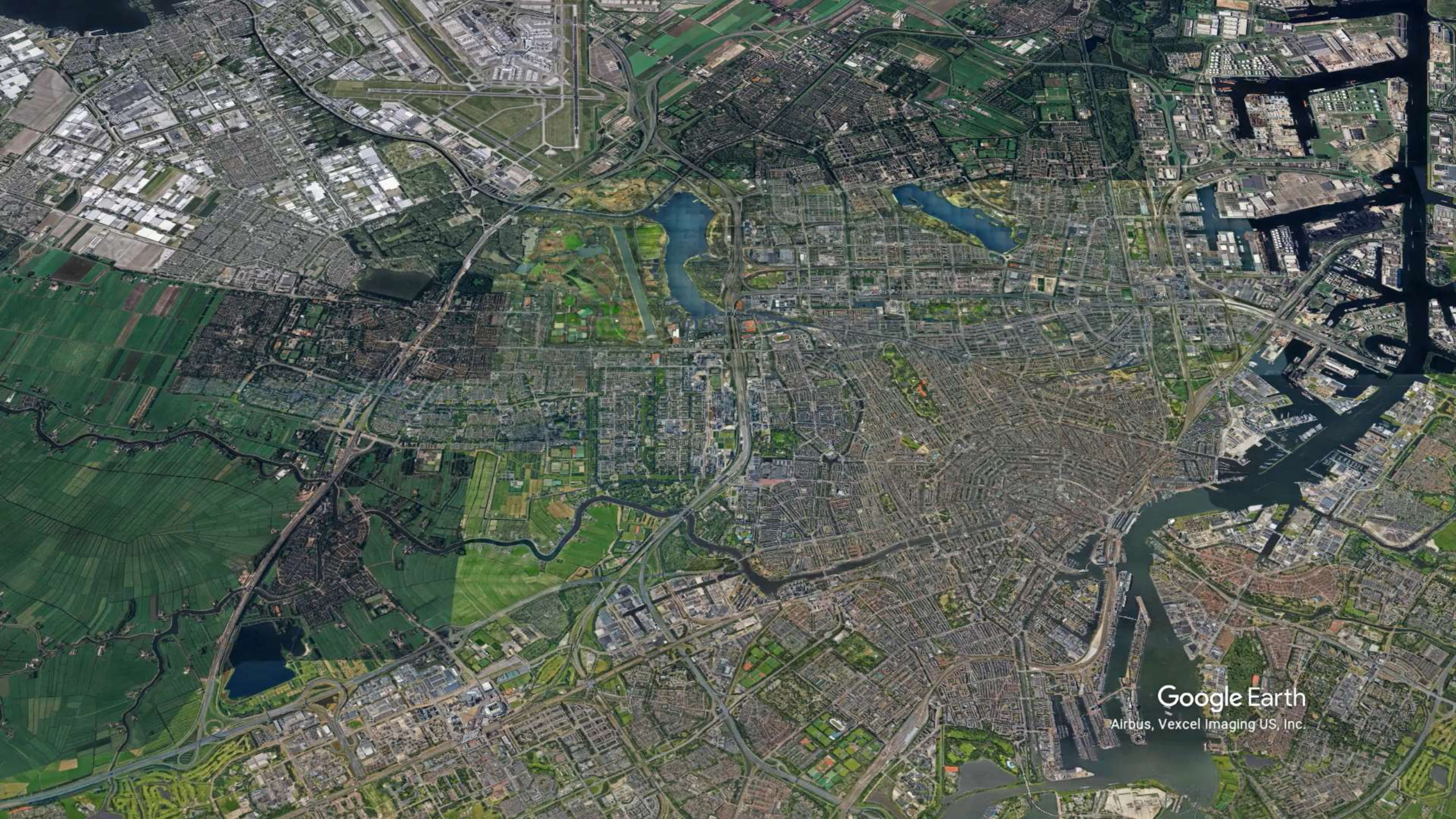
Every year again, from sustainably managed forests!

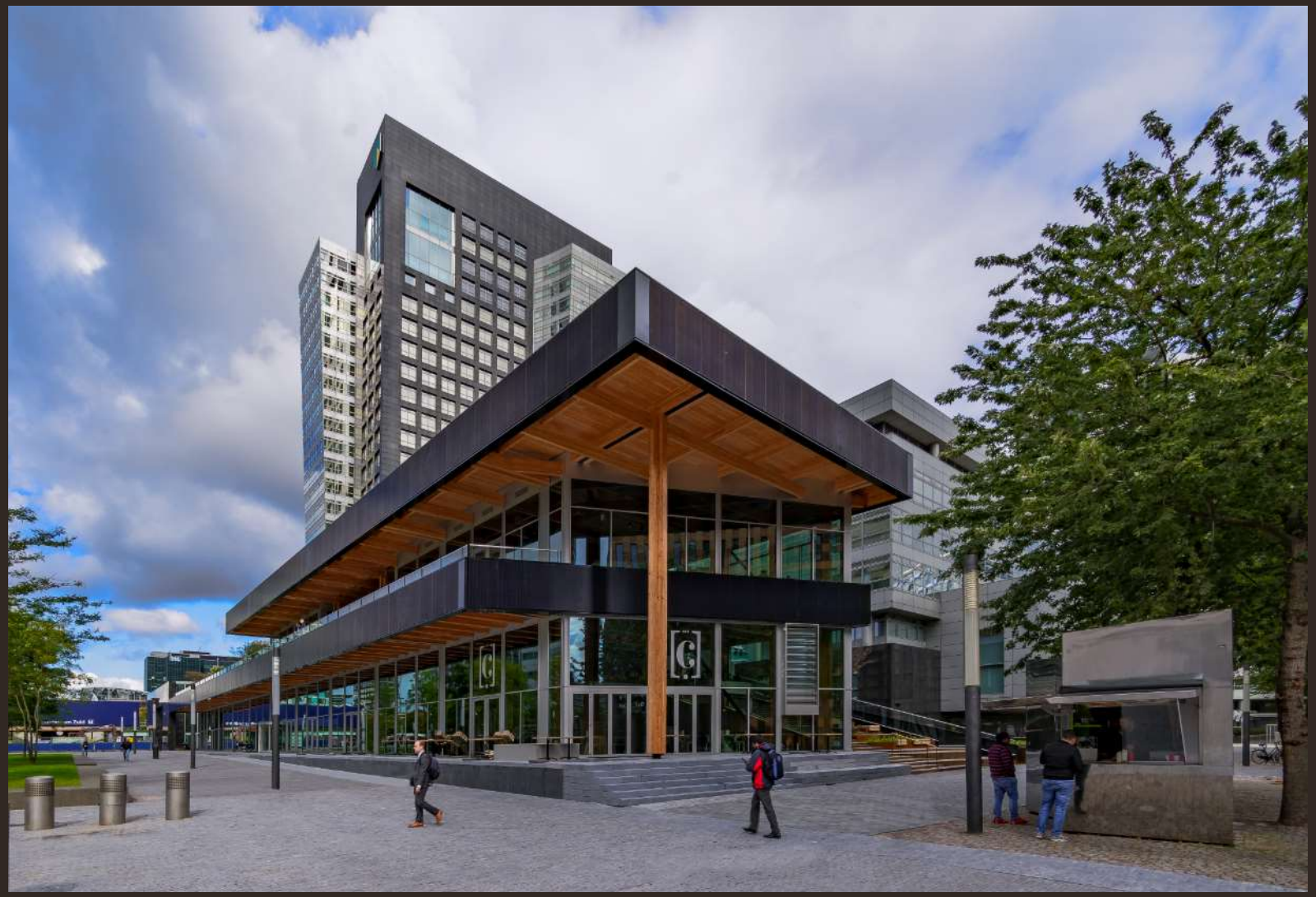

“IS THERE ENOUGH WOOD?”



Photo: Stephen Codrington


“WHERE DO YOU GROW
YOUR CONCRETE AND STEEL?”


Google Earth
Airbus, Vexcel Imaging US, Inc.



CIRCL PAVILION

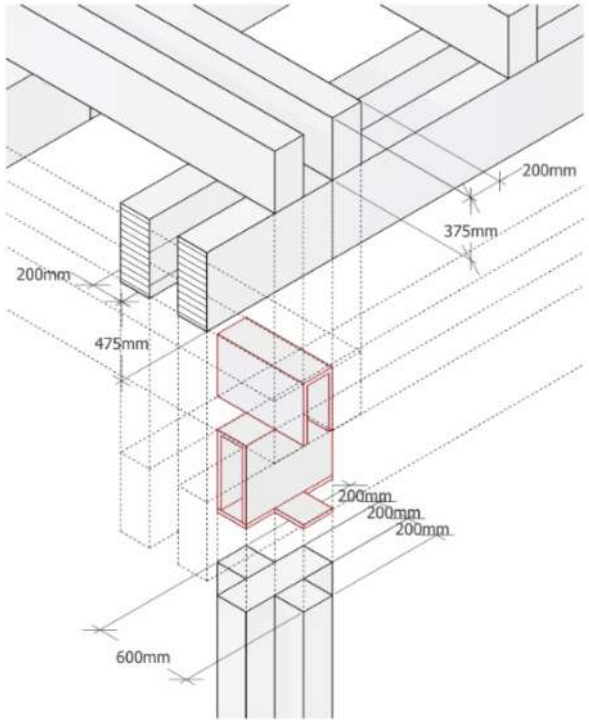
Location
Amsterdam, The Netherlands

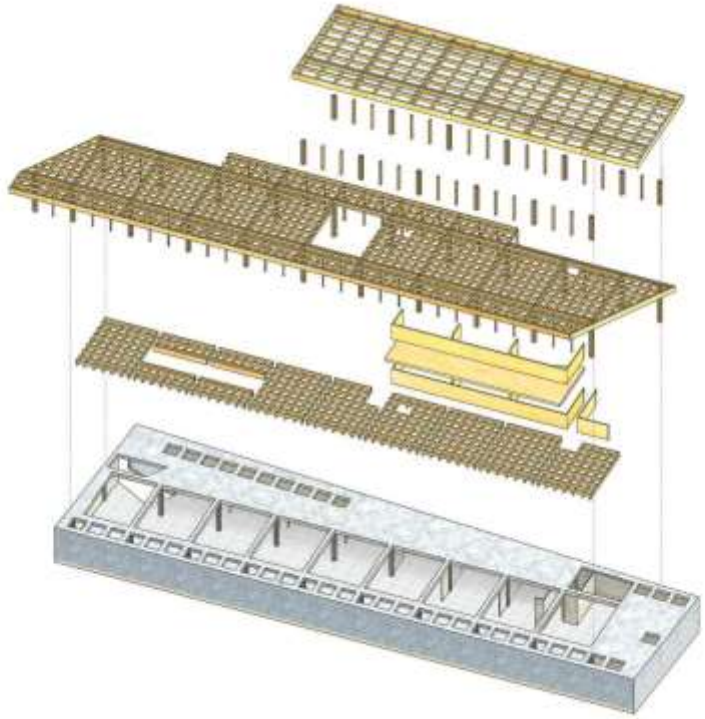
Architect
Architecten Cie

Circularity
Design for dissassembly, oversized glulam beams, high-end re-use of off-cuts, maximum use of circular materials

Photo: DERIX group

CIRCULARITY - DEMOUNTABILITY





Credit: DERIX group





CIRCL PAVILION

Location
Amsterdam, The Netherlands

Architect
Architecten Cie

Circularity
Design for dissassembly, oversized glulam beams, high-end re-use of off-cuts, maximum use of circular materials

Credit: Pablo van der Lugt



Circl Amsterdam I De Architecten cie

Photo: Pablo van der Lugt

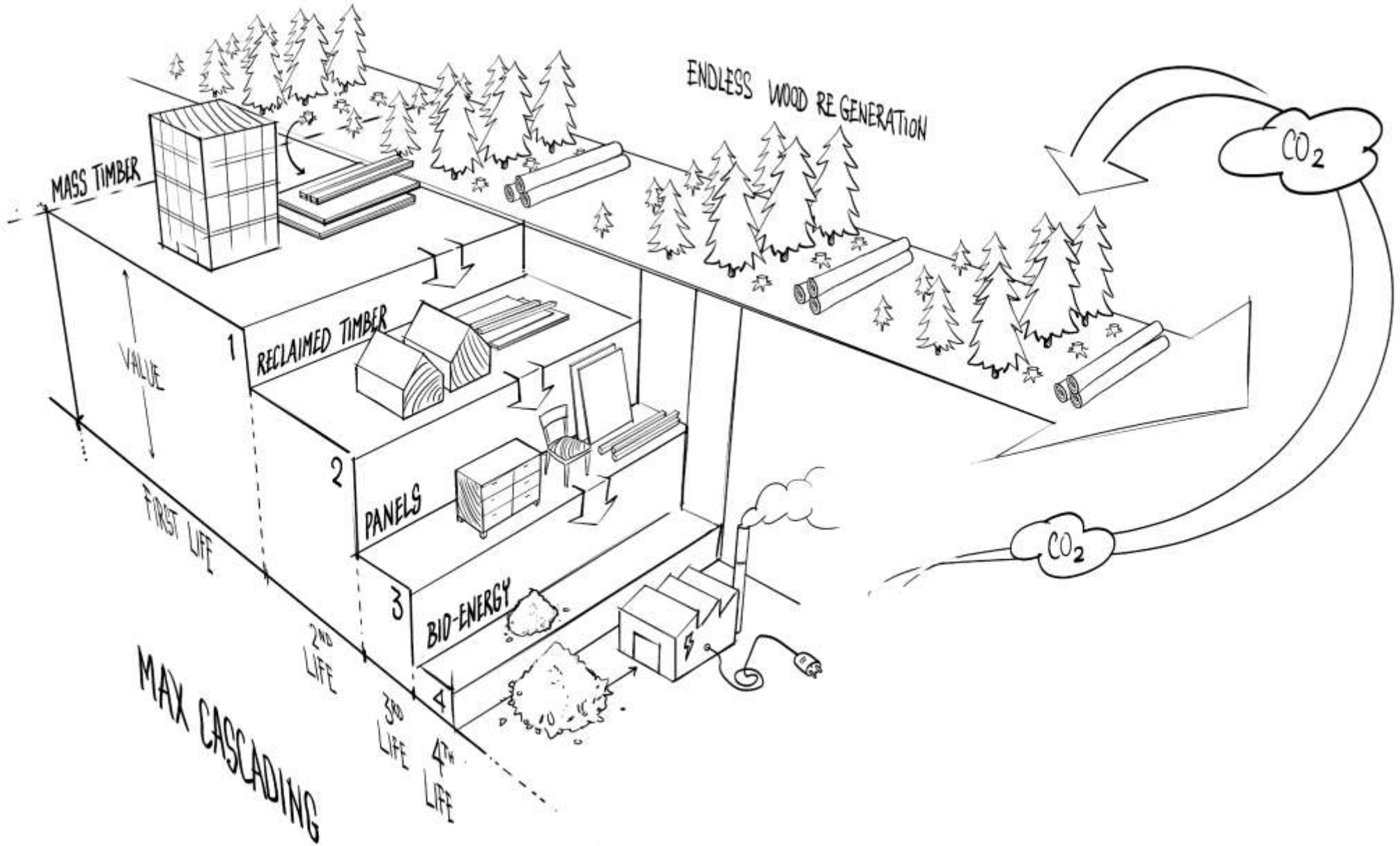






Circl Amsterdam l De Architecten cie

Photo: Lagemaat, Joost Puttenstein



Source: Tomorrow's Timber (MaterialDistrict 2020)

INCREASING EFFICIENCY

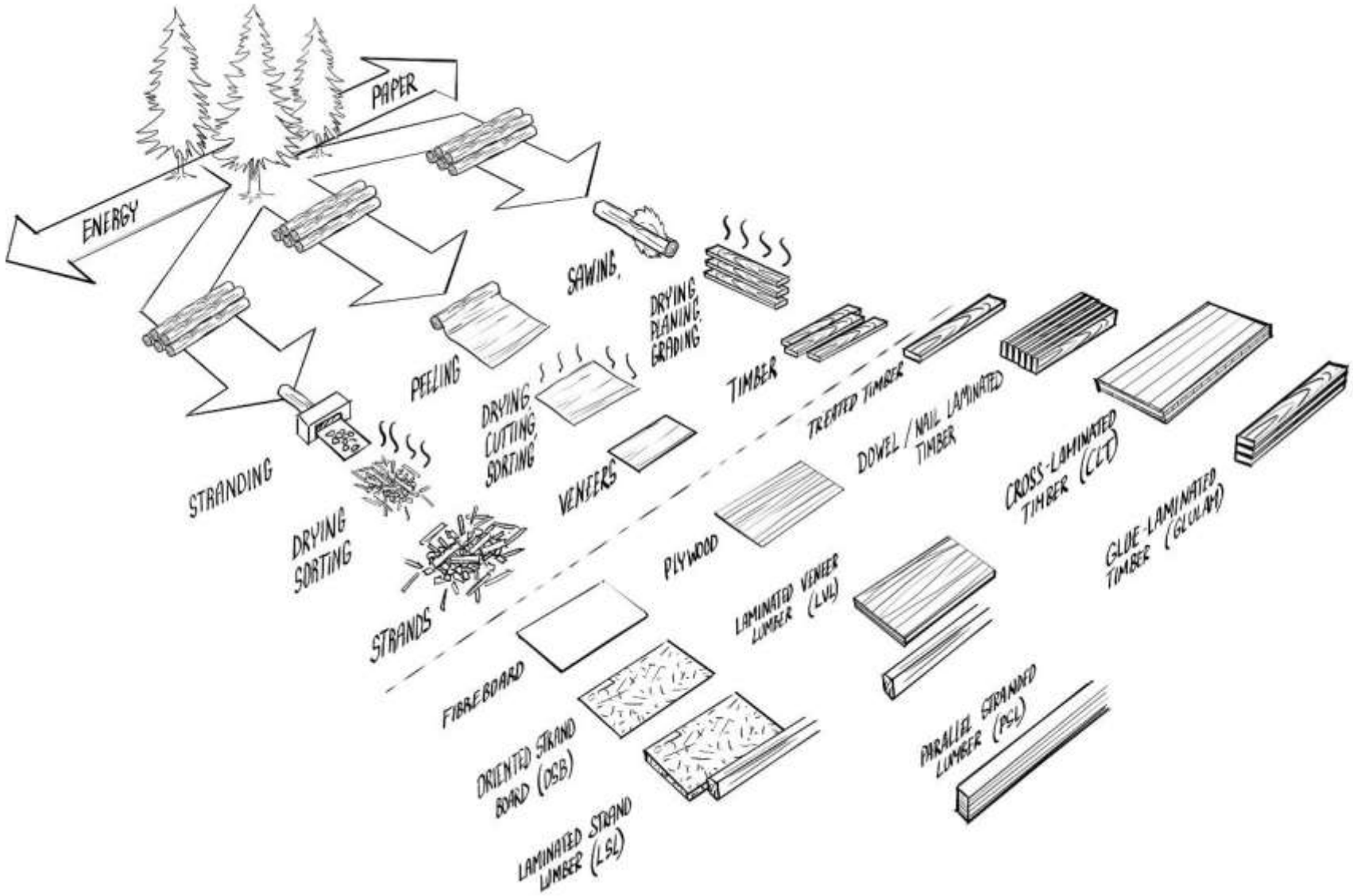


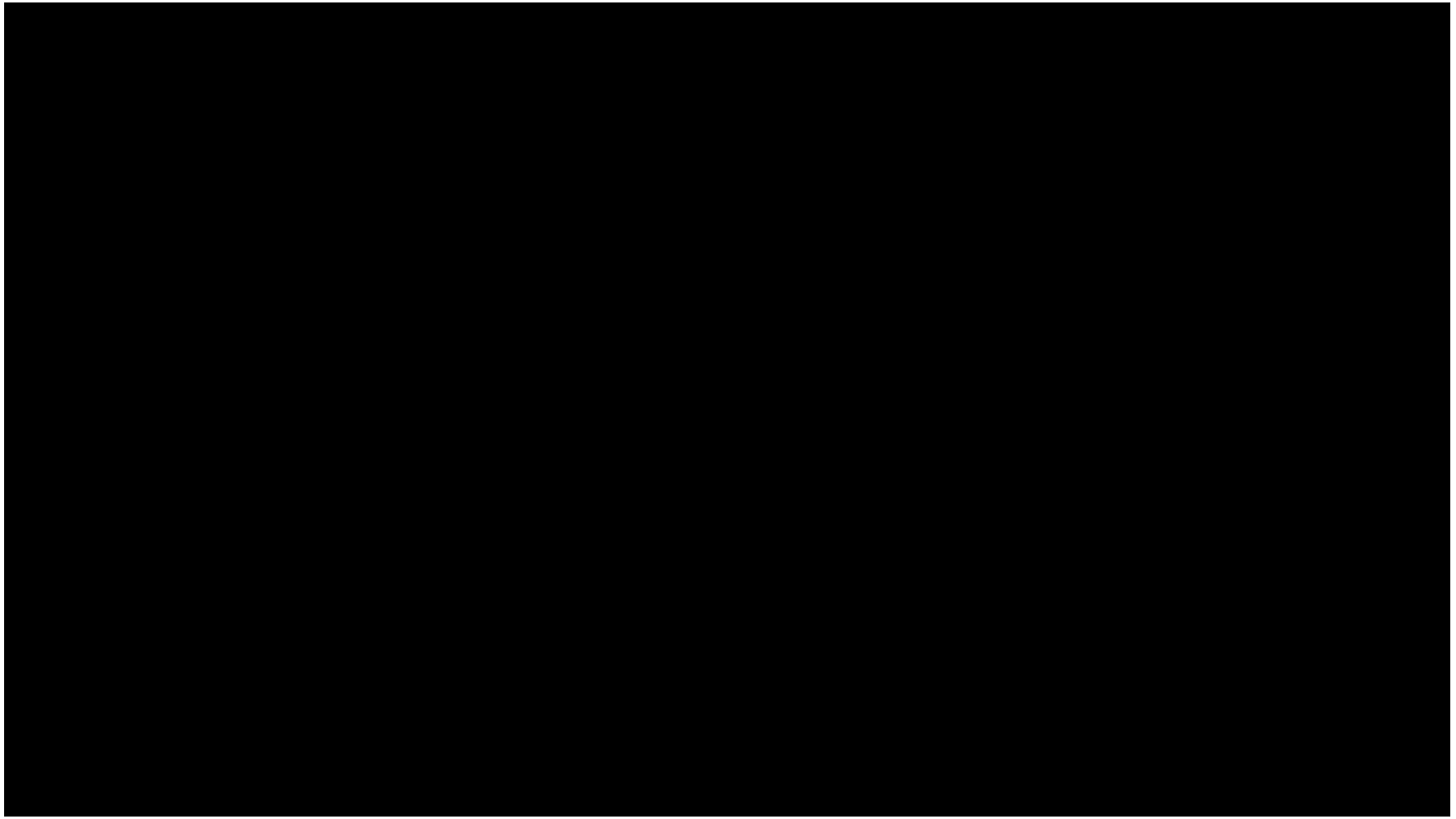






Photo: dataholz.eu

LVL PRODUCTION (KERTO)





BLACK & WHITE BUILDING

Location
London

Architect
Waugh Thistleton

CLT slabs, LVL (beech) post and beam system

Photo: WTA



BLACK & WHITE BUILDING

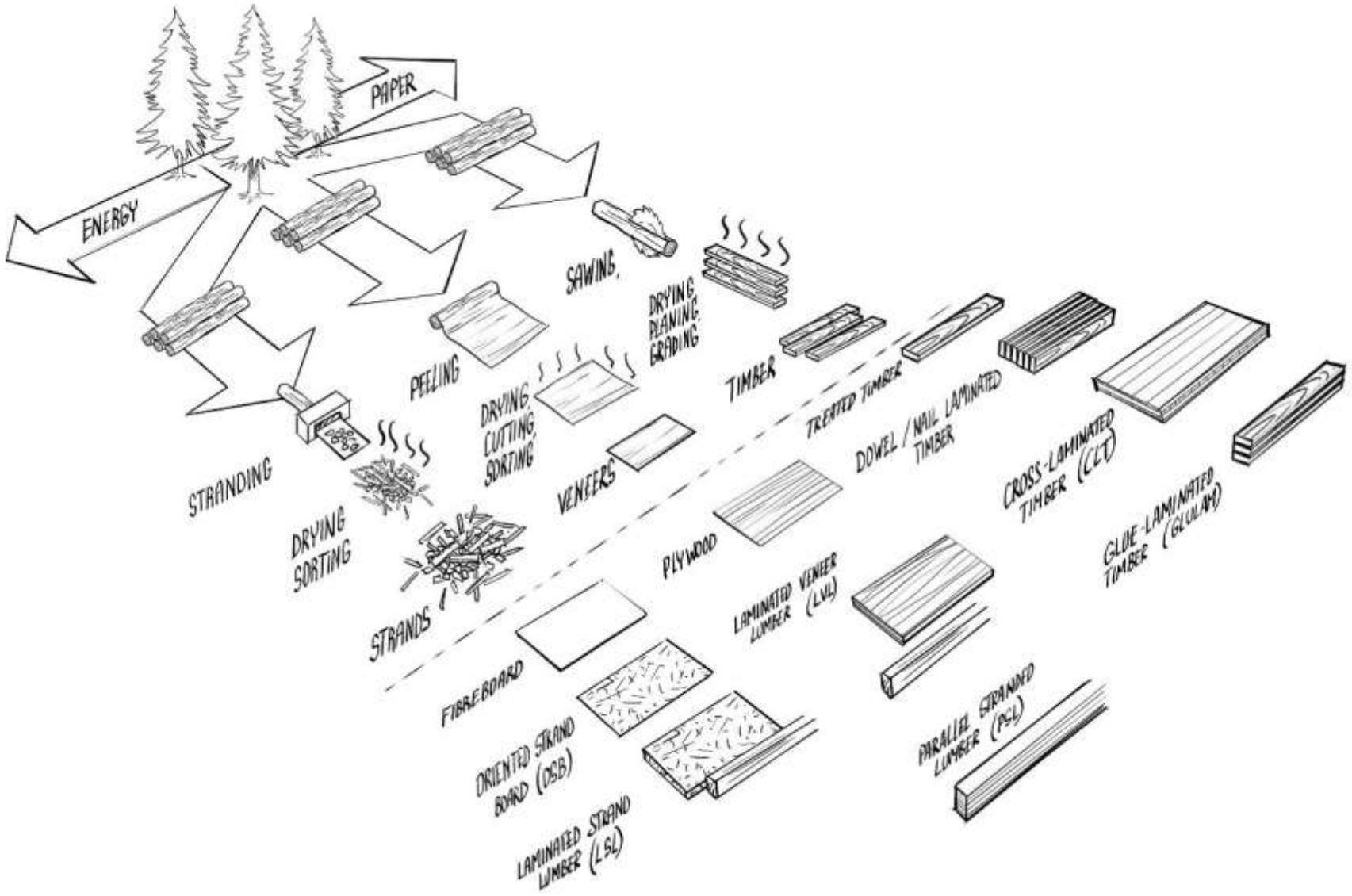
Location
London

Architect
Waugh Thistleton

CLT slabs, LVL (beech) post and beam system

Photo: WTA

INCREASING EFFICIENCY











Ter Wilgen I Astene - België

Credit: van Houtven



Ter Wilgen | Astene - België

Credit: van Houtven

POLITICAL SUPPORT



Credit: Metropolitan Region Amsterdam (MRA)

+ MRA TIMBER MAP 2024













































Haut | Amsterdam, the Netherlands | Team V Architecture

Photo: Jannes Linders



Haut | Amsterdam, the Netherlands | Team V Architecture

Photo: Jannes Linders



Switi | Amsterdam, the Netherlands | HOH architecten

Photo: Marcel van den Burg, Inlay: Max Hart Nibbrig





Photo: MOSO International



Koelmalaan I Alkmaar, the Netherlands I Finch buildings

Credit: Finch Buildings inlay picture: Nick Gammon)



Woningbouw Koemanlaan I Woonwaard, Alkmaar, the Netherlands I Finch

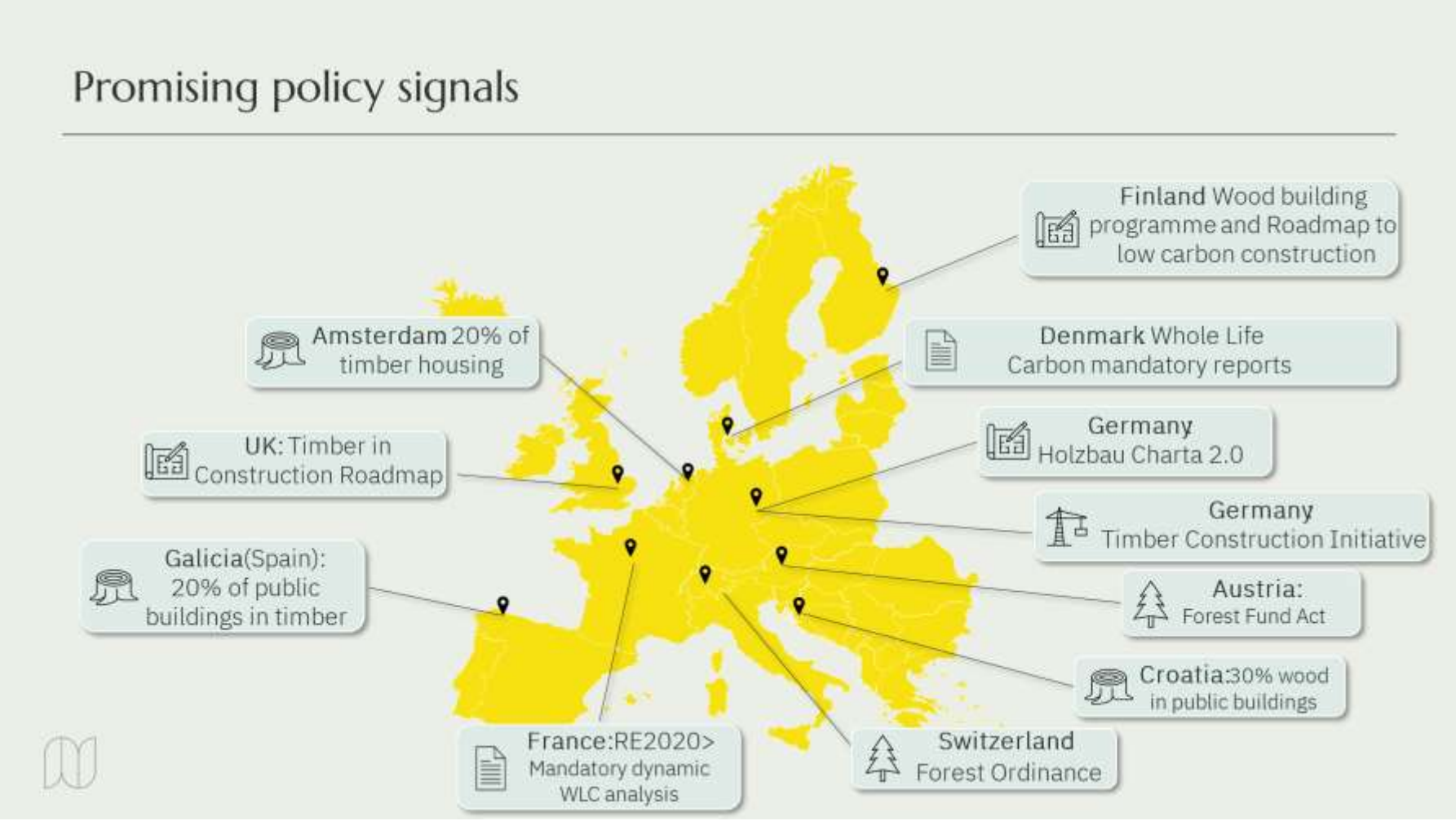
Photo: #



Monnickendam I Finch Buildings

Credit: Finch Buildings

POLITICAL SUPPORT



Credit: Built by Nature



Arboretum (125.000 m2 office) | Nanterre La Defense, France | Architect: Nicolas Laisne, Leclerq associes

Photo: Liebherr, WO2



Arboretum (125.000 m2 office) l Nanterre La Defense, France l Architect: Nicolas Laisne, Leclerq associés

Photo: Liebherr, WO2



Faelledby neighbourhood development Copenhagen I Henning Larsen

Credit: Henning Larsen



Henning Larsen to design Copenhagen's first all timber neighborhood

Envisioned as 40 percent undeveloped nature, the Fælledby community illustrates how new developments can combine sustainable architecture and environmentalist principles to serve people and animals alike.

Faelledby neighbourhood development Copenhagen | Henning Larsen

Credit: Henning Larsen

THE WORLD'S LARGEST WOODEN CITY

In a ground-breaking move, the Swedish urban developer Atrium Ljungberg has initiated Stockholm Wood City - the world's largest urban wooden construction project. The ambitious project is being built in Sickla, which is located in the southern, central parts of Stockholm, and extends over 250,000 square meters. It will offer a vibrant, urban environment with a mix of workplaces, housing, restaurants and shops. Through innovative design, technology and a strong collaborative culture, a new standard is set for sustainable construction.





STOCKHOLM WOOD CITY

Stockholm Wood City extends over 250,000 square meters in Sickla, in the southern parts of Stockholm, and is thus the world's largest known urban construction project in wood. The new area houses additional 7,000 office spaces and 2,000 homes in a vibrant, urban environment. The first sod is planned to be turned in 2025 and the first buildings are expected to be completed in 2027.



Wood City development I Stockholm I White Arkitekter

Credit: White Arkitekter & Atrium Ljungberg



Wood City development I Stockholm I White Arkitekter

Credit: White Arkitekter & Atrium Ljungberg

‘It is the world’s largest urban development project built in wood’

MARIANNE PERSLOW, THE PROJECT'S HEAD OF COMMUNICATION



(Image credit: Atrium Ljungberg)

Wood City development I Stockholm I White Arkitekter

Credit: White Arkitekter & Atrium Ljungberg

BUILDING
IN UNISON WITH NATURE



Faelledby neighbourhood development Copenhagen I Henning Larsen

Credit: Henning Larsen