Urban Wood Utilization and Industrial Clusters: *A Twin Cities Case Study*

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Introduction

Today there are about 4 billion urban trees[1] in the U.S., with another 70 billion growing in metropolitan areas[2]. As urban land in the U.S. expands, so do the urban forests. Urban land in the lower 48 states increased from 2.5% of total land area in 1990 to 3.1% in 2000, an area about the size of Vermont and New Hampshire combined. Researchers from the U.S. Forest Service project that urban land in the coterminous U.S. will nearly triple in size to over 8% by 2050, an area larger than the state of Montana (Nowak and Walton 2005).

The number of trees, and hence the volume of wood, removed annually from our nation's urban forests is significant. Estimates of removal (due to pests, wind storms, construction, hazard trees, etc.) range from 16 to 38 million green tons per year. Even the lower value of these estimates is comparable to total annual harvests from America's National Forests (Bratkovich et al. 2008).

Although the utilization of urban trees for wood and paper products is occurring only sporadically, there are signs that momentum is increasing. Community officials, wood-using industries, arborists, tree care firms, researchers, public agencies, non-profit organizations, and others are devoting additional resources and new initiatives to convert urban "waste" wood to useful products.[3]

Nationally, the U.S. Forest Service, State and Private Forestry, has developed publications, case studies, and educational programs, as well as provided financial support for demonstration projects on urban wood use. The Ash Utilization Options project—spearheaded by the Southeast Michigan Resource Conservation and Development Council—is one example of a regional effort (created after the discovery of the emerald ash borer) to promote better utilization of urban trees.[4] Numerous wood-using industries and entrepreneurs—including, as examples, CitiLog in New Jersey, Horigan Urban Forest Products in Illinois, and Pacific Coast Lumber in California[5]—have expanded or created new businesses in recent years based on converting urban trees to value-added products. Even local construction projects in numerous communities—Cross Plains,

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[1] Urban areas as defined by the Census Bureau include (1) urbanized areas with a population of 50,000 or more and a minimum density of 1,000 people/sq. mi., (2) places that contain some urbanized areas within their boundaries, and (3) places with at least 2,500 people and located outside of urbanized areas. Also, areas totally surrounded by urbanized areas but not within an urbanized area are considered to be an urban area (Nowak et al. 2001)

[2] Metropolitan areas as defined by the Office of Management and Budget defines metropolitan areas by county, not places (except in the six New England states). Metropolitan areas have one or more large core populations that are socially and economically linked to adjacent counties. For example, the New York metro area—the largest in the country—covers 36 counties in New York, Connecticut, New Jersey and Pennsylvania (Sherrill 2003).

[3] This report focuses on "urban wood" derived from trees and other woody vegetation. Construction and demolition wood (C&D), discarded pallets and other forms of dunnage, mill residues, etc., are not included.

[4] For more information on the Ash Utilization Options Project, see http://www.semircd.org/ash/.

[5] See http://www.citilogs.com/, http://www.horiganufp.com/ and http://www.pacificcoastenterprises.com/.

Wisconsin and Ann Arbor, Michigan as examples—have featured urban tree "take downs" in products such as flooring, paneling, benches, tables and chairs.[6] Also, select communities such as Lompoc, California[7] have ramped up efforts to use all or a portion of their tree removals for a variety of products including mulch, biomass (for energy), animal bedding, specialty products and lumber. Augmenting these initiatives are a variety of books, videos, conferences, art exhibits and partnerships, all of which have been developed during the past decade with a specific focus on urban wood use.[8]

All of these urban wood utilization efforts are important and praiseworthy for their environmental and economic benefits for local communities. Many do an excellent job of focusing on one or more key elements needed to create awareness and sustain activities of an urban wood utilization project such as education, financing, or entrepreneurship. Each specific effort has the potential for replication or use in other areas throughout the country.

Another approach for planning and developing a broad-based community-wide urban wood utilization program is to base the effort on a "big picture" (comprehensive) model or proven business or economic development strategy that includes many or all key elements for success. One such strategy or model that could be used as a template for building an urban or community based wood utilization program is the notion of "industry clusters".

This report focuses on an emerging urban wood-based industrial (business) cluster in the Minneapolis-St. Paul (Twin Cities) metropolitan area. Examples of Twin Cities' cluster-based wood utilization activities and corresponding cluster-building techniques are highlighted. Recommendations for advancing wood utilization activities on a community-wide basis are offered.

What is an Industry or Business Cluster?

Industry clusters are groups of firms and/or organizations located within a defined geographic region who have developed cooperative links with one another through value and supply chains, labor, and use of similar inputs, technology, and complementary products. Another way of stating this is that a "cluster" is any instance of closely located (i.e., geographic proximity) and closely aligned operations (i.e., high frequency or number of transactions, or closely related product lines). For a cluster to flourish, it is necessary that the parties involved receive a mutual benefit.

Clusters can be formally organized through trade associations, buyers groups, or cooperatives, or developed through an informal manner (e.g., via friends, families, or neighbors). Some clusters

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[6] Libraries in Cross Plains, WI and Ann Arbor, MI both used lumber products from on-site trees. See http://www.scls.lib.wi.us/crossplains/LEEDtour.pdf and http://www.aadl.org/buildings/traverwood.

[7] See http://www.cityoflompoc.com/parks_rec/urbanforestry.htm.

[8] "Harvesting Urban Timber" by Sam Sherrill (http://harvestingurbantimber.com/?page_id=6) is an example of a recent book devoted to urban wood utilization. A recent video on the subject is "Up From Ashes" by KDM Films and Detroit Public TV.

are developed intentionally through government intervention or actions by a development agency while others evolve as a result of local entrepreneurs that discover, and seize, new market opportunities.

An appealing characteristic of clusters is that they often provide benefits of efficiency, enhanced productivity, and greater resiliency to members due to the synergies and relationships they support. On the downside, clusters have been known to create conditions of co-dependence, which can limit any individual participant's ability to innovate. Interdependence can also contribute to the quick demise of enterprises due to significant changes in economic, social, or environmental conditions.

Examples of well-known clusters throughout the U.S. include the high technology-oriented (computer) industry in "Silicon Valley" California, the automotive industry in and around southern Michigan[9], the "research triangle park" cluster in North Carolina, and movie production in Hollywood. On a smaller scale, wood-based clusters include the Amish furniture industry in Holmes County, Ohio, the Forest Industry Park in Ladysmith, Wisconsin, and the wooden boat cluster in Port Townsend, Washington.

Ingredients for a Successful Cluster

In 2008, the U.S. Endowment for Forestry and Communities commissioned a study to examine the status of, and opportunities for, business clustering within the U.S. forest products sector and other closely aligned sectors.[10] One of the outcomes of this study was a summary and description of "ingredients" for a successful industry cluster. The ingredients for success include:[11]

- Feasibility analysis
- Education, technical and research support
- Supportive government actions including financial grants
- Supporting and complementary industries
- Entrepreneurship and innovation
- Access to raw materials, markets and transportation networks
- Leadership, commitment and collaboration
- Business climate

[9] The auto industry has been one of the most recognized industry clusters in the U.S. For decades, hundreds of companies "clustered" around this core industry to provide supporting services and products. Today, some of the shortcomings of clusters can be illustrated within this industry sector.

[10] The complete report is available at the U.S. Endowment website: http://www.usendowment.org. An additional summary report is available at the Dovetail Partners' website: http://www.dovetailinc.org/files/DovetailEconClustering0809.pdf.

[11] Because clusters can initially form and grow in different ways (via entrepreneurship, government intervention, cooperatives, etc.) the elements or "ingredients for success" can vary from the above list and include other ingredients such as private financing (private investment), labor resources and overall infrastructure including availability of utilities, buildings, building sites, work force, etc.

In any given cluster, certain ingredients will be more important or critical for success than others. For example, *entrepreneurship and innovation* might be the critical ingredients for a business person developing a new product in an untapped market which can lead to a wave of similar industries in a geographic region. Likewise, *leadership, commitment and collaboration* spearheaded by a champion (individual or group) are often vital to jump-start a cluster such as in the case of an industrial park development. Regardless of the critical key to success, most successful industry clusters will exhibit most, if not all, of the above "ingredients" during their development and initial expansion.

The Cluster Model Applied to the Twin Cities Urban Wood Utilization

This section highlights the above "ingredients for success" with a brief explanation of the ingredient or element adapted from the U.S. Endowment report (*in italics*) followed by a description of activities related to Twin Cities urban wood utilization.

Feasibility Analysis

A feasibility analysis serves as a starting point for activities leading to the development of new, or expansion of existing, business clusters. To capture market potential, the analysis should include assessment of a region's economic conditions, raw material supply, labor resources, existing infrastructure, potential markets and development opportunities—including types of new industries that would complement existing firms.

Hub and Spoke Cluster Evident in Twin Cities

There are four descriptive categories of clusters. *Marshallian clusters* are typically local small and medium-sized companies that trade their products and services with other cluster members. *Hub and spoke clusters* include one or several large companies serving as anchor companies interacting with numerous small suppliers. *Satellite platform clusters* consist of large companies with multiple branch locations that act independently. *State-anchored clusters* are based on an anchoring institution such as a university, government agency or military installation.

The Twin Cities urban wood utilization cluster can be described as *hub and spoke* whereas District Energy (which can use upwards of 1,000 tons of wood per day) serves as the large anchor industry that is supplied with raw material (directly or indirectly) by 100 or more small firms (arborists, communities, loggers, etc.). Aspects of a *Marshallian cluster* also exist as many smaller cluster members operate "under the radar" of the large anchor company by trading products and services with one another (ex.: a tree service firm supplying logs to a "reclaimer" who uses a custom sawyer and dryer to provide lumber that is manufactured into products that are sold to numerous small retailers).

Two major events during the 1970s created turmoil and a sense of urgency for urban forests and wood in the Twin Cities. First, the ravages of the Dutch Elm Disease (DED) were experienced in both St. Paul and Minneapolis (and surrounding communities). Second, the energy crises led visionaries to explore alternative heating options for the metropolitan area. Feasibility analyses were conducted as a first step in assessing potential solutions to both problems.

Dutch Elm Disease

The DED epidemic that peaked in the 1970s created an environment to explore wood utilization options for the thousands of elm trees being removed annually.[12] Unfortunately, massive amounts of elm materials were disposed through open burning or burial in landfills. State grants attempted to help communities with utilization efforts but success was limited. The need for better wood utilization options continued to grow during the '80s and in 1992 funding was received from the U.S. Forest Service to conduct a multi-year utilization project.[13] The intent of the project was to identify and develop increased uses for urban tree residues. Outcomes from the study included (1) development of Twin Cities urban tree residue statistics (volumes, disposal methods, products, producer categories, etc.), (2) development of markets for three new users of urban wood chips, (3) establishment of a centralized referral system connecting producers and users of saw logs and wood chips, and (4) informational brochures on wood utilization options.[14]

Companion studies during this same time period (early 1990s) by the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Public Service investigated landfilling of yard and dry wood waste in the Twin Cities metropolitan area, and the generation of dry wood waste, respectively. Construction debris and non-hazardous waste (wood) received at metropolitan area demolition and construction landfills were also studied by MPCA.

District Energy St. Paul

Concurrent with the explosion of DED during the mid-and late 1970s, many individuals, organizations and businesses were experiencing high energy prices and unstable energy supplies. Following a 1979 fact-finding mission by a Minnesota delegation to Europe, St. Paul mayor George Latimer led an effort to adopt Swedish technology to solve the heating problems of the city. The goal was to prove that a hot water district heating system could be successful in a state with cold winters. Following a series of feasibility studies and lobbying efforts, District Energy became a reality in 1983 as an energy efficient, fuel flexible, heating facility that would provide stable rates for customers. In 1993, District Energy began offering district cooling to downtown building owners in St. Paul.

During the late 1990s and early 2000s District Energy was involved in a number of different assessments of wood availability in the Twin Cities area. In 2003, a combined heat and power plant (CHP) fueled primarily (70%) by urban wood waste began serving the District Energy system. Currently, the CHP plant simultaneously produces 65 megawatts of thermal energy for District Energy and 25 megawatts of electricity for Xcel Energy. It is the largest wood-fired CHP plant serving a district energy system in the nation, using about 280,000 tons of clean urban tree trimmings, forest residuals and other wood waste per year.

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[12] During the two year period of 1977-1978 Minneapolis removed over 52,000 elm trees. St. Paul and surrounding communities also removed large numbers of elms.

[13] Another driver of urban wood utilization was 1988 State of Minnesota legislation that banned Twin Cities' yard waste, including tree materials, from entering landfills after January 1, 1990.

[14] Minnesota DNR. 1994. Urban Tree Utilization Project: Final Report. St. Paul, MN (in cooperation with Minnesota Shade Tree Advisory Committee Utilization Task Force), 52 p.

Recap

Both the DED-related wood utilization project, and the District Energy CHP plant were preceded by feasibility-type studies that evaluated options and alternatives for urban wood use. In the first case, the analysis was broad in scope with the potential to impact a wide array of producers and users of wood. In the latter, the feasibility assessment targeted a specific business end-user. In both instances, the analyses served as a starting point for activities leading to the development of a Twin Cities urban wood utilization cluster.

Education, Technical and Research Support

Education, technical and research support is important for the growth of a business cluster. The role of public and private universities, community and technical colleges, public agency outreach programs, and training activities sponsored by trade organizations are vital.

The Twin Cities metropolitan area provides a wealth of opportunities for urban forestry-related practitioners, businesses and organizations to partake in education, technical training and research. The following is a sampling of such programs.

One of the stalwarts of education, technical training and transfer of applied research related to urban forestry in Minnesota is the annual Shade Tree Short Course (STSC). This program, started in 1963, has grown annually to become the largest state-level urban forestry conference in the nation. The two-day 2010 short course set an attendance record with over 860 participants including private and public arborists, consulting foresters, utility foresters, turf and grounds managers, university and government personnel, representatives of non-governmental organizations and urban forestry business owners. Coordinated by the University of Minnesota (Twin Cities), and supported by many program partners, the STSC is an opportunity for urban forestry-minded individuals to gather and partake in sessions ranging from introductory to an advanced technical, including sessions on urban wood use. International Society of Arboriculture (ISA) certified arborists continuing education credits are offered for attendees.[15]

Since 1974 the Minnesota Shade Tree Advisory Council (MnSTAC) has advanced the state's commitment to the health, care and future of all urban and community forests in Minnesota. MnSTAC not only advises the governor, legislature, state forester and others on urban and community forest issues but provides a forum for communication and exchange of information and experiences regarding these forests. MnSTAC was instrumental in the early 1990s with its Utilization Task Force in assisting the DNR with the urban tree utilization assessment project (see above). Today, monthly educational meetings are held, typically in the Twin Cities, on a variety of urban forestry topics. Also, MnSTAC publishes a quarterly newsletter, the *Shade Tree Advocate*, to advance its mission.[16]

[15] For more information on the Shade Tree Short Course, see http://www.cce.umn.edu/Annual-Minnesota-Shade-Tree-Short-Course/index.html.

[16] For more information on MnSTAC, see http://www.mnstac.org/index.html.

The Twin Cities is the only large metropolitan region in the U.S. that has a 4-year bachelor degree program in urban forestry—a program offered through the University of Minnesota (U of M). Many graduates of the U of M urban forestry program accept employment in communities in the metro-area thus creating a strong connection between on-the-ground urban foresters and the U of M forestry department. This relationship is strengthened by numerous urban forestry student internships within the Twin Cities metro-area. Also, university-level urban forestry research can be implemented efficiently due to U of M-trained foresters and interns located throughout the metro area. This unique relationship between (1) a metro-based urban forestry program, (2) locally educated urban foresters, (3) continuing internship opportunities for urban forestry students, and (4) ongoing urban forestry research projects in partnership between the university and communities, leads to a strong support system for the numerous Twin Cities-based urban forestry businesses and organizations. It is worth noting that Hennepin Technical College in the Twin Cities has a two-year urban forestry technician program. Also, Rochester Community and Technical College, a short drive south of the Twin Cities, will offer urban forestry classes beginning in 2011.

Another important provider of support service for an expanding urban wood utilization program in the Twin Cities is the Forest Products Utilization and Marketing (U&M) unit of the Minnesota Department of Natural Resources (DNR). For decades, the U&M unit has maintained a full-time staff specialist in St. Paul including additional part-time U&M specialists. DNR U&M staff have provided significant support to urban wood utilization initiatives. For instance, U&M specialists have worked with local urban forestry businesses, communities, and organizations regarding Dutch elm disease wood utilization in the 1970s through more recently assisting District Energy in St. Paul with wood availability studies, procurement strategies, and fuel processing options. Also, the U&M unit has been instrumental in developing metro-area urban wood processing directories and in providing technical assistance to many urban wood using firms.

A new but significant player in educational and technical support for urban forestry practitioners is the Urban Forestry Institute (UFI) at Rainbow Treecare. Started in 2002, the UFI is a unique private venture created to advance the scientific knowledge of tree health in the Twin Cities. The UFI offers educational programs for practicing arborists on topics such as emerald ash borer, oak wilt, tree biology, pruning and more. The UFI is investigating soil modification techniques through the use of mulch and is interested in reducing waste through better wood utilization practices.[17]

Recap

Education, technical training, and research support for urban forestry programs and practitioners in the Twin Cities has been in place for many years. The Minnesota Shade Tree Short Course and the Minnesota Shade Tree Advisory Council are examples of long-standing programs. The University of Minnesota urban forestry degree program and the Minnesota DNR Utilization and Marketing program provide levels of expertise seldom found in large metropolitan areas. The Urban Forestry Institute is a unique private endeavor that builds on the success of public and not-

[17] For more information on the Urban Forestry Institute, see http://www.rainbowtreecare.com/institute/.

for-profit efforts. These support programs, plus many others present but not described, have contributed to the success of an emerging urban wood utilization cluster in the Twin Cities.

Supportive Government Actions including Financial Grants

Government—local, regional, or federal—often plays a key role in cluster development and/or expansion. In some instances, public dollars or human resources are needed to jump start a cluster initiative. In others, government can contribute by assisting struggling clusters regain lost momentum and direction.

Minnesota has a number of unique and innovative urban forestry programs spurred by government that have indirectly supported an urban wood utilization cluster in the Twin Cities. Other programs have been supported by government actions to directly impact wood utilization. The following is a brief history and sampling of such programs.

A Minnesota shade tree program was launched in 1974 with key support from three Minnesota governmental departments—Agriculture, Natural Resources, and Transportation—all in cooperation with the University of Minnesota. Approximately $80 million was invested within the first decade for Dutch elm disease and oak wilt tree removal, reforestation, community assistance, research and wood utilization efforts. Many excellent programs were spin-offs of these early shade tree management efforts.[18]

The Minnesota Tree Inspector Program was started in 1974 in response to inspection of, and sanitation efforts related to, trees infected with Dutch elm disease and oak wilt. Currently, there are 800+ certified tree inspectors in the state with approximately one-half in the Twin Cities metropolitan area. A uniqueness of the tree inspector program compared to many programs in the country is that participants must attend annual recertification workshops to learn the latest on tree care, exotic species management, insect and disease identification, and native tree species including identification of felled and downed trees with bark intact. The tree inspector program is "law" in Minnesota with the authority to oversee the program transferred from the Minnesota Department of Agriculture to the Minnesota DNR in 2007. This change aligns DNR forestry expertise and existing programs, such as the MN ReLeaf Program,[19] with municipal tree programs.[20]

A second example of positive government intervention is the 1993 allocation of federal dollars to the State of Minnesota (via the U.S. Forest Service), to establish a Minnesota Tree Care Advisor Program. This program, focused on training volunteers, has contributed nearly 70,000 hours of volunteer time to topics such as tree health, pest identification, hazard tree detection, and related urban forestry issues. The Tree Care Advisors program involves a network of trained

[18] Source: Personal communication with Ken Holman, MN DNR Urban Forestry Coordinator.

[19] A description of the MN ReLeaf Program is available at: http://www.dnr.state.mn.us/grants/forestmgmt/releaf.html.

[20] For more information on the MN Tree Inspector Program, see http://www.dnr.state.mn.us/forestry/urban/certifiedtreeprogram/index.html.

community-based volunteers who assist the University of Minnesota, the state Master Gardener program and county extension offices, and other state agencies and municipalities in promoting urban and community forestry. Today, the Tree Care Advisor Program is a self-supporting, independently run program. The success of this program—which is rather unique in the U.S.—has contributed to an urban forestry "mind-set" in the Twin Cities that helps spawn innovative and "out-of-the-box" programs including wood utilization.[21]

A direct example of how government actions can support a key player in a business cluster occurred in 2007 when the Minnesota Legislature appropriated $500,000 to the Department of Natural Resources, Division of Ecological Resources, to implement a new and innovative project titled "Linking Habitat Restoration to Bioenergy". The funding was to help assist habitat restoration efforts that might not have otherwise occurred while making the woody material generated as a by-product available to District Energy St. Paul and other bioenergy facilities. By law, all restoration projects funded through this mechanism had to be within 75 miles of St. Paul.[22]

Recap

The role of government, at both the State and Federal levels, has made positive contributions to the Twin Cities urban forestry program including funding for shade tree activities during severe pest outbreaks, creation of tree inspector and tree care advisor programs, and direct legislative support for a key urban-based wood-using industry.

Supporting and Complementary Industries

Business clusters often provide benefits of efficiency, enhanced productivity, and greater resiliency to members due to the synergies and relationships they support.

There are numerous industries that either directly or indirectly support one another regarding urban wood use in the Twin Cities. These include a large biomass user (District Energy) which serves as an anchor industry, medium to small-sized biomass users, biomass suppliers, greenhouse operators, tree service firms (private arborists), mulch and chip producers, landscapers and garden centers, lumber wholesalers, lumber dryers, urban saw log reclaimers, green building businesses, food cooperatives and related "natural" businesses, sawmill operators (conventional), custom portable mill operators, tree nurseries, cabinet and furniture makers, habitat and ecological restoration providers, land clearers, and municipalities (public arborists).

To demonstrate the interconnectedness of many of these various industries, consider the following (real world) Twin Cities scenario. A (1) tree service firm provides quality saw logs to a (2) lumber reclaimer who uses a (3) contract sawyer for milling the logs and a (4) custom dry kiln for lumber drying services. After the lumber has been dried, the urban log reclaimer manufactures products that are sold wholesale to various retailers including (5-7) three green

[21] For more information on the MN Tree Care Advisor Program, see http://www.mntca.org/.

[22] For more information on the Linking Habitat Restoration to Bioenergy program, see http://www.dnr.state.mn.us/grants/habitat/biomass.html.

building suppliers, (8-9) two food cooperatives, (10-18) green-oriented specialty gift shops with nine retail outlets, (19-21) three secondary manufacturers and (22) a hardwood flooring company. Also, the tree service company that supplies the logs to the reclaimer has options for lower value wood including selling low-end logs to a (23) pallet mill and chips to a (24) biomass energy user. Therefore, in this example, two dozen businesses are directly involved in the manufacturing and marketing of urban wood products originating from tree removals by one tree service firm. In addition, thousands of end users of the "final" products (energy for heating and cooling, pallets for industrial uses, hardwood flooring, cutting boards, etc.) are involved in the cascading impact of one tree service firm.[23]

Recap

Supporting and complementary industries are key to cluster development and success. The Twin Cities urban wood cluster provides strong evidence of such activity.

Entrepreneurship and Innovation

Entrepreneurial thinking by the leadership of cluster businesses, governments and supporting organizations is crucial to success. Entrepreneurship is instrumental in helping identify niche markets, stimulating innovativeness, and in developing competitive advantage.

As noted earlier, District Energy St. Paul is not only a large anchor industry for the urban wood cluster in the Twin Cities but an organization with entrepreneurial and innovator characteristics as well. When District Energy was first evaluating the opportunity to use urban wood as a fuel source for its CHP plant, raw material was to be obtained directly from tree service firms and other producers. However, due to fluctuations in raw material delivery (quantity and timeliness) as well as quality of the product and other logistical issues, District Energy realized that a different "raw material model" was needed to lessen challenges. Consequently, a closely affiliated partner—Environmental Wood Supply (EWS)—was created to procure all wood used by the CHP plant. EWS also was responsible for developing agreements with communities, private arborists, loggers, and other entities that were potential wood suppliers for the CHP plant and District Energy. Another component of EWS was managing a "wood yard" at a nearby site so as to maintain a 30-day supply of fuel. Currently, EWS pays a "gate rate" at their wood yard of $3/yard for chips and $2.50/yard for mulch; no charge is assessed for logs and branches (free tip fee for producers). EWS also provides to communities/wood handlers the grinding of tree debris (at locations throughout the Twin Cities metro area) and trucking to the CHP plant.

A second example of entrepreneurship and innovation in the Twin Cities urban wood cluster is Wood from the Hood. Founded by Rick and Cindy Siewert of Minneapolis in 2008, Wood from the Hood obtains logs from tree service firms and converts them into an array of products including flooring, paneling, cutting boards, cribbage boards, picture frames, coasters and more.

[23] In addition to the products outlined in this real-world example, any woody material that finds its way into the Twin Cities mulch market will likely be distributed through tree nurseries, landscapers, and garden centers, bringing the total to a minimum of 27 impacted businesses.

Logs are sawn on-site by a custom portable mill operator[24] and dried by a custom dryer; Siewert also built his own 300 board foot kiln. The dried lumber is finished and assembled into products at Siewert Cabinet (a family business since 1965). Wood from the Hood typically sells its products through a number of retail outlets including a green builder, flooring company, food cooperatives, and specialty stores. All products—from flooring to cutting boards—are inscribed with the zip code (neighborHOOD) from where the wood was obtained.

An example of entrepreneurship and innovation in the public sector is demonstrated by the Minneapolis Park and Recreation Board (MPRB). In the recent past, MPRB paid as much as $318 per hour for tub grinding services at one wood processing site while also incurring a tipping fee for wood residue at a second site. In total, approximately $100,000 was spent annually on tree disposal. Today, due to markets for landscape mulch and biomass, the MPRB was able to negotiate an innovative lease agreement with a private wood recycling firm where MPRB delivers limbs, brush, and large trees (> 18" diameter) to a processing site in the city. In return, the recycling firm pays MPRB $75,000 annually and provides free tipping at a second processing site. Also, MPRB uses their own wood chippers to produce chips from logs not diverted to the lease site (< 18"). MPRB provides the material free-of-charge to homeowners and sells a large volume of the chips and stump grindings to a local nursery where they are used as a potting medium. In return, the nursery pays the MPRB $75,000 for the product. These two revenue streams—lease arrangement and chip sales—are "cost avoidance" strategies as they enable the MPRB to turn an annual expense into an innovative revenue producing operation, thus saving tax payer money while providing a raw material in demand by local industries.

Recap

Entrepreneurship and innovation are crucial for the success of business clusters. The Twin Cities urban wood cluster has many examples of these characteristics including large—District Energy—as well as small businesses—Wood from the Hood. The Minneapolis Park and Recreation Board—a public entity—demonstrates that entrepreneurship and innovation are not limited to only private industry. Successful spin-off and affiliated businesses are additional elements of successful clusters and both are evident in the above examples.

Access to Raw Materials, Markets and Transportation Networks

Access to raw materials (inputs) and markets is crucial to cluster development and long-term viability. A dependable flow of raw materials and stable markets for products and services are key to sustainable clusters. An adequate transportation infrastructure is needed to ensure access to raw materials and markets.

The Twin Cities supports an array of urban tree-based businesses due to its ample raw material supply. On a metropolitan-wide basis, the Twin Cities generates about 450,000 green tons of

[24] As of April 2010, about 50% of the logs are processed on-site (at Wood from the Hood) with the remaining 50% processed off-site.

urban tree residue annually (estimate based on a recent study).[25] Minneapolis, for example, has approximately 1 million urban trees. Although many of these trees are small, over 25% are 13 inches or larger DBH.[26] At a conservative 1% annual removal rate (due to storms, pests, construction, etc.), the volume available to large and small businesses, entrepreneurs, and other tree "reclaimers" is significant.

In addition to a significant annual "harvest" of raw materials, the Twin Cities metropolitan area is home to roughly 2.9 million people. Consequently, markets for energy, landscape materials (mulch), lumber, specialty wood products, etc., are robust. Producers of urban wood products can advertise, sell, and distribute their items locally to a large and growing population.

The Twin Cities are at the crossroads of two interstate highways (I-94 and I-35) which assist in moving raw materials and products to market in a relatively efficient manner. Movement of materials is also facilitated by the fact that public transit is growing in both St. Paul and Minneapolis, helping to reduce congestion on streets and highways.

Recap

Access to raw materials and markets is evident in the Twin Cities urban wood cluster. Compared to some rural forested regions where timber (raw material) availability is dependent on government policies/actions and markets are hundreds of miles distant, the Twin Cities has a relatively steady flow of material and nearby markets.[27] The interstate highway system in and around the Twin Cities facilitates the transport of raw materials and products.

Leadership, Commitment and Collaboration

Leadership by a third party (industry, non-profit organization, public entity, etc.) is often needed to coordinate activities of stakeholders involved in developing a business cluster. An umbrella organization can help cluster businesses and organizations identify niche markets, assist with workforce training and development, seek financial resources, improve networking among cluster members, educate businesses about the benefits of clustering, and gain political support for the cluster. It is important that cluster stakeholders, representing industry, government, and supporting organizations work together to create a long-term vision for the cluster and use strategies and policies that support cluster development.

The Twin Cities urban wood utilization cluster has received outstanding support and leadership from a number of organizations. Three of these key stakeholders are highlighted below.

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[25] Green Institute. 2007. Renewing Rock-Tenn: A Biomass Fuels Assessment for Rock-Tenn's St. Paul Recycled Paper Mill. See http://www.greeninstitute.org/media/documents/RenewingRock-Tenn_BiomassFuelsAssessment_GreenInstitute_032907.pdf.

[26] For additional information on the urban tree inventory in Minneapolis, see http://www.na.fs.fed.us/urban/treespayusback/vol1/ufore%20mpls%20summary.pdf.

[27] A steady-flow of urban raw material is actually a "minimum flow" as volumes available for recovery can increase significantly immediately after a major weather event or pest outbreak.

The Minnesota Shade Tree Advisory Council (MnSTAC), as described previously, has been active in urban forestry issues since 1974. Although MnSTAC's primary focus is not utilization, the organization has contributed immensely by providing a vision for urban forestry and serving as a collaborator and organizer of many educational and related events. Attendees at the monthly MnSTAC programs cross boundaries and represent a who's who of the Twin Cities urban forestry community. MnSTAC members have traditionally thought beyond just "tree planting" and embraced a big picture outlook. When major issues arise, MnSTAC has provided leadership and advocacy in convening special task forces such as the utilization assessment and feasibility study in the 1990s.

The University of Minnesota (U of M), through its sponsorship of the Shade Tree Short Course (STSC), has provided the leadership for education and training since 1963 (see above). This is especially true for the practicing arborist who needs hands-on training and up-to-date practical information that can be used on a daily basis in the field. Also, the University's 4-year degree program in urban forestry has provided a network of graduates for numerous employers in the Twin Cities. This has created a synergy between the University and its many collaborators (communities, private arborists, non-profit organizations, etc.). Outreach by U of M Extension wood products specialists through publications, newsletters, and workshops (as examples) have also contributed to this effort.

The Minnesota DNR, Division of Forestry, has a long history of providing technical assistance to the forest products and related industries and organizations in the state. The DNR has maintained a leadership role in assisting with urban wood availability assessments, market studies, processing and storage options, economic assumptions and more. During the period of District Energy's investigation into a woody biomass system, the Division of Forestry had an assigned wood products specialist devoted to the Twin Cities and surrounding metropolitan area.

Recap

The Twin Cities has been blessed with a number of organizations and individuals who have provided leadership and commitment through a collaborative process to support an urban-based wood cluster. MnSTAC has been the primary advocacy group for urban forestry while supporting many educational efforts over the years. The University of Minnesota manages the popular Shade Tree Short Course, provides undergraduate training in urban forestry, and supports a wood products extension outreach effort. The DNR Division of Forestry has been the "go-to" organization for technical assistance relating to urban wood use.

Business Climate

A supportive business environment is crucial to the development and strength of business clusters.

Urban wood utilization is essentially a *recycling* activity since tree removals are diverted from the waste stream into useful products. Since recycling is typically considered a *green* activity, the utilization of discarded urban trees is acknowledged as a green behavior. The Twin Cities metropolitan area is recognized for its green attitudes and behavior, so it is not surprising that public and private acceptance is high for the development and growth of an urban wood utilization cluster.

According to a recent survey, the Twin Cities of Minneapolis and St. Paul rank as the11th greenest metropolitan area in the nation (out of 41 areas).[28] Minneapolis is home to over 160 green businesses according to the city's Community Planning & Economic Development Department and the city has a commitment to help green businesses succeed as a part of its economic development strategy. Minneapolis also adopted a sustainability initiative in 2003 and enacted policies that require LEED building Silver Level requirements, the use of green cleaning products and putting a preference on environmentally friendly purchasing.

The Twin Cities also is home to the University of Minnesota's Institute on the Environment, the popular Science Museum of Minnesota located in St. Paul, and the Bell Museum of Natural History in Minneapolis. Also, a new professional baseball stadium was opened in Minneapolis and is considered the greenest of any stadium in the country (LEED Silver Certification) with more than 30 percent of all installed materials made from recycled content and more than 70 percent of construction waste diverted or recycled.

On a broader scale, Minnesota is a hub for forest management and chain-of-custody certification, has a strong farmers market and Community Supported Agriculture movement, and has numerous active environmental groups, 80 of which are members of the Minnesota Environmental Partnership (MEP) and supported by over 450,000 Minnesotans. The Living Green Expo in St. Paul, with a mission for the past eight years of inspiring people to live healthier and more sustainable lives, was sponsored in 2010 by the MEP. Another sign of Minnesotan's environmental leadership occurred in November 2008, when in the midst of the worst economic news in a generation, voters statewide approved a sales tax increase to support the environment.[29]

The previous examples, plus many more, attest to the greenness and environmental literacy that abounds in the Twins Cities and throughout the state.

Recap

Minnesota, and in particular the Twin Cities, has a business climate and citizenship that supports green industries, initiatives and policies. Urban wood utilization activities have directly benefited from this *green* business environment and mindset.

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[28] Source: *Minneapolis St. Paul Business Journal*, April 9, 2010.

[29] See http://dovetailinc.org/files/DovetailNatResPriorities0309.pdf for the Dovetail Partners, Inc. report titled: *Building a Constituency of Forest Productivity Advocates: What Do We Know About Minnesotan's Natural Resources Priorities?*

Recommendations for Advancing Urban Wood Utilization Clustering in Communities

Urban wood utilization efforts in the Twin Cities contain many key ingredients of a successful economic cluster. Observations and lessons learned from the Twin Cities cluster lead to the following recommendations within the framework of cluster development.

- *Conduct a feasibility study in the early stages of cluster development* – Examine raw material availability (quantity and quality of tree removals) and existing disposal and/or utilization practices including potential markets.

- *Evaluate economic conditions, existing infrastructure, labor resources and other factors that impact the overall business climate* – This effort can be included in the feasibility study if time and resources permit; if not, a separate analysis should be conducted. An element to include in this analysis is the receptivity or "personality" of a community and its inclination to embark on a wood utilization program. For example, Minneapolis and St. Paul were two of the first cities in the U.S. to ban the land filling of trees, setting the stage for aggressive pursuit of urban wood utilization activities.

- *Collaborate with stakeholders from industry, government and supporting individuals and organizations* – The key is to get buy-in from various stakeholders and develop a vision for the urban wood utilization cluster including next-steps and action items.

- *Engage the leadership of a key, external organization to coordinate activities, facilitate development and to gain policy support* – The leader or champion does not necessarily have to possess a utilization background but should strongly support the utilization effort and should have the ability to use his or her position to "rally the troops." A local and respected urban forestry leader could fill this role.

- *Secure funding* – Financial resources—both private and public—are important to support feasibility studies, technology development, workforce training, capital investment, applied research and other project components. Funding sources can include national, state, or local initiatives. Programs directed at wood utilization and urban forestry efforts are obvious avenues for obtaining funding but broad-based recycling grants, small business loans, and bio-based energy programs (as examples) can also provide direct financial support for an urban wood cluster.

- *Focus on education and engagement of entrepreneurial thinking and innovation* – Support the creation of a position with the assigned duties of "urban wood utilization". A person in this capacity can efficiently focus on education and training opportunities for arborists (log manufacturing, grading, transport, etc.), assist and encourage start-up urban wood businesses, conduct utilization-based feasibility studies (see above), and become a focal point for technical /hands-on utilization activities.

- *Nurture supporting and complementary industries* – An important task of either the cluster champion, urban wood utilization specialist, or a key stakeholder(s) is to facilitate partnerships and relationships (formal and informal) between the numerous industries (and organizations) that are in the cluster. This effort should show cluster members how their businesses are inter-connected and dependent on one another from procurement of raw materials (such as a boulevard tree) to production, marketing and distribution of end-products (mulch, picture frames or energy from biomass).

- *Recognize the differences in types of clusters and act accordingly* – One strategy for cluster development is to select or nurture one of four models as a starting point, or build upon what already exists (see sidebar on page 5). This can help focus efforts and provide a framework for collaborative work.

Although not a cluster strategy per se, the Twin Cities case study illustrates how a strong, progressive urban forestry program can serve as a foundation for wood utilization activities. Consequently, targeting communities with vibrant urban forestry programs appears to be an excellent starting point for developing community-based wood utilization projects. Also, urban wood utilization complements existing green and recycling/reuse initiatives in a community. Forging partnerships with these on-going efforts will foster community goodwill, expand recognition and establish legitimacy to an emerging urban wood utilization program.

Bottom Line

Business or economic clusters offer a comprehensive research-based approach for starting and/or expanding an urban wood utilization program. Many communities likely already have one or more elements (ingredients for success) of clusters in place. The key for communities, industries, or organizations seeking to develop an urban-based wood cluster is to recognize what elements (ingredients) are either, present, absent or need bolstering. As described in this report, the Twin Cities urban wood utilization cluster provides a case study of how key ingredients can build upon one another to create an emerging and successful cluster.

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