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State Case Studies on the Use of Construction & Demolition Materials to Address the Nation's Infrastructure Needs

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Introduction

States play a critical role in ensuring the efficient and sustainable use of construction and demolition (C&D) materials in infrastructure. According to the American Society of Civil Engineers (ASCE), infrastructure encompasses a broad range of categories such as aviation, bridges, dams, drinking water and wastewater, energy, parks and recreation, rail, roads, solid waste, and schools. Infrastructure that supports a growing, environmentally conscious society requires the sustainable reuse of a wide range of materials, both in terms of input (i.e., reusing materials and minimizing environmental impacts of new construction) and output (i.e., decreasing construction byproducts and diverting waste from landfills). Although C&D materials like concrete, brick, asphalt, wood, metals, and glass generated during construction, renovation, and demolition are often non-hazardous, their sheer volume presents a challenge. The U.S. Environmental Protection Agency (EPA) estimates that in 2017, 569 tons of C&D debris were generated, more than twice the amount of municipal solid waste (MSW).[1] C&D waste requirements vary from state to state, yet there is now universal emphasis on materials reuse and measurement of that reuse through lifecycle assessments during the C&D process.

As the nation's infrastructure needs expand, so too must lifecycle-based approaches for C&D materials. ASCE's 2017 Infrastructure Report Card rated U.S. roads as a "D," citing poor highway conditions and a need for road rehabilitation. Meanwhile, solid waste infrastructure received a "C+" because 53 percent of the 258 million tons of MSW generated was sent to a landfill.[2] These low ratings exemplify the importance of improved handling of C&D and MSW materials.

[1] Advancing Sustainable Materials Management Fact Sheet, EPA, 2017.
[2] Infrastructure Report Card, American Society of Civil Engineers, 2017.

At the federal level, EPA is addressing such challenges by advancing sustainable materials management (SMM) in infrastructure, otherwise known as the "built environment." The agency's fiscal year 2017-2022 SMM **strategic plan** outlines goals to enhance C&D material data and measurement, improve disaster debris management, and incorporate lifecycle SMM concepts into the built environment marketplace. Steps include increasing safe reuse and recycling of C&D materials, incorporating lifecycle cost considerations, and improving beneficial reuse (use of industrial byproducts that maintain the functional benefit of virgin materials without posing concerns to human health and the environment).[3] EPA looks to partnerships with other stakeholders, especially states that regulate local C&D programs.

According to an **article** on Missouri C&D research, about half of the states have specific C&D regulations, while the other states run C&D programs through traditional MSW programs. State promotion of C&D beneficial reuse is important because it can: conserve landfill capacity; offset environmental impacts associated with the extraction and consumption of virgin resources and production of new materials; reduce project expenses through avoided purchase and disposal costs; and create jobs in recycling industries and local communities. As states look to promote beneficial reuse of C&D materials in infrastructure, they should consider a range of materials and program structures.

Report Overview

This report presents several case studies, each examining a state approach or innovative tool to encourage beneficial reuse of C&D materials in infrastructure projects. Each case study also looks at past state activities leading to the approach, and provides a sense of how the approach could inform future efforts of the state or other states. The purpose of the report is to share best practices that other state environmental agencies might replicate.

Case Study #1: Maryland Department of the Environment on Dredged Material

Background on Dredged Material

Dredged material is sediment removed from the bottom of lakes, rivers, harbors, and other water bodies. Dredging is routine, as sediments like sand and silt naturally wash downstream from industrial, agricultural, or urban development activities and gradually accumulate in harbors and shipping channels.[4] While geologic formations and human activities affect sediment differently across regions, the process of removing sediments to ensure navigational safety and reduce exposure to contaminants is universally important. A key challenge lies in finding ways to store and use material once it is dredged in order to limit the need to place material in open waters.

Federal and state agencies regulate the discharge of dredged material into U.S. waters under Section 404 of the Clean Water Act, and the U.S. Army Corps of Engineers regulates these discharges into oceans under the Marine Protection, Research, and Sanctuaries Act. In 1995, several federal agencies formed the National Dredging Team to promote consistency on dredging, provide a mechanism for conflict resolution, and facilitate a forum for information exchange on beneficial uses for dredged material. The team has approved several uses for dredged material, including in C&D projects, new aquatic habitats, ecological restoration activities, landfill cover, and structural or non-structural fills or soils (i.e., Brownfield reclamation use as manufactured topsoil).

[3] **Methodology for Evaluating Beneficial Uses of Industrial Non-Hazardous Secondary Materials**, EPA, 2016.
[4] **What is Dredging?**, National Oceanic and Atmospheric Administration, 2019.

Maryland History & Use of Dredged Material

The Maryland Department of the Environment (MDE) has several programs aimed at preserving the state's environmental resources, especially the Chesapeake Bay watershed and the Port of Baltimore, from contaminants and excavated sediment such as dredged material. In 2001, the state passed the Dredged Material Management Act to prioritize advanced planning for how and where to place sediments (including innovative reuse[5] and beneficial use, expansion of existing facilities, and options to meet long-term placement needs).[6] Regulatory and permitting barriers still limited innovative uses of the material, especially for end-users who were unfamiliar with the contamination risks. To further clarify the process, MDE developed the **Innovative Reuse and Beneficial Use of Dredged Material Guidance Document** that outlines sampling requirements, environmental and public health standards, and long-term management needs to guide end-users of dredged material through the steps, permits, and approvals needed based on the proposed projects and material contamination levels.

Under Maryland's current policy, authorized beneficial uses of dredged material include underwater grass restoration; island restoration; eroding shoreline stabilization; beach area replenishment; wetlands creation and restoration; and fish and shellfish habitat creation, restoration, and enhancement. About five million cubic yards of sediments are dredged from channels serving the Port of Baltimore every year.[7] Material placement varies based on the channel dredged. For example, material dredged from the Baltimore Harbor and Southern Approach channels is placed in upland containment facilities; material from the Maryland portion of the Bay is taken to an island for ecosystem restoration projects; and material from the Virginia portion of the Bay is placed in a Virginia-permitted open water placement site.

MDE's Innovative Reuse and Beneficial Use of Dredged Material Guidance Document

MDE's document sets a framework for state authorities on handling dredged material, promoting innovative reuse, and beneficial use of dredged material. MDE engaged stakeholders like the Maryland Department of Transportation's Port Administration (Port of Baltimore) and State Highway Administration in an Interagency Regulatory Workgroup to make recommendations on guidance and technical screening criteria.[8]

The first portion of the guidance outlines Maryland dredging practices and material management, including materials processing and dredging permitting. It helps permit-seekers, as well as MDE toxicologists that work with permittees, understand the regulations around the materials they plan on using. The second part of the guidance highlights various types of innovative reuse and beneficial use applications for dredged material, including sampling and analysis considerations.

MDE plans to update the document with other acceptable uses (including building materials and aggregate, mine and quarry reclamation, or other upland uses) as they are approved on a case-by-case basis. The agency notes that outreach and education are the keys to using this guidance to implement a successful program.

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[5] Maryland is unique in that it has separate definitions of "innovative reuse" and "beneficial use." It uses the standard beneficial use definition, and defines innovative reuse as upland applications for dredged material (i.e., development of commercial, industrial, agricultural, or other products).

[6] **Innovative Reuse and Beneficial Use of Dredged Material Guidance Document**, Maryland Department of the Environment, 2019.

[7] **Dredging and Dredged Material Management**, Maryland Department of the Environment.

[8] In addition to MDE and the Maryland Department of Transportation, Interagency Regulatory Workgroup members include the EPA, the U.S. Army Corps of Engineers (Baltimore District), the Maryland Department of Natural Resources, the Maryland Geological Survey, and the Maryland Environmental Service.

The Maryland Coastal Atlas and the BUILD Tool

MDE uses an online mapping tool to inform its dredged material policies. The **Maryland Coastal Atlas** helps state and local decision makers visually analyze and explore coastal and ocean data to advance projects and planning. It includes many map layers with data on efforts like recreational use, species habitat areas, shoreline erosion rates, and sea-level rise vulnerability. One layer entitled "Beneficial Use: Identifying Locations for Dredge (BUILD)" estimates where in Maryland dredged materials can be beneficially reused based on three primary criteria:

- Spatial Alignment: The channel being dredged must be within a reasonable distance from the restoration site (typically between two and four miles at most) to make the project financially feasible;
- Temporal Alignment: Dredging and restoration projects must align time wise so that the material from the navigational channel can be placed directly onto the restoration site, providing transportation cost-savings; and
- Qualitative Alignment: The quantity and chemical and physical composition of the dredged material must be suitable for the restoration design.

Alignment of restoration and dredging projects saves money that otherwise would be spent to transport dredged material to upland placement or restoration sites. Using the BUILD tool can help planners decide how and where to place dredged material in ways that provide important environmental and social benefits. See the beneficial use demonstration projects **webpage** for some examples of how Maryland has used the tool.

Next Steps for Maryland on Dredged Material

MDE, which regulates the dredged material program, highlights several important next steps planned by the Port of Baltimore, which implements the program:

- Continued implementation of an Innovative Reuse Program that has facilitated pilot projects using dredged material from the Baltimore Harbor and published a Request for Proposals soliciting research and development projects to explore feasible applications for harbor-dredged material;
- Use of information provided by the University of Maryland at College Park, which completed two blending studies aimed at developing dredged material blends suitable for topsoil and highway embankment applications; and
- Participation in the Western Dredging Association **Beneficial Use Workgroup**, which is developing guidance on dredging best practices.

Maryland will continue to study and implement these policies as part of a broad sustainability strategy, the **SMM Maryland** (SM3) initiative, stemming from Governor Hogan's 2017 Waste Reduction/Resource Recovery Executive Order.

Case Study #2: Massachusetts Department of Environmental Protection on Waste Disposal Bans & Recycling Grants

Background on Waste Disposal & Recycling Grants

Materials have varying disposal requirements based on their ability to be reused, repurposed, or discarded. For example, within the C&D material framework, a subcategory known as asphalt, brick, and concrete (ABC) has traditionally been an easy category of materials to divert from disposal and repurpose, due to its viability as aggregate and the existence of a robust market for the materials. Some other C&D materials like wood or gypsum wallboard,

however, have less established markets and can be prone to contamination (e.g. painted/treated), deceasing market value. C&D wood consists of both clean wood and wood that has been painted or treated. There are markets for clean wood, but collecting and processing C&D wood to separate the clean wood from the painted and treated wood is challenging. State use of disposal bans, as well as grants or other funding opportunities to enhance the collection and processing infrastructure, can encourage waste managers and generators to divert these materials for reuse and recycling.

Massachusetts History & Use of Waste Disposal & Recycling Grants

For decades, waste ban regulations have been an integral part of Massachusetts Department of Environmental Protection (MassDEP) strategies on waste reduction and recycling. MassDEP uses waste disposal bans to drive the separation and disposal of targeted materials, while striving to develop markets for in-state processing businesses and preserve limited disposal capacity. In 2006, MassDEP imposed disposal bans on C&D materials including ABC materials, metal, and wood. The agency worked with a Construction and Demolition Debris Subcommittee to identify markets for the banned materials. In 2011, it added a ban on clean gypsum wallboard. In its **Draft 2030 Solid Waste Master Plan**, MassDEP set a goal of reducing disposal of C&D materials by 260,000 tons by 2030, more than double the current C&D recycling tonnage.[9]

C&D Market Study

In 2016, MassDEP contracted with the Northeast Recycling Council and DSM Environmental Services to evaluate C&D management in the state and to recommend opportunities to improve diversion of C&D materials. DSM reviewed Massachusetts' solid waste facility reports to determine the quantities of materials received at its C&D processing facilities. It also visited seven facilities that collectively handle 40 percent of the total material sent to facilities within the state in 2015, and conducted visual analyses of incoming and outgoing materials.

DSM estimated that recovery rates by processors and transfer stations for ABC and metal were high, at 100 percent and 90 percent respectively, while wood and clean gypsum board lagged behind at 22 and four percent respectively.[10] The state noted that waste wood, which makes up the greatest proportion of C&D waste in Massachusetts, has traditionally seen a robust market as boiler fuel and particleboard. More recently, though, many facilities have stopped accepting waste wood due to a number of factors, including tighter restrictions on combustion specifications and lower fossil fuel prices. Fines, or mixed residuals, are a byproduct of processing mixed C&D waste. If materials break as loads are dumped onto a tipping floor or sorted by excavators, fines may have higher levels of trace metals and other contaminants that make placement difficult.

After characterizing the quantities and composition of C&D materials, DSM assessed the capabilities of, barriers for, and possible improvements to these facilities. In its final **report**, DSM noted that while MassDEP has a goal of diverting 50 percent of C&D materials from disposal, the actual diversion rate in recent years plateaued at around 30 percent because the wood waste market has seen less capacity and tighter quality restrictions than when it was last studied in 2007. The report also concluded that increasing the amount of materials recovered in Massachusetts would require a continued investment in equipment at existing processing facilities. Under current conditions, low value C&D is not worth the capital investment for processors, and DSM advised that MassDEP consider providing processors with assistance to invest in equipment to help process wood, non-ferrous metals, and bulky plastics. The MassDEP C&D Subcommittee now meets on a regular basis to monitor these trends and find ways to improve diversion efforts.

[9] **Frequently Asked Questions about the Massachusetts Construction and Demolition Materials Waste Bans**, MassDEP, 2020.
[10] **2016 Construction and Demolition Debris Market Study**, DSM Environmental Services, 2017.

Recycling Grants

In addition to waste bans and in response to recommendations of the C&D subcommittee and the C&D Market Study, MassDEP targeted recycling grant and assistance programs that encourage companies to improve their manufacturing, processing, and reuse activities toward efforts to divert wood and clean gypsum. Described below are two such MassDEP programs.

The Loan Fund

Established in 1995, the **Loan Fund** provides incentives to companies to stimulate recycling markets, business development, and job growth. Capitalized with about $4 million in funds from MassDEP and administered by BDC Capital, the fund provides competitive loans to recycling businesses that may otherwise experience hurdles to traditional financing. Eligible activities include collecting or separating recyclable materials, processing or converting materials into marketable products, and manufacturing products that use recycled materials. Since its founding, the fund has provided more than 74 loans for a total of more than $16 million. Six C&D processing companies have received loans, as have dozens of other companies involved in paper, plastics, anaerobic digestion, and glass industries, to name a few.

The Recycling Business Development Grant

The **Recycling Business Development Grant** (RBDG) program was established in 2016 to help Massachusetts recycling processors and manufacturers create sustainable markets for eligible waste materials. RBDG has provided five grants for $650,000 dollars providing direct investment for C&D recyclers to install equipment at their facilities to promote recycling and materials reuse with a specific focus on wood. Under the program, grantees provide a minimum 25 percent match of the funds (between $50,000 and $400,000) from MassDEP. A portion of the grant is received upon installation of equipment and the remainder is provided under a performance contract paid out over two years.

The goal of the program is to expand local markets for recyclable materials, with grants targeted at specific materials like glass, packaged food material, plastics, wood, gypsum and mattresses to name a few. MassDEP typically targets between four and five material types at a time, allocating funds among several grantees. The 2020 grant program is targeting a wide array of C&D materials in an effort to increase the recovery rate at C&D processors in Massachusetts. The program has proven successful and has fostered an increase of 35,000 tons of recovered C&D wood, in addition to other materials.

Next Steps for Massachusetts on Waste Disposal & Recycling Grants

MassDEP has employed a number of other **financial and technical assistance programs for waste disposal**, including its Sustainable Materials Recovery Program (SMRP) Municipal Grant; the SMRP Recycling Dividends Program; the SMRP Municipal Technical Assistance Grant; and the Reduce, Reuse, Repair Micro-Grant. More recently, MassDEP developed the **Recycling IQ Kit**, which provides cities and towns with the steps, tools, resources, and grants of up to $40,000 to improve the quality of local recycling programs and **Recycle Smart** initiative, which is a statewide educational initiative to provide answers and educate residents on what can and cannot be recycled.

As it continues to pursue the goals established in its Solid Waste Master Plan, MassDEP will continue to utilize a combination of regulatory, financial and technical assistance programs to drive diversion, establish infrastructure and develop markets for these diverted materials. MassDEP does this through the development of specific Action Plans such as the **C&D Action Plan**, which recently developed and announced a **minimum performance standard** for C&D handling facilities to improve compliance with waste bans and increase diversion of C&D materials from disposal.

Case Study #3: North Carolina Department of Environmental Quality on Recycling Markets

Background on Recycling Markets

Increased volumes of waste and growing demand for disposal alternatives have created opportunities for the private sector, particularly in reuse of C&D materials or similar wastes. In its 2020 **Recycling Position Paper**, the Association of State and Territorial Solid Waste Management Officials discusses benefits and challenges to the nation's recycling system. One key issue, also highlighted in EPA's 2019 **Status Report: Framework for Advancing the U.S. Recycling System**, is the lack of efficient secondary materials markets. This can be resolved by incentivizing manufacturer use of recycled materials instead of less expensive virgin materials. Because the U.S. can no longer depend on the export of recycling materials due to China's 2018 National Sword Policy, it needs domestic markets to absorb the nation's huge supply of recycled commodities. Raising the value of recycled material and making the industry more profitable will help generate circular economies, or closed-loop systems of continual material reuse.

One solution is to establish recycling markets; just as businesses create waste with materials that are no longer usable to them, they can also incorporate other businesses' "wasted" materials into their processing, enabling a more circular economy with a focus on waste reduction, reuse, and recycling.

North Carolina History & Use of Recycling Markets

Most state environmental agency waste divisions focus on common materials that can be disposed of in large municipal solid waste or C&D landfills. Not all of these materials are treated as waste, however, and can be recovered from the waste stream to be put to beneficial uses.

The North Carolina Department of Environmental Quality (NC DEQ) implements an array of waste and materials management efforts throughout the state. In its 2019 Annual Report to the North Carolina General Assembly, NC DEQ noted the importance of C&D debris recovery, as recycling efforts in this waste stream (which includes materials like shingles, carpet, brick aggregate, or vinyl siding) can yield large tonnage results.[11] The report cites a FY2017-18 decrease of nearly 105,000 tons of public C&D recycling, approximately half of which can be attributed to the recovery of aggregate. The report also points to large percentages of plastic, glass, and other materials recovered from state waste streams. For solid waste, report data show that while source reduction and local reuse programs can be cost-effective, many local governments have yet to implement them, signaling the need for broader solutions.

In terms of what is recycled in state C&D markets, the North Carolina Department of Transportation (DOT) requests proposals from other state agencies to contribute recycled content for construction items. For example, the state recently allowed post-consumer plastic to be used in DOT's drainage pipe projects. According to a 2019 **Recycling and Solid Waste Management Report for Highway Construction and Maintenance Projects**, items containing more than nine million tons of reclaimed asphalt pavement, more than 1,000 tons of recycled concrete in fill or base material, and nearly 168,000 linear feet of plastic pipe, among other materials, were reused for C&D maintenance projects.

The NC Recycling Markets Directory

[11] **Division of Waste Management Annual Report to the North Carolina General Assembly**, North Carolina Department of Environmental Quality, 2019.

The NC **Recycling Markets Directory** is a compilation of companies providing recycling services throughout the state. Users search by material, including C&D, and can specify needs like asphalt pavement. The directory also provides contact information for providers and recipients. NC DEQ notes the tool's successes in placing several materials, including recycled plastic in pipes and concrete in fill/base material, mulch and compost material, reclaimed asphalt pavement and shingles for asphalt mix, and glass beads in pavement markings.

The NC WasteTrader

The **NC WasteTrader** is the state's marketplace for discarded or surplus materials and products. It serves as a materials exchange service to divert recoverable materials from disposal while providing feedstocks and supplies to potential users. With one click, users can access lists of materials available or wanted, amounts and frequencies available, prices, and cities. For more than 20 years, NC DEQ also has offered grants for recycling infrastructure improvements for **local governments** and **private recycling businesses**.

Other North Carolina Recycling Market Programs

NC DEQ also provides grants for business recycling market development to spur additional private recycling infrastructure expansion and strengthen the domestic marketplace.[12] In FY 2017-18, North Carolina's Recycling Business Development Grant program provided awards to 21 companies. Many companies whose materials were affected by China's import ban have been awarded grant funding, helping finance critical capital expansion projects in areas like mixed paper and agricultural plastics. Awardees include: four material recovery facilities that made upgrades; two companies that manufactured new products using recycled content; ten companies that increased the quantities and types of recyclable plastic they can process; two companies that offered curbside recycling collection to new customers in rural areas; and other companies that increased electronics recycling, processed tires into crumb rubber for manufacturing, or increased recovery of wood waste from pallets and C&D debris.

Next Steps for North Carolina on Recycling Markets

On the heels of successes in its recycling markets programs, NC DEQ's waste division plans to shift the focus in its next strategic plan to matters like food waste, composting, and organics diversion.

Related Activities

North Carolina's Recycling Markets Directory and WasteTrader are state-led efforts similar to the Materials Marketplace, a cloud-based platform developed by the U.S. Business Council for Sustainable Development (USBCSD) that connects businesses to scale reuse and recycling opportunities. Through its partnership with ECOS, USBCSD has set up markets with the Ohio Environmental Protection Agency, Tennessee Department of Environment & Conservation, and Michigan Department of Environment, Great Lakes, & Energy, as well as with local and regional groups. Fostering such circular, closed-loop economies not only diverts waste from landfills, but also generates significant cost and energy savings and creates new jobs and business opportunities.

Case Study #4: Louisiana Department of Environmental Quality on Waste Tires

[12] **Division of Waste Management Annual Report to the North Carolina General Assembly**, North Carolina Department of Environmental Quality, 2019.

Background on Waste Tires

Waste tires are tires that are no longer suitable for their intended use due to wear or damage. Historically, waste tires, because of their size, shape, and potential for creating environmental hazards, have been difficult and expensive to dispose of and recycle. Stockpiles or illegal dumping can result in rainwater accumulation, creating a breeding ground for mosquitoes and other vectors. Piles of tires can also burn for weeks, causing the rubber to decompose to oil and polluting the ground and surface water. Therefore, it is important to manage waste tire collection, transportation, recycling, and processing to minimize harmful environmental consequences.

In the U.S., scrap tire supply outpaces market demand, and though the supply has stabilized in the past few years, the development of new markets remains an important goal.[13] In fact, there are many potential beneficial end uses for tires. According to EPA, more than 290 million scrap tires were generated in the U.S. in 2003, nearly 100 million of which were recycled into new products and 130 million of which were reused as tire-derived fuel in various industrial industries.[14] The most common end use for waste tires is asphalt, as the elasticity of tire rubber allows for expansion, and its frictional components contribute to ice control and fewer accidents. While rubber asphalt is a relatively new beneficial use and there are not yet many standards and specifications among departments of transportation, it shows promise as an ongoing developing market for excess waste tires. Tire-derived fuel reportedly is another potential end use. In 2015, the agency's 15-year study of 80 facilities recognized the use of the fuel as a viable alternative to fossil fuels, given that it has a higher BTU value than coal.[15]

According to EPA, waste tire uses can be evaluated using a waste management hierarchy. The agency's order of preference is reduce, reuse, recycle, waste-to-energy, and disposal in an appropriate facility. Forty-eight states have laws to address waste tires.[16]

Louisiana History & Use of Waste Tires

The **Louisiana Department of Environmental Quality (LDEQ) Waste Tire Program** was established in the 1990s to reduce the illegal disposal of waste tires in the state. The program encourages recycling and provides for the appropriate disposal of waste tires and waste tire material by removing them from the solid waste stream and landfills. The effort reportedly helps ensure public health and safety, prevents nuisances, extends the usable life of landfills, aids in the conservation and recovery of valuable resources, and conserves energy through efficient reuse.

Pursuant to the **Louisiana Environmental Quality Act** at La. R.S. 30:2418, the LDEQ Secretary promulgates rules, regulations, and guidelines for the administration and enforcement of the program. The program is subject to legislative review and approval by the Louisiana Senate Committee on Environmental Quality and the Louisiana House Committee on Natural Resources & Environment. Other provisions also establish the Waste Tire Management Fund, which is administered by the Secretary solely for the purpose of solving the state's waste tire problem. The fund collects waste tire fees from consumers when they purchase a new or used tire in Louisiana. The regulations require that this fee be listed on a separate line of the retail sales invoice and be identified as the "LDEQ waste tire fee." The tire dealer is also required to prominently display regulatory language notifying the public that it is unlawful to discard, dispose, or burn waste tires, and to display a notification of the regulatory language about the waste tire fee. Currently, the waste tire fees are $2.25 per passenger vehicle, light truck, or small farm service tire, $5 per medium truck tire, and $10 per off-road tire. These fees are remitted monthly to the LDEQ for deposit into the fund. The fund then pays permitted waste

[13] **U.S. Scrap Tire Management Summary**, U.S. Tire Manufacturers Association, 2017.
[14] **Scrap Tires**, EPA, 2016.
[15] **Tire-Derived Fuel Report**, EPA, 2005.
[16] **Scrap Tires**, EPA, 2016.

tire processors a minimum of 7.5 cents per pound for eligible waste tire material that reaches an LDEQ-approved end market use.

Waste tire transporters carrying in excess of 20 waste tires at a time are required to obtain a transporter certificate prior to collecting and transporting waste tires to a permitted waste tire processor. Currently, there are approximately 190 licensed transporters operating in Louisiana that transport about four million passenger tires and about 500,000 medium-truck tires per year, in addition to thousands of off-road and exempt tires. These waste tires are transported to permitted processing facilities for recycling. All transported tires are tracked from point-of-generation to the disposal facility through the use of one manifest. Another manifest tracks the delivery of waste tire material from the permitted processing facility to either disposal or to an approved end-market use project.

Permitted processors may request reimbursements from the fund for LDEQ-approved projects with a processing agreement that is renewed annually. The permitted processor must also receive LDEQ approval of the proposed end-market use. Approved end-market uses have included engineering projects such as slope stabilization, landfill leachate collection/gas collection system liners, and other types of projects such as tire derived fuel and metal recycling. Recently, three processors received approval to deliver waste tire material to a permitted de-polymerization facility. A list of beneficial use projects that LDEQ has approved in the past is posted on the agency's **website**.

LDEQ maintains an active list of waste tire **generators**, **transporters**, and **processors** throughout the state. The agency holds all entities to strict standards for transportation and handling, and conducts regular monitoring to ensure compliance. The program integrates several divisions or sections within LDEQ, including Inspections, Enforcement, Permitting, Audits, and Fiscal, all of which maintain important functions to ensure overall program success and compliance with regulations.

The LDEQ Waste Tire Program is considered one of the most effective in the nation due to its success in removing such a large percentage of waste tires from the solid waste stream and facilitating waste tire beneficial use projects.

Disaster Debris Plan

LDEQ maintains a **Comprehensive Plan for Disaster Cleanup and Debris Management** that establishes a framework for efficient and prompt management of debris generated by natural disasters within the state. One of the plan's primary objectives is to conserve landfill capacity and protect natural resources to the maximum extent possible. Therefore, when the LDEQ Secretary declares an emergency, the agency has the flexibility needed to authorize actions and approve waivers for standard waste management processes.

Established based on experience gained from previous natural disasters, the plan allows for revisions to address future challenges that may arise. After Hurricanes Katrina and Rita in 2005, the state Legislature enacted a bill directing the agency to develop and implement a debris management plan. The stated goal in authorizing legislation for the plan is to "reuse and recycle material, including the removal of aluminum from debris, in an environmentally beneficial manner and to divert debris from disposal in landfills to the maximum extent practical and efficient which is protective of human health and the environment."

The debris management plan only considers waste tires, and excludes tires weighing more than 500 pounds and/or solid tires. Tires are separated from other types of waste debris and vehicle parts, like refrigerants, batteries, and mercury switches. Under the plan, approved staging sites for tires are restricted to piles of ten feet in height, 20 feet in width, and 200 feet in length, with a minimum of 50 feet between piles. Piles should be covered as much as possible to avoid water collection that could lead to mosquito propagation. Tires collected through hurricane debris collection activities are ineligible for reimbursement from the Waste Tire Management Fund and are treated as debris under FEMA-funded debris removal programs.

Next Steps for Louisiana on Waste Tires

LDEQ is conducting a pilot study to determine the effectiveness of land reclamation using waste tire material as aggregate. The study will conclude by December 31, 2020, at which time the department will issue a summary of the results and determine if it will continue to allow land reclamation products.

Related Activities

As waste tires pile up across the nation, markets for scrap tires must expand proportionally. Several groups like the U.S. Tire Manufacturers Association and the Scrap Tire Research and Education Foundation (STREF) are focused on recycling and future sustainability of this waste material. STREF hosts an annual Scrap Tire Recycling Conference at which attendees consider circular economy issues of tires, as well as challenges and opportunities for existing and potential markets for scrap tires. That collaboration is important to fostering state and other stakeholder cooperation in developing markets and expanding beneficial use options.

Case Study #5: Wisconsin Department of Natural Resources on Coal Combustion Residuals (CCR)

Background on Coal Use

Coal has been used for centuries as an effective energy and heat source. While it has likely passed peak use in the U.S. due to air pollution considerations, coal is still extracted and burned for electricity in many states, and the coal and utility industries have developed several practices to help mitigate negative environmental externalities.[17]

Coal is regulated by both the Clean Air and Clean Water Acts, which limit concentrations of pollutants released into air and water, thereby reducing acid rain and other negative effects formerly associated with burning coal. Over time, new practices and technologies have contributed to environmental improvements. Today, energy producers burning coal rely on technologies like scrubbers to reduce emissions of volatile organic compounds, and they are looking to expanded use of carbon capture technology to further minimize impacts. Even with new technologies, however, state and federal regulators are working to manage byproducts from coal-burning facilities.

Coal Combustion Residuals

Coal Combustion Residuals (CCR) (otherwise known as coal ash, boiler ash, or fly ash), a byproduct of burning coal for electricity, is one of the largest types of industrial waste generated in the U.S.[18] Due to its lightweight composition, CCR can easily be blown away with wind, requiring facilities to create lined ponds and landfills to store it in a liquid state but keep it out of groundwater. Because CCR has also proven effective for beneficial reuse in many infrastructure projects, states have found ways to remove many of their CCR surface impoundments.

Since 2000, state environmental agencies have been required under the Resource Conservation and Recovery Act (RCRA) to regulate the beneficial reuse of CCR if it:

- Provides a functional benefit;
- Substitutes the use of a virgin material;

[17] Use of Coal, U.S. Energy Information Administration, 2020.
[18] Coal Ash, EPA.

- Meets product specifications and/or design standards; and
- Results in environmental releases to groundwater, surface water, soil, and air from encapsulated land placement of 12,400 tons or more in non-roadway applications comparable to or lower than those from virgin materials (i.e., products made without CCR), or that releases will be below relevant regulatory and health-based benchmarks for human and ecological receptors.[19]

For infrastructure products, encapsulated uses in which CCR binds to materials such as wallboard, concrete, or filler for aggregate or other materials has proven most effective, both for the project (because the CCR increases the strength of the concrete or material while remaining a lightweight additive) and for limiting emissions to the environment.[20] CCR also tends to be cheaper than virgin materials such as lime in concrete mix, and has contributed to the reopening of many impoundments and landfills to attain and beneficially reuse the material.[21]

Wisconsin History & Use of CCR

Wisconsin is one of 18 states in which coal is more widely used for electricity generation than other forms of fuel, like natural gas.[22] Wisconsin has no carbon-based fossil fuel resources of any kind, so it has relied on imports of coal from other states. Since the mid-1980s, Wisconsin's primary source of coal has been Powder River Basin (PRB) coal, which is lower in sulfur and higher in salts than coal produced in Eastern and Midwestern U.S. states. The resulting CCR from burning PRB coal is a high-alkalinity Class C Fly Ash, which is ideal for use in cement manufacturing.

According to the Wisconsin Department of Natural Resources (DNR), approximately three million tons of industrial byproducts (defined by the state statutes as CCR, foundry process/waste, and paper mill sludge) are generated in the state each year. [23] Landfilling this volume of waste material instead of finding beneficial uses would reduce solid waste landfill capacity and force industries to use more virgin materials. To encourage beneficial reuse of these byproducts, the Wisconsin Legislature directed the DNR to establish administrative rules governing the acceptable use of the byproducts. After receiving input from a Technical Advisory Committee comprised of nine stakeholders from the state Department of Transportation, environmental groups, utilities, end users, and construction firms, as well as comments from the public, the DNR in 1997 established an administrative rule, **Chapter NR 538: Beneficial Use of Industrial Byproducts**.

Chapter NR 538 Wisconsin Administrative Code

Chapter NR 538 Wisconsin Administrative Code regulates the beneficial use of industrial byproducts like CCR in the state. The beneficial use program is largely self-implementing, so CCR generators can reuse the material if they meet the use and characterization standards in the Code. Most beneficial reuses outlined in the Code do not need direct DNR approval; DNR approval is only necessary for larger geotechnical fill projects (in excess of 5000 cubic yards) and uses or byproducts that do not meet the Code requirements.

To qualify, generators must demonstrate that the byproduct material will be "legitimately used" and will not result in environmental harm. While the Code outlines required steps for reuse characterization, the program requires a high level of industry understanding of the materials and potential uses. DNR staff review each generator's initial certifications and characterization analyses to determine if the industrial byproduct meets the requirements for beneficial reuse. DNR conducts periodic facility and project inspections to verify that CCR byproduct material is being

[19] **Coal Ash Reuse**, EPA.
[20] **Fly Ash Facts for Highway Engineers**, U.S Department of Transportation's Federal Highway Administration, 2017.
[21] **Methodology for Evaluating Beneficial Uses of Industrial Non-Hazardous Secondary Materials**, EPA, 2016.
[22] **Coal is the most-used energy generation source in 18 states; natural gas in 16**, U.S. Energy Information Administration, 2018.
[23] **Wisconsin DNR Homepage**

reused in accordance with the Code. CCR that is beneficially reused as an ingredient in a product (i.e., cement) is treated as a product of that facility, and DNR no longer requires updates on its application. However, CCR byproducts used as geotechnical fill are still regulated under stolid waste rules and must be managed as such if excavated in the future. If a facility chooses to use CCR byproduct in geotechnical fill projects, such as coal slag used as road sub-base aggregate, it might require concurrence from the DNR if the project meets certain conditions. The Code excludes any use of CCR byproduct as geotechnical fill in residential areas (e.g., in neighborhoods and school zones) to reduce potential human exposure.

Next Steps for Wisconsin on CCR

Wisconsin continues to encourage the beneficial reuse of CCR. DNR voluntarily publishes annual facility-reported data on CCR recycling rates. According to DNR, since the Code took effect the CCR recycling rate has historically been around 90 percent.

In 2016, DNR initiated the rule revision process to significantly update the rule for the first time since 1997. Proposed changes include additional and updated environmental standards, continued encouragement of beneficial use, and further requirements guiding legitimate and responsible management and reuse of the materials. The rule revision process included extensive public comment and input. The updated rule was published on June 1, 2020 and goes into effect November 1, 2020.[24]

Like other states, Wisconsin is starting to move away from coal and toward other fuel sources with fewer byproducts that need sustainable reuse programs. In 2019, for the first time in more than three decades, coal-fired power plants provided less than half (42 percent) of Wisconsin's electricity net generation.[25] Three coal-fired electrical generating plants in the state have recently been shut down permanently, and two more are slated for retirement in the next few years. Utilities in the state have no plans to construct new coal-fired generating plants to replace the retired facilities.[26]

Key Contacts

For questions or to contact one of the state environmental agencies who contributed to the case studies in this report, please email **Connor MacCartney** and/or **Sarah Grace Longsworth** of ECOS.

[24] **Revisions to Ch. NR. 538, Wisc. Adm. Code**, Wisconsin Department of Natural Resources, 2019.
[25] **Wisconsin State Profile**, U.S. Energy Information Administration, 2020.
[26] **Alliant Energy Announces Plans to Shutter Edgewater Coal Plant**, Wisconsin Public Radio, 2020.