THE INNORENEW COE
INTERNATIONAL CONFERENCE
2023

13-14 September 2023 | Izola, Slovenia

2023

BASAJAUN

Demonstrating innovative wood-based materials and products in green public procurement: The co-design of the BASAJAUN demo building following the New European Bauhaus values and principles

Vanesa Baño[1], Uwe Kies[1], Javier Garcia Jaca[2], Julen Astudillo Larraz[2] and Tom Minderhoud[3]

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 862942

basajaun-horizon.eu

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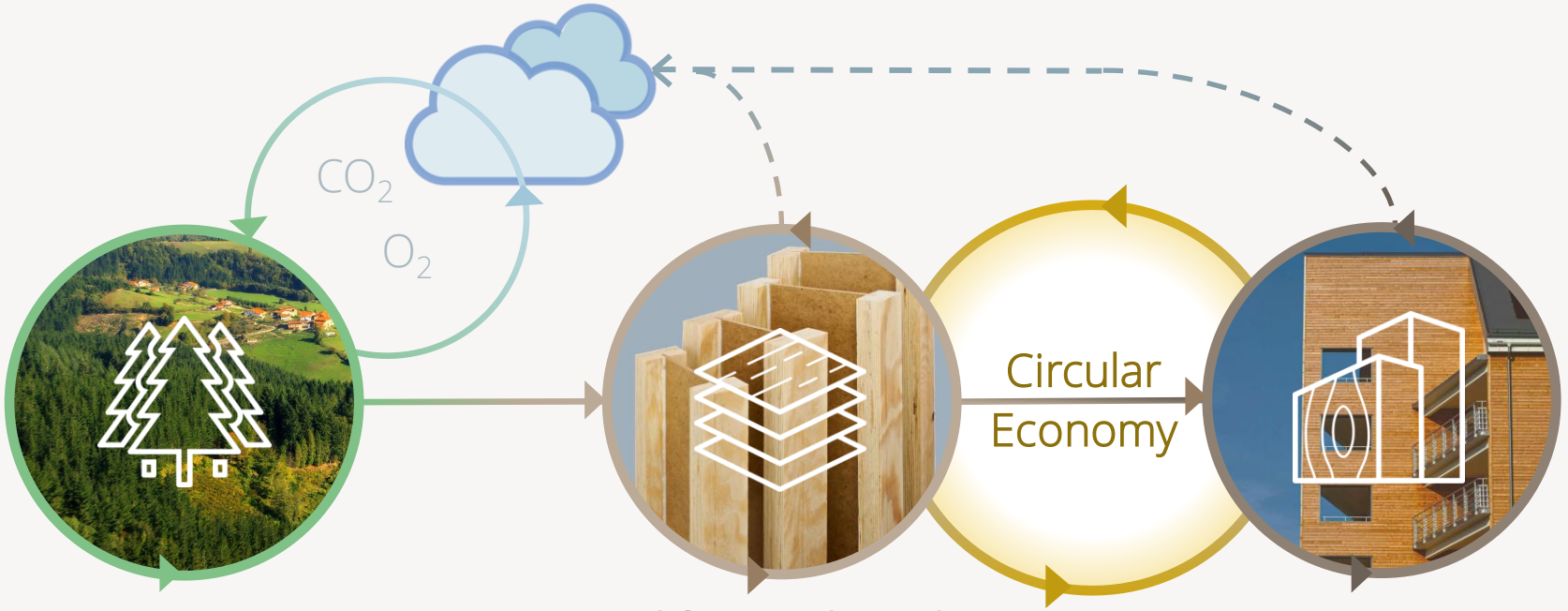
Introduction

Climate benefits of building with wood for the green transformation are gaining more attention

Cities as carbon sinks

Forest-construction chain as a major carbon pump



Digitalisation

Skills & education

Construction sector

Architecture

Urban planning

Cities and regions

Cultural heritage

Biophilic design

Social inclusion

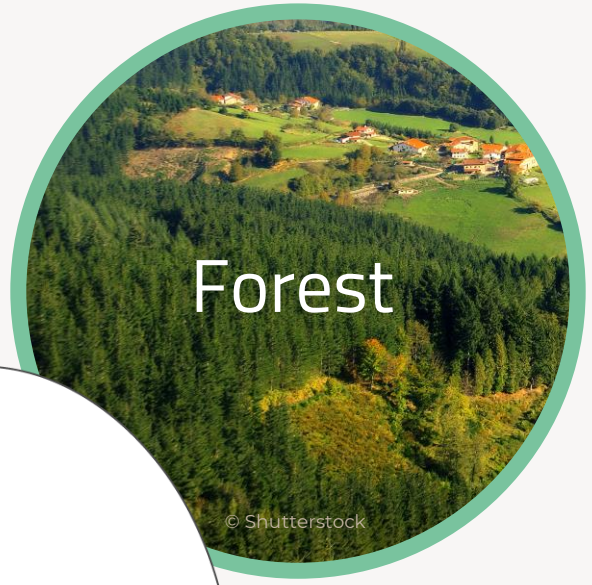
Nature-based solutions

EU policies affecting building with wood

European Commission

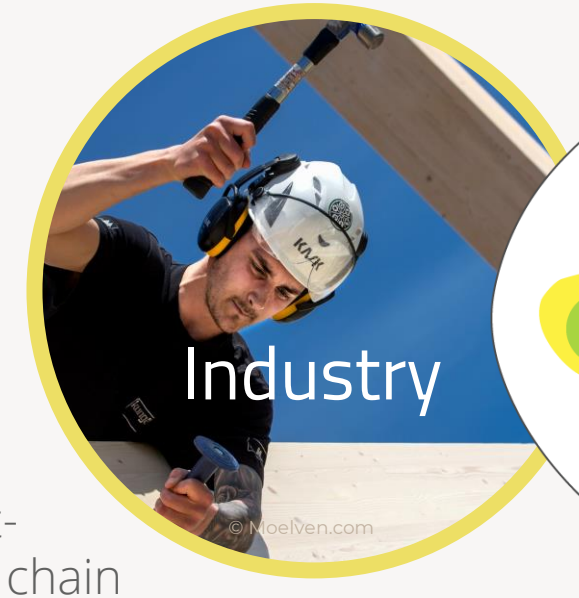
- European Green Deal (2019)
- Renovation wave (2020)
- Circular Economy Action Plan (2020)
- Fit for 55 package (2021)
- Carbon Removals Certification Regulation (CRC, 2022)
- Construction Products Regulation (CPR revision, 2022)
- Energy Performance of Buildings Directive (EPBD 2018, recast 2023)
- EU Taxonomy Environmental Delegated Act (Taxonomy, 2023)
- **New European Bauhaus** (2020)

Timber construction :
contribution to NEB principles

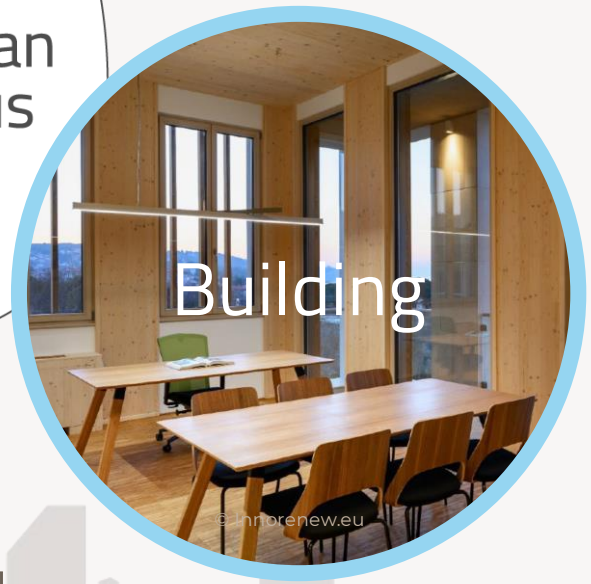


sustainable

- managed ecosystems protecting natural cycles & climate
- true carbon pump
- wood = renewable building material



New European Bauhaus



together

- whole forest-based value chain
- Interdisciplinarity
- society

beautiful

- aesthetic buildings & interiors
- healthy living

wood4bauhaus.eu

Objectives

1. Description of the co-design process on the case study of BASAJAUN demo building.

2. Implementation of wood-based innovations in the demo building.

3. NEB Compass assessment of the co-design process in the demo building

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BASAJAUN

BASAJAUN: Sustainable Wood Construction fostering Rural Development and Urban Transformation

Horizon 2020 IA
grant no. 862942
Call LC-RUR-11Part B

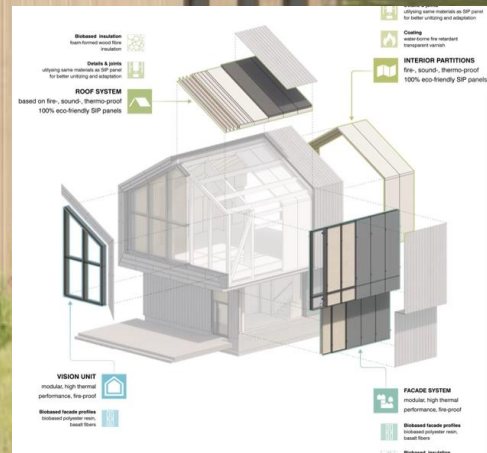
Oct 2019 – Sep 2023
Total budget 12.2 M€
Total EC grant 10M€

Consortium
29 partners in
12 countries

Coordinator
Tecnalia Research and Innovation
Javier.GarciaJaca@tecnalia.com

Wood building of a new school complex in rural Southern France

BASAJAUN demo



BASAJAUN demo: public policies in France

Action plan in the construction sector: public policies supporting the development of wood and bio-based materials in construction

National policy guidelines:

- The construction sector has been identified as the most promising market for timber, with policies to enhance competitiveness and industrial performance to create jobs
- Public policy priorities are the design, innovation and technological development for:
  1) wood construction (mainly multistorey buildings),
  2) resource valorisation (mainly hardwoods, and waste),
  3) demonstrator projects, etc.

The Department of Gironde has a specific requirement for including **wood in at least 7.5% of the building volume** with the aim that buildings fit well into its natural surrounding forest environment (Landes pine and oak forest).

The college is located in the town of Pian Médoc. The department has a plot of 3 hectares, of which 2 hectares are classified as wooded area.

The construction floor area of the Project is 9.600 m^2, of which 520 m^2 are destined to the construction of an apartment building with 4 flats for the school staff

Demo building New Aquitaine, France

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Demo building New Aquitaine, France

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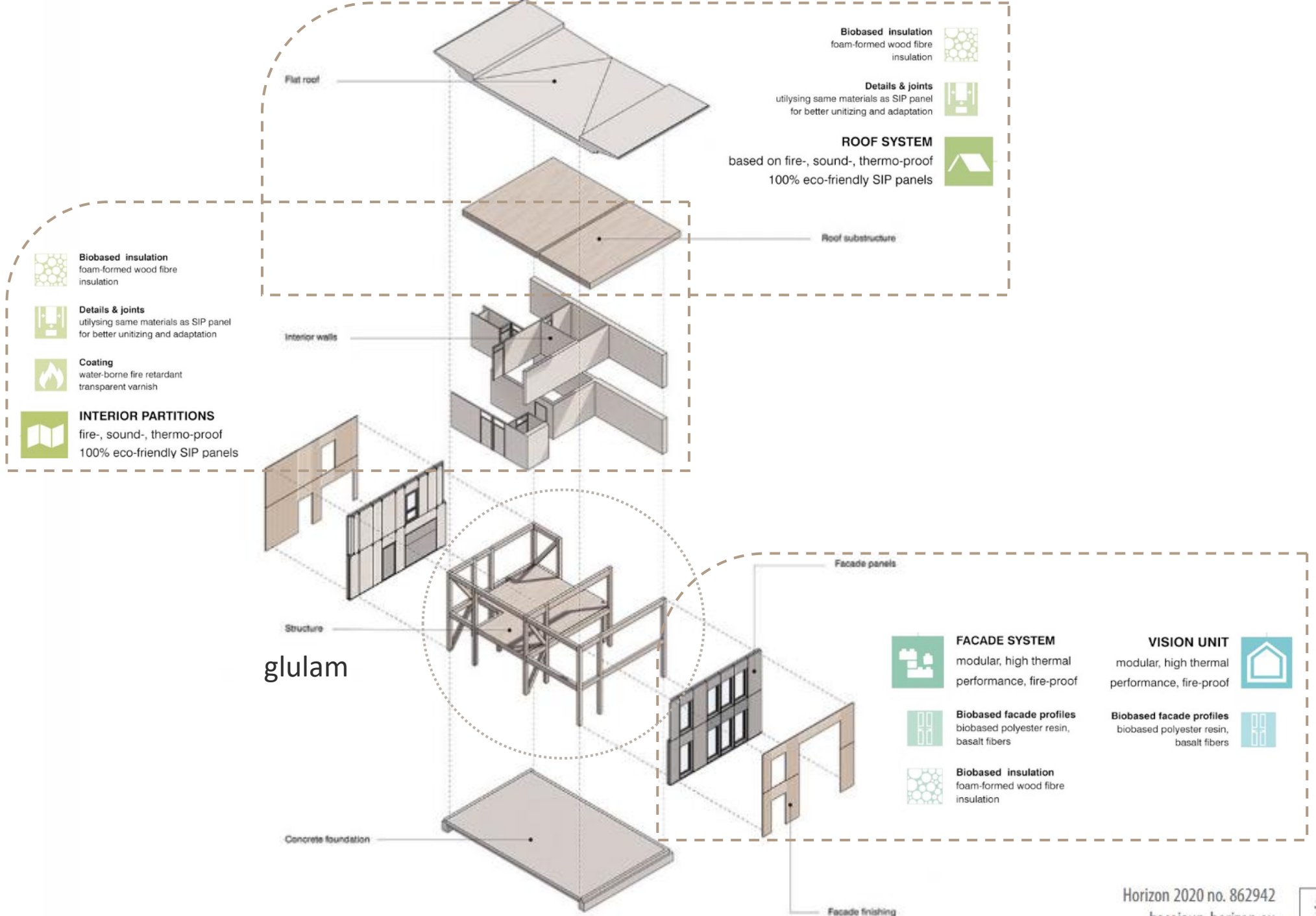
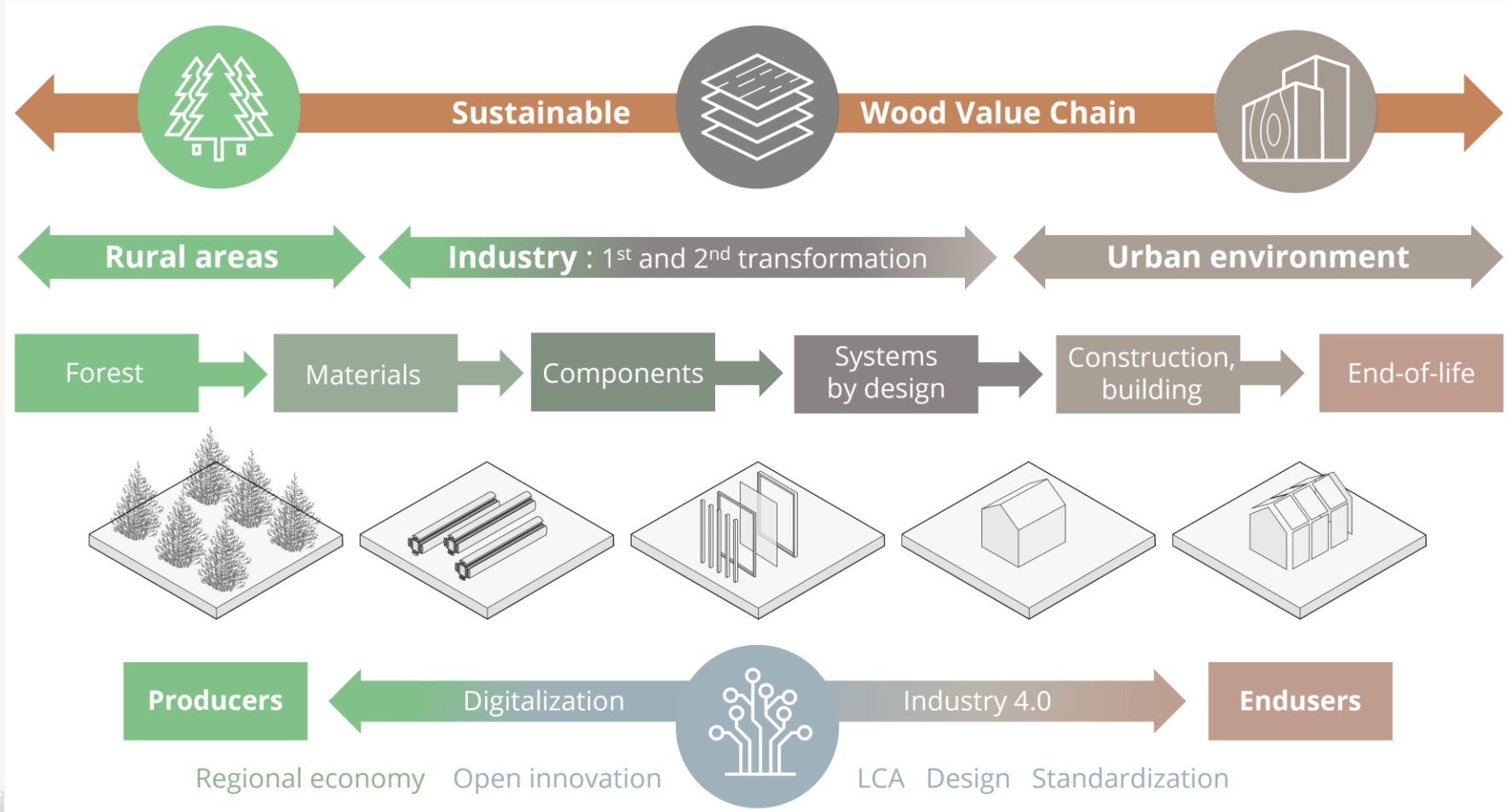

Flat roof
Roof substructure
Interior walls
Structure
Concrete foundation
Facade panels
Facade finishing
Biobased insulation
foam-formed wood fibre insulation
Details & joints
utilysing same materials as SIP panel for better unitizing and adaptation
ROOF SYSTEM
based on fire-, sound-, thermo-proof 100% eco-friendly SIP panels
Biobased insulation
foam-formed wood fibre insulation
Details & joints
utilysing same materials as SIP panel for better unitizing and adaptation
Coating
water-borne fire retardant transparent varnish
INTERIOR PARTITIONS
fire-, sound-, thermo-proof 100% eco-friendly SIP panels
glulam
FACADE SYSTEM
modular, high thermal performance, fire-proof
Biobased facade profiles
biobased polyester resin, basalt fibers
Biobased insulation
foam-formed wood fibre insulation
VISION UNIT
modular, high thermal performance, fire-proof
Biobased facade profiles
biobased polyester resin, basalt fibers

BASAJAUN

Co-design process



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BASAJAUN

Main innovations a nutshell

WP1 Sustainable wood construction value chain
European forest potential, rural and urban areas

WP2 Recyclability, environmental issues
End of Life - recyclability and reusability of BASAJAUN products

WP3 Forest 2 building digital framework
Design of a 'backbone' architecture

WP4 Innovative materials
Fire retarded WPC ◦ Foamed WPC ◦ Insulations ◦ Structural insulation panels (SIP) ◦ Coatings

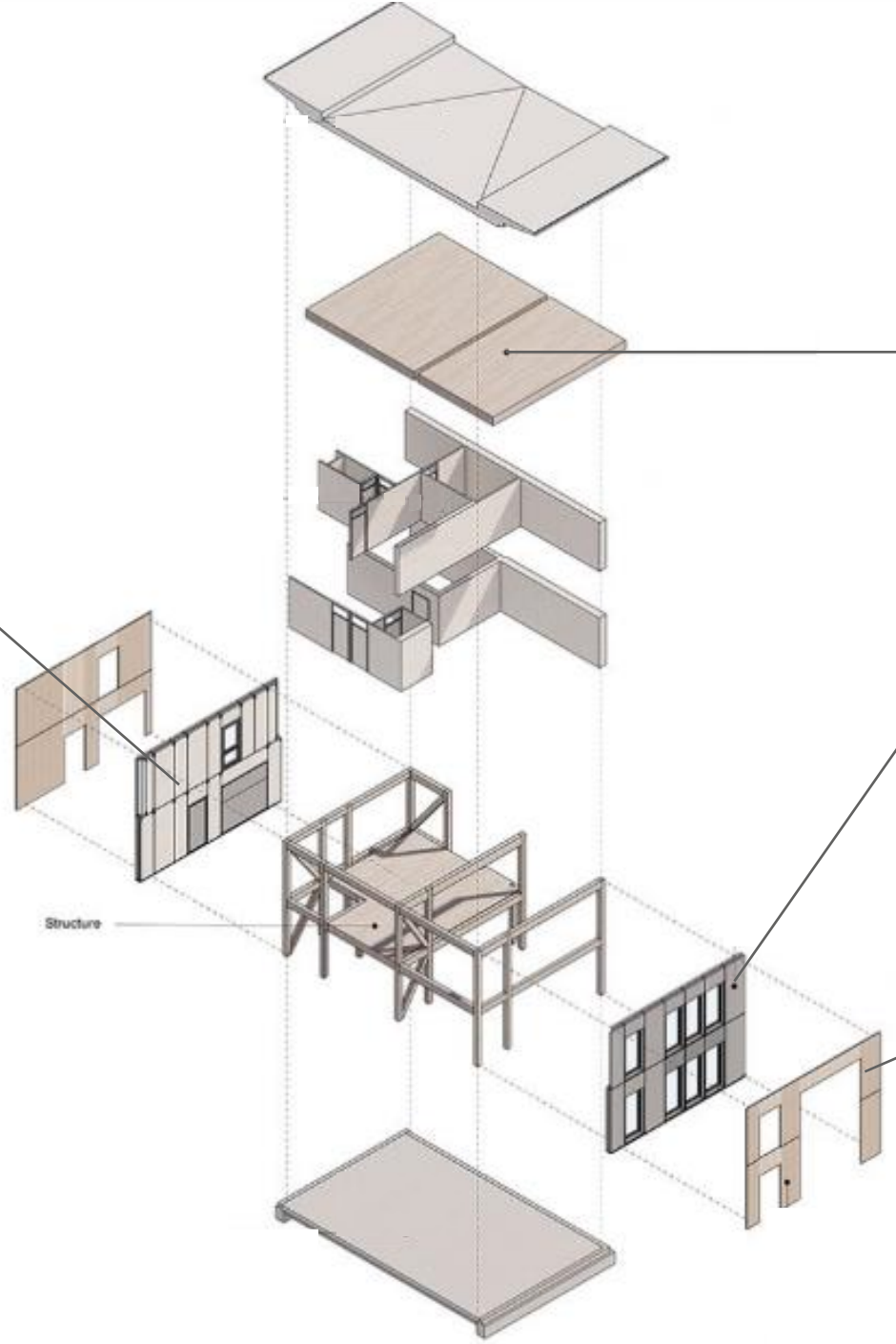
WP5 Building systems and products
Structural components, Facades, Roofs, Bio-composite profiles

WP6 Demo buildings
Demo building Southern France

Wood-based innovations

Thermal insulation material

Furniture finishing



Interior walls, exterior panels and roof substructure

Curtain-walls façade system

Project innovation fact sheet

VTT

Wood Pulp Panels

Fibre panels for thermal building insulation

APPLICATION

- **Thermal insulation** material as core layer of Structural Insulation Panels (SIP) for building walls
- **Many applications** of similar conventional materials (e.g., glass wool)

VTT

BENEFITS

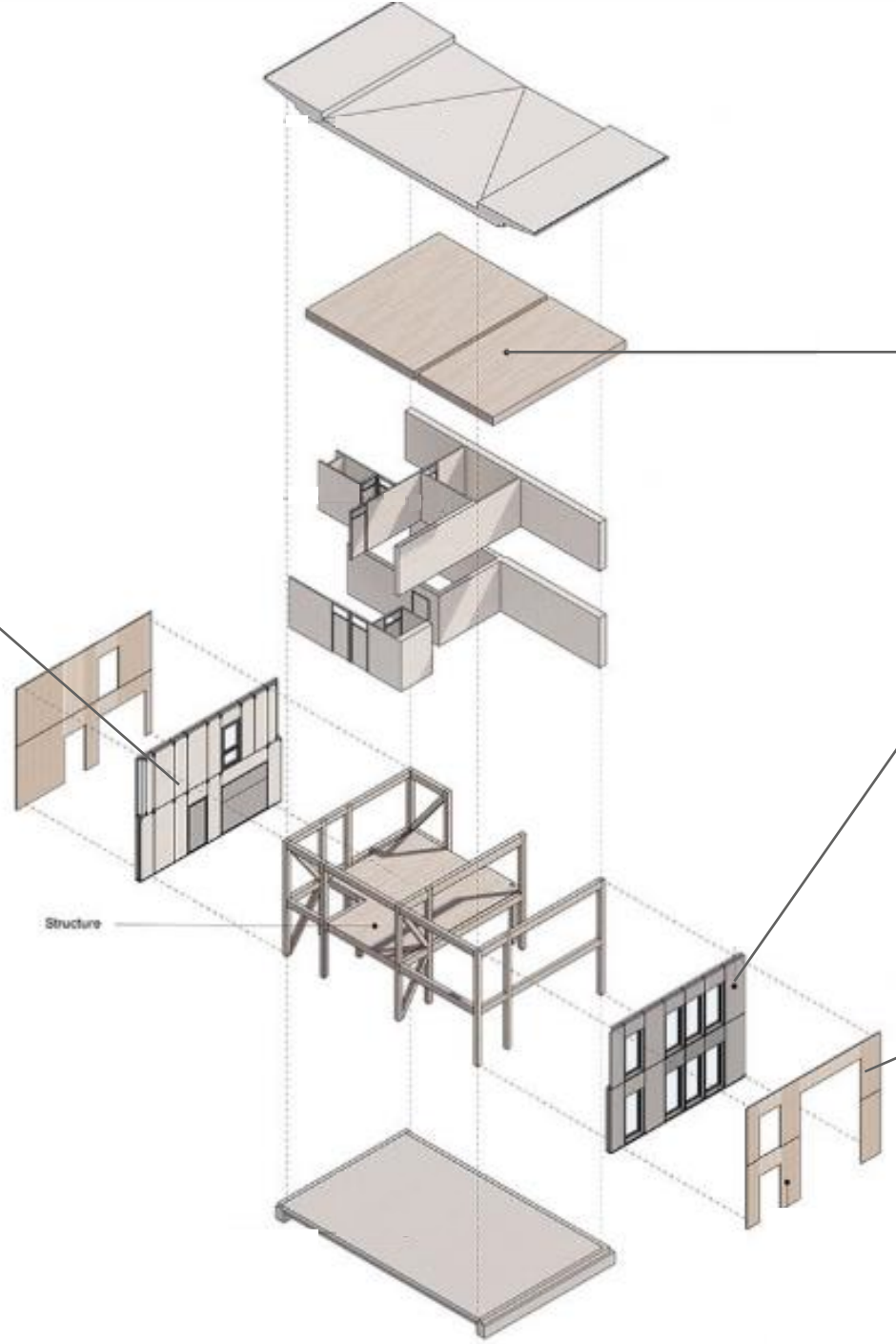
- **Equal insulation performance** as existing wood-based products
- Very **light weight**, no training need for assembly
- Made from **renewable wood** pulp
- Recycled wood can be utilized as a raw material
- **Lowers** greenhouse gas **emissions** and **stores** CO_2 in building walls
- **Easy** recycling and use in circular economy value chains (if suitable fire retardant is used)

NEXT STEPS

- Increasing strength for structural applications
- Upscaling of production
- Other applications e.g., acoustic panels, wind protective panels, cushioning material (e.g., packaging)

Thermal insulation material

Furniture finishing



Interior walls, exterior panels and roof substructure

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Project innovation fact sheet

garnica
Challenge the ordinary

G-Brick-Eco

Biobased Structural Insulation Panel

APPLICATIONS

- Load-bearing **walls** and **partitions**
- **Roofs** and **ceiling** components
- **Conventional buildings** and **tiny houses**

garnica
Challenge the ordinary

BENEFITS

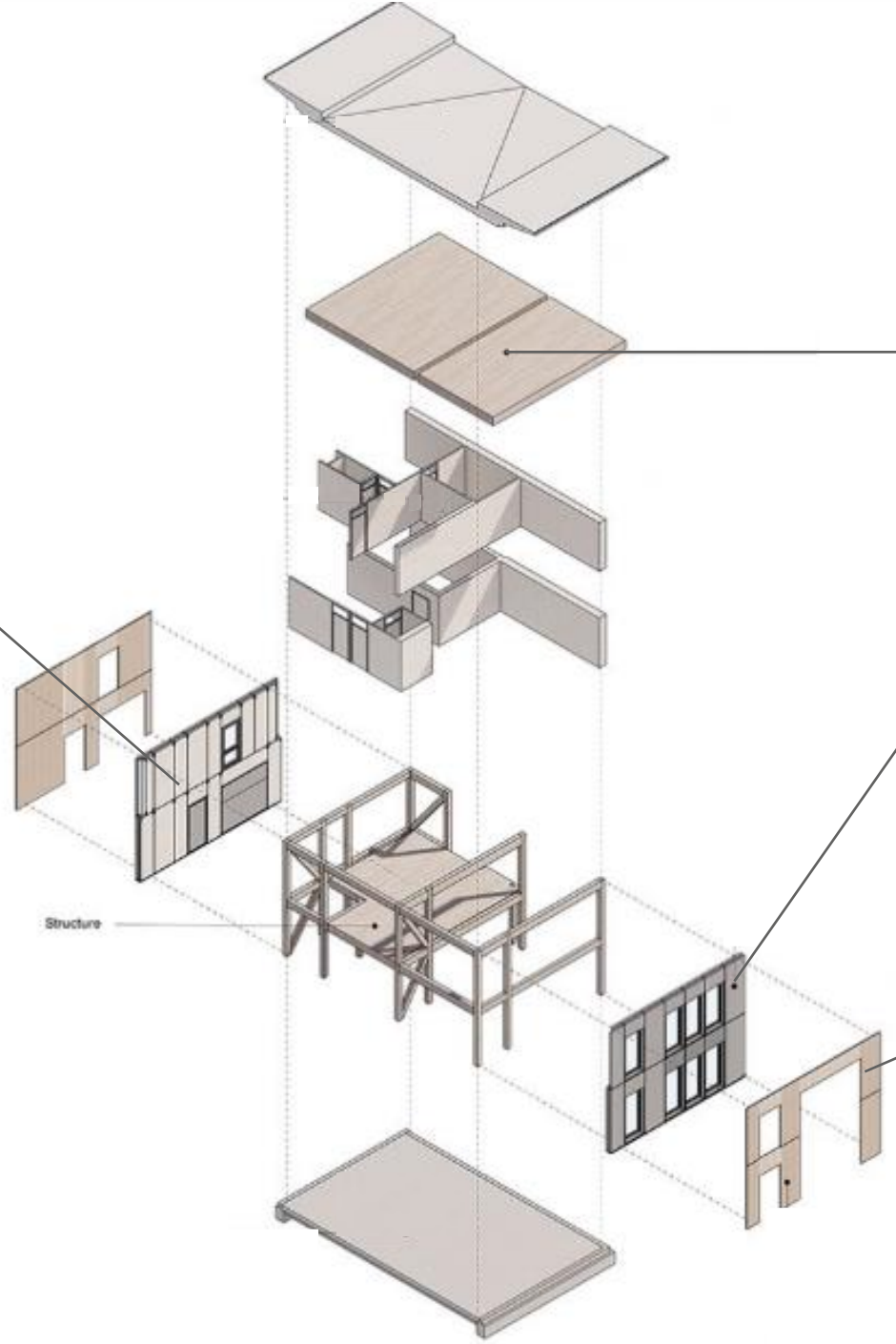
- G-Brick-Eco panels are load bearing and thermally insulated building wall elements allowing for very **short construction times** both in renovation and new built.
- Suitable for **diffusion-closed construction** systems.
- Easy handling on site.
- **Fire resistance** for low- and midrise buildings.
- The **mechanical resistance is enhanced** by vertical ribs rigidly connecting both plywood surfaces
- When compared to competing products such as Cross Laminated Timber (CLT), G-Brick-Eco is much more **cost, energy and resource efficient**

NEXT STEPS

- **Upscaling** of the production facilities
- Optimising ribs adhesion process
- **Automation** of the production process

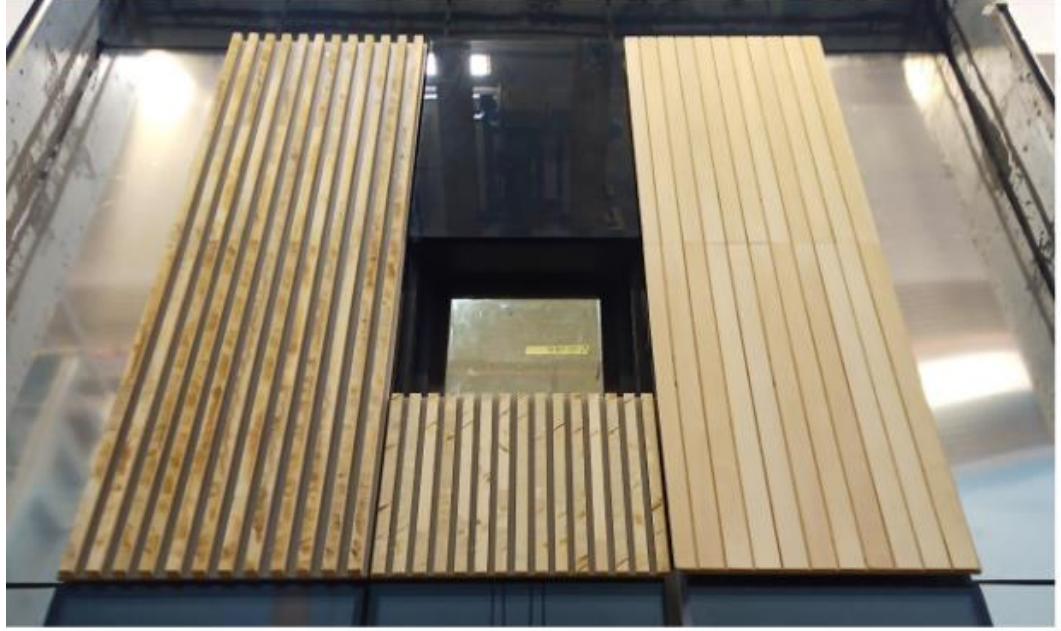
Thermal insulation material

Furniture finishing



Interior walls, exterior panels and roof substructure

Curtain-walls façade system



Project innovation fact sheet

FOCCHI

Wood-based curtain wall façade system

APPLICATIONS

- **Prefabricated** building envelope
- Low-, mid- and high-rise buildings
- **Opaque** and **vision** units of the buildings

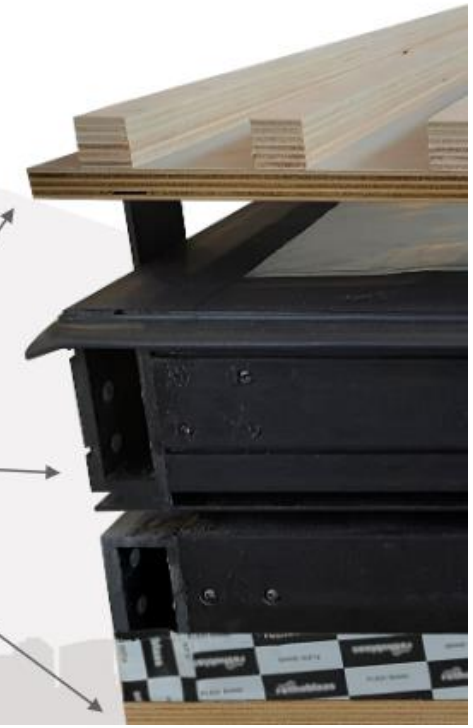
FOCCHI

BENEFITS

- Applicable to **opaque** and **vision units** of the buildings
- **Breathable** with high thermal insulation properties
- **Save, easy and fast on-site assembly**
- **Customisable** exterior finish
- Mainly made from **renewable biobased materials**
- Designed for **disassembly** for use in closed **circular economy material loops**

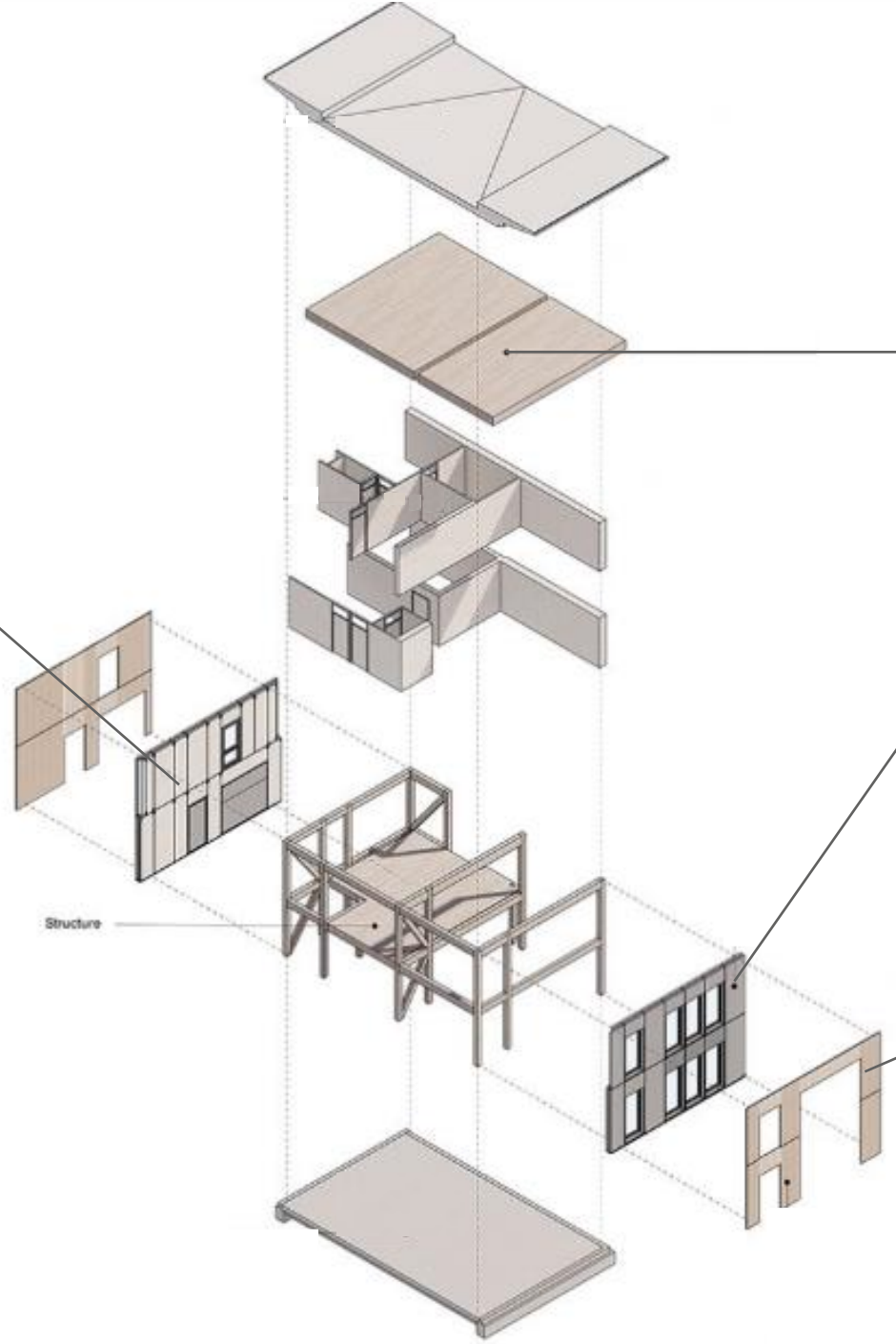
NEXT STEPS

- Increasing **cost efficiency**
- **Increasing biobased** parts
- Reducing weight
- Production **process optimization**



Thermal insulation material

Furniture finishing



Interior walls, exterior panels and roof substructure

Curtain-walls façade system

Project innovation fact sheet

Fraunhofer WKI

Thermoplastic composite sheet

from recycled wood and biopolymers

APPLICATIONS

- Replacement of High-Pressure Laminate (HPL) as **plywood top-sheet**
- Applications where HPL acts as top-sheet, and for use on **other wood-based panels** such as oriented strand board (OSB)

Fraunhofer WKI

BENEFITS

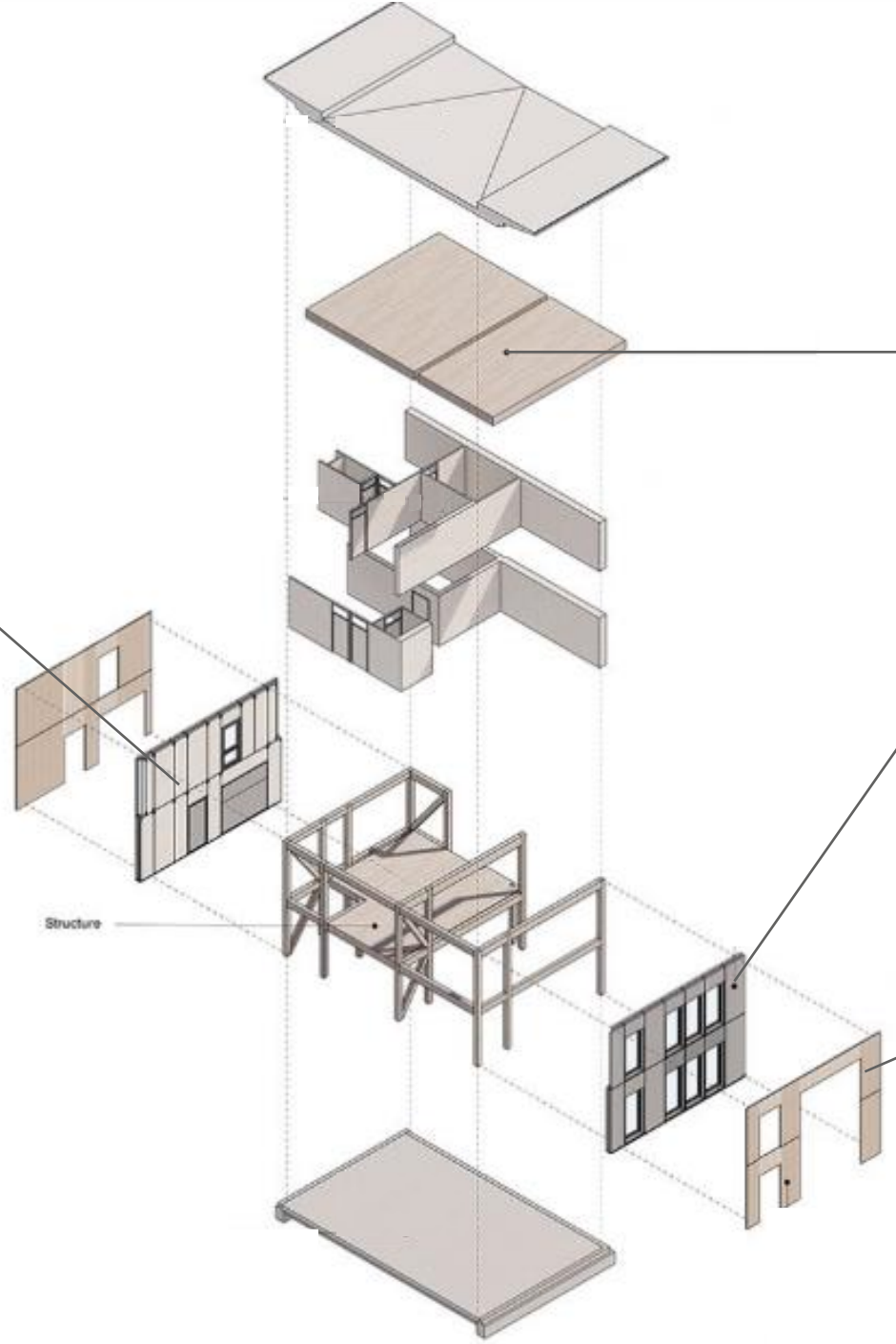
- Application to architectural interior **walls and furniture** or other uses e.g., concrete formwork
- The non-fire-retarded version consists of almost **100% bio-based** materials
- **Fire-retardancy**: the material was **classified** as V-0 at 4 mm (UL94)
- **Customisable** exterior **finish**
- Easy **recycling**
- **Cost efficient**

NEXT STEPS

- **Upscaling** of the production process
- Determination of selected **mechanical** and **physical properties** including durability
- **Fire classification** of final product
- Other applications in construction and furniture, vehicle production, decorative laminates, thermoplastic sheets

Thermal insulation material

Furniture finishing



Interior walls, exterior panels and roof substructure

Curtain-walls façade system

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Technology readiness levels (TRL)

- TRL1. Basis principles observed
- TRL2. Technology concept formulated
- TRL3. Experimental proof of concept
- TRL4. Technology validated in lab
- TRL5. Technology validated in relevant environment
  industrial relevant environment in case of key enabling technologies
- TRL6. Technology demonstrated in relevant environment
  industrially relevant environment in case of key enabling technologies
- TRL7. System prototype demonstration in operational environment
- TRL8. System complete and qualified
- TRL9. Actual system proven in operational environment
  competitive manufacturing in the case of key enabling technologies or in space

Basic Requirements
Construction Product
Regulation (CPR)

1. BR1: Mechanical resistance and stability
2. BR2: Safety in case of fire
3. BR3: Hygiene, health and the environment
4. BR4: Safety and accessibility in use
5. BR5: Protection against noise
6. BR6: Energy economy and heat retention
7. BR7: Sustainable use of natural resources

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2023

Technology readiness levels

Thermal insulation material

- TRL1. Basis principles observed
- TRL2. Technology concept formulated
- TRL3. Experimental proof of concept
- TRL4. Technology validated in lab
- **TRL5. Technology validated in relevant environment** (industrial relevant environment in case of key enabling technologies)
- TRL6. Technology demonstrated in relevant environment (industrially relevant environment in case of key enabling technologies)
- **TRL7. System prototype demonstration in operational environment**
- TRL8. System complete and qualified
- TRL9. Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies: or in space)

It needs final scaleup in an industrial production line

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Interior walls, exterior panels and roof substructure

Technology readiness levels

- TRL1. Basis principles observed
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- TRL3. Experimental proof of concept
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- TRL8. System complete and qualified
- **TRL9. Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies: or in space)**

Already commercial

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2023

Furniture finishing

Technology readiness levels

TRL1. Basis principles observed

TRL2. Technology concept formulated

TRL3. Experimental proof of concept

TRL4. Technology validated in lab

TRL5. Technology validated in relevant environment (industrial relevant environment in case of key enabling technologies)

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TRL9. Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies: or in space)

Samples for small demos

BASAJAUN

IRIC

2023

Curtain-walls façade system

Technology readiness levels

- TRL1. Basis principles observed
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- **TRL8. System complete and qualified**
- TRL9. Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies: or in space)

Several doubts because the final product is always customized in the normal commercial activity, like this one

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2023

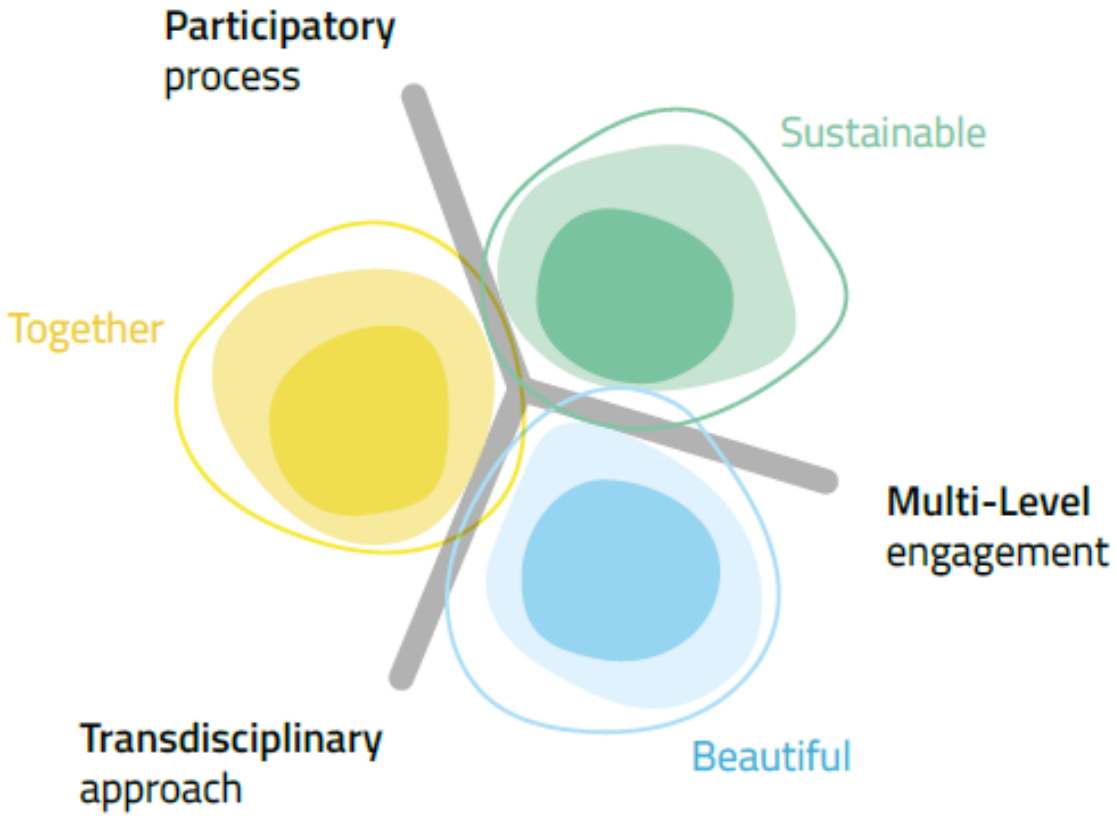
Objectives

1. Description of the co-design process on the case study of a wood building of a new school complex in rural Southern France.

2. Show the implementation of wood-based innovations in the demo building to maximise the use of wood in response to green public procurement (GPP) criteria set by the regional authority.

3. NEB Compass assessment of the co-design process in the demo building

NEB Compass: values and principles



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NEB **Compass**

		Ambition I	Ambition II	Ambition III
Values	Beautiful	to activate	to connect	to integrate
	Sustainable	to repurpose	to close the loop	to regenerate
	Together	to include	to consolidate	to transform
Principles	Participatory	to consult	to co-develop	to self-govern
	Multi-level	to work locally	to work across levels	to work globally
	Transdisciplinary	to be multidisciplinary	to be interdisciplinary	to be beyond-disciplinary

New European Bauhaus Compass, 2023. https://new-european-bauhaus.europa.eu/system/files/2023-01/NEB_Compass_V_4.pdf

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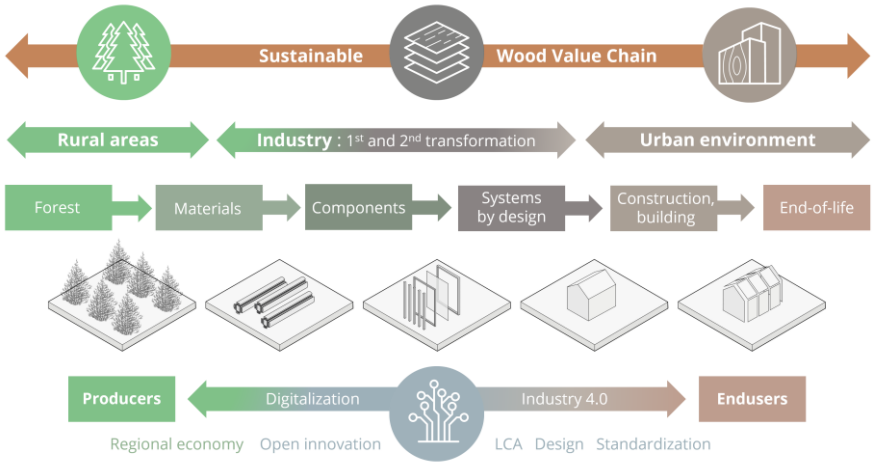
BASAJAUN demo building

France (2023)



Project description

BASAJAUN presents a new approach to the co-design process throughout the whole value chain, from forests to building construction and end-of-life. The building, destined as a residence for the staff, is part of an education complex for high school students from ten to fifteen years old owned by the Gironde Department. It was originally designed using a concrete structure, which was substituted by wood. Several Wood-based innovations were developed and implemented in the building to solve roofs, walls, and partitions and improve the health and safety of persons involved throughout the life cycle of the construction Works and comfort and safety throughout the whole building life.

NEB **Compass**
Values

BASAJAUN demo building

Beautiful

AMBITION I: to activate

BASAJAUN considers the comfort of its users in terms of materials, and thermal and acoustic insulation. Its timber structure is conceived to remain visible inside the building, enhancing sensorial perceptions (visual, tactile and olfactory).

AMBITION II: to connect

The building aesthetics connect with the surroundings, a forest of pines. It provides attractive and comfortable apartments to accommodate school staff, which lets people with different backgrounds experiment with temporary living in a wood-based building, interchange impressions and learn about wood-based innovations thanks to the building process information located in the hall.

AMBITION III: to integrate

The project reflects the future needs of the users in terms of offering the chance to learn more about sustainable materials, lifecycle thinking and the possibility of reusing.

Sustainable

AMBITION I: to repurpose

The original project design, conceived with a concrete structure, was modified for a timber one, common insulation materials (petroleum or rock wool derivatives) were replaced by wood-based ones, and new bio-based coatings were developed to improve the wood durability.

AMBITION II: to close the loop

The process design of the building considered the whole life cycle analysis for both materials and components from the forest resource to the end of life of the building, allowing the possibility of reusing or recycling the wood-based components.

AMBITION III: to regenerate

Most of the elements that compose the structure and envelope (except connectors) are made of wood and derived materials from sustainably managed forest. The wood building becomes a carbon store during its service life and beyond due to the possibility of reusing.

Together

AMBITION I: to include

The building is inclusive by design, with no physical barriers on the ground floor. The school staff can access it without any distinction.

NEB **Compass** Principles

BASAJAUN demo building

Participatory Process

AMBITION I: to consult

BASAJAUN team maintained a continuous dialogue with the public representatives in meetings and with the general public, communicating the progress of the developed innovations and the design and construction process through presentations, publications, etc.

AMBITION II: to develope

The building was developed in collaboration with stakeholders in the whole value chain, from producers to end-users, from the forest resources to the building construction, and from rural areas to the urban environment.

Multi-level engagement

AMBITION I: to work locally

The Project was conceived as a demonstrator for a wood-based building from local resources (with the exception of the glulam), trying to influence the local living environment.

AMBITION II: to work across levels

The building is integrated in an educational complex for high scholl students, connected with other regional/national educational institutions. In addition, the commune of Le Pian-Médoc is connected with others in the Gironde Department and geographically at the border of the metropolitan area of Bordeaux. The building is an example to comply with the policy of the Department of at least 7.5% of the building volume made with wood.

AMBITION III: to work globally

Stakeholders form different countries were involved in the design and building process. The French demo building was taken as an example of replicability in a virtual model for a building in Finland.

Transdisciplinary approach

AMBITION I: to be multidisciplinary

The project brings together academics with professionals and industry through an innovative co-design approach with people from different backgrounds (foresters, chemical, industrial, structural and timber engineers, architects, rural planners, etc.)

AMBITION II: to be interdisciplinary

The project was characterised by a high intensity of communication between the players, lead by one coordinator and different responsible for tasks, as usual in European projects. The creation of knowledge and development of innovations was in a chain, e.g. development of SIP panels depending on pulp-based insulation

AMBITION III: to be beyond disciplinary

A collaborative process in the development of wood-based innovations for building facilitated the merging of different knowledge fields. Different institutions and people with different background worked to develop and integrate more sustainable materials and products in building.

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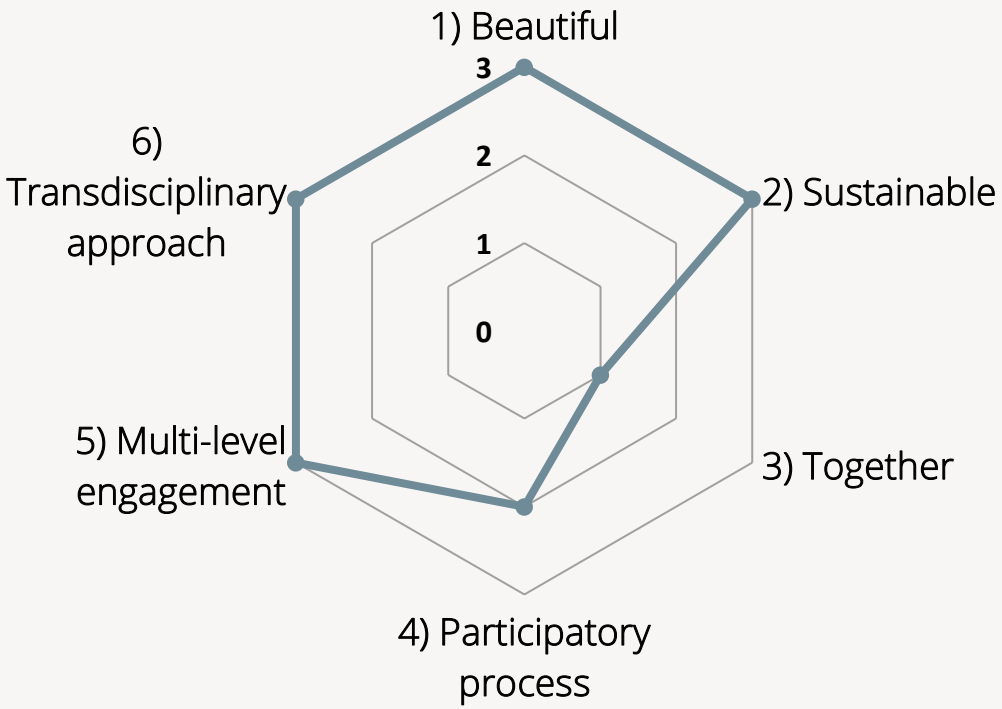
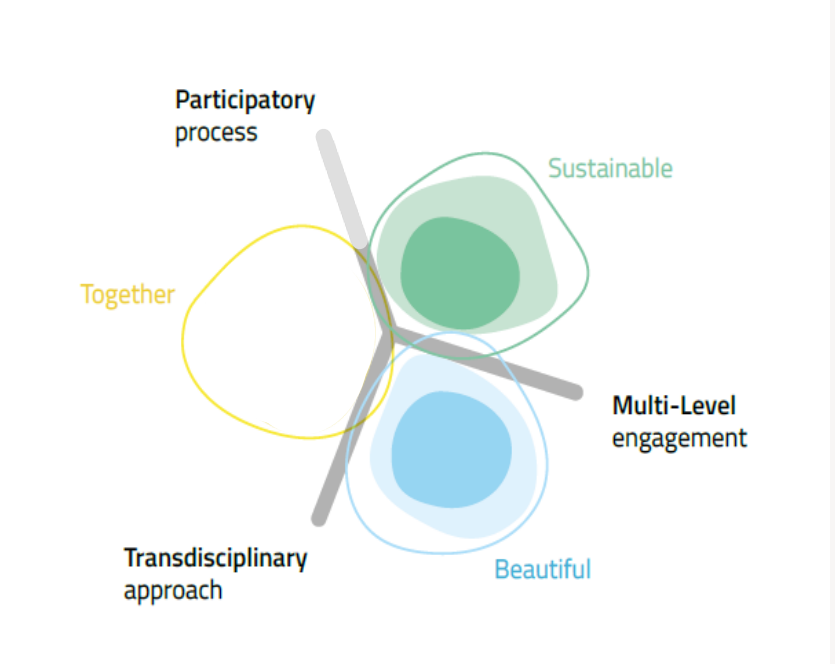
Demo building

France (2023)

NEB **Compass**

BASAJAUN´s NEB Ambitions





NEB values compass - comparison

NEB **Compass**
Examples

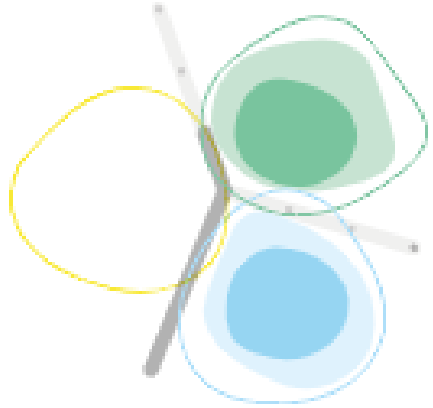
BUGA Wood Pavilion

Germany (2019)
by ICD/ITKE & University of Stuttgart

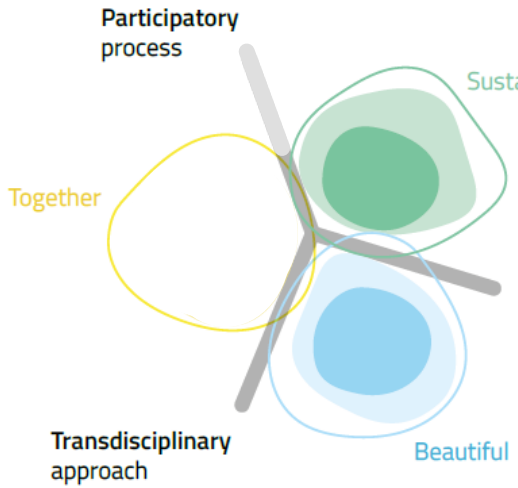
Project description

The BUGA Wood Pavilion celebrates a new approach to digital timber construction. The stunning wooden roof spans 30 metres over a public event area, using a minimum amount of material while also generating a unique architectural space. The pavilion was developed by an interdisciplinary team of architects, engineers, scientists, craft and public stakeholders. Due to its innovative building system it can be fully reassembled at a new location and completely recycled at the end of the structure's life.

BUGA Wood Pavilion



BASAJAUN Wood building



Conclusions

1. The NEB compass applied to the Basajaun demo building resulted in complying with the ambitions 3 for *Beautiful*; 3 for *Sustainable*, and 1 for *Together*; and with the ambition 2 for the *Participatory process* and 3 for *Multilevel* and for *Transdisciplinarity*.
2. The co-design process of the Basajaun project improved the scores of *Together* and *Participatory process*. This is a model for replication according to NEB principles.
3. However, it seems difficult to define and apply objective terms in the NEB evaluation. Developing NEB-related questions and indicators for checking could help to better compare projects.
4. CPR requirements ensuring the performance of the building need to be considered in parallel to the NEB values and principles, especially in aspects related to the structure of buildings that may result in a safety risk.

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