The US Wood Products Industry: Facilitating the Post-COVID Recovery

Introduction

Chair Spanberger, Ranking Member LaMalfa, and Members of the Committee, thank you for the opportunity to testify today. My name is Iain Macdonald and I serve as the Director of the TallWood Design Institute (TDI), a unique collaboration between the Colleges of Forestry and Engineering at Oregon State University and the College of Design at University of Oregon.

TDI carries out applied research, works in partnership with industry on product development and testing, and offers education and outreach to current and future designers, builders and manufacturers. Our mission is to conduct the science that can open up viable new applications for the use of wood in the built environment and to disseminate the results of that work efficiently to stakeholders in the public and private sectors. The data we generate is used to validate designs for innovative new buildings, evolve building codes, increase the knowledge of design and construction practitioners, and help U.S. manufacturers develop and launch new products and compete effectively in domestic and export markets. Our work focuses heavily on a new breed of engineered wood products collectively known as mass timber, which can make use of small-diameter logs that can be sourced from sustainably managed forests and forest restoration projects, and contribute to the reduction of greenhouse gases and wildfire risk.

The US Wood Products Sector and COVID Impacts

The forestry and wood products sector is a major contributor of employment and GDP to the national economy. Overall, forest products comprised about 1.5% of the total U.S. economy in 2018, supported almost 3 million jobs, and represented about 5% of the entire manufacturing output of the country. The sector is particularly important to the hundreds of rural communities in which processing facilities are located, from the Pacific Northwest to the Southeast. Importantly, the forest sector in the US is one of the only significant economic sectors with net negative carbon emissions, making wood products the most climate-sensitive structural building material available today.

During the COVID-19 pandemic, most forestry and wood product manufacturing businesses stayed open as essential services, but there were still significant impacts to this sector. The need to implement safety and social distancing protocols in plants resulted in temporary shutdowns and lower concentrations of staff in certain spaces, both of which decreased productivity. Delivery logjams further constrained supply. Lumber producers anticipated reduced housing demand in the early days of the pandemic and decreased production levels accordingly. Broadly, the industry has faced these lumber supply constraints while also experiencing high demand for lumber for remodeling and renovation work, which has caused a record spike in prices.

Outside of the supply of lumber for single-family homes, the mass timber product industry experienced reduced demand when some commercial office and hotel projects that would have used mass timber were put on hold or cancelled altogether. Additionally, uncertainty around the extent to which remote employees will return to offices continues to impact the commercial construction sector. In the pulp and paper sector there were some mill closures due to a lack of

demand for high-quality paper for events, programs, etc. And, critically, the logging industry lost approximately $1B of revenue.

Wood as a Tool to Sustainably Rebuild our Infrastructure and Economy

Wood is the only major building material that can be renewed and regrown. The capacity to process this basic material into engineered products with reliable and predictable strength and performance attributes has undergone a renaissance of late. A family of relatively new engineered products, known as mass timber, is facilitating a sea change in sustainable construction around the world. The characteristics of these products allow wood, which has typically been restricted to single-family homes and low- and mid-rise multifamily dwellings, to be used in buildings that are larger and taller than ever before.

Wood fell out of favor as a building material in office, institutional and commercial buildings around 100 years ago, as concrete and steel became dominant. At the time there were justifiable concerns about wood use in these types of structures, relating to fire, structural strength and seismic resilience. Today this landscape is radically different. Mass timber products are precision-engineered and robotically-fabricated to offer specific strength and stiffness characteristics, depending on where they are needed in a building and what loads they must bear. Modern fire suppression and alarm systems have greatly improved fire safety, and mass timber beams, columns and panels are supplied in large cross-sections, meaning that the face of the wood element will char at a slow, predictable rate, while insulating the core structure and preserving its load-carrying capacity. All of this has been empirically validated through applied research at our major universities and institutes, due in large part to investments made to and through the USDA Forest Service, Forest Products Lab, and Agricultural Research Service.

As a result of this work, we are continually pushing the boundaries of what is possible with wood. In 2015, with support from researchers at OSU, Oregon was the first state to start producing cross-laminated-timber panels certified for use in buildings. This product can be fabricated in large dimensions up to 12 feet by 60 feet for wall and floor applications, and is a game-changer in terms of construction speed and efficiency. As a result, Oregon became home to many of the nation's earliest mass timber buildings. A vibrant cohort of pioneering architects, engineers and construction firms have emerged in the state, with expertise that is now in demand across the country. In Milwaukee, Wisconsin, a 25-story mass timber apartment building named Ascent will shortly become the tallest wood building in the world, at 284 feet, with the timber engineering, fabrication and installation performed by a company in Portland, Oregon.

In the last five years, the rate of adoption of mass timber in the United States has been dramatic. In 2013, there were less than five construction projects started. In 2020 more than 100 projects commenced, and as of June 2021, 1,169 mass timber buildings had been constructed or were in design, with projects in all 50 states. Manufacturing capacity has expanded in lockstep, from just one U.S. production facility in 2015 to nine today[i]. These are now bringing high-value jobs back to rural communities, from Colville, Washington to Dothan, Alabama.

This progress is impressive for a new-to-the-US construction technology, but mass timber buildings still represent a tiny fraction of U.S. real estate that is built each year. There are currently just over five million square feet of mass timber buildings in the nation, but in 2019 there was 93 billion

square feet of commercial building space[ii]. The U.S. has the capacity and know-how to significantly ramp up the number of mass timber structures, and there are compelling reasons for doing so.

The manufacturing processes for timber products have a significantly lower carbon footprint than those for concrete and steel. Furthermore, the carbon naturally sequestered in wood is stored within the building for its lifetime, and the wood components have the potential to be recycled and given a second life afterward. The lighter strength-to-weight ratio also means that less concrete is needed in the foundations. All these things are important, given that the general scientific consensus is that the warming effects of CO2 emissions will be irreversible unless we can achieve significant reductions by 2030.

Currently 40% of U.S. greenhouse gas emissions are derived from the construction and operation of buildings. Efforts to improve the thermal insulation of windows, doors and walls to reduce the energy consumed for heating and cooling are laudable, but these alone will be insufficient to achieve reduction targets. Mass timber building can further advance efforts to achieve measurable new gains in the sector and nation's carbon reduction efforts. As soon as we construct a mass timber building we immediately avoid emissions. For example, District Office, a 6-story office building in Portland, avoided 750 tons of carbon emissions by using timber instead of concrete, the equivalent of taking 570 cars off the road for a year. The amount of timber used to build it took Oregon's forests just 21 minutes to grow.

Research is Driving the Expanded Use of Sustainable Wood Products

Research and development are driving innovation and adoption of mass timber products and modern wood construction. The work that is ongoing at TDI and other institutions aims eliminate a number of key barriers to wood use, as well as learning more about how we can enhance technical, sustainability and cost performance. We already know that mass timber buildings, when designed correctly, can deliver fire and seismic safety on par with any concrete or steel structure. However, further research is critical to help our industry drive down the cost of doing that, while at the same time optimizing fiber use and allowing mass timber to be implemented on a broad scale.

At TDI, we are putting data into the public domain on fire, seismic, structural and acoustic performance of tall wood buildings, so that more architects and engineers have the tools and confidence they need to effectively design them and contractors have the know-how to build them. And the research goes beyond the wood itself. We are testing different kinds of connectors and assemblies to find out which ones offer the best combinations of cost-efficiency, strength, fire resistance, moisture protection and acoustic separation. We are working on termite-resistant CLT for Hawaii and the southern states, and energy-efficient structural panelized systems for use in Alaska. Along the way we are even learning important things about the psychological and physiological benefits of wood in our indoor environments, which have important ramifications for wellness and disease control.

All of this work involves a high degree of collaboration, both across university research institutions and between the public and private sector. Early next year, ten universities, twenty companies and the USDA Forest Products Lab will be working together to test a 10-story mass timber building on the shake table at UC San Diego. The test will yield a treasure trove of new information about the behavior of these buildings in earthquakes, enabling us to further optimize their performance.

The USDA Agricultural Research Service, the Forest Products Lab and the US Forest Service have been invaluable partners for our own research at TDI. Since 2015 their support has enabled our affiliated researchers to launch more than 50 research projects and acquire state-of-the-art technical equipment that is helping us train our manufacturers in critical new skills like computer-aided design and fabrication. The leadership and financial contributions of these agencies have been matched 200% by state and private-sector support, and industry has worked hand in hand with our researchers to identify the applied research projects that can generate tangible market impacts in a three-to-five-year timeframe. This year we launched the REACTS Consortium for Research on Engineering, Architecture and Construction of Timber Structures. The organization consists of pioneering firms in those industry sectors who are partnering with us and pooling cash contributions and technical expertise to jointly drive the innovation agenda. Notably, work at OSU funded by the Economic Development Administration directly resulted in the launch of a first-in-the-world mass timber product - the Mass Plywood Panel - by Oregon's Freres Lumber Company, and their investment in a $40M greenfield manufacturing facility.

Mass timber innovations can play a positive role in our nation's rebuilding in other ways too. TDI is working hard to evaluate the viability of using under-utilized species in these products, and research is underway already to test the strength properties of ponderosa pine, white fir and Alaskan spruce for use in CLT. Each year sees our forestlands and the communities in proximity to them increasingly threatened by wildfire. By selectively thinning these overstocked forests and using the restoration fiber in our buildings we can simultaneously reduce fire risk, improve the safety of humans and property, and support high-value jobs in rural communities as well as design and construction jobs in urban centers.

Two innovative projects in Oregon seek to embrace opportunities for developing wood products made with under-utilized species while at the same time tackling the housing affordability crisis that plagues many of our major cities. Their aim is to design kit-of-parts housing systems using domestic mass timber that can be prefabricated in a factory and deployed in high volume and at low unit cost to communities in need - whether these are urban centers addressing homelessness, rural communities ravaged by fire or other natural disasters, or working families caught in the 'missing middle' who cannot afford to move from rental housing into their own homes. The projects exploit the rapid assembly advantages of mass timber and utilize design principles that enable disassembly and reuse at end of life, helping to further extend the sustainability of these structures. What has been particularly invigorating about these projects is the momentum and determination of all involved to make a lasting impact on these challenges - from federal agencies like FEMA and EDA to Oregon state agencies and private firms.

Key Roles that Government can Play

The research funding and scientific leadership provided through the USDA Agricultural Research Service and the Wood Innovations Program has been pivotal in advancing the science around mass timber buildings, and TDI is grateful to the Subcommittee for its work in supporting these key agencies and their research programs. Continuing and expanding the support available for this critical applied research work will enable the innovative collaborations between research institutions, federal and state agencies and the private sector to make even greater impacts.

Support for workforce training and development will also be critical for the growth of the mass timber supply chain in the U.S. When firms move up the value chain from commodity products such as lumber to custom products such as mass timber, they pivot from a focus on producing products of low complexity and low variation in high volumes to a business model in which each component is designed for a specific place in a specific building. This typically means that those firms must train or hire for new digital skills such as 3D computer-aided-design and computer-controlled fabrication. The good news is that these digitally-oriented jobs are more likely to be appealing to young people than traditional physical work, provided that training is available. TDI is rolling out a certificate program on these topics for industry learners. However, it will be important to implement strategies to introduce these new careers to young people and encourage them to take them up, in particular among demographics that have not traditionally been associated with the forest industry.

And, regarding the Subcommittee's current efforts to consider priority needs for modern infrastructure investment, the INVEST in America Act includes some key investments in rail infrastructure that would help to address critical lumber supply chain constraints. For example, in Oregon, TDI completed a supply chain analysis last year that revealed existing rail infrastructure is serving as an impediment to growth, due to loading constraints on some bridges.

Lastly, I would like to encourage the Subcommittee to consider opportunities for incentivizing federal, state and municipal levels of government to accelerate adoption of green construction with the use of domestically-produced low carbon building materials. By stimulating domestic demand for products like mass timber, we can divert logs from offshore export to domestic processing, grow our manufacturing base and maximize the socio-economic benefits provided by each tree harvested. This is the best way to ensure that forests remain as forests.

In closing, thank you for the opportunity to testify today. I welcome the opportunity to answer any questions.

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[i] 2021 International Mass Timber Report, Forest Business Network

[ii] US Energy Information Administration: Annual Energy Outlook 2020