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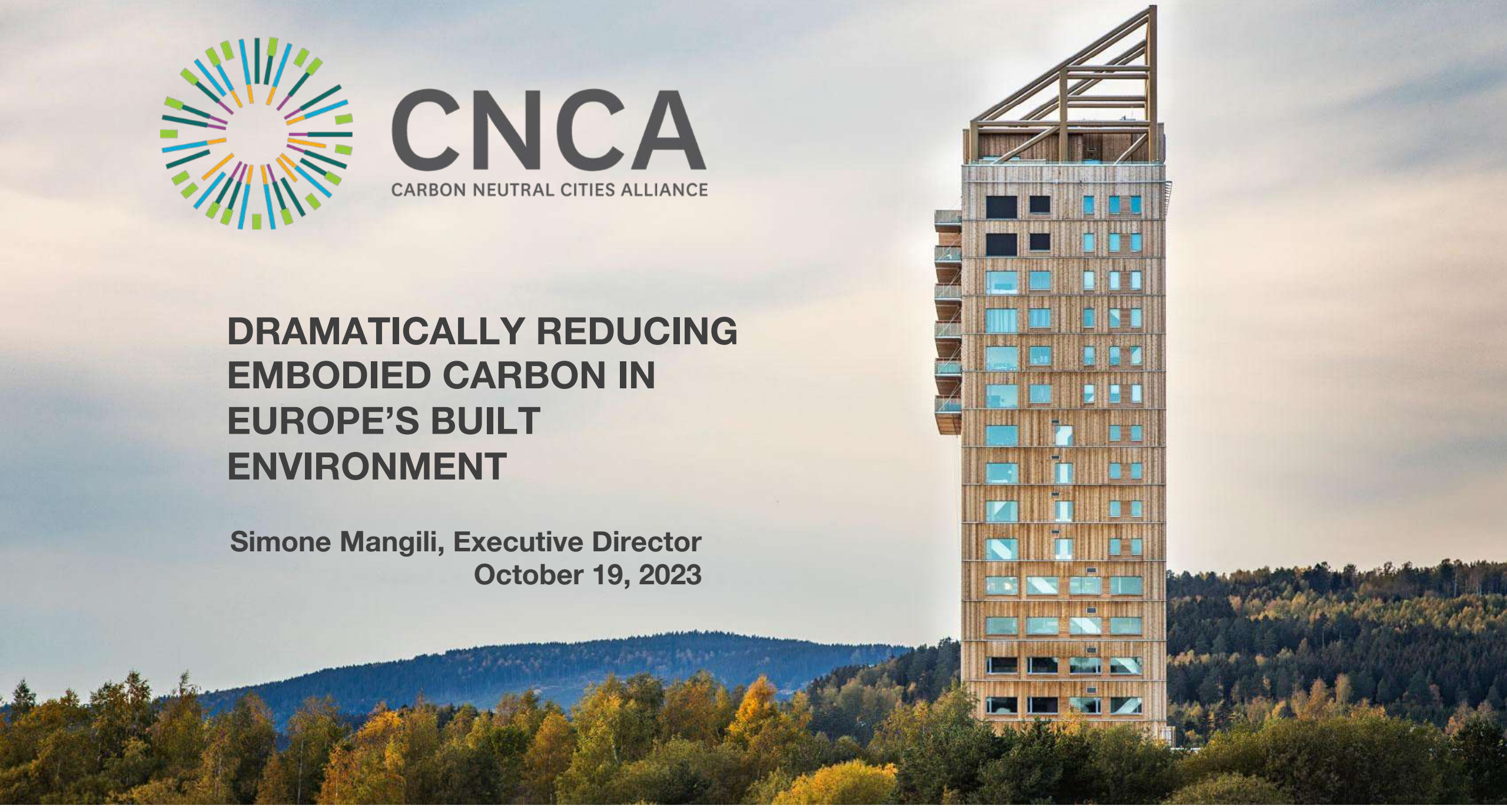
CARBON NEUTRAL CITIES ALLIANCE

DRAMATICALLY REDUCING EMBODIED CARBON IN EUROPE'S BUILT ENVIRONMENT

Simone Mangili, Executive Director

October 19, 2023



Who We Are

An alliance of leading global cities working collaboratively

to achieve carbon neutrality in the next 10-20 years

while demonstrating innovative solutions and policy approaches

to inspire other cities to reach carbon neutrality as quickly as possible

CNCA member cities are globally influential, have demonstrated deep carbon reductions, and are vocal leaders and risk takers

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Adelaide • Amsterdam • Boston • Boulder • Copenhagen • Glasgow • Helsinki
London • Melbourne • Minneapolis • NYC • Oslo • Portland • Rio de Janeiro • San Francisco
Seattle • Stockholm • Sydney • Toronto • Vancouver • Washington, DC • Yokohama

Why CNCA

Climate Leaders of Vanguard Cities Seek the CNCA Community to:

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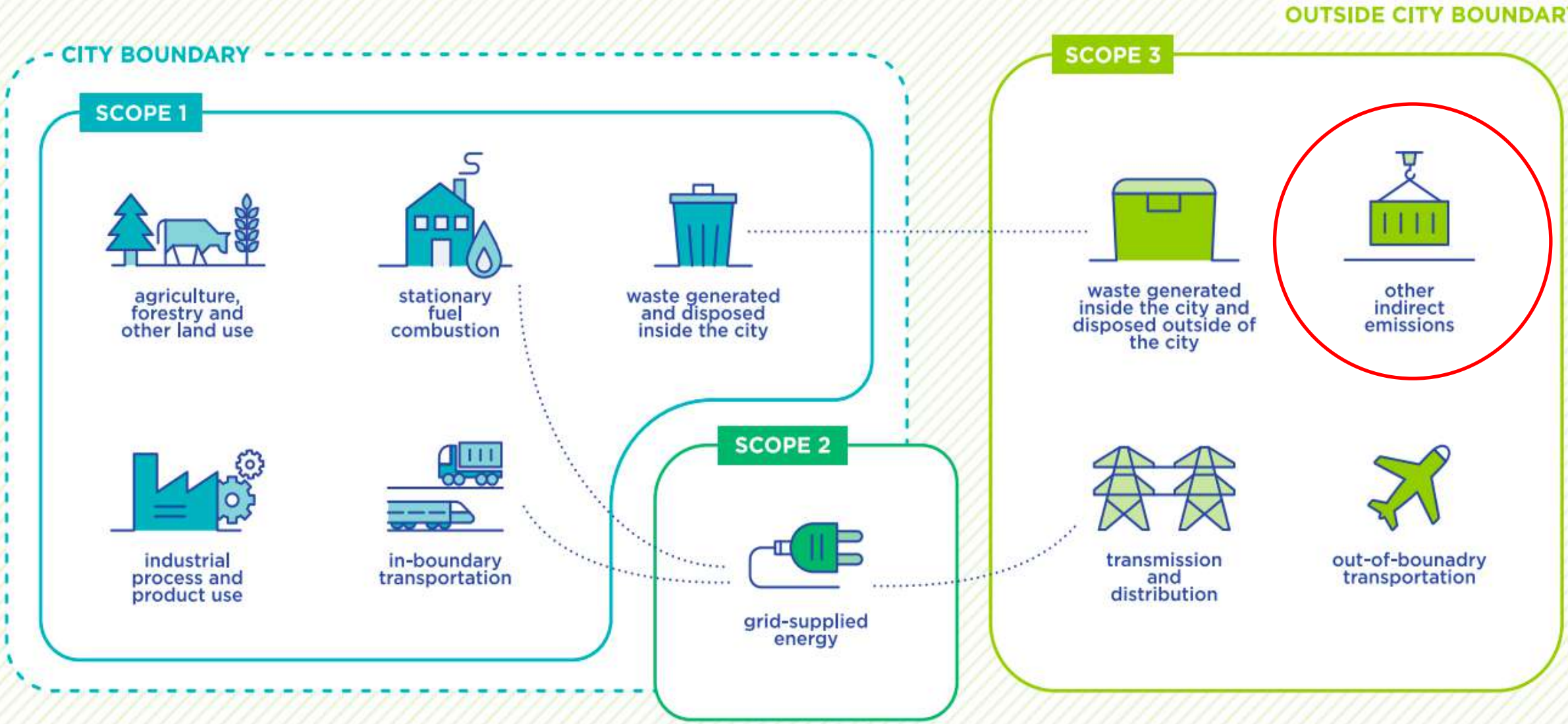
Images: CNCA Meetings + Fund Project by City of Melbourne (Scaling Corporate Renewable PPAs)

What Are Scope 3 Emissions?



https://www.c40knowledgehub.org/s/article/Consumption-based-GHG-emissions-of-C40-cities?language=en_US

45% of global greenhouse gas emissions can be attributed to the production of materials, products, and food, and to land management.

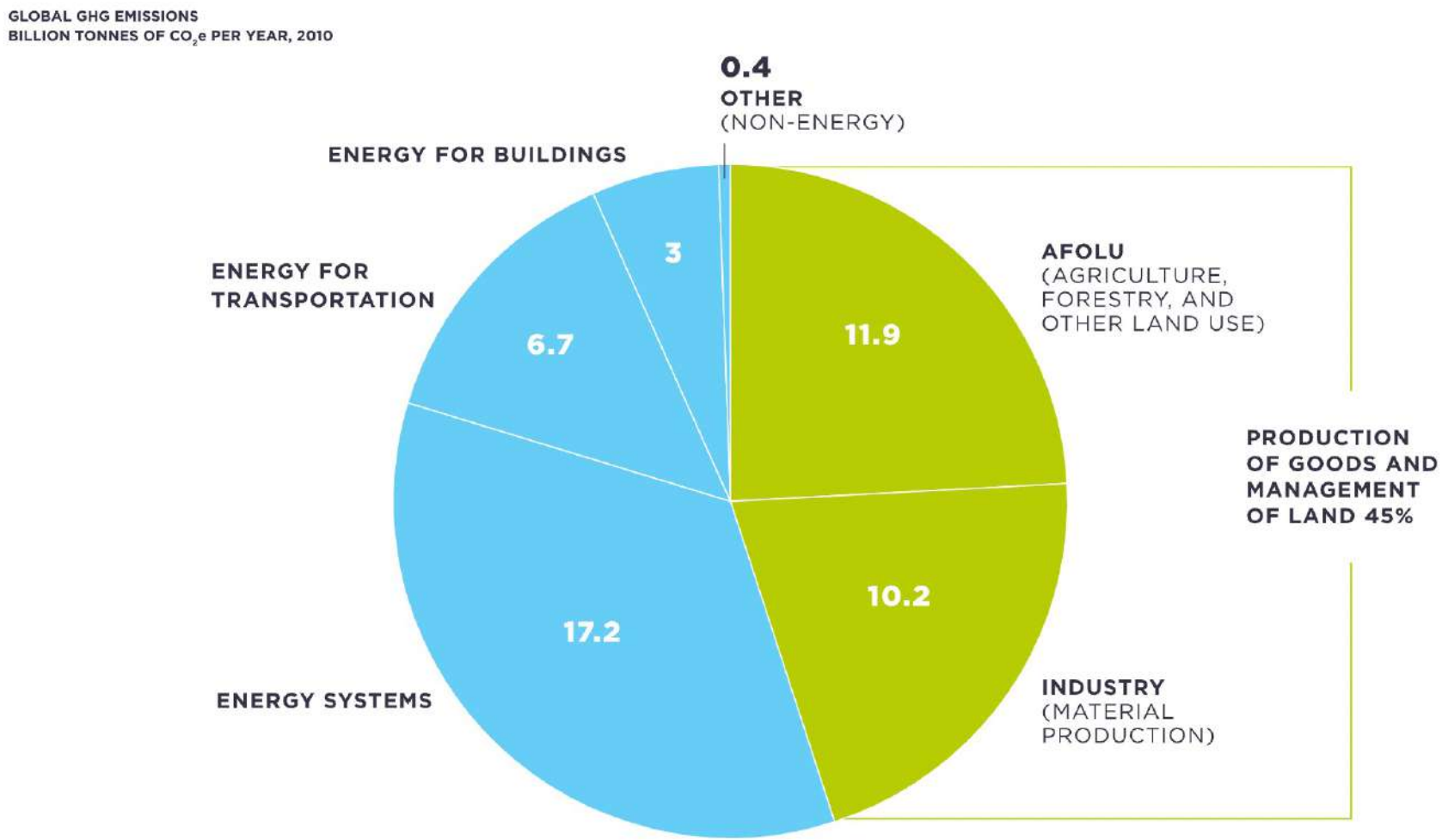


Image source: Ellen MacArthur Foundation, Completing the Picture: How the Circular Economy Tackles Climate Change

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What is Embodied Carbon?

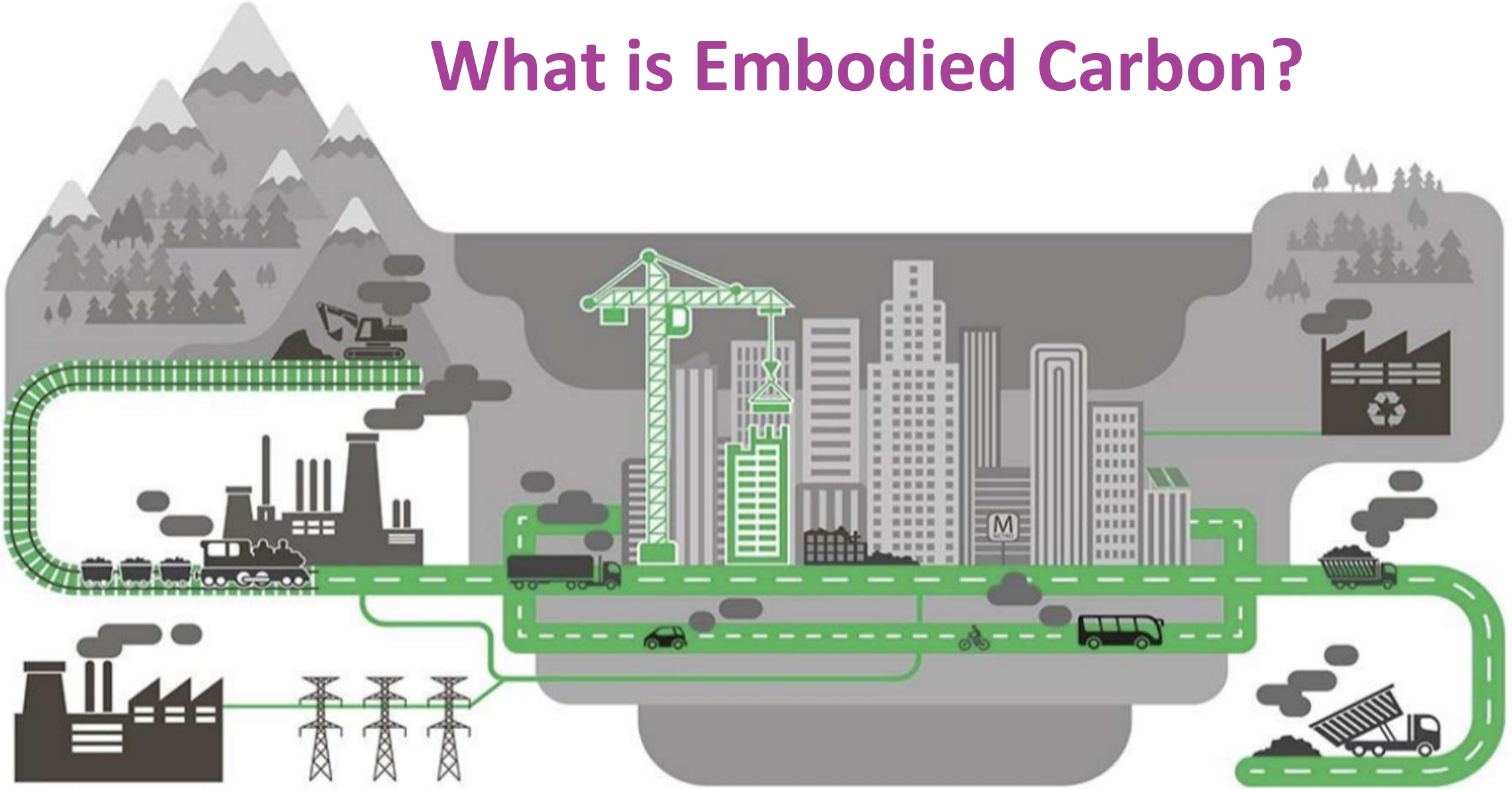

Figure 1: One Click LCA (2020)

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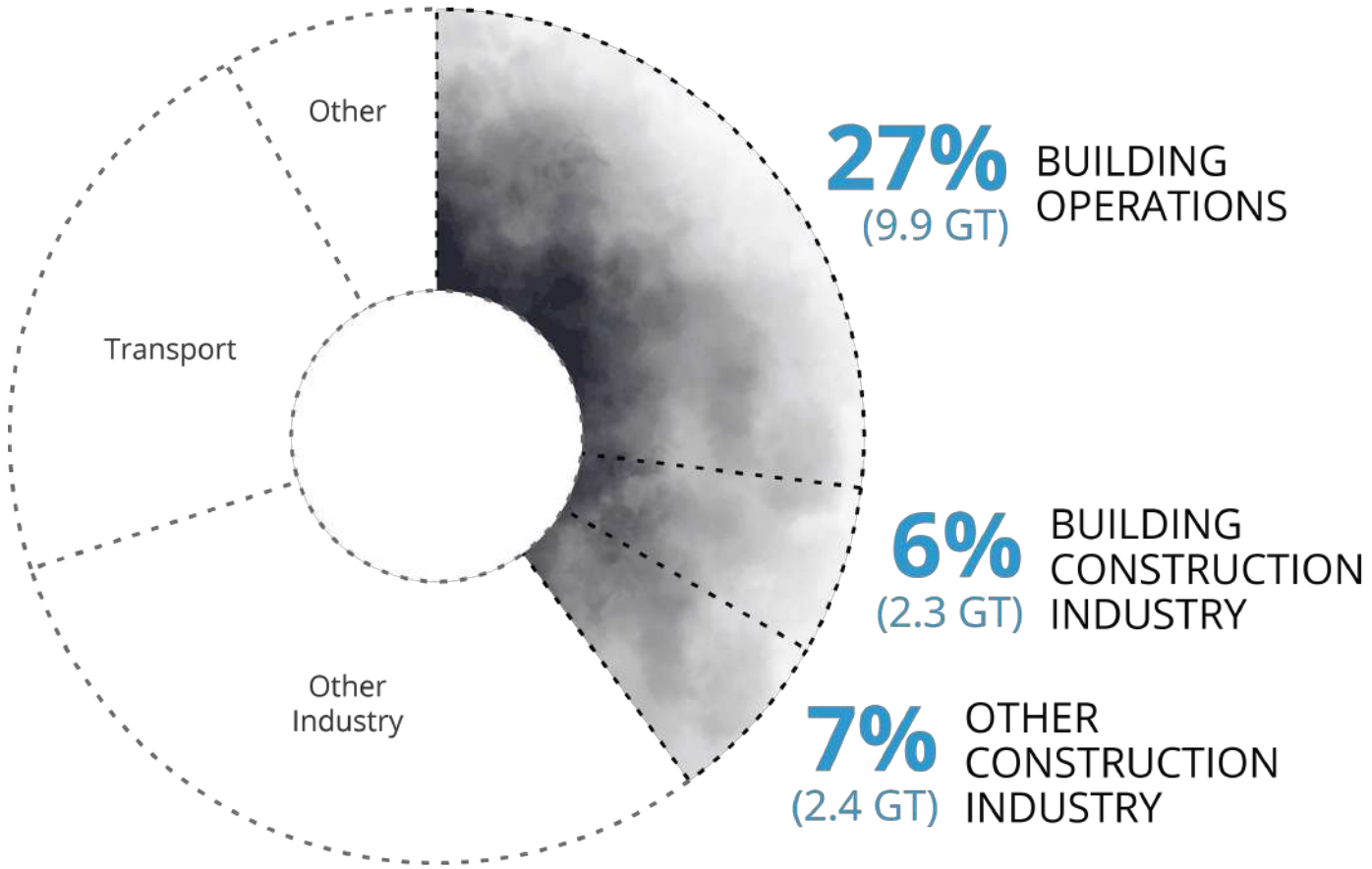

The built environment generates 40% of annual global CO2 emissions.

Of those total emissions, building operations are responsible for 27% annually, while building and infrastructure materials and construction (typically referred to as embodied carbon) are responsible for an additional 13% annually.

Building Construction Industry and Other Construction Industry represent emissions from concrete, steel, and aluminum for buildings and infrastructure respectively.

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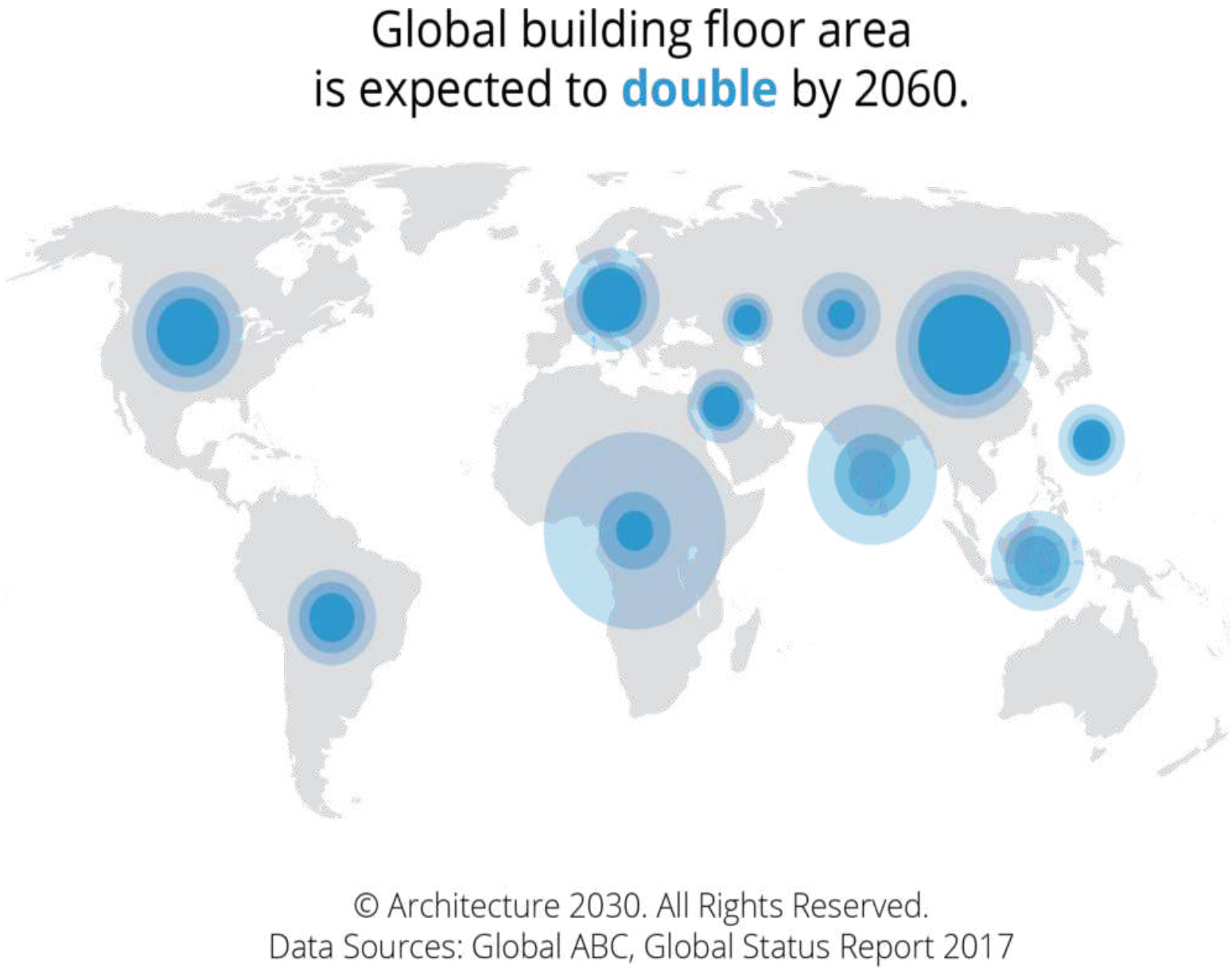

Global building floor area is expected to double by 2060.

To accommodate the largest wave of urban growth in human history, we expect to add 230 billion m^2 of new floor area to the global building stock, **the equivalent of adding an entire New York City to the world, every month, for 40 years.**

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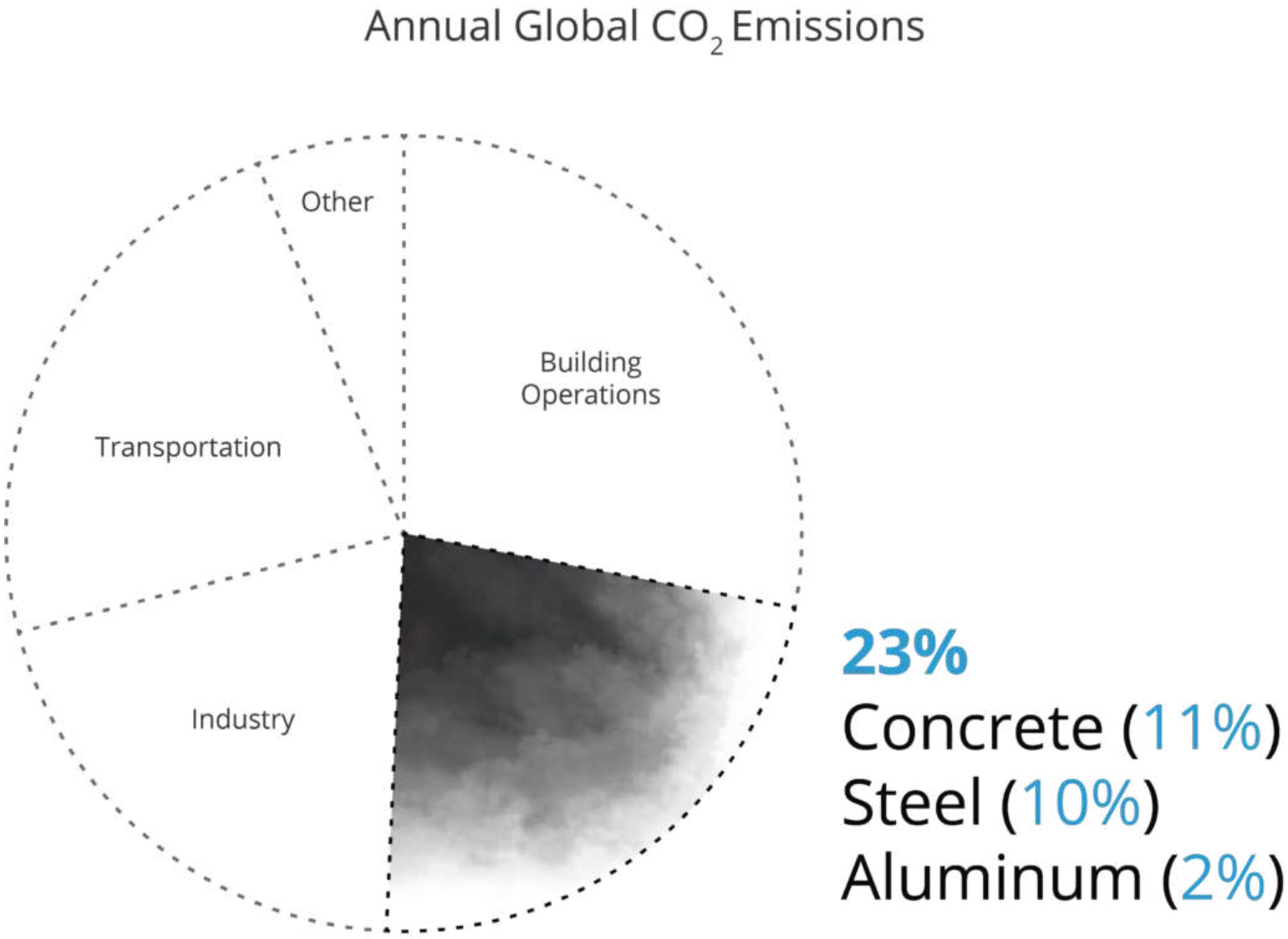

Data Sources: Global ABC Global Status Report 2018, EIA

Just three materials – concrete, steel, and aluminium – are responsible for 23% of total global emissions (most of this used in the built environment).

Opportunity for embodied carbon reduction in these high-impact materials through policy, design, material selection, and specification.

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Why Cities?

Manage and govern an extensive portfolio of buildings

Approve renovation and building permits

Through green public procurement they can influence the private sector

As the closest level of government to citizens, they can support building owners and help match supply and demand for the reuse of

A policy framework for embodied carbon

https://www.embodiedcarbonpolicies.com/

What are the policy tools out there?

How do they rank in terms of emission impact, cost-efficiency and their legal basis?

Gives cities research-based choices

Dramatically reducing embodied carbon in Europe's built environment

The following tables have been developed under the framework of the project "Dramatically Reducing Embodied Carbon in Europe's Built Environment", launched by Carbon Neutral Cities Alliance (CNCA) in 2021 with the support of the Laudes Foundation.

The suggested recommendations result from the technical assessments conducted by One Click LCA throughout 2021/2022 of leading European cities' current laws impacting embodied carbon and bio-based materials and their possible policy paths and actions forward.

The project involves more than 10 European cities and builds on CNCA Embodied Carbon City Policy Framework, published in 2020.

Recommendations

- Zoning and land use
- Building regulation and supervision
- Procurement
- Waste and circularity
- Municipal buildings
- Urban design guidelines

DRAMATICALLY REDUCING EMBODIED CARBON IN EUROPE

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ABOUT THE PROJECT

The Carbon Neutral Cities Alliance's **"Dramatically Reducing Embodied Carbon in Europe"** project aims to foster widespread adoption of ambitious local, national and regional policies that will reduce embodied carbon and increase the uptake of bio-based materials in the built environment in Europe. The project was launched in 2021 with the support of the Laudes Foundation and will run through the end of 2023.

Targeted technical assessments

- Technical Assessments conducted by One Click LCA in 2021-2022
- Working with cities to analyze current policy development initiatives, & regulatory frameworks that impact embodied carbon and bio-based materials
- Delivering policy recommendations and insights to decarbonize cities' built environment

https://carbonneutralcities.org/wp-content/uploads/2022/11/Technical-

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Zoning and land use

covers policies on what can be built where and land sales / leases. Zoning and land use policies are a key instrument for embodied carbon reduction across the entire construction sector.

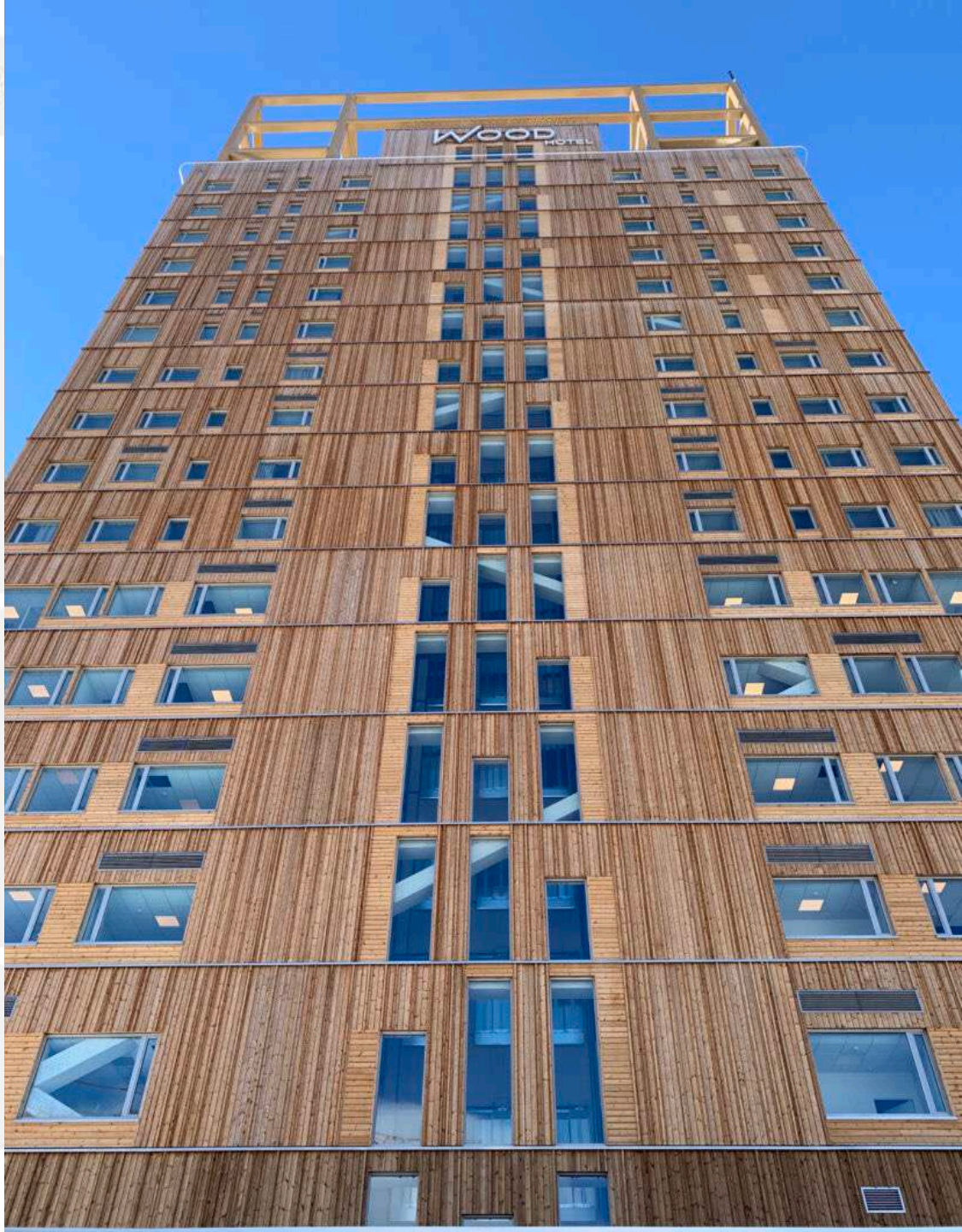
Z POLICIES

- Z1 Embodied carbon targets for zoning process
- Z2 Set zoning requirements for bio-based materials ✓
- Z3 Carbon-scored land sales competitions ✓
- Z4 Parking requirement optimization ✓
- Z5 Apartment size and space efficiency guidelines
- Z6 Prefabricated or modular construction priority
- Z7 Increasing density using existing infrastructure ✓
- Z8 Use low carbon building typologies in zoning
- OTHER Avoidance of piling construction sites during the zoning phase where possible ✓

✓ Recommendation issued

Z2 Set zoning requirements for bio-based materials

RECOMMENDED ACTION	CITIES
Embodied carbon and bio-based materials in strategic plans and policies Due to the future role of climate change and life-cycle emission reductions in the construction sector, the city should also enhance the assessment of all construction related emissions, including material usage along with energy usage into the scope of emissions measured and tracked. The city should also encourage the usage of biobased materials, such as timber, in all construction as well as include biobased materials into urban design guidelines and zoning requirements.	
Embodied carbon and bio-based materials in tendering process Emphasis of embodied carbon and biobased materials in the tendering criteria alongside environmental aspects for all competitions. The usage of biobased materials in constructions, when technically plausible, should be considered in the sub criteria along with emissions from the whole life cycle of materials. Alternatively, the city could set a requirement for the minimum share of biobased materials in new construction. All biobased materials used should be sustainably sourced.	
Use of wood in construction Requiring bio-based materials through zoning (either by requiring sustainable wood in the façade and frame, or by adding a minimum requirement for bio-based products).	



Building regulation and supervision

policies exert influence over all private and public construction, making these policies effective carbon reduction instruments.

R POLICIES

- R1 Life-cycle carbon limits for new buildings
- R2 Low carbon cement and concrete policy
- R3 Material-efficient structural design requirement
- R4 Density bonus for carbon efficiency
- R5 Zero carbon construction sites
- R6 Construction materials efficiency declaration
- R7 Expedited permitting for low carbon projects
- R8 Prohibiting extremely high emitting materials
- R9 Life-cycle carbon calculation and reporting

Recommendation issued

Procurement

policies allow for leveraging the use of taxpayer money towards embodied carbon reduction.

P POLICIES

- P1 Carbon limits for key building materials for city projects ✓
- P2 Green public procurement for public buildings
- P3 Requirement of recycled aggregates
- P4 Low-carbon asphalt procurement
- P5 Require use of certified wood products
- P6 Circular materials purchasing strategy ✓

✓ Recommendation issued

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P1 Carbon limits for key building materials for city projects

RECOMMENDED ACTION	CITIES	INTERLINKED POLICY

EPDs in public works and procurement

EN 15804 / ISO 21930 compliant Environmental product declarations demonstrate the environmental performance of building products. Where sustainability and circularity are considered in cities' documents, requiring third party verified EPDs should be separately noted. Cities should require the following for public procurement, when possible, by governmental regulation:

- For all main building materials, projects shall require suppliers to provide company specific Environmental Product Declarations (EPD) in compliance with EN 15804 / ISO 21930 and ISO 14025.
- The EPDs used must be valid at point of specification and cover the products supplied. Product embodied carbon performance data, including EPDs, shall be recorded and submitted as part of the project documentation.

Product embodied carbon performance data, including EPDs, shall be recorded and submitted as part of the project documentation.

P2 Green public procurement for public buildings

Third party verified EPD

For comparability and reliability of environmental performance, the city should require EPDs used to have a third-party verification, and not only internal verification by the city. EPDs should also be in compliance with EN 15804 / ISO 21930.

Municipal buildings

policies specifically target buildings that are owned and/or operated by the city, which typically account for a small percentage of total citywide building stock.

M POLICIES

- M1 Space use and occupancy efficiency
- M2 Embodied carbon limits for new & leased buildings
- M3 Use carbon as a criterion for design competitions
- M4 Low carbon sites, stabilization and foundations
- M5 Publicize best practices and case study projects
- M6 Renovation vs. knock down and rebuild comparison
- M7 Salvaged, reused or recycled material minimums

OTHER Action plan for embodied carbon

Recommendation issued

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Waste and circularity

policies leverage a city's power to regulate permits and therefore attach requirements on waste handling to different types of projects.

W POLICIES

- W1 Design for disassembly and adaptability criteria ✓
- W2 Mandatory pre-demolition audits and data sharing ✓
- W3 Mandatory material takeback program ✓
- W4 Soil coordination for mass storage and reuse ✓
- W5 Information on adaptability and waste reduction ✓
- W6 Materials longevity policy
- W7 Establish or supported materials reuse facilities
- W8 Carbon or salvaging requirement for demolitions
- W9 Mandatory construction and demolition waste landfill diversion

OTHER Reusing carbon intensive elements (such as foundations) in demolition – new construction projects ✓

✓ Recommendation issued

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Most recommended policies

Bio-based materials

- Promote the usage of biobased materials in public space projects whenever technically and aesthetically viable
- Prioritize the use of wood as the predominant frame and façade material
- Include biobased materials into strategic plans
- Set zoning requirements for bio-based materials
- Include biobased materials in standard construction requirements
- Encouraging the use of timber in all city-owned projects

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Communicating the Importance of

Embodied Carbon and Bio-based Materials

in the Built Environment

Factsheets

CNCA

Laudes Foundation

Communicating the Importance of

Embodied Carbon and Bio-based Materials

in the Built Environment

Q&A

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Laudes Foundation

Bio-based materials

What are bio-based materials and how are they used in construction?

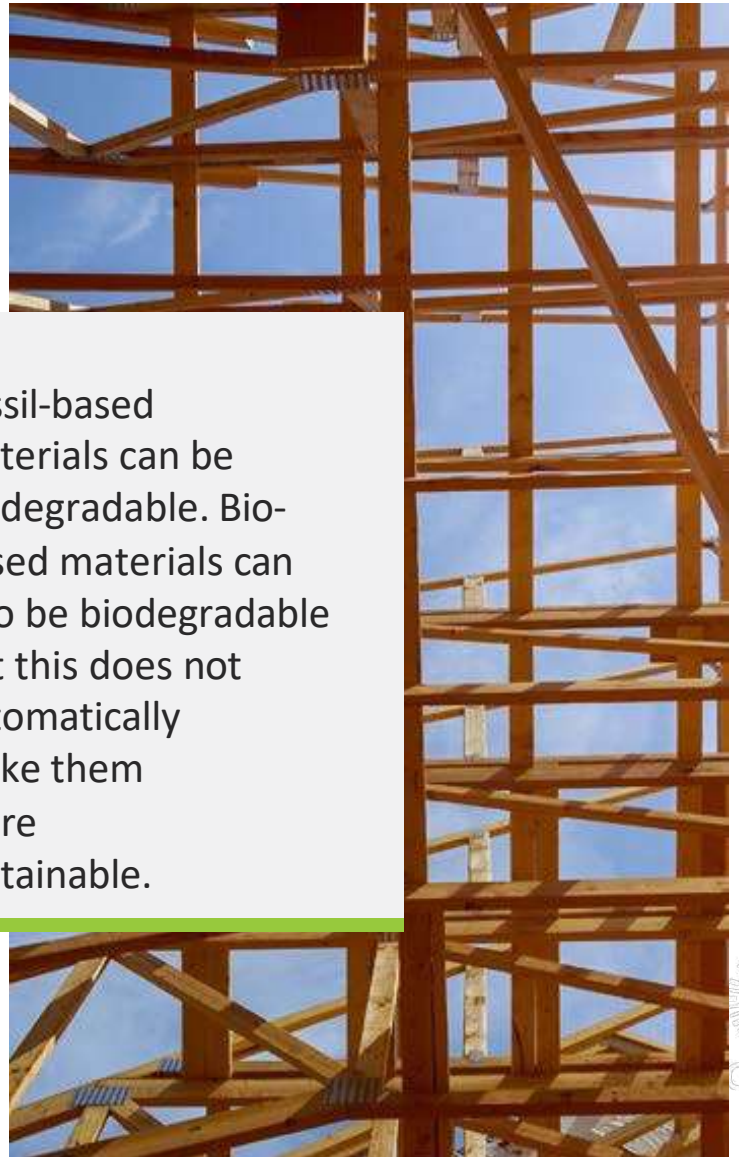
Simply put, bio-based materials are made from biological matter. They are renewable materials whose main constituents are originally derived from living organisms – which may be natural or synthesised – and exist in nature.

Bio-based materials can potentially be used in a range of building materials, such as bricks, wool insulation and plaster. Sustainably-sourced wood is increasingly touted as a lighter, easier-to-handle, more environmentally-friendly and safer alternative to concrete and steel, which is also durable. While metal and concrete absorb, emit and reflect heat, warming cities, wood does not.

Does bio-based also mean biodegradable?

No. Biodegradability occurs when organic matter is given the right conditions – in presence of microorganisms, fungi, or bacteria – to break back down to its basic components. Fossil-based materials can be biodegradable.

Bio-based materials can also be biodegradable but this does not automatically make them more sustainable. Biodegradable materials of all types can lead to unsustainable processes like releasing damaging chemicals, taking many years to break down.



Fossil-based materials can be biodegradable. Bio-based materials can also be biodegradable but this does not automatically make them more sustainable.

Are bio-based materials always more sustainable?

As bio-based materials use renewable feedstock, it is likely that overall carbon emissions will be reduced against fossil fuel alternatives. Waste can be minimised, and handling expenses will decrease compared to traditional chemicals.

Bio-based materials are also a way to boost business opportunities in cities looking for a green, post-pandemic recovery – and create a global business model with a local value chain. The EU bioeconomy sector employs around 22 million people and its annual turnover is €2 trillion.

However, bio-based materials are not automatically more sustainable or circular. For example, despite higher carbon emissions emitted during production, the recycling and upcycling value chain needs to be considered in the round when considering the overall carbon footprint of bio-based materials against polymers. – so may have an overall lower carbon footprint. Therefore, it is important to consider and address issues such as resources, feedstock, energy use and recycling when discussing bio-based materials. Encouraging more LCAs is likely to make bio-based materials a more attractive solution for the construction sector.

How does industry view bio-based materials?

While brands are increasingly setting targets for bio-based procurement and products – and cite consumer demand and public image as driving uptake – many require more information on barriers to adoption, such as pricing, availability and performance.

Again, it is important to openly consider and address these issues when discussing bio-based materials. It is also important to keep in mind that all carbon-intensive industries will increasingly be affected by climate regulation and fossil-based materials will become increasingly expensive.

Why are cities choosing to focus on bio-based materials in construction?

Under the right conditions, bio-based materials are the most sustainable option, helping the construction sector reduce embodied carbon and helping cities to reach Net Zero by 2050.

As urban planning changes to accommodate new ways of life and post- pandemic realities, bio-based construction materials are an opportunity to stimulate more sustainable procurement and create greener, local jobs using renewable feedstock.

BIO-BASED AND CIRCULAR BUILDINGS FOR HEALTHY, CLEAN CITIES

A Handbook to help cities reduce embodied carbon in construction

Healthy, Clean Cities
EU CINCO - **EU**ropean **CI**ties for climate-**N**eutral **CO**nstruction

July 2022

CNCA


Discussing
Timber
Myths:
a dialogue between
our ambitions
and the facts
Design: SeARCH
Picture: Lior Teitler for Moso International
BUILT
BY NATURE
AMS

INTRODUCTION

HOW TO READ

BUILDING QUALITY & PERFORMANCE

M1: timber buildings are unsafe and weak

M2: timber buildings do not last long

M3: timber buildings are not fire safe

M4: timber buildings have poor acoustics

M5: timber buildings look like log cabins

ENVIRONMENT & CLIMATE

M6: harvesting and processing make the forestry and timber sector a huge carbon emitter

M7: timber buildings are incinerated at the end of their life

M8: the glue used in mass timber negates its environmental benefits

FORESTRY & WOOD AVAILABILITY

M9: building more in timber destroys forests worldwide

M10: it is always better to leave forests alone

M11: there is not enough wood in the European forests to meet housing demand

ECONOMICS

M12: timber is always more expensive than traditional construction

NEXT STEPS

BUILT BY NATURE

Laudes Foundation

Bauhaus der Erde

CNCA

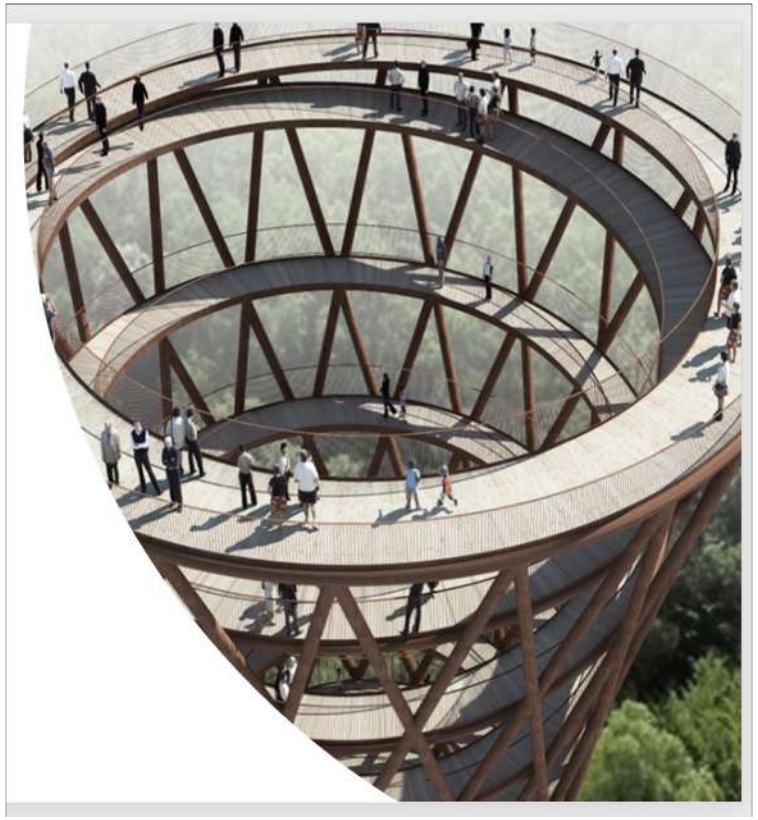
CENTRE FOR NATURAL MATERIAL INNOVATION

Cities4Forests

eit Climate-KIC

Co-funded by the European Union

CNCA & ARUP partner to develop carbon neutral buildings handbook for cities



- Designed as an interactive tool that urban policymakers & planners can tailor to specific building projects
- Offers cities a practical approach to reduce CO2 emissions through low carbon construction
- Visualizes processes for evolving procurement to accelerate use of bio-based building materials
- Provides general and location-specific guidance on the procuring biobased & low-carbon building material

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Timber

Structure and Envelop

ARUP

Description

Structural timber refers to timber that is strength graded for construction use. The classification system gives reasonable predictions of the structural performance of the individual piece of timber, ensuring it can withstand the highest anticipated load. In general across Europe, the grading is regulated by Building Standards, in accordance with EN 14081. Structural timber can be either sawn directly from logs, or it can be processed into Engineered Timber.

Engineered Timber is another form of structural timber. A broad term, it can refer to timber processed to make use of waste, or to timber processed to improve the performance of the construction product. Commonly used engineered timbers are: Engineered Joists, Cross Laminated Timber (CLT), Glue Laminate Timber (Glulam), Structurally Insulated Panels (SIPS) and the innovative new Dowel Laminated Timber (DLT).

It is important to highlight that timber based products are also widely used as cladding material as well as lining.

Technical Performance

EN 1995 contains the mechanical resistance, serviceability, durability and fire resistance of timber structures.

The carbon assessment of timber is highly sensitive to sourcing, as well as, the recorded energy mix and energy use during production. Refer to the IStructE's guide for "Mass timber embodied carbon factors". Considerations of the processing and transportation of structural timber products is necessary in order to calculate an accurate GWP.

Healthy & Safe

Timber is intrinsically a healthy and safe material however it may be subjected to processes where additives are added.

Engineered timber products such as CLT and Glulam, for example, contain adhesives such as Polyurethane, two-part thermosetting adhesives or single pack adhesives. Adhesives such as PRF, MUF or MF contain added formaldehyde which is a known carcinogen which is also toxic, and causes skin and eye damage. Production methods have greatly reduced formaldehyde emissions and these can be reduced further by selecting no added formaldehyde products, however this can affect the performance (as formaldehyde-based adhesives are typically the most durable, moisture and heat resistant).

Similarly, additional sealants, intumescent paint or varnish or chemical treatments may be specified in order to improve fire and/or moisture resistance of timber elements Compliance with COSHH, REACH, ECHA, as well as local building regulations should be checked for individual products.

Responsible Sourcing

The wood used in engineered timber products comes from trees grown in forests worldwide. Re-growing these trees and maintaining ecological systems is essential to mitigate the impacts of climate change. Understanding how our forests can be maintained and restored to become sustainable sources of wood requires intricate knowledge on the wider carbon cycles and the importance of biodiversity.

On a global scale, forests are key in managing and maintaining the earth's carbon balance as they act as one of the world's largest carbon sinks by storing carbon in soil long-term . If managed correctly, harvesting improves the carbon balance of forests in the long run .

In Europe, almost all timber is grown sustainably; however, there are two global certification schemes (FSC and PEFC) which ensure supplies are from sustainably managed forests . Being conscious about where timber is harvested from plays a significant role in creating carbon stores and lowering greenhouse gas emissions. The ability to protect and restore these forests lies within the

Village Walk Mall © Arup

Circularity

At the of its end-of-life timber products can be reused, processed into other products such as panel boards or animal bedding or used as biomass fuel (which returns the sequestered carbon back to the atmosphere). However surface treatments (paints and varnishes) and other chemical treatments (for preservation or fire performance) may impact the ability for timber products to be recycled.

Scale of Production

SMALL — MEDIUM — HIGH

Bamboo

Structure and Envelop

ARUP

Description

More than 1,600 bamboo species have been identified worldwide, but only a few possess the characteristics that make them compatible for construction. Moso, Asper and Guadua are the most common.

Bamboo as a structural element can be used directly from bamboo culms or processed into Structural Engineered Bamboo (SEB). Natural bamboo is vulnerable to insects, fungi and ultraviolet radiation, hence it usually requires additional chemical treatments in order to improve durability.

SEB products improve the performance of the building product. Laminated bamboo is produced from flat bamboo strips, which are laid horizontally or vertically and adhesively fixed together, producing base material for different applications. The density and strength of laminated bamboo can be compared to that of laminated timber products, however, they are likely to consume more energy due to the higher amount of processing, waste and adhesives required.

Technical Performance

Like trees, different bamboo species have different structural and mechanical properties. For example, some have large, straight culms, while others are smaller and more flexible. In addition, there are other conditions in bamboo growth that can affect the mechanical properties of bamboo within a species, such as climate, altitude and soil. Tropical bamboos tend to be taller and larger than temperate bamboos and have thicker walls, which usually translates into better structural and mechanical properties. ISO 22156 contains the requirements for mechanical resistance, serviceability and durability of bamboo structures.

The embodied carbon of bamboo is highly dependent on whether energy is required for drying the bamboo or heating up the treatment liquid. Furthermore given the locations bamboo grows embodied carbon associated to transportation may dominate the total global warming potential. Considerations of the processing

Healthy & Safe

Bamboo is inherently a healthy and safe material, but to improve its properties it can be subjected to processes in which chemical additives are added.

Chemical treatments containing boron or copper based chemicals may be specified to improve the fire and/or moisture resistance of these timber elements. Furthermore, through the incorporation of varnishes or during the manufacture of bamboo laminate products containing formaldehydes or other harmful compounds may be added to the product. Compliance with COSHH, REACH, ECHA and local building regulations must be checked for each product.

Responsible Sourcing

Bamboo is a rapidly self-generating crop: it grows fast, and when well managed it can be harvested without the need to replant. Bamboo grows in a “belt” running through tropical, subtropical and temperate climates around the globe, and up to 3500m altitude. Depending on the species, bamboo can be ready for harvesting in less than 10 years. It has a higher yield per hectare and greater resilience than traditional timber resources.

When suitably managed, bamboo plantations may aid restabilising eroded landscapes, enhancing soil health and preventing erosion. However, special care must be taken with bamboo plantations and their relationship with ecosystems as some species can become invasive if not strictly controlled.

Similarly to timber, it is maintaining ecological systems around these crops to mitigate the impacts of climate change. Products with FSC certification or similar should be sought to ensure supplies are from sustainably managed plantations.

Circularity

Bamboo cannot realistically be recycled, but it can be reused, for example, for building something else.

SEB elements can be reused, transformed into other products such as fibreboard, particleboard, flooring, furniture or used as biomass

© Laminated Bamboo by ReNüTeq

At the end of its useful life, depending on the preservatives used, it can be burnt as a biofuel or safely buried and composted. This is the case for boron treateated bamboo however, bamboo treated with copper-based chemicals is more difficult to safely dispose of, should not be burnt, and generally should be buried.

Any residual solution from the boron treatment can be safely diluted down and used as a fertiliser. However, overuse or simply dumping into rivers can have detrimental impacts such as eutrophication of rivers.

Scale of Production

SMALL — MEDIUM — HIGH

Wood fibre insulation

Thermal insulation

ARUP

Description

Wood fibre insulation, derived from discarded coniferous and deciduous wood. Products can be either rigid or flexible. The insulation is produced using residual wood and non-sawable thinnings obtained during the manufacturing of construction-grade timber. Wood fibre insulation can be used to insulate walls, floors and roofs. In general, wood fibre insulation is moisture-resistant and not prone to pests, fungi, and decay. Additionally, it can be treated to repel water, making it suitable to be placed below rainscreen cladding.

Technical Performance

Technical performance data for the Flex 036 insulation by STEICO is provided below to illustrate the achievable properties of wood fibre insulation.

THICKNESS: 40mm ≤ thickness ≤ 200mm
BULK DENSITY: 60 kg/m³

REACTION TO FIRE: E (EN 13501-1)
FIRE RESISTANCE: NOT AVAILABLE

THERMAL CONDUCTIVITY λ: 0,036 W/mK
THERMAL RESISTANCE R_D: 1.1 - 5.55 m²K/W (depending on thickness)

GWP: -84 kg CO2-eq/m³
BIOGENIC CARBON: NOT AVAILABLE

Healthy & Safe

Wood fibre panels can be made both with or without the use of additional binders, depending on the processing technique used. Wood fibre insulation products, may contain binding agents or fire retardant that emit formaldehyde and VOCs. Compliance with COSHH, REACH, ECHA, as well as local building regulations should be checked for individual products.

Responsible Sourcing

Wood fibre insulation is typically made from waste wood obtained from forestry and lumber operations. The wood used in wood fibre insulation is primarily derived from non-sawable thinning's, sawmill residues, and forest residues, such as branches and tree tops, that are typically left behind after the harvesting of timber.

There are two global certification schemes (FSC and PEFC) which ensure supplies are from sustainably managed forests. Even though wood fibre insulation is made from waste products of the timber industry, being conscious about where timber is harvested from plays a significant role in creating carbon stores and lowering greenhouse gas emissions from production.

Circularity

At the end-of-life wood fibre insulation with no binder product can be recycled into the fibre stream for other fibre products. Products contains binders can not easily be recycled, therefore, they are typically used as biomass fuel, generating energy or heat, however in this case the sequestered CO_2 will be released and further GHG emissions may occur.

© Flex 036 by STEICO

Manufacturers

- STEICO, Germany and United Kindgom
- GUTEX, Germany
- Building Products of Canada/SmartCore, Canada
- BetonWood, Italy
- TimberHP, USA

Scale of production

SMALL — MEDIUM — HIGH

Wood Wool Boards

Wall lining

ARUP

Description

Wood wool boards are made of an interlacing of wood fibres, water and Portland cement. The wood wool is combined with Portland cement and water to give the product the strength and structure needed to hold up in any environment. Once the three components are assembled, they are pressed into large blocks of wood fibre.

Wood wool boards are primarily used as wall linings however due to the air that is fixed between fibres, the panels have good thermal and acoustic properties too.

Technical Performance

Table below includes technical performance for *CEWOOD* construction panels to illustrate the achievable properties for this product category. As this is a Portland cement based product, wood wool boards general have better water and frost resistance, as well as, high fire resistance and mould.

THICKNESS:	25 mm
BULK DENSITY:	460kg/m^3
REACTION TO FIRE:	B,s1 - d01 (EN 13501-1)
FIRE RESISTANCE:	NOT AVAILABLE
THERMAL CONDUCTIVITY λ:	0,066 W/mK
THERMAL RESISTANCE RD:	0,35 m^{2}K/W
GWP:	fossil 244 / biogenic -300 kgCO2e/m^3 [1]
BIOGENIC CARBON:	81,6 kgC/m3

1. EPD functional unit GWP calculations includes Wood Wool Boards and the use of packaging materials.

Healthy & Safe

The main component of these construction materials is wood and mineral compounds, mainly Portland cement which do not contain VOCs, heavy metals, formaldehyde or other harmful substances or allergens. In addition, in case it burns, it does not emit toxic fumes if it is burnt. Compliance with COSHH, REACH, ECHA, as well as local building regulations should be checked for individual products.

Responsible Sourcing

The wood used to manufacture wood wool panels comes from waste from other wood industries, whose raw material, trees, grow in forests around the world. Therefore, the responsible sourcing of wood fibres will depend on the management and maintenance of forests. It is important to ensure that products have sustainable forest management certifications, such as FSC and PEFC, as supporting the sustainable management of forests will ensure the responsible sourcing of wood fibres.

Besides wood fibres, Portland cement is present in a significant proportion in wood wool boards. Unfortunately, Portland cement has a high environmental cost, both in terms of CO2 emissions and raw material use. Therefore, it should be noted the importance of studying the incorporation of sustainable cements or even investigating more sustainable alternatives to cement that serve as a binder.

Circularity

At the end of their useful life, wood wool products can be recycled, reused, or used as biomass fuel (returning sequestered carbon to the atmosphere). However, surface treatments, such as paints or other wall finishes, may affect its recyclability. Manufacturers are achieving aesthetically pleasing walls that do not need additional finishing, making them easier to recycle and using less

© Wood wool Board by Cewood

Manufacturers

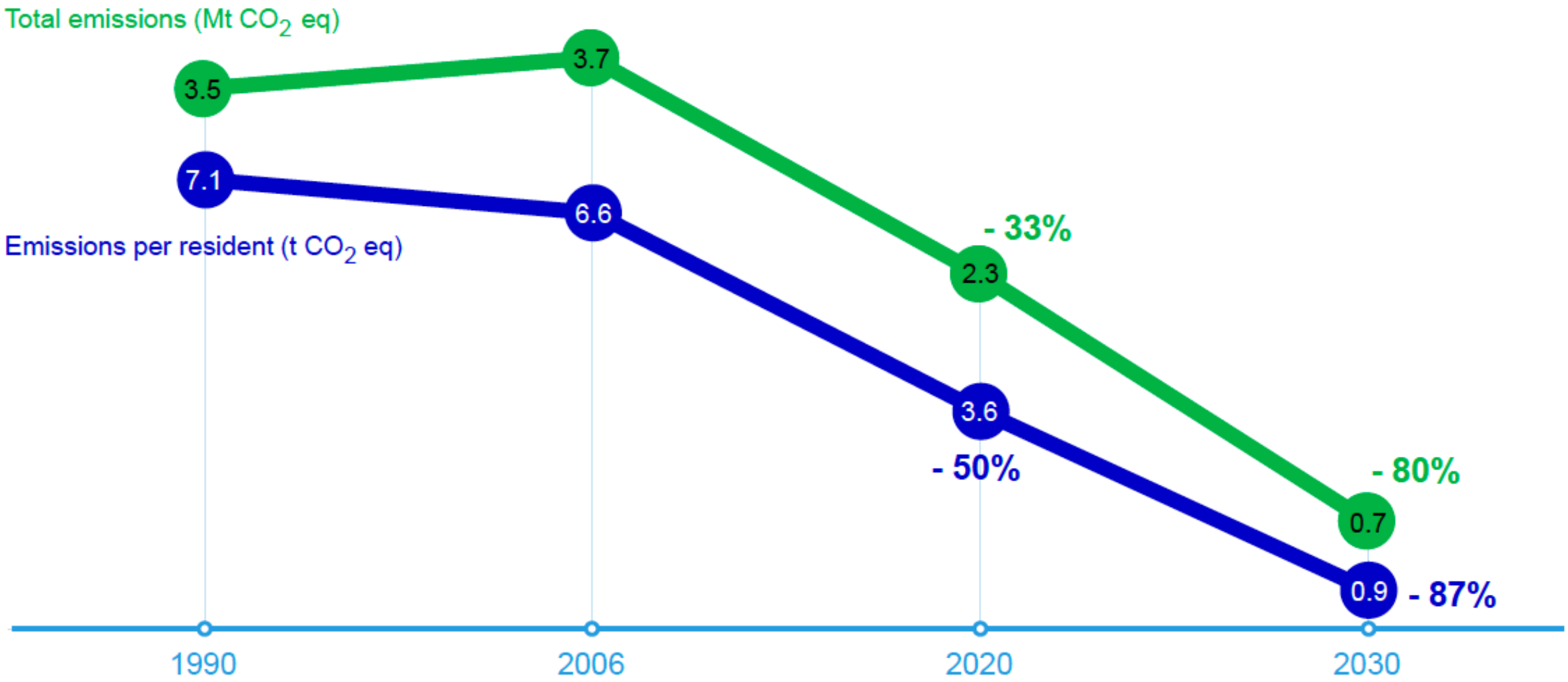
- Savolit, UK
- Celenit, Italy
- Ceewood, Latvia
- Knauf, Global
- Baux, Sweden

Scale of Production

SMALL — MEDIUM — HIGH

CNCA

Helsinki is set to be carbon neutral by 2030



Helsinki

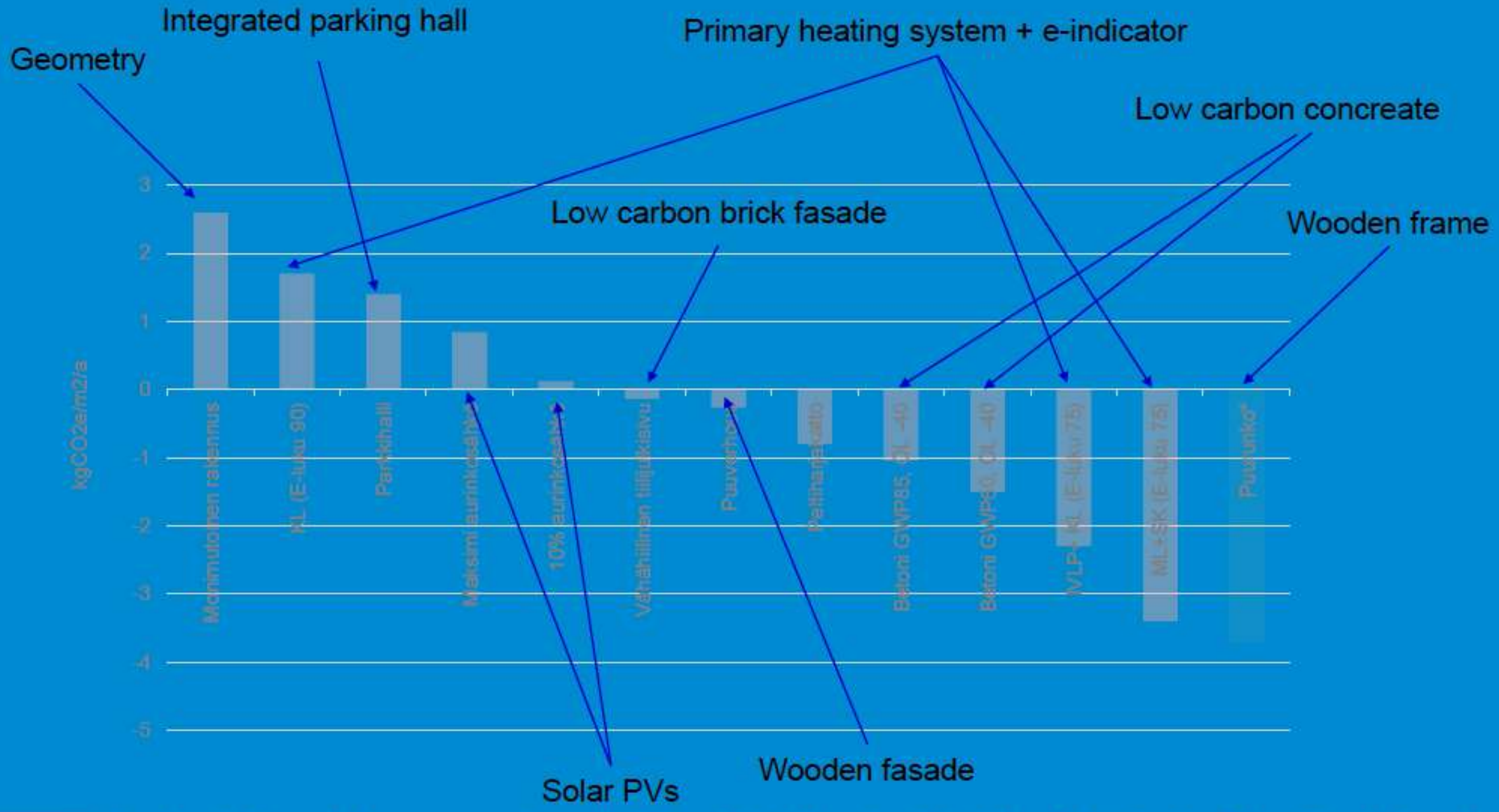
Lifecycle carbon footprint for residential buildings

How

1. Research
2. Pilot
3. Market dialogue
4. Regulation

Helsinki

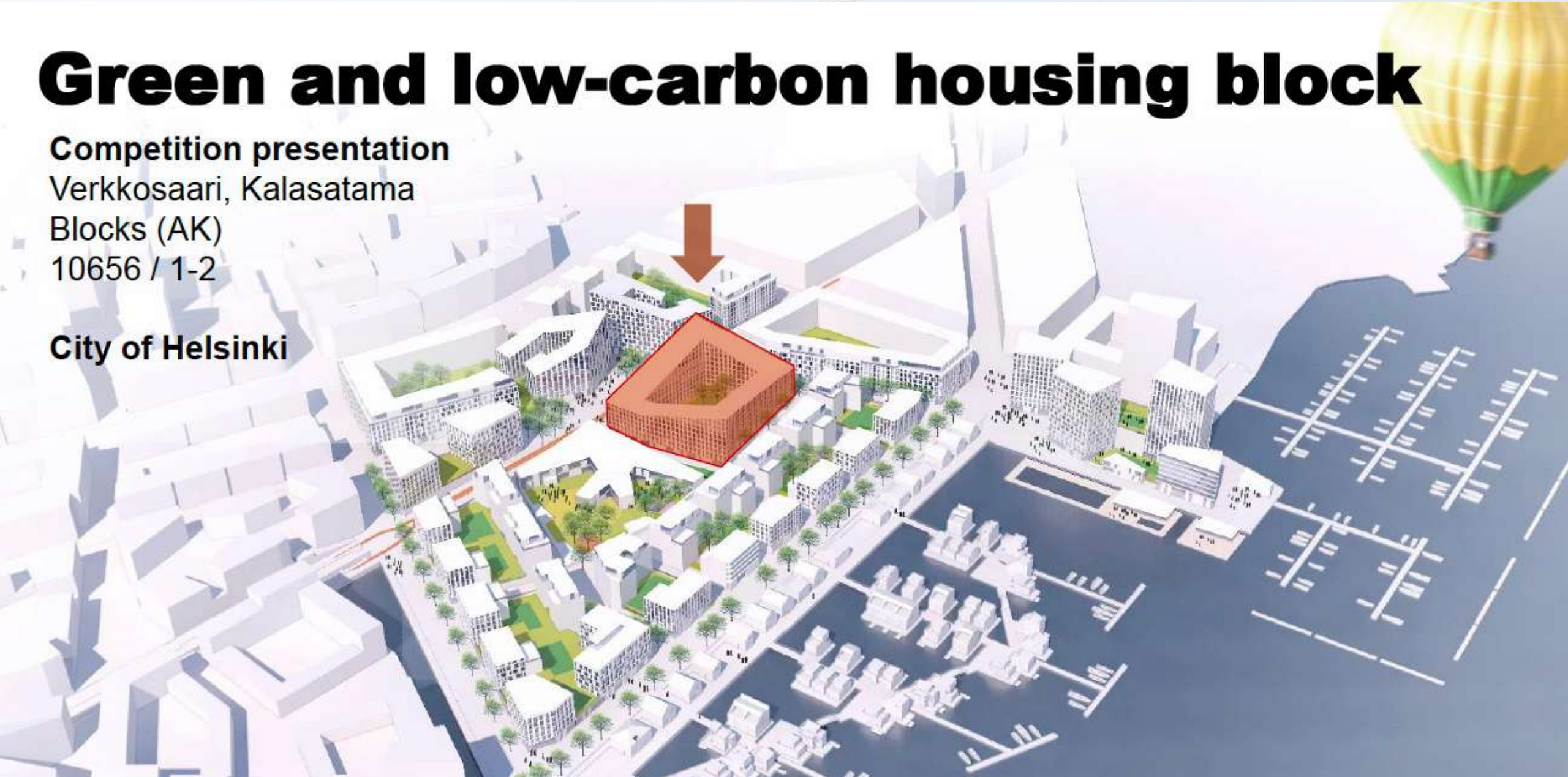
Photo: Jussi Helsten



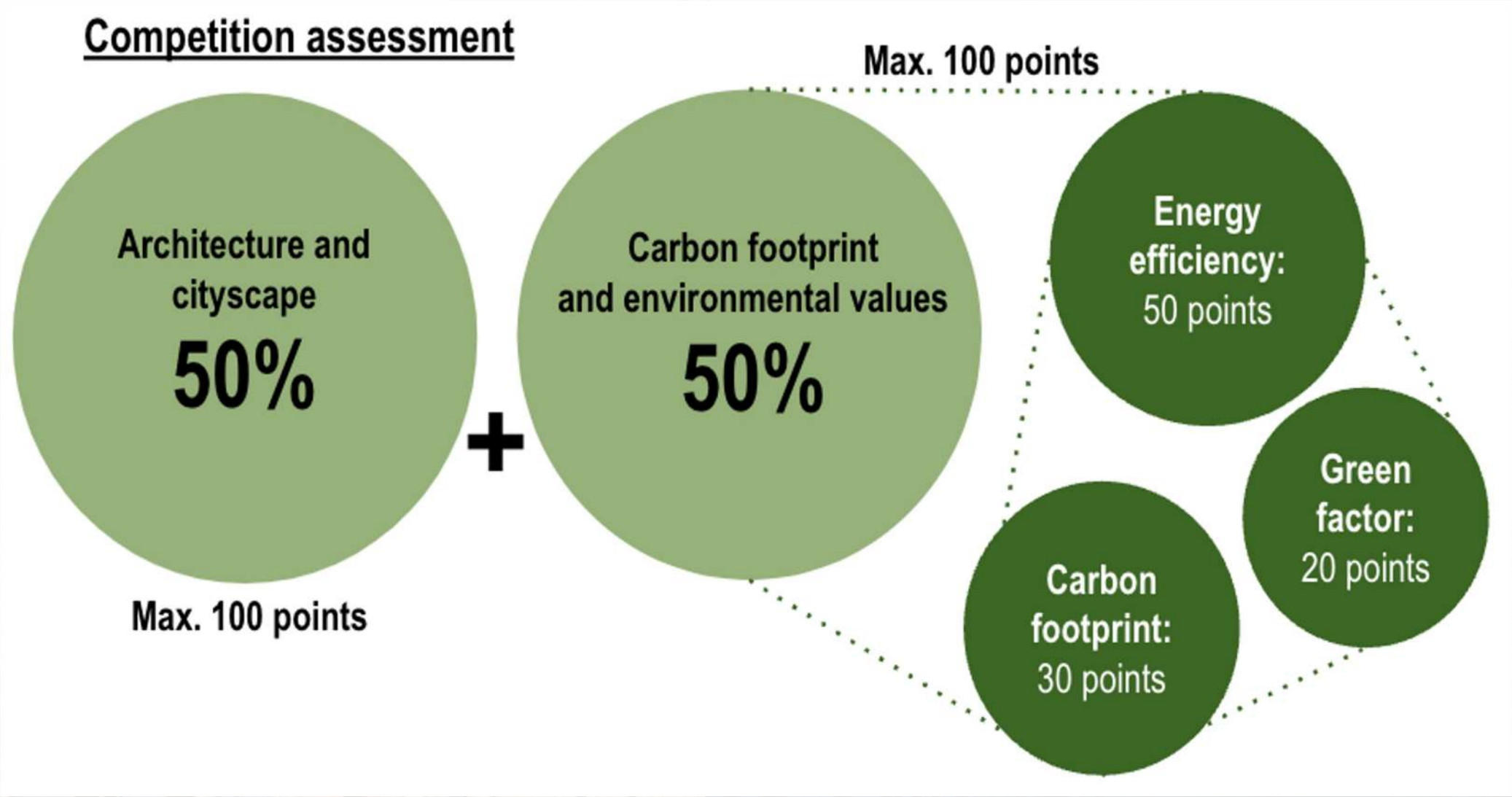
Helsinki

Zero-level: Concrete frame, one stairwell, flat roof, brick facade, district heat (E-indicator 75), without integrated parking hall

Carbon Scored Land Sale



How Helsinki Structured the Land Sale



CNCA

	CARBON FOOTPRINT		
Average building project	1. Grün in der mitte (winner proposal)	2. Hiiling	3. Verkkosaaren puuverso
~16kg/m2/a	8,46/m2/a	5,83/m2/a	11,88/m2/a
			

	CALCULATED TOTAL ENERGY CONSUMPTION		
National requirement in Finland / in Helsinki	1. Grün in der mitte (winner proposal)	2. Hiiling	3. Verkkosaaren puuverso
<90 kWh/m2/a <75 kWh/m2/a	31 kWh/m2/a	39 kWh/m2/a	28 kWh/m2/a

= Lowest in the competition

- Carbon footprint limit for new residential buildings- 16 /m²/a in 50 year timeframe
  - ✓ room for market innovations
  - ✓ many different combinations from building materials to heating systems
- Low Carbon Concreate in all infrasturcture contracts (GWP85 -> GWP60)
- Project areas to be prebuilt with -50% emissions

https://carbonneutralcities.org

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