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Championing sustainable construction using timber in the Baltic Sea Region

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Executive summary

Timber construction can radically cut carbon emissions. The construction sector is accountable for c. 40% of global emissions, a third of which comes from the production of building materials. Replacing concrete and steel with timber offers a huge opportunity to reach the carbon neutrality goals. Nordic and Baltic countries have a unique advantage in leading the way, given the vast forest resources available, a long legacy of the forestry industry and wood building, the in-built industrial capacity, and the well-functioning and interlinked supply chains across the Baltic Sea Region (BSR). Yet, decisive policy measures are needed to overcome technical, regulatory, and cultural obstacles. Challenging the status quo and creating a market shift demands holistic and collaborative approaches that can enable systemic change, as well as targeted measures to navigate through country-specific obstacles.



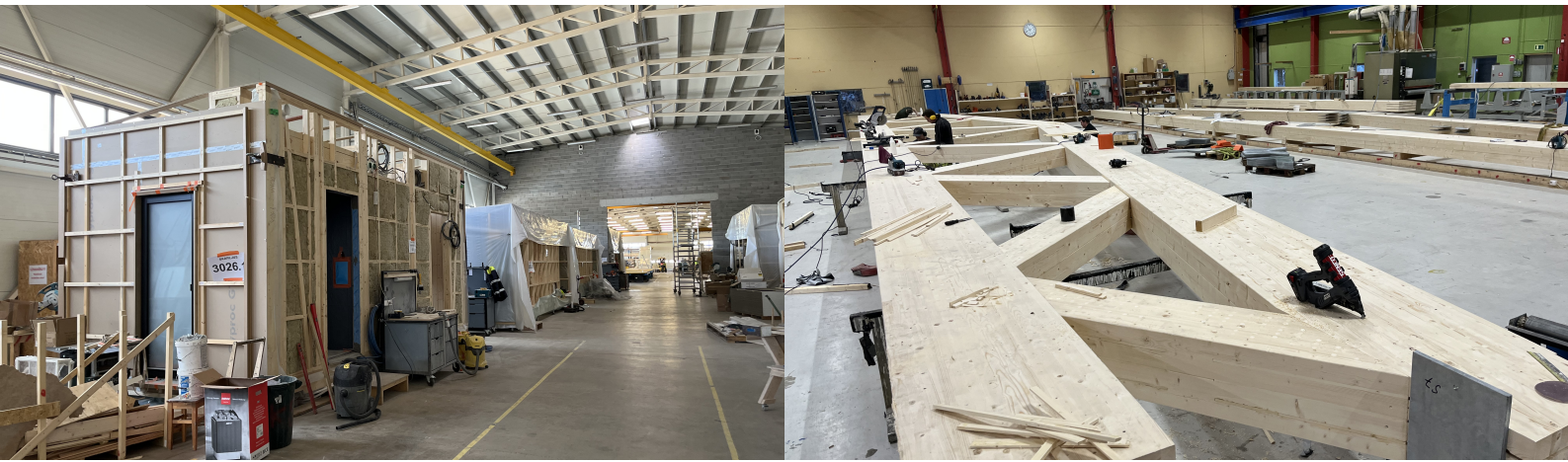
Background: Pathway towards greener timber construction

Today, the broad policy frameworks at EU and national levels are all aligned towards the implementation of the Green Transition, which requires a profound transformation of the economy, industry, society, and social behaviours. In this context, timber as a construction material has gained considerable attention in recent years, not only as an efficient way towards achieving carbon neutrality in the construction sector, but also for its potential in generating significant economic opportunities.

Timber construction systems in Nordic and Baltic countries are highly advanced despite many continuing to associate wooden buildings with being old-fashioned, low-tech, small-scale, or less durable. The industry is proving these misgivings wrong. Modern timber buildings can meet the highest standards of quality, and design and can be built of nearly any dimension.

Picture 1: Pavasars Modular Factory, Latvia

Picture 2: Glulam beam, Holmen Factory, Sweden



Modern timber construction systems use either elements and modules (volumes), and/or engineered wood products (Mass Timber) which are prefabricated offsite. Modules are LEGO-like building blocks in human scale that can come out from the factory with all electrical installations, heating, plumbing, and air-conditioning systems (*Picture 1*). Mass timber are structural materials made by gluing wood, veneers, panels, strands, or fibres together to build the frame of buildings and even bridges (*Picture 2*). The key advantages of these systems, aside from replacing concrete and steel, is that they can be used to build in height (multi-storey buildings) and can be highly industrialised (up to 95% completion offsite) to scale-up production cutting costs and energy, and replacing the slow and cumbersome process of building onsite.

Despite the clear opportunities, greening the construction sector by increasing the adoption of timber building systems, will not be achieved via technological innovation alone. Innovation and industrialisation of modern timber construction systems has been a gradual process that has taken over a century.

Changes to legislation introduced from the 1990's and onwards in different countries, have opened the door for multi-storey buildings made of timber. This is a game-changer for the industry. Yet, the increase in market share has been much slower than expected.

Sweden took the lead by removing all bans on multi-story building in 1995 and formulated a national strategy that came into effect in 2005 to support timber construction. Substantial efforts were mobilised to aid innovation and industrialisation, generate knowledge, skills, and experience. Yet, creating market conditions also required great efforts from policy, industry, research, and 'place leaders' (irrespective of their formal position). The unchallenged hegemony of well-established systems consolidated over time a strong network of actors along supply-chains that reinforce the status quo. In addition, planning systems, finance and business models, insurance conditions, among other nodes in the system, are specifically tied to the establishment, challenging the emergence of alternative systems.

Picture 3: SARA Cultural Centre, Skellefteå, Sweden



Picture 4: BSRWood project participants at Pelgulinna Highschool in Tallinn, Estonia



After decades of hard work, timber construction has made its way into the market in Nordic and Baltic countries (beyond an already established market for single-family homes), initially with pilot projects and often iconic buildings aimed at shaking up societal perceptions, such as Sara Cultural Centre in Skellefteå, Sweden (Picture 3) or the Pelgulinna Highschool in Tallinn, Estonia (Picture 4). But in several countries, timber buildings have now created a market niche within the 'regular' market of multi-story buildings. Timber buildings in Sweden have reached a 20% share, in the apartment building market, which provides a sufficient foundation for reassuring investors and regulators of the technical and financial viability of this emerging industry.



Policy contexts

Legal frameworks and policy approaches differ to an extent between Sweden, Finland, and the Baltic countries. Even though Sweden changed its *building code* from material-based to function-based standards, in line with EU's guidelines, the EU rules leave much room for implementation to individual member states. Therefore, Finland took more gradual steps and eventually adopted a more hybrid approach. Baltic states have moved even more cautiously, however multi-story-building in timber is not restricted. So far, there are a few pilot projects, but a mix between fear from private actors and other related regulatory barriers still make development slow. Estonia has already standards for up to eight story timber buildings and is to encourage market creation by using timber in 50% of all new public buildings in coming years. Similarly, Lithuania aims at imposing a minimum quota of 50% of all public buildings being built of biological resources.

There are pros and cons to the different approaches. Removing technical specifications to building regulations makes the use of timber possible, though it does not automatically incentivise its use. Indeed, requiring the use of timber, or any other material, in public procurement in Sweden is not permitted. Instead, the Lithuanian approach of requiring the use of bio-resources would more directly steer the industry to adapt. These approaches may be more or less effective in different countries. Rather than hard policies, Sweden has put emphasis on research and triple-helix cooperation and in that way generating knowledge, awareness, and trust amongst stakeholders. However, this might also relate to the specific idiosyncrasies of different cultures and policy traditions. Finland's policy efforts have mainly focused on solving technical issues and in the Baltics, multi-storey timber construction efforts have mainly taken the form of pilot projects. All these have helped push ahead the development of the market niche. On their own, however, they are not enough to secure long-term development.

Today, regulations are tightening up as the deadline for meeting the carbon neutrality goals is nearly at the doorstep. In 2022, Sweden and Finland adopted the requirement for climate declarations on all new buildings and will start setting up limit values for carbon emissions in upcoming years (expected by 2025). Baltic countries are expected to take a similar path as well as the EU, which is expected to make standard expectations for the whole union. In Estonia climate declarations will be required from 2025. Regardless of countries' regulatory frameworks, limitations on carbon emissions will automatically incentivise the use of timber.

Despite differences in policies and regulations, however, all countries struggle with similar challenges, which go beyond regulatory bottlenecks.

Challenges forward

Slow insertion of timber construction systems in the market of multi-story buildings and the construction sector is generally the result of what we call '*structural inertia*' (Figure 1). It means that despite the removal of regulatory barriers and the existence of technical solutions, the system leans towards maintaining the status quo as a result of long-established traditions and practices, investment and technological lock-ins, knowledge gaps, among other bottlenecks such as the risks involved in developing a new industry or the general reluctance of any society to change. We illustrate this web of bottlenecks in Figure 1 and describe them as follows.

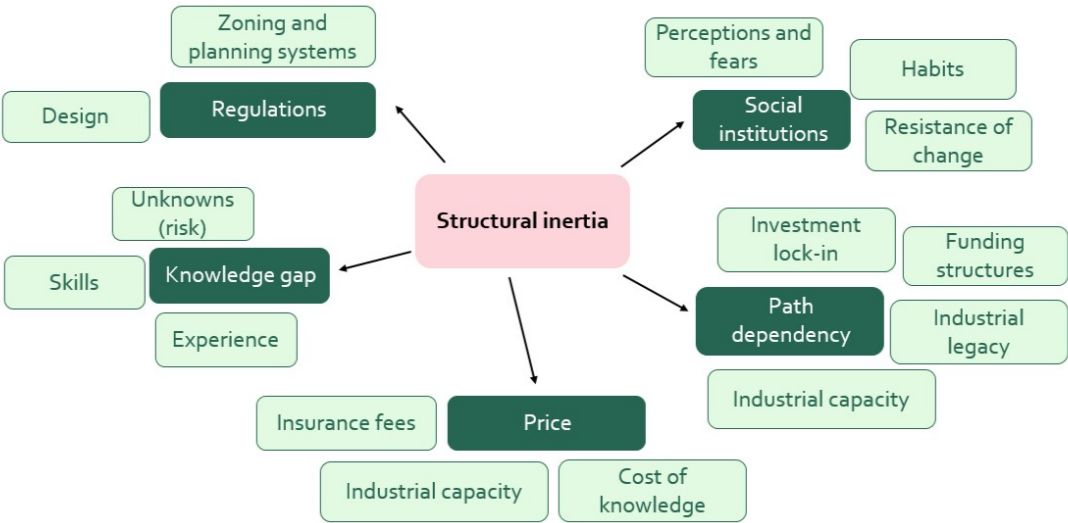


Figure 1: Structural inertia

Key bottlenecks:

1. Path dependency: an established system normally resists change, not simply because of society's or firms' 'fear of change' or because they are 'comfortable' where they are. Resistance to change emerges from the way all components in a system have been positioned in a complex web of intertwined and co-dependent actors, where one 'piece of the puzzle' is shaped to fit the whole, and thus cannot easily break off to fit a new puzzle. In this way, all components of the construction sector, including material and service suppliers, construction companies, real estate firms and all players along supply chains have welded a strong mutually dependent relation, which is glued together by a regulatory system and policy framework that is designed to determine the boundaries of the known system. All this makes it difficult to wedge between these links.

2. Social institutions: structural inertia is also the result of society's resistance to change due to the well-formed norms or 'ways-to-do-things', which is built over time by tradition, experience, and accumulated knowledge of what works, and what does not. In this way, wood as a material is commonly perceived as a fire hazard, that it risks moulding, or that it is lower quality than other seemingly more robust materials such as cement and steel. Resistance comes also from the practical implications on household economies, or disruptions in regular life, as well as mistrust to what change implies generally. For instance, despite the enormous benefits for living conditions, the programme for mass renovations of old soviet buildings in Estonia does receive some resistance from certain members of society.

3. Regulations: although multi-storey buildings in timber are now unrestricted, there remains some barriers, mainly related to fire safety regulations. Moreover, municipal planning systems and zoning regulations are slower to change. They are generally designed to meet the technical requirements of standard construction systems, for instance by determining the height of buildings in a street or neighbourhood. Yet, a building made using mass timber frames will automatically be taller than a concrete building of the same number of floors. Another barrier is that public procurement rules generally favour the cheapest proposal rather than, the most environmentally friendly option. In Sweden, what was initially a benefit to timber construction, the 'material neutrality' principle, has to some extent also become a limitation as municipalities cannot demand the use of timber in publicly procured projects.

4. Knowledge gap: there is a general vacuum of knowledge about timber construction in the whole system, from structural engineers, developers, builders, architects, to material scientists and academics, all the way to educators, regulators, real estate firms, banks, and insurance companies. In addition, there are insufficient data about the performance of existing wood buildings or the state of the built stock to inform new projects, as well as reducing uncertainties and the

perceived risks. For instance, 40% of registered buildings in Latvia have unclassified intended use. More comprehensive data collection would be essential for strategic policy design, such as the programme of serial renovations in Estonia.

5. Price/costs: there are high costs related to acquiring knowledge and training, testing, piloting, establishing new practices, scaling up industrial capacity (including huge investments in infrastructure and equipment). In early phases, new products i.e., timber buildings are generally more expensive than conventional concrete buildings. There are also costs in establishing new business ties and building a new network of suppliers and clients. Finally, there may be higher costs of interest loans and insurance premiums based on perceived or expected risks linked to innovations. Often, the lack of accumulated experience results in banks hesitation to give loans for timber buildings or for renovations as they are unable to assess the risks.



Implications & recommendations

Increasing the market share of timber construction is a matter of systemic change and requires holistic perspectives, policy coordination across levels, and close collaboration with research and business actors.

Recommendations by key bottleneck:

1. Nurturing market maturity to challenge path dependency

Changing societal and market conditions can challenge the status quo and brew market maturity for something new. The strong societal focus on sustainability is not only altering consumer choices but is the basis for major policy shift focusing on transforming production systems, not least by introducing new regulations and support schemes. While conventional industries resist change, many entrepreneurs and pioneers welcome the change, as does the forestry industry.

- Sweden's success has relied on multiple actors: including **pioneering companies** taking high risks and challenging existing supply chains and business models; **municipalities help in** creating a market via green procurement and other policy tools, sharing risks, and facilitating stakeholder collaboration; **research and education institutions** have generated technical and practical knowledge; and many other players have been key in bringing new knowledge and solutions from architecture and design, from finance sector, and other unrelated industries.
- In the Baltics, the huge scale in mass renovations, paired with reliable funding from the EU has offered a promising alternative for **local industries** specialised in modular building systems. Seizing this opportunity would allow for a more resilient timber construction industry by diversifying markets and increasing local presence. Policy measures have the potential of creating ripple effects towards this direction. **National authorities** can help private actors create more stable local markets, by improving the conditions for tenants to welcome the process of renovations or increasing incentives such as permitting constructors to build an additional floor to existing buildings or exclusively timber buildings.

2. Social transition

The push towards sustainability comes largely from society itself, which has demanded change. Positive associations of wood to a sustainable, 'homy' or beautiful material also contribute positively to the cultural change. Architecture and design play an important role here.

A good practice identified in renovation programmes in the Baltics, is the engagement of **social workers** to help tenants understand the benefits of renovations beyond the long-term or abstract carbon emissions goals, instead focusing on energy savings or comfortability.

3. Adapting regulatory frameworks to overcome barriers

Removing barriers for timber construction is essential, not to mention specific bans on height, or materials. Yet, there are other barriers to be found in municipal planning systems and zoning regulations. Besides regulation itself, **municipalities** can favour timber in several indirect ways, including setting sustainability requirements in 'land allocation agreements', setting examples for favourable design, or by making strategic procurement decisions, such as requiring low carbon emissions. Municipalities also have the power to change zoning requirements and specifications and create new master plans to timber and concrete buildings in equal footing regardless of height specifications or allow for raising the height of existing buildings (with 'add-ons') if using a low weight structure, or if they own the land, they can control the requirements for new buildings.

4. Filling the knowledge gap

Education and training need to be tackled from basic and higher education to vocational and professional training programmes. In addition to full degrees, education institutions need to set up short and flexible supplementary degrees (micro-degrees) targeting workers which are already active in the labour market, updating their skills and acquiring new knowledge throughout their professional life. Universities in different countries should join forces (e.g. via ERASMUS+ programmes) to build attractive programmes, gather a critical mass of students needed to start a course, and also to generate exchange between students of different disciplines.

Furthermore, filling the knowledge gap is only partly about education and largely about knowledge sharing. A low-hanging fruit is to generate awareness about the already existing technologies, projects, or buildings across different countries. One possible solution would be to translate material that is vastly available in Swedish or German into Baltic languages. Another way is to facilitate study visits to good practice regions.

Knowledge exchange should also be done strategically via triple helix collaboration by establishing task forces with key players to pool expert knowledge to define the areas for R&D projects and solve technical or policy challenges. Actors involved should not only include authority and technical experts on construction systems but also other nodes in the system such as real estate companies, spatial planners, and financiers. Wood City Sweden, for instance, is a good example of a collaborative initiative that has helped generate and knowledge to support municipalities on how to overcome bottlenecks. In the Baltics, existing organisations can follow its lead by having actors such as Estonian Woodhouse Association or Latvian Wood Construction Cluster bring forth material and knowledge for municipalities to better understand how to use the tools they already have at their disposal to steer development and overcome barriers.

5. Cutting costs

Costs generally go down once industrial capacity increases, improving efficiency, streamlining processes, and consolidating supply lines. Incentives are needed to reach this point, such as public authorities procuring timber buildings to incentivise market creation. Banks are also now required to provide 'green financing' which is bringing more finance into the sector. Finally, insurance premiums are based as risk levels, which is determined by evidence. An increasing built stock will provide the data to allow risks to be more accurately assessed.



Who should do what?

National authorities

- Take advantage of the industrial capacities and accumulated knowledge to build a domestic market for timber construction, benefiting from the results nationally, not only from exports.
- Draft legislation and regulation with clearly defined quantifiable goals.
- Investigate strategic tax incentives and regulatory measures.
- Set up steering groups or 'task forces' of experts.
- Accelerate action by identifying and supporting triple helix collaborations.

Regions

- Pool resources together across regions and national borders to enable educational and knowledge sharing opportunities.
- Identify pioneering municipalities and private actors and support them e.g. in applying for EU funding.

Municipalities

- Work with residents to make reforms and renovations relevant to their needs.
- Induce market creation via planning systems and master plans, green procurement, land-allocation agreements, public-private risk-sharing schemes.
- Broadcast a vision for sustainable buildings.
- Benchmark good practices to share with other municipalities.
- Create pressure for low-emissions construction on publicly owned land developments.

Academia & technical research

- Assist knowledge creation and knowledge transfer, create new more flexible education and training modules and cooperation programs.

Industry Associations/ organisations

- Support education institutes in bridging education and industry closer together and training students
- Support municipalities in building capacities for how to work with timber construction, by preparing easily understandable material on good practices from other countries, or regions and by engaging them in events, study visits, roundtable discussions, etc.

Banks & financiers

- Develop new credit schemes for off-site - industrialised (prefabricated) construction systems as opposed to current schemes based on progress of the construction on-site.
- Continue developing green financing schemes.
- Evaluate possible prejudice and disproportionate barriers on the way of timber and prefab construction. For instance, re-evaluate risk assessments by considering the existing built stock in neighbouring countries.

About the policy brief & acknowledgments

This policy brief is based on the results of two projects: 1) *Systems perspectives on Green Innovation* (GRINGO) a research study conducted within the Nordic Thematic Group for Green, Innovative and Resilient Regions 2021-2024 and funded by the Nordic Council of Ministers; and 2) *BSRWood project* funded by the Swedish Institute to enhance collaboration and knowledge transfer across the Baltic Sea Region (BSR). In addition to desk study, interviews, workshops, and study tours with many experts from different organisations and countries served to collect multiple perspectives for how to address the bottlenecks in timber construction in relation to technology, public sector and institutional innovation, cultural shifts, and systemic phenomena.

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Further reading

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