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North American Wood Waste Forum

Summary of Group Feedback, February 2–3, 2012

Bob Falk



Abstract

This report summarizes the feedback and recommendations of the North American Wood Recovery Group. This report summarizes the barriers and opportunities in wood recovery, reuse, and recycling as identified by this group of stakeholders from the wood industry, waste industry, and relevant government agencies.

Keywords: wood, recycling, reuse, recovery, salvage, deconstruction

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Contributors

- Buddy Showalter, American Wood Council (AWC)
- Damian Sawka, Boxfish Group, Forest Products Association of Canada (FPAC)
- Lorne Johnson, Boxfish Group, Forest Products Association of Canada (FPAC)
- Anne Nicklin, Building Materials Reuse Association (BMRA)
- Bill Turley, Construction Materials Recycling Association (CMRA)
- Jim Bowyer, Dovetail Partners, Inc.
- Bob Falk, USDA Forest Products Laboratory (FPL)
- Jason Haus, National Demolition Association (NDA)
- Chas Miller, National Solid Waste Management Association (NSWMA)
- Bryce Jacobson, Portland METRO
- Wes Sullens, Stopwaste.Org
- Tom Napier, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory (CERL)
- Ksenija Janjic, U.S. Environmental Protection Agency (EPA), Office of Solid Waste
- Vicki Worden, Worden Associates, Inc.
- Matt McKinney, Waste Management, Inc.–Recycle America

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North American Wood Waste Forum

Summary of Group Feedback, February 2–3, 2012

Bob Falk, Research General Engineer
Forest Products Laboratory, Madison, Wisconsin

Executive Summary

On average, about 130 million metric tons of wood-based products is produced annually in the United States. The harvesting and manufacture of these products results in about 76 million metric tons of wood residue, 98% of which is used by the wood products industry for fuel, pulpwood, and feedstock for products such as particleboard. Whereas these manufacturing residues are efficiently used, there is another large source of wood that is not—the wood that ends up in our Nation's solid waste stream. It is estimated that about 6% of the municipal solid waste (MSW) stream and between 15% to 40% of the construction and demolition (C&D) waste stream is wood. In 2010, over 64 million metric tons of solid wood was disposed of in landfills in the United States and Canada.

The USDA Forest Products Laboratory (FPL) hosted a 2-day forum aimed at identifying the current state of wood recovery, reuse, and recycling in North America and developing strategies to maximize the diversion of wood from these landfills. Key representatives from the solid waste industry, wood industry, and various government agencies participated. These stakeholders represented generators, processors and consumers of wood, regulators, policy makers, and researchers.

This report provides a high-level summary of the feedback received through the forum, both from presenters and attendees, about ways in which North America can increase its diversion of wood from landfilling and encourage market development for recovered wood.

The most commonly cited barriers to diversion and market uptake of wood from the waste stream were as follows:

- Limited markets for recovered wood in general
- Lack of awareness (consumers) and need for education (building professionals) about recovered wood
- Lack of incentive to recover, flawed price signals (cost of diversion compared with disposal), poor understanding of costs of recovering wood
- High operating costs (labor and storage) for reused products
- Consistency and lack of understanding of supply volumes of reused products
- The public's perception about the quality of reused and recycled wood materials

- Consistency of supply of recycled wood materials
- Low tipping fees for waste disposal
- Patchwork of regulations
- Contaminant issues for biomass

The most commonly cited opportunities to diversion and market uptake of wood from the waste stream were as follows:

- Improve quality and aesthetics perception
- Address high costs of recycling
- Increase research and education efforts
- Develop better marketing tools
- Look for ways to increase quality of products
- Work on consistency of supply
- Work to counter low tipping fees
- Increase producer involvement to assist markets
- Work with green building programs to increase awareness and credit for recovery, reuse, and recycling
- Work with regulatory agencies to develop appropriate regulations

Introduction

Wood is used in many applications including lumber and other building materials, furniture, crating, containers, pallets, and other consumer goods. This wide array of wood products not only produces a large amount of industrial wood residue during the manufacturing process, but a large amount of wood is landfilled when these products are disposed of at the end of their useful lives.

While the wood industry achieves high levels of utilization (>98%) of the wood residue generated in primary wood processing operations, the reuse and recycling of post-industrial and post-consumer wood from our waste streams lags far behind. Recovery of wood from the wood fraction of the C&D waste stream (33 million metric tons) is estimated at 8%, and the wood fraction of the MSW (14 million metric tons) has a recovery rate of 15% (not counting recovery for energy combustion). This is in contrast to other widely used materials, such as concrete and steel that have achieved much higher recovery rates. According to the Steel Recycling Institute, the recycling rate for structural steel is about

98%, while concrete recycling is reported at about 82%, according to the Construction Materials Recycling Association (CMRA).

The development of strategies that encourage the diversion of usable wood from the waste stream will not only help extend the value of wood products to the economy, but it will also have a positive effect on the environment by reducing the need for disposal space and lengthening the lifespan of existing landfills.

Objective

The North American Wood Waste Forum was organized to bring together various stakeholders associated with the recovery, reuse, and recycling of wood:

- Establish the current state of wood recovery activities in North America
- Clarify the newest technologies and approaches
- Define participant interests and activities
- Identify key barriers and opportunities to increasing wood recovery, reuse, and recycling
- Develop a realistic national strategy to overcome barriers and capitalize on opportunities (to be reviewed by a broader base constituency)

Bringing together the forest products and waste management sectors to discuss strategies for increasing wood recovery, reuse, and recycling can help in defining the future direction of policy, regulatory, technology development, and technology transfer efforts in this area.

The first day of the symposium began with five presentations intended to set the stage for further discussion. These presentations (Appendix) focused on defining the magnitude of the wood landfilling problem, summarizing current reuse and recycling efforts, as well as highlighting experiences from municipal and waste industry representatives. Following these presentations, facilitated discussion focused on identifying barriers to wood recovery and opportunities to develop greater diversion from landfills and increase market uptake.

The second day focused on summarizing the identified barriers and opportunities for diversion and identified strategies to address them.

Purpose of Report

This report summarizes feedback generated during the forum, both from presenters and from attendees, about ways to increase diversion of wood from landfills and encourage market development. The forum, though facilitated, was designed to limit predetermined bias and allow for open and candid discussion.

The feedback presented here has been summarized but is not edited for content. For this reason, some of the issues may

conflict or at times be redundant. The main objective is to document and summarize what was said.

Discussion Framework

Participants were asked to discuss both barriers and opportunities to wood recovery in the context of two drivers—diversion and market uptake. That is, what are the barriers and opportunities that affect the diversion of wood from landfills, and what are the barriers and opportunities that affect market uptake for these materials? The markets identified included wood reuse, wood recycling, biomass (i.e., combustion), and mulch and other products.

- Barriers and opportunities
 - Diversion
 - Market uptake
 - Reuse
 - Recycle
 - Biomass
 - Mulch and other

The participants were also asked to identify barriers and opportunities as they relate to the categories listed below.

- Categories of barriers and opportunities
 - Economics and price signals
 - Education and outreach
 - Research and technology, development and technology transfer
 - Policies and regulations
 - Industry infrastructure
 - Coordination and integration

Wood Recovery Barriers

Initially, participants were asked to identify barriers to wood recovery without being specific to the uptake markets identified above (i.e., reuse, recycling, biomass, and mulch). Each participant was asked to identify three barriers. The barriers most frequently identified by participants (in descending order) were as follows:

- Limited markets for recovered wood—limited markets were seen by several participants as the most significant barrier to recovering wood for reuse and recycling. Several respondents thought that reusing wood materials held promise for increased market development.
- Lack of awareness and need for education
 - Among consumers

Lack of awareness about the environmental benefits of wood recycling was seen as a barrier to increased wood recovery.

- Among building professionals

Building professionals were seen as a group that could facilitate the increased use of reused and recycled wood into building products and projects; however, they need to be educated about the advantages of using these materials. Also, building professionals need to be made aware of what markets exist for reusable and recyclable materials generated through their projects.

- Lack of incentive to recover and flawed price signals

Cost of diversion compared with the cost of disposal was seen as a possible barrier to wood recovery. In addition, there is a poor understanding of the full societal costs of waste management.

- Confusion in standards regarding definitions and nomenclature

Participants indicated inconsistency and confusion in the definitions and nomenclature regarding diverted materials. For example, should combustion of wood for energy recovery be defined as recycling?

- High costs of material separation

A significant cost for C&D mixed-waste recycling facilities is the separation of comingled waste into more homogeneous streams for market diversion. The feasibility and economics of separating materials on site (source separation) or at the recycling facility may vary depending on site constraints and recycling facility capability.

- Lack of awareness of material value

Most people do not understand that there may be value in the materials contained in our Nation's waste stream. Too often, these materials are considered waste, not a resource.

- Limited characterization data and poor data tracking of recoverable wood

We know relatively little about the character and volumes of wood in both the MSW and C&D waste streams. The EPA's characterization studies, as well as regional and state studies, need to include more detail in this regard. They also need to be updated on a more regular basis and use more consistent metrics across different regions.

- Weak and fragmented supply chains for recovered wood

Weak and fragmented supply chains for recovered wood largely limit the marketability of this material to regional markets rather than a national commodity market. More open and competitive marketplaces need to be developed.

- Recovery facility space requirements

Wood is a voluminous material, and reuse and recycling requires a significant amount of space to collect, sort, and store. Limited space at the demolition or new construction sites, as well as at the waste facility, limits recovery.

- Regulations (especially concerning combustion and emission)

Pending Federal regulations could negatively affect the use of C&D-derived biomass in the United States.

- Knowledge gaps that lead to incorrect interpretation of the waste hierarchy

There is a lack of understanding among the public, policy makers, and others about the hierarchy of waste management strategies, whereby reuse is preferred to recycling, and combustion is preferred to landfilling.

- Life-cycle assessment (LCA) and life-cycle cost analysis (LCCA)

Participants indicated that there was a lack of uniformity in how different life-cycle analyses are executed. Because the scope, categories of effects, and system boundaries of an analysis can vary, a variety of results can be obtained. Further, LCA models do not adequately incorporate upstream benefits of using recycled or reused feedstock in the creation of new products.

Other Barriers Identified (Random Order)

- Knowledge and technology transfer on broader LCA issues

Participants felt that more dissemination of information on the life cycle of materials is necessary. This would clarify the true impact of disposal on product manufacture and help building professionals understand the full life-cycle costs and effects of the materials they specify.

- Quantifying benefits from diversion

Increased awareness of the environmental benefits of diversion is needed, as well as more refined analysis techniques to quantify them. This includes the effect of recovery on greenhouse gas (GHG) emissions and carbon sequestration.

- Limited marketplace tools and resources

The development of model request for proposals (RFPs), contracts, and specifications for recovered materials would help the acceptance of these materials in the marketplace.

- Transportation costs and geographic accessibility to markets

Often, markets for wood waste materials are far from the generated source and result in high transportation costs. These transportation costs can also limit market development. Reuse materials, for example, do not have as many efficient distribution channels and transportation networks as other commoditized wood products do.

- In some markets, exclusive waste hauling franchises in municipalities limit competition. If the hauling company

does not own a recycling facility in the area, it is not going to send the wood waste to a recycling facility, which it would consider a competitor. Rather, the hauler will send the waste to its designated transfer station for probable disposal in a landfill.

- There is a lack of data and knowledge on how to comply with regulations for combustion.
- Currently there is confusion in the marketplace on the future of using C&D biomass for combustion in biomass boilers because of potential Federal regulations.
- There is a lack of data and knowledge to help develop better policies and regulations surrounding wood recovery and reuse. There is also a general lack of centralized and objective material characterization and market data from which to develop policy and regulation.
- Research data gaps
 - Resource information
- Limited information exists on what materials have been used in what regions during what eras, life-cycle inventory information on these materials, and the character and extent of recovery and reuse markets. A comprehensive effort is needed to understand this national resource, on par with mapping the forest resources of the continent.
 - Safety and regulation

There is a need to develop new identification technologies to help separate contaminated components from clean materials (e.g., treated or clean wood). Inexpensive remediation techniques also need development.

Participants were next asked to identify barriers specific to the wood waste markets identified including wood reuse, wood recycling, biomass (i.e., combustion), and mulch and other products.

Barriers Specific to Reuse

The barriers most frequently identified by participants (in descending order) were as follows:

- Quality and aesthetics perception

Many consumers perceive reused materials as being inferior to new materials both in quality and aesthetics. This is ironic, as many reused materials (e.g., lumber) can be of much higher quality than what is available new.
- High operating costs

Deconstruction is a labor-intensive activity resulting in high labor costs. This is particularly the case if prevailing wage comes into play on a jobsite. Storage of materials is also a driver of higher costs.
- Inconsistency of supply and lack of understanding of supply volumes

The intermittent and unpredictable supply of reused building materials makes it difficult to consistently and reliably supply large commercial markets. In addition, there is not a clear understanding of the size of the reuse and recycling markets, both in terms of the number of businesses or in terms of the volumes of materials currently available.

- Limited infrastructure

The reuse industry lacks enough infrastructure to adequately compete in the marketplace. Participants suggested that the development of a mega reuse facility (or national clearing house of materials) could help in economies of scale and to access larger markets.
 - Difficult market access

The relatively low volumes of materials in the reused market make it difficult to access many markets, as a large and consistent volume of materials is often needed for various projects.
 - Markets are opaque

There is currently no single public marketplace or centralized tracking of the supply or sales of reclaimed materials. This fragmented marketplace precludes parties across the continent from gaining reasonable information regarding value or volume of the market. Also, suppliers of reuse materials tend to protect their material supply chains, resulting in markets that are difficult to assess.
 - No warranties

Most reused materials are sold without warranty “as is.” This can negatively impact consumers’ trust in product performance.
- Other barriers were also identified in random order.
- Societal bias on the 3Rs toward recycling

Many consumers do not understand the difference between reduction, reuse, or recycling and tend to think that the only option for materials from the waste stream is recycling.
 - High costs to guarantee quality of product

A perception exists, perhaps justified, that high costs are associated with guaranteeing the quality of reused products.
 - Patchwork of regulations that might affect reuse

A variety of regulations exist that affect the salvage and reuse of building materials. This is especially true of lead-based paint (LBP) that is regulated by the U.S. Department of Housing and Urban Development (HUD), the EPA, the Consumer Product Safety Commission (CPSC), and state regulations. It is not always clear how these regulations affect the remanufacture and resale of building materials that might be coated with LBP.

- Low tipping fees that discourage reuse

Landfill tipping fees vary dramatically around North America. Low tipping fees create a disincentive toward recovery and reuse of building materials.

- Lack of standards infrastructure

Material standards need development for reused materials that normalize performance and acceptance (e.g., grading standards for reused lumber).

- Poor integration of players throughout building construction life cycle

Participants felt that there was a lack of coordination and integration of the key players involved in the life cycle of building construction. This negatively affects the acceptability of reused materials. We lack a multi-disciplinary effort involving wood product manufacturers, building professionals, material suppliers, and reuse and recycling professionals to promote the use of recovered wood products.

- Regulations developed for recycling not suitable for reuse

Recycling regulations treat everything as a material that will get ground up or melted down. This is especially evident at waste facilities where they focus on meeting recycling objectives measured in tons. Reuse is usually measured in dollar value and jobs, and its small tonnages usually get eclipsed and forgotten in the presence of the larger recycling tonnage. There is also a definitional issue with the reuse and recycling terminology that frequently gets blurred by those in and outside the recycling industry.

- Environmental claims developed for recycled products may not be adequate for reuse

A reused product may not have the same definition as a “recycled content” product under standards (e.g., ISO 140000). If reused wood is defined as “post-consumer recycled content,” is a loaded term because it generally refers to the process and manufacturing of feedstocks, which are not typical steps in determining wood reuse products.

- High regional variation of markets

There is high variability in the acceptance of reused materials in different regions as well as different degrees of market maturity.

- Few market tools exist

There are not currently any available tools for treating diverted wood materials as a commodity; e.g., farmer’s cooperatives or similar market access tools. Also lacking is inventory tracking of materials that connect reuse buyers with suppliers. Not many available LCA or carbon-accounting systems fully analyze reuse.

- Vertical integration and lumped services in contracts

A trend toward the tendering by municipalities of “lumped” services to waste management contractors limits the use of specialized contractors who may emphasize diversion. Specifications are not always conducive to reuse. The design team may desire reuse, but especially in projects where the design team has no say in selecting the construction team, other contract considerations (e.g., the lowest bid) may eliminate reuse from the construction timeline, subcontractor’s scope of work, or the design requirements.

Large garbage companies are often described as being vertically integrated when they own the collection, transfer, and disposal assets. This integration can have the effect of reducing the actual cost to landfill the material they collect, making recycling and reuse a less attractive alternative than disposal to these companies.

- Unwillingness of building professionals to reuse materials

Because reused materials are not mainstream and there is uncertainty in product availability, quality, and volume, building professionals are reluctant to specify reused materials.

- Lack of building professionals’ awareness of the product life cycle that they use

Many building professionals do not recognize or understand the life-cycle impact of the materials they specify. With a better understanding, they might be more inclined to specify reused materials.

- Timelines in demolition are not conducive to deconstruction

Salvage of materials takes longer than demolition. Rapid removal of buildings using demolition and the expectation that creates for building owners creates a disincentive for deconstruction.

- Reuse “industry” is still maturing

The reuse industry is relatively young compared with the demolition industry and will require time to establish itself in the marketplace.

- Poor or limited recognition of reuse in green building systems and codes

Existing green building programs (e.g., Leadership in Energy and Environmental Design (LEED)) do not adequately recognize the positive environmental impact of deconstruction and reuse. The number of points granted is not commensurate with this effect. Designing for deconstruction and reuse is not recognized.

Barriers Specific to Recycling

The barriers most frequently identified by participants (in descending order) were as follows:

- Quality perception

There is a perception that virgin products are higher quality, cleaner, and have higher tolerances. When remanufacturing with recycled content feedstock, manufacturers are concerned that equipment may be damaged because of contaminants (e.g., metal). To some extent, products made from recycled materials suffer from similar quality perceptions as reused products. That is, because the resource is waste-based, the products are inferior to virgin products.

- Consistency of supply

Consistently supplying high-quality recycled content feedstock can be problematic. Existing manufacturing processes can't necessarily tolerate the variations in material streams from recycled content feedstock, as they were developed to accommodate virgin product streams. When there is an oversupply of virgin wood fiber, manufacturers will choose it, stifling markets for recycled wood fiber.

Waste and recycling tonnage and composition fluctuates widely from day to day and even hour to hour. This makes it harder for those selling recycled materials as a feedstock to a manufacturer to meet their specifications. For example, engineered wood feedstocks are typically set for a particular species and moisture content, as waste wood is almost never one species.

- Low tipping fees

As in the case of reuse, low tipping fees for waste disposal are a disincentive for recycling wood waste.

- Patchwork of regulations

Regulations and specifications vary from city to city, making consistent application of technologies and product quality difficult.

- Product producers need to more fully consider end-of-life (EOL) issues regarding their products

While many companies have developed sustainability agendas and are examining life-cycle analyses for the production of their products, they don't often consider EOL issues (e.g., alternatives to disposal). For example, if the adhesives used in composite wood products make them unsuitable for recycling, mulch, and fuel applications, producers need to consider this in the design of these products. Research efforts to develop products that are fully acceptable for post-consumer reuse, recycling, and fuel applications may be needed. Environmental product declaration (EPD) labeling is just getting started but gives consumers and manufacturers a basic level of data about their product's life-cycle costs related to GHG and other factors that determine the environmental effect of the product from cradle to grave.

- Lack of definitions and standardization and verification labels

Unlike scrap metal, where there is an intricate system of rating the quality and type of material in a recycled product, there is little to compare to that in C&D, although the CMRA and National Solid Waste Management Association (NSWMA) recently released a guideline document on different grades of C&D wood fuel based on current markets in the United States. These problems are one of the reasons that an EPD program is needed. It should solve this confusion and get folks looking at the bigger picture, instead of just looking only at one attribute like recycled content.

Other barriers were also identified in random order.

- Foreign production

The availability of low-cost virgin lumber products from foreign countries makes it difficult for our North American-produced recycled lumber products to compete.

- Lack of warranties

A lack of warranties for reused and recycled content products hinders acceptance in the marketplace when warranties are commonplace for virgin materials.

- Under-utilized markets

The opportunity to supply C&D wood to added-value markets, such as composite panels and furniture, is limited by the abundance of virgin wood residual from lumber and other wood product manufacturers.

- Virgin materials are cheap

The low cost of virgin wood makes it difficult to market recycled wood waste on a cost basis. Manufacturers already are accustomed to making use of their waste materials, such as for particleboards or medium-density fiberboards (MDFs). Therefore, demand for recycled wood pulp content is low.

- Market volatility and consistency

Changes in demand or the regulatory environment can dramatically affect markets. For example, in the United Kingdom, the particleboard market was suddenly forced to compete with the biomass market for feedstock, because of new regulations that favored the production of green energy from biomass. Also, opportunities for C&D biomass are subject to the variable needs of the boiler companies. The recycler may not have the room to store material until demand rebounds, so disposal could be the only option.

- Fear of contaminants

There is a perception that all recycled wood is dirty. Though the capability exists to sort and clean for a specific application, there are some industries and products for which there is no tolerance for minor color variation due to paint or visual impurities. This is unlike Europe, where a higher degree of visual contaminant is allowed.

Some markets (e.g., green building) demand a low-emitting, formaldehyde-free product from recycled feedstock. This can be difficult to supply given the original product composition from which the recycled feedstock is derived.

- Alternative daily cover (ADC) being removed as recycling

A LEED 2012 draft (at time of meeting) had a new provision that excluded ADC as recycling or diversion, which may hurt markets for recycled wood products. Some participants felt that without a viable and reasonably economically effective market for waste wood into ADC, C&D recycling facilities would lose the financial underpinning that supports the recycling of fringe materials, such as drywall or plastics. Some participants felt that the same argument can be made for the use of C&D wood as biomass. Without a market for the wood, little else will get recycled, resulting in more landfilling because most of the fringe materials, such as ceiling tile, drywall, and plastics can't be reused. Outside of biomass, it was felt that most of the recycling options are limited and will be for the foreseeable future.

- Inaccurate reporting of recycling at facilities

Recovery rates at mixed-waste recovery facilities are not independently verified, causing lack of accountability and accuracy in claims.

Barriers Specific to Biomass (Combustion)

The barriers most frequently identified by participants (in descending order) were as follows:

- Regulations

Participants felt that there was a patchwork of regulations as well as a sense of overregulation that affects the wood fuel market. Also, existing regulations focus on process, not performance. The loss of U.S. biomass burners due to the economic downturn and the migration of papermills from domestic to offshore production may be creating oversupply of hogged fuel in some areas like the Northwest.

- Contaminants

Like reuse, there are questions about lead and other contaminants in C&D biomass, even though product specifications require levels of cleanliness. Regulations are considered strict and as a result disincentivize combustion of a significant portion of the wood waste recycling stream (the Maximum Achievable Control Technology (MACT) standards that view painted and treated wood as contaminants); especially the smaller dimension fines resultant from mixed recovery facilities.

- Lack of standardized specifications nationwide

A CMRA study researched all the hogged fuel and biomass fuel specifications being used in the United States

and found hundreds of different specifications and almost no standardization from particle size, moisture content, or contaminate definitions.

- Distance to markets results in limited markets

Markets can be constrained because they are not often proximate to the source of the wood waste available.

- Scrutiny among green building rating systems and codes for incineration

The recently released 2012 International Green Construction Code specifically does not allow credit for biomass combustion for energy recovery. LEED may not give credit to biomass in the future.

Barriers Specific to Mulch and Other Uses

The barriers most frequently identified by participants (in descending order) were as follows:

- Costs to clean product

Mixed recovery facilities must balance the ability to separate contaminants with the markets for outbound materials. Cleaning significant feedstock for mulch is simply more costly than the market will pay. Therefore, only the cleanest and easiest to separate woody materials end up as mulch.

- Oversupply and oversaturation

There is more supply than there is demand, which drives costs down and markets can quickly become saturated (with fewer large-scale customers).

Other barriers were also identified in random order.

- Low value relative to processing costs

It can easily cost as much to clean the material to the required specification and transport it to the market as it does to landfill it.

- Large seasonal variation in demand in some regions

In northern climates, landscaping and construction tends to occur seasonally, limiting demand and supply for mulch.

Wood Recovery Opportunities

Participants were next asked to identify opportunities based on the barriers identified above as well as other opportunities independent of barriers that might already exist.

Opportunities Specific to Reuse

- Quality and aesthetics perception

- Develop better certification/documentation/product labeling

Development of a reused product certification and labeling system would help in standardizing product

- types and make it easier for building professionals to specify products.
- Target building professionals in demonstrating product performance

This could be achieved through the sponsorship of awards targeted to building professionals such as the American Institute of Architects (AIA). Also, the use of case studies, social media, and articles in various professional publications could help in demonstrating recovered product performance. One example is the Design for Reuse Primer published by Public Architecture (<http://www.publicarchitecture.org/reuse/pdf/Primer-Online.pdf>).
 - Incentivize production of high-quality reused products

Encourage rating systems and green building codes to better reward reuse, such as with the Reuse X Prize [(X Prize Foundation, Playa Vista, California)] Develop policies (voluntary and regulatory) that create incentives for the production of high-quality reused products. Investigate the marketing and development of reused material products along the same lines as those offered to the certified pre-owned vehicle market. Look at the Toyota certified used car concept, where lumber wholesalers and retailers (Habitat for Humanity’s ReStore first, then mainstream retailers later) would offer units of used lumber alongside new products. This would require a scaling up of the supply chain for used materials, though the used lumber industry may not be ready outside of a few select markets.
 - Develop testing protocols that test reused products

Development of testing procedures and quality control protocols for reused materials would help legitimize their acceptance in the marketplace. To assure confidence in performance, perhaps some sort of insurance agency could be developed that will, for a fee, provide guarantees and warranties for reused products so that they can be used within buildings as substitutes to new products. Guarantees for certain reuse products would be comparable to new products; for example, warranties could be provided for flooring, trim, and doors so that reuse could compete with new products, and this barrier could be addressed. Of course these arrangements would span other products as well (ceiling tiles or carpets).
 - Move toward an industry that pays for products rather than those that accept donations

Participants felt that the non-profit reuse industry needs to move away from a donation-based business model toward a more profit-based industry that pays for the products it sells. This would be a financial driver for the supply of reused and recycled wood.

- High costs
 - Provide more training to increase labor productivity for deconstruction

Encourage the development of standardized training to increase productivity, lower costs, and raise the quality of recovered materials. Furthermore, educate associated industries on reuse, because the existing inertia is to demolish is probably pretty high.
 - Permitting incentives for salvage

Encourage salvage and reuse by providing incentives to building removal projects that employ salvage before or instead of demolition. Suggestions included putting submitted building removal permits that use deconstruction at the head of the line or require a mandatory waiting period before demolition to evaluate salvage feasibility. These ideas needed to consider that demolition may be the most efficient recycling method for certain building types (concrete, steel).
- In San Diego, California, the demolition permit applicant has to pay a certain amount per square foot as a deposit. Once applicants demonstrate that they achieved a specified level of diversion, they get the deposit back.
- Increase cost of disposal

Increased tipping fees, especially in parts of the country where they are very low, would encourage recovery, reuse, and recycling.
 - Adopt occupational categories for deconstruction

More formal definition of job categories for building material recovery and reuse would help in training, lowering insurance costs, and increasing the professionalism of the reuse industry.
 - Encourage municipal investment for development of shared storage (such as tipping fees)

Municipal investment in larger central facilities that encourage recovery and reuse would help in solving space issues and provide the opportunity to take advantage of economies of scale for wood waste handling. Increased tipping fees could also help defray costs.
 - Reduce occupational health and safety and insurance costs

Because there is no standard definition of the duties and risks faced by deconstruction workers, the insurance industry often puts these workers in the highest job risk categories. Educating the insurance industry and developing universal job descriptions could help lower rates.
 - Encourage creative financing (e.g., bond repayments based on the percentage reused and recycled)

When permits are issued, require a bond that gets replayed if certain diversion thresholds are met. San Jose, California, has something like this for C&D recycling thresholds (not necessarily reuse). Is there a place for financial institutions to provide products that help bridge the time gap between an increased cost for deconstruction and an eventual deduction on taxes?

- Standardize quality standards at C&D landfills to make costs more consistent

Variable quality standards of landfills around the country result in artificially low tipping fees in landfills with low standards. A unification of standards will help make tipping fees more consistent across the country.

- Involve economic development agencies

The involvement of economic development agencies could help in coordination of the material supply, market development for reused products (e.g., reused lumber), development of roles for consolidators and wholesalers, and development of shared storage infrastructure.

- Develop data on scale to products available

These data would help in development of markets by indicating the volume of products available (e.g., number of doors).

- Develop a deposit system for building materials

Using a concept similar to returnable bottles, materials would have a deposit associated with them that would be recouped upon return to a reuse or recycling facility.

Participants also identified opportunities in the following areas

- Research and education

- Encourage studies to develop more efficient deconstruction techniques

Much like the construction industry, development of techniques to speed deconstruction will help lower costs (e.g., hybrid deconstruction).

- Develop better cost data on different deconstruction techniques

The development of real costs associated with various deconstruction techniques could help in making the deconstruction process more efficient and in lowering costs.

- Design and deliver education/training on deconstruction

Similar to the Occupational Safety and Health Administration (OSHA) training that would develop a standardized education program for wood recovery.

- Modify LCA tools for EOL analysis

Currently available LCA tools (e.g., Athena Sustainable Materials Institute, Ottawa, Canada) need modification to incorporate different EOL uses (reuse, recycle, or C&D biomass) so that a more accurate picture of life cycle can be developed. Current LCA tools don't necessarily capture the upstream benefits of reuse (avoidance of cutting new virgin lumber) when comparing EOL to "prior-to-life" benefits.

- More fully develop design for deconstruction concepts

Development and encouragement of construction techniques that make building disassembly easier will lower costs of building removal and increase the conservation of resources through higher recovered material yields.

- Market tools

- Promote greater EOL consideration for composite and engineered product manufacture development and marketing of wood products generally does not consider EOL issues. Consideration of EOL issues should be part of the initial product design process.

- Develop product category rules (PCRs)

Product category rules provide uniform reporting of environmental impacts for specific and functionally equivalent products. Assuming that recovered wood for particular uses can be deemed functionally equivalent to virgin wood or to products made of other materials, then it may be helpful to develop PCRs for comparing virgin and recovered products. Identifying cases where reused products are functionally equivalent (or superior) to virgin wood when looking at a life-cycle perspective would be needed.

- Trial selling of reused lumber in ReStores and other reused outlets

Investigate opportunities to market and sell larger volumes of reclaimed lumber through the existing system of ReStores and other reused building materials outlets (e.g., Second Change store in Colorado).

- Incorporate reusability of product into environmental product declarations (EPDs)

EPDs are being developed for many wood products. These declarations should incorporate information on the reusability of the product.

- Need for more user-friendly LCA models (e.g., Athena)

The rigor and relatively high costs of conducting full LCAs can limit their use; however, they need to be more sophisticated so they can account for the harder to quantify aspects of wood reuse (i.e., trees left standing if not cut down for virgin product, determination of “functionally equivalent” products, and EOL issues). However, enough rigor needs to be maintained for scientific accuracy so that bias and politics are not introduced into oversimplified models.

Opportunities Specific to Recycling

- Quality

- Separate haulage of construction waste from demolition waste

Separation of debris at the demolition site will help reduce sorting costs at the recycling facility as well as reduce contamination through comingling.

- Product stewardship for manufacturers and forest products companies

Similar mechanisms exist for carpet and ceiling tiles. Most of these approaches are legislated at the state or national level. Manufacturers play a financial role in the EOL for their products or a family of products that they or their competitors make, distribute, or sell. The fee is collected at the retail sale and funds EOL collection/processing and recycling. Composite materials like TREX® (Trex Company, Winchester, Virginia) decking were discussed. Participants felt that there should be a focus on composite materials that are not recyclable.

- Develop demand drivers for high domestic recycled content

Develop standardized purchasing specifications and legislated purchasing requirements for the public sector.

- Call out inaccurate claims of recycled content originating within mills

The steel industry continues to advertise an 85% to 90% recycling rate, when in fact the recycled content of light framing is on the order of 25% to 29%, with only about half of that being post-consumer recycled content. They have been so successful in their claims that the new International Green Construction Code allows the steel industry to claim the average recycled content of steel from oxygen and electric arc processes for all of their products—including light steel framing.

ISO 14021 might be a mechanism to bring more truth to the advertising of recycled content. California’s green building code, for instance, allows products with recycled content that are not labelled pre- or post-consumer to assume that

one-half of the recycled content is pre- and that half is post-consumer. This is inaccurate and encourages inaccurate reporting by manufacturers.

- Inaccurate reporting of recycling at facilities

Fix the approach to assessing the tonnage of waste products (measurement inaccuracies at recovery facilities) via third-party verification of diversion.

- Greater adoption of third-party verification of recycled content

Third-party verification of recycled content can help in eliminating false claims on recycled content and level the playing field for product marketing.

- Encourage new recycled product development

Use various marketing techniques (such as X Prize) to encourage development of new products from recovered wood waste.

- Develop collaborations to produce higher quality and higher performance waste-based products

Collaborations between the C&D waste industries and innovative companies (e.g., Andersen Windows, Bayport, Minnesota, composite frame cladding) can help in the development of new products.

- Consistency of supply

- Standardization and labeling of recycled materials

Standardization of product types and labeling can help in the marketing and acceptance of these materials in the marketplace.

- Develop better regional data on expected supply

A better picture of expected volumes and types of wood waste based on historical construction techniques by region will help in development of markets and expected transportation costs.

- Develop better sourcing tools for recycled content products

Develop a consistent labeling system so that recycled content is clearly and uniformly labelled on products (and can be searched for easily).

- Low tipping fees

- Credible full-cost accounting analysis of landfill use

Very low tipping fees are usually subsidized by someone. To better assess the true cost of landfilling, information is needed on the societal costs of landfills beyond their operational life (typically 30–50 y). What’s the cost of long-term maintenance, GHGs, sulphur dioxide, methane capture, or groundwater contamination?

Participants also identified opportunities in the following areas

- Market tools and producer involvement

- Incorporation of recyclability of product into EPD

An environmental product declaration should include information on recyclability of the product.

- Promote advanced framing techniques to reduce material use and associated waste

A reduction in material use at the jobsite can reduce the overall stream of material to the landfill. Weyerhaeuser's iLevel (Weyerhaeuser, Federal Way, Washington) suite of software helps builders plan for more efficient use of materials with less waste.

- Better information to drive specifications that reduce waste in new construction

Factory panelized construction and designing to 4-ft increments are effective ways to minimize wood residue in new construction.

- Encourage producer involvement in considering the life cycle of products

Product producers should be more involved in the life cycle of their products, especially at end of life.

- Broader identification of products that can be recycled

Encourage labeling of forest products indicating that they can be recycled at the end of their useful life. This may involve overhaul of the recycling arrows branding to something more effective.

- Explore adoption of credit similar to Europe and possible adoption in North America

Stimulate markets for recycled or reused wood via a carbon credit system. Wood recycling or reuse may reduce the number of trees that need to be harvested if they offset virgin product inputs. This results in a greater number of trees not harvested, which could be given an economic value should harvest times be increased over standard practice (whereby greater tree diameter growth sequesters more CO₂ than shorter harvest cycles). Provides additional monetary incentive for reuse/recycling.

- Factor reuse/recycled wood into production credit systems

Similar to how FSC or Sustainable Forestry Initiative (SFI) credit systems allow manufacturers to “bank” sustainably harvested wood and therefore sell it under such labels as “FSC mixed” except that recycled content or reuse would be specifically included.

- EPD for buildings

Environmental product declarations are being developed for individual products, but this idea was to develop them for entire buildings. Similar to the total energy score idea where a house is awarded a single energy score (like the water heater label that identifies efficiency) that consumers can use to make a home choice.

- Explore a scalable business model based on reused rather than solely recycled materials and create a competitive prize (such as the X Prize model)

- Research and education

- Develop a forum/dialogue involving recycled wood buyers/consumers or organize a national conference on wood recycling.

- Research new, high-end applications for recycled content

Support research and development (R&D) into the development of higher performance and higher value products from recovered wood waste. Consider giving an X Prize to the winner.

Provide LCA analysis on C&D going to bioenergy compared with going to recycled product reuse—the Consortium for Research on Renewable Industrial Materials (CORRIM) is currently looking at wood-to-energy issues. If specific market-acceptable products from recovered wood can be identified, then it would be relatively easy for CORRIM to extend analyses to included comparisons with recycled product use. Investigate work by Bergman and others. Another example is when Portland METRO developed an environmental benefits calculator that considers local conditions and variables to weigh the choice of what type of market a material goes to for recycling.

- Green building community and LEED

- Give more credit to post-consumer recycled content

Encourage greater rewards for recycled content materials in LEED through standards development process and public commenting.

- Fix approach to assessing tonnage of waste products (better measurement inaccuracies at the truck)

To date, LEED hasn't provided any useful advice to the dry waste materials recovery facility (MRF) to create a standard for measurement, so the MRF operators each create their own. The resulting data chaos from this practice has gone on for 10 y now.

- Develop reasonable limits for recycling credit for ADC

Some recycling purists see ADC as fake recycling and think the recycling value should be zero. However, the wood biomass industry believes a complete phase-out of ADC recycling credit could induce a bias against mixed C&D facilities and a preference for small, construction waste-only facilities, of which only one exists in the country. Because of the demolition and transport process, a mixed C&D facility receives about 30% 2-in.-minus fines that have little other value other than replacing virgin dirt as cover at a landfill. Some states derate ADC value to a lower value (one ton only counts for 50%, or 1,000 lb). This might be a compromise between the all or nothing camps on this issue.

- Make the green building community more aware of limited market options for C&D materials

The rapid expansion of the mixed C&D recycling market allowed a majority of LEED certified projects to achieve very high (>75%) diversion rates, based largely on the ADC market. There is limited popular knowledge in the green building market that there is almost no recycling of non-metallic waste outside of ADC. Green builders think they have solved the problem of recycling already, so we need to restate the challenge.

No opportunities were identified specific to biomass or mulch or other products.

Next Steps

As a final exercise, the participants were asked to suggest how the barriers and opportunities might best be addressed.

- Formalize group effort
 - Development of North American Wood Recovery Group
- Add market representatives to group
 - Biomass
 - Composite product manufacturers
 - General contractors (National Association of Home Builders (NAHB), commercial contractors)
 - Material market experts (with knowledge of the costs that owners and projects will bear)
 - Forest Products Laboratory (FPL) economists
- Develop matrix of low-cost and high-impact opportunities
- Outcome or product of forum
 - Need to spread it more broadly than a white paper
 - Identify low-cost applications to spread information (such as social media)
 - High-level, external communications stating that the group met

Appendix—North American Wood Waste Forum

North American Wood Waste Forum February 2-3, 2012, Madison, Wisconsin

The USDA Forest Products Laboratory (FPL) welcomes you to this two-day meeting focused on increasing the reuse and recovery of wood waste. This forum is intended to bring together the various stakeholders associated with wood waste and other wood by-products. Our intent is to establish the state-of-the-art in wood reuse and recovery, define participant interests and activities, develop a roadmap and associated strategies to increase the utilization of waste wood through reuse, recycling, and other diversion efforts, identify key challenges and opportunities to increased wood waste utilization, and develop action plans to address these issues. This effort will benefit the environment by reducing greenhouse gas emissions, support resource conservation and sustainability, and lead to the creation of green jobs.

Agenda

Thursday, February 2, 2012

8:00–5:00 FPL Centennial Research Facility
Conference Room

The purpose of this first day session is to provide an overview of the current state of wood waste recovery in North America and explore the opportunities and challenges involved in wood reuse, recycling, and other diversion efforts. A series of short talks by experts in the field will provide background for continued group discussion.

- 8:00–8:30 Welcome & Introductions (Bob Falk, Mike Ritter, FPL)
- 8:30–8:50 Overview of Wood Waste in North America (Ksenija Janic, US EPA)
- 8:50–9:10 Wood Reuse: The First Step in Diversion (Anne Nicklin, BMRA)
- 9:10–9:20 State of Wood Recycling in the US (Bill Turly, CMRA)
- 9:20–9:40 Recycling Wood Waste from an Urban Environment (Bryce Jacobson, Portland METRO)
- 9:40–10:00 Opportunities and Challenges of Recycling Wood Waste (Matthew McKinney, Waste Management Recycle America)
- 10:00–10:15 *Coffee Break*
- 10:15–12:00 Facilitated Discussion
 - Questions and answers from the morning discussions

- 12:00–1:00 *Catered Lunch*
- 1:00–3:00 Facilitated discussion
 - Hurdles and obstacles to increased diversion:
 - Identifying, categorizing, and prioritizing key barriers to increased diversion and market uptake of wood waste
- 3:00–3:15 *Coffee Break*
- 3:15–5:00 Facilitated discussion
 - Pathways to increased diversion of wood waste:
 - Identifying, categorizing, and prioritizing key opportunities to increased diversion and market uptake of wood waste

Friday, February 3, 2012

8:00–12:00 FPL Centennial Research Facility
Conference Room

The purpose of this half day session is to summarize the previous day's information and begin to develop and document a roadmap and associated strategies to increase wood reuse and recovery.

- 8:00–10:00 Facilitated Discussion
 - Recap of priority barriers/opportunities to increased diversion of wood waste
 - Discussion of actions to address specific barriers/opportunities
 - Identification of easier (low cost/effort and/or shorter-term) versus harder (higher cost/effort and/or longer-term) opportunities and barriers
 - Discussion and identification on best strategic approaches needed to advance on priority barriers and opportunities
- 10:00–10:15 *Coffee Break*
- 10:15–12:00 Facilitated Discussion, Summary, Closeout
 - Continuation of discussion and identification of best strategic approaches/actions needed to address priority barriers and opportunities
 - Options for moving forward with strategic approaches/action identified above
 - Next Steps

12:00 Meeting Ends

List of Invitees

American Wood Council (AWC)
Association of State & Territorial Solid Waste Management
Officials (ASTSWMO)
Biomass Power Association
Boxfish Group
Building Materials Reuse Association (BMRA)
Canadian Wood Council (CWC)
Construction Materials Recycling Association (CMRA)
Dovetail Partners, Inc.
Forest Products Association of Canada (FPAC)
National Association of Home Builders (NAHB)
National Demolition Association (NDA)
National Solid Waste Management Association (NSWMA)
Portland METRO
Solid Waste Association of North America (SWANA)
Stopwaste.Org
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency (EPA), Office of
Solid Waste
Waste Management, Inc.
Waste Management, Inc.–Recycle America

