

***Accelerating the Northern Forest Bioeconomy:
Through Innovation, Commercialization, Workforce and Community Redevelopment***

Vision for the Regional Growth Cluster

Maine will be a global leader in accelerating growth of the forest bioeconomy with a thriving, innovative, and diverse industry that provides good jobs in vibrant Maine communities.

Accelerating the Northern Forest Bioeconomy represents an opportunity for rural, distressed communities in the Northeast who are among the hardest hit by the pandemic to build back better, cleaner, and greener through strategic investment building on the region's oldest resource and a heritage industry transformed by the next generation of forest bioproducts.

The above vision for the Northern Forest Bioeconomy cluster is adapted from the Forest Opportunity Roadmap (FOR/Maine), an industry-led coalition of Maine's forest sector stakeholders formed in 2016 to address the sudden closure of 5 major mills in an 18-month period. This economic disaster led to the deployment of an EDA-led Economic Development Assistance Team (EDAT) in 2016, and a multi-agency assessment as the springboard to develop and implement the long-range vision of FOR/Maine with follow-on federal support.

The vision stakes out seizing a leadership position for the Northeastern US in the globally significant and market competitive migration to bio-based materials and applications. Only sustainably managed forest materials can supply the volume of materials needed for this transition while protecting the environment. The component projects advance this vision to pivot away from petroleum-based feedstocks and chemicals to bio-based, renewable products and in so doing address our most critical regional crises – affordable housing, climate change, income inequality, rural decay, and lost manufacturing jobs. Catalytic expansion of the forest bioeconomy lifts up distressed, rural communities with new opportunities for wealth creation.

Economic Opportunity

The Northern Forest Bioeconomy cluster seeks to add nearly \$4 billion in total economic impact to the Maine economy, and to build workforce pathways to fill an estimated 5,000 direct job openings over the next 15 years. In baseline, \$8.1 billion in economic impact and 31,822 total direct/indirect jobs were tied to the forest products sector in Maine in 2019 – approximately 1 out of every 25 dollars of Maine's GDP and 1 out of 25 Maine jobs respectively. Based on a 2018 global market analysis (updated 2020) and an assessment of Maine's operating ecosystem, the opportunities for Maine to generate this growth are to build on current strengths in sawn timber, pulp and paper, and building products with new market development in biomaterials, additive manufacturing, biofuels and advanced building materials. These over-arching economic opportunities are integrally tied to community and climate resiliency.

Growth in sustainable forest bioproducts production and usage will sink and sequester carbon in products and on the stump to help meet Maine's climate action goals (an estimated 70% of Maine's gross annual CO₂ emissions are offset by forests/forest products today).

The statewide forest bioeconomy sector, and the opportunity for growth and alleviation of significant economic distress, is most concentrated in nine rural and high-poverty counties in Maine. The federal Northern Border Regional Commission (NBRC) serves 12 of Maine's 16 counties and deems these nine rural counties as "distressed" and eligible for the most favorable

match rate. Building the capacity for community-led economic development and diversification in these distressed regions is critical to cluster growth.

A successful Maine forest bioeconomy cluster will ripple across the multistate Northern Forest wood basket; and build market demand, supply chains, and national replication opportunities.

Coalition Members

Coalition members are a subset of FOR/Maine, including the lead institution for this proposal, the entities that are committed to submit applications for component projects, and other partners critical to the transformation of the Northern Forest Bioeconomy cluster. Coalition members include leaders from industry, education, workforce and community development, and state government as well as community-based organizations serving historically excluded populations. Coalition members include: The University of Maine (Lead Institution), Maine Development Foundation (MDF), Maine Forest Products Council (MFPC), Four Directions Development Corporation, Professional Logging Contractors of Maine, Maine Department of Economic and Community Development, Eastern Maine Development Corporation, Northern Maine Development Commission, Maine Community College System, and Maine Woodland Owners. Letters of commitment documenting each Coalition member’s role in the project and in economic growth in the region are included in the Attachments.

POTENTIAL COMPONENT PROJECTS - SUMMARIES AND TIMELINES AT A GLANCE			
Component Project <i>(short name)</i>	Project Lead(s)	Project Cost <i>(millions)</i>	Timeline <i>(mos.)</i>
CLUSTER LEADERSHIP (FOR/Maine Goals 2 & 5)			
Coordination, Engagement & Leadership	MFPC, MDF, UM	\$3-4	24-48
FOREST ECONOMY COMMUNITIES (FOR/Maine Goal 4)			
Welcoming, Resilient, Sustainable Communities	MDF	\$3-4	24
Industrial Sites Reenergized & Redeveloped	MDF	\$15-30	48
WORKFORCE (FOR/Maine Goal 3)			
Preparing Maine’s Workforce for the Future	MDF	\$5-10	24-48
STRATEGIC INVESTMENT AND MARKET ATTRACTION (FOR/Maine Goals 1 & 4)			
Strategic Investment & Market Attraction	DECD, UM	\$4-5	12-48
COMMERCIALIZATION AND INNOVATION: Factory of the Future (FOR/ME Goals 1 & 4)			
Forest Biomaterials Innovation Center	UM	\$20-30	36
Green Engineering & Materials Laboratory	UM	\$30-41	48
Stimulating Bioeconomy Supply Chains	DECD, UM	\$10-20	12-36
TOTAL POTENTIAL COST		\$90-144	
Cost Share (budgets, financial modeling, and match to be finalized during Phase 1 planning)		EDA Share: \$72-\$100 Match: \$18-30	

The component projects of *Accelerating the Northern Forest Bioeconomy* represent an integrated investment package in people, place, and products across five focus areas that will transform the region into an advanced manufacturing powerhouse and exporter of high-value, sustainable forest products.

1.Cluster Coordination, Engagement and Leadership: This project sustains the industry-led governance, engagement, and coordination function of FOR/Maine in the cluster, ensures ongoing project alignment, and intersects with state-wide economic development and climate action plans to bust barriers and leverage assets. This project will continue to promote broad awareness of opportunities in Maine’s forest economy with a specific focus on shifting public perceptions of the industry; increasing engagement with Maine woodland owners; and supporting the ongoing priority Equity work and UMaine RECO activities.

2.Creating Welcoming, Resilient and Sustainable Communities: MDF with community stakeholders will develop a collaborative, strategic, “no wrong door” approach to rural economic/community development, *Rural Thriving Communities Pilot*. The enhanced tools and capabilities will address fractured delivery and leverage dollars for coordinated impact for long-term economic resiliency in the rural forest economy region. MDF and partners (e.g., EDDs) will deploy technical assistance for communities’ work on priorities such as business diversification, leadership, downtown revitalization, broadband, workforce housing, and childcare -- working with the Equity Planning Group to ensure an equity lens is woven into this work.

3.Industrial Sites Reenergized and Redeveloped: This project leverages new investment in transitioning both idled and active mill sites in Maine, to attract private capital and transform into commercial campuses for next generation forest products and complementary businesses. The effort builds on existing redevelopment in these critical local economic engines, including the recent MDF/Maine Rural Development Authority (MRDA) partnership on a successful mill site redevelopment subgrant program that leveraged NBRC, State, and private match, to deploy over \$1.2M in five community mill site projects. With a successful process in place, recapitalizing this vital local development work is both essential and efficient.

4.Preparing Maine’s Workforce for the Future: This project addresses crucial sector workforce and skills gaps advancing recommendations provided in the July 2021, FOR/Maine Workforce Development Strategy report. Strategies include: Coordinated marketing campaign to generate current/future workforce pipeline; Increase participation of youth, women, displaced workers, immigrants, and other often marginalized populations. Cultivate workforce pipelines and integrate with statewide attraction and recruitment efforts; Leverage existing workforce infrastructure to increase coordination/engagement and expand existing apprenticeship internship, and training programs; Foster awareness of opportunities in the sector to Maine secondary schools (including trades schools); and Maintain an information system that enables continuous monitoring and evaluation;

5.Strategic Investment and Market Attraction: This project builds on an initial pilot effort to actively market Maine forest bioeconomy and its assets to domestic and foreign direct investment through strategic promotion, partnerships, and competitive marketing materials. Data-driven strategies to sustain lead generation and investment attraction include: Increase Maine’s Visibility on the National and Global Stage in a Positive Way; Continuously Fill the Investment Attraction Pipeline; Perform Limited Technical Evaluation; Nurture Leads and Relationships; Improve Site Selection Assistance; and Target Mass Timber Business Attraction.

6.Forest Biomaterials Innovation Center (FBIC): The project accelerates the use of Maine fiber in packaging and next-gen building materials by expanding UMaine’s Process Development

Center with a pilot/commercial scale innovation center to include a linerboard line, fiberboard line, thermomechanical pulping pilot equipment and thermoforming equipment. This will enable demonstration and support activities for new applications of nanocellulose and forest materials, commercializing UMaine technologies such as microwave driven dewatering and forming, nanocellulose based composites, and cellulosic and biopolymer material alternatives. The pilot and demonstration scale supports external companies and entrepreneurs.

7.Green Engineering and Materials (GEM) Laboratory: UMaine will develop a **Factory of the Future** facility(45k sf) to usher in a new era of AI-enabled large-scale bio-based additive manufacturing. GEM will house AI-enabled arrays of large-scale, 3D printers and sensors to manufacture and test new products from wood-derived cellulose and other advanced biomaterials, collaborate with industry, and train the next generation manufacturing workforce. Goals include 3D print homes etc. The project includes a Fiber Processing and Compounding demonstration, training, and incubation space to transform wood residuals into wood flour and to create wood fiber compounds to support fiber-based thermoplastics and additive manufacturing development and commercialization. Commercial users include sustainable packaging, affordable housing, building materials, and other consumer goods.

8.Stimulating Bioproducts Supply Chains by Accelerating Public Procurement: By leveraging existing procurement processes and Maine T-REC incentive programs to accelerate adoption of bioenergy and biomaterials, this project will strengthen the supply chain for under-utilized logging and mill residuals; replace use of fossil fuels; and incent the development of production facilities and associated jobs. Actions include: Expanding Biofuel and Biomass Energy for Public Facilities; Stimulating Conversion to Modern Wood Heat by Pre-Purchasing Thermal Renewable Energy Certificates; Conducting Cross-Laminated Timber Demonstration Projects; and Targeted Procurement of Forest Bioproducts (e.g. State’s Early Adopter & Lead-by-Example programs).

Proposed Metrics of Success

Proposed metrics of success cluster-wide and across the several component projects include: *Economic Impact, Jobs & Equity:* 1) Increase in the overall economic contribution of Maine’s forest products sector of \$4B, value-added impact, total employment. 2) Build pathways to retain and increase quality of 5,000 jobs in the most rural, higher-poverty areas of Maine.

New Market Opportunities & Innovation: 1) Grow new markets for wood fiber and next generation products. 2) Increase private capital investment (including FDI). 3) Direct metrics of R&D & commercialization activities with new technologies, companies, and startups.

Community Economic Resilience & Readiness: 1) Increase community economic base (including community capacity built; idled sites reactivated and redeveloped as commercial development parks). 2) Improve socioeconomic resilience (demographic, tax base, equity, and asset metrics).

Environmental Sustainability & Climate: 1) Maintain sustainable forestry (growth-to-harvest ratio). 2) Maintain/exceed 70% forest/forest products net offset of Maine’s CO₂ emissions.

Accessibility of Matching Funds

The lead institution, UMaine, and coalition members have a proven track record of attracting matching and complementary investments from a diverse array of internal funds and industry, governmental, and philanthropic funding partners. UMaine is fully committed to make the

match requirement through internal and external funds for the approved list of projects.

Matching & complementary funding opportunities include:

- Match: UMaine will identify internal matching funds; seek private funds from philanthropy and companies and state funds including Maine Technology Institute (MTI) which often matches UMaine EDA awards; and assess applicability of funds such as \$50M for engineering buildings, and \$20M for workforce development awarded by Alford Foundation.
- Co-investment: 1) other committed and requested federal funds, e.g., \$15M in ARP for building infrastructure; 2) ongoing projects with the Department of Energy/Oak Ridge National Lab and the Defense Logistics Agency on accelerating biomaterials and biochemicals applications (inc. industry partnerships); 3) private company funding of innovation and commercialization projects (~\$3M annually) and equipment donations.

Project Leads & Partners: MDF has attracted recent FOR/Maine cash match and co-investment from Maine CDBG funds, MRDA, NBRC, philanthropy, and unrestricted corporate funding. In planning, qualifying match will be identified by project leads, sub-awardees, and partners: e.g., Workforce will integrate existing, general-funded delivery partner programs; communities will help match Industrial Site redevelopment; and Stimulating Supply Chains will leverage public procurement budgets. The State of Maine allotted ARP funds for innovation via MTI (including a \$20M dedicated forest sector fund); as well as to workforce, business support, and housing.

Barriers to Implementation and Strategies to Mitigate

Key barriers to success include limitations of 1) external factors (e.g. COVID-19), supply chain disruptions, foreign competition, and reduced ability to develop FDI and other critical relationships; 2) demographics – low population scale, density, diversity, and growth of working-age population in Maine; 3) workforce scale and skills; 4) capacity due to small, rural, underserved communities; 5) weaknesses in Maine’s enabling environment (business climate, energy costs, etc.); 6) potential misalignment or discontinuity in subsector objectives, policy, resources, or asset deployment – underpinned by lack of public awareness or perception of the opportunity set; 7) time and scale – action is needed now to seize global bioeconomy opportunities for the Northern Forest and substantial investment in the enabling environment is necessary to attract billions in direct investment in the coming years.

The cluster growth strategy is designed structurally -- and in the selection of the priorities and component projects, to overcome each of these types of barriers by (a) leveraging existing cluster strengths which are considerable as enumerated in the asset list and commitment letters; (b) building from sound, objective data analyses compiled by FOR/Maine; and (c) utilizing the barrier-busting, communications, and alignment-generating power of a strong industry-led coalition that can ensure industry needs are met, public and private investment needs are complementary, policy alignment is positive and persistent, and project management, coordination, and integration is seamless. FOR/Maine and coalition members have a proven track record of building and sustaining this cluster leadership, alignment, and project management to optimize the assets and bust barriers.

General Timeline for Implementation – SEE PROJECT SUMMARIES AND TIMELINE above