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Plant it, build it - Carbon Capture and Storage with Bamboo Based Construction materials

Dr. Edwin Zea Escamilla
Chair for Sustainable Construction – ETH Zürich
Task Force on Bamboo Construction - INBAR

Chair of Sustainable Constuction

INBAR BAMBOO CONSTRUCTION TASK FORCE

INBAR INTERNATIONAL BAMBOO AND RATTAN ORGANISATION


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KENT HARRIES
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USA
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CEO & FOUNDER OF
KALTIA AND BAMBUTERRA
CAORI TAKEUCHI
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RODOLFO LORENZO
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UNIVERSITY OF CAMBRIDGE
UK
BHAVNA SHARMA
UNIVERSITY OF BATH
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UNIVERSITY OF SURREY
UK
ANDREW LAWRENCE
ARUP
UK
DAVID TRUJILLO
COVENTRY UNIVERSITY
UK
MAURICIO CARDENAS LAVERDE
STUDIO CARDENAS CONSCIOUS DESIGN
ITALY
ARJAN VAN DER VEGTE
MOSO INTERNATIONAL
THE NETHERLANDS
HECTOR ARCHILA SANTOS
UNIVERSITY OF BATH
UK
DENAMO ADDISSIE
ADDIS ABABA UNIVERSITY
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CSIR-FORESTRY RESEARCH INSTITUTE
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INSTITUT TEKNOLOGI BANDUNG
INDONESIA
MAHMUD ASHRAF
SCHOOL OF ENGINEERING
DEAKIN UNIVERSITY AUSTRALIA
MATEO GUTIERREZ GONZALEZ
UNIVERSOTY OF QUEENSLAND
AUSTRALIA
TASK FORCE
COORDINATOR
LIU KEWEI
COORDINATOR OF THE GLOBAL
BAMBOO CONSTRUCTION PROGRAMME
AT INBAR
TASK FORCE
CHAIR
EDWIN ZEA ESCAMILLA
ETH ZURICH
SWITZERLAND
INBAR BAMBOO
CONSTRUCTION TASK FORCE
INBAR
INTERNATIONAL BAMBOO
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We have BAMBOO ISO Standards!

ISO 19624:2018 Bamboo structures — Grading of bamboo culms — Basic principles and procedures

ISO 22157:2019 Bamboo structures — Determination of physical and mechanical properties of bamboo culms — Test methods

ISO 22156:2021 Bamboo structures — Bamboo culms — Structural design

ISO 23478:2022 Bamboo structures — Engineered bamboo products — Test methods for determination of physical and mechanical properties

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Building codes with BAMBOO

Source: Lopez, L.F.

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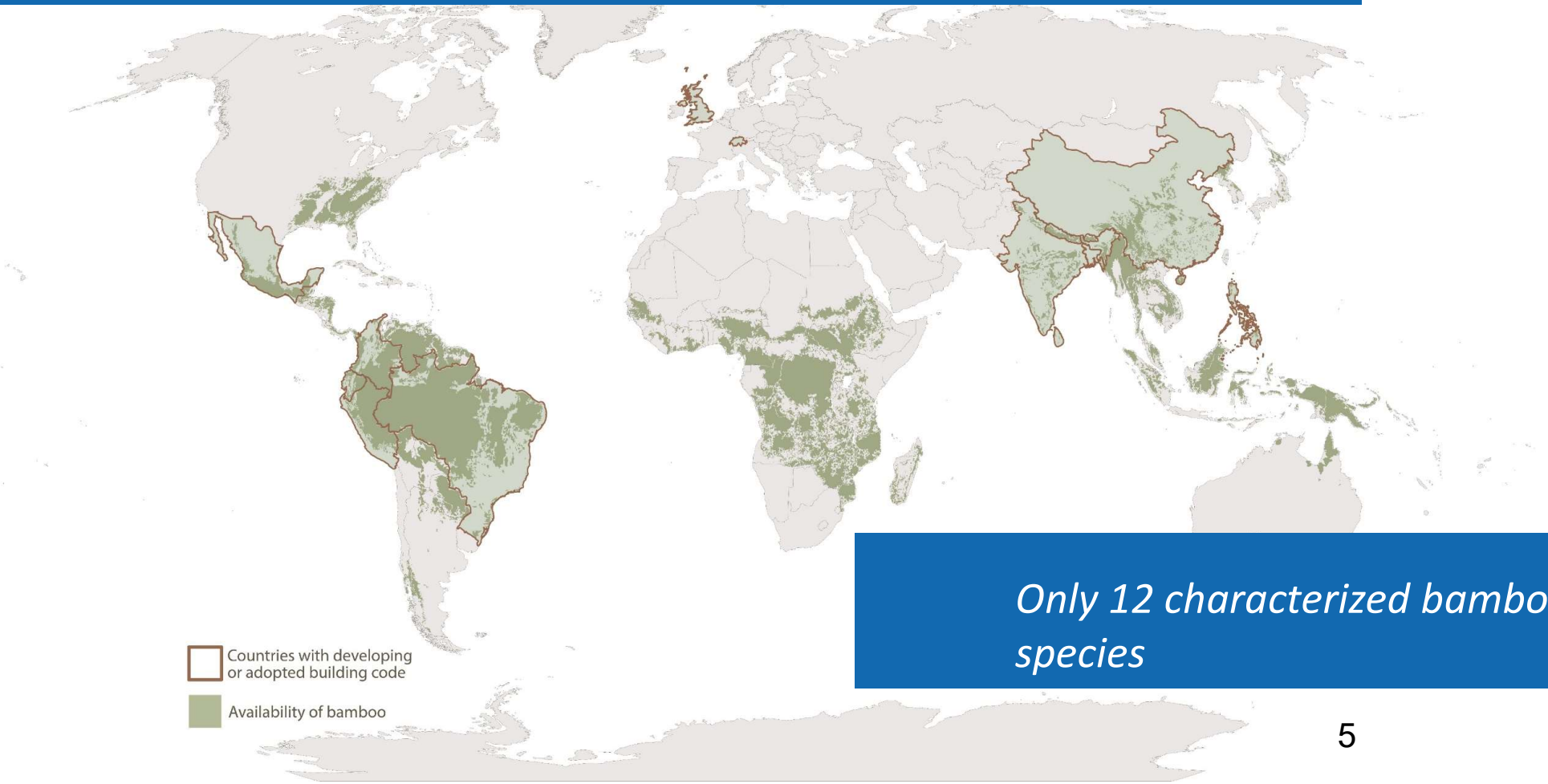
The knowledge/regulatory gap



Only 12 characterized bamboo species

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RILEM – TC MCB : Mechanical Characterisation of Bamboo.

Task 1 Review, Gap Analysis and Prioritisation

Task 2 International Database

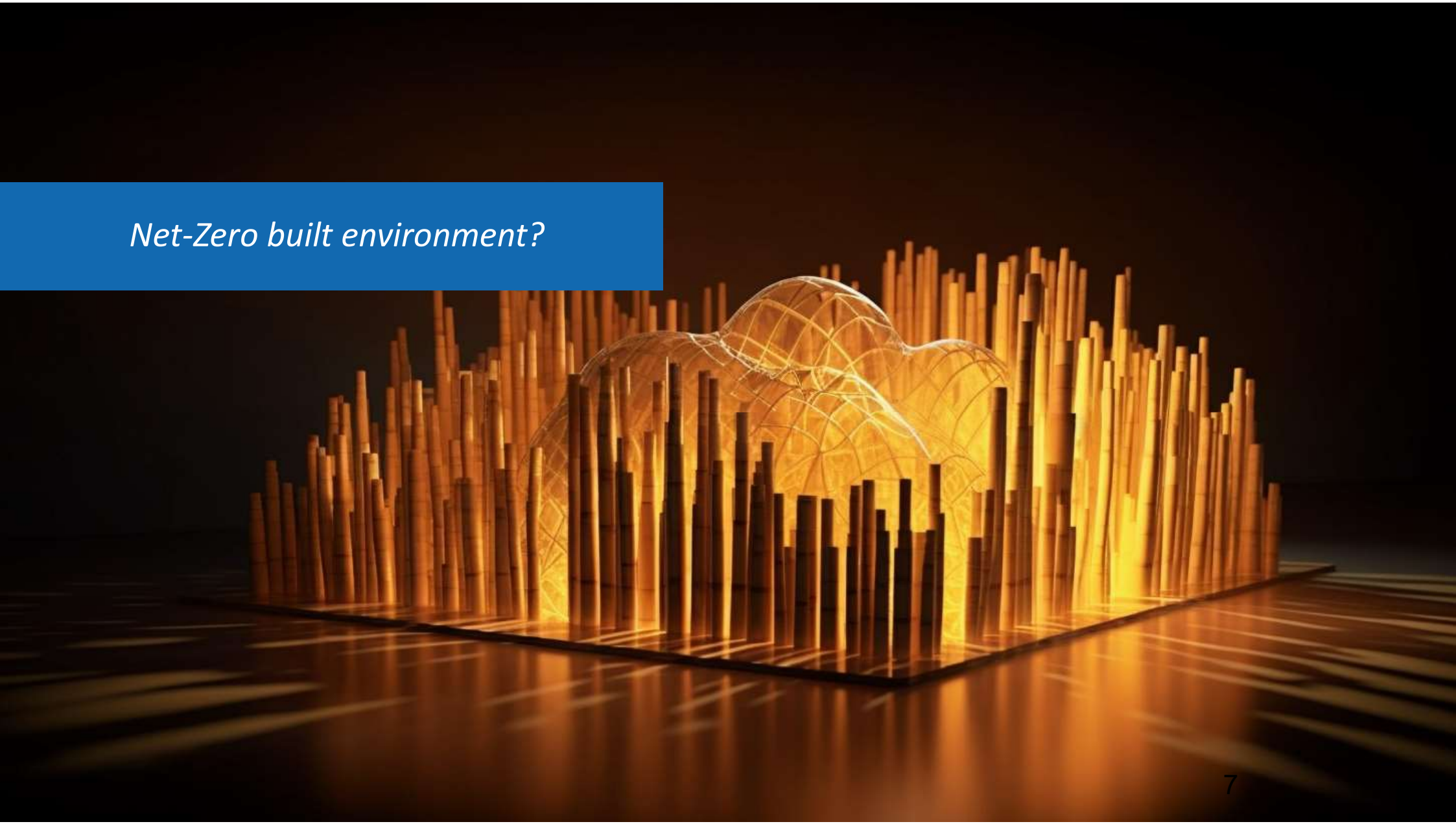
Task 3 Oversight of Round-Robin Testing

Task 4 Classification and Grading Synthesis

Task 5 Quantification of Sustainability Credentials (CO_2 capture and storage)

Task 6 Recommendations for Standard Test Methods

Join us!


Net-Zero built environment?

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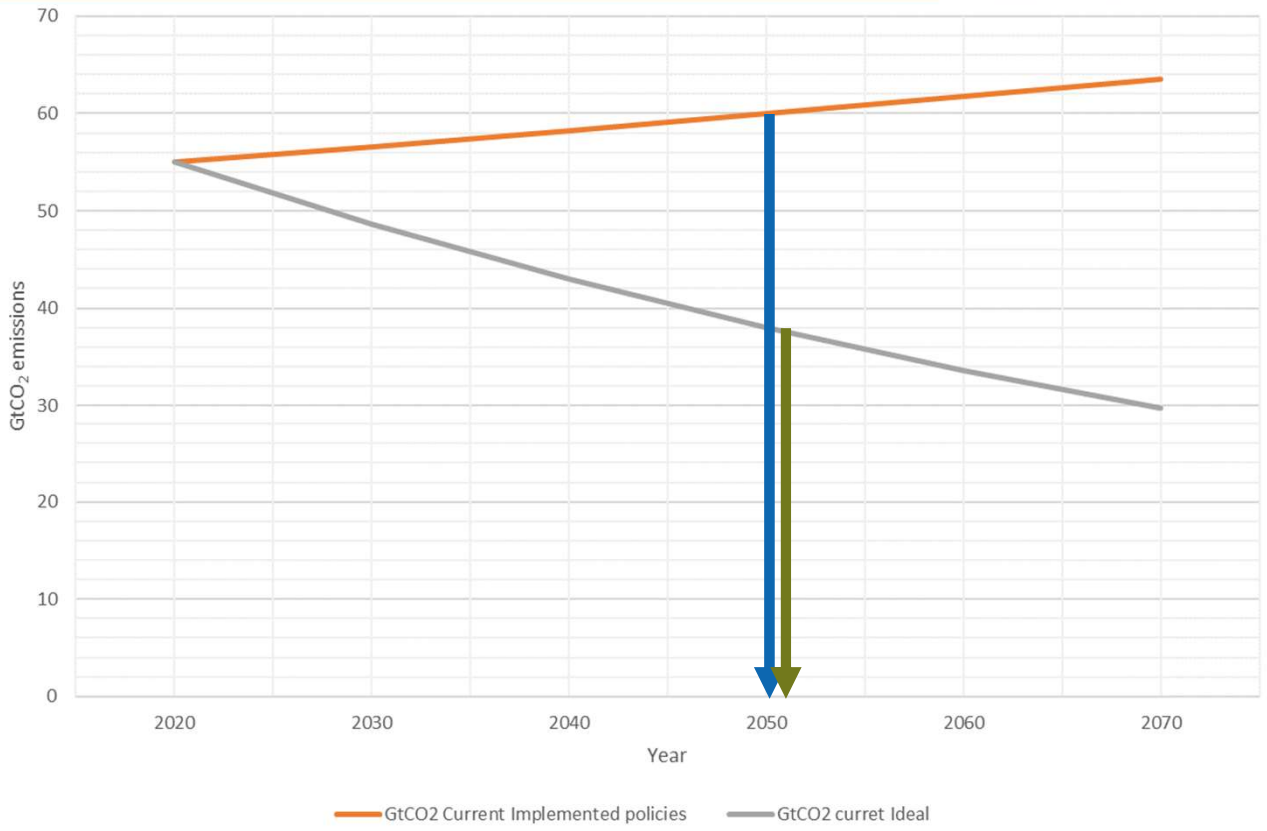
NetZero: The Challenge ahead

We should reduce emissions to Net Zero by 2050

Current implemented policies are not working

The ideal path (IPCC AR6) also does not reach the target

We need to capture/sink between ***~40 to 60 $GtCO_2$*** per year



IPCC AR6

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What is CCS?

CCS is a technology designed to capture and store carbon dioxide (CO_2) emissions from industrial processes and power generation

Applications:
- Power plants (especially coal and gas-fired plants).
- Heavy industries (like steel, cement, and chemicals)
- Direct air capture (removing CO_2 directly from the atmosphere)

Challenges
- High initial investment costs (low rate of success)
- Energy-intensive capture processes
- Public concerns about storage safety

CCS installed capacities?

The installed capacity is not near close to what we need

The previous years saw a decrease on installed capacity

Most of the experiences fail economically after the government subsidies run out (e.g. Australia)

To make a real contribution CCS needs to have an increase of several orders of magnitude

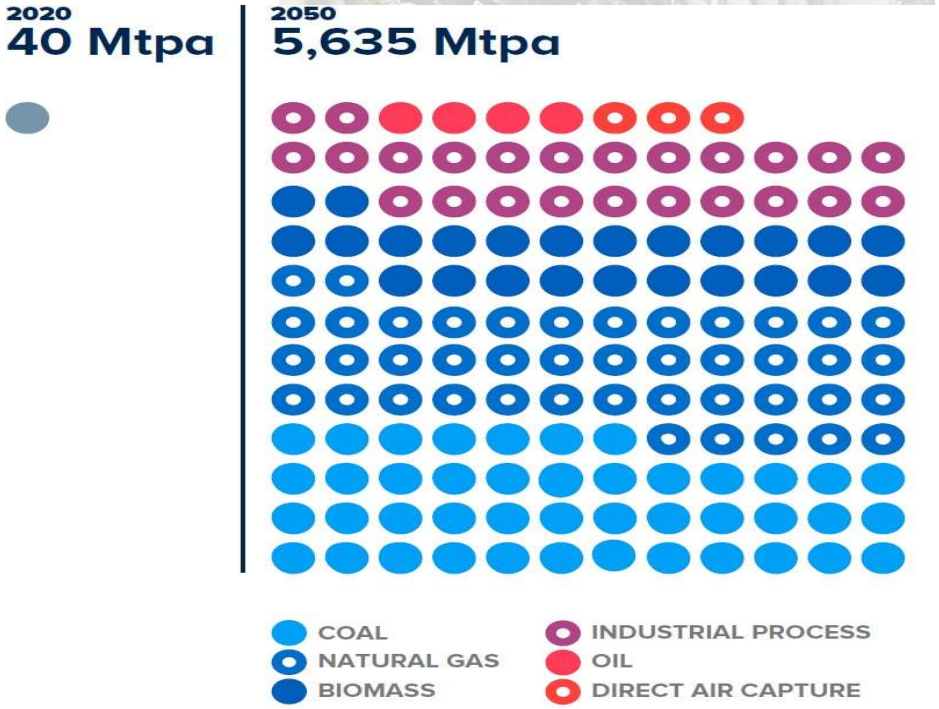

FIGURE 2 CO_2 CAPTURE CAPACITY IN 2020 AND 2050 BY FUEL AND SECTOR IN THE IEA SUSTAINABLE DEVELOPMENT SCENARIO[b]

Includes CO_2 captured for use (369 Mtpa) and storage (5,266 Mtpa) in 2050

Sce: Carbon Capture & Storage Institute. 2021. Global Status of Carbon Capture and Storage in 2020


Fast-growing bio-based materials

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Primer on Bamboo

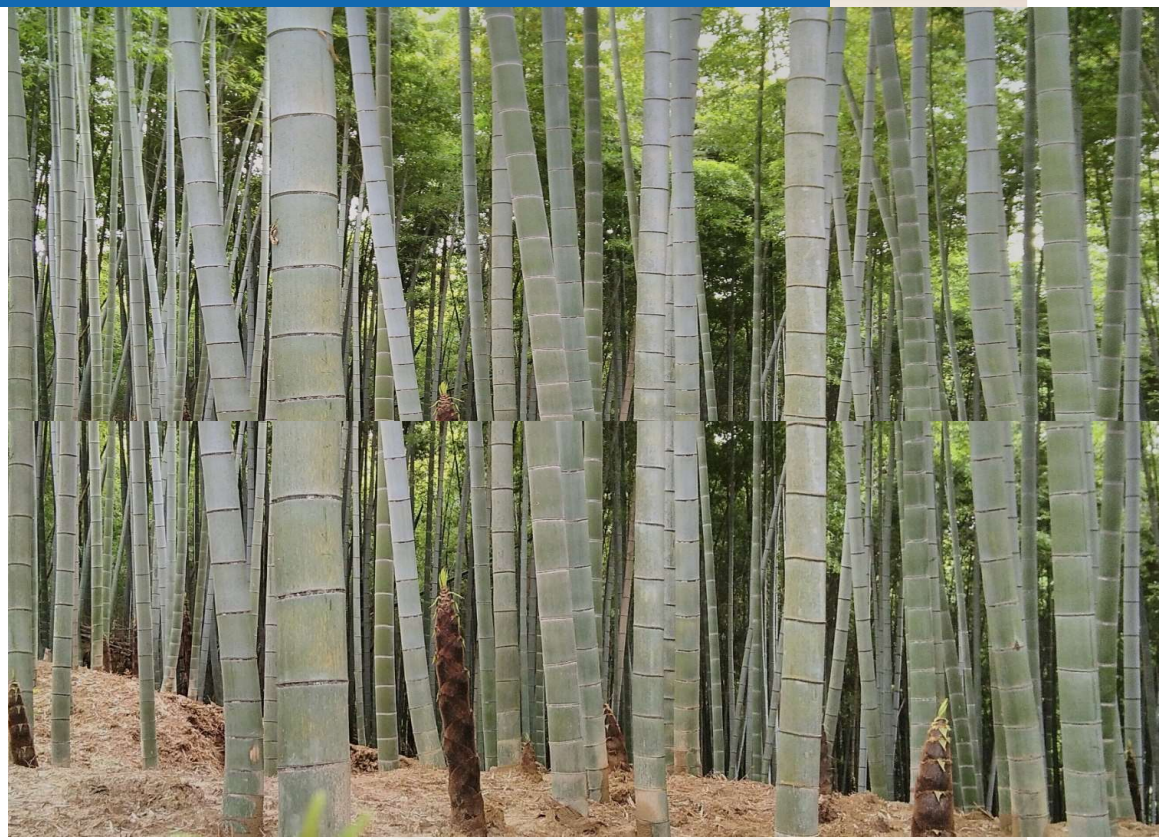
It is a giant grass (Not a tree) –part of the Gramineae family

Native to all continents except Antarctica and Europe
>1600 species in the world

Reproduces through expansion of root network
Creates large root network (up to 100km/Ha)

Grows very quickly, up to heights of 25-30m in 3 months

Only undergoes primary growth i.e. does not become wider



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Exnovation! is the new Innovation

…***Exnovation*** is the recognition and appreciation of existing practices, highlighting their inherent value and the potential richness they offer in everyday activities…

Jessica Mesman

..We can use fast-growing bio-based materials not only to solve the crisis but also to heal the planet…

Guillaume Habert

Sce: BASE-Bahay Foundation

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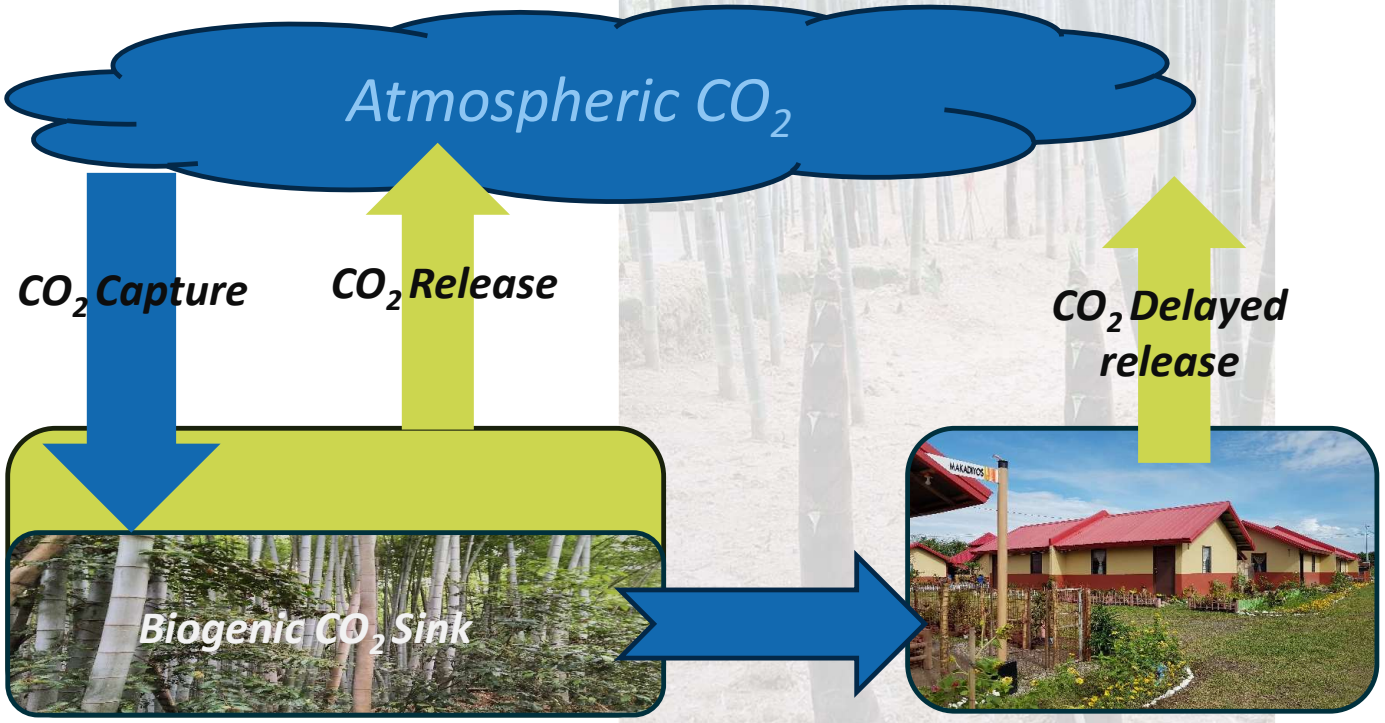
The role of bio-based materials

Natural carbon sinks have a maximum capacity, defined by their area and type of bio-mass

The reach a steady-state of capture and release

The transformation of bio-mass into biobased construction materials allow us to create a secondary sink in the anthroposphere and delay the emission



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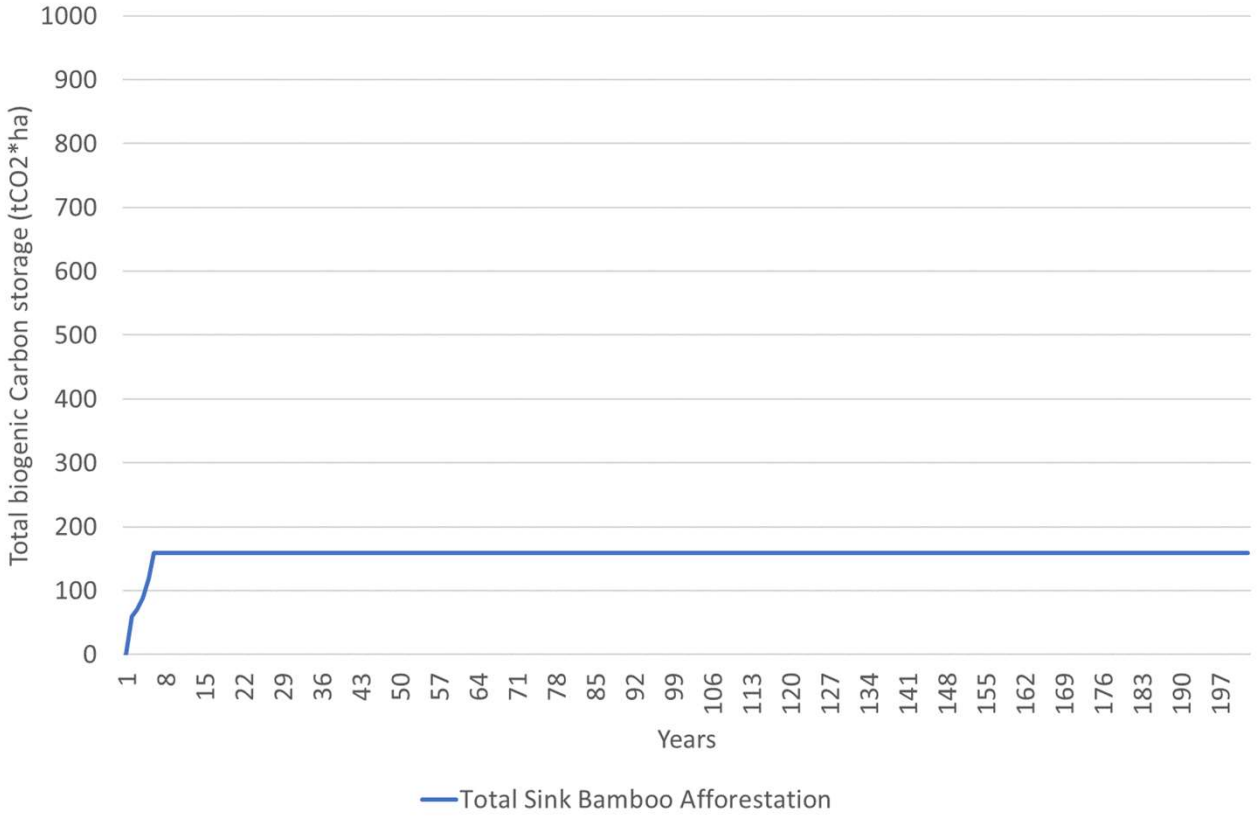
Bamboo forest

Their carbon capture and storage capacity is limited by the land used and the species

Once the maximum is reached a steady-state is established: what is captured is equal to what is released

The only way to increase capacity is to increase the land, which is limited and under strong competition



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From linear production to regenerative value chains

Afforestation with bamboo is a regenerative strategy not only to

Combat climate change but also to mitigate the effects of climate change

Protecting river banks, heaven for bio-diversity

Providing cooling effect in urban and peri-urban areas

- BUT –

Afforestation is not enough!

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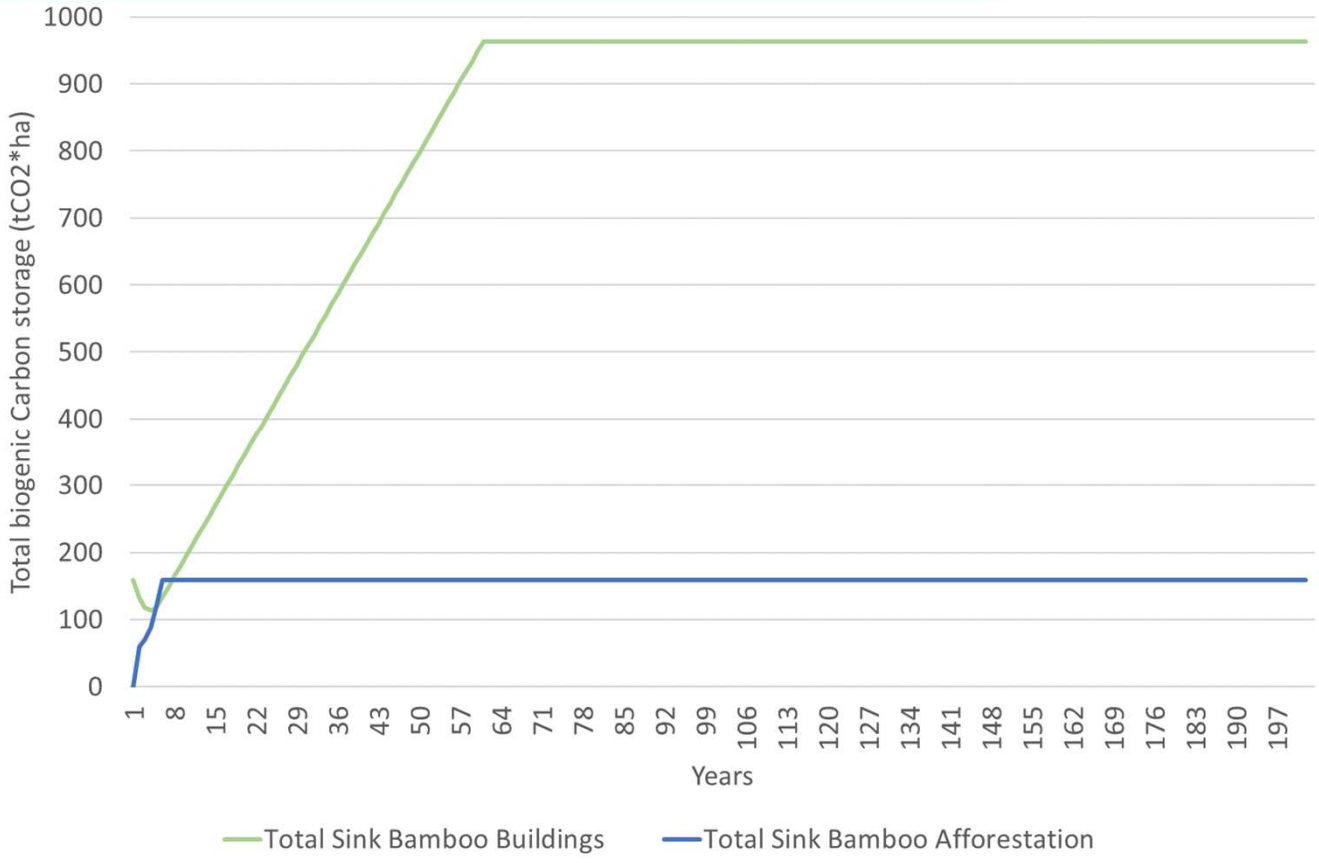
From bamboo forest to bamboo buildings

Bamboo maintains around 40% of the above-ground bio-mass on the natural sink (forest/groove)

Bio-mass can be transformed into bio based materials on a yearly basis while maintaining the forest

The carbon sink on the Anthropocene is directly related to the service life of the bamboo-based buildings

An extended carbon sink can store more than five times than the bamboo forest alone



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From linear production to regenerative value chains

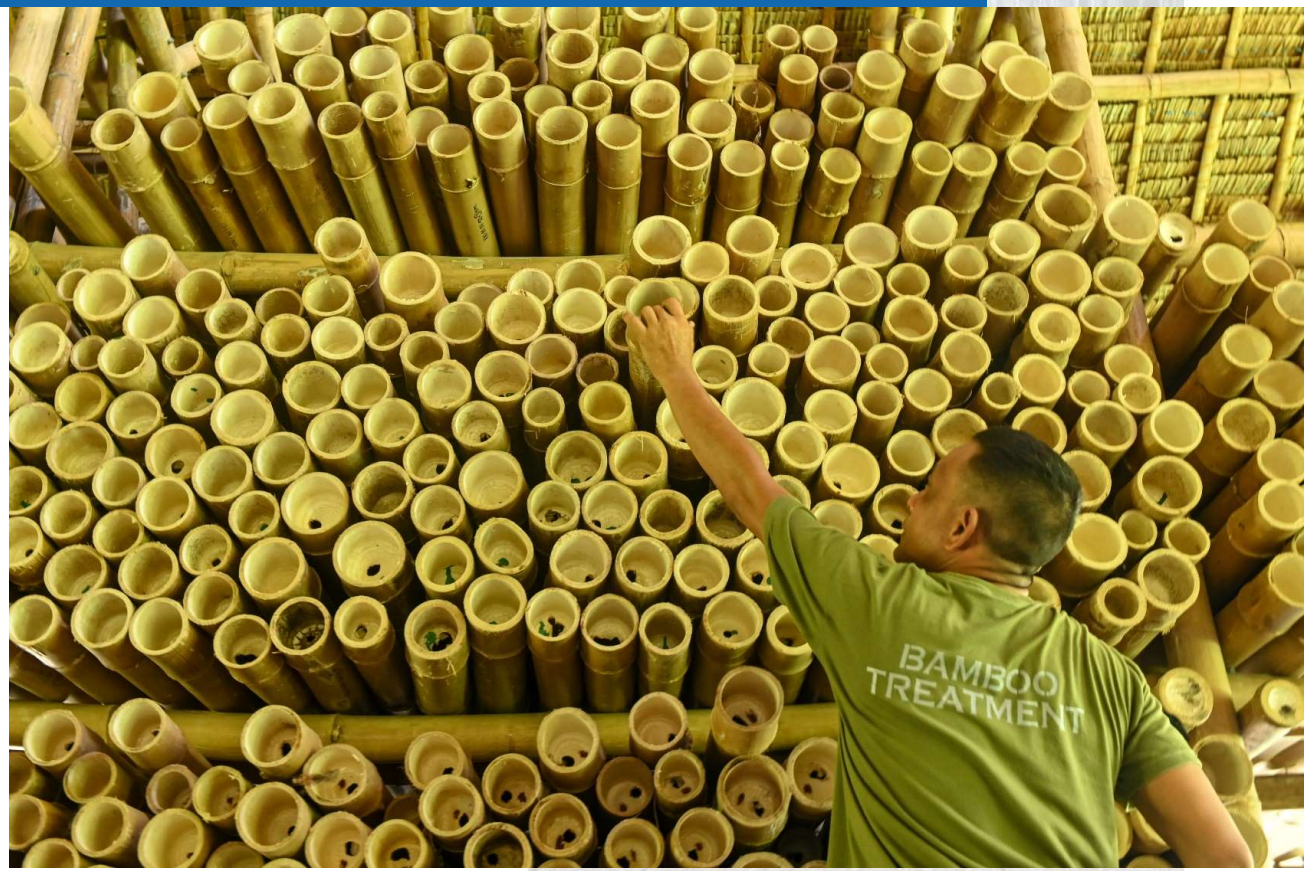
We should not just plant trees or bamboo in someone's backyard

Bamboo enables the creation of regenerative value chain

Where local communities:

Get an economic incentive from planting, processing and commercializing bamboo

Engage in the protection of their local environment and benefit from the natural goods around them



Sce: BASE-Bahay Foundation

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From linear production to regenerative value chains

Where local communities:

Get access to new skills and trades while engaging in positive activities

Get access to dignifying, resilient, affordable and carbon neutral housing solutions

Become part of the solution and stewards of the solutions to the climate crises created by them, for them

Sce: BASE-Bahay Foundation

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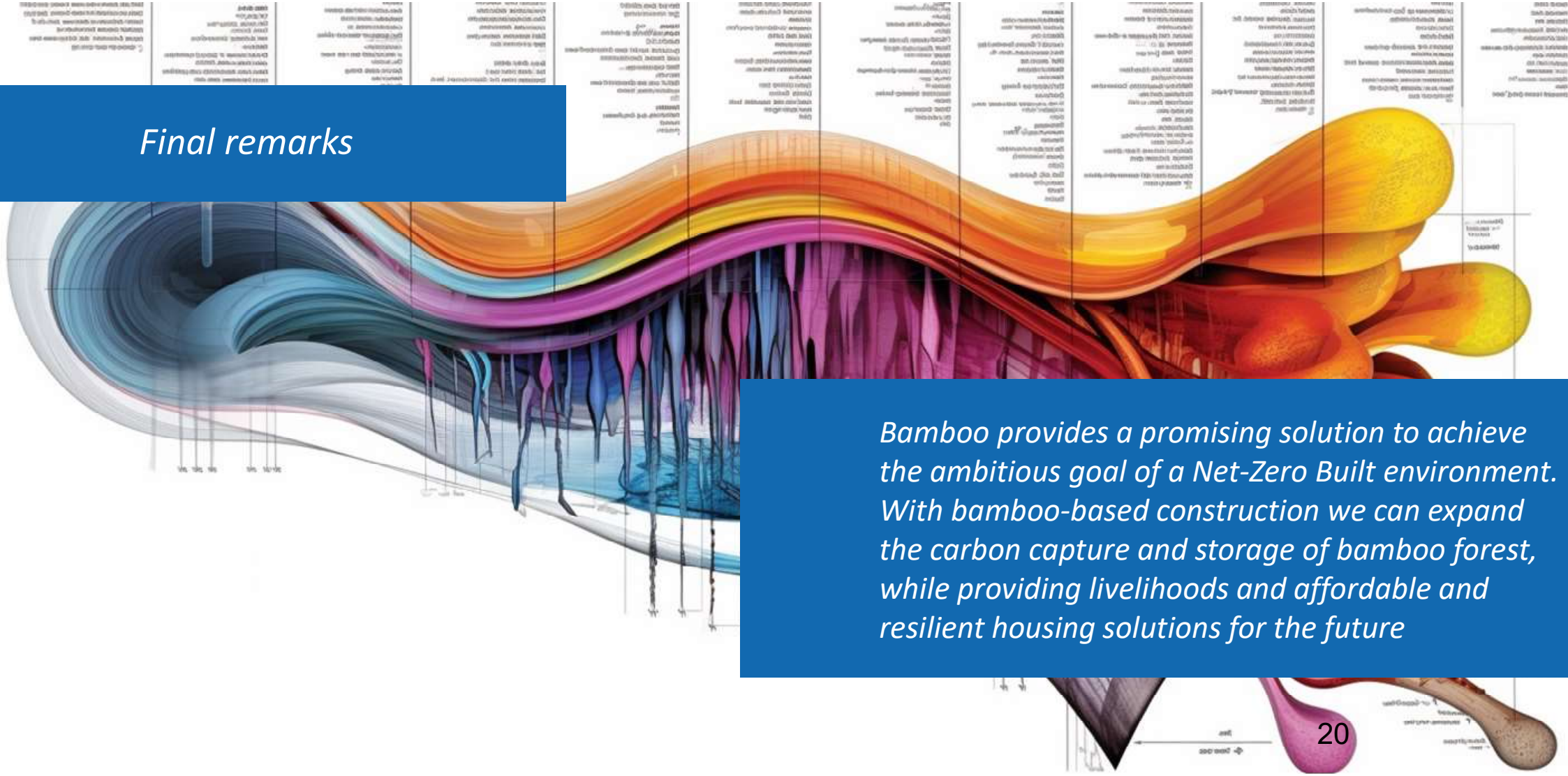
Final remarks



Bamboo provides a promising solution to achieve the ambitious goal of a Net-Zero Built environment. With bamboo-based construction we can expand the carbon capture and storage of bamboo forest, while providing livelihoods and affordable and resilient housing solutions for the future

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Special Issue "Fast-Growing, Bio-Based Construction Materials as Key Drivers to a Net-Zero-Carbon Built Environment"

INBAR GARDEN PAVILION - 2019 BEIJING INTERNATIONAL HORTICULTURAL EXHIBITION
www.studiocardenas.it

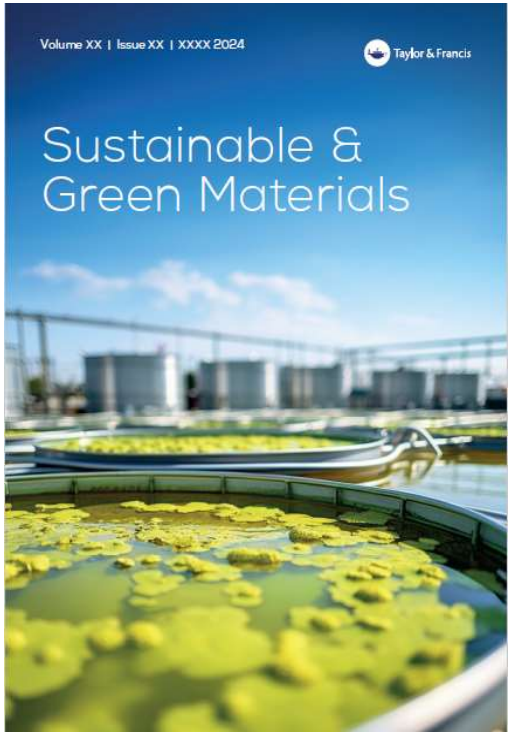
Special Issue!

Sustainable & Green Materials

Launching May 2024

The Sustainable and Green Materials Journal is dedicated to publishing high-quality research and review articles related to materials that will have a **significant impact on the environment and climate change.**

Our aim is to provide a platform for cutting-edge research in the field of **sustainable and environmentally-friendly materials.** We welcome contributions from scientists, engineers, and experts in various disciplines, all united in their commitment to addressing the pressing challenges of our changing climate. By disseminating innovative findings, we strive to accelerate advancements in material science that pave the way towards a more sustainable future for generations to come.



https://www.tandfonline.com/journals/tsgm20

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Thank you for your attention

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Get in touch!