Editorial



LUCIAN A. LUCIA
TAPPI Journal
Editorial Board

The U.S. pulp & paper industry at a crossroads: Can it lead the bioeconomy?

For more than a century, the pulp and paper industry has been a quiet pioneer in sustainability, long before the term "biorefinery" entered the lexicon. Mills converted renewable wood fiber into essential products while simultaneously generating energy from residual biomass, closing material loops, and recovering chemicals for reuse. Our industry balanced production efficiency with tangible and reliable resource stewardship, demonstrating that large-scale manufacturing and environmental responsibility can indeed coexist. From kraft and sulfite pulping processes that recycle caustic chemicals, to cogeneration of heat and power from black liquor, pulp and paper operations have been the de facto model of circular economy principles, producing both material and energy from renewable feedstocks decades before climate and resource constraints made it a global imperative.



At a crossroads: Will the U.S. industry direct its focus toward the bioeconomy?

A critical juncture for the industry

The industry is entering a pivotal moment in which many of us find ourselves engaged in deep soul searching. Since the days of Francis Bacon when the illustrious triumvirate of gunpowder, the compass, and paper were the drivers of civilizations, our community has enjoyed a noble place at the table. Indeed, especially over the last 100 years, pulp and paper has quietly powered communication, commerce, and, more than ever today, packaging, thus representing a steady backbone for the continued stability of many global industries.

However, in 2025, stability is no longer our defining challenge. Rising consumer rejection of plastic packaging is a case in point. Food and beverage companies are under regulatory and social pressure to eliminate single-use plastics, and governments, businesses, and consumers are urgently seeking fiber-based, environmentally friendly alternatives. Governments worldwide are phasing them out, and brand owners are scrambling for scalable fiber-based alternatives, but if the United States cannot deliver, global competitors will. In 2025, stability is no longer the defining challenge for the country. Policy, consumer pressure, and global competition are converging in ways that threaten to leave us behind if we do not act boldly. If the United States industry cannot answer these demands at scale and cost, competitors abroad will.

Pivoting to address social and regulatory demands

Policy, consumer pressure, and competition are therefore coalescing in ways that will leave the United States industry behind if it does not boldly respond.

Plastic bans are no longer isolated experiments; they are becoming the regulatory norm. The European Union has already banned a plethora of single-use plastics and is now tightening recyclability requirements under its Packaging and Packaging Waste Regulation. Canada has followed suit with nationwide restrictions, and several U.S. states, from California to New York, are just now implementing their own.

At the same time, climate action is moving in the opposite direction of complacency. Corporate supply chains are being measured against stringent carbon disclosure frameworks, and large consumer brands now demand verifiable Scope 3 emissions reductions from their suppliers. This is not voluntary; it is becoming a license to operate.

Investors, too, are voting with their capital. BlackRock, a global investment management company, has warned that companies without credible climate transition plans are being phased out of its portfolios. For example, Norway's sovereign wealth fund has divested from unsustain-

able forestry and plastics, and dedicated funds like Breakthrough Energy Ventures and Closed Loop Partners are channeling billions into cellulose-based packaging, biopolymers, and circular infrastructure. Global capital is concentrating on those companies that can credibly demonstrate carbon neutrality, circularity, and renewable innovation, leaving "business as usual" firms behind. Those unable to provide this proof risk being excluded from the next wave of capital flows.

Meanwhile, Asia and Europe are forging boldly ahead. Billions of euros and yuan are being funneled into bio-based materials, from cellulose films that can replace petroleum-based plastics to lignin-based carbon fibers that may one day rival petrochemical composites. These regions are not treating bio-based innovation as peripheral, but as central to their industrial strategy.

Finding the courage to reimagine fiber

Too often, we are still stuck debating incremental gains in yield, energy use, or mill uptime; valuable, yes, but insufficient in a world demanding transformational innovation. Unless we shift our focus, we risk watching others define the very bioeconomy that might have been ours to lead.

This is not a comfortable truth, but it must be said: if we remain focused only on tonnage, cost reduction, and incremental process improvements, the U.S. pulp and paper industry risks being a minor player in the global bioeconomy. Our legacy will not be defined by how efficiently we made paper; it will be defined by whether we had the courage to reimagine fiber as the building block of a sustainable future.

The stakes are not just economic. Policymakers are beginning to dictate material choices through regulation. The European Union's Green Deal and Packaging and Packaging Waste Regulation set aggressive targets for recyclability and biobased content. Canada has imposed single-use plastic bans. We are historically slow to legislate in this space but are moving toward stricter environmental accounting.

Leading the industry with visionary actions

Industry leadership means reframing pulp and paper not only as a commodity sector, but also as a platform for advanced bio-based innovation. Lignin must move beyond boilers: UPM and Stora Enso in Europe are developing lignin-based adhesives and carbon fibers, showing that North American mills could similarly turn what was once waste into high-value materials. Cellulose must move beyond paper. For example, nanocellulose and cellulose films are already addressing rheology, coatings, and even plastic replacement applications abroad, yet in North America, they remain largely pilot-scale curiosities. Hemicellulose, too, must be valorized, as it can be converted into barrier coatings, bioplastics, and nutraceuticals rather than being flushed away.

Leadership also requires strategic partnerships. Europe's Bio-Based Industries Joint Undertaking demonstrates the power of coordinated multibillion dollar collaborations between industry, academia, and government to de-risk high-reward innovation. A North American equivalent could link TAPPI's industrial base with federal sustainability goals and university research, creating pipelines for transformative materials development.

Finally, leadership is a cultural imperative. Bold experimentation must be valued as much as quarterly efficiency. Only by cultivating a culture that encourages calculated risk-taking can U.S. pulp and paper companies position themselves at the center of the emerging bioeconomy, rather than reacting to it. The era of incremental improvement is over; indeed, the time for visionary action is now.

The choice is clear: adapt and lead or resist and continue business as usual, forsaking a leadership role. Other industries, petrochemicals, plastics, and even textiles are already moving aggressively to position themselves as major players in the circular economy. Why not us? We have the forests, the fiber expertise, and the industrial base. What we lack is the urgency.

For TAPPI and our community, this is a time to issue a clarion call to arms. The future of U.S. pulp and paper leadership will not be written in boilers or bleaching towers, but instead it will be written in policy frameworks, global collaborations, and breakthrough materials that redefine what fiber can be for the global bioeconomy. **TJ**

Lucian Lucia is a professor in the Departments of Forest Biomaterials and Chemistry at North Carolina State University and a member of the TAPPI Journal Editorial Board.

ABOUT THIS COLUMN

Cite this article as:
Lucia, L.A., *TAPPI J.* 24(10): 464(2025). https://doi.org/10.32964/TJ24.10.464

DOI: https://doi.org/10.32964/TJ24.10.464

ISSN: 0734-1415

Publisher: TAPPI Press

Copyright: ©TAPPI Press 2025

About this journal