



Timber Perception Lab
First Year Report



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1. FOREWORD

Globally, the use of engineered timber in multi storey construction is on the rise (see scientific report, p. 8). Governments, the construction sector, and the real estate market are evolving to enable the use of mass timber, and other low carbon technologies, to respond to urgent societal challenges such as climate change and the housing crisis.

Incremental change won't be enough to accelerate this transition, aligned multi-stakeholder action will be key. The real estate and construction sectors, local communities, policymakers, investors, developers, asset owners, designers and insurers will need to work together on a journey to unlock systemic change.

In early 2022, a consortium of partners led by EIT Climate-KIC, Lendlease, and Waugh Thistleton Architects and including Politecnico di Milano, Arup and StoraEnso launched Perception of Timber at MIND Milan Innovation District (PoT@MIND), an initiative aimed at unlocking the adoption of mass timber construction in the Italian context. The initiative, sponsored by Built by Nature, supported by founding partner Laudes Foundation, and co-funded by Lendlease, engaged more than 50 multi-stakeholder organisations in workshops and activities. The main outcomes include identifying the value-chain barriers to

building in mass timber in Italy, which stakeholders could work together to unlock these challenges, a list of clear priority actions for this purpose, and the creation of the first Italian Timber Living Lab.

This report describes our journey to understand the 'Perception of Timber' in Italy and how we can work towards transforming it. We are excited about what we, as an ecosystem of value-chain stakeholders, can do to address some of the most pressing challenges of our and future generations.



Amanda Sturgeon

CEO, Built by Nature



Andrea Ruckstuhl

Director, EMEA at Lend Lease

2. EXECUTIVE SUMMARY

In 2018 the IPCC stated that the world needs to reach net zero by 2050 if it is to meet the Paris Agreement target of limiting global warming to 1.5°C. The deadline was included in the Glasgow Climate Pact agreed at COP26 in 2021. According to the International Energy Agency (IEA), **the built environment generates 40% of annual global CO₂-equivalent**

emissions. Circularity and the use of bio-based materials are two key strategies to reduce embodied carbon in the construction sector.

The **use of wood in buildings offers a triple benefit.** First, **trees are replenishable** and carbon is sequestered as the tree grows. Second, **other high-carbon materials - i.e. concrete and steel - are displaced,** mitigating their associated emissions. Third, by reducing the weight of the superstructure and therefore the size of foundations, **less material is used and related emissions released.**

In light of the climate challenge we face, timber construction systems offer a familiar, viable, and scalable solution for decarbonising the construction industry.

European forests grow 840 million m³ of timber a year and building with wood, procured from sustainable and certified sources, stimulates the growth of sustainable forests. Additionally, timber is the only mainstream construction material that can be considered as truly replenishable

Modern engineered timber products, such as glue laminated timber (Glulam) and Cross Laminated Timber (CLT), **provide us with an opportunity to use products from the process of capturing CO₂,** and use them in our buildings (storing carbon for at least the lifetime of the buildings). Additionally, substituting concrete and steel with wood can save an average of 45 tons of CO₂ per dwelling.

Mass timber products can be used as part of prefabricated solutions to deliver faster to erect buildings. **Timber buildings are also shown to have health and well being benefits.**

Developers of multi storey buildings, such as Lendlease, are embracing the use of these type of low carbon engineered timber products in their journey towards absolute zero carbon

emissions. The largest timber building ever built by Lendlease, 25King St, used 6545 m³ of timber regrown in less than an hour (56 minutes) and stores the equivalent carbon of 1600 annual car emissions.

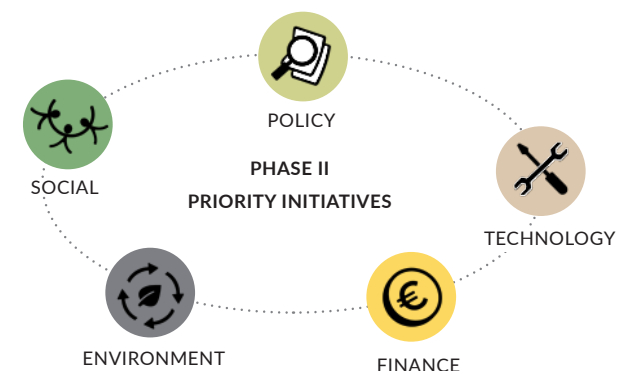
During 2022 a Network of **more than 30 Industry organizations gathered at MIND Milano Innovation District** in space of 6 months to understand if building with sustainable engineered timber was possible in the Italian context.

Dialogue among investors, developers, insurers, local community, designers, engineers and the civil society allowed the **identification of perceived barriers,** including perceived risk, competence, data, guidance, etc. Myths were busted along the process by bringing experts and key actors to improve the network knowledge, confidence was boosted, yet it was acknowledged that barriers to scale remain. These were categorised as follows: regulatory and policy, financial, technological, social and cultural as well as environmental.

It was broadly understood that to overcome these barriers, we need to collaborate as an industry. **21 key initiatives were methodically curated by the network, and 5 priorities identified** with their activation in process.

The first Italian Timber Living Lab was created to disseminate and build on the body of knowledge. Additionally, the journey and learning of the Network was captured in an Exhibition curated to support a wider campaign to attract the public and local politicians.

Phase II is to see the activation of priority initiatives driven in collaboration by a multi-faceted network of influential organizations and individual, using MIND Milano Innovation District as a test bed to continue the progress that has already seen the refurbishment of two timber low-rise and of six medium-rise timber buildings, and the design of high-rise timber building.



Note:

Detailed description of Phase II initiatives is available at page 35

3. REASONS FOR THIS JOURNEY

The built environment generates 40% of annual global CO2-equivalent emissions. Building operations are responsible for 27% of the share, while carbon emission generated through building and infrastructure materials and construction processes (typically referred to as embodied carbon) are responsible for the remaining 13%. As the energy supply decarbonises however, the share of embodied carbon is expected to rise to half of all new buildings' emissions between now and 2050. Circularity and the use of bio-based materials are two of the key strategies to reduce embodied carbon in the construction sector. The use of wood in buildings offers a triple benefit. First, carbon is sequestered as the tree grows, second, other high-carbon materials – usually concrete and steel – are displaced, avoiding those emissions, and third, by reducing the weight of the superstructure and therefore the size of foundations, less material is used and related emissions released. However, through our analysis of the 'perception of timber' in Italy we found that there isn't a single bottleneck to the adoption of mass timber, but instead interlinked / interdependent barriers are spread across both the demand and the supply side - which might be the reason why progress can sometimes feel stuck without a central orchestrating agent.

Examples of potential challenges:

- supply of sustainably sourced raw material with the required quality (sourcing wood, if not done sustainably, can create possible

- negative effects in land-use emissions and biodiversity loss),
- technical aspects related to fire safety and resilience, acoustic performance, and moisture control,
- lack of design and evaluation data and expertise,
- value chain limited experience with mass timber products and technology
- uncondusive regulation, guidance, and construction policy,
- deterring mortgage and insurance premiums,
- limited access to finance.

Single-point interventions will not take us where we need to be. The likelihood that the system will tip towards mainstreaming circular, bio-based buildings increases exponentially the more stakeholders act simultaneously and in alignment towards a shared goal.

Fundamental to achieving cross-sectoral alignment is Climate KICs systems innovation approach to coordination across technology, policy and regulation, culture and society, finance and economics, data and digitalisation. In this regard, philanthropic funding such as Built by Nature's Accelerator Fund is filling a crucial gap in the deployment of resources towards multi stakeholder efforts with a focus on collective, strategic learning through experimentation, long-term relationships, and developing room for enabling flexible responses and strategic pooling of resources, including funds.



Kirsten Dunlop

CEO, EIT Climate-KIC



Riccardo Marini

Marini Urbanismo

4. TIMBER PERCEPTION LAB: A JOURNEY AND ITS OUTCOMES

The initiative's objective was to **develop multi-stakeholder actions** to lift perceived barriers to the use of timber in buildings. Lendlease's Milano Innovation District (MIND) was the ideal platform to engage key decision-makers active in the Milanese, Italian and EU context in co-creation activities to demonstrate that barriers can be overcome through collective, coordinated action.

The project targeted stakeholders including developers, investors, cities, designers, insurers, and assets owners - resulting in the launch of Italy's first collaborative Timber Living Lab. In addition, the network produced a public exhibition, and a set of aligned, multi-lever priority actions to mainstream the use of timber in Italy for joint implementation in the second phase of the project.

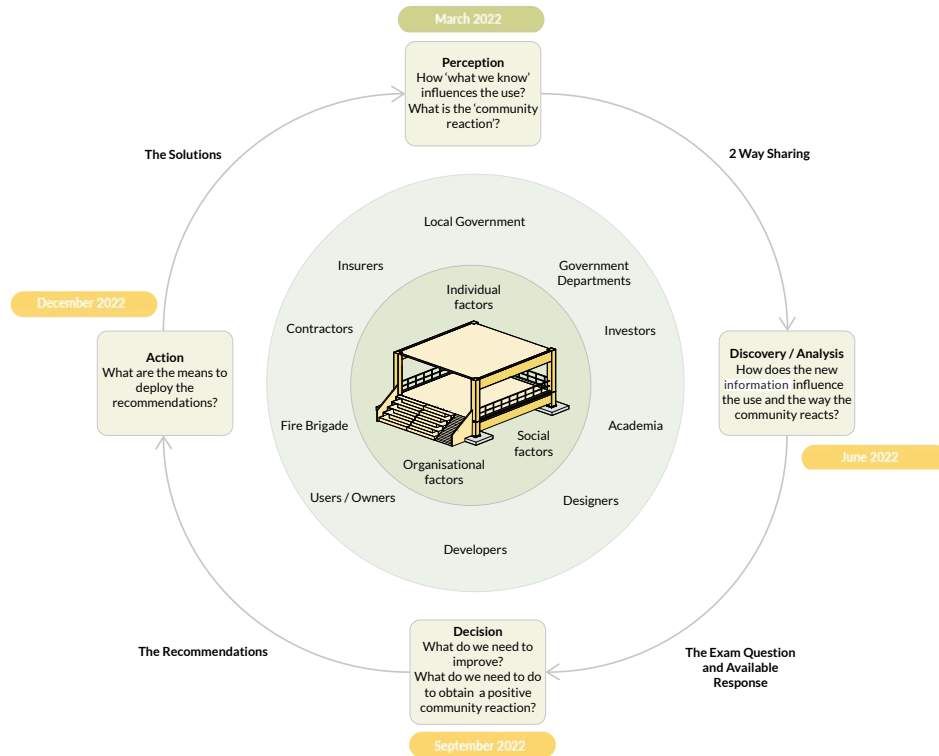


Figure: The chosen research method and its expected outcomes

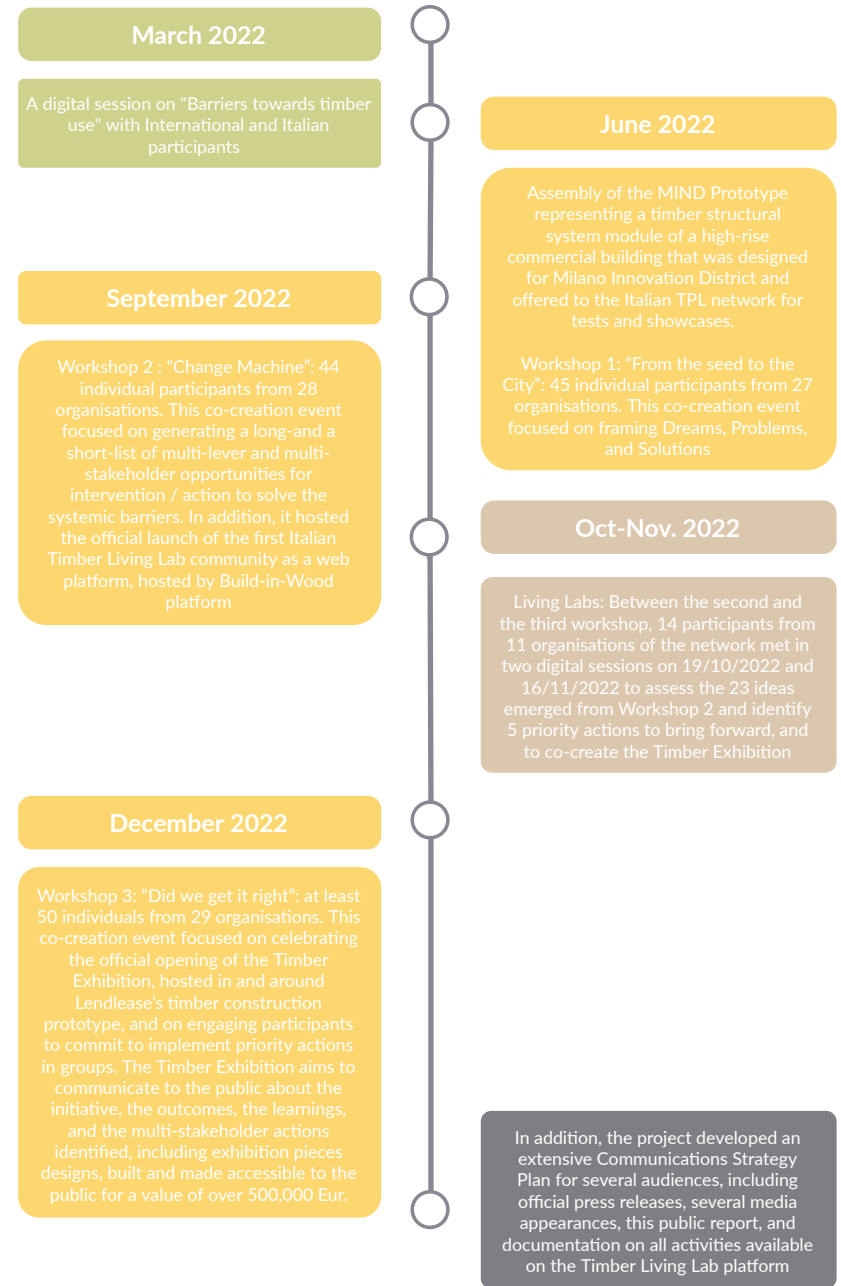


Figure: List of the activities and events that the initiative team has organised over the past nine months

4.1 THE PROTOTYPE

To prevent global temperatures from rising above 1.5°C, we consider it essential to eliminate emissions from the built environment; this is why Lendlease has set sustainability targets outlining the roadmap to absolute zero emissions: Net Zero Carbon by 2025 for Scope 1 emissions, i.e. those generated directly from the fuels used, and Scope 2 emissions from the energy consumed and Absolute Zero Carbon by 2040 with the elimination of all emissions, including Scope 3, i.e. those generated indirectly, without the use of offsets. The European Commission has elected wood as main material for the buildings of the future. In addition to the advantages of its off-site and high-tech use, it represents an important tool for decarbonising the city. Yet, in Italy and unlike other European countries, the building industry struggles to use it on a large scale and in large-scale property developments. An attempt to reverse this trend comes from and about Milan.

The use of low-carbon and potentially carbon-negative materials will be a priority throughout the development of the MIND project. The adoption of engineered timber in collaboration with other innovative materials can be a key factor in reducing construction sector emissions. The **MIND Timber Prototype** is a **typical structural module for commercial high-rise buildings** and **serves as a catalytic agent** in fulfilling the objectives defined within the Perception of Timber journey.

The aim was to represent the actual sizing of the components that would be designed into

the high-rise building and demonstrate the look and feel of what the future engineered timber structures will be. This gave us the opportunity to test the assembly of the prefabricated timber components and find opportunities for improvement to be discussed with the Italian network. The prototype was designed adopting a Digital Twin approach, converting the building 3D model into an advanced manufacturing model with all the details and data required for production. Assembled under the supervision of Lendlease in collaboration with Woodbeton, it serves as a common ground to work together and collaborate on the adoption barriers related to insurance, policy, and technology.

Last December, the MIND Timber Prototype was turned into a stage and incorporated in the final exhibition of the Perception of Timber journey and is being showcased not only to the construction industry members, but also to the public for learning and social awareness purposes.



Eneida Lila

Lendlease Italy

Digital Innovation Manager



Figure: Physical prototype in its latest configuration

4.2 CHALLENGES OF USING MASS TIMBER

1

Social and Cultural Barriers



Lack of knowledge in the final users



Lack of collaboration between the stakeholders



Lack of information shared between the stakeholders



Lack of communication between the sector and politics



Lack of knowledge in the Public Administration about the benefits

2

Regulatory and Policy Barriers



Lack of competency and professional pathways certification



Restrictive bureaucracy for timber buildings



Old-fashioned and conservative legislation



Absence of significant directives

4

Financial Barriers



General mistrust from financial institutions



Lack of Return on Investment in the short term



Purchasing costs of bio-based materials



Insufficient clarity on criteria that make timber buildings 'sustainable'

3

Technological Barriers



Absence of continuity from BIM to construction



Absence of certifications for end-to-end quality



Poor development of end-of-life scenarios



The lowest price criterion applied by public administration is disadvantageous

5

Environmental Barriers



Absence of an incentive for the supply chain



Absence of short supply chains in the country



Sustainability in Energy performance certifications is not considered



Biogenic CO2 storage is disadvantaged in static LCAs

4.3 WORKSHOP 1: FROM THE SEED TO THE CITY



WORKSHOP 1 REPORT



DOWNLOAD HERE

4.3 WORKSHOP 1: FROM THE SEED TO THE CITY

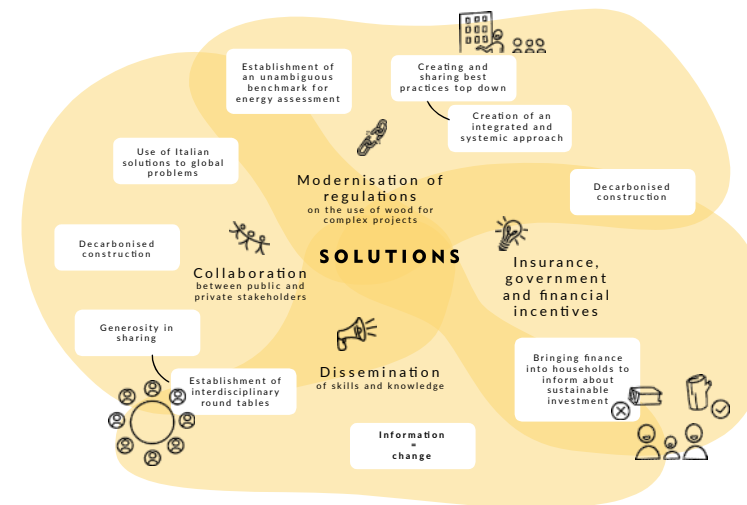
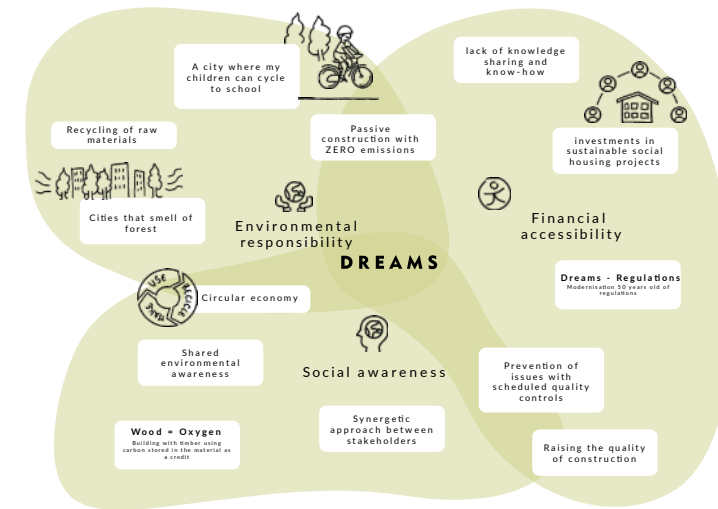
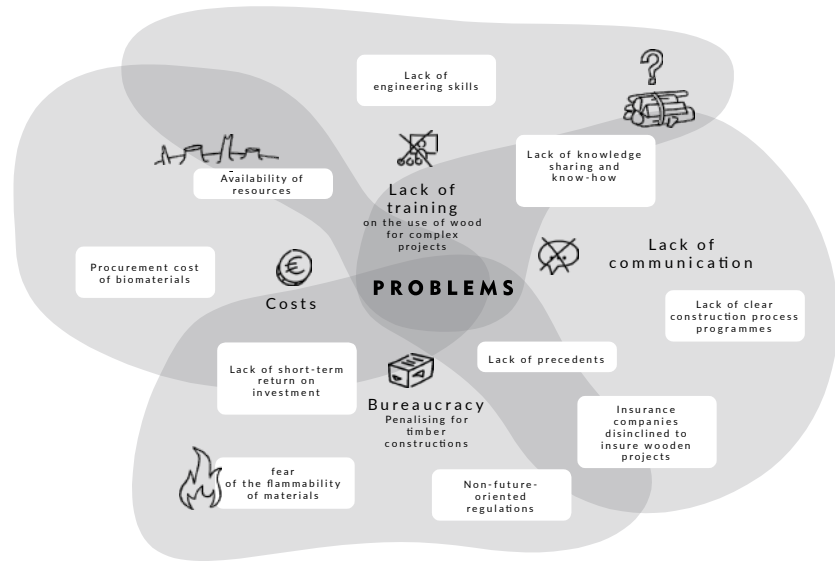


Figure: Main outcomes of the discussions held at the first Timber Perception Lab workshop: an insight into the dreams, the perceived barriers and ways to overcome them

4.4 WORKSHOP 2: CHANGE MACHINE

WORKSHOP 2 REPORT



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POLITICAL

Why/The Problem	How/The Action
A review of the existing policies and legal framework is necessary to unlock the potential of engineered timber, especially with regards to embodied carbon and carbon sequestration (see also environmental breakout room discussion, point 1)	Implementing a national framework of regulations with clear obligations, incentives (and penalties) e.g., carbon taxation, fiscal incentives
EPD (Environmental Product Declaration) certification to be used as reference	Requiring a minimum quantity of timber to be used in new developments. Key points to define successful policies: clear criteria, clear short/medium/long term targets and objectives, sure enforcement
Removal/revision of regulatory barriers, especially with regards to structural, fire and acoustic performance	Development and use of clear, solid, unified environmental documentation describing production of materials and reuse of buildings components and materials (end of life)
	Model building that addresses regulatory, insurance and other key stakeholder requirements in the most efficient manner and agreed among a panel of representatives from all parties



TECHNICAL

Why/The Problem	How/The Action
A continuous approach from design to execution, which would help increase standardization of components. There is no continuity from BIM to construction	1) Model building / playbook with DfMA process that can be agreed by key value chain stakeholders (model building design with key DfMA process embedded, kit of parts) 2) Collaborate with designers and suppliers to establish a DfMA-BIM Quality Control to facilitate the generation of a manufacturing digital 3D model - digital section in the playbook
There are enough certifications that prove the quality of the materials when it comes to their manufacturing, but there is more to be done for the quality preservation once they are delivered to the construction site (end-to-end quality)	1) Investigate the insurance rulebook already being worked on the UK and see how it might / might not apply to the Italian market. 2) Investigate how the SALE protocol (or any other assurance certification protocol) meets the needs of insurers and designers and define improvement opportunities
End-of-life scenarios: OSB Panel New product from recycled material Re-certification - there is an existing protocol that proves it through lab testing Sawing the structural timber and reuse for furniture	1) Develop end of life theoretical models, such as leasing of timber from manufacturer. 2) Collect practical examples from research institutions and manufacturers to the living lab
Public Administration has to use another way of evaluating proposals in a bid, that doesn't give the highest value just based on the lower cost	Develop a criteria or weighting system, to adequately evaluate value Quantifying the value of timber beyond carbon and cost



SOCIAL

Why/The Problem	How/The Action
Before structuring specialized training programmes we need to disseminate knowledge about the benefits and advantages of timber buildings, reducing the gap with the final users	Hackathon or contest launched by Federlegno on a timber challenge, with a reward for winners. Workshops for students of the School of Architecture or Engineering of Polimi (in collaboration with a sponsor company). Proposal to use timber building as a lab topic in one of the courses of the School of Architecture or Engineering of Polimi
While the collaboration with professional associations is good and effective, the competition between companies remains an obstacle to create synergies and the relationship with the public authority is very difficult	Launch of a special project by the Federated Innovation (e.g. Model-building), which first action is a collective call for funds aimed at financing the project. Stakeholders collaborate at writing the proposal to be submitted, clarifying the role each one will play. This could become the first concrete collaboration setting the ground for the future creation of a living lab
Not all the data and the knowledge produced by companies is shareable with the wider community, but the expertise on common problems and how certain criticalities have been solved are information that each stakeholder could provide	Definition of a communication strategy (e.g. Presentation at conferences, events, news by professional associations, ...) to promote and invite people to participate in the call for best practices already open in our website.
Make society aware of the benefits through elevating the topic to political leaders / figures in the Milan Municipality	Work on event, exhibition and campaign that attracts political figures as well as the public



ENVIRONM.

Why/The Problem	How/The Action
Creating an economic incentive for the supply chain through the access of Italian companies to carbon removal credits	Improving the EPDs process - making it easier for players within the mass timber supply chain to obtain EPDs by reducing time and costs of making environmental declarations
Developing short supply chains with economic and social spin-offs in the country	Improve the production chain already in place. Encourage the creation of a short supply chain in Italy. Use land that is currently abandoned for wood production through the involvement of the public administration
Review energy performance certifications to promote sustainable buildings, suitable with the drivers described in the Financial break-out room	Review the actual certification scheme in order to consider the operational and embodied carbon with life cycle approach
Introduce the dynamic method for impact assessment	Investigation on the inclusion of dynamic LCA as a mandatory step in standardization



FINANCIAL

Why/The Problem	How/The Action
Insufficient clarity on criteria that make timber buildings more 'sustainable'	Collaborative white paper proposal to identify criteria for projects aligned with ESGs, EU Taxonomy, SFDR
There is already evidence for loss of value in the market for 'unsustainable' investments, but this is not quantified	Analysis / research of data availability to quantify loss of value of unsustainable investments based on criteria identified by initiative above
Insurers' models discourage use of timber	Proposal for alternative insurance risk assessment model
Insufficient access to capital for timber buildings, as they are perceived as more expensive compared to concrete.	Feasibility study of investment model for 'timberfund' for timber buildings in Italy (e.g. ICAWOOD by Wo2) considering S.A.L.E. protocol and any other available assurance means

Figure: Workshop 2 saw key initiatives across five thematic sectors being outlined with the aim to show what can be done to encourage the the use of mass timber in the Italian market

4.5 WORKSHOP 3: DID WE GET THIS RIGHT?

WORKSHOP 3 REPORT



DOWNLOAD HERE





4.6 THE FIRST ITALIAN LIVING LAB

Through the “Perceptions of Timber” initiative and the network of stakeholders gathered through the workshops, Politecnico di Milano has led the development of the first timber Living Lab in Italy: The Timber Perception Lab. The purpose of this Living Lab is to **support stakeholders in exchanging their knowledge and expertise**, and to enable them in workshop ideas that can offer solutions in the Italian market.

Facilitated by the “Perceptions of Timber” team, an interest group was formed by some of the workshops’ participants, who were invited to participate in a **co-creation process** aimed at defining the Living Lab mission and the possible options for a first joint experiment. The interest group saw the

participation of 14 people from 11 different companies. Despite being considered just a first attempt to test the interest of stakeholders toward this kind of initiative, it allowed us to better understand their level of commitment to collaborate on a shared mission. Also, thanks to this activity, we could detect on the one hand the most active stakeholders and identify, on the other hand, what are the obstacles to participation and engagement.

Through the Living Lab co-creation process it became clear that to activate the Italian timber community we need to define a common objective and develop it through a concrete project.

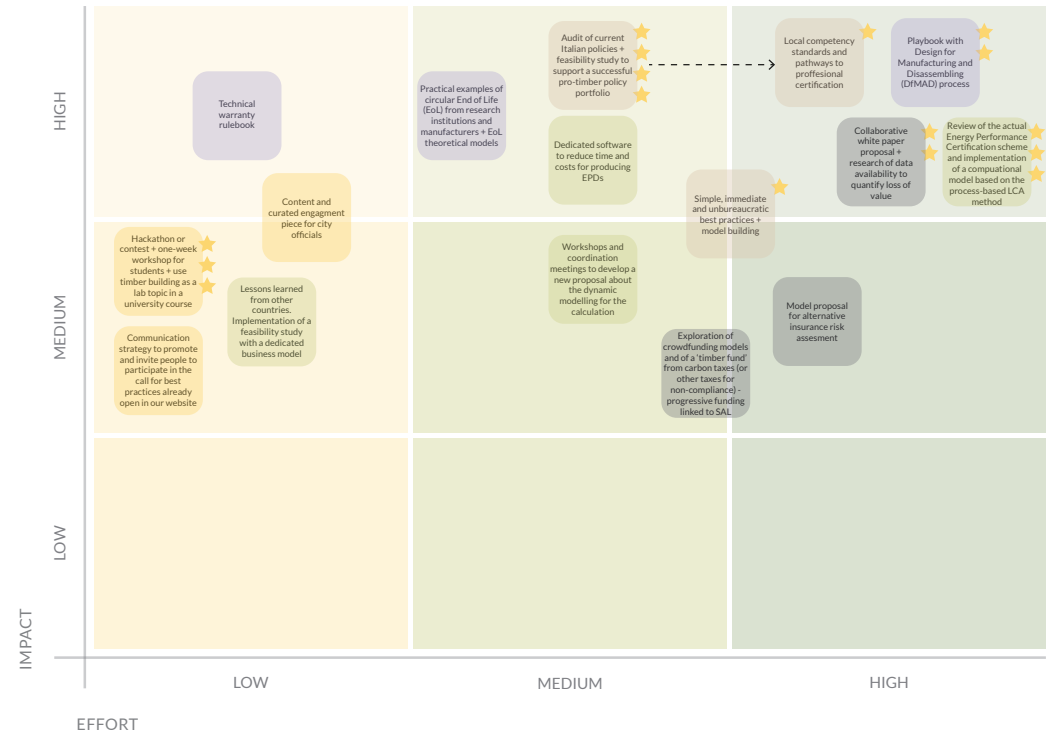


Figure: Living Lab action impact assessment methodology



Francesca Foglieni

Politecnico di Milano

4.7 SCIENTIFIC REPORT

Initially developed in Austria and Germany in the 1990s, Mass Timber is now considered an alternative to conventional materials, such as reinforced concrete and steel.

The growing interest in this construction technology has carbon intensive advantages over the aforementioned materials in terms of the potential impact on climate change, thanks to the lower primary, non-renewable energy demand during fabrication and manufacture.

These advantages are fundamental to achieve the de-carbonization of the construction sector by 2050 in line with European Commission targets. Despite this, Mass Timber continues to have large-scale application limitations partly related to its perception.

Polimi's scientific report aims to address, **raise awareness**, and overcome negative barriers to the perception of structural timber applied to buildings.

An outline list of potential barriers limiting the diffusion of Mass Timber in the Italian construction market emerged during 3 workshops organized in 2022 with the stakeholders.

Based on the workshops' outcomes and reviewing the existing literature, the authors provide an overall view by collecting financial data, i.e., revenue, import and export as well as state of the Italian forests. Policies, economic, financial, and environmental aspects are also analysed, and some possible solutions are put forward.

Some of the report's key findings are summarised in the accompanying info-graphic; for further information follow the QR code to the scientific report (bottom right).



Mario Motta

Politecnico di Milano



36%

Italian territory is covered by forests



Sales and companies are mainly situated in Lombardy, Veneto, and Trentino Alto Adige



61%

Percentage of Italian timber buildings are erected by specialized manufacturers



6%

New construction realized using mass timber technologies



4th

European wood products market

Figure: Scientific report findings

SCIENTIFIC REPORT



DOWNLOAD HERE

5. ACTIONS

After almost 6 months of dialogue and discussion on the challenges and opportunities of using mass timber in the Italian construction sector, we have identified **clear and tangible initiatives** that can be undertaken by the Perceptions of Timber network. The network of organisations is coming together to lead and support some of these initiatives in a 'mission-driven portfolio' in phase 2 of the project. This success must be celebrated but also amplified, to ensure that the impact of the network resonates with industry, institutions, and the wider public.

The project stems from a climate change crisis, however important co-benefits will be felt by the stakeholders involved in this transition.

Society will benefit if the share of the construction sector using bio-based materials increases, therefore, stakeholders from manufacturing, design, investment and policy have an incentive to support these actions. In the first workshop on June 16th 2022, we focused on WHY cities need circular, timber buildings. We identified dreams, barriers and solutions.

In the second workshop on September 17th, we developed key initiatives across 5 thematic sectors to show WHAT can be done to move value chains in Italy towards the use of engineered timber. During online sessions in October and November 2022,

we condensed the long list of initiatives in a short-list of high priority actions. In the third workshop on December 16th, we defined WHO, WHEN, and HOW the priority actions would be implemented. The actions divide into the 5 categories and represent a shared roadmap to overcome perceived barriers to the use of timber in Italian buildings. The initiative's local core partners Lendlease Italy, EIT Climate-KIC, Waugh Thistleton Architects, Arup, and POLIMI are engaging the network around the mission-led portfolio of initiatives in phase 2.

It is essential that the actions are contextualized in the wider local framework of aligned developments in this space, including:

- The publication of Decarbonisation Roadmap for the Italian Built Environment by GBC Italy in December 2022
- Comune di Milano's signature of C40's Clean Construction Declaration in October 2022
- Comune di Milano's selection as one of 9 Italian Pilot Cities within the EU Cities Mission towards full decarbonisation

Work just concluded during the first stage of the project Healthy, Clean European Cities for Circular and Embodied Carbon Neutral Construction (HCC EU CINCO), led locally by Comune di Milano with AMAT and POLIMI.



SOCIAL

Develop a campaign aimed at attracting political figures as well as the public. This is to build on the PoT programme phase I and exhibition at MIND but expanded to get wider public attention

Hackathon or contest launched in collaboration between key partners (Lendlease, CKIC etc.) on a timber challenge, with a reward for winners; one-week workshop for students at the School of Architecture or Engineering of Polimi (in collaboration with a sponsor company); proposal to use timber building as a lab topic in one of the courses of the School of Architecture or Engineering

Local competency standards and pathways to professional certification to recognize and identify competent professionals in matters pertaining to the safe and efficient design of timber buildings

A systematic audit of current policies to identify and define gaps and counterproductive policies. A feasibility study to support a successful pro-timber policy portfolio, including key points clear criteria, clear short/medium/long term targets and objectives, and provisions for robust enforcement

Simple, immediate and unbureaucratic best practices, drafted considering EU examples. A model building addressing regulatory, insurance, and other key stakeholders requirements (agreed upon among a panel of representatives from all parties), in the most efficient manner, as a first step towards developing a local timber guidebook

Model building / playbook with DfMAD process that can be agreed by key value chain stakeholders. Collaborate with designers and suppliers to establish a DfMADBIM Quality Control to facilitate the generation of a manufacturing digital 3D model - digital section in the guidebook

A collaborative white paper proposal which identifies criteria for timber building projects aligned with ESGs, EU Taxonomy, and SFDR, with the purpose of certifying compliance. Analysis / research of data availability to quantify loss of value of unsustainable investments based on criteria identified

An investment model, e.g., a 'timber fund' for timber buildings in Italy (e.g., ICAWOOD by Wo2) considering S.A.L.E. protocol and any other available assurance means

Review of the actual Energy Performance Certification scheme and implementation of a computational model based on the process-based LCA method, considering both the embodied and the operational emissions

Workshops and coordination meetings to develop a new proposal about the dynamic modelling for the LCA calculation and to write an EU community-level position paper with stakeholders



POLICY



TECH.



FINANCE



ENVIRONM.

Figure: key actions subdivided in categories

5.1 THE EXHIBITION

Climate change is real, and its impacts are being felt in our lifetime. What we do as individuals, as businesses, and as a society will have implications for our children, and our children's children. We therefore have a responsibility to future generations to challenge existing modes of practice and to find innovative solutions that can arrest our resource intensive way of living.

Of course, the climate crisis is too big of an issue to solve independently. But if we focus on what we can change, and what we can do, then we can affect wider cultural and societal change that may just shift the dial in our favour. But where do we start?

As already said elsewhere in this document - but it is worth repeating - the construction industry is accountable for 40% of all global carbon emissions; a staggering 8% of global carbon emissions can be attributed to the production of cement alone.

If cement were a country, it would be the world's third biggest polluter after China and the USA; we need to decarbonise concrete but also accelerate the use of timber.

This exhibition is intended to inform, to challenge what you think you know about this humble and familiar material; it has been conceived as a tool to improve awareness about how and why timber is the only viable alternative to concrete and steel, the building material of the 21st Century.

The Timber Exhibition is the first of the priority multi-stakeholder actions to be implemented. It was opened officially to the network on Friday, December 16th during the third workshop of the Perception of Timber initiative. The exhibition space is available for organized visits by companies and institutions that join the network.



Andrew Waugh

Waugh Thistleton Architects

EXHIBITION BOARDS



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5.2 THE TIMBER HACKATHON

Following what the Timber Perception Lab stakeholders expressed during the workshops held together, Lendlease decided to dedicate one of the Hackathon Challenges of the next **Social Innovation Campus** edition to the role of timber in construction, asking the students to propose how they suggest breaking one of the main barriers to the adoption of timber: social awareness.

The **Social Innovation Campus** is one of the main reference events in Italy on Social Innovation. It is an international event on Innovation and Social Impact, Sustainable and Inclusive Technologies, Digitalisation, and Finance including Profit and Non Profit partners.

For the edition held on the 1-2 March 2023, Fondazione Triulza built with its partners a rich Cultural Program around the Transition to the Future. The hackathons took place in the Social Innovation Academy of MIND - Milano Innovation District. The activities were based on a “cooperation of all for the good of all” approach: a sustainable development model, where students create a startup experience with a common mission.



Eneida Lila

Lendlease Italy

Digital Innovation Manager



(C) Fondazione Triulza

5.3 AN ITALIAN TIMBER BUILDING GUIDEBOOK

The Perception of Timber research outcome showed that there is limited guidance on how to design and assemble timber buildings in Italy. This poses several challenges from the perspective of enabling timber construction, including uncertainty about risks and an overall inefficient and slow design process.

The development of a guidebook was identified as part of the solutions during the phase I. The Guidebook aims to change the status quo and build a timber knowledge base among all stakeholders. The objective is to challenge the market perception of timber construction by clearly demonstrating how it can be safely used for multi-storey commercial and residential buildings within current Italian building regulations. Our goal is to provide confidence and clarity to the wider construction industry in the safe

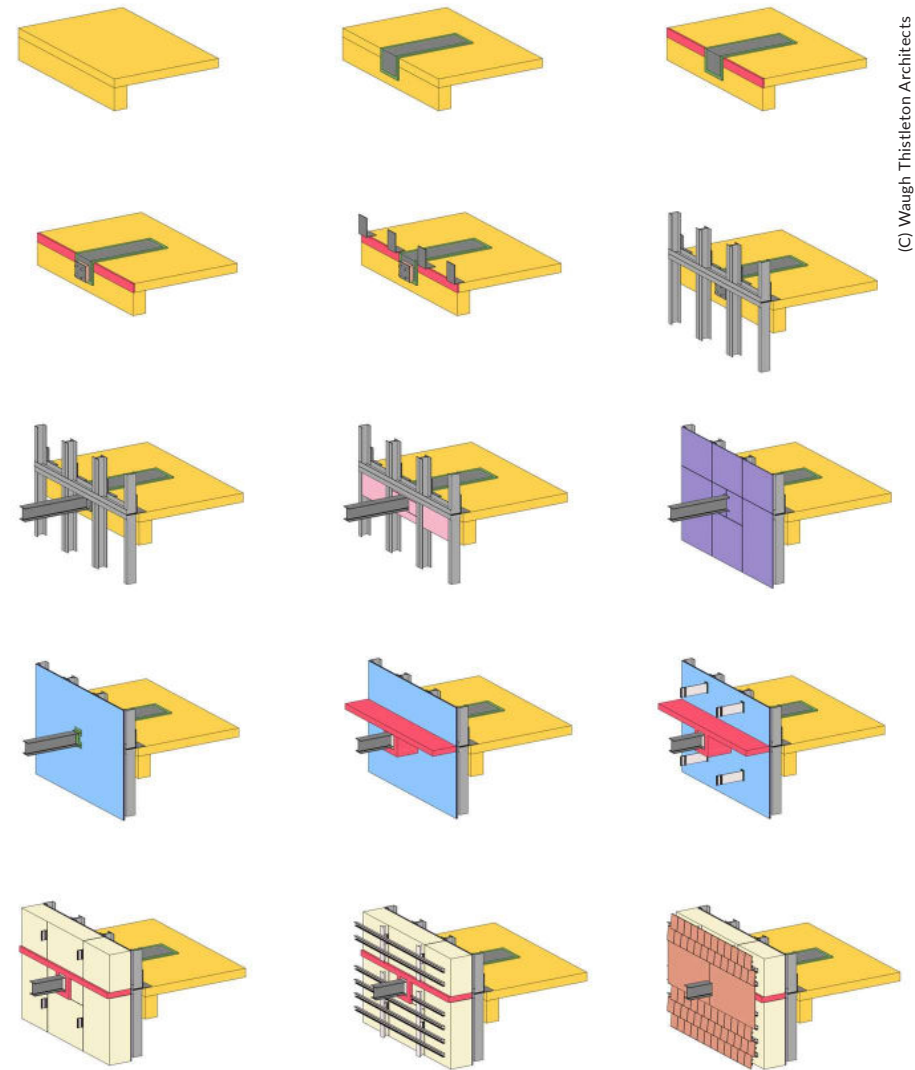
application of engineered timber.

The Guidebook aims at being a holistic endeavour and, as such, to be developed by a highly competent consulting team of designers, structural, fire and sustainability engineers, academic partners as well as representatives from insurance companies, investors and asset owners; the team is proposed to be led by a steering group of large developers who are helping to drive the low carbon transition.



Kirsten Haggart

Waugh Thistleton Architects



(C) Waugh Thistleton Architects

Figure: Typical guidebook explanation; post&beam structure slab-edge to balcony interface highlighting materials and components

6. LESSONS LEARNED

Actions listed in the previous section are aimed at accelerating the use of timber in the Italian market. This section presents lessons learnt from the process and recommendations which could be implemented in other projects and jurisdictions to maximise impact towards the shared goal of mainstreaming timber buildings.

Lesson 1: Due to the interconnectedness of the system, many stakeholders feel that they can't address the problem from their perspective because of a barrier up or down-stream in the value / supply chain, over which they do not have direct control. For example, developers (whether public or private) perceive a barrier in the lack of benchmark data for decision-making from financial actors and suppliers. Financial actors and suppliers cannot generate this data due to lack of demand (i.e. case studies to learn from), which translates into lack of practical experience and evidence-based knowledge.

Recommendation: Adopt a value-chain approach with a central orchestrating agent for projects aimed at unlocking barriers to the use of timber in buildings. Establishing long-term conversations and developing approaches for collaborative learning with related initiatives and organisations like C40, GBC etc could also help.

Lesson 2: There is a tension between high level ambition and fitting to local priorities and conditions.

Recommendation: Co-create and socialise an overall, locally adjusted, and relevant narrative to support a shared understanding of the context, to connect high-level ambition and local reality, and to help stakeholders understand their roles could be motivating to take leadership and accelerate change.

Lesson 3: Lack of knowledge around mass timber building materials impacts several aspects of their wider adoption. A general lack of experience and institutional know-how means that there is a need for the recognition, promotion, and drive of the use of existing tools and practices in the sector for further development.

Recommendation: Communicate on available evidence, international references and best-practices showing that solutions are present, have been tested and validated, creating trust in the system. In addition, opportunities for (re-)education and skills building, sectoral working groups and communities of practice for knowledge sharing, could be of advantage. For example, training architects and engineers to design beautiful circular, bio-based buildings, educating clients and developers to request performance-based solutions that incentivize or mandate the adoption of circularity principles and bio-based materials,

reskilling local sawmills and carpenters to build solid, cost-effective, competitive market solutions for construction materials and components in wood.

Lesson 3: Lack of data, closely connected with lack of knowledge, means that the construction sector is not adequately equipped to address the issues identified. The integration of embodied carbon data with BIM (Building Information Modelling) software is at an early stage.

Recommendation: There is a need to develop the digital infrastructure necessary to collect, process and use LCA and other standardised data that could be gathered from public and private projects. This would reverberate to unlock several other barriers, for example, standardised measurements and putting in place a robust, ongoing monitoring and reporting vehicle could be key investment enablers. Practical tools, e.g. a "decision making" support model including environmental impact criteria to evaluate the different bidders in a tender, could help.

Lesson 4: Financing and insuring circular, mass timber buildings has been identified as a particular challenge. The sector is at a nascent stage, and there is a lack of understanding of and engagement with financing instruments for sustainable buildings across all groups of actors. Another

challenge is to understand how the emerging risk models that are used function and how mature they are.

Recommendation: Extensive research into the suitability of new and innovative financial instruments - such as outcome-linked loans (OLL) - is needed to accelerate adoption. The potential of parametric insurance to timber construction should be explored, this could lead to risk assessments for standardised modular timber construction elements, improving the ability to risk assess whole buildings, and therefore accelerating access to insurance products. Providing forward contracts between timber producers and the construction industry to de-risk timber production could also help unlocking supply.

Lesson 5: Recent developments in mass timber products have created new cost-efficient construction opportunities that reduce embodied carbon. However, the market is highly fragmented, so that structural challenges remain in place that require simultaneous national, international, regional and local efforts to enable the widespread use of local, sustainable timber. **Recommendation:** Connect interventions to unlock the widespread production and use of sustainable, national (locally sourced), high-value timber products in construction

where this is not present, such as in Italy. Local forestry managers could be activated to create a supply of cost-competitive timber-grade wood by assessing and addressing potential barriers such as lack of sawmills, limited digital and industrialised capacities throughout the supply chain, forest property atomization through inheritance, and a loss of contact of owners with the territory, among others.

Lesson 6: Procurement and tendering has been identified as an essential area, critically connected to other challenges such as those found along the value chain. Strong consensus arose around the need to promote the general sustainability of the entire building sector by introducing tools able to evaluate the environmental impact of a project's entire life cycle. However, contractual regulation and the complexity of related administrative procedures often limit the capacity for agile action, especially from city officers.

Recommendation: The private sector has been developing or procuring custom tools and solutions for this purpose, now the public administration must level the playing field and set the direction for everyone by creating open, shared, robust, coherent standards, guidelines and databases. (This will require addressing issues around data sharing, governance, privacy, and legal sensitivities.) For example:

- Recognition, introduction, and promotion of dynamic LCA as a tool for assessing the environmental footprint in standards and regulations and its application to buildings.

- Development of national open, standardised, official databases to create an evidence basis (these could facilitate uptake of new assessment and decision-making models, e.g. in the insurance sector).
- A Material Registry / Building Passport ensuring environmental impact data exist in a consistent and correct format would be ideal.
- Existing standards and rules that are considered limiting for the development of structural timber and for which the introduction of updated parameters is demonstrable should be revised.
- Standards and rules that currently consider wood as a waste material should also be urgently revised.

In addition, collaboration at national and regional scale is desirable, as although there is a large amount of interest in the topic from cities and industry, many of the barriers are Europe-wide.

Lesson 7: The level of engagement from different local partners can differ. Municipal stakeholders in particular are perceived as time-poor and often have to refocus their limited capacity in response to emerging political priorities and changing contexts. This may be due to the relative lower priority attached to Scope 3 emissions compared to Scope 1 and 2, as is currently the case in cities in general, with some exceptions. More active engagement and co-creation can be expected from finance and industry stakeholders, compared to policymakers. However, city administrations are increasingly aware that as the electricity grid

decarbonises, embodied carbon becomes more relevant and with it their willingness to engage with initiatives around this aspect.

Recommendation: Reaching the seniority level necessary to push forward transformational changes could be achieved by, for example, strategic official collaborations with existing programmes and frameworks such as C40, since cities take those as main reference for their policy pledges and activities. If the city has existing Scope 1 and 2 pledges, these can be linked to circular and bio-based construction as a long-term carbon storage and offsetting strategy, drastically increasing the chances of meeting ambitions at urban level. Coupled with evidence of the socioeconomic benefits of creating a local value chain for timber, this could result in strong citizen support.

In summary, we learnt that there isn't a single bottleneck, but interlinked barriers spread across the value chain of circular, bio-based buildings in Milan and beyond. At the same time, we have found that the solutions to these barriers are, at least on a theoretical basis, within reach of the current administration of the partners we have worked with, meaning there is no fundamental reason why they should not be feasibly implemented, with varying degrees of effort.

There is a need to connect and activate many different actors and resources to maximise impact through alignment. The construction of relationships (especially those not based on economic interest)

requires a considerable, and often difficult to estimate, amount of time and energy. Unlocking one barrier brings to the next set of challenges: almost never a problem is solved at the first attempt. At the same time, for the same reason, new opportunities can arise along the way. Flexibility to react to unexpected results, contextual changes, and evolving priorities should be highly valued.

Even if a market has been identified as a target, and local organisations gather under the idea of collaborating on driving change, it is fundamental to understand that the scale of the change needed in each country is such that the vision should be medium to long term.



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7. THE JOURNEY CONTINUES

The first rotation around the perception cycle has aligned stakeholders working towards improving the perception and trust in adopting engineered timber. This work has been valuable for raising awareness about the opportunities and difficulties in adopting this material in Italy.

MIND Milano Innovation District serves as a testbed for all stakeholders to share their experiences and collaborate on challenging the existing market to remove the main barriers. As such, it facilitates the engagement process with the construction industry stakeholders to consolidate the guidelines that will allow the implementation of engineered timber.

The second year's objective is to see practical outcomes that will widen the application and accessibility of this construction system in the Italian market through collaborative and resourced initiatives. This will require other organisations and innovation hubs to accelerate the adoption of the required transformation.



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GLOSSARY

CLT: Cross-laminated timber.

GLT: Glue Laminated Timber.

Hackathon: an event where people engage in rapid and collaborative engineering over a relatively short period of time such as 24 or 48 hours.

Living Lab: user-centred, open innovation ecosystems, integrating research and innovation processes in real life communities and settings. They are places where both open innovation and user innovation processes can be studied and subject to experiments and where new solutions are developed (definition by ENoLL - European Network of Living Labs).

Mass Timber: Mass timber is a new category of wood products. It is comprised of multiple solid wood panels nailed or glued together, which provide exceptional strength and stability.



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