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APPALACHIAN ReUse CORRIDOR **Strategic Plan** (2022–2026)

A plan that assesses the materials management conditions in the Appalachian ReUse Corridor and explores opportunities for economic development through the application of sustainable materials management and circular economy principles and strategies.

April 2021

APPALACHIAN ABOUT US ReUse CORRIDOR

An emerging federation of organizations and other stakeholders invested in reintegrating the traditional values of resource conservation and material reuse within their business models to create jobs, strengthen economies, and build resilient communities. These organizations and individuals include material generators, collectors, and aggregators, up cyclers, makers and craftsmen, and manufacturers aligned to share resources, capture resources and transform resources. Spanning Kentucky, West Virginia, and Ohio, the corridor is an untapped material logistics system poised to connect communities generating supply of recycled feedstocks with primary processors and manufacturers with demand for electronics, cardboard, plastics, organics, ferrous and non-ferrous metals, hard-to-recycle items, construction materials, batteries, and medical equipment.

CONTENT

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ReUse Corridor Partners

The following organizations participated in different ways to contribute to the development of this ReUse Corridor Strategic Plan. Contributions included participation in conference meetings, responding to surveys, provision of data and value-add input that benefitted this planning process.

- **ACEnet**
- **Alcon**
- **Appalachian Voices**
- **Athens-Hocking Recycling Centers**
- **Atlas Metal Recycling**
- **Cabell County Solid Waste Authority**
- **Coalfield Development Corporation**
- **Constellium Rolled Products Ravenswood, LLC**
- **Elmcrest Farm**

- **Goodwill Industries of KYOVA**
- **Habitat for Humanity of the Tri-State**
- **MacKenzie-Dow Furniture**
- **Marshall University Sustainability Department**
- **The Metal Center Recycling**
- **Mingo County Redevelopment Authority**
- **The Neighborhood Association**
- **PureCycle Technologies**
- **Rural Action**
- **Reclaiming Appalachia Coalition**
- **SOGEFI USA**
- **Taylor Iron & Metal Recycling**
- **The H.T. Hackney Co.**
- **Valicor Environmental Services, LLC**
- **Wayne County Economic Development Authority**
- **Wayne County Solid Waste Authority**
- **Zero Waste Event Productions**

WCEDA contracted with **MSW Consultants**, an expert solid waste, recycling, and materials management firm, to guide the **WCEDA** and **ReUse Corridor Partners** in developing this **Appalachian ReUse Corridor Strategic Plan (2022 – 2026)**.

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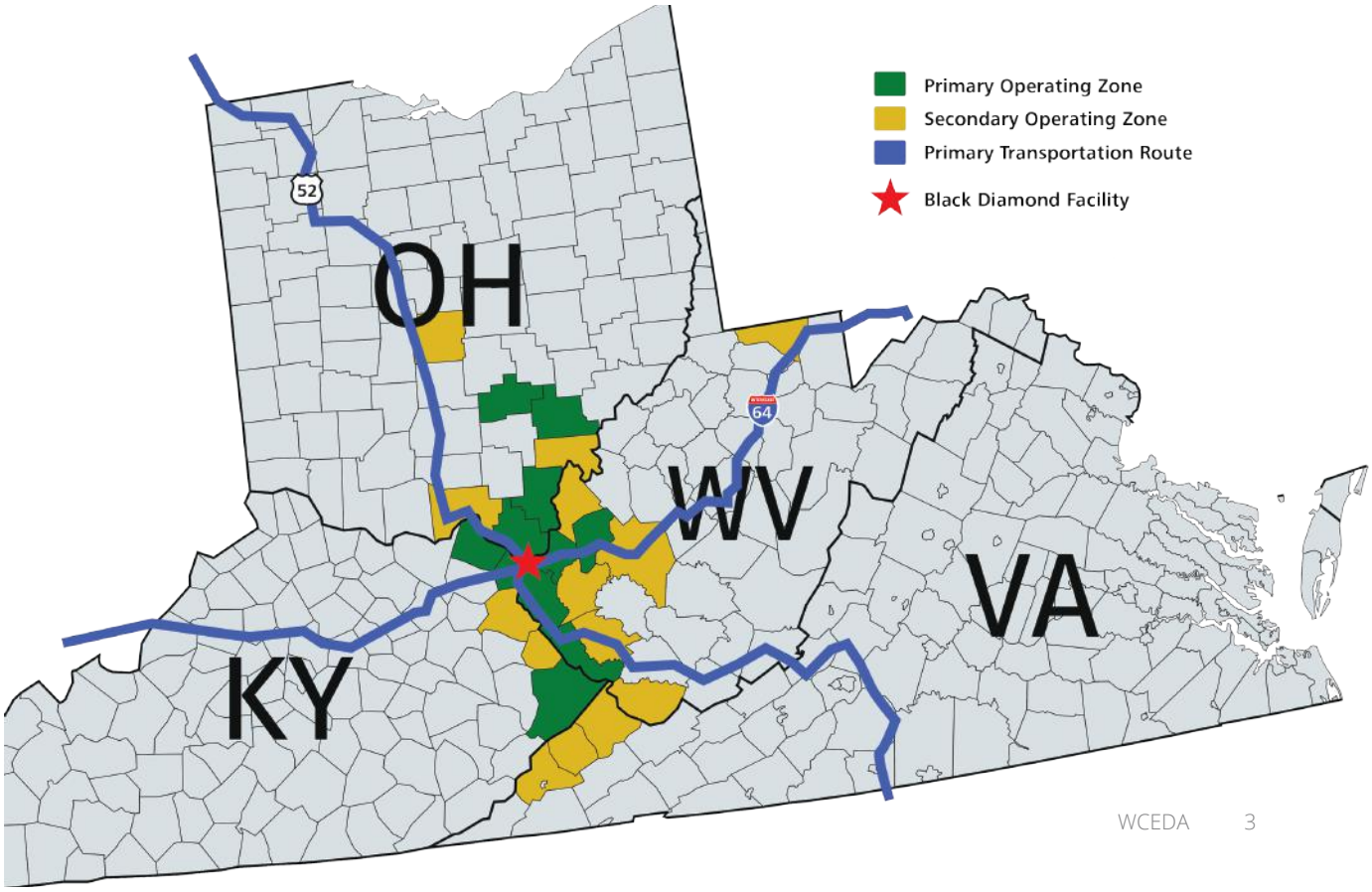
1 INTRODUCTION

1.1 APPALACHIAN REUSE CORRIDOR INITIATIVE

The Appalachian ReUse Corridor initiative and this Strategic Plan is an exciting first step in redefining how regional stakeholders think about materials management and its role in job creation and resource conservation. This initiative is a multi-stakeholder effort to evaluate and improve materials management strategies and practices within West Virginia, Ohio, Kentucky and with broader collaborations in Virginia. Plan funding was allocated through an Appalachian Regional Commission (ARC) Power Grant awarded to the Wayne County Economic Development Authority (WCEDA). ARC is a federal and state government partnership created to spur innovation and investments that build community capacity and foster economic growth in 420 counties within the 13 Appalachian states.

The ReUse Corridor material generators, collectors, processors, and manufacturers are connected by a road network including U.S. Highway 52, or **"King Coal Highway**", State Route 2, and Interstate 64 that can support material logistics for West Virginia, Ohio, and Kentucky and beyond **(Figure 1-1)**.

Figure 1–1 Appalachian ReUse Corridor Map



1.2 GOALS & OBJECTIVES

Sustainable materials management (SMM) integrated with Circular Economy (CE) *requires a concerted effort to divert recoverable materials from landfill disposal. SMM/CE can be leveraged to promote economic growth and to conserve natural resources and landscapes while improving synergies among regional material generators, manufacturers, and Appalachia communities.* Throughout this Strategic Plan, **"SMM/CE" is combined to convey a materials management strategy to simultaneously enhance material supply (collection) and demand (processing) within the ReUse Corridor.**

This Strategic Plan highlights the current conditions of the ReUse Corridor materials management system and applies this information to identify gaps and opportunities to improve materials management. It is necessary to systematically diverge from tradition waste and recycling paradigms toward integrated, comprehensive, efficient and environmentally responsible disposal of wastes while enhancing the recovery of secondary raw materials ("recyclables").

This Strategic Plan explores a culture shift where enhanced collection, transportation, recycling, and reuse is integrated within a broader economic framework and a more circular economy. How can we leverage manufacturers in the region to process recovered materials, promote workforce development, and evolve environmental stewardship in WV, OH, and KY?

This Strategic Plan is the tip of the iceberg. A SMM strategy is not in play yet for the ReUse Corridor or across WV, OH, and KY. With this in mind, this Strategic Plan assesses current material generation, collection, transportation, and processing practices for solid waste and recyclable commodities.

This Strategic Plan may serve as a model for other economically distressed areas with a declining manufacturing base.

Strategic Plan Goals

1. Improve the understanding of the material management system in the ReUse Corridor that spans West Virginia (WV), Ohio (OH), and Kentucky (KY).
2. Provide a resource to shape and inform discussions among regional stakeholders about how sustainable materials management and circular economy models create opportunities to enhance Appalachia's economic development.

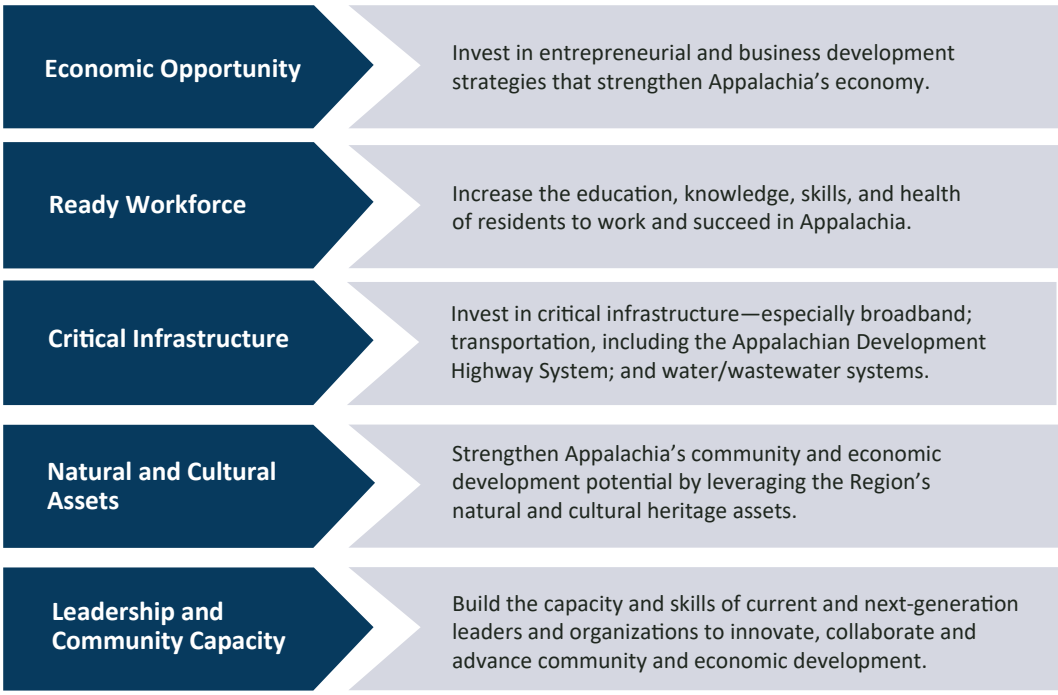
Strategic Plan Objectives

1. Introduce SMM/CE in the context of the Appalachian ReUse Corridor.
2. Assess "market" conditions – the regional and ReUse Corridor waste and recycling performance.
3. Identify, survey, and engage ReUse Corridor Partners interested in advancing sustainable materials/ circular economy principles, best practices, and strategies.
4. Identify gaps, opportunities, and action items relating to improving materials management.

1.3 ALIGNMENT WITH ARC'S STRATEGIC INVESTMENT GOALS

Advancing SSM/CE strategies and programs demands significant changes and investment in the economic system. It requires invested people and leadership, planning, analysis, infrastructure, technology, procurement, resource allocation, education, policy development, innovation and more – ***this is economic development*** – aligned seamlessly with the Appalachian Regional Commission's Strategic Investment Goals, **Figure 1-2**.

Figure 1–2 ARC's Strategic Investment Goals



1.4 STRATEGIC PLAN TIMING AND SCHEDULE

Timing – an unprecedented period in U.S. history for materials management.
The global commodities market crisis, Covid-19 pandemic, and depressed economy place significant economic risks on local, county, and state jurisdictions. While it is easy to shift our eyes away from waste and recycling to other priorities – let us not forget that materials management and the mobilization of goods and services is one of the largest industries in the world. Many interdependent factors elevate the critical importance and present need to rethink materials management within the Appalachian ReUse Corridor:

Beginning in 2018, the Republic of China, through its National Sword Policy, banned most scrap imports and imposed impractical quality restrictions on imported materials such as paper, plastics, and metals. Until that time, China was the largest consumer of recovered materials from the U.S., importing approximately 35 percent of U.S.-generated recyclable commodities.

The loss of China as an end-market for U.S. recovered materials has significantly escalated recycling program costs and local programs and industries struggle to find replacement end-markets or continue to dispose valuable commodities. Effectively managing the private sector waste and recycling industry through procurement, contracts, ordinances, and other policies is being tested. These volatile material market conditions leave two pathways with drastically different outcomes:

1) Continue traditional materials (waste and recycling) management while experiencing dramatically higher costs (began 2018, spiked in 2020) or,
2) Get involved in materials management to actively manage costs and outcomes.

Employment decline persists among middle-class workers as resource extraction opportunities shrink, manufacturers deploy technology in place of high-cost labor, and some work is outsourced to overseas markets. Enhanced materials management fills employment gaps because it is not possible to capture, transport, process, and manufacture recyclables into products without significant job creation.

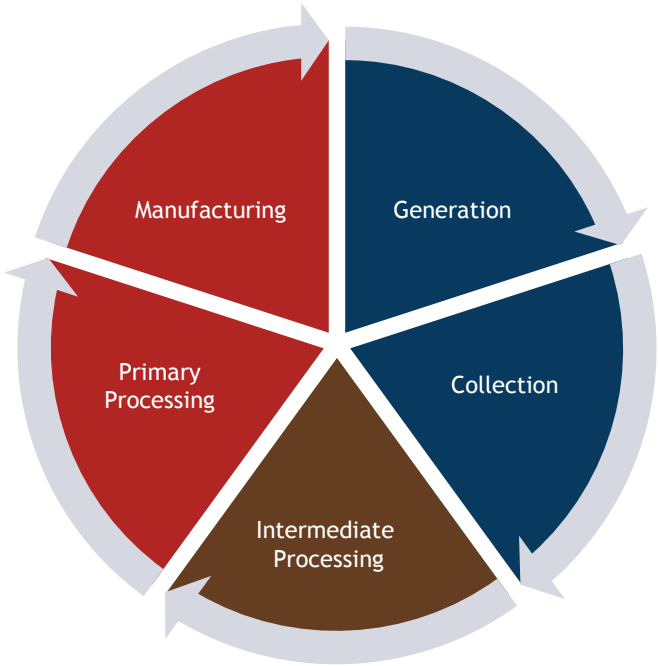
OPPORTUNITY TO RETHINK MATERIAL LIFE CYCLES

Through the convergence of unprecedented material market conditions, a strong ReUse Corridor manufacturing sector, and a shared regional interest to revitalize economic development in greater Appalachia emerges an opportunity to rethink material life cycles – at a regional scale, deployed systematically – engage generators, collectors, transporters, intermediate processors, product manufactures and other Appalachia stakeholders. **Collaborate. "Steer". Manage** – Regional materials with the intention to integrate and leverage environmentally responsible waste disposal, waste reduction/recycling, and manufacturing to produce sustainable economic development.

2 MATERIALS MANAGEMENT: Sustainable & Circular Economies

2.1 TRADITIONAL WASTE MANAGEMENT SCHEMES

A "**waste scheme**" refers to the overall management approach that determines how materials, specifically waste and recyclables, are managed. While waste and recyclables are often managed by the local town or city, the larger region or "**system**" is in play because most materials are transported outside of the original jurisdictional boundary to be disposed or processed.



Many waste management and recycling programs are either not sustainable or get propped up by passing on the elevated costs of an inefficient system. After all, it is easy for haulers and processors to increase fees paid by residents and businesses. The nationwide recycling crisis highlights the fragility of our traditional waste management systems. Recycling programs are shutting down and often because "**commodity values dropped**." More likely, recycling programs collapse because the materials management system (trash and recycling service) was not effectively planned or "**actively managed**". Optimizing material collection, transportation, and processing at a regional scale using diverse and sustainable financial strategies – is complex. **It requires actively managing waste disposal and recycling as an integrated system, because recycling is rarely feasible without also managing trash.**

Mature Versus Immature Waste System

Measuring the scope of economic opportunity tied to materials management starts with understanding "mature" and "immature" waste systems. Where does West Virginia, Ohio, and Kentucky fall within in this broad characterization of materials management performance?

MATURE solid waste management systems develop systematically over time through integrated planning and the application of proven best practices in the areas of materials management, collection, transportation, processing, marketing, and policy implementation. Mature solid waste management

systems capture, divert, and recycle a large portion of the waste stream (30 – 50 percent) while managing users'/generators' costs equitably. Developing mature, sustainable materials management systems at the county or even larger regional scale may take ten years or longer. Mature solid waste systems are more common in dense urban areas and/or where a jurisdictional body establishes a framework, culture, and policies that advance solid waste best practices and programs using sustainable funding mechanisms.

Many cities develop mature waste systems in response to safety and economic concerns arising from littering and illegal dumping in densely populated areas. Comprehensive collection services are more easily justified in urban centers; the tax base provides funding for comprehensive materials management. Mature solid waste systems are also operated by County-level governments and solid waste authorities that assume a direct role in materials management with clear goals to measure and meet recycling, reuse, and other materials management targets and objectives. An "**active role**" in materials management includes owning and operating equipment and infrastructure (waste collection vehicles, transfer stations, etc.), implementing policies, or managing private vendors via contracts to influence material management efficiency, cost, and performance.

IMMATURE solid waste management systems are not systematically planned at the local and regional scale, and are the result when generators, collectors, transporters, and processors largely operate independently of on another. The Appalachian ReUse Corridor is

5-Year Planning OBJECTIVE

Coalfield Development, the ReUse Corridor Partners, and regional stakeholders to learn, collaborate, and influence a shift toward active management of integrated waste and recycling programs, where the application of best practices and sustainable funding mechanisms improve performance of the materials management system and significantly increase material diversion to recycling, reuse, upcycling and manufacturing.

a relatively "**immature**" materials management system. Landfill disposal convenience and economics compete with disposal alternatives like recycling. Most generators, collectors, counties, local governments, and states manage materials independently – sacrificing economies of scale – an essential ingredient to manage costs and to sustain recycling. Broadly, an active role in the management of Appalachia's material resources has not yet been assumed, particularly to integrate recyclables collection. While this finding is common, traditional waste schemes are largely ineffective at diverting materials from disposal and impede the ability to build the economic and social value potential of reuse and recycling.

2.2 SUSTAINABLE MATERIALS MANAGEMENT 101

To understand SMM opportunities for the ReUse Corridor that may be obscured by existing waste schemes, an introduction to Sustainable Materials Management (SMM) and Circular Economy (CE), or in combination (SMM/CE) is required.

We know about the ReUse Corridor:

1. Significant quantities of valuable commodities are disposed or exported out of the region
2. The majority of the material system in not actively managed and
3. The manufacturing sector creates demand for materials.

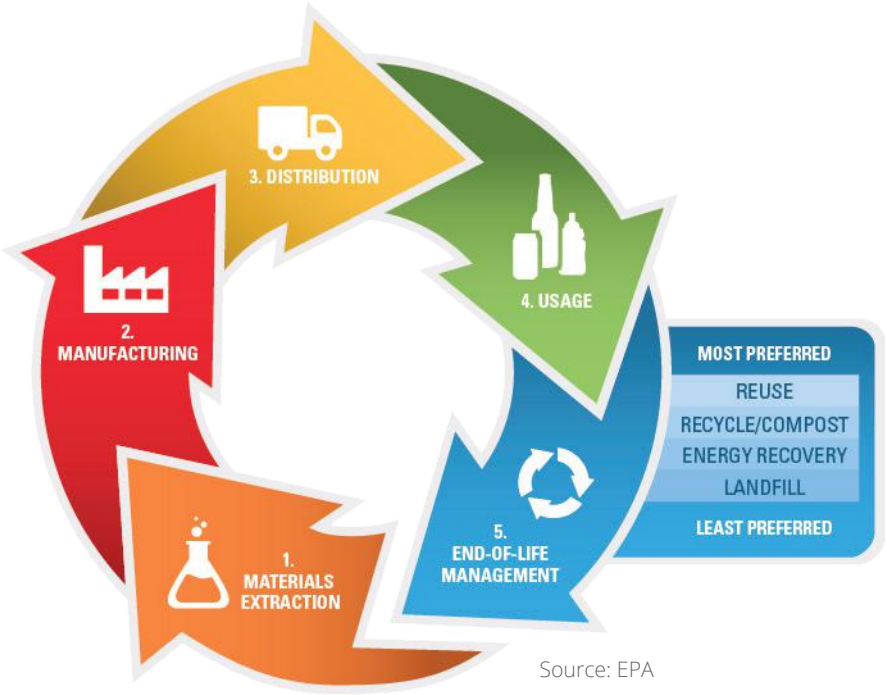
People Build Management Capacity

Shifting to sustainable materials management practices lies squarely on the shoulders of the people in Appalachia. People, leadership and communities will shape a successful transition to a mature materials management system. Alignment around a shared vision is required along with a laser-focus commitment to increase the number of people involved (human capacity) to create change.

"**Sustainable materials management (SMM)** is a systemic approach to using and reusing materials more productively over their entire life cycles."[1] Waste management includes managing and minimizing waste, while sustainable materials management aims to use resources most productively, **Figure 2–1**:

- Productively use materials while emphasizing waste elimination.
- Reduce toxic chemicals and environmental impacts throughout material life cycles.
- Assure sufficient resources to meet today's needs and those of the future.[2]

Figure 2–1 EPA Sustainable Material Life Cycle



Source: EPA

ReUse Corridor SMM

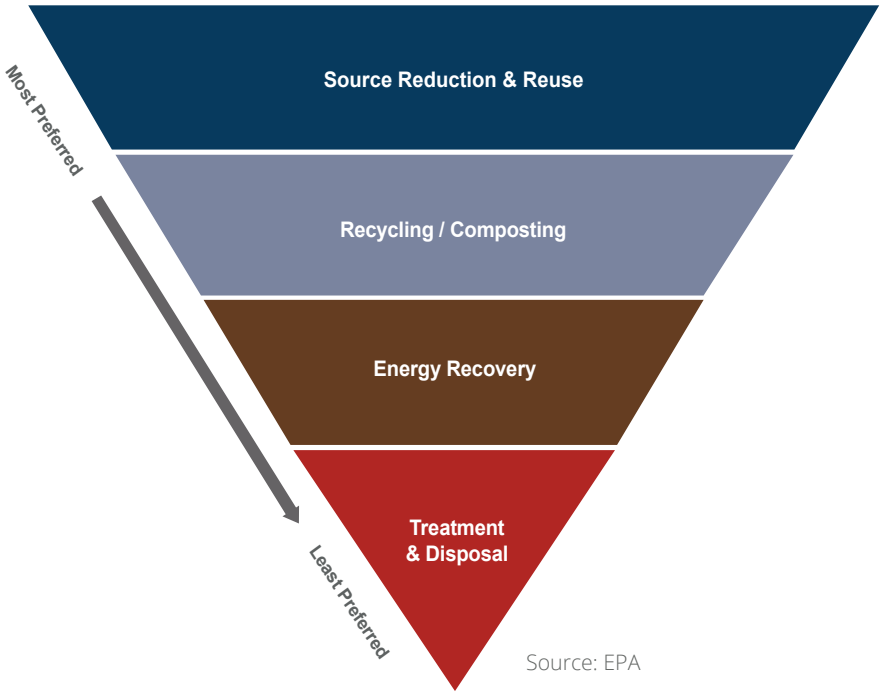
Connects the generation/collection or SUPPLY with the DEMAND including material processors and manufacturers.

[1] US EPA, Sustainable Materials Management Basics, https://www.epa.gov/smm/sustainable-materials-management-basics

[2] Ibid

EPA's hierarchy for management of solid waste identifies source reduction as the most preferred method of resource conservation, followed by reuse and recycling, **Figure 2–2**.

Figure 2–2 EPA Waste Management Hierarchy



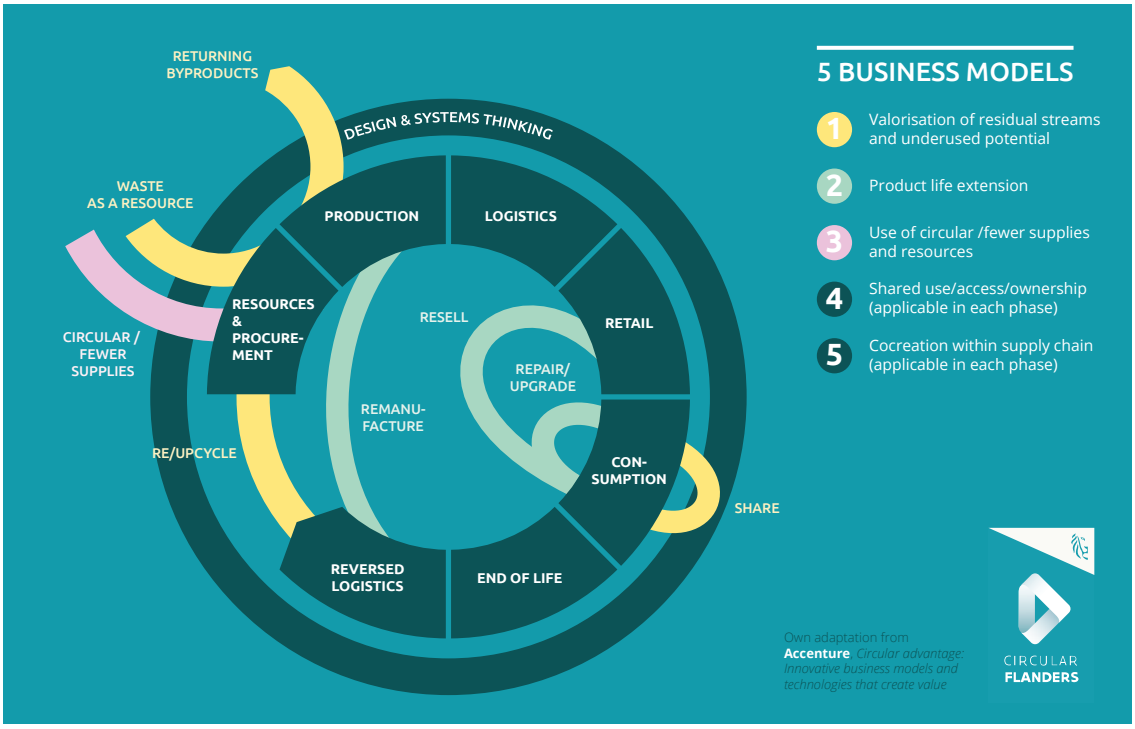
Source: EPA

2.3 CIRCULAR ECONOMY 101

In a **circular economy (CE)**, economic activity builds and rebuilds overall system health. The economy can work effectively at different scales – for large and small businesses, organizations, and individuals operating locally and globally. Design and systems thinking is tied to resources and products along a supply chain **Figure 2–3.** "Transitioning to a circular economy does not only amount to adjustments aimed at reducing the negative impacts of the linear economy. Rather, it represents a **systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits."**[3] Policies and resources must be allocated to manage this complex system and to train, educate and retrain an evolving circular economy workforce.

[3] Ellen MacArthur Foundation, What is a Circular Economy? https://www.ellenmacarthurfoundation.org/circular-economy/concept

Figure 2–3 Circular Economy Systems Diagram



Source: Circular Flanders

Financial Benefits of a Circular Economy

JOBS – A study by the Ontario Waste Management Association in Canada estimated that increasing the province's waste diversion rate from 23% to 60% would create almost 13,000 new direct and indirect full-time jobs.[4] A 2015 report from Britain[5] stated: "that by 2030, on the basis of the current development path, the circular economy could create over 200,000 gross jobs and reduce unemployment by about 54,000 with the potential to offset seven percent of the expected decline in skilled employment to the year 2022."

[4] V. Gill and J. Knowles, "Opportunities for Ontario's Waste: Economic Impacts of Waste Diversion in North America," The Conference Board of Canada, May 28, 2014
https://www.conferenceboard.ca/e-library/abstract.aspx?did=6233&AspxAutoDetectCookieSupport=1

[5] Waste and Resources Action Program, Employment and the Circular Economy Job Creation in a More Resource Efficient Britain, London, England, 2015, page 5
http://www.wrap.org.uk/sites/files/wrap/Employment%20and%20the%20circular%20economy%20summary.pdf

Potential economic benefits for Appalachia connected to SMM/CE include:

- Increased local job opportunities across all skill levels to manage materials and "to turn old goods into new resources, to collect and process recycled materials, and to source materials locally"[6]
- Additional refurbishing, repair, product recovery, and manufacturing
- "Circular-related initiatives such as vertical farming, local sourcing of produce, and the adoption of local food procurement policies—in cities like Baltimore, Seattle, New York and Los Angeles—shorten supply chains between farmers and retailers/ consumers while creating jobs locally"[7]
- Manufacturing – upcycling: producing higher value products from recyclables
- New products and new markets
- Local material loops and shortened supply chains boost local economies
- Improves the security of the material supply
- Stimulates innovation and entrepreneurship
- Reduces the cost of feedstock to businesses
- Proper and comprehensive waste/ recyclable collection reduces of litter and dumping translate to higher property values, cleaner landscapes, tourism, and permanent tenancy

Environmental Benefits of a Circular Economy

- Increases the share of renewable/ recyclable resources
- Reduces the extraction and consumption of raw materials and the associated emissions and impacts to landscapes
- Significantly reduces transportation-related environmental impact, often through partner collaboration that builds economies of scale and maximizes the use of transportation equipment and infrastructure
- Preserves the vitality of natural landscapes including soil, air, and water resources. For example, CE agriculture reduces artificial fertilizers
- Reduces waste generation, waste disposal, littering dumping, and pollution

[6] Anne van Riel, "The circular economy could create an enormous jobs boom," June 3, 2019, https://www.fastcompany.com/90343657/the-circular-economy-could-create-an-enormous-jobs-boom

[7] Ibid

Circular Economy Building Blocks

The Ellen MacArthur Foundation identifies "four essential building blocks of a circular economy."[8]

1. **Circular Product and Process Design** – Material selection, standardized components, designed-to-last products, design for easy end-of-life sorting, separation or reuse of products and materials, and design-for-manufacturing criteria that take into account possible useful applications of by-products and wastes."[9]

   a. *What products generated in Appalachia can be captured, converted to products in demand by the local region, and recovered again after use in a cycle?*

2. **New Business Models** – Innovative models that replace existing models or capture new opportunities. Entrepreneurs will be the developers of many of the new models, as well as materials and products. Existing companies play a significant role in building a circular economy.

   a. *How do ReUse Corridor manufacturers improve capabilities to process more secondary recycled materials and produce easily recovered products for reuse over and over again?*

3. **Reverse Cycles** – The return of materials back into the industrial production process or back into the soil. Delivery chain logistics, sorting, warehousing, risk management, power generation, and molecular biology, and polymer chemistry are some of the new and additional skills needed. "With cost-efficient, better-quality collection and treatment systems, and effective segmentation of end-of-life products, the leakage of materials out of the system will decrease, supporting the economics of circular design."[10]

4. **Enablers and Favorable System Conditions** – Policymakers, educational institutions, and opinion leaders must support the market mechanisms for a circular economy:
   - Collaboration between all the parties involved,
   - Rethinking incentives,
   - Providing appropriate laws, ordinances, and regulations,
   - Leading by example and encouraging rapid copying and upscaling of successes, and
   - Access to financing.

[9] Ibid

[9] Ibid

2.4 GROWING MATERIALS MANAGEMENT CAPACITY

The ReUse Corridor is in a unique position to build material supply and material demand – simultaneously. This requires developing core competencies and capacity to manage this initiative and it will take time and resources.

- Steering Committee (not yet finalized)
- Black Diamond Facility/ Coalfield Development
- ReUse Corridor Partners

Developing ReUse Corridor **MANAGEMENT CAPACITY:**

On the Supply-Side, material generators should not recycle items arbitrarily. Start by strategically targeting and efficiently capturing clean, valued commodities that meet processor specifications. But be careful! - Just because there is a place to take material, doesn't make it a good idea. Do the math, plan the routes, aggregate materials, and assess the cost and impacts of different alternatives. In the initial years of this initiative, the ReUse Corridor Partners should place its highest prioritization on the supply-side to improve its overall ability to get peak generators and peak generating areas to participate in comprehensive recycling efforts to increase supply and improve economies of scale for waste diversion programs.

On the Demand-Side, there are many intermediate processors and manufacturers serving Appalachia – but what is their demand for recyclables? Collaborate with processors and manufactures. Align and grow capabilities and capacities to process materials diverted from the waste stream. Complete material loops using intentional design and production strategies to maximize local product use and sales, re-capture, to be upcycled again. Industrial and manufacturer material refining includes pelletizing, extrusion, grinding, shredding, and other methods to either be done at the facility making the end-products or another company. Manufacturers may become instrumental in material logistics in the ReUse Corridor.

On the Logistics-Side, solving materials transportation will serve as the "bridge" to materials management success because transportation costs and inefficiency is a challenging barrier, particularly for materials targeted for reuse and upcycling. Leverage the strong transportation networks, partnerships (e.g., equipment sharing) and systematically plan and design material supply and demand to reduce transportation and customer costs and top increase capture of valuable commodities. Strategic investments in intermediate, primary processors, and manufacturers informed by spatial awareness (e.g., proximity of supply to demand) can be integrated to enhance economic growth. Plan locally while considering regional markets, generation points, quantities, and efficiencies to minimize transportation cost and build sustainable material diversion programs.

5-Year OBJECTIVE

Coalfield Development and the ReUse Corridor Partner to grow its materials management competency, capability and capacity to more effectively plan and manage materials. Leverage enhanced management capacity to address these important questions.

1. **Are we targeting the recovery of high-quality materials that can be pre-processed and manufactured into products by local manufacturers?**
2. **Are we sending recyclables to landfills or out of the region along with their economic and employment value while increasing environmental impacts?**
3. **Do we have sufficient collection infrastructure, is it "right-sized", in the right location and maximizing recovery of clean, targeted materials?**
4. **How do we achieve aggressive diversion targets via sustainable recycling programs while connecting these efforts and material to regional demand to build circular economies?**

Steering Committee(s) **for SMM/CE**

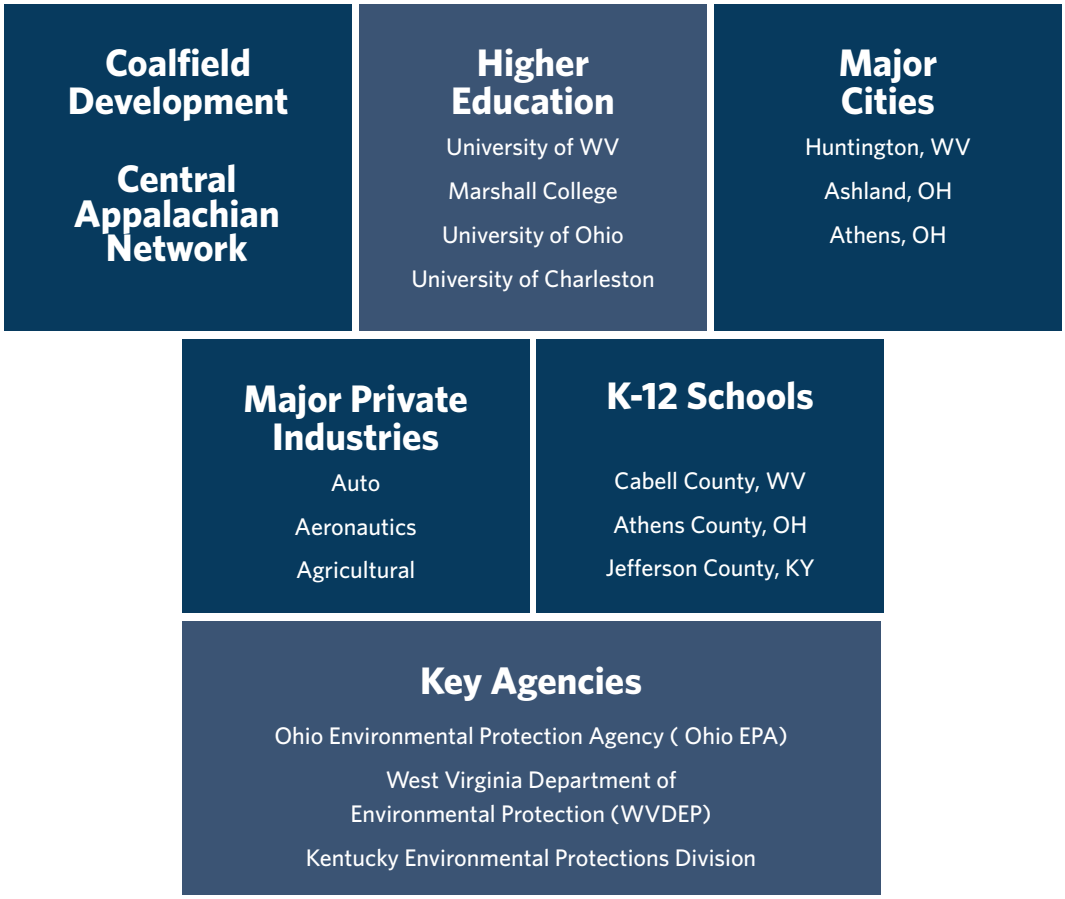
Advancing and implementing SMM/CE programs requires involvement and sponsorship by many regional partners and organizations over an extended period of time. A transformational change, culture shift, and vision is needed. A **Steering Committee** can guide this complex process at a regional scale, involving many organizations, to shape and contribute to these core management competencies:

- Planning
- Sustainable Funding Mechanisms
- Data management
- Material logistics
- Stakeholder Engagement
- Education
- County/local Government Technical Assistance
- Implementation Documents

Long-term success hinges on the ability to engage and educate Appalachia sponsors and stakeholders, and continually expand "active" materials management capacity including the number of people involved in shaping ReUse Corridor initiatives.

Figure 2-4 presents a conceptual Appalachian ReUse Corridor Steering Committee.

Figure 2–4 ReUse Corridor Steering Committee



Black Diamond Highlights

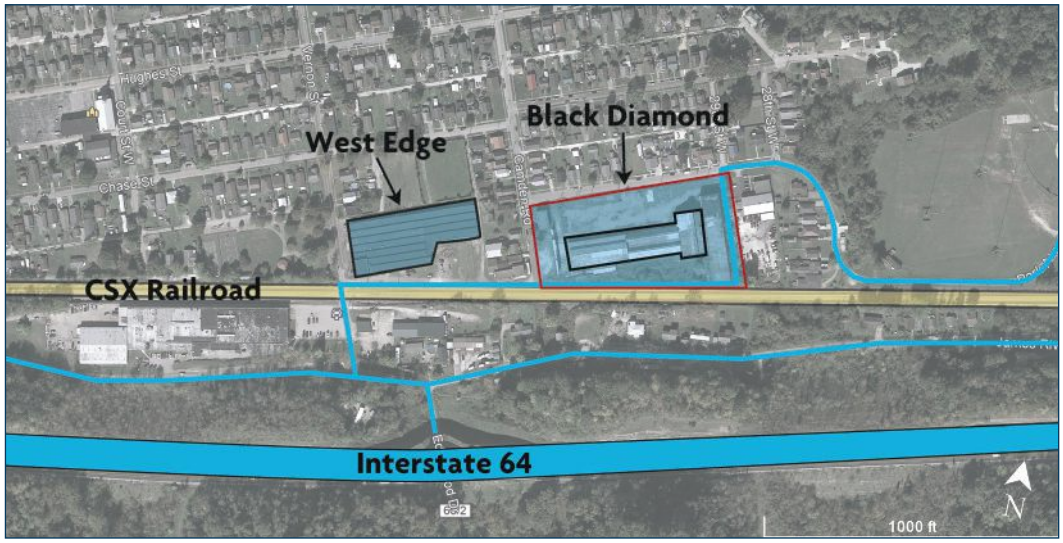
Building reuse and site remediation exemplify sustainable resource management. Converting the former Black Diamond industrial complex into a beneficial resource management facility while also remediating hazards is a great community revitalization story.

What's in Store for Materials Management at Black Diamond?

By serving as an intermediate material processor, technical resource for strategic materials management, and through collaboration with stakeholders, the Black Diamond facility can unleash potential economic opportunities by leveraging enhanced material management in the ReUse Corridor. With a vision to produce employment opportunities through material consolidation, recycling, upcycling, refurbishing, production and marketing – the Black Diamond facility can emerge as a strategic centerpiece for materials management for West Virginia, Kentucky, and Ohio. Proposed material consolidation activities include:

- Material Consolidation
- Material Pre-Processing (shredding or baling)
- Product Manufacturing (makers space)
- Upcycling, Refurbishing, Recycling
- Transportation Logistics

Strategic Command & Control Center



The materials management potential for the 5-acre site and 50,000 square feet of building space will continually evolve. Located adjacent to Coalfield Development's West Edge facility, the hub of job-creation and social enterprise incubation, there are many potential synergies and opportunities to innovate, collaborate and share resources. Black Diamond is scheduled to be operational by 2022.

Black Diamond can help fill a void in regional-scale materials management planning by function in some capacities as a strategic command and control center, with these highlights:

- Appalachian ReUse Corridor Headquarters
- Adjacent to West Edge Factory, Coalfield Developement's Hub of Job-Creation and Social Enterprise
- Central to WV, KY, OH and ReUse Corridor
- Technical Resource, Data Management, & Innovation Hub
- Stakeholder Engagement, Education, & Collaboration Lead
- Makerspace Showroom for Circular Economy
- Tours, Training, & Conference Center
- Waste or Material Exchange

Black Diamond Renderings

2.5 MATERIAL MANAGEMENT: GAP ANALYSIS

The ReUse Corridor initiative is new. There is ample room to grow materials management: **strategy, practices, processes,** and **capabilities.** This Strategic Plan and gap analysis differentiate two focus areas of materials management:

1. **Coalfield Development Corporation – Centralized management of ReUse Corridor initiatives and activities**
2. **Regional – Waste and recyclables management**

WHERE WE ARE
MANAGEMENT

- **Coalfield Development Corporation** materials management capacity is fairly limited but showing potential. Coalfield Development and ReUse Corridor Partners are beginning to collaborate, leverage resources, collect data and explore opportunities and to improve materials management performance.
- **Regionally**, limited "active management" of waste and recyclables contributes to disposed commodities, elevated costs, littering and dumping, and creates barriers for expanding recycling and reuse opportunities.
- **ICI** sector materials management activities, specifically recycling, are not well documented.
- **Material Management Costs** are escalating rapidly due to market disruptions and COVID-19.
- **Traditional Waste Schemes** dominate the region, and disposal outcompetes recycling.
- **Sustainable Funding Mechanisms** for recycling program and SMM/CE initiatives are not developed or not utilized by many communities and organizations. WCEDA is an emerging resource for grants and funding allocated to SMM/CE, including funding for this Strategic Plan.
- **Manufacturing** capabilities and demand for recyclables (secondary raw materials) is not known.

WHERE WE WANT TO BE
MANAGEMENT

- **Increased Management Capability Embraced by Coalfield Development.** Resources allocated to and by Coalfield Development to continually increase its level of influence, leadership, development and implementation of SMM/CE initiatives and programs.
- **Regionally, Transition Away from Traditional Waste Management Toward SMM/CE Principles, Strategies, and Programs.** Prioritization allocated to peak generators and peak generating areas (e.g., urban areas) to increase diversion to recycling/reuse/manufacturing.
- **Improved Data Management.** Improve Coalfield Development and regional SMM/CE data standardization and capabilities to inform planning decisions and to track and report incremental progress.
- **A Highly Engaged SMM/CE Community.** Leaders, stakeholders, sponsors, jurisdictions, and individuals continually maximizing economic, social, and environmental benefits of SMM/CE.

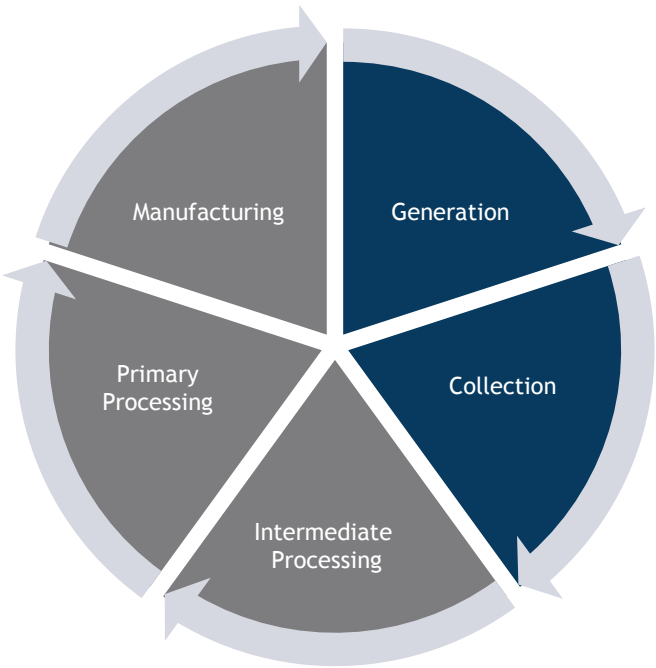
HOW WE GET THERE
MANAGEMENT

- **Steering Committee.** Assemble a passionate, skilled, and diverse steering committee of public and private sector leaders representing core areas of the material supply chain to advance SMM/CE.
- **Coalfield Development Central Materials Management Role.** Continually increase capacity, including staffing and technical ability to plan, manage, monitor, and report SMM/CE activities.
- **Active Materials Management.** ReUse Corridor Partners, local and county jurisdictions, solid waste authorities, businesses to increase active management of waste disposal and waste diversion as an integrated system to increase recovery, processing, and manufacturing of recyclables.
- **Engagement.** Continually increase the number of ReUse Corridor Partners, individuals, communities, businesses, educational providers, social networks and stakeholders actively involved in SMM/CE. Leverage the talent, passion and treasure of the people and organizations of Appalachia.

3 | MATERIALS SUPPLY: Generation & Collection

3.1 GENERATION

The **generation** of waste is **"the inevitable consequence of all processes where materials are used."**[1] Households, stores, farms and factories, construction activities, and wastewater treatment plants generate waste and recoverable materials and by-products on a regular basis. After generation, most materials enter the materials management system through **collection.**



In the ReUse Corridor, the dominant material cycle includes manufacturing virgin raw materials into products, products are consumed, and the residuals are discarded. Recycling assures some materials are separated from waste disposal and reintroduced as products. The reuse of recovered materials or conversion of recovered materials to consumer products usually results in fewer environmental impacts when compared to raw resource extraction to make the same products. Curbside and rural recycling programs do not complete a circular economy. Still, they can be designed and operated to recover meaningful supplies of recycled feedstocks while creating employment opportunities at each stage: collection, transportation, and processing.

Sustainable Materials Management SMM

SUPPLY and represent the Generation and Collection programs — the critical front end of a circular economy.

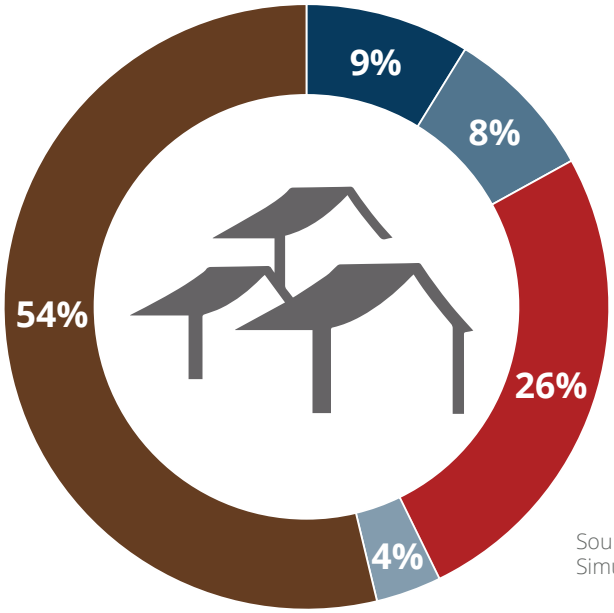
[1] Lagerkvist A., Dahlén L. (2012) Solid Waste Generation and Characterization. In: Meyers R.A. (eds) Encyclopedia of Sustainability Science and Technology. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-0851-3_110

Residential Sector Generation

Household Waste and Recyclables are predictable in content and quantity, making it relatively easy to design effective residential waste and recycling programs. In the ReUse Corridor, few local jurisdictions are actively involved in managing residential generated materials, particularly for the delivery of comprehensive recycling services. Actively managing the residential waste stream has its challenges: human behavior, politics, and the influence the private sector imposes on our waste systems. If recycling is perceived as inconvenient or expensive, participation falters. When residents are asked to separate recyclables, contamination can result, particularly if universal education is not delivered effectively and continuously to customers.

Residential Waste and Recyclables Collection Programs may be managed wholly or partly by local municipalities, counties, and solid waste authorities. Local officials can provide quality service, measure waste generation, and manage program operations and costs like a business to keep taxpayer costs equitable.

Figure 3–1 Residential Sector Recyclables & Organics Generated



Half of Residential Generation is Recyclable

54% Non-Recoverable Wastes
9% Recoverable Paper
8% Recoverable Containers
26% Compostables
4% Special Items/HHW

Source: MSW Consultants Composition Simulation for ReUse Corridor (2021)

This can be accomplished by either delivering curbside or drop-off collection services with their staff and equipment or using well-structured contracts with private haulers.

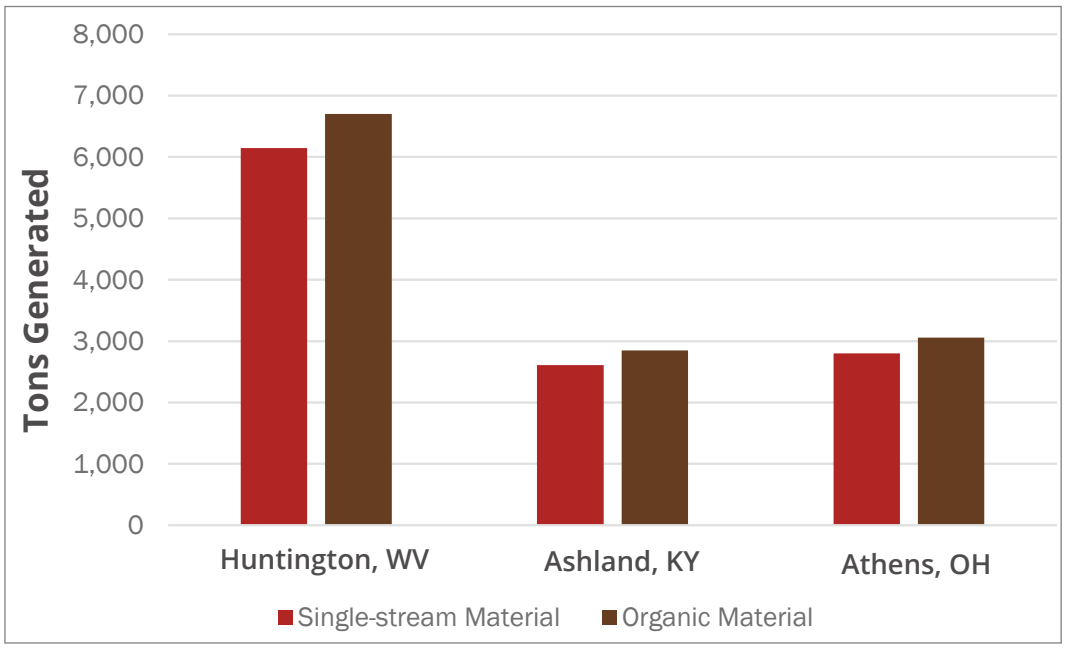
Waste Disposal is profitable and convenient, but many residential generators do not subscribe and pay for waste collection and disposal. Many landfill owners are "vertically integrated," providing both waste disposal and waste hauling services. Consequently, there is a powerful financial incentive in traditional waste schemes to collect and haul waste to landfills while ignoring recycling. However, about half of the residential sector's disposed materials are recyclable, so the potential for diversion and economic opportunity is substantial, **Figure 3-1**.

Figure 3-2 presents conceptual residential material generation projections for **Huntington (WV)**, **Ashland (KY)**, and **Athens (OH)** to get a sense of recycling potential. The projection reflects the estimated quantities of single-stream (commingled paper and container recyclables) and organics (food and yard wastes) from the residential sector. Approximately 11,000 tons of single-stream and 12,000 tons of organic material are generated annually by residential establishments within the three cities.

5-Year Planning OBJECTIVE

Evaluate and implement enhanced and new comprehensive curbside waste/recycling programs in these three (3) ReUse Corridor Partner cities ("peak generating areas") using best practices and sustainable funding mechanisms. This is necessary to build scale, significantly increasing captured quantities of recyclables to shape the conversation with the manufacturing sector regarding replacing virgin materials with recovered feedstocks.

Figure 3–2 Residential Recyclables & Organics Generation (Huntington-WV, Ashland-KY, Athens-OH)



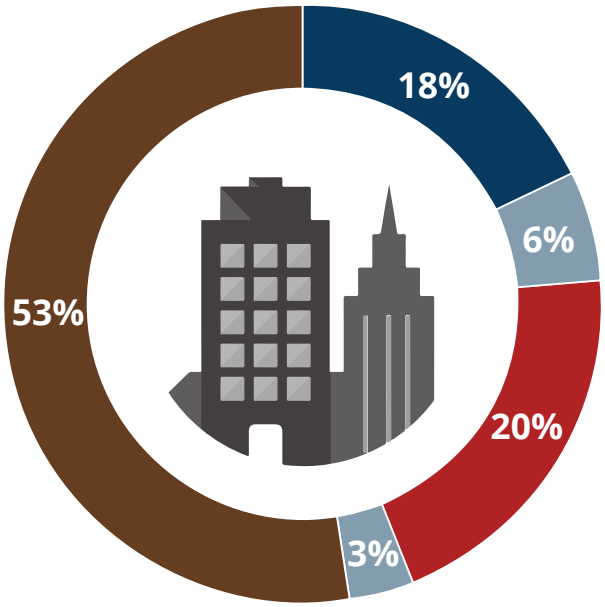
Source: MSW Consultants' estimates of 2020 waste stream or material generation.

Institutional, Commercial, & Industrial (ICI) Sector Generation

Material generation from Institutional, Commercial, and Industrial (ICI) establishments is less predictable than household generation. The quantity and types of materials generated vary based on the scale and function of the organization, and some ICI establishments recover and reuse by-products and incinerate or digest wastes on-site. About half of the disposed waste stream from the ICI sector is recyclable, including 18 percent of recoverable paper, **Figure 3-3**. Because large quantities may be separated on-site, the potential to recover clean commodities and boost reuse and recycling rates in the ReUse Corridor is substantial.

ICI waste/recyclables data reporting is highly variable and difficult to obtain if deemed proprietary. Some ICI establishments submit mandatory or voluntary annual waste disposal reports. Some states and jurisdictions place waste reporting on haulers. State-permitted landfills are required to submit yearly landfill operating reports that present scale weight data for materials separated into categories (e.g., municipal solid waste, C&D, asbestos, ash, residual, hazardous, and others).

Figure 3–3 ICI Recyclables & Organics Generated (2020)



Half of ICI generation is recyclable

54% Non-Recoverable Wastes
18% Recoverable Paper
6% Recoverable Containers
26% Compostables
4% Special Items/HHW

Many ICI establishments provide various materials management services to improve operating efficiency, reduce energy, eliminate waste, and increase profits. ICI establishments are skilled in SMM/CE. They can be strategic partners to streamline materials management processes, serve as local aggregators and processors for recovered materials, and significantly improve logistics in a corridor that does not have extensive recyclable processing capability in place.

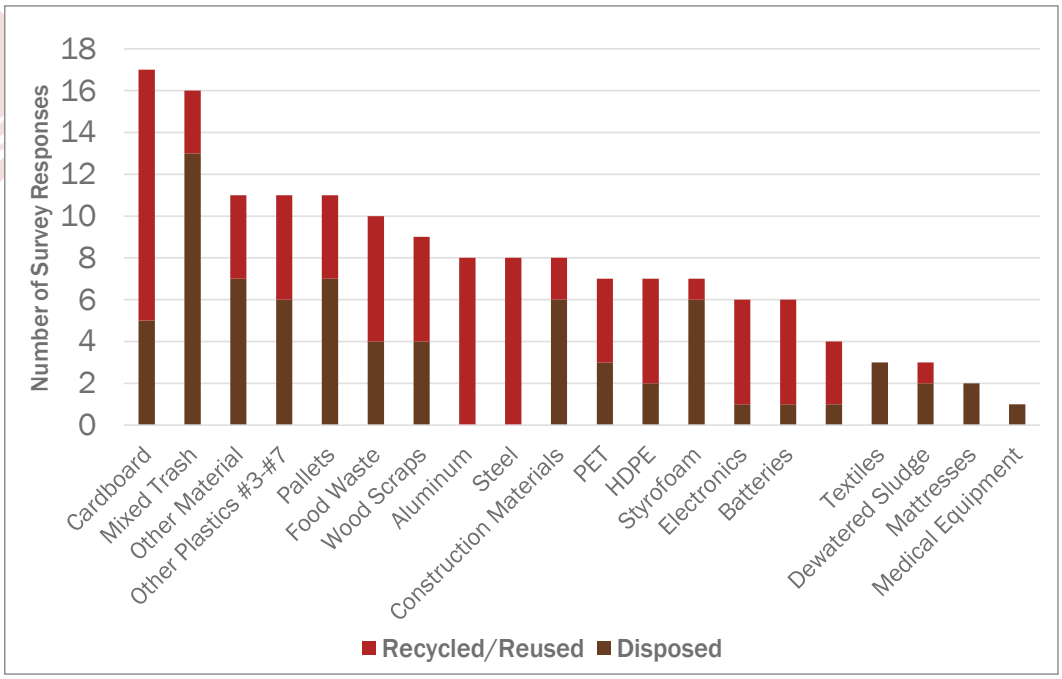
5-Year Planning OBJECTIVE

Coalfield Development and ReUse Corridor Partner to inventory ICI establishments to identify the largest ICI generators and use data to guide strategic materials management decisions. ***Some ICI establishments are "peak generators" and produce massive quantities of recoverable clean recyclables or reusable materials in one location.*** **The inventory process can create synergies and reveal opportunities among ReUse Corridor Partners, businesses, and manufacturers.**

Collection, Disposal & Recycling Survey (2020)

A survey was distributed in July 2020 to waste generators and collectors in the ReUse Corridor. This survey captured data about the material collection, disposal, and recycling practices from organizations and establishments in the ReUse Corridor. It was the first step to assess interest and to identify target participants for advancing materials management initiatives. Fifteen (15) survey responses were received with representation from manufacturers, solid waste authorities, a university, and the recycling industry. According to survey responses **(Figure 3–4)**, cardboard, plastics #3-7, and pallets make up the top three potentially recoverable materials generated. Half of the survey respondents reported generating aluminum, steel, and PET, which are preferable to target based on market value.

Figure 3–4 Materials Generated by Survey Respondents (2020)



Note: "Other Material" includes 55-gal drums (3 responses), hydrated lime (2), assorted metals (1), mixed paper and containers (1), MRF residuals (1), wood dust (1), and other mixed/unspecified material (2).
Note: Materials listed as both Recycled/Reused and Disposed are represented twice.
Source: MSW Consultants. (July 2020). The ReUse Corridor Materials Management Survey.

Generation Data & Benchmarking Performance

"**Benchmarking**" is a process of measuring materials management performance and can be used to identify opportunities for improvement or to compare performance to other programs. Generation data, including quantities of disposed and recycled materials that haulers can provide, disposal facilities, and recyclables processors, is required to measure waste and recycling program performance and costs. Material generation/composition data from Appalachia communities and ICI generators can be leveraged to:

- Benchmark current performance and measure incremental improvements,
- Target enhanced diversion from peak commercial generators (large ICI establishments)
- Target enhanced diversion from peak generating area (e.g., cities through curbside collection),
- Target high-value commodities with known markets,
- Measure the performance of alternatives and best practices,
- Rightsize' collection systems to optimize performance,
- Improve material logistics, and
- Prioritize funding allocations to opportunities (e.g., diversion) with the highest return on investment (ROI).

5-Year Planning OBJECTIVE

Coalfield Development and the ReUse Corridor Partners to "benchmark" current performance including tons diverted, total costs, and costs per ton, and measure annual incremental performance against the year one (1) benchmark.

WHERE WE ARE
GENERATION

- **Many Residential and ICI Establishments** prioritize waste disposal and do not recycle.
- **Only a Small Amount** of the total potential generated quantities of recyclables in the ReUse Corridor are diverted to recycling. This limited scale elevates costs and becomes a barrier.
- **Limited Generation and Composition Data** is available for the residential sector and ICI sector.
- **Generation and Composition Data** is not being utilized for material management and operating performance or to inform and prioritize materials management decisions, including investments in collection infrastructure and programs serving the ReUse Corridor.

WHERE WE WANT TO BE
GENERATION

- **Increased Recovery of Generated Recyclables**, starting with peak waste generators and peak generating areas to build supply systematically.
- **Uniform Waste Generation Data** (disposal and recycling rates and composition) captured and managed by a centralized source and applied to advance ReUse Corridor materials management strategies and programs using best practices.

HOW WE GET THERE
GENERATION

- **Inventory** the peak generators (ICI establishments) and peak generating areas (i.e., dense urban areas) with the most significant potential to increase diversion of recyclables that are in demand.
- **Capture** local municipality and county-level data and monitor and report the performance of residential curbside and public recycling sites (drop-off) programs.
- **Analyze** generation and composition data of residential waste.
- **Establish** uniform methodologies to track waste generation in the residential sector and ICI generators, haulers, and processors.

3.2 COLLECTION

Collection is the temporary, on-site containment and subsequent transportation of material from one or more generators. **Collection service represents over 50 percent of solid waste system costs.** Collection services for trash and recycling in the ReUse Corridor are primarily provided by the private sector haulers secured independently by residents and businesses. To a lesser extent, local governments, solid waste authorities, and ICI establishments in the ReUse Corridor actively manage collection services by executing contracts with haulers or by self-hauling materials to disposal or recyclable processing facilities. Operating inefficient waste and recycling programs is a widespread issue in the ReUse Corridor and nationally. Inefficiency relating to collection and transportation elevate costs (e.g., trash bills), which then becomes a barrier for investing in additional collection services, including comprehensive recycling programs. Collection deficiencies include:

- Poor management, policy, guidance, procurement, and regulation,
- Poor design and operation,
- Inadequate training and education,
- Inefficient routing,
- Limited participation (not all households have or use the service),
- Economies of scale,
- Ineffective implementing documents (collection contracts and ordinances),
- Contamination of targeted recyclables,
- Distance to disposal, transfer, and processing,
- Waste and recycling are not integrated.

To grow a successful collection and diversion program, communities and material generators of the ReUse Corridor need to overcome operational challenges and political barriers to implement efficient collection programs. This effort requires collaboration, technical expertise, sharing resources, and using proven best practices for collection systems. As the ReUse Corridor Partners and regional stakeholders shift toward actively managing collection programs to increase diversion and shape a circular economy - answer these philosophical and strategic questions:

1. Do waste and recycling operations impact the health, safety, and welfare of the Appalachia community?
2. Do local governments (and other regional stakeholders) have a responsibility to protect the Appalachia community's health, safety, and welfare through the assurance of proper materials management?
3. Are the current collection systems optimized to provide comprehensive waste and recycling services efficiently?
4. Are we letting disposal end the life of resources that we could divert into economic development and products that benefit the ReUse Corridor?
5. Why are so few comprehensive curbside recycling programs serving Appalachian residential communities?
6. How do we cost-effectively implement residential curbside recycling programs to capture recycled feedstocks?

5-Year Planning OBJECTIVE

Coalfield Development and the ReUse Corridor Partners to increase the level and quality of comprehensive collection services, including the diversion of targeted recyclables, using best practices and sustainable funding mechanisms. Prioritization allocated to:

- **Peak generating areas** (e.g., dense urban areas, residential curbside recycling)
- **Peak generators (large ICI establishments)**
  - *Food processors*
  - *Cardboard/Office paper*
  - *Construction & Demolition waste (e.g., wood recovery)*
- **Public recycling sites** (improving existing sites and adding new sites)
- **Black Diamond Facility**

Curbside Recycling

Since a strong push in the late 20th century, curbside recycling has been an economically and environmentally preferred method for capturing source-separated paper, plastics, and metals from countless households and small businesses in suburban and urban areas throughout the U.S. In many suburban areas, haulers collect leaves and yard waste (a.k.a, green waste) at the curbside, giving a significant boost in landfill diversion to composting. As anaerobic digestion facilities and food waste compost facilities emerge, curbside food waste collection and diversion is increasing.

Critical Curbside Recycling Question

How do we cost-effectively implement residential curbside recycling programs to capture recycled feedstocks from these priority peak generating areas?

Convenient curbside recycling boosts participation and **capture rates**. Sales, rebates, credits, or revenue can be generated from marketed recyclables to partially offset costs. Curbside recycling is significant to the ReUse Corridor initiative. Maximizing the diversion rates from cities like Huntington (WV), Ashland (KY), and Athens (OH) is necessary to grow a reliable and large **supply** of secondary raw materials (recyclables) that justify investment by the manufacturing sector to increase its **demand** for recyclables generated in the region. **This presents a significant opportunity for the region.**

Implementing curbside single-stream programs in the cities of Huntington (WV), Ashland (KY), and Athens (OH) is estimated[2] to result in the combined annual collection of about 6,500 tons of single-stream recyclables. As seen in **Figure 3-5**, these baled recyclable

Only 1 out 3 aluminum and steel cans are recovered for recycling. This ratio is an example of a capture rate. Capture rates are the proportion of recyclables recovered (or "captured") compared to the total recyclables generated. Capture rates vary based on material, collection method, and the level of educational outreach provided to program participants.

Source: The Recycling Partnership. (Feb. 2020) State of Curbside Recycling Report.

[2] Based on a preliminary analysis conducted by MSW Consultants. It should be noted that a number of simplifying assumptions are used in this analysis, and therefore, these estimates should be treated as preliminary, high-level approximations.

commodities are worth about $450,000. Assuming all eligible households are offered curbside recycling and collection routes are efficient, the cost to provide once-per-week, automated collection using 96-gallon recycling carts is expected to range from $3.50 to $4.20 per customer per month. Curbside recycling costs can be reduced by providing every-other-week service and effective municipal procurement processes where contracted trash and recycling services are bundled.

Once-per-Week, Curbside Single-Stream Recycling Programs

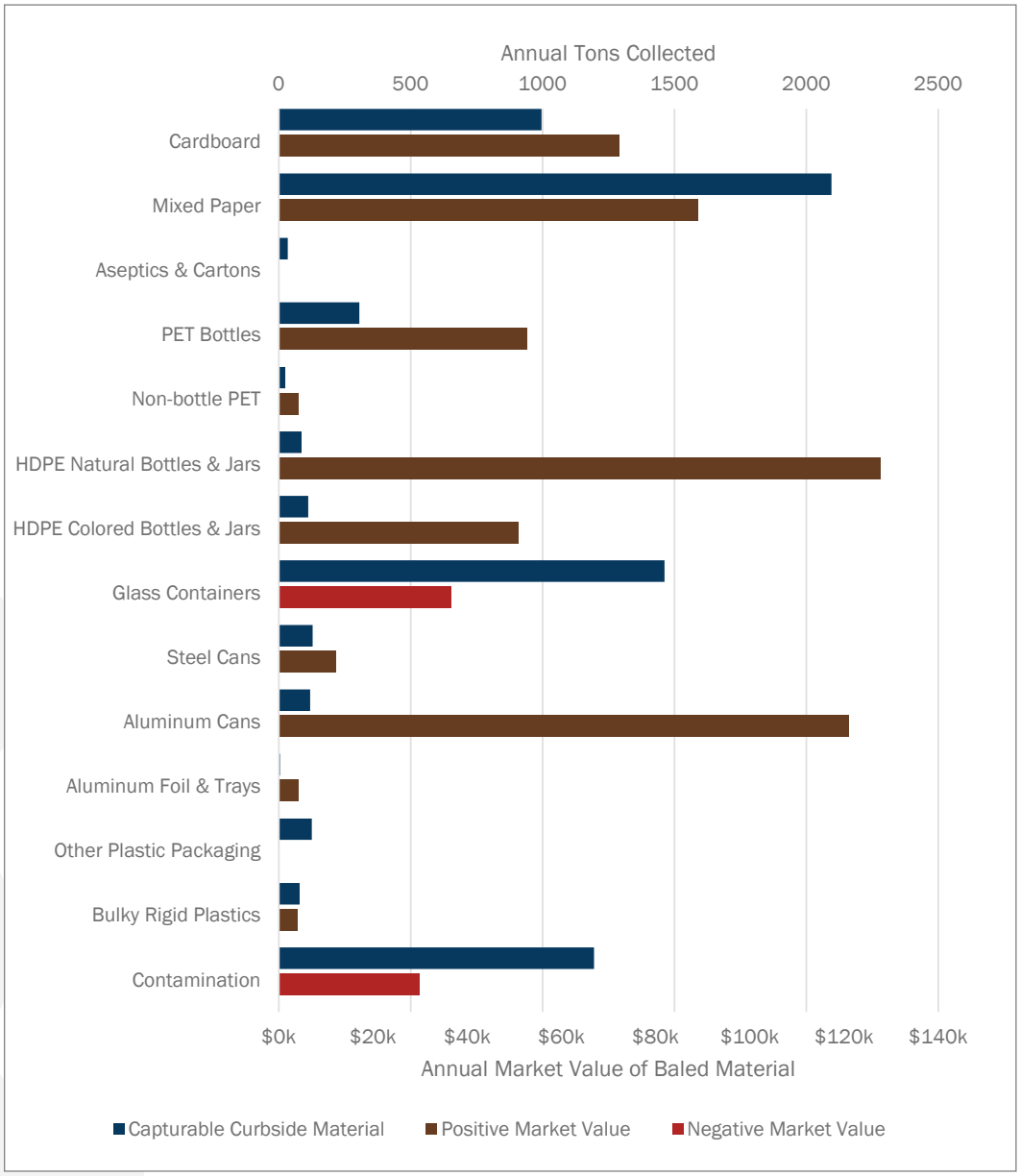
Huntington (WV), Ashland (KY), and Athens (OH)

6,500 Tons Recyclables Collected
and diverted from landfill annually.

$450,000 of Material Collected Annually.

Ten full-time jobs created to provide and manage collection services.

Figure 3–5 Estimated Quantity and Market Value of Curbside Single-stream Material (2020)



Notes: Combined estimated tonnages for Huntington (WV), Ashland (KY), and Athens (OH). Average Chicago (Midwest/Central) region prices (February 3, 2020). Prices are material values after sorting and bailing.
Source: MSW Consultants' estimates; recyclingmarkets.net.

Public Recycling Sites

Providing locations, including public recycling sites, can be a cost-effective way to recover materials. Residents, small businesses, and other approved generators could deposit recyclables, hard-to-recycle items, and/or items requiring special handling (e.g., tires, appliances, household hazardous wastes) at these locations. Public recycling sites are sometimes referred to as "convenience centers." Drop-off programs are cost-effective because generators assume some of the transportation and material sorting costs. Public recycling sites can be operated at a cost range of **$2 to $5 per year per household**, compared to **$36 – $60 per household for curbside recycling.**

5-Year Planning OBJECTIVE

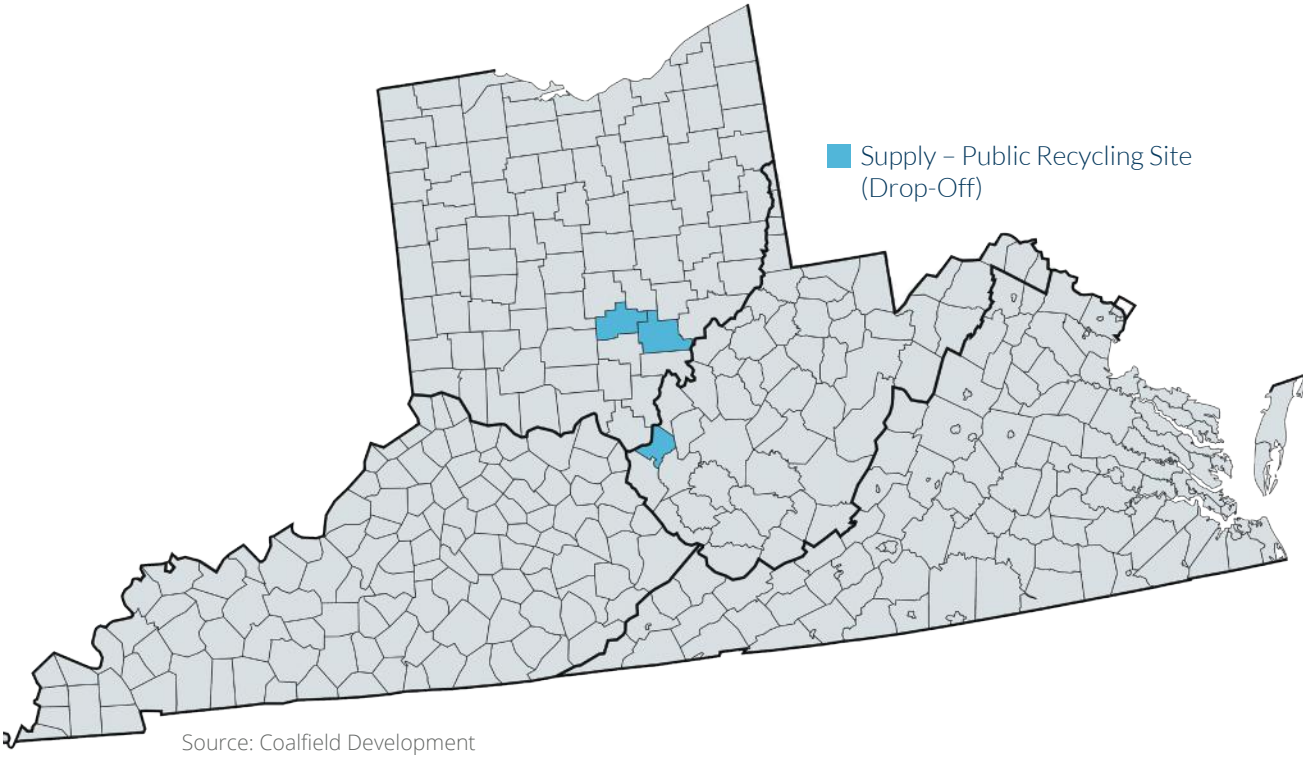
Coalfield Development and the ReUse Corridor Partners optimize the performance of existing public recycling sites and implement additional public recycling sites using best practices and sustainable funding mechanisms. This objective includes prioritizing transportation efficiency and targeting materials like cardboard that are high-volume, high-value, and are relatively cost-effective to recover.

Public recycling sites are often located in underserved, rural areas that do not have access to curbside recycling. Towns, counties, cities, authorities, and private organizations like scrap metal dealers can operate public recycling sites. With the proper design, operation, signage, and sorting requirements, public recycling sites can effectively minimize contamination and divert clean recyclables ready for additional processing. However, many public recycling sites are not operated using best practices. Inefficient methods, equipment, containers, and vehicles to collect, store, aggregate, and transport materials can substantially increase labor and transportation costs and create site safety hazards, including poor traffic flow and overaccumulation of materials.

Coalfield Development and the ReUse Corridor Partners monitor or operate 1– 2 permanent sites per county and

2-3 mobile sites or sites that host recycling "events" in Cabell County (WV), Athens County (OH), and Hocking County (OH), **Figure 3–6**. Various public and private organizations operate these and other sites (not shown). In Q4 of 2020, the ReUse Corridor public recycling sites diverted 86,210 pounds of recyclables, **Table 3–1**. These sites are open to all residents and do not require a subscription to use. The solution includes alignment and standardization of public recycling sites: standard signage, labels, and educational materials, and universal public-facing messages that are widely distributed on websites and other media to maximize participation and increase the total quantities of materials collected. This solution can include public recycling events and rotational public recycling sites to expand recycling opportunities by collecting different materials and improving access to more generators.

Figure 3–6 ReUse Corridor Public Recycling Sites



Source: Coalfield Development

Table 3–1 ReUse Corridor, Public Recycling Site, Recovered Quantities (Q4 2020)

Materials	Cabell County, WV	Athens County, OH	Hocking County, OH	Pounds Recovered
Textiles	0	18,360	0	18,360
Mattresses	0	9,940	4,900	14,840
Trash	0	9,320	1,800	11,120
Appliances/Metals/E-Waste	10,880	0	0	10,880
E-Waste	3,260	5,440	1,600	10,300
Scrap Metal	0	5,400	2,940	8,340
Books	0	6,880	0	6,880
Electronics	4,080	0	0	4,080
Medical Supplies	0	503	627	1,130
Rechargeable Batteries	0	80	100	180
Other Batteries	0	0	100	100
Total	**18,220**	**55,923**	**12,067**	**86,210**

ICI Recyclables Collection

The extent that ICI establishments recycle in the ReUse Corridor is not clear. Generally, businesses recycle when they generate large quantities of a commodity like cardboard, and recycling lowers their trash bill and/or as part of environmental stewardship. Recyclables for large ICI establishments are collected in rigid plastic carts, dumpsters, roll-off containers, and compactors. Containers are serviced or "pulled" frequently, often on an on-call basis when they are nearly full. ICI establishments primarily secure private haulers for recyclables collection services but may use their own staff and equipment.

Separating wood and other materials from C&D activities for reuse/recycling is often "low-hanging fruit". This requires working with construction contractors and haulers, and developing guidance and policies.

ICI activities like building demolition, retrofits, and new construction can boost the diversion of wood and other easy-to-recover construction materials that are in demand. Food generators/processors are a likely target for diversion since diverting dense, heavy organics may reduce disposal fees and produce organic products - making diversion economically attractive.

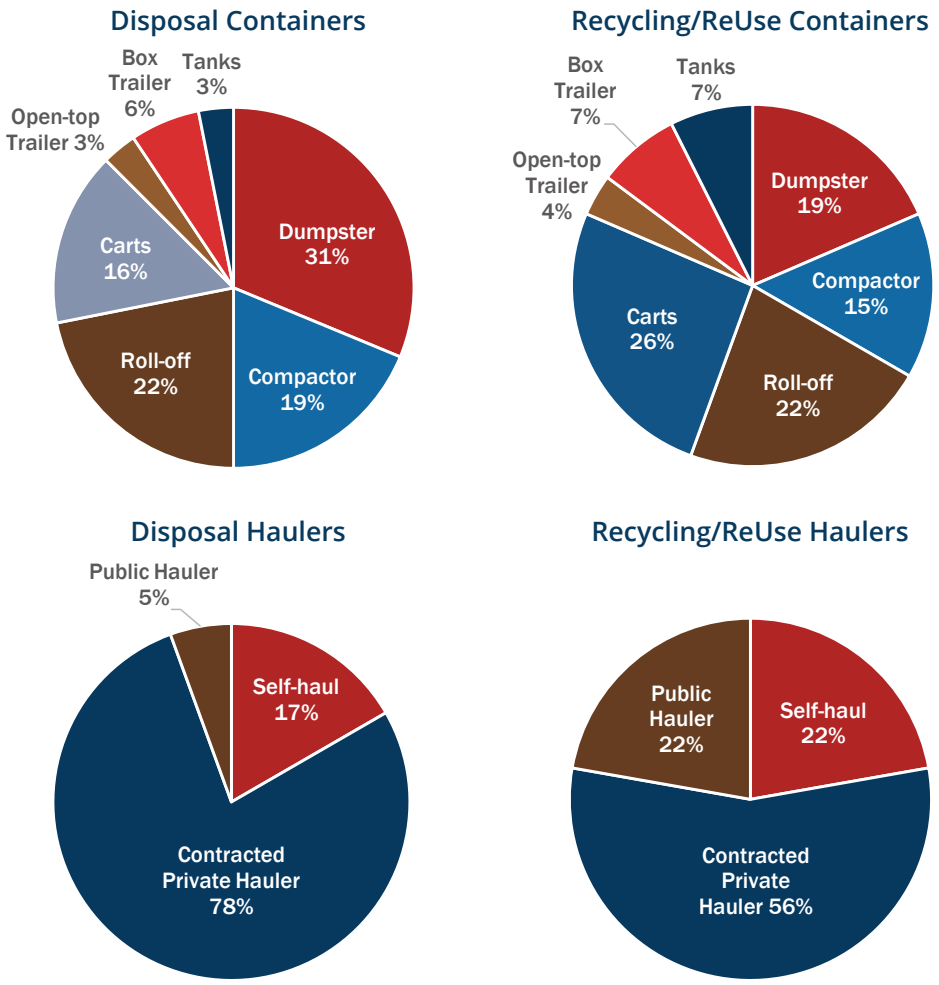
Potential exists to divert large quantities of materials from one establishment or a few establishments generating same-type commodities, and some ReUse Corridor Partners are beginning to realize recycling benefits. **Marshall University** installed the second-largest university in-vessel composting system in the eastern United States in 2021, with the capacity to compost eight (8) tons of food waste and other organics per day. Some ICI establishments like **Sogefi** are diverting cardboard and other commodities.

Typically, recycling at large ICI establishments can be easy and highly cost-effective compared to residential sector recycling because separating very clean materials for delivery to nearby primary processors and manufacturers is possible. Over the next five years, inventorying and increasing diversion of targeted recyclables from large ICI establishments (peak generators) is a logical objective for Coalfield Development and the ReUse Corridor Partners. A Steering Committee can be leveraged to establish connections and maintain an open dialogue among regional ICI establishments, ReUse Corridor partners, and other stakeholders as part of advancing SMM/CE initiatives.

ReUse Corridor Survey

ReUse Corridor Partners and organizations were surveyed in July 2020. The survey asked questions about collection methods for disposed and recycled/reused materials. Responses revealed: 1) a wide variety of container types and methods are used to store wastes and recyclables, and 2) most organizations contract with private haulers for collection services, **Figure 3-7**. These findings are common but shed some light on opportunities to "rightsize" and standardize collection services among generators in the ReUse Corridor.

Figure 3–7 Collection Methods: ReUse Corridor Survey (2020)



Source: MSW Consultants. (July 2020). The ReUse Corridor Materials Management Survey.

Present need to Collect Clean Recyclables

Historically, after intermediate processing (e.g., baling), most U.S. recyclables were exported overseas – making contamination someone else's problem. Consequently, the U.S. has had no reason to invest heavily in domestic processing, material refining, or circular economies for recovered materials. But everything changed in 2018, and China, Vietnam, Cambodia, Indonesia, Malaysia, and others no longer accept certain commodities, and stringent contamination specifications substantially reduced recovered material exports.

The loss of overseas export markets presents a business proposition for the ReUse Corridor when we desperately need to put Americans to work.

Increase investments to recover and divert more materials while investing in local and regional processing and manufacturing – well, it just makes sense. It particularly makes sense while recognizing that putting those same materials in existing landfills does not create the same economic growth opportunities – it is not even close. Due to the transition to "domestic" processing over exports, diverting clean materials is key. It reduces costs along the entire supply chain and makes circular materials management efficient and possible. Contamination slows down Material Recovery Facility (MRF) processing (e.g., belt speeds). Contaminants have to be separated manually or automatically and then disposed. MRFs can reject entire truckloads of recyclables and/or **charge contamination or "residue" fees over $100 per ton.**

The **QUALITY of PARTICIPATION**, including separating clean recyclables from waste, primarily occurs at generation/collection and affects the cost and fate of recovered commodities. Contamination rates of residential curbside recycling programs, including mixed-material and single-stream programs, frequently exceed 25 percent.[3] Drop-off program contamination rates are highly variable but are typically lower than mixed curbside programs because materials are source-separated

WHERE WE ARE
COLLECTION

- **Coalfield Development Corporation** materials management capacity is fairly limited but showing potential. Coalfield Development and ReUse Corridor Partners are beginning to collaborate, leverage resources, collect data and explore opportunities and to improve materials management performance.
- **Regionally**, limited "active management" of waste and recyclables contributes to disposed commodities, elevated costs, littering and dumping, and creates barriers for expanding recycling and reuse opportunities.
- **ICI** sector materials management activities, specifically recycling, are not well documented.
- **Material Management Costs** are escalating rapidly due to market disruptions and COVID-19.
- **Traditional Waste Schemes** dominate the region, and disposal outcompetes recycling.
- **Sustainable Funding Mechanisms** for recycling program and SMM/CE initiatives are not developed or not utilized by many communities and organizations. WCEDA is an emerging resource for grants and funding allocated to SMM/CE, including funding for this Strategic Plan.
- **Manufacturing** capabilities and demand for recyclables (secondary raw materials) is not known.

[3] Koerth, Maggie. (2019) "The Era Of Easy Recycling May Be Coming To An End." FiveThirtyEight. https://fivethirtyeight.com/features/the-era-of-easy-recycling-may-be-coming-to-an-end/

WHERE WE WANT TO BE
COLLECTION

- **Residents and Small Businesses** in peak generating areas have affordable, comprehensive curbside recyclables and trash collection services.
- **Peak ICI Generators** separate recoverable materials like food waste, cardboard, and office paper for diversion to recycling, reuse, processing, and other non-landfill alternatives in the region.
- **Residents** are well educated on the merits of recycling and proper procedures.
- **Residents in Rural Areas** have access to public recycling sites. Collection schemes are designed to efficiently collect and manage clean, targeted materials, including high-value commodities and items requiring special handling (e.g., appliances).

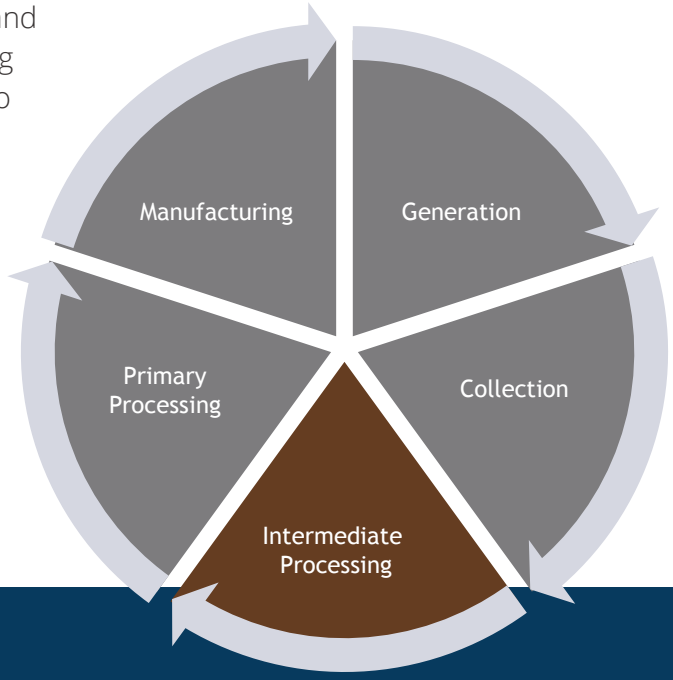
HOW WE GET THERE
COLLECTION

- **Starting with Pilot Cities** like Huntington (WV), Ashland (KY), and Athens (OH), implement new and enhanced curbside recyclables collection services in peak generating areas using best practices and sustainable funding mechanisms.
- **Enhance** existing ReUse Corridor Partner public recycling site performance using best practices.
- **Expand** the number of sites and capabilities of public recycling sites using best practices.
- **Inventory** organics collection programs, organics processors, and compost facilities, and prioritize diversion by large food waste generators.
- **Using ICI Inventory Data**, implement new or enhanced recyclables collection programs for generators. Build strong relationships with ICI waste generators to reveal synergies for collection and processing.
- **Leverage** a Steering Committee for collection system technical assistance and resources to improve/expand/implement recyclables collection services.
- **Deliver** extensive, universal education/public outreach to increase the use of proper collection methods for trash and recycling.

4 | MATERIALS LOGISTICS:
Transportation & Intermediate Processing

4.1 SCALE IMPROVES MATERIAL LOGISTICS

Scale is the backbone of sound waste and recyclables logistics. Countless recycling programs struggle due to their failure to maximize economies of scale. Hauling small quantities of recyclables that may be lightweight and/or contaminated with unwanted materials over long distances is a recipe for disaster. Material consolidation, sortation, and transportation work in concert to benefit logistics, particularly for materials diverted from landfill disposal.



Sorting / Separation

- Separate materials by type
- Remove contaminants
- Increase material value
- Meet market specifications

Consolidation / Processing

- Strategic collection points
- Increase captured quantities
- Increase material density
- Increase weight per haul load

Transportation

- Collection routes/routes to next-stage processing
- Consolidation & intermediate processing sites
- Intermediate processors to primary processors
- Primary processors to manufacturers

To advance recycling and reuse in rural and urban areas of the ReUse Corridor, a long-term commitment to improving material logistics is vital. Purposefully increasing economies of scale while optimizing collection and transportation equipment and services enables communities, counties, solid waste authorities, and generators to overcome economic and operational barriers plaguing recycling programs. Even small programs can work together to build scale and overcome transportation barriers.

Staff from Rural Action in Athens, Ohio load a boxtruck from Coalfield Development (based in Huntington, West Virginia) with textiles from Upcycle Thrift (Athens) to deliver to The Neighborhood Association in Ashland, KY

4.2 MATERIAL CONSOLIDATION & INTERMEDIATE PROCESSING

Much of the ReUse Corridor is not located near (say within 30 miles) of one or more large Material Recovery Facilities (MRFs) with mixed material sorting capability. Limited access to recyclables processors highlights the need to leverage consolidation and intermediate processing sites to optimize material transportation of targeted materials.

Consolidation refers to bulking or aggregating compatible materials at a location. Many consolidation sites perform some intermediate processing (e.g., bale cardboard).

- Open top transfer trailers
- Industrial compactors
- Tractor-trailers
- Roll-offs

Intermediate processing refers to manually and mechanically sorting compatible materials, usually changing material characteristics, like density. Primary objectives include the removal of unwanted materials, efficient material transport, and improved marketability.

- Baling
- Densifying
- Compacting
- Flaking
- Pelletizing
- Dewatering/dehydrating
- Grinding

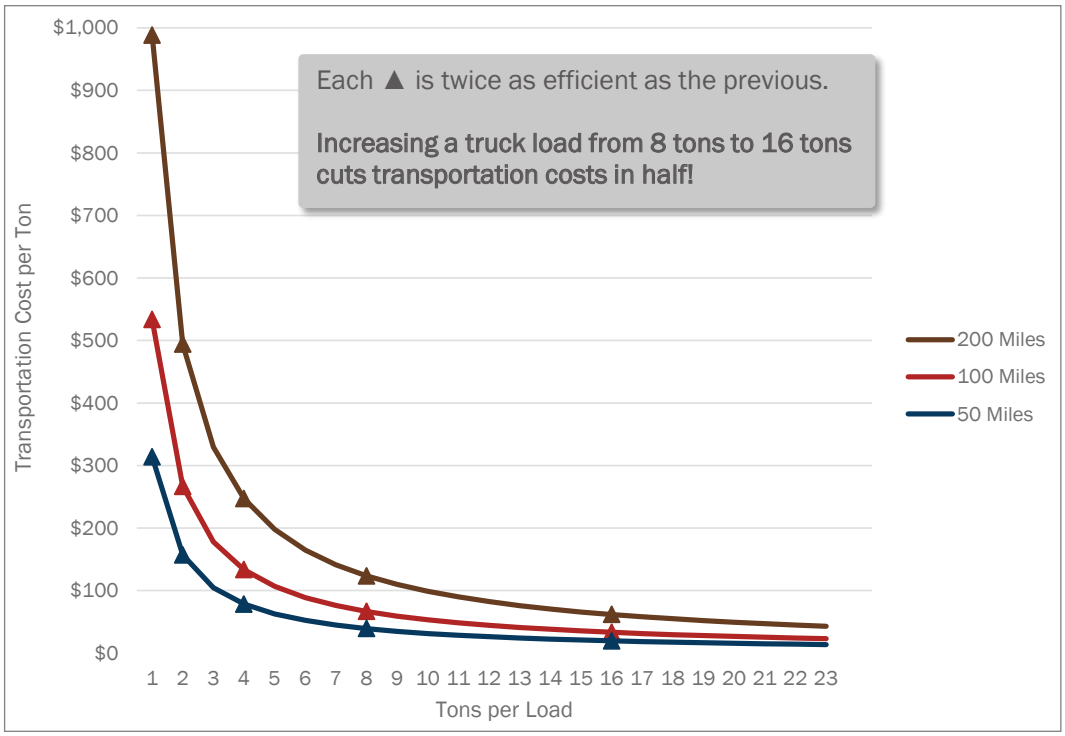
Strategically located and distributed material collection points, consolidation sites, and intermediate processing sites reduces transportation distances and increases the quantity of material transported per load. For example, consolidation materials that double the weight of outbound loads cuts transportation costs in half, **Figure 4–1**. The tons per truckload of material consolidation and intermediate processing can lower total material management costs, often measured as a "**cost per ton**".

COST PER TON

A unit of measure commonly used by material processors and organizations that manage waste and recyclables. Cost per ton can be a measurement for the total cost to collect and processing recyclables and wastes. Conceptually, curbside collection and processing recyclables might range from $200 - $300 per ton and collection and processing waste might range from $100 - $200 per ton, with the higher cost of recycling attributed to inefficiency of collecting smaller volumes (and weight) of recyclables.

Cost reductions achieved through efficient material transportation and processing are meaningful because affordable, comprehensive waste and recycling services increase customer participation and material recovery.

Figure 4–1 Truckload Efficiency



Consolidation Sites

Waste/Recyclables Transfer Stations

Trucks tip waste loads and waste is bulked in open-top trailers, walking floor trailers, compactors, or other high-capacity equipment to improve transportation efficiency in route to a disposal facility.

Public (drop-off) Recycling Sites and Convenience Centers

These collection sites serve generators like the public and small businesses approved to deliver/drop-off recyclables, hard-to-recycle-items, and special handling items like household hazardous wastes. Visitors source-separate materials by placing items into designated/labeled containers and staging areas. Site staff may separate items and bulk materials for transport off-site. Consolidation includes placing compatible materials in high-capacity equipment (e.g., 100-yard open top trailers). Cabell County (WV) , Athens County (OH), and Hocking County (OH) public recycling sites and event recovered 86,210 pounds of recyclable/reuseable material in Q4, 2020.

Staff from Cabell County Solid Waste Authority and Coalfield Development work together with local community volunteers to consolidate compatible electronics into skidded gaylords at a Public Recycling Site in Huntington, WV prior to transport to Athens Hocking Recycling in Ohio, and Taylor Recycling in Huntington

Material Consolidation Points with Intermediate Processing

In addition to aggregating materials, some collection points including Public Recycling Sites also process one or more materials on site to reduce volume/ increase density to optimize load weights and transportation efficiency. This approach is essential to ReUse Corridor material logistics because access to large processors are limited. The Black Diamond facility will bale cardboard and Coalfield is evaluating other processing equipment like shredders and densifiers to streamline material handling for targeted materials accepted at the Black Diamond facility.

Consolidation by Equipment

Rightsizing trash/recycling containers improves consolidation at the generation point. Swap out a small dumpster for a larger one or replace dumpsters with waste or cardboard compactors to reduce hauling frequency and costs.

ICI Material Consolidation

Some ICI establishments bulk waste, recyclables, and even by-products on-site to improve operating and transportation efficiency (e.g., baling, compacting, dehydrating, incinerating, and other methods).

Strategically Located Consolidation Points

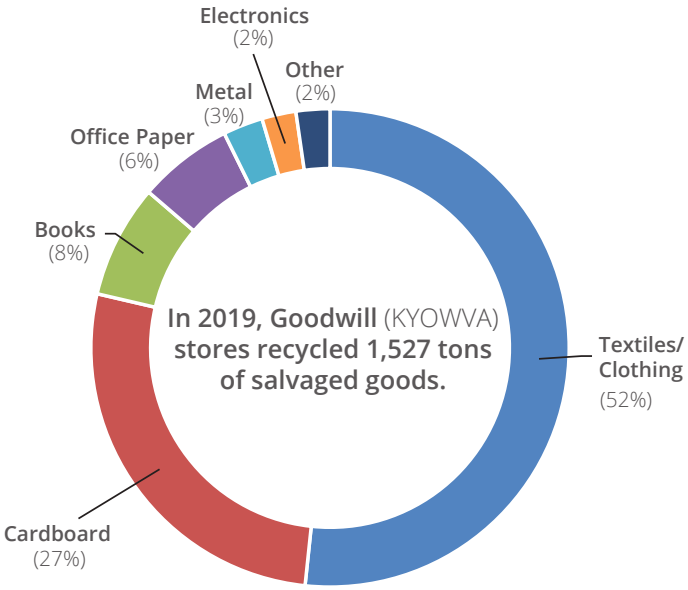
1. Serve peak generating areas
2. Expand recycling opportunities/access to underserved generators
3. In rural landscapes, are located in regularly visited areas shopping/food centers
4. Near traffic corridors that assure safe, efficient inbound and outbound traffic flow
5. Are sited based on a facility siting assessment considering operational, environmental, and site development requirements like permitting and project financing.
6. Are monitored and secured by staff and/or video surveillance, security fences, etc.

Goodwill Industries (KYOWVA) **Highlights**

Goodwill Industries of KYOWVA Area, Inc., founded in 1973, has nine retail stores in West Virginia and Kentucky and an online store. Goodwill offers job training, education, and job-finding skills to those with disabilities or other disadvantaging conditions and provide counseling – individual, family, and group – as well as credit counseling services and homebuyer education programs. Goodwill (KYOWVA) **recycling efforts divert over 2.5 million pounds of the materials from the landfill each year.**

Goodwill (Kyowva) **Materials Management & Circular Economy**

Goodwill (KYOWVA) is a material consolidation point that performs some intermediate processing like baling carboard and textiles – an exciting example of a versatile and circular business model that embraces responsible materials management. This non-profit retail store provides significant economic and social value to the ReUse Corridor and beyond. Goodwill applies the "**Kaizen Process**" – A management process originating from Japan that seeks to continually improve all business functions and processes while involving all employees of the organization. Goodwill operates as a hybrid intermediate processor because it aggregates, separates, and even processes certain material (i.e., baling cardboard). Goodwill is one of the largest ReUse Corridor Partner recyclers. Coalfield and the ReUse Corridor Partners are exploring synergies with Goodwill (KYOWVA) to improve logistics and to advance SMM/CE initiatives.



MRF and Large Intermediate Processors

Processing large quantities of mixed and separated commodities originating from residential and ICI generators is made possible by intermediate processing technologies and equipment, like those operated at large Material Recovery Facilities (MRFs). The ability to process **mixed recyclables**, including plastic, glass, and metal containers and paper, has significant implications on material transportation: one truck/route collects many different materials. This makes recycling easy for generators, encourages participation and increases diversion.

MRFs and large intermediate processors like scrap recyclers and regional organics processors (large compost facilities) separate compatible commodities from trash and aggregate and/or process them before transport to primary processors and manufacturers.

MRF

- High-throughput facility
- Manual labor & technologies for separating mixed recyclables
- Material densification (e.g., baling)

Metal / SCRAP Recycler

- Metals aggregation
- Metals sorting by type
- Metals crushing and/or shredded

Regional Organics Processors

- Food depackaging (if applicable)
- Food waste mixing or slurrying
- Food dehydration
- Digestion/composting

Material Recovery Facilities (MRFs)

MRF refers to mid to large-scale recyclables processors that have emerged around the U.S. to process mixed recyclables originating from residential curbside programs. MRFs are expensive to build and operate and usually located in or near one or more cities where scale justifies heavy capital investments (e.g., $15M - $20M+). **MRFs are critical to regional material management initiatives because they serve as primary markets.** Processing and marketing contracts are executed between the MRF and the cities, towns, solid waste authorities, and haulers delivering recyclables that are processed and marketed by the MRF to next-stage material refineries and processors and manufacturers. MRF's may provide rebates or discounted tip fees for recyclables based on sales values back to the generators, usually tied to a consumer price index (CPI).

Athens-Hocking Recycling Center, Inc. is the only MRF serving the ReUse Corridor accepting mixed or single-stream or recyclables. The Athens-Hocking Recycling Center, Inc. is a 501c3 nonprofit organization that provides collection and recyclables processing to greater southeast Ohio, the northern boundary of the ReUse Corridor. This MRF processes 5,000 to 6,000 tons of metal, glass, plastic containers, cardboard, and paper each year using manual labor, sortation technologies, and processing equipment.

Athens-Hocking Recycling Center Economic Benefit

- **28 full-time employees**
- **14 part-time employees.**

Huntington, WV and Ashland, KY are located about 90 miles from the Athens-Hocking Recycling Center – direct-hauling loose recyclables to this MRF is cost-prohibitive. Developing comprehensive recycling programs in dense urban areas of the ReUse Corridor is connected to developing intermediate processing capacity, MRFs, and similar processing solutions to improve logistics and lower collection and transportation costs.

Material	Percent Composition	Average Annual Tons
Cardboard	54.0%	2,874
Mixed paper	29.2%	1,554
Glass	7.4%	394
Plastic 1-7	4.3%	229
Office paper	2.6%	138
Steel	1.5%	80
Aluminum	0.9%	48
Total	**100%**	**5,317**

Full-Scale MRF

Traditional MRF. Can be scaled to actual throughput. For 50K to 75k TPY MRF[1]:

Building Space Requirement: 30,000 SF – 50,000 SF.

Capital Equipment Cost: $15M – $20M

Processing Cost per Ton: $70 – $80

Jobs Created: (~2) Managers/Supervisors
(~5) Technicians/Operators
(~10) Laborers

Photo Credit Closed Loop Commodities Group

Mini MRF

Recent technology consolidating traditional MRF functions to service a 12k–15k TPY throughput:

Building Space Requirement: 15,000 sq. ft.

Capital Equipment Cost: $2.0 – 2.2 million

Processing Cost per Ton: $80 – 95

Jobs Created: (1) Managers/Supervisors
(2) Technicians/Operators
(8) Laborers

Mobile MRF

Mobile sort station. Throughput will vary by usage but can reach up to 10k TPY:

Building Space Requirement: 5,000 sq. ft.

Capital Equipment Cost: $0.6 – 1.0 million

Processing Cost per Ton: Varies by throughput

Jobs Created: (1) Managers/Supervisors
(1) Technicians/Operators
(4 – 6) Laborers

Photo Credit Closed Loop Commodities Group

[1] Estimates based on Baseline scenario as reported in: Metro Waste Authority, HDR. (2018). Materials Recovery Facility (MRF) Feasibility Study. https://resource-recycling.com/resourcerecycling/wp-content/uploads/2020/06/December_2018_Board_Packet-23-94.pdf

4.3 SINGLE STREAM MATERIAL VALUES

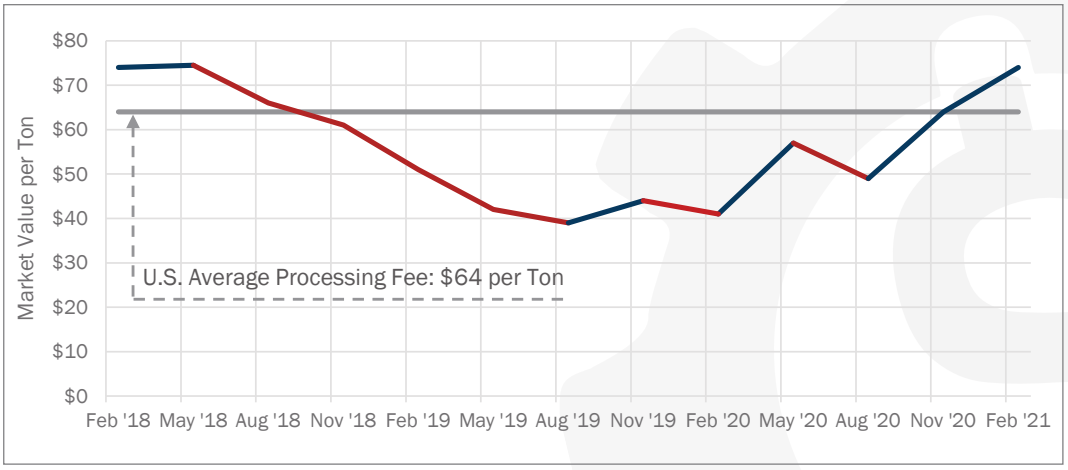
Commodity values for mixed recyclables processed by MRFs and other recovered materials fluctuate significantly based on regional and global market conditions. The drop in material values when China and other countries restricted U.S. imports beginning in 2018 was significant but showing signs of recovery, **Figure 4–2**. While MRFs do not create the **DEMAND** for recycled feedstocks, MRFs supply the manufacturing sector that shapes commodity values.

NOTICE

Volatile commodity values and rapidly escalating waste and recycling costs magnify the potential value in shifting toward proactively managing Appalachia's material resources.

The revenues from material sales rarely offset recycling program costs, so it is essential to optimize material logistics at collection, transportation, and intermediate processing stages, so transportation costs do not erode material values.

Figure 4–2 Single-Stream Material Market Values (2018-2021)



Sources: recyclingmarkets.net; The Recycling Partnership. (2020). The State of Curbside Recycling.

4.4 TRANSPORTATION

Optimizing material transportation may be the most critical challenge for the ReUse Corridor to grow a materials-based economy. However, it is possible to overcome transportation distance and cost barriers by targeting the recovery of in-demand materials, expanding consolidation and intermediate processing capabilities, and direct-hauling to local manufacturers. Common waste and recyclable collection and hauling arrangements include subscription with private haulers, hauling contracts between local governments and haulers, public collection service, and self-haul by residents and businesses.

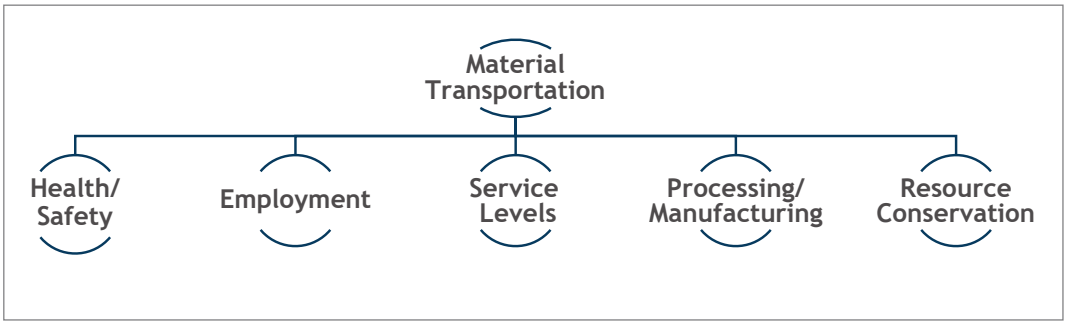
Transportation Solutions demand a holistic, integrated approach because goods and material transport is interconnected to broader regional priorities like health, wellness, employment, and resource conservation, **Figure 4–3**. Additionally, transportation efficiency is connected to service levels, infrastructure, equipment, policy, participation, and the distances traveled to perform material collection, hauling, consolidation, and processing – the details matter. While it might not seem like the container (trash can or dumpster) at a residence or business is that big of a transportation-deal, it is. The container size and type can dictate the collection vehicle, storage capacity, and how frequently the service is provided to the generator to empty the container and prevent overfilling . Waste, recycling, and reuse services directly influence miles traveled, efficiency, transportation impacts, and the bottom line, which is usually a trash bill.

5-Year Planning OBJECTIVE

1. **Collaborate with material generators, transporters, processors, and manufacturers to solve logistics challenges**
2. **Optimize existing public recycling sites and similar material consolidation sites**
3. **Add new consolidation and intermediate processing facilities**
4. **Evaluate mixed processing (MRF) to serve the Huntington (WV) – Charleston (WV) – Parkersburg (WV) area**
5. **Continually evaluate transportation equipment and operating arrangements at existing and new material collection sites to improve logistics: aggregation, processing (e.g., baling), backhauling, and equipment-sharing.**

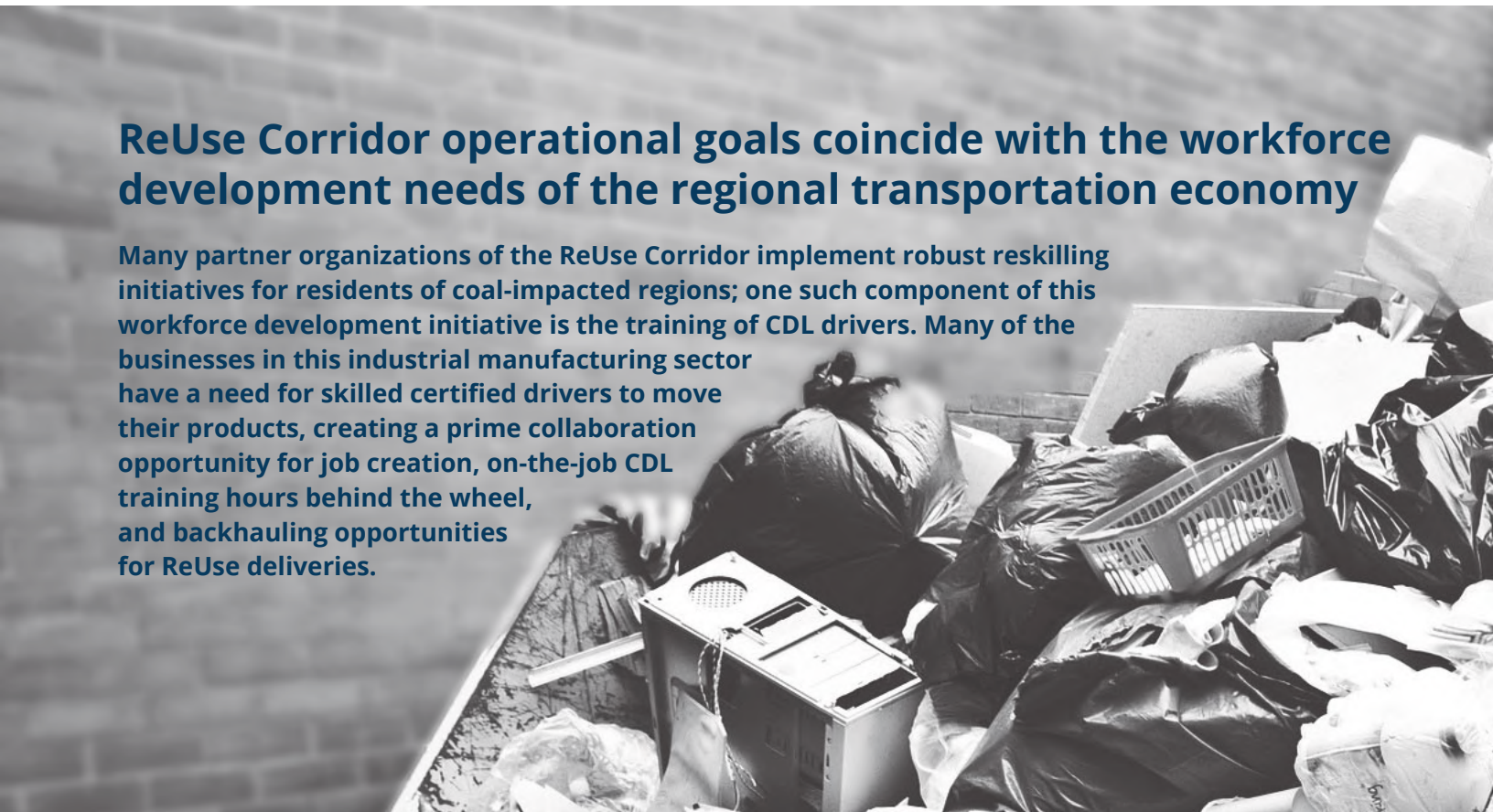
Improving the transportation system for trash, recyclables, and other materials generated by the ReUse Corridor is an exciting business proposition. It is impossible to divert materials from a landfill without investing in transportation infrastructure and employment to perform the collection, consolidation, and intermediate processing along the new material supply chain. This makes a solid case to spur economic development by providing comprehensive collection and hauling services to the residential sector and to ICI customers to achieve shared-interest material recovery/reuse/manufacturing objectives.

Figure 4–3 Material Transportation Interconnectedness



ReUse Corridor operational goals coincide with the workforce development needs of the regional transportation economy

Many partner organizations of the ReUse Corridor implement robust reskilling initiatives for residents of coal-impacted regions; one such component of this workforce development initiative is the training of CDL drivers. Many of the businesses in this industrial manufacturing sector have a need for skilled certified drivers to move their products, creating a prime collaboration opportunity for job creation, on-the-job CDL training hours behind the wheel, and backhauling opportunities for ReUse deliveries.



ReUse Corridor Partner Transportation

The ReUse Corridor Partners are beginning to cooperate to solve transportation challenges in increased recycling/reuse opportunities. Coalfield, The Neighborhood Association, Rural Action, and Goodwill (KYOWVA) collectively operate about 10 box trucks that manage materials to and from public recycling sites and events. Where opportunities exist, equipment is shared, or other logistics details are worked out to benefit transportation services and recycling/reuse programs. Some salvaged materials from public recycling sites and ReUse Corridor Partners are hauled over 100 miles one-way to an outlet. The Athens-Hocking Recycling Center provides collection and processing services to infrastructure simultaneously and manages large quantities of recyclables originating from relatively dense suburban and urban centers along Route 50 and others, making transportation, even for recyclables, pretty efficient.

Strategies to Improve Material Transportation Efficiency

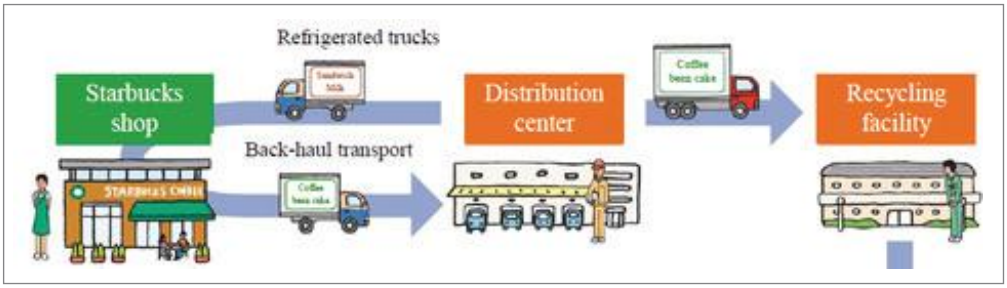
- Consolidation to increase the capacity of storage/shipping containers
- Densification to achieve maximum outbound load weights.
- High-capacity vehicles (compaction, volume, and maximum gross vehicle weight (GVW)
- Optimal collection/hauling routes (design and rightsized service levels)
- Minimal distance between collection and next-stage processing
- Overlap cross-economy opportunities between workforce development, training, materials transportation and processing, and logistics planning and technology solutions.

Backhauling

Empty backhauling, sometimes called “deadheading,” is a freight industry challenge with financial and environmental impacts. Many states report that about **50% of trucks travel empty** on return trips. Empty backhauling is higher in states with imbalanced trade flows - high goods consumption and relatively

small manufacturing sector. Since additional freight hauling capacity and transportation networks are needed for ReUse Corridor material collection, processing, and product distribution, this leaves a significant opportunity for backhauling. Filling vehicles for the return journey cuts unit costs for logistics while reducing emissions.

Figure 4–4 Backhauling Recyclables & Reusable Materials



Participation Rates & Logistics

How many households in the Appalachian ReUse Corridor participate in recycling? Are services provided at-the-door of a home, or are recyclables and hard-to-recycle items driven voluntarily to a drop-off site?

Participation Rates for waste and recycling services include:

1. The percentage of customers using a collection service, and
2. The amount of material collected per customer.

Participation Quality refers to how well the generators comply with the requirements, like separating the correct recyclables from trash. All three aspects of participation have an enormous impact on collection points, routes, and transportation efficiency.

Under traditional waste schemes, 20 to 40 percent of household customers may "opt-out" of securing trash service. This option contributes to littering, dumping, or theft-of-service and can increase costs for the customers who do pay for trash and/or recycling services. Increasing participation in recycling (and waste disposal) programs is achievable by establishing levels of service that meet customer needs.

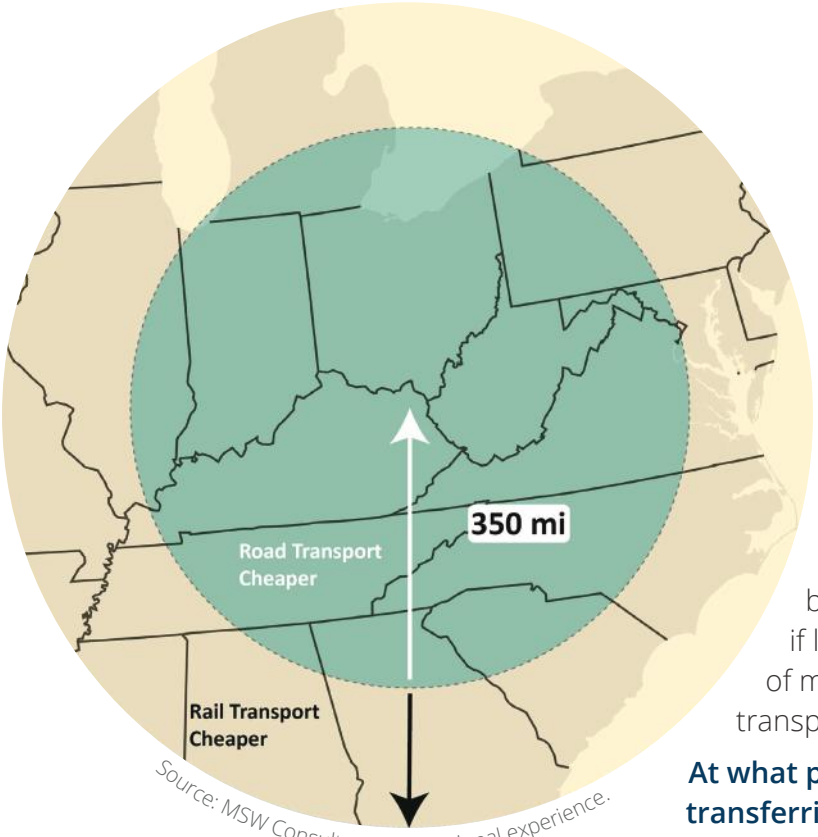
Figure 4–5 West Virginia State Rail Plan

Road Versus Rail – Material Transportation Cost Dynamics

Waste-by-rail and intermodal transportation solution (trucks-rail-ships) is growing in the U.S. in response to large regional landfills and waste-to-energy facilities replacing local dumps. A robust railroad network connects the ReUse Corridor and Ohio River Valley. The state of West Virginia and cities like Huntington, Parkersburg, and Charleston have rail access, **Figure 4– 5**. The Black Diamond facility, poised as

5-Year Planning OBJECTIVE

Inventory the current level of service offered in peak generating areas and rural areas. Develop a list of comprehensive recycling (and waste) services designed to achieve ReUse Corridor diversion targets and implement the enhanced levels of service to the extent feasible.



Source: MSW Consultants professional experience.

Figure 4–6 Road Versus Rail Logistics

a strategic centerpiece for ReUse Corridor materials management, is immediately adjacent to CSX railroad and a nearby rail transload facility. Connecting the Black Diamond facility to rail service by spur or nearby transload site might be economically feasible in the future if large and predictable quantities of materials are consolidated and transported long distances.

At what point do the economics for transferring waste, construction and demolition materials, and recyclable commodities favor rail transport? Answering this question requires comparing the pricing at various disposal/processing options and sites and determining the logistics and cost for transporting waste and/or other material from your site. Processing material on-site for easy handling (e.g., baling) creates the option for truck transport to a rail transload site. Rail becomes more economically feasible than roadway trucking over a greater distance. Generally, 350 miles is the threshold where rail transportation is more cost-effective than truck transport, excluding the cost of disposal or processing.

4.5 GAP ANALYSIS (Transportation)

ReUse Corridor Partners are beginning to collaborate to improve the performance of Public Recycling Sites and events and are exploring opportunities to share equipment and resources to improve material recovery and transportation efficiency.

Collection and transportation costs are a primary barrier facing recycling programs that can be overcome with planning, designing material recovery programs using best practices, sharing resources and equipment, and leadership. Since the ReUse Corridor initiative is in the early stages of ramping up material diversion and converting recovered materials into new products, it will have to strategically pick its battles and priorities.

WHERE WE ARE
TRANSPORTATION

- **The ReUse Corridor and Greater Appalachia** do not have adequate comprehensive waste/recycling/reuse programs, and do not enjoy the benefits of economies of scale that reduce material manage costs and yield economic development opportunities.
- **The Athens-Hocking Recycling Center** facilitates collection and material transportation logistics for southern Ohio, but much of the ReUse Corridor does not have access to mixed processing capabilities.
- **Interconnected Factors Magnify Transportation Challenges** for waste and recyclables: small quantities, distance to next-stage processors, low-capacity equipment/vehicles, limited recycling participation, vehicles, program design, policy, economies of scale, and others.
- **Manufacturing Corridor** material processing and transportation capabilities and freight companies serving the ReUse Corridor are potentially important partners for solving material logistics but this has not been explored.
- **Large Quantities of Recyclables** are not being recovered from peak generating areas (e.g., dense urban areas) and peak generators (e.g., large ICI establishments). This creates an opportunity to design and implement efficient and economically viable material recovery and transportation systems.
- **ReUse Corridor Partners'** growing network includes public recycling sites, scrap yards, and manufacturers exploring material processing and transportation capabilities and opportunities to work together.

WHERE WE WANT TO BE
TRANSPORTATION

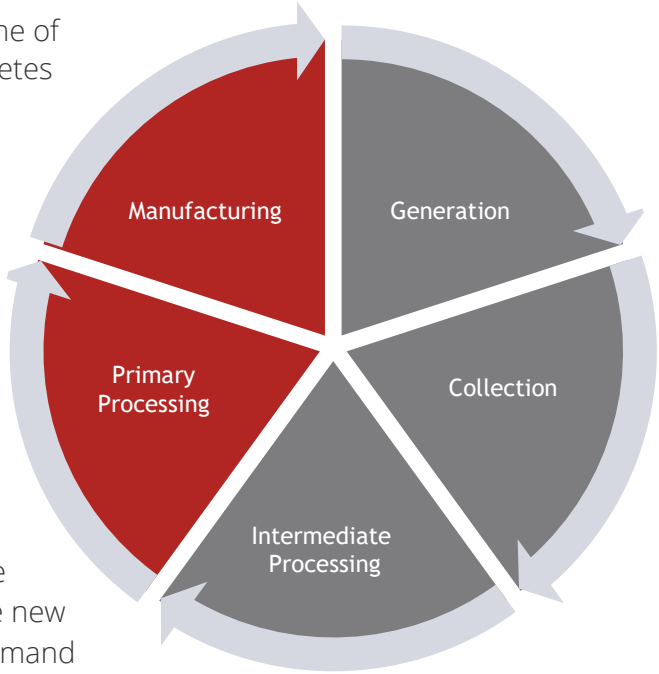
- **A Significant Boost** in comprehensive waste/recycling/reuse programs serving the ReUse Corridor and greater Appalachia that enhance scale, improve logistics, lower unit costs for transportation and the cost per ton for materials management.
- **Expertise** in waste and recyclables/reuse collection systems and logistics is applied to existing and proposed material recovery programs to optimize performance, so transportation costs are not an insurmountable barrier or unnecessarily passed on to generators/customers.
- **Existing** recycling, reuse, and waste programs, equipment and service levels are rightsized to improve material transportation efficiency.
- **Maximum Outbound Load** weights of compatible targeted materials are distribution is to the nearest next-stage processor (which might be a manufacturer).
- **ReUse Corridor Partners**, intermediate processors, manufacturers, haulers, and intermodal agencies (trucking – rail – maritime) are continually working together to plan strategically and overcome transportation barriers, ultimately reducing the unit cost of logistics.
- **Empty Backhauling** is decreased by adding recyclable/reusable goods on return routes as a cost-effective measure to maximize diversion, promote economic growth, and minimize transportation emissions and other roadway impacts (e.g., traffic and road surface damage).
- **A Comprehensive GIS Inventory** of material generators, collectors, haulers, intermediate processors, and manufacturers is leveraged to optimize the flow of materials from recovery to the production of new products.
- **Funding Mechanisms** are established, and strategic investments are made for transportation planning and capital improvements in collection, transportation, and processing infrastructure to optimize logistics, create jobs and reduce emissions.
- **Collection System Optimization** allows for the delivery of affordable, comprehensive collection services and increased participation that reduces litter, reduces illegal dumping, and diverts more materials away from landfill disposal.

HOW WE GET THERE
TRANSPORTATION

- **Evaluate, Optimize, and Rightsize** existing material recovery and hauling programs.
- **Develop** local, and region-specific collection and route plans to streamline routes, schedules, and equipment utilization. Expand capabilities for material aggregation, sortation, and transportation.
- **Embrace** the grass-roots programs, energy, passion, and shared interests among ReUse Corridor Partners and prioritize material collection, hauling, and processing optimization as a collaborative effort.
- **Implement** equipment-share, cost-share, and resource-share arrangements that maximize cooperation and community building and accelerate advancing ReUse Corridor initiatives and programs.
- **Implement Sustainable**, equitable funding mechanisms for waste and recyclables collection, transportation, processing and marketing services that utilize full-cost accounting, fully offset costs, and fairly allocate service and transportation fees to generators/customers.
- **Rightsize** transportation equipment and services. Align collection "levels of service" for generators (i.e., customers) for trash and recycling to optimize performance. Fine-tune the type, methods, and frequency of collection services to achieve waste disposal and recycling goals.
- **Reinforce** the delivery of comprehensive waste, recycling/reuse, processing, transportation, and manufacturing services with economically, socially, and environmentally responsible implementation documents including: guidelines, policies, ordinances, and waste / recycling / reuse collection, processing service contracts.
- **Develop** technical assistance programs to teach local governments, businesses, and other stakeholders on how to plan, design, implement and operate material recovery and transport programs that maximize diversion while minimizing cost.

5 | MATERIAL DEMAND: Processing & Manufacturing

5.1 DEMAND – THE FOUNDATION OF SUCCESSFUL MATERIALS MANAGEMNT



Material **DEMAND** is the economic engine of successful circular economies – it completes the loop. Since the ReUse Corridor is a manufacturing corridor, demand for materials to make products is high.

This Strategic Plan emphasizes the critical timing and present need to embrace **active sustainable materials management** as a proactive strategy and action-oriented response to the global waste/recycling market crisis, COVID-19, waste-industry dominance, and recession. Leverage SMM/CE to manage escalating disposal and recyclables processing costs, reduce impacts from landfill reliance, encourage new economic development, and stabilize demand by recovering "critical" materials essential to product manufacturing. Increasing demand through circular material management strategies **PUTS THE PEOPLE OF APPALACHIA FIRST** through workforce development and sustainable employment opportunities created through material recovery.

Demand determines collection and processing feasibility and logistics and sets material values. Current market conditions and other factors justify investments in circular material strategies to grow U.S. and ReUse Corridor demand for recovered materials:

Global Demand for U.S. scrap, non-ferrous metals, and other recyclables is significantly down. The International Trade Commission reported the value of all scrap exports from the U.S. to China fell in the first quarter of 2019 from US$ 1.235 billion in 2018 to US$ 539 million.

Stringent Material Quality Specifications, both domestically and globally, have created a critical need to recover cleaner recyclables and salvaged goods and/or to include sorting and processing technologies that achieve industry tolerances for contaminants.

Many "Critical Materials" used by the manufacturing sector are imported from other countries or extracted through mining and similar activities in the Appalachian region.

Demand Sites for Recyclables are primarily located out of the region. Many materials from rural and curbside recycling programs are distributed to MRFs, transfer stations, and processing facilities and ultimately exported out of the region for final processing and manufacturing into new products.

Collaboration among ReUse Corridor partners and the manufacturing sector could yield significant benefits for the overall performance and economic opportunity by creating solutions for material logistics, particularly because of the scarcity of large material processors serving the region

5.2 RE-MEASURING "VALUE" TO SHAPE DEMAND

Significantly increasing **DEMAND** for recovered recyclables and reusable materials is not possible without effectively communicating its **VALUE**. How much unrealized potential value will be disposed with the 125+ million tons of municipal solid waste landfilled by West Virginia, Ohio, and Kentucky over the next five years?

Financial constructs and incentives can be used to re-assign "value," making recycling and circular material management an attractive financial proposition. Many European countries implement significant landfill assessments that push disposal costs over $100 per ton, produce diversion rates over 40 percent, and create a large revenue stream invested in environmentally and economically beneficial programs. These programs maximize material resource recovery and mitigate and remediate environmental damage. Many European countries divert 20-30 percent more waste than the U.S. to make new products.

Countries and cities worldwide are developing strategies to advance circular economies to create revenue, avoid disposal costs, provide employment opportunities, reduce emissions, and realize other benefits. Interesting case studies presenting the value of SMM/CE are emerging, **Table 5–1**.

Table 5–1 Circular Value Case Studies

Case Study	Description	Benefits
Online Marketplace, Austin TX[1]	Users web-post materials to arrange purchase/ free removal Direct partnership with events for material recovery	2014-2019 (5-year) 400 tons diverted $638,000 marketplace trade value 960 MT CO2e avoided Network of 400 local businesses/organizations 600+ business transactions
Palm Fronds to Livestock Feed, Phoenix AZ[2]	City partnership with a private company to divert palm fronds and mix with unsellable dates to produce livestock feed.	~ 34,000 tons diverted annually ~ $10M in annual sales and 12 jobs created 5-year savings of 27.2B gallons water and 5,800 acres of farmland preserved
Electronics Refurbishment/ Repair, Chicago IL[3]	CoreCentric Solutions works to recover, repair, and resell commercial and consumer electronics, especially customer 'defect' returns.	In 2017 recovered 2M+ parts, 700,000 products. Estimated $35M annual revenue[4] Products at 20-50% discount over OEM parts
Magnet Recycling & Remanufacturing, San Marcos TX[5]	Urban Mining collects and remanufactures waste magnets, competing with magnets made from imported rare earth metals	Estimated 25 FTE[6] Raised over $20M in funding 11 tons CO2e avoided per ton of product

[1] Municipality-led circular economy case studies. Climate-KIC. https://www.c40.org/researches/municipality-led-circular-economy. 2019
[2] https://www.ellenmacarthurfoundation.org/case-studies/palm-fronds-to-cattle-feed-valorising-a-costly-waste-stream. 2021
[3] https://www.corecentricsolutions.com/company/sustainability/. 2021
[4] https://www.zoominfo.com/c/corecentric-solutions-inc/356173294. 2021
[5] https://www.ellenmacarthurfoundation.org/case-studies/finding-rare-earth-elements-above-ground-not-underground. 2021
[6] https://pitchbook.com/profiles/company/124659-01#overview. 2021

Re-valuing recycling/reuse involves a shift from measuring the **linear flow** of traditional waste management and "cost of disposal" to calculating the extent linear flow (virgin products ➡ disposal) has been **minimized**, and the **restorative flow** (recycled/reuse ➡ recovery) has been maximized, **Figure 5–1**.

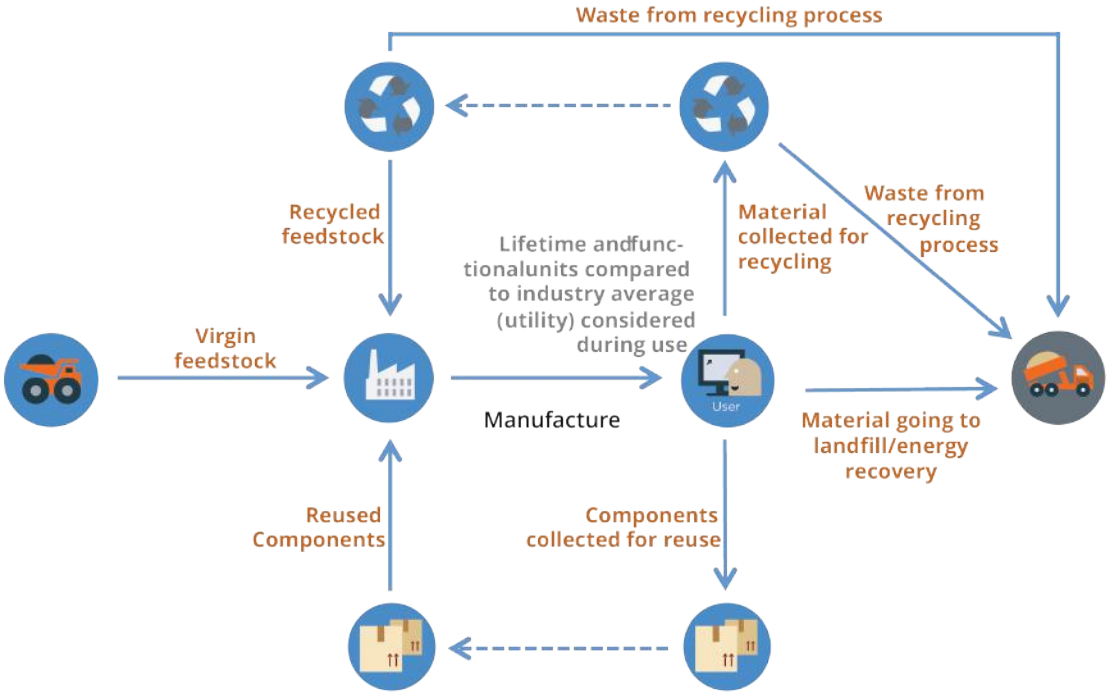
CRITICAL QUESTION

Is "**recycling**" expensive and inconvenient or a game-changing opportunity to put the people of Appalachia back to work while preserving scarce resources and the natural landscapes that so many enjoy?

Measuring Restorative Material Flow

Residents, businesses, and stakeholders must believe that converting wastes to products is an essential strategy for economic development in the region. Transform how we think about waste, so the public and private sector increase demand for comprehensive waste/recycling/reuse/manufacturing services. Demand from generators/customers for beneficial materials management services is required to grow the supply of recycled feedstocks at sufficient quantities to help stabilize demand by the manufacturing sector.

Figure 5–1 Measuring Restorative Material Flow



Source: Ellen MacArthur Foundation.

Visualizing & Communicating Benefits

Shaping demand for recyclables and reusable materials through a circular economic model requires engaging the community and stakeholders around shared interests, like thriving and resilient communities, and protecting the natural resources of Appalachia. Leveraging shared interests, like agreement on the highest priority materials to recover and cycle through the Appalachian economy, makes it possible to align best practices, strategies, policies, and initiatives as a foundation for sustainable materials management.

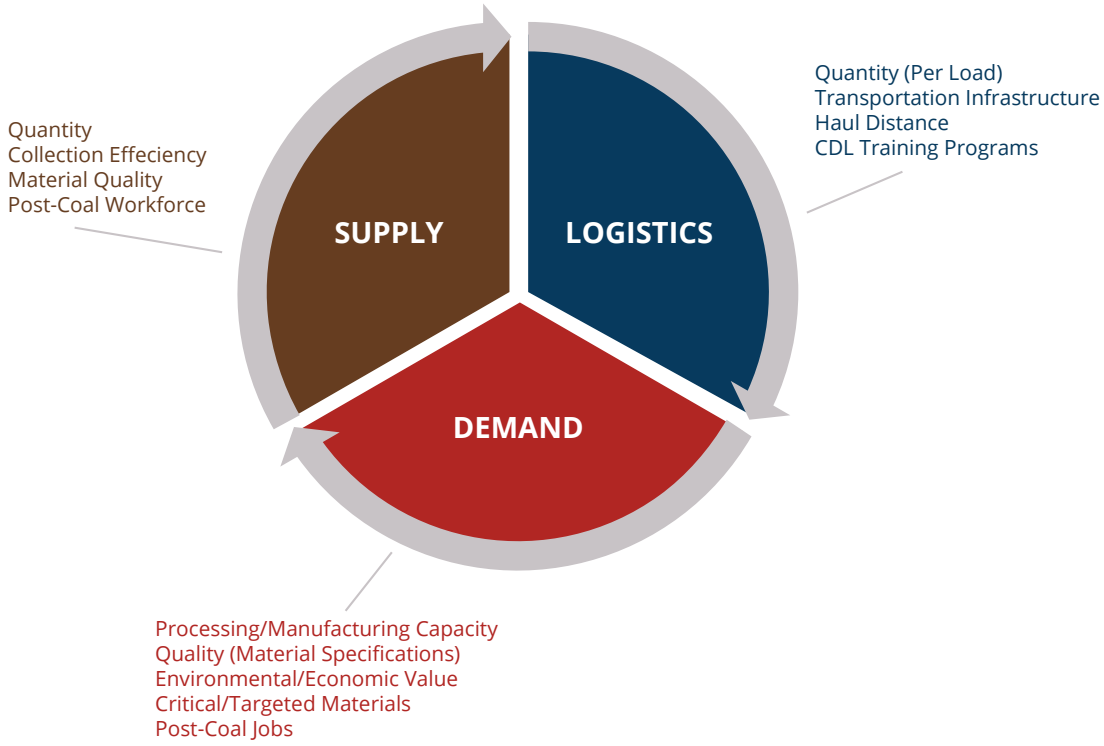
5.3 OVERCOMING DEMAND BARRIERS

How do we build upon the circular material programs and initiatives advanced by Coalfield, Rural Action, the Neighborhood Association, and other ReUse Corridor partners to realize a bigger economic benefit from SMM/CE? Overcome these barriers to increase demand for recyclables and reusable materials:

- Competition with affordable, convenient disposal
- Competition with "critical" virgin materials used by manufacturers that are available locally, imported, and may not be easily replaced by recoverable secondary raw materials
- Entrenched beliefs, attitudes, behaviors, political dispositions
- Regionalized/consolidated private waste industry
- Logistics or transportation inefficiencies that escalate costs
- Building a regional-scale supply-demand inventory

Since comprehensive waste and recycling programs do not dominate the ReUse Corridor, there is significant opportunity to add recycling programs, improve recycling performance, and increase total material diversion. Overcoming barriers to build demand in the ReUse Corridor for secondary raw materials (i.e., recyclables) requires a concerted, long-term engagement process to connect the recovered supply to local manufacturers. Implement economically feasible strategies to recover the supply of recyclables/reusable materials, solve logistics, and link the supply of secondary raw feedstocks to regional manufacturers. Yes, this means optimizing the circular supply chain from the generators to producers as an interconnected strategy to reduce wasted costs and maximize economic benefits, **Figure 5–2**.

Figure 5–2 Relationship: Supply-Logistics-Demand



Demand by Primary Processors & Manufacturers & ReUse Corridor Partners

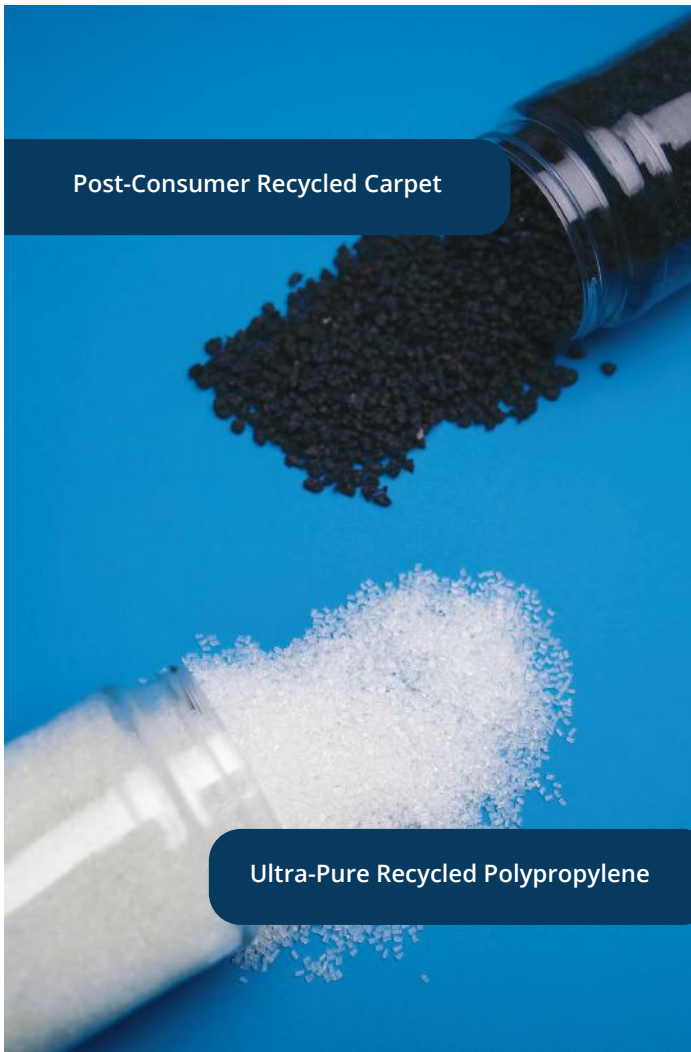
Material demand is created by primary processors and manufacturers requiring raw materials or feedstocks to operate and produce new products. Some organizations operate as primary processors and manufacturers. Their distinction from intermediate processors is important. Intermediate processors like recyclables drop-off sites and MRFs consolidate materials. They are critical to logistics, but they are not the primary drivers of material demand that shape recovered and virgin materials' economic value.

Primary Processors (Demand)

Convert material into useable form and function for manufacturers. In this context, processing is not limited to material aggregation. It includes processes that change the characteristics of the recovered material (e.g., shredding, melting, pelletizing, extrusion, forming, chemical processing, and other methods). Primary processors and manufacturers can, in some cases, be one and the same, for instance, a compost site or anaerobic digester.

- Plastics recyclers/refineries
- Steel mills
- Pulp, paper, packaging manufacturers
- Compost sites
- Anaerobic digestion facilities

PureCycle Technologies (PureCycle) is a primary processor centrally located within the ReUse Corridor in Ironton, Ohio. PureCycle converts recovered plastics (polypropylene) back into ultra-pure-recycled propylene (UPRP). This process creates pure, compatible plastic feedstocks for manufacturing. Built in 2020, PureCycle has a demand for recovered polypropylene from the region. PureCycle may serve as a

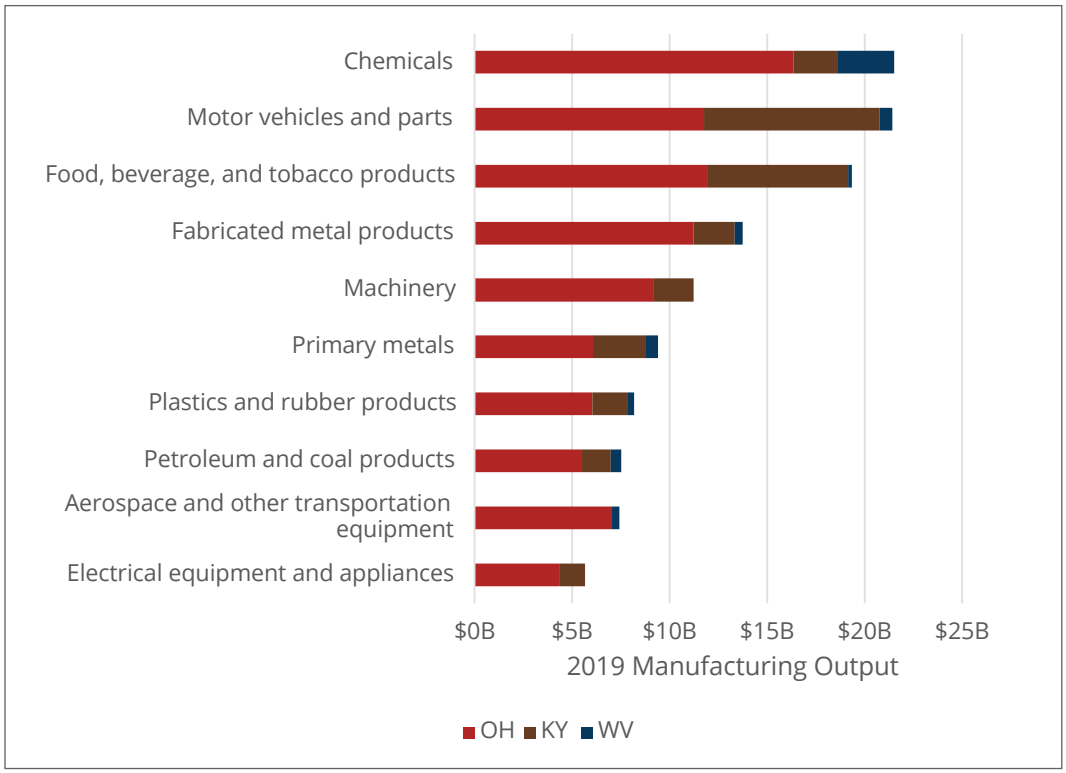


primary and intermediate processor with some capacity to aggregate plastics (not limited to polypropylene) and benefit ReUse Corridor plastic recovery and logistics.

Manufacturers (Demand)

Use processed materials to make products. Some manufacturers perform primary processing on site. **Manufacturers are in the ultimate position of choosing between virgin and recycled materials.** ReUse Corridor manufacturers shape the demand and value of virgin and secondary raw materials. Manufacturers rely on inbound supply chains of virgin-raw materials and recycled feedstocks to support the production of new products. Supply contracts meet supply needs with various suppliers of the feedstocks required for production. Manufacturing statistics for WV, OH, and KY are are useful in benchmarking current manufacturing efforts and establishing links and gaps between material supply and demand on a regional scale, **Figure 5–3**.

Figure 5–3 Manufacturing Output for OH, WV, KY (2019)



Note: A zero quantity indicates the output for the sector did not rank in the top 10 for the respective state in 2019. Source: National Association of Manufacturers.

ReUse Corridor Partner (demand). Programs by Rural Action, Coalfield, The Neighborhood, and a growing list of ReUse Corridor Partners are connecting supply to demand circularly and organically by coalescing around a vision to conserve resources while creating economic development.

WOOD

Wood recovery to make wood products by Coalfield, Rural Action, and the Neighborhood Association.

PLASTICS

Plastics recovery to make jewelry, COVID-19 face masks, planters, and other products by Rural Action/Zero Waste events, AHRC. PureCycle conversion of recovered polyethylene back to pure feedstock for manufacturers.

TEXTILES

Textiles and salvaged goods recovered by Goodwill and shared with the local region while providing jobs and high-value beneficial services.

WORKFORCE

People facing occupational barriers to employment gain valuable development in career certifications, workplace experience, and financial diversity. Material recovery to production demands expanding and developing new skillsets in logistics and manufacturing to be leveraged across dynamic economies.

Employment Opportunities

- Planning
- Collection
- Transportation
- Logistics
- Processing
- Manufactuirng
- Sales
- Fiancing
- Technology

5.4 CRITICAL & TARGET MATERIALS

Systematically increasing the supply of recyclables to decrease reliance on virgin materials requires alignment between the **critical materials** inkling virgin and recycled materials used by product makers and manufacturers (demand) with the **targeted materials** (supply) generated and collected by public recycling sites, ICI sector recyclers, and curbside programs.

5-Year Planning OBJECTIVES (DEMAND)

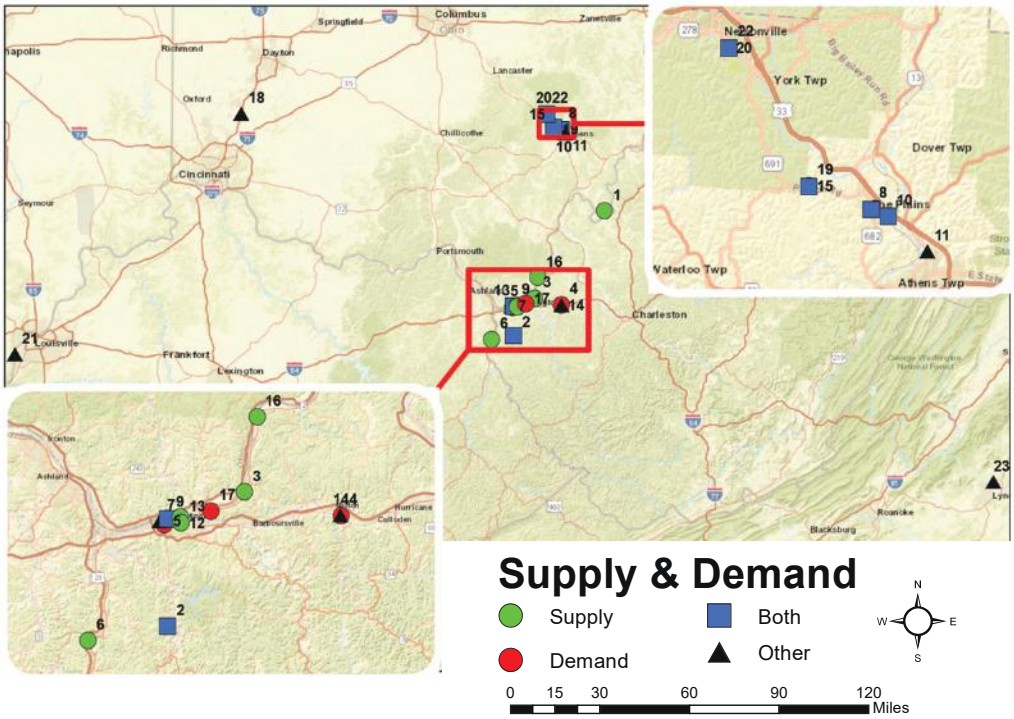
Reshape ReUse Corridor demand by systematically and continuously:

1. **Complete a demand inventory of primary processors and manufacturers. Quantify the demand for virgin and secondary raw materials, confirm material specifications, confirm processing-equipment-infrastructure needs, and identify barriers and opportunities.**
2. **Replace virgin materials with recovered materials in regional manufacturing processes.**
3. **Put the people of Appalachia first through workforce development and new employment opportunities through increased Appalachia-circular-demand for recovered materials by primary processors, artisans, makers, and large manufacturers while minimizing recovered material exports out of the region.**
4. **Leverage demand sites including primary processors and manufacturers to solve logistics barriers, including distribution of compatible materials directly to the demand sites.**
5. **Communicate the value and economic benefits of recycling, reuse, and circular materials management to regional stakeholders.**

Critical Materials or Critical Raw Materials (Demand) – A term, within the circular economy context, referring to raw virgin materials and secondary raw materials (recycled materials) essential to a stable, secure supply of materials for product manufacturing. Most critical materials used by the manufacturing sector are virgin. Critical materials, like rare earth metals, are at risk of supply constraints, have environmental implications, are financially costly or volatile, and may be difficult to substitute due to unique properties or economic reasons.

Target Materials/Targeted Materials (Supply) – Generally, a term referring to materials including recyclable commodities targeted for diversion from landfilling (or other forms of disposal) through recycling and reuse. In the context of this Strategic Plan and within the Appalachian Reuse Corridor, targeted materials were identified through surveys of ReUse Corridor Partners. They were largely based on the common materials generated, already being collected and diverted, and having processing capacity in the region for those materials.

The ability to align supply and demand at ReUse Corridor scale can be facilitate by inventorying and mapping suppliers and manufactures similar to the preliminary supply-demand developed with a small number of ReUse Corridor Partners, **Figure 5–4**.



1	Constellium Rolled Products Ravenswood, LLC	7	Cabell County Solid Waste Authority	13	MacKenzie-Dow Furniture	19	Zero Waste Program with Rural Action
2	Elmcrest Farm	8	Zero Waste Program with Rural Action	14	The H.T. Hackney Co.	20	ACEnet
3	Alcon	9	Habitat for Humanity of the Tri-State	15	Athens-Hocking Recycling Centers	21	Valicor Environmental Services, LLC
4	Metal Center Recycling	10	Zero Waste Event Productions	16	Alcon	22	Zero Waste Program with Rural Action (Miltin, LLC)
5	Valicor Environmental Services, LLC	11	ACEnet	17	Metal Center Recycling	23	The H.T. Hackney Co.
6	SOGEFI USA	12	Marshall University Sustainability Department	18	Valicor Environmental Services, LLC		

Reuse Corridor Target Materials

Determining which materials to target for diversion from landfills is a science that begins with inventorying the material collection points, processors, and manufacturers. **Target Materials** were identified during the development of this Strategic Plan based on stakeholder engagement efforts involving ReUse

Corridor Partners and interested stakeholders, **Table 5–2**. Additional high-value materials will be identified by continually evaluating changing market conditions. Some Target Materials, including plastics, organics and electronics are broken down into material subcategories, **Figures 5–4, 5–5, 5–6**. Material subcategories can influence collection, processing, and material specifications and are an important consideration in aligning supply to meet demand site requirements.

Table 5–2 Target Materials

Materials	Recoverability	Potential Supply	Potential Demand	Special Considerations
Cardboard	High: sortable, compactable.	High: Generation is increasing due to online shopping.	Baled cardboard: $30 to $100/ton.	Consolidations sites can add balers to improve logistics
Electronics	Medium: Heavy, bulky.	Medium-High: Ample supply but illegal and landfill disposal competes with recovery	Some intermediate processors like Goodwill and Atlas Metals Recycling, WV but no local de-manufacturers.	Prone to illegal dumping and contains hazardous materials. Contains high-value metals.
Organics	Medium: Yard trimmings bulky. Food waste is wet, dense, and odorous.	High: yard trimmings and food represent 30% of the waste stream.	Organics diversion required to achieve aggressive residential diversion rates (e.g., over 30%). Compost facilities are circular: recover, grow plants, sell.	Local/regional compost facilities are limited.
Plastics	Low-medium: Lightweight, high-volume, many types	Medium to high: Plastics represent over 18% of landfilled materials. Generation is growing, particularly plastic packaging.	Clean, separated plastics sales values are extremely high (e.g., .20 to .70 cents per pound. PureCycle has demand for polypropylene	Cost-prohibitive to haul long distances without processing (e.g., baling, shredding, pelletizing) Mixed plastics recovery prone to contamination
Textiles	High: Sortable, reusable, compactable, shreddable.	High	Reusability facilitates local supply-demand centers like Goodwill.	Versatile for reuse and new products

Figure 5–4 Plastics Material Subcategories

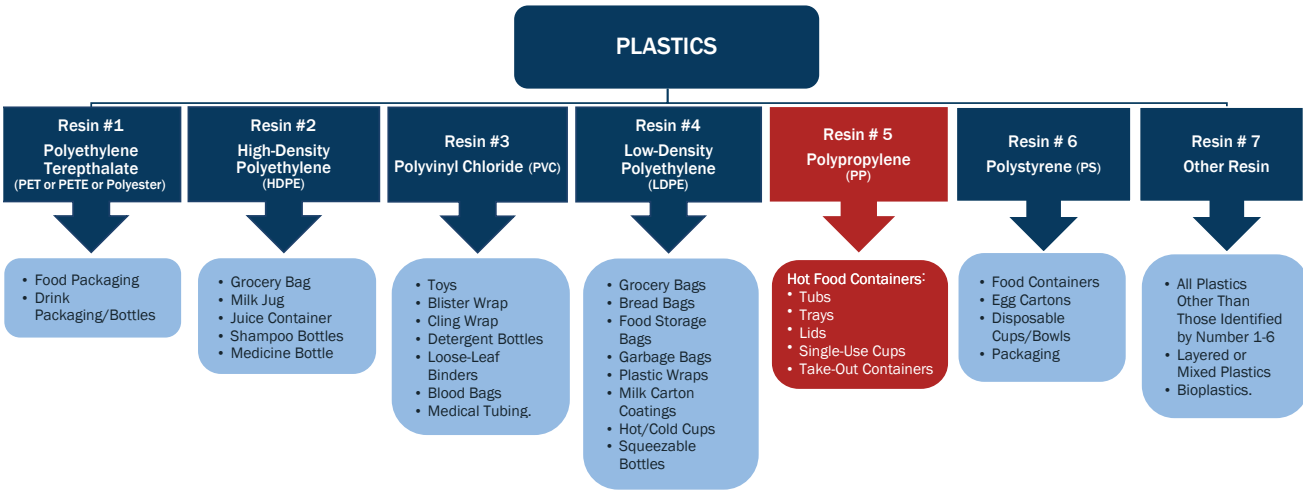


Figure 5–5 Organics Material Subcategories

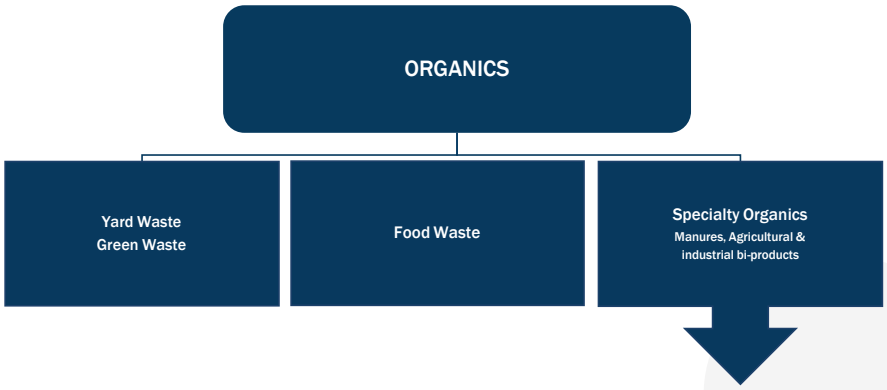
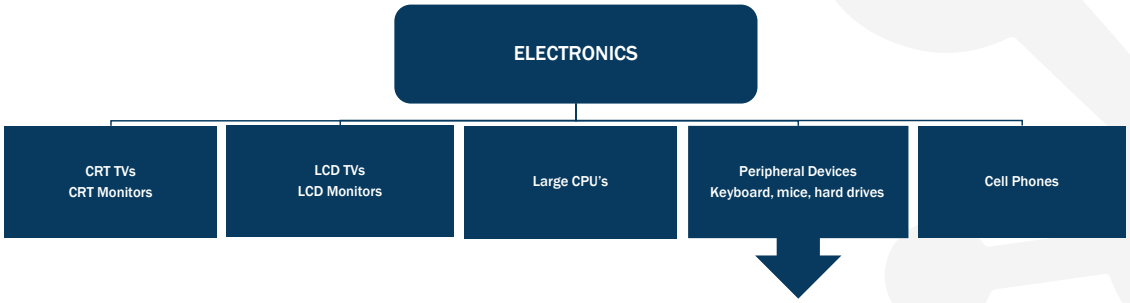


Figure 5–6 Electronics Material Subcategories



Organics Demand and Initiatives

Developing local and regional compost facilities to increase demand for organics deserves special mention. Properly sited and operated compost facilities are a strong business case:

1. Food waste/yard waste represent 30 percent of the disposed waste stream, making the potential "avoided cost of disposal" significant.
2. Compost facilities charge receiving and processing fees for inbound organics (revenue)
3. Compost facilities charge fees processed organic products (revenue)
4. Compost sites are in high demand by residents and businesses for material processing and products
5. Compost facilities can be operated circularly through their unique on-stop-shop of diverse services and products (revenue + circular benefits)

Blended Soils	**Mushrooms**
Compost Mixes	**Specialty Products**
Enriched Topsoil	**Vegetables**
Mulch	**Plants, Shrubs, Trees, Flowers**
Substrates	**Lawn/Aesthetic Field Turf**

Through a **USDA Specialty Crop Grant**, WCEDA investigated opportunities to enhance the production and consumption mushrooms classified as specialty crops in the ReUse Corridor. Funds were allocated to identify a facility to pilot test mushroom production and to support continued education and mushroom production at Wayne County Schools. WCEDA is pursuing Abandoned Mine Lands (AML) funds to develop a regional composting capability and resource processing center in Mingo County West Virginia.

Regional sales data confirms mushroom markets are strong, particularly for oyster mushrooms and shitakes. Mushrooms are probable targets to pilot test and possibly expand to commercial-scale production as part of ReUse Corridor initiatives and connected with compost facility development.

WHERE WE ARE
DEMAND

- **The Demand for Virgin and Secondary Raw Materials** by primary processors and manufacturers is unknown, at least in the context of centralized planning to advance ReUse Corridor initiatives.
- **An Additional Supply of Recycled and Reusable Materials** is readily available, but far greater quantities of clean materials need to be captured and connected with local/regional demand sites. This untapped supply represents an opportunity to stabilize demand by replacing a portion of virgin materials used in product manufacturing.
- **There is Local/Regional Demand** for specialty products like polyethylene but limited local/regional demand for commonly generated recyclable and organics like yard trimmings and food waste.
- **There is an Available Post-Coal Workforce** that is ready to engage with a circular economy but require workforce development and developed occupational systems to leverage and expand their skillsets.

WHERE WE WANT TO BE
DEMAND

- **A People-First** transformation of materials management where the people of Appalachia actively shape and grow the demand for recovered materials and the essential services, products, learning, and economic, social, and environmental opportunities of SMM/CE.
- **Increase** local/regional product reuse and manufacturing of targeted material within the ReUse Corridor.
- **Increase workforce** development and training for the employment opportunities related to increase product reuse and remanufacturing and new product manufacturing.
- **More** circular and ReUse Corridor-captive supply-demand cycles and models are utilized. Recycled products, after local/regional consumption, are captured again and remade into new products to grow economies.
- **Demand** sites like primary processors and manufacturers are leveraged to improve logistics and support the economic feasibility of additional/new material recovery by bypassing long-haul to MRFs and exporting recovered materials to the extent feasible.
- **Local and Regional Policy** and implementation documents increase demand for recyclables and reusable materials.
- **The Workforce Vacuum** left by coal and similar mining industries is mitigated by circular economy employment opportunities, catalyzing old infrastructure and resources to empower local communities through the strength of occupational diversity.

HOW WE GET THERE
DEMAND

- **Create** a continuous, adaptive, engaging, and action-based process that is an all-in commitment to leverage SMM/CE and is congruent with broader economic, social, and environmental initiatives embraced by the Appalachian regional community.
- **Inventory the ReUse Corridor Demand Sites**, including primary processors, manufacturers, and smaller-scale product manufactures, to locate, quantify, and understand the specifications and capacity for each demand site serving the region.
- **Steer Policy** and implementation document development in shape and align demand for recovery and manufacturing of recovered materials at the local, regional and at state level.
- **Leverage** preexisting federal, state, and local workforce development training programs to help prepare a ready local workforce to engage with the operations, logistics, and processing of the ReUse Corridor.

6 STRATEGIC ACTIONS

6.1 ReUse CORRIDOR PATHWAY FORWARD

This Strategic Plan represents an essential action that Coalfield Development and the ReUse Corridor Partners have taken to expand their reach and impact through sustainable material management and circular economy (SMM/CE). This Strategic Plan highlights the recycling-reuse-makerspace success stories and sustainable culture established by passionate ReUse Corridor Partners while acknowledging that the path forward to reshape the economic landscape through circular materials management requires far greater involvement by the people, businesses, and stakeholders in Appalachia.

Perhaps the most challenging task is connecting on common ground to shift belief systems, attitudes, knowledge, behaviors, and material management practices that have historically prioritized the disposal of both wastes and valuable commodities. The supply and demand for recovered materials have been inventoried and enhanced over the 5-year planning period to spur economic growth.

SUSTAINABLE MATERIALS MANAGEMENT (SMM)	**SUPPLY-SIDE:** Improve efficiency of generators, collectors/haulers, processors, and logistics. Rightsize service levels and equipment that capture supply of clean targeted materials. Deliver material directly to local manufacturers, even bypassing collection points and MRFs when viable.
CIRCULAR ECONOMY (CE)	**DEMAND-SIDE:** Inventory primary processors/manufacturers to assess demand. Work strategically with manufacturers to align targeted materials, logistics, processing, manufacturing, and ReUse Corridor initiatives. Leverage circular materials management to boost economic development in Appalachia.

Build SMM/CE Planning & Management Capacity

There is limited centralized planning and management capacity allocated and specialized for SMM/CE, particularly at the ReUse Corridor scale. Consequently, proposed Strategic Actions aim to grow planning and management capacity as a foundation for measuring SMM/CE program performance and developing skillsets and workforces to effectively plan complex material management systems at a regional scale.

Strategic Action Objectives

Strategic Actions apply to Coalfield Development, ReUse Corridor Partners, and regional stakeholders with a vested interest in economic, social, and environmental growth and stewardship. The planning priorities and initiatives identified during Strategic Plan development are provided to encourage a continuous process to engage people of Appalachia to increase their capacity and capabilities to manage materials and collect, transport, process, and manufacture recovered materials into valued products.

These Strategic Actions support the **5-year Planning Objectives** for the ReUse Corridor included in previous sections:

5-Year Objectives MATERIALS MANGEMENT

1. **Expand materials management competency, capability,** and capacity to more effectively and actively plan, manage, and measure the material management system's performance.
2. **Influence a regional culture shift toward "active materials management."**
3. **Leverage best practices and sustainable funding mechanisms** for integrated waste, recycling, and reuse programs.
4. **More cost-effectively divert greater quantities of recoverable materials** away from disposal to ReUse Corridor manufacturers, makerspaces, artisans, and other product makers.

5-Year Objectives MATERIAL SUPPLY Collection & Generation

1. **Improve existing ReUse Corridor Partner collection programs** by rightsizing the equipment, methods, and levels of service.
2. **Evaluate/implement enhanced and new comprehensive curbside waste/ recycling programs** starting with these three (3) ReUse Corridor Partner cities: Huntington (WV), Ashland (KY), and Athens (OH). Apply best practices and sustainable funding mechanisms to increase the levels of service while keeping costs affordable.
3. **Identify/inventory the "peak ICI generators."** Target and collaborate with ICI establishments producing large quantities of recoverable materials. Leverage the inventory process to build synergies among ReUse Corridor Partners, businesses, and manufacturers.

5-Year Objectives MATERIAL LOGISTICS

1. **Collaborate with generators, transporters, processors, and manufacturers and leverage demand sites to solve logistics.**
2. **Optimize existing Public Recycling Sites and material consolidation sites.**
3. **Add new consolidation and intermediate processing capabilities/facilities** (e.g., baling).
4. **Evaluate mixed processing (MRF)** to serve the Huntington (WV) – Charleston (WV) – Parkersburg (WV) area.
5. **Continually evaluate transportation equipment and operating arrangements** at existing and new material collection sites to improve logistics and rightsize operations: aggregation, processing (e.g., baling), backhauling, and equipment-sharing.

5-Year Objectives MATERIAL DEMAND

1. **Complete a demand inventory** of primary processors and manufacturers.
2. **Replace virgin materials with recovered materials in regional manufacturing.**
3. **Put the people of Appalachia first through workforce development** and new employment opportunities by primary processors, artisans, makers, and large manufacturers.
4. **Leverage demand sites** by sending truckloads of compatible recovered materials directly to demand sites, bypassing other processors when feasible.
5. **Communicate the value of SMM/CE** to increase demand for recycling, reuse, and circular materials management services.

Reframe Materials Management Conversations

Creating valued products through successful recycling and reuse programs is an amazing story. One that engages and connects the Appalachian ReUse Corridor communities to traditional values and economic opportunity. Successful implementation of the proposed Strategic Actions requires hands-on activities, projects, financial investments, and workforce development. The core objective and requirement is to engage more people in recycling, reusing, making products, and circularity. To do this involves reframing “recycling” to unveil the massive economic opportunities for service providers, manufacturers, individuals, and communities of Appalachia. This involves conversations about these and related messages:

Landfilling Recoverable Commodities Ends the Material Life Cycle.

As soon as a material is buried in a landfill, its potential to create jobs and to minimize environmental harm is over. Disposal ends the potential economic opportunities, innovation, and infrastructure that emerges through collecting, transporting, processing, manufacturing, marketing, and managing recovered materials.

Recycling is Not Cost-Prohibitive nor Expensive.

Minimize comparisons of recycling/reuse to waste disposal; implement integrated materials management systems using best practices and sustainable funding mechanisms. Most people and businesses are willing to pay their equitable share to manage materials responsibly.

Actively Managing Materials is Good for Business and Local Communities.

Many towns, cities, and counties in Appalachia leave trash and recycling services up to the generators and the private waste industry. It's often assumed generators properly manage materials and that private-sector competition will assure fair or "equitable" trash bills. However, this method has not produced good results and equitable rates. Litter, illegal dumping, and cost-inequity persist and plague rural and urban waste management programs across the country. Many residential and commercial generators do not secure comprehensive waste or recyclables collection services, and the inefficiency and impacts are passed on to burden-paying customers and communities.

Economic Diversity of Materials.

The types and scale of material recovery programs and the products made can be extremely diverse. Grassroots recycling efforts can be immensely successful in rural areas where materials are captured and converted to artwork and crafts sold at local fairs. Mid-size programs can capture and convert targeted plastics to resins for 3-D printing. More extensive programs can divert metals, plastics, and paper to feed the manufacturing sector and cycle these products through consumers in the region.

6.2 STRATEGIC ACTIONS

The Strategic Actions presented in the following tables are organized into five (5) categories, with the higher priority Strategic Actions presented first. The responsible party and conceptual timeframe (years) for implementation are shown. Coalfield Development is listed as the responsible party for most Strategic Actions; however, it is intended that through the formation of a Steering Committee and with collaboration among ReUse Corridor Partners, manufacturers, and stakeholders the actions and responsibilities will evolve dynamically over the 5-year planning period.

Planning & Management

Expand centralized capacity and skillsets to advance ReUse Corridor SMM/CE initiatives to grow existing programs, develop planning solutions like enhanced material logistics, and connect the supply of recovered feedstocks with demand.

Data Management

Develop uniform data management and measurement standards for materials. Build and leverage databases like Geography Information Systems (GIS) to manage assets and material generation (supply) and processing (demand) information spatially at a regional scale.

Existing Reuse Corridor Programs

Initially prioritize investments to enhance existing programs, including the Black Diamond Facility, Public Recycling Sites, makerspaces, and upcycling programs. Improve operating performance using best practices, rightsizing, and sustainable funding mechanisms to divert more, cleaner material at a lower cost per ton.

New Reuse Corridor Programs

With the goal to recover materials from peak generators and peak generating areas, evaluate and implement **new** programs including

1. Comprehensive waste and recycling services in peak generating areas (e.g., dense suburban and urban areas, via curbside recycling),
2. Recovering targeted materials from peak generators, including large ICI establishments, and
3. Expand the network of public drop-off sites to include more locations and more recycling events.

Engagement/Education

Develop a comprehensive and sustained SMM/CE engagement and education campaign that spans all levels of local and state government. Standardize public-facing information and create a brand for SMM/CE and ReUse Corridor initiatives. Use standard labels and signage with simple text plus symbols and/or pictures to influence proper material handling, improve the quality of captured materials, and shape buy-in at a regional scale. Share the recycling and circular economy story and brand and highlight economic opportunity across diverse media platforms.

Strategic Action Timeline

YEARS 1 & 2 (2021 – 2022)

Prioritize optimizing and rightsizing existing material recovery and makerspace programs like the Black Diamond facility, public recycling sites, and the product manufacturing and distribution programs operated by Coalfield Development, Rural Action, The Neighborhood Association, Athens-Hocking Recycling Center, and other partners. Inventory the regional market to identify supply-demand opportunities and synergies that improve material recovery, logistics, and economic growth. Embrace collaboration, education, and engagement to share best practices among the emerging and growing list of active ReUse Corridor Partners and to engage regional stakeholders.

YEARS 3 – 5 (2023 – 2025)

Continue to enhance existing programs but shift priorities to the evaluation and development of new programs that can significantly enhance diversion from landfilling and increase the use and production of products using recycled feedstocks by primary processors and manufacturers serving the ReUse Corridor. Target recovery and recyclable material manufacturing of material originating from peak generation areas (dense suburban and urban areas) and peak generators (i.e., large ICI establishments).

Planning & Management (PM) – Strategic Actions

Action #	Action	Action Description	Responsible Party	Timeframe
PM.1	**Steering Committee**	1) Form small (e.g., 6-member), diversely represented Steering Committee to advance SMM/CE, ReUse Corridor initiatives. 2) Expand to three (3) Steering Committees, one for each state (WV, OH, KY) to benefit from their respective states' unique experience. 3) Include representation from materials management, generation/ collection, processing/manufacturing, and distribution.	Coalfield Dev. Rural Action Neighborhood Assoc.	2021/ Ongoing
PM.2	**Confirm Staff Roles & Workforce Development**	1) Confirm in writing, staff roles, expertise, capacity to advance SMM/CE programs. Prioritize the Black Diamond facility, Public Recycling Sites, and makerspace programs operated by Coalfield Development. 2) Confirm division of responsibility (DOR) by ReUse Corridor Partners, reviewing these quarterly. 3) Fill in staffing and skillset gaps through Workforce Development & outsourcing to the private sector. 4) Learn and apply CE business models.	Coalfield Dev. Rural Action Neighborhood Assoc.	2021/ Ongoing
PM.3	**Earmark Annual SMM/ CE Budget-Expense Allocations for Planning and Projects**	Confirm financial obligations for staff salaries/benefits, equipment, and expenses with prioritization to rightsize staffing, service levels, and equipment to advance/optimize approved SMM/CE initiatives.	Coalfield Dev. Rural Action Neighborhood Assoc.	2021/ Ongoing
PM.4	**Management/Planning/ Technical Services - Outsourced/Contract**	Confirm outsourced planning/technical services needed to advance SMM/CE initiatives. Submit grants to offset eligible costs.	Coalfield Dev. Rural Action Neighborhood Assoc.	2021/ Ongoing
PM.5	**Uniform Material Specifications, Definitions & Best Practices**	Align material definitions, specifications, targeted materials, and best practices for storage, collection, transport, and material quality to meet next-stage processor requirements. Produce universally applied specifications conveyed by standardized education materials among ReUse Corridor Partners.	Coalfield Dev. Rural Action Neighborhood Assoc.	2022/ Ongoing
PM.6	**Sustainable Funding Mechanisms**	Evaluate/implement sustainable funding mechanisms to enable expansion of ReUse Corridor initiatives and economic benefits. Leverage grants with prioritization to purchase materials, equipment, and infrastructure that optimize collection, hauling, and product making.	Coalfield Dev. Rural Action Neighborhood Assoc.	2022/ Ongoing

Data Management (DM) – Strategic Actions

Action #	Action	Action Description	Responsible Party	Timeframe
DM.1	**Black Diamond Command/Control Ctr.**	Establish Coalfield Development, through its Black Diamond Facility and staff, as the SMM/CE Command & Control Center. Act as a centralized data management center to monitor existing programs while tracking and inventorying information on a regional scale.	Coalfield Dev.	2022/ Ongoing
DM.2	**Benchmark/Monitor Material Management System Performance**	Benchmark performance and measure annual progress of ReUse Corridor Programs: costs, jobs, material quantities, recycling rates, commodity values, and GHG. Track metrics monthly and generate publicly available annual Performance Reports.	Coalfield Dev. Rural Action Neighborhood Assoc.	2022/ Ongoing
DM.3	**Supply-Demand Inventory & GIS Database**	Inventory the location and attributes of material generators and collectors (supply) and processors (demand) sites using Geographic Information System (GIS). Use the spatial data (maps) to inform and plan efficient circular material flows and improve planning capability and material logistics. Use ArcGIS StoryMaps to visually present data in real-time to communicate performance and benefits to stakeholders.	Coalfield Dev. Rural Action Neighborhood Assoc.	2022/ Ongoing
DM.4	**Host Waste or Materials "Exchange"**	In Black Diamond's and Coalfield Development's role in centralized planning, consider managing or collaborating to create a "waste exchange" - an information clearinghouse where businesses, industries, and organizations register and list available materials, including the type, quantity, frequency of availability, geographic location, and date listed. Examples: Southern Waste Information Exchange (SWIX), https://www.wastexchange.org, and Mahoning Valley Materials Exchange (MVME), https://ysu.edu/recycling/mahoning-valley-materials-exchange-mvme.	Coalfield Dev. Interested participant(s)	2022/ Ongoing
DM.5	**Implement Documents Review**	Review local and state implementation documents (e.g., ordinances and contracts) and policies governing waste, recycling, and SMM/CE. ID gaps, conflicts, and barriers for advancing SMM/CE. Develop new/revised implementation documents that leverage best practices and sustainable funding mechanisms. Share the model documents.	Coalfield Dev. Rural Action Neighborhood Assoc.	2022/ Ongoing

ReUse Corridor Existing Programs (EP) – Strategic Actions

Action #	Action	Action Description	Responsible Party	Timeframe
EP.1	**Black Diamond Facility**	1) Develop SMM/CE planning capacity and capability by adding qualified staff to provide centralized planning functions. 2) Confirm target materials for recovery at Black Diamond and align these materials with the processing capabilities and capital investments (e.g., shredding or baling) with the on-site makerspace programs envisioned. 3) Leverage Black Diamond as a pilot testing and workforce development site for SMM/CE.	Coalfield Dev.	2022/ Ongoing
EP.2	**Enhance Existing Public Recycling Sites and Events**	1) Confirm material specs for ReUse Corridor Partner facilities accepting and processing recovered materials. 2) Modify site procedures to meet specs, including material quality tolerances. 3) Work collaboratively to rightsize storage and transportation equipment and to leverage equipment-share opportunities, with the aim of collecting more clean materials while reducing operating and transportation costs. 4) Standardize lists and definitions of targeted materials and align handling procedures and educational delivery (container labels and site signage schemes for all drop-off locations).	Coalfield Dev. Rural Action Neighborhood Assoc. Participating jurisdictions	2022/ Ongoing
EP.3	**Expand E-waste Collection**	1) Collaborate with ReUse Corridor partners to target additional collection of electronics, standardizing the methods across collection events and sites to the extent feasible. 2) Establish rate schedules for items like TVs and laptops to charge customers (e.g., $20 – $50 per item) to offset the costs of processing electronics. 3) Use competitive bid processes to secure qualified haulers and processors to provide electronics collection and processing and to ensure the program is financially sustainable. 4) Evaluate feasibility of developing local electronics de-manufacturing. 5) Identify and address policy conflicts, like allowances to dispose of electronics in landfills	Coalfield Dev. Rural Action Neighborhood Assoc. Participating jurisdictions	2023/ Ongoing
EP.4	**Expand Plastic Recycling**	1) Confirm the targeted plastic subcategories that have the greatest feasibility for recovery from the ReUse Corridor for diversion to local makerspaces and larger manufacturers. 2) Evaluate the diversion of polypropylene (PP) to PureCycle along with other plastics consolidation/processing by PureCycle.	Coalfield Dev. PureCycle AHRC Participating jurisdictions	2022/ Ongoing
EP.5	**Expand Cardboard Recycling & Consider Cardboard Collection Routes**	1) Target enhanced recovery of cardboard at existing and new public recycling sites. Optimize processing/transportation by shipping baled cardboard in 53' trailers. 2) 2Evaluate/implement cardboard collection routes and sites that serve residents and businesses using packer trucks, that can each service 10-15 collection points and capture 4-6 tons of cardboard for delivery to intermediate processor to be baled prior to transport or directly to the manufacturer if compatible.	Coalfield Dev Marshall University Neighborhood Assoc. ReUse Corridor Partners	2023/ Ongoing
EP.6	**Evaluate Regional Composting Capacity**	Explore organics recovery integrated with CE opportunities like special crops production from compost. Collaborate with Marshall University and their commercial composting facility. Explore the development of additional regional composting capacity. Encourage backyard composting in appropriate residential areas.	Coalfield Dev Marshall University Neighborhood Assoc. ReUse Corridor Partners	2023/ Ongoing

ReUse Corridor New Programs (NP) – Strategic Actions

Action #	Action	Action Description	Responsible Party	Timeframe
NP.1	**Implement ICI Establishment Recycling/ Processing Programs**	Using data from the supply-demand inventory, evaluate opportunities to collaborate with the ICI peak generators in the region. Implement recycling programs and/ or material consolidation or manufacturing programs for recovered materials with interested ICI establishments.	Coalfield Dev. Rural Action Neighborhood Assoc.	2023/ Ongoing
NP.2	**Curbside Recycling Program Assessments/ Implementation**	Conduct curbside recycling assessment(s) for the Cities and urban centers interested in exploring and implementing comprehensive waste and recycling service delivery in at least three (3) urban areas such as Athens (OH), Charleston (WV), Ashland (KY), and possibly Parkersburg (WV). Curbside recycling is required to significantly grow the supply of recycled feedstocks.	Coalfield Dev. Participating jurisdictions	2023/ Ongoing
NP.3	**Expand "Network" of Public Recycling Sites**	Apply lessons learned/ best practices from the improved existing Public Recycling Sites. Identify/develop new sites to capture target materials, including those that increase recycling access in rural areas. Locate new sites near supply (e.g., dense urban areas). In rural areas, site collection points where people shop or travel frequently, and where sites can be monitored. New sites should limit targeted materials to higher-value commodities that can be kept clean and have a local/regional market.	Coalfield Dev. Rural Action Neighborhood Assoc. Participating jurisdictions	2023/ Ongoing

ReUse Corridor Education/Engagement (EP) – Strategic Actions

Action #	Action	Action Description	Responsible Party	Timeframe
EE.1	**Recycling Across America (RAA) container Labels**	Apply RAA standard labels/signage across ReUse Corridor recycling programs as a uniform education scheme with recognizable text and symbols. This will benefit material quality, participation, and awareness.	Coalfield Dev. Rural Action Neighborhood Assoc.	2023/ Ongoing
EE.2	**Form Zero Waste Education Committee**	1) Include representation from diverse entities in the ReUse Corridor. 2) Identify opportunities to improve recycling education with an emphasis on zero waste education. 3) Develop a committee to expand education capacity (e.g., identify volunteers, incentive programs, and methods to educate beyond the current efforts).	Coalfield Dev. Rural Action Neighborhood Assoc. Interested participants	2023/ Ongoing
EE.3	**Standard Zero Waste Education/Message/ Brand**	1) Media/Outreach Coordinator to lead standardized education and messaging development/distribution. 2) Develop a local brand for waste diversion initiatives (e.g., "Don't Feed the Landfill"). 3) Share standard messaging with residents, businesses, and other waste generators and stakeholders. 4) Share ReUse Corridor Partner program success, highlights, and performance metrics.	Coalfield Dev. Rural Action Neighborhood Assoc. Participating jurisdiction	2023/ Ongoing
EE.4	**Visitor Education Needs Assessment/Audits**	Seasonally assess recycling education, signage, and media needs. Identify locations, content, signage type, costs, and opportunities to improve visitor education and participation.	Coalfield Dev. Rural Action Neighborhood Assoc. Participating jurisdiction	2023/ Ongoing
EE.5	**Annual SMM/ CE Conference**	Develop, in coordination with colleges and universities, an annual SMM/CE conference that would include presentations, training, products made from recycled feedstock, SMM/CE-vendors, etc.	Coalfield Dev. Rural Action Neighborhood Assoc. Interested participants Sponsors/Donors Higher-ed Partners	2023/ Ongoing

ReUse Corridor
PARTNER PROFILES

West Virginia

Organization: Atlas Metal Recycling
Location: Ceredo, WV
Representative:
Position:
Email:
Phone: 304-781-0303
Materials Demand: metals (annual tons: unknown)
Materials Supply:
Logistical Capability: Medium

Summary: Atlas Metal Recycling is locally-owned and operated and provides retail scrap purchasing, commercial recycling, and roll-off boxes. They purchase aluminum, steel, vehicles, appliances, copper, brass, and other metals. For commercial customers, they also offer equipment reclamation and on-site cleanup.

Organization: Cabell County Solid Waste Authority (CCSWA)
Location: Huntington, WV
Representative: Mark Buchanan
Position: Executive Director
Email: buchanan7@marshall.edu
Phone: 304-412-3287
Materials Demand: textiles, cardboard, paper, electronics, plastics (annual tons: unknown)
Materials Supply:
Logistical Capability: Low

Summary: Cabell County Solid Waste Authority's recycling program began in 2011. Due illegal dumping, overfilling recycling containers, and cost for unsupervised locations, the CCSWA closed the eight drop-off recycling sites in 2017 and replaced them with a gated and monitored facility. By 2020, almost 1,100 households signed up to use the service. The following items are accepted in a single-stream system: paper, plastic bottles, metal cans, glass, and cartons.

Organization: Coalfield Development
Location: Huntington, WV
Representative: Jacob Israel Hannah
Position: Conservation Coordinator
Email: jhannah@coalfield-development.org
Phone: 304-614-8035
Materials Demand: reclaimed wood (annual tons: unknown)
Materials Supply: cardboard, sawdust (annual tons: unknown)
Logistical Capability: Medium

Summary: Coalfield Development Company operates in diverse capacities ranging from financing and planning to construction to lead and collaborate on community-based revitalization projects in the Appalachian region. Coalfield Development Company is a lead strategic partner responsible for advancing the ReUse Corridor initiative. Key responsibilities include identifying funding sources, strategic planning, securing and working with consultants, finding and collaborating with strategic partners, and advancing ReUse Corridor projects. Projects include the Black Diamond facility to serve as an integrated materials collection and processing facility, makerspace, and planning hub.

Organization: Goodwill Industries of KYOWVA Area, Inc.
Location: Huntington, WV
Representative: Alissa Stewart
Position: Executive Director
Email: astewart@goodwillhunting.org
Phone: 304-5257034
Materials Demand: textiles, cardboard, paper, electronics (annual tons: unknown)
Materials Supply: wicker baskets (annual tons: unknown)
Logistical Capability: High

Summary: Goodwill Industries of KYOWVA Area, Inc., founded in 1973, has nine retail stores in West Virginia and Kentucky and an online store. They offer job training, education, and job-finding skills to those with disabilities or other disadvantaging conditions and provide counseling – individual, family, and group – as well as credit counseling services and homebuyer education programs. The company offers recycling of paper, cardboard, and electronics to the community. Revenue from the sale of donated goods helps to support their services.

Organization: Marshall University
Location: Huntington, WV
Representative: Amy Parsons-White
Position: Sustainability Director
Email: parsons133@marshall.edu
Phone: 304-395-1264
Materials Demand: compostables (annual tons: unknown)
Materials Supply: plastics, cardboard (annual tons: unknown)
ReUse Corridor Activity Level: Medium
Logistical Capability: Low

Summary: Marshall University is a public research university with a student enrollment of 13,200. The University Sustainability Department identifies guidelines to promote the efficient use of University resources and coordinate education on campus and beyond. Marshall University implements various sustainability programs, including recycling, composting, energy management, and water conservation programs. The University Sustainability Manager participates in regular video conferences with ReUse Corridor partners to discuss materials management opportunities.

Organization: Taylor Iron & Metal Recycling
Location: Huntington, WV
Representative: Jimmy Taylor
Position: Owner/Founder
Email: timinc@ntelos.net
Phone: 304-525-6390
Materials Demand: metals, appliances, electronics (annual tons: unknown)
Materials Supply: batteries (annual tons: unknown)
Logistical Capability: Medium

Summary: Taylor Iron & Metal Recycling is a family-owned and operated scrap metal recycling center and auto parts business, which began operation in the 1950s. With a radiation gun on-site, the company determines the type of metal brought in and can, therefore, pay the best rate. Taylor Iron & Metal focuses on recycling metals and electronics.

Organization: The Metal Center
Location: Milton, WV
Representative: Allen Howard
Position: Executive Director
Email: allen.howard@themetalcenter.com
Phone: 304-390-5746
Materials Demand: metals (annual tons: unknown)
Materials Supply:
Logistical Capability: Medium

Summary: The Metal Center, established in 2013, is a full-service recycling center. They purchase both post-consumer and industrial scrap metal and provide roll-off service. The Center accepts both ferrous and non-ferrous metals, including aluminum, copper, brass, and steel. For commercial customers, they also offer brokerage services for materials between buyer and seller.

Organization: Wayne County Economic Development Authority (WCEDA)
Location: Wayne, WV
Representative: Park Ferguson
Position: Executive Director
Email: parkferg2007@yahoo.com
Phone: 304-654-4245
Materials Demand:
Materials Supply:
Logistical Capability: Medium

Summary: WCEDA, established in 1962 is a public corporation administered by a nine member Board of Directors comprised of the Governor, Tax Commissioner and seven at-large members appointed by the Governor. WCEDA has statutory authority to borrow funds from the West Virginia Board of Treasury Investments to loan to borrowers. WCEDA is charged with the responsibility to develop and advance the business prosperity and economic welfare by providing financial assistance in the form of loans and direct financing and operating leases to industrial development agencies and enterprises for the promotion and retention of new and existing commercial and industrial development. WCEDA is a lead strategic partner responsible for advancing the ReUse Corridor initiative and secured funding through ARC to develop this Appalachian ReUse Corridor strategic plan.

Ohio

Organization: Atlas Metal Recycling
Location: Athens, OH
Representative: Bruce Underwood
Position: Chief Operations Officer
Email: bruceunderwood8902@gmail.com
Phone: 740-594-5312
Materials Demand: plastics, cardboard (annual tons: unknown)
Materials Supply: compost (annual tons: unknown)
Logistical Capability: High

Summary: Athens-Hocking Recycling Centers is a 501c3 non-profit organization whose mission is to collect and process recyclable materials in southeast Ohio. They accept cardboard, paper, metals, glass, plastic bottles, and tubs collected curbside. Collection events in May and September take scrap metal. Residents can drop off electronic waste at the AHRC office.

Organization: PureCycle Technologies LLC
Location: Ironton, OH
Representative: Melissa Whitt
Position: Business Administration Leader
Email: mwhitt@purecycletech.com
Phone: 740-357-0312
Materials Demand: #5 plastics (annual tons: unknown)
Materials Supply: Pelletized plastics
Logistical Capability: unknown

Summary: PureCycle Technologies, with global headquarters in Orlando, FL, uses a patented recycling process developed by Procter & Gamble to transform plastic waste feedstock into "ultra-pure recycled polypropylene." This process closes the loop by converting waste plastic into virgin-like plastic. Phase 1, Feedstock Evaluation Unit, successfully transformed waste carpet into clear, odorless ultra-pure recycled polypropylene (UPRP). The first commercial plant, Phase II Industrial Line, is being built in Ironton, Ohio. The company expects this plant to produce over 105 million pounds of UPRP per year.

Organization: ReUse Makerspace
Location: Athens, OH
Representative: Paul Patton
Position: Social Enterprise Director
Email: paul@ruralaction.org
Phone: 740-594-5103
Materials Demand: textiles, reclaimed wood, pelletized plastics (annual tons: unknown)
Materials Supply: textiles
Logistical Capability: High

Summary: The original ReUse Industries closed in February 2020 due to financial issues. Local organizations worked to reimagine the work begun by ReUse Industries. On September 26, 2020, a new ReUse Makerspace and thrift store had a soft opening, with a parking lot recycling event. Plans include membership tiers, including access to workshop spaces. Fabrics and textiles, metal, wood, and plastics are items to be included. The Makerspace will also offer access to technical assistance and business planning to local entrepreneurs.

Organization: Rural Action
Location: Athens, OH
Representative: Ed Newman
Position: Zero Waste Program Director
Email: ed@ruralaction.org
Phone: 740-677-4000
Materials Demand: plastics, cardboard, textiles, medical equipment (annual tons: unknown)
Materials Supply:
Logistical Capability: High

Summary: Rural Action, founded in 1991, takes a community development approach in focusing on food and agriculture, forestry, zero waste and recycling, environmental education, watershed restoration, and energy. More recently, they are adding social enterprise development and local tourism. Part of their core work is growing local businesses and jobs and restoring the environment. To reach the goal of more equitable development and greater opportunities, they see a need for sustainable

systems and practices to be widely adopted in the region. A network of over 600 members throughout Appalachian Ohio are part of Rural Action, and there is substantial private sector involvement. The governing Board has members from across Appalachian Ohio and oversees a CEO with 28 full-time equivalent staff, 31 AmeriCorps members, and five AmeriCorps VISTA members. In addition to Ohio's work, Rural Action works and collaborates on other state projects, including West Virginia, Kentucky, Pennsylvania, Michigan, Tennessee, and Illinois through Zero Waste Event Productions, LLC.

Kentucky

Organization: SOAR (Shaping Our Appalachian Region)
Location: Pikeville, KY
Representative:
Position:
Email:
Phone:
Materials Demand: Low
Materials Supply: Low
Logistical Capability: Low

Summary: SOAR is a non-profit, non-partisan organization that is a champion for Appalachia Kentucky. SOAR's mission is to expand job creation, enhance regional opportunity, innovation and identity, improve quality of life and to support all those working to achieve these goals in Kentucky.

Organization: The Ashland Neighborhood Association (ANA)
Location: Ashland, KY
Representative: Renee Parsons
Position: Chief Operations Officer
Email: hopecentral2912@gmail.com
Phone: 606-315-4945
Materials Demand: textiles, pallets (annual tons: unknown)
Materials Supply:
Logistical Capability: High

Summary: The Ashland Neighborhood Association is a non-profit neighborhood association incorporated in 1986, with a 12-member governing Board of elected officers and neighborhood representatives. The National Register of Historic Places includes the Neighborhood in its listing. There are approximately 465 buildings in the ANA. ANA activities include neighborhood design, property enhancement activities, neighborhood safety programs, and other initiatives to increase communication and connectivity.

RESOURCES

Sustainable Materials Management

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Ellen MacArthur Foundation, "Circularity Indicators, An Approach to Measuring Circularity: Method, May 2015, **Circularity Indicators**

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World Business Council for Sustainable Development (WBCSD), "Circular Transition Indicators V2.0: Metrics for business, by business", February 1, 2021, **Circular Transition Indicators V2.0**

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International Labour Office, "World Employment Social Outlook - Trends 2019", Geneva, 2019, **World Employment Social Outlook**

Navigant – a Guidehouse Company and the U.S. Chamber of Commerce Foundation, "Creating a Circular Economy in the Great Lakes Region", January 28, 2020, **Creating a Circular Economy in Great Lakes Region**

V. Gill and J. Knowles, "Opportunities for Ontario's Waste: Economic Impacts of Waste Diversion in North America," The Conference Board of Canada, May 28, 2014. **Opportunities for Ontario's Waste**

Waste and Resources Action Program, "Employment and the Circular Economy: Job Creation in a More Resource Efficient Britain", London, England, 2015. **Employment and the Circular Economy**

Coalfield Development Online Store, Sustainable office essentials, home essentials, personal care, and clothing handmade in Appalachia, **https://coalfielddevelopment.square.site/**

Supply Chains

The Sustainability Consortium, "Greening Global Supply Chains: From Blind Spots To Hotspots To Action," 2016 Impact Report, **Greening Global Supply Chains**

Bernard Sinclair-Desgagné (2013), "Greening Global Value Chains: Implementation Challenges", OECD Green Growth Papers, 2013-04, OECD Publishing, Paris, **Greening Global Value Chains: Implementation Challenges** (to download the paper)

Martin Murray, "Introduction to the Green Supply Chain," The Balance Small Business, Updated January 21, 2019, **Introduction to the Green Supply Chain**

Joshua M. Pearce, "How to turn plastic waste in your recycle bin into profit," The Conversation, January 11, 2021, **How to turn plastic waste in your recycle bin into profit**

Manufacturers Marketplace, a marketplace for supply chain needs, with a searchable database that includes 140,000 manufacturers. **https://manufacturersmarketplace.us/about-the-marketplace/**

National Association of Manufacturers (NAM), a resource and advocate, which represents 14,000 member companies – from small businesses to global leaders – in every industrial sector. **https://www.nam.org/**

Organizations

Circular Economy Club (CEC). https://www.circulareconomyclub.com/location/united-states/oregon/

Summary: The Circular Economy Club (CEC) is the largest international network of circular economy professionals and organizations with over 260 CEC local chapters in over 110 countries. Non-for-profit, global and open to anyone to join the club for free.

Vision: "We envision a new era where all cities worldwide function through a circular model, setting the end of an age of waste."

Circular Flanders. https://vlaanderen-circulair.be/en

Summary: Circular Flanders is the hub for the circular economy in Flanders. The circular economy is one of the seven transition priorities set by the Government of Flanders. The core organizations of the partnership are governments, companies, civil society, and the knowledge community. Information provided includes Circular Business, Circular Cities, and case studies. The site also has excellent infographics.

Generation West Virginia, https://generationwv.org/

Summary: Because West Virginia is the only state where the population is declining, Generation West Virginia (GWV), a statewide organization, is focused on attracting, retaining, and advancing young people in WV. According to their website, they achieve this by:

- "Developing and sustaining an activated network of young people
- "Providing accessible programs and educational tools that empower and inspire young leaders
- "Identifying and communicating the priorities, motivations, and needs of the next generation of West Virginians
- "Serving as a voice and a source of action for young people to impact policy at the local, state, and federal levels"

Waste to Wealth, Institute for Local Self Reliance (ILSR), https://ilsr.org/waste-to-wealth/

Summary: The ILSR works toward its vision of "thriving, diverse, equitable communities." The purpose of the ILSR's Waste to Wealth program is to move toward a zero-waste economy and a closed-loop system of waste management. Waste to Wealth initiatives encourage the increase of local capacity and acceleration of economic development through efficient use and reuse of local resources.

West Virginia Forward, https://wvforward.wvu.edu/

Summary: West Virginia Forward began as a partnership and collaboration between West Virginia University, the West Virginia Department of Commerce and Marshall University, and has grown into a larger, statewide effort. According to the website, "So far, innovative solutions and opportunities include advancing West Virginia's workforce, business climate, educational opportunities, community development, sector growth, cybersecurity, entrepreneurship and infrastructure."

Central Appalachian Network (CAN), https://www.cannetwork.org/

Summary: CAN's mission is to develop and deploy economic strategies that build wealth in local communities, conserve natural and cultural resources, and empower marginalized communities. We work in collaboration across sectors, partnering with other non-profits, community groups, funders, educational institutions, local government, and private business. CAN actively pursues economic transition in Central Appalachian communities through a variety of economic sectors and market-based strategies, and currently focuses on: Food systems, clean energy, and creative place making.

DEFINITIONS & ABBREVIATIONS

Definitions

Definitions include common terms used in the waste and recycling industry and terms from the Solid Waste Association of North America (SWANA) Solid Waste Glossary.

Beneficial Use – Utilization or reuse of a material that would otherwise become solid waste. Examples include landfill cover, aggregate substitute, fuel substitute, or the feedstock in a manufacturing process.

Biodegradable – Describes waste materials capable of being biologically decomposed by microorganisms and bacteria. For example, organic wastes such as paper, wood, food, and plants are biodegradable; metals, glass, and most plastics are not.

Buy Recycled – Purchasing recycled products. Buy Recycled programs often emphasize the purchase of products that contain a specified or maximum level of post-consumer content and/or recyclable materials content without affecting the intended use of the product.

Buyback Center – Facility that refunds deposits on containers subject to bottle bill redemption and/or purchases recyclable materials.

Capture Rate – Ratio of the quantity of recyclable materials diverted for recovery to the total quantity of recyclable materials available for recovery. *See Diversion Rate and Participation Rate.*

Circular Economy – An all-inclusive, innovative, creative, and interactive economy designed to create opportunities through maximum feasible utilization of available resources, including physical resources, ideas, concepts, intellectual property, untapped resources, and technology.

Commercial Waste or Recyclables – Solid waste or recyclables from businesses, office buildings, stores, and markets and sometimes including institutional waste. *Contrast Household Hazardous Waste or Recyclables.*

Commingled Recyclables – Recyclable Materials designated for recycling either by (1) generators' placement with other recyclable materials mixed in a single, common container for collection, or (2) collectors' sorting and placement in a single, common compartment on the collection vehicle. *See Single Stream Recyclables. Contrast Source Separated Recyclables.*

Composting – Biological decomposition or decay of organic wastes (sometimes including mixed solid waste) under controlled conditions. Composting takes place under aerobic conditions, typically in an open pile (called a windrow) or in a tank or container (called in-vessel composting).

Construction/Demolition (C&D) Debris – Materials resulting from the construction and demolition (C&D) of buildings and other structures, including materials such as metals, wood, gypsum, asphalt shingles, roofing, concrete, rocks, rubble, soil, paper, plastics, and glass, but excluding putrescible wastes.

Contamination – Commingling of Garbage, Refuse, or other material having unsuitable physical or chemical properties with recyclable materials or organic wastes, thereby rendering the recyclable materials or organic wastes unfit for further reuse, requiring processing prior to reuse, or decreasing their value for reuse. A recycling example is paper products sullied by food. A composting example is a compost degraded by glass particles (a physical property) or heavy metals (a chemical property) present in the feedstock.

Critical Materials or Critical Raw Materials – A term often used within a circular economy context referring to raw materials that are essential to a secure and sustainable supply, including "secondary raw materials" or recycled materials, which contribute to the security of raw material supply and advance a more circular economy.

Diversion – Re-direction of recyclable materials from disposal through resource recovery.

Diversion Rate – Ratio of the quantity of recovered materials to the sum of the quantity of recovered materials plus the quantity of disposed materials. What materials are deemed recovered or disposed may vary among different local, state, provincial and national governments. "Diversion Rate" is often referred to as "recycling rate" or "recycling diversion rate." *Compare Capture Rate and Participation Rate.*

Drop-Off Center – Containers such as bins and roll-off boxes placed at collection sites designated for deposit by generators of specified materials such as recyclable materials or solid waste.

E-Scrap or E-Waste – Discarded electronic equipment including computers, monitors, printers, TVs, stereo systems, VCRs, and other personal electronic devices.

Garbage – Kitchen and table food waste and animal or vegetative waste that is attendant with or results from the storage, preparation, cooking, or handling of food materials. Compare Refuse.

Green Purchasing (or Environmentally Preferable Purchasing) – Buying environmentally preferable products or services that have a less or reduced adverse effect on human health and the environment than competing products or services that serve the same purpose, considering life cycle impacts: raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal.

Green Waste – Solid waste comprised of grass clippings, shrub and tree cuttings, and other organic wastes resulting from lawn care and gardening. See also Yard Debris.

High Density Polyethylene (HDPE) – A plastic product in which the ethylene molecules are linked in long chains with few side branches. Examples of HDPE products include milk jugs, detergent bottles, margarine tubs, and garbage containers that are often identified by the number "2" inside the recycling arrows stamped on the container.

Household Hazardous Waste (HHW) – Certain hazardous wastes generated in small quantities by homes and residences, such as batteries, paint, and oil.

Household Waste or Recyclables (or Residential/Domestic Waste) – Solid waste or recyclables originating from homes and residences. Contrast Commercial Waste and Recycling.

Incinerator – Generic term for an enclosed unit that burns Solid Waste, sometimes without energy recovery. See also Waste-to-Energy.

Industrial Waste – Solid waste originating from industrial processes or manufacturing operations.

Institutional Waste – Solid waste originating from schools, universities, hospitals, and other institutions.

Integrated Solid Waste Management (ISWM) – Environmentally and economically sound, systematic approach to solid waste handling that combines source reduction, reuse, recycling, composting, energy recovery, collection, transfer, transport, and disposal in sanitary landfills, solid waste combustors, or other solid waste disposal and processing facilities in order to conserve and recover resources and dispose of solid waste in a manner that protects human health and the environment.

Intermediate Processing Center (IPC) – Term used interchangeably with Materials Recovery Facility (MRF), or to signify MRF that not only sorts and recovers single stream and commingled recyclables (usually from residential and commercial sources) but additionally processes them into new recycled materials feedstock or recycled products. See Materials Recovery Facility (MRF).

Low-Density Polyethylene (LDPE) – A plastic material in which the ethylene molecules are linked in a random fashion with the main chains of the polymer having long and short side branches. A plastic used to make a variety of products, including sheeting, films, and packaging material that are often identified by the number "4" inside the recycling arrows stamped on the container.

Materials Recovery Facility (MRF) – Building where commingled recyclables are separated and processed (including sorting, baling, and crushing) or where source-separated recyclables are processed for sale to various markets. See Intermediate Processing Center. In a Dirty MRF, the incoming recyclable materials are co-collected and commingled with other non-recyclable portions of solid waste. See Mixed Waste Processing.

Mixed Waste Processing – Picking, sorting, and otherwise separating recyclable materials from commingled refuse and Garbage, as opposed to picking, sorting, and otherwise separating one type of commingled recyclables (such as fiber) from another type of commingled recyclable (such as containers). See Materials Recovery Facility (MRF).

MRF – (Pronounced MURF.) See Materials Recovery Facility.

Municipal Solid Waste (MSW) – A term commonly used in reference to conventional waste or "trash" and includes source-separated recyclables from households, businesses, and institutions. Refers to materials such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources, such as appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets, and cafeteria wastes. Excludes solid wastes from other sources, such as construction and demolition debris, auto bodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in municipal waste landfills or incinerators.

Organic Wastes – Solid wastes containing carbon compounds that are capable of

being biologically degraded, including paper, food residuals, wood wastes, yard debris, and plant wastes but not metals and glass or plastic. (Plastic contains carbon compounds and is theoretically organic in nature, but generally is not readily biodegradable.)

Participation Rate – Ratio of generators (e.g., individuals, households, or businesses) of recyclables materials that actually participate in a recycling program by setting out recyclables for collection during a prescribed period of time, to generators which are served by the recycling program and could participate in the recycling program. See Capture Rate and Diversion Rate.

PAY-AS-YOU-THROW (PAYT)/Variable Rates – A tiered financing mechanism for solid waste collection services that charges customers based on garbage volume (such as 32-, 64-, or 96-gallon carts) or weight to encourage recycling and discourage disposal. Variable Rates do not necessarily reflect actual operational costs but is proven to influence customer recycling efforts.

Polyethylene Terephthalate (PET) – A plastic commonly used to make containers such as soft drink bottles. PET containers are often identified by the number "1" inside the recycling arrows stamped on the container.

Polypropylene (PP) – A plastic polymer made by stringing together, or polymerizing, styrene, a building-block chemical. As a hard, solid plastic, it is often used in products that require clarity, such as food packaging and laboratory ware. Combined with various colorants, additives or other plastics, polystyrene is used to make appliances, electronics, automobile parts, toys, gardening pots and equipment. Expanded PP foam is used for cushioning and insulation and is 95 percent air.

Post-Consumer – Describes products purchased and used by consumers, then discarded or recycled, such as a newspaper that has been purchased and read, recycled, then used to make newsprint. Contrast Pre-Consumer.

Pre-Consumer – Describes feedstock used in manufacturing, fabrication, or industrial production, then discarded or recycled, comprised of scrap, trimmings, cuttings, and other post-production discards such as overruns, over-issue publications, and obsolete inventories. Contrast Post-Consumer.

Procurement Preference – Purchase of recycled products even though their price exceeds the price of similar products with less or no recycled materials content, often by creating exceptions to procurement laws or practices that require purchasing qualifying products having the lowest cost.

Product Stewardship – Appeal to all parties in a product life cycle—manufacturers, retailers, users, and waste managers — to share responsibility and costs for reducing the adverse environmental impacts of products. From a solid waste management perspective, Product Stewardship involves the actions taken to improve the design and manufacture of products to facilitate either their reuse, recycling, or disposal, as well as actions to establish programs to collect, process, and reuse or recycle products when they are discarded.

Rail Haul – Transportation of solid waste (generally long distances) by railroad.

Recyclable Material - Substance that can potentially be reused as-is or recycled into a recycled material or recycled product. See also Recycled Material and Recycled Products.

Recyclables – Materials separated, collected, and/or recovered from the municipal waste stream for sale or reuse, including metals, glass, paper, plastics, and other materials that would otherwise be disposed or processed as municipal waste. See also Recyclable Material.

Recyclables Broker – Individual or entity that acts as agent or intermediary between the sellers and buyers of recyclable materials such as metals, paper, and glass.

Recyclables Residue – Materials remaining after recycling processing or recycling has been completed. Recyclables residues are usually disposed. Residue rates or quantities are significant since most processors charge a disposal fee for residues and this can significantly reduce the value of recyclables.

Recycled Content – Portion of a product's or package's weight that is composed of materials remanufactured from a recyclable product or packaging material, including pre-consumer materials or post-consumer materials.

Recycled Material – Material that has been converted into feedstock for use in the manufacture of a new recycled product, including containers or packaging.

Recycled Products – Includes (1) products having specified percentages of their total weight comprised of pre-consumer or post-consumer recycled material and/

or secondary materials (such as certain paper products, plastic products, aluminum containers, compost, and co-compost, glass products, lubricating oils, paints, and solvents); (2) used products that are not disposed but refurbished for reuse without substantial alteration (such as refilling beverage bottles returned to a bottler, dock bumpers made of scrap tires, remanufactured laser toner cartridges, repaired office furniture, reconditioned carpet, retreaded tires, and reformatted computer disks.

Refuse – Both Rubbish and Garbage or a combination or mixture of Rubbish and Garbage, including paper, glass, metal, and other discarded matter, excluding Recyclable Materials and Yard Trash. See Garbage and Rubbish.

Remanufacture – Disassembling used products that have been recovered instead of discarded, including cleaning, repairing, or replacing necessary parts, and reassembling them for resale and reuse. Remanufacture often involves breaking down a used product into its main/core subsystems/modules and adding extensive parts and labor. Remanufacture may be distinguished from "refurbishing," which is less extensive, including renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality, or value of the used product for reuse or resale.

Resource Recovery – Recovery rather than disposal of Recyclable Materials or energy from solid waste, encompassing recycling, reuse, composting, and energy recovery.

Reuse – Use of a product more than once in its same form for the same or different purpose without substantial alteration. See Recycled Products.

ReUse Corridor – The primary project boundary delineated through this project to be targeted for enhanced material management. The area includes the manufacturing corridor located in proximity to U.S. Highway 52 within West Virginia, Ohio, and Kentucky.

Rightsize –To reduce for the purpose of optimization. Specific to waste/recycling programs, refers to improving efficiency by modifying service levels, methods, containers, equipment, infrastructure, and staffing to assure comprehensive material management services are provided cost-effectively. For example, increasing the size and/or number of collection containers (e.g., dumpsters) at a generation point for

the purpose of reducing the collection frequency and costs associated with material removal from one or more generation points.

Rubbish – Waste material other than Garbage, usually attendant to domestic households or housekeeping, and attendant to the operation of stores, offices, and other places of business. Rubbish shall include but is not limited to paper, magazines, packaging, receptacles, textile materials, excelsior, bottles, cans, and ceramic materials. See Garbage.

Single-Stream Recycling – See Commingled Recycling.

Solid Waste – Any garbage, refuse, sludge, and other discarded material, including solid, liquid, semisolid, or contained gaseous material, resulting from residential habitation; industrial, commercial, mining, and agricultural operations; and community activities. This definition may vary under diverse local, state, provincial, and national laws.

Solid Waste Disposal – The discharge, deposit, injection, dumping, spilling, leaking, or placing of solid waste on or in the land or water. This definition may vary under diverse local, state, provincial, and national laws.

Solid Waste Management – Planned and organized handling of solid waste and recyclable materials in an environmentally and economically sound manner, encompassing the generation, storage, collection, transfer, transportation, processing, resource recovery, reuse, and disposal of solid waste and recyclable materials and including all administrative, financial, educational, environmental, legal, planning, marketing, and operational aspects thereof.

Source Reduction (or Waste Reduction) – Actions taken to reduce solid waste toxicity or disposal, including (1) manufacturers' redesign and management of products and packaging to extend product life and facilitating repair, (2) consumers' reduced purchase and consumption of products that become wastes; and (3) manufacturers and consumers' reuse of products.

Source Separated Recyclables – Recyclable materials that are sorted and removed from Refuse, Garbage, and commingled recyclables by the generator or owner of those recyclable materials so that they can be collected in different containers for recycling or composting. Examples include sorting newspapers, glass bottles, metal

cans, plastic containers, corrugated cardboard, office papers, and lawn and garden wastes. Contrast Commingled Recyclables and Single-Stream Recyclables.

Special Items – Sometimes referred to as "hard-to-recycle materials," special items are materials that are routinely generated and usually require special storage, collection, processing, and transportation for recycling and/or disposal. Special items are usually targeted for recovery for the purpose of recycling and/or to assure proper handling. Examples include bulk items, tires, household hazardous waste, electronics, appliances, scrap metal, and construction and demolition materials.

Sustainable materials management (SMM) – A systemic approach to using and reusing materials more productively over their entire life cycles. It represents a change in how our society thinks about the use of natural resources and environmental protection. By looking at a product's entire life cycle (generation to product manufacturing and recovery), we can find new opportunities to reduce environmental impacts, conserve resources and reduce costs. SMM is a foundational component of circular economy.

Target Materials/Targeted Materials – Generally, a term referring to materials including recyclable commodities that are targeted for diversion from landfilling (or other forms of disposal) through recycling and reuse. In the context of this Strategic Plan and within the Appalachian Reuse Corridor, targeted materials were identified through surveys of ReUse Corridor Partners and was largely based on the common materials generated, already being collected and diverted and having processing capacity in the region for those materials.

Target Participants – Preferred generators (supply) and processors (demand) demonstrating the willingness and capacity to support the development and implementation of enhanced material management strategies.

Tipping Fee – Fee charged for accepting recyclable materials or solid waste at a solid waste management facility (i.e., transfer station, MRF, IPC, sanitary landfill, compost facility, or WTE).

Transfer Station – Facility that receives and consolidates solid waste or recyclable materials from municipal or commercial collection trucks and self-haulers' vehicles and loads the solid waste onto tractor-trailers, railcars, or barges for long-haul transport to a distant disposal facility.

Upstream Diversion – Diversion of recyclable materials that occurs prior to a specified place or time before setting out the balance of recyclable materials at the curb for collection in a recyclables collection program. An example of Upstream Diversion is a generator's source reduction, charitable donation, or delivery of recyclable materials to a buy-back center.

Waste Exchange – Organization or service that facilitates or arranges for recyclable materials or discarded materials from various generators or industries to be recycled or reused by others.

Waste Generation – Total amount of disposed Solid Waste and diverted Recyclables.

Waste Reduction – See Source Reduction.

Waste-to-Energy (WTE) – Controlled combustion of solid waste in solid waste combustors having state-of-the-art pollution controls and energy recovery therefrom. Types of Waste-to-Energy facilities include mass burn units that incinerate mixed solid waste with little or no prior separation and RDF (Refuse Derived Fuel) units that separate combustible solid waste from noncombustible solid waste prior to combustion.

Yard Debris – Yard trimmings including grass, leaves, and tree and brush trimmings from residential, institutional and commercial sources and sometimes referred to as yard waste or Green Waste.

Zero Waste – Efforts to reduce solid waste generation waste to nothing, or as close to nothing as possible, by minimizing excess consumption and maximizing the recovery of solid wastes through recycling and composting.

Abbreviations

ABBREVIATION	EXPLANATION
ARC	Appalachian Regional Commission
C.Y.	Cubic Yard
C&D	Construction and Demolition
EPA	United States Environmental Protection Agency
E-Scrap or E-Waste	Discarded Electronic Equipment
GHG	Greenhouse Gas
HADCO	Huntington Area Development Council
HDPE	High Density Polyethylene
HHW	Household Hazardous Waste
ISWM	Integrated Solid Waste Management
IPC	Intermediate Processing Center
LDPE	Low Density Polyethylene
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MTCE	Metric Tons of Carbon Equivalent
MTCO2E	Metric tons of Carbon Dioxide Equivalent
OCC	Old Corrugated Containers
ONP	Old Newspaper
O&M	Operation and Maintenance
PAYT	Pay-As-You-Throw
PET	Polyethylene Terephthalate
PP	Polypropylene
PS	Polystyrene
RFP	Request for Proposal
TPY	Tons per Year
WARM	Waste Reduction Model (EPA)
WCEDA	Wayne County Economic Development Authority
WTE	Waste-To-Energy

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