

**ENVIRONMENTAL
FINANCE CENTER**

Recycling in Kansas

CURRENT LANDSCAPE AND GROWTH POTENTIAL

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Executive Summary

Recycling is often a priority topic when discussing solid waste management issues. Public demand for recycling to reduce environmental harm, municipal efforts to reduce waste, and business approaches to reducing carbon footprints and overall waste streams are often-cited variables when discussing recycling in general as well as new or enhanced recycling programs.

This evaluation of the current landscape of recycling in Kansas and the potential opportunities to fill in the gaps is a first step in better understanding the recycling systems and markets within the state. Evaluations of recycling databases, at both the county and community level, provide a broad overview of the types of materials that are recycled across the State and which areas have limited access to recycling opportunities. Rural areas have little to no access to recycling opportunities. Some communities in less populated areas have some access to recycling; however, the remote nature of a large part of the State is prohibitive of expanding recycling services. Transportation and storage challenges are often cited as concerns to recycling expansion.

Innovative and emerging technologies and processes show promising advances for the recycling industry. More efficient use of existing resources, enhanced tracking, sorting, and cleaning, and developing collaborative approaches to expanding recycling opportunities are seeing positive results in proprietary and pilot programs.

While this analysis of the recycling opportunities in Kansas provides a solid overview, further research and evaluations are needed to understand the nuanced challenges that Kansas, and its bordering states, face. Next steps can include:

- A more in-depth gap analysis of each type of recyclable material
- In-dept research of community participation in recycling programs
- Waste characterization studies to determine the quantity of recyclable materials that end up in the trash
- Develop community outreach, engagement, and education tools to enhance community understanding of proper recycling practices and impacts of recycling

KEY TAKEAWAYS

Current Landscape of KS Recycling

Recycling in Kansas is primarily driven at the local level through private, public, and non-profit organizations. State laws or regulations do not exist.

Rural Recycling Gaps

Rural areas have little to no access to recycling opportunities and the distance to larger facilities prohibits growth of recycling programs.

New & Emerging Technologies

Efficient use of resources, enhanced tracking, sorting, & cleaning, and collaborative approaches to expanding recycling opportunities are seeing positive results in proprietary and pilot programs.

Next Steps

More in-depth analyses of recycling gaps and community participation in recycling programs can continue to enhance knowledge and innovative solutions for expanding recycling in Kansas. Community outreach, engagement, and education can help with increasing proper recycling practices and improve understanding of the positive impacts of recycling.

Introduction

Recycling is often a priority topic when discussing solid waste management issues. Public demand for recycling to reduce environmental harm, municipal efforts to reduce waste, and business approaches to reducing carbon footprints and overall waste streams are often-cited variables when discussing recycling in general as well as new or enhanced recycling programs.

Commonly missing from local and regional conversations is the research to better understand how the recycling economy and processes are working within a geographic location. The goals of enhancing recycling processes are admirable and are a part of strategic goals for many local, state, and federal groups and agencies. To succeed in developing effective and efficient recycling markets, processes, and strategies, communities require an understanding of process capacity, market availability, and community outreach and education.

This research focuses on the current state of recycling for the State of Kansas and includes potential enhancements for the industry, including potential end uses for existing recyclable materials, new and emerging technologies in the recycling industry, and possible recycling brokers and markets in Kansas and neighboring states. Recycling in Kansas has the potential to expand which will enhance not only the environmental goals of the state and the region, but also the economic impact of the state and its communities.

Background

Recycling is the collecting, sorting, processing, and reusing materials to keep them out of landfills. Recycling can reduce greenhouse gas emissions, create jobs, and enhance economic development goals for communities, counties, and states.

In Kansas, recycling is a voluntary activity. There are several parts of the State that have limited access, or even no access at all, to recycling opportunities. According to the Kansas Organization of Recyclers, approximately 33% of all municipal solid waste in Kansas is currently being recycled¹. While quantitative data does not exist for the State, anecdotal data show that there is great potential to recycle more waste.

According to a 2021 study² by John Dunham & Associates for the Institute of Scrap Recycling Industries, Inc (ISRI), recycling has a positive impact on the economy and job market. As a result of recycling in Kansas, 1,143 direct jobs were created with wages reaching \$73,197,800 and an economic output of \$252,721,600. Additionally, the inclusion of supplier and induced jobs, the number of jobs created by Kansas recyclers increased to 3,188 with wages reaching \$187,834,300 and an economic output of \$713,877,700.

¹ Kansas Organization of Recyclers. (2023). Retrieved from <https://www.kskor.org/Recycling>.

² Institute of Scrap Recycling Industries. (2021). Economic impact study, U.S.-based recycling industry. Retrieved from <https://tinyurl.com/63vj3d6x>.

The research conducted for this study used scholarly research, publicly available data, and interviews with recyclers in the State. All interviewee information remains confidential, and any provided data is reported in the aggregate.

Definitions

There are three classifications of recyclers. They are defined as:

- Materials Recovery Facility (MRF) – a facility that receives, separates, and prepares materials for end users.
- Hauler – either public or private organization that collects recyclable materials from residences and/or businesses
- Drop-off location – an enclosed site that is available for the public to deposit their recyclable materials. Most often these sites only allow one type of material.

There are four types of recycling services provided to communities: automatic, opt-in, subscription, and drop-off³.

- Automatic – Community members automatically receive recycling services directly to their homes as part of a standard waste collection service.
- Opt-in - Waste collection services provide the opportunity to pay extra to have recycling service at their home through their regular waste service. These services are often provided through municipal waste management.
- Subscription – Similar to opt-in, community members pay for curbside recycling services from private service providers in addition to or separate from their regular waste collection service.
- Drop-off - Community members bring recyclables to a collection point that is away from their residence.

Automatic services are usually on a community level, and research indicates that automatic services have higher participation rates than other types of collection³. For example, waste collection services in a south-central community includes recycling. There is no municipal

TAX REVENUES FROM RECYCLING

Recycling generates ~\$5billion in local and state revenue that goes back to the community.

The recycling industry pays \$7.33 billion in federal taxes annually.

Geographic Regions Defined

Community/Municipality – an area within the boundaries of a legally defined city or town and a level of local government

County - a territorial division of the state and a level of local government

Region – an unofficial area within the State of Kansas without formal borders, but colloquially used when referring to various parts of the state: northwest, southwest, northeast, southeast, central.

State – the entirety of the State of Kansas

³ Morawski, C. and Wilcox, J. (2017). Is access everything. *Resource Recycling*. Retrieved from <https://tinyurl.com/mta3e27>.

requirement for community members to recycle; however, customers pay a recycling program fee for waste service regardless of participation.

Many communities have waste collection services that provide the option to pay an additional fee to recycling. Participation rates in these programs are beyond the scope of this research; however, nationally, approximately 1/3rd of households with subscription or opt-in recycling opportunities participate in those services⁴.

In certain counties drop-off events are held once a month. For example, a county in southeast Kansas does not have a permanent recycling drop-off location, but for 4 hours a month a trailer is available for the community to drop-off their recyclable materials.

While drop-off services do not have the same impact in terms of diversion from the landfill, they are an economically frugal solution to addressing recycling in a community. Temporary trailer sites also allow for a community to share recycling services with several different communities, which further dilutes the cost to the participants.

Current Landscape of Recycling in Kansas

Recycling in Kansas is primarily being driven at the local level through private, public, and nonprofit programs. Kansas does not have statewide laws or regulations that require recycling or ban specific materials from landfills.

Recently, the Kansas Department of Health and Environment (KDHE) sponsored a survey⁵ of recyclers across Kansas to gain a snapshot look at recycling. The results of the survey are neither statistically significant nor representative; however, it does provide some insight into how recycling is happening in the state.

The Recycling Survey⁵ reports that certain types of paper, cardboard, glass, metal, and certain types of plastic are the most common recycled material in the state. Additionally, the report indicates that recyclers identify aluminum/tin cans, lithium-ion batteries, glass, and plastics #3-#7 as materials that lack adequate markets despite being commonly collected.

The 2020 State Solid Waste Management Plan (SSWMP) lays out the state's approach to handling various solid waste, including recycling. The SSWMP noted that China's "National Sword" policy and "Basel Convention", implemented in 2018, significantly reduced the amount of recyclable materials that are being exported⁶. Recyclers and waste management services experienced a reduction in exported recyclables immediately. The policy reduced the amount of plastic materials exported to China by 99.1% between 2017 and 2018⁷. The recycling industry still experiences negative impacts from the disruption of the global market⁵. Recent recycling

⁴ Sustainable Packaging Coalition. (2016). Findings released from SPC centralized study on availability of recycling. Retrieved from <https://sustainablepackaging.org/findings-released-spc-centralized-study-availability-recycling/>.

⁵ Environmental Finance Center (2023). State of recycling in Kansas: Results from a statewide survey. Retrieved from <https://tinyurl.com/3mway7vc>.

⁶ Kansas Department of Health and Environment. (2020). State solid waste management plan. Retrieved from <https://www.kdhe.ks.gov/DocumentCenter/View/22543/2021-2025-State-Solid-Waste-Management-Plan>.

⁷ [China: Plastic imports down 99 percent, paper down a third \(resource-recycling.com\)](https://www.resource-recycling.com)

research⁸ asserts that there are still lingering negative impacts, such as price volatility for recycled materials, a disparity between low-quality plastic bales produced and the number of buyers available for low-quality bales, increased operating costs, and lower profitability.

During the extent of this research, recycling has continued to transform in the state. Some areas have many opportunities to recycle, while others are eliminating their programs entirely. According to one interview, a part of the State experienced a large reduction in recycling access when their primary waste hauler eliminated their recycling division. During the interview, it was indicated that supply chain shortages on parts, fuel prices, driver shortages, truck shortages, and low commodity prices for the last 3-4 years were all factors in the decision to end the program. Additionally, over the last 10 years the program lost money due to lack of interest in paying for recycling services. The successes in recycling in rural parts of Kansas occur when recycling programs are subsidized.

The Kansas Organization of Recyclers (KOR) maintains a [database](#) of recyclers across the State and is publicly available via an online search tool. This database provides information on which recycling organizations collect which types of materials. Additional conclusions about potential gaps in recycling access and markets are extrapolated from the data. KOR provided the 2021 Excel-based data that informs the searchable tool to enhance this research.

Database Analysis

While opportunities for a wide variety of recycling exist in Kansas, this research focuses on entities that recycle paper, cardboard, glass, plastics, metal, and electronics.

County-level Data

In Figure 1, each county is labeled with the number of the above-mentioned materials collected within that county. The darker the color, the more types of materials that the county collects. These collections could be from one recycler or multiple recyclers; however, that delineation is beyond the scope of this research. The data reported in Figure 1 is from self-reported data; therefore, counties may show little access to recycling despite recycling being available. Additionally, these data report recycling within the boundaries of the county and does not consider access to recycling in adjacent counties.

⁸ Vedantam.A., Suresh, N.C., Ajmal, K., and Shelly, M. (2022). Impact of China's National Sword policy on the U.S. landfill and plastics recycling industry. *Sustainability*. Retrieved from <https://doi.org/10.3390/su14042456>.

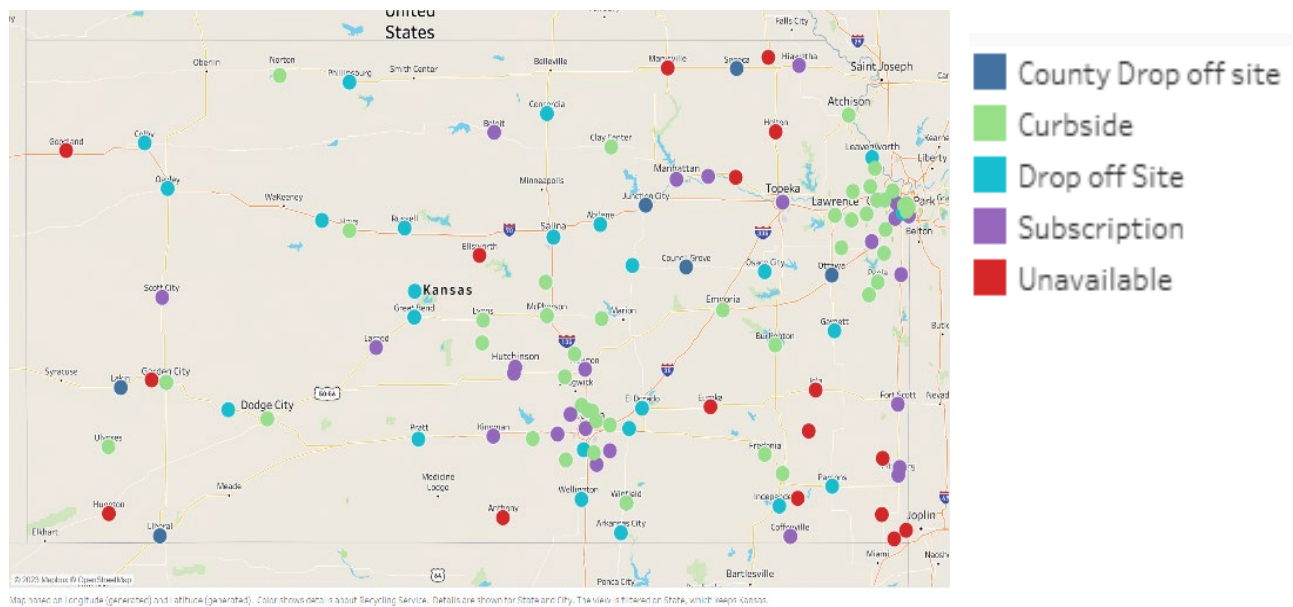


Figure 2: Map of types of recycling opportunities by community

These data result in Figure 3, which represents:

- 36.7% of communities offer curbside recycling
- 22.7% have subscription providers in their communities
- 21.9% have at least one drop-off center inside of the community with an additional 4.7% having access to a drop-off site inside of their county
- 14.1%, do not have recycling opportunities available to them.

Type of Recycling Available to Communities with >2,000 in Population

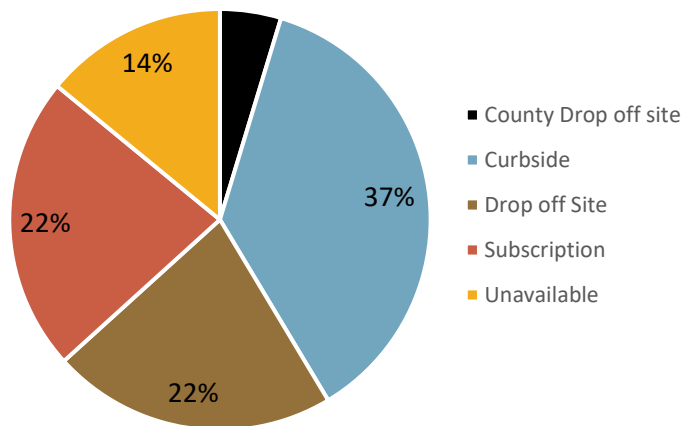
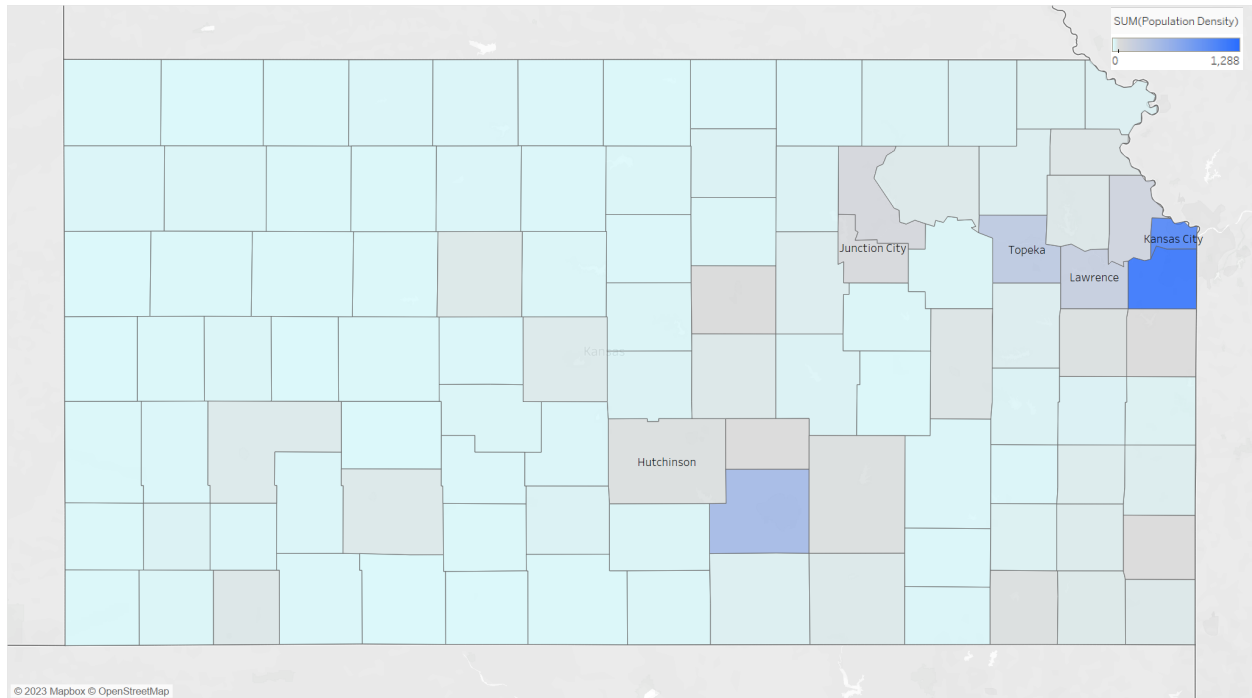


Figure 3: Type of recycling available to communities >2,000

Rural Recycling Gaps

Most larger communities in the State of Kansas have access to a MRF and curbside recycling. In contrast, rural areas have little to no access to recycling infrastructure and that distance is a hindrance to the growth of recycling programs. Figure 3 shows all of Kansas counties' population density. The darker blue areas indicate high population density while the lighter blue indicates low population density. The gray area are the mid-range population density numbers. The cities listed indicate the location of the five MRFs in Kansas.



Map based on Longitude (generated) and Latitude (generated). Color shows sum of Population Density. The marks are labeled by MRF. Details are shown for State and County.

Figure 4: Pop. Density Map. Named communities are locations of MRFs

Parts of western Kansas, the least populated part of the State, have some recycling programs as indicated in previous maps; however, their access to larger facilities is prohibitive to expanding recycling in the area. Additionally, the remote nature of a vast majority of Kansas poses transportation challenges. These long distances to reach MRFs, coupled with low volumes of recyclable materials can increase the costs of hauling recyclable materials and decrease potential for profits for smaller, more rural communities, prohibiting the initiation or expansion of recycling infrastructure. Further economic analysis of the potential costs associated with increasing recycling in rural areas is beyond the scope of this research; however, interview results indicate that cost is the barrier to expanding recycling in rural areas.

Comparatively, rural, western, and northern Kansas does have some curbside and drop-off recycling available. Between curbside and drop-off recycling opportunities, western and northern Kansas are able to provide recycling access; however, transportation issues and low volumes remain barriers.

Curbside services are often single stream, meaning all recyclables are placed in one bin for the waste hauler to collect, then sorting occurs at the MRF. Many drop off centers require that the materials be separated by the people dropping off their recyclables. The number of materials accepted might be limited by the ability of the drop off center to market and sell that material. Drop off centers may also be inconvenient for community members; thus, a low volume of materials collected.

Rural Recycling Challenges

Rural areas of Kansas serve areas with smaller populations which makes recycling and transportation of recyclable materials challenging. Conversations with recyclers reveal that the most challenging barrier to recycling is distance. Rural communities are less likely to have curbside recycling, leaving only drop-off recycling as their only option. Cities may have drop-off locations within their borders for community members within and close to those communities to use; however, the onus is on the city to transport to a recycling center or larger drop-off location. If a city does not have a drop-off location, then community members are faced with either transporting their recyclables to a county drop-off location or not recycling.

To compound the challenges that rural communities face, areas with lower populations generally have lower volumes of recyclable materials which makes it less economically viable for private recycling companies or government sponsored services.

New and Emerging Technology

While many new technologies are proprietary, the amount of research and innovation in the recycling industry shows promising advancements for enhanced and more efficient processes that increase the capacity of recyclers to process various materials, increase the amount of raw materials for reuse and repurposing, and expand the types and numbers of markets that buy and sell recyclable products.

The following technologies and innovations represent a few examples of the potential for recycling in Kansas.

The Internet of Things (IoT)

The IoT provides ways to track cell phones, baggage while traveling, refrigerator inventory, the temperature on the outdoor grill, and much more. Sensors and chips are being used as a way to reduce inefficiencies in waste management. The following examples show how sensors and trackers could be used to enhance existing recycling services to be more efficient and reduce contamination.

1. A [Swedish start-up company](#) is using fill-level sensors which allow waste haulers and collectors to visualize how much waste is in a container or bin at residences, recycling stations, underground, and more. This technology can help ensure that waste is collected and sorted efficiently to reduce litter, waste, and contamination.

2. Radio Frequency Identification (RFID) can be leveraged to identify amounts and types of waste by using smartphone technology to identify packaging⁹. Diminutive chips can be incorporated into packaging to make material identification easier and effective for consumers. A tap of the smartphone, and users will know which bin to throw their waste. This technology can help with reducing contamination and increasing overall recycling rates of multiple types of materials.

Innovative Sorting Equipment

With limited time and staff capacity, some recyclers are turning to machinery and artificial intelligence to enhance efficient sorting and processing. Robotics and Artificial Intelligence can utilize machine learning to gather information and develop predictive models that can help a facility understand its waste streams and how to invest in upgrades in machinery and/or processes. Robotics and AI can also increase the speed and efficiency of sorting and processing, which can reduce time lost due to limited staff capacity. Additionally, electric, autonomous vehicles can be used in place of larger, gas powered waste collection vehicles. The following example shows how innovative practices using existing technologies could enhance sorting processes to increase speed and accuracy of separating recyclable materials.

1. [Ursa Robotics](#) is developing such vehicles that could improve efficiency and reduce waste management costs.
2. [Wastelabs'](#) software uses AI to optimize routes, processes, and potential profits by using data analytics and artificial intelligence. The technology uses public and private data to develop efficient routes that help to keep costs and environmental impact low while enhancing the profitability of the recycler.
3. [Sortera Alloys](#) has an automated metal sorting system that uses AI and data analytics to classify and sort waste streams resulting in lower costs and high-quality alloys for reuse.
4. [CleanRobotics](#) uses AI and robotics to develop cost-effective and creative solutions for reducing waste. An [EPA SBIR](#) grant recipient, CleanRobotics is gathers and provides data that can empower decision-makers to move toward a zero-waste vision.

Effective Cleaning Technologies and Strategies

Often, contaminated loads are a challenge for recyclers. New methods of sorting and cleaning are advancing rapidly as a way to reduce the amount of recyclable materials ending up in the landfill due to contamination issues. Thus far, cleaning technologies use proprietary processes and formulas; however, understanding how they work could expand their usage and make recyclable materials that are challenging to recycle more likely to stay in the circular economy of plastics, paper, metal, etc.

1. [Juno](#) uses proprietary processes that sanitize recyclable materials to make materials viable for recycling and reuse. This process provides Juno with the opportunity to reduce the amount of materials that end up in the landfill. Additionally, the increased

⁹ Hanlon, A. (2021). How RFID and innovative electronics can boost recycling. *RFID Journal*. Retrieved from <https://www.rfidjournal.com/how-rfid-and-innovative-electronics-can-boost-recycling>

amount of materials that return to the economy helps to drive demand for recyclables that can be used for new products.

2. [FCC Environmental Services](#) is using a newly installed robotic sorting apparatus that can sort food and beverage containers more efficiently to ensure that the materials are able to be reprocessed into new paper products¹⁰.

Transformation Innovations

Plastic materials pose a unique challenge for recyclers. Multiple types of plastics exist (#1-#7), and several require a unique process to prepare for reuse. Polypropylene (commonly used in consumer packaging) and polyethylene (commonly used in plastic shopping bags) are identified as plastics with unique recycling challenges. The challenge for plastics recyclers and manufacturers is to develop and enhance the circular economy for plastic, targeting polypropylene.

A recent study¹¹ found that polyethylene can be converted into polypropylene for use in new products. The study revealed that the piloted chemical process can be scaled up to provide measurable positive impacts on the amount of plastic shopping bags, cling wrap, laminated plastics, and other single-use low density polyethylene products found in the landfill.

Again, these processes and formulas are often proprietary; however, understanding the methods for which recyclers are using them helps expand the processes and increase their use.

[PureCycle](#) uses a proprietary method for transforming polypropylene into “virgin-like resin” to be used as the base for plastic products. The company is using its technology in different pilot programs in Ohio to enhance recycling and developing a circular economy for specific plastics.

1. The process includes¹²:
 - Melting & Filtering: Polymer Extruder and Polymer Filter
 - Extraction: Polymer/Solvent Mixer and Extraction Column
 - Mixing & Setting: Polymer Mixer and Large Particle Settler
 - Filtering: Candle Filters
 - Purification
 - Separation: Polypropylene/Solvent and Product Decanter
 - Extruding & Pelletizing: Polymer Extruder and Polymer Pelletizer
2. [Braven Environmental](#) is working on a similar process that breaks down plastics into a product that replaces extracted fossil fuels.

¹⁰ Waste 360. (2023). New Technology Enables Paper Cup Recycling and Improves Food and Beverage Carton Recycling in Dallas. Retrieved from <https://www.waste360.com/recycling/new-technology-enables-paper-cup-recycling-and-improves-food-and-beverage-carton-recycling>.

¹¹ Wang, N., Strong, G., DaSilva, V., Gao, L., Huacuja, R., Konstantinov, I.A., Rosen, M.S., Nett, A.J., Swart, S., Geyer, R., Scott, S.L., and Guironnet, D. (2022). Chemical recycling of polyethylene by tandem catalytic conversion to propylene. *Journal of the American Chemical Society*. Retrieved from <https://doi.org/10.1021/jacs.2c07781>.

¹² PureCycle. (2023). Our process uses game-changing recycling technology. Retrieved from: <https://www.purecycle.com/our-process>.

3. [Plastic Back](#) uses a proprietary formula to provide recyclers with the opportunity to not only reduce the amount of recycling that goes to the landfill, but also provides an opportunity to increase profits by selling the plastic residuals.
4. [Refiberd](#) specializes in using a green chemical recycling technique to convert used textiles into reusable threads. Recycled fibers, such as polyester and cellulose can be used to create new textiles, such as clothing and linens.
5. [Graphic Packaging](#) using a new, energy-efficient paperboard-making machine that works faster than its previous machines. Known as K2, the machine can produce 2,000 feet of paperboard per minute¹³, which is then used to make paper-based food packaging, such as cereal boxes and package wraps that reduce the use of plastics.

New Markets, Models, and Buyers

Conversations with Kansas recyclers illuminated the fact that most recyclable materials ultimately leave the state for reuse. With the exception of a few identified locations, the destinations of recyclable materials are kept proprietary. Respondents to the Kansas Recycling Survey⁵ indicated that some materials are shipped as far as Florida and Maryland; however, most respondents indicated that recyclable materials stayed within neighboring states. (It is worth noting that these responses are not representative of all recyclers across the State.)

Appendix C shows a list of potential buyers within Kansas and the surrounding states. Some specialty materials, such as coated paper and textiles, will likely continue to require further shipping; however, utilizing the recycling models mentioned below may make further markets more economical.

While these recycling models may be useful for any type of community, they are ideal options for rural areas as they consider distance a factor.

Regional Planning via Council of Governments

Councils of Governments (COGs) can be used to build stronger recycling systems within a specific region and may be able to facilitate dialogue that addresses what that region might be lacking in recycling infrastructure and education.

Examples of COGs operating in the State of Kansas would be the Mid-America Regional Council (MARC). MARC works with location governments to divert waste from landfills. They are able to do this through a grant program and recycling outreach and education¹⁴. MARC also used an organization



Photo courtesy of MARC

¹³ Paper & Packaging. (2023). Meet the leaders of paper recycling. Retrieved from <https://www.howlifeunfolds.com/sustainability/meet-leaders-paper-recycling-innovation>.

¹⁴ [Recycling and Solid Waste | MARC](#)

called “Recycle Spot” to connect residential users of recyclable waste with their relevant recycling centers¹⁵.

Cooperative Teamwork and Recycling Assistance

One way to enhance a rural recycling program is through a cooperative marketing program, which allows rural communities to negotiate better pricing with recycling processors or end markets and can less the burden on transportation costs to get recyclable materials to processors. These cooperative agreements can help communities in rural areas meet minimum volume and supply needed by a processor or end user of recyclable materials. Research from emerging economies from across the world show that cooperative recycling models can have a short- to mid-term positive impact in places where recycling infrastructure is minimal, and development of new infrastructure is a long-term plan¹⁶.

The [Northeast Resource Recovery Association \(NRR\)](#) is one of few recyclables marketing cooperative that seeks to connect organizations that are buying or selling recyclables. Another example is the [Common Market Co+Op](#). They provide opportunities for community members to recycle specialty materials, and then use their partnerships and relationships to get those recyclables to processors and buyers.

What can you recycle at the Common Market?

VISIT OUR RECYCLING CENTERS TO RECYCLE THESE SPECIALTY ITEMS



Photo courtesy of the Common Market Coop

Hub and Spoke Recycling Model

The Hub and Spoke Recycling Model (HSRM) is often considered for rural communities¹⁷. The HSRM works when one community acts as a “hub,” which invests in infrastructure that is



needed to sort, bale, and store recyclable materials before it sends the materials to an end market. Surrounding communities, known as “spokes,” invest in recycling infrastructure aimed at collecting and transporting materials to the closest hub. This system can increase access to recycling for rural or remote areas by addressing transportation issues and consolidating recyclable materials until volumes are met, in a similar way that a Cooperative Teamwork and Recycling Assistance program can. Depending on market conditions, a hub can generate enough revenue for the sale of recyclable materials to cover the basic operating costs.

¹⁵ [KC Region Recycling Centers \(recyclespot.org\)](#)

¹⁶ Miranda, I.T.P., Fidelis, R., Fidelis, D.A. de S., Pilatti, L.A., and Picinin, C.T. (2020). The integration of recycling cooperatives in the formal management of the municipal solid waste as a strategy for the circular economy. *Sustainability*. <https://doi.org/10.3390/su122410513>.

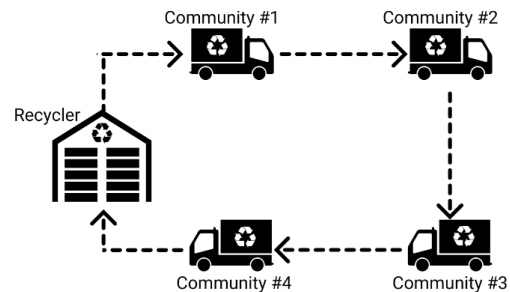
¹⁷ Szczepanski, M., (2018). The benefits of a hub and spoke recycling system. *Waste 360*. Retrieved from <https://www.scsengineers.com/scs-articles/benefits-hub-spoke-recycling-system/>.

The Arizona Department of Environmental Quality hosts a [toolkit](#) to help communities establish a hub and spoke model that provides increased access to recycling services, reduced transportation costs, economies of scales, job creation, and revenue.

Milk Runs

A recycling “milk run” is a method of transportation of materials that follows the coordination of milk runs used in eras before home refrigeration. The process is meant to replenish consumed material on a specific schedule. It uses a fixed route on a fixed schedule and only gathers needed materials. A processor or end-user sends a single truck to make multiple stops at communities along a transportation route to collect materials. That truck takes the collected materials back to the processor where it refills the coffers with only the materials the processor uses.

The “milk run” model can be an effective approach for materials that are generated at lower volumes in communities. A glass recycler in Kansas uses this model. They have bunkers located across the state from which they gather materials. In addition to gathering materials from centralized locations, the recycler is able to transport non-recyclable cargo to a location near their bunker site, and then return with their recyclable glass. This multipurpose transport mechanism reduces costs because trucks are not leaving or returning empty and allows for materials to come from various distances across Kansas. The challenge associated with this model is that due to transportation costs, processors are sometimes unable to pay for the raw materials returning to their processing facility.



An electronics recycler in New Jersey uses the “milk run” model to gather electronic materials¹⁸; however, they gather all items at the locations that each route serves. Each route is assigned to “big box” stores or smaller stores with varying distances.

“Milk runs” for recyclable materials can be adapted to suit the needs of the collector and the storage facilities. Whether the collector seeks specific materials or gathers all materials, the “milk run” model can provide solutions for material needs and transportation challenges.

Further Research and Recommendations

This research report highlights challenges in the recycling industry in Kansas. There are multiple next steps and additional research that can be completed to understand niche markets,

¹⁸ Caudill, R.J. & Dickinson, D.A. Sustainability, and end-of-life product management: A case study of electronics collection scenarios. *Multi-lifecycle Engineering Research Center*. New Jersey Institute of Technology. Retrieved from <https://njies.njit.edu/resources/IEEE%20EOL%20STM%202004.pdf>.

potential efficient models for rural Kansas, and community outreach and education opportunities.

Further research may be necessary to better understand the recycling markets and infrastructure from community members, municipalities, recyclers, MRFs, etc. In-depth exploratory research could further drive the conversation about Kansas' recycling needs including gaps and potential for innovation and expansion. The following topics of research could enhance the recycling conversation:

1. In-depth research of participation rates among community members including segmentation of the various types of recycling options, could provide a type of gap-analysis to clarify where people are recycling, what the barriers to recycling are, and how to improve recycling participation rates.
 - a. The Sustainable Packaging Coalition reports that recycling participation rates are highest where a recycling subscription is mandatory⁴. While some communities in Kansas offer automatic recycling and some cities have recycling ordinances that require recycling, these are few.
2. Cost analysis of improving transportation options for existing recyclers to expand to a model that would serve more areas in rural Kansas.
3. According to the Kansas Organization of Recyclers¹, approximately 33% of all municipal solid waste in Kansas is currently being recycled; however, what is not known is how much recyclables, statewide, are still ending up in the trash.
 - a. Using the City of [Salina, Kansas Waste Characterization Study](#) as the model, research could evaluate the potential for duplication of their waste collection and management model in other cities, counties, or regions.
4. Examine the relationship between Kansas communities and their recycling model. This will allow for a better understanding of the true diversion of materials from Kansas landfills as well as better understanding where recycling is expanding or contracting. For example, research questions could include, which communities offer which types of recycling models, what is their diversion rate, and how can it be improved?
5. Enhance both statewide and regional recycling networks through collaboration and partnership building. As reported in the Kansas Recycling Survey, many respondents indicated that the majority of their markets are immediate markets, with little to no long-term contracts to ensure buyers. Developing relationships, connections, and partnerships, in Kansas and with bordering states, can enhance the stability of recycling in the region and encourage expansion and enhancement.
6. Evaluate the potential for new technologies at existing recyclers, including cost analysis of upgrades and returns on investment through new markets, products, and buyers.
7. Establish a regional marketplace where recyclers can share which materials they need to have or would like to sell.
8. Develop community outreach and education tools in accordance with the Kansas Department of Health and Environment's [Keep it Clean Kansas](#) program. Customizable materials for communities, organizations, and recyclers could help spread the message

of how, when, and where to recycle. A repository of resources for various entities could enhance the volume of recyclable materials and decrease the amount of recyclables that end up in the landfill.

Conclusion

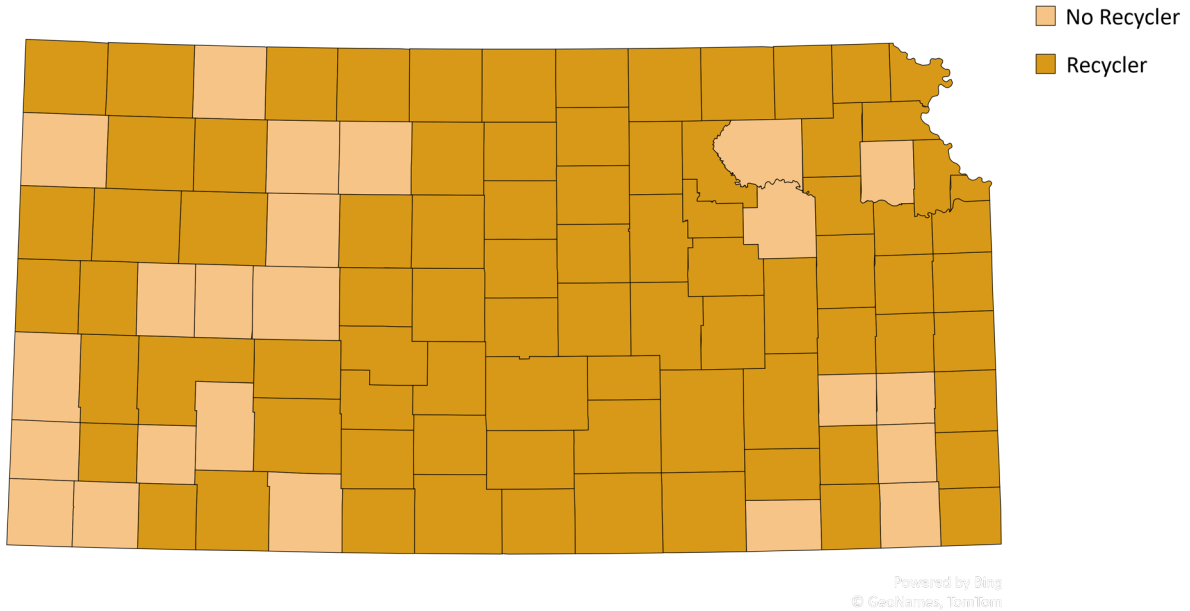
This research provides an overview of the state of recycling in Kansas. While not comprehensive, it does inform of the challenges unique to the state and provides some avenues for additional research and options for evaluating recycling expansion and enhancement in the State.

The recommendations for next steps and research serve as a potential menu of options for communities, organizations, and the State to develop a strategic approach to developing, growing, and maintaining an efficient and effective recycling industry that can make Kansas a leader in the circular economy.

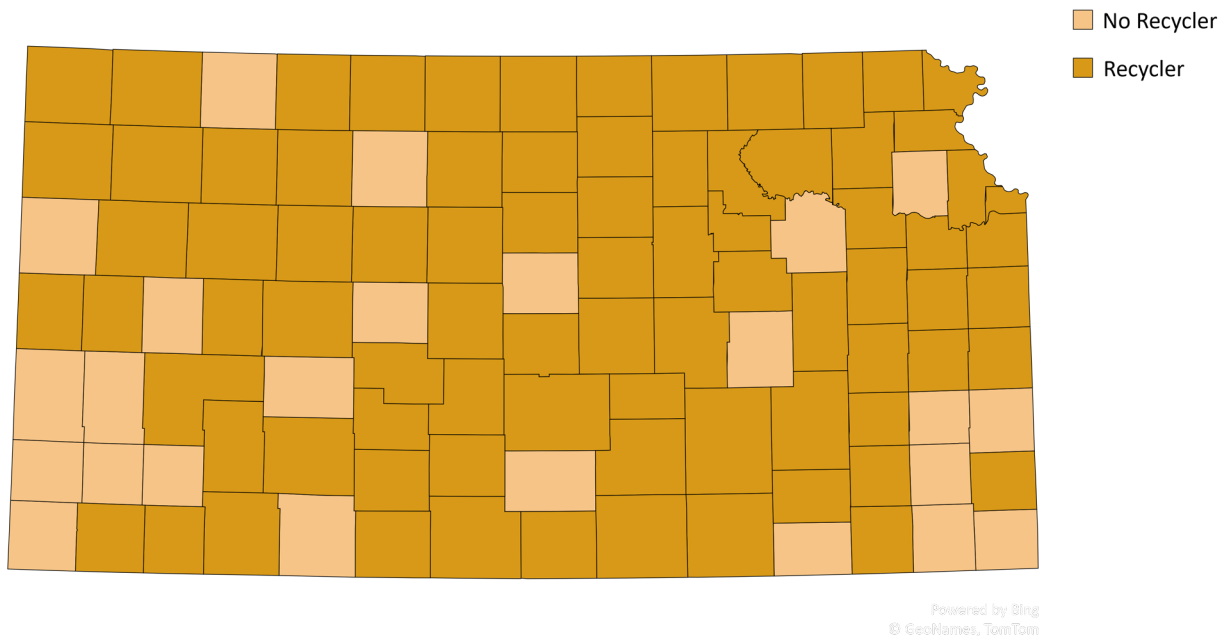
Appendices

Appendix A: Recycling opportunities by County and Material

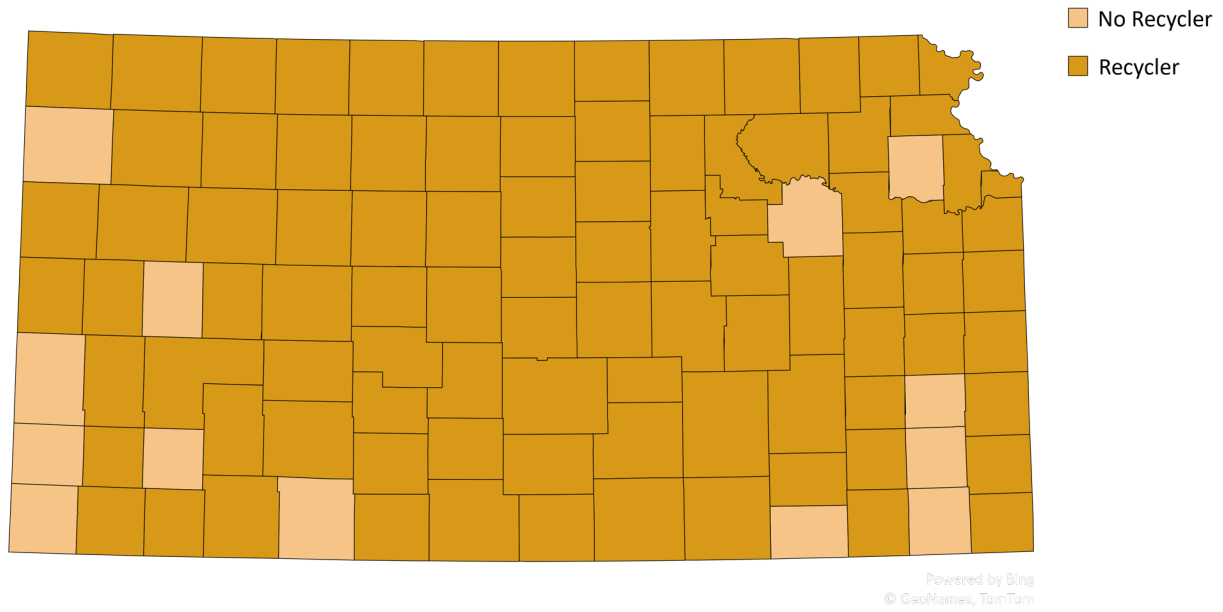
Counties with Plastic Recycling



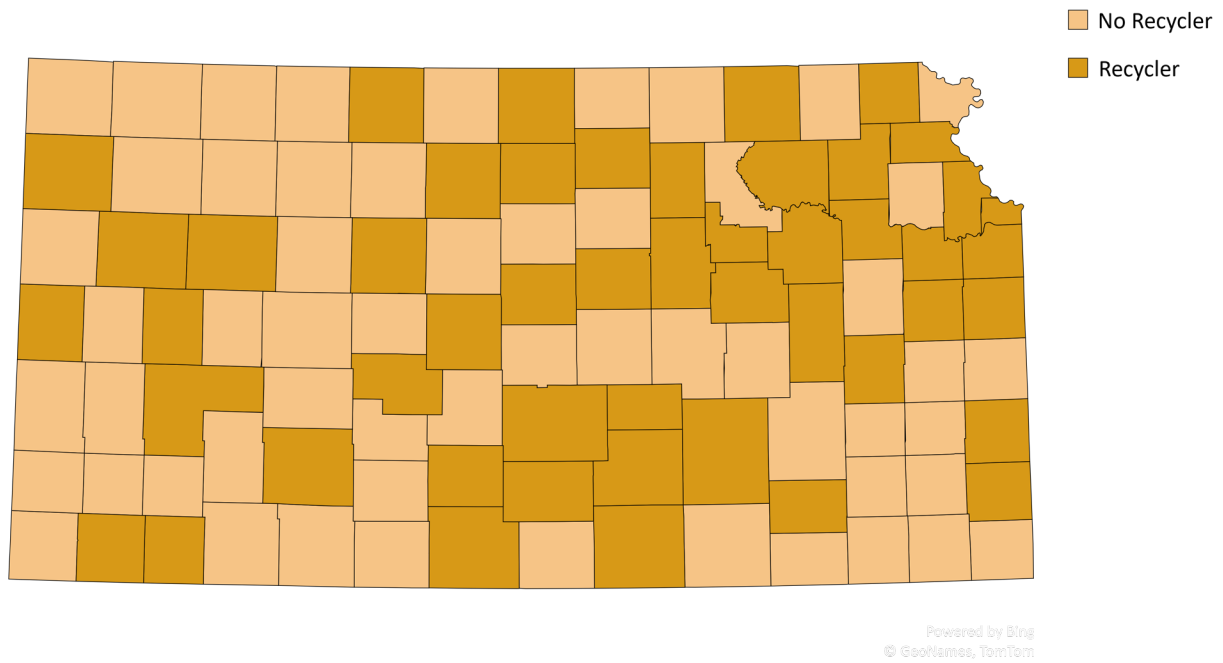
Glass Recycling in the State



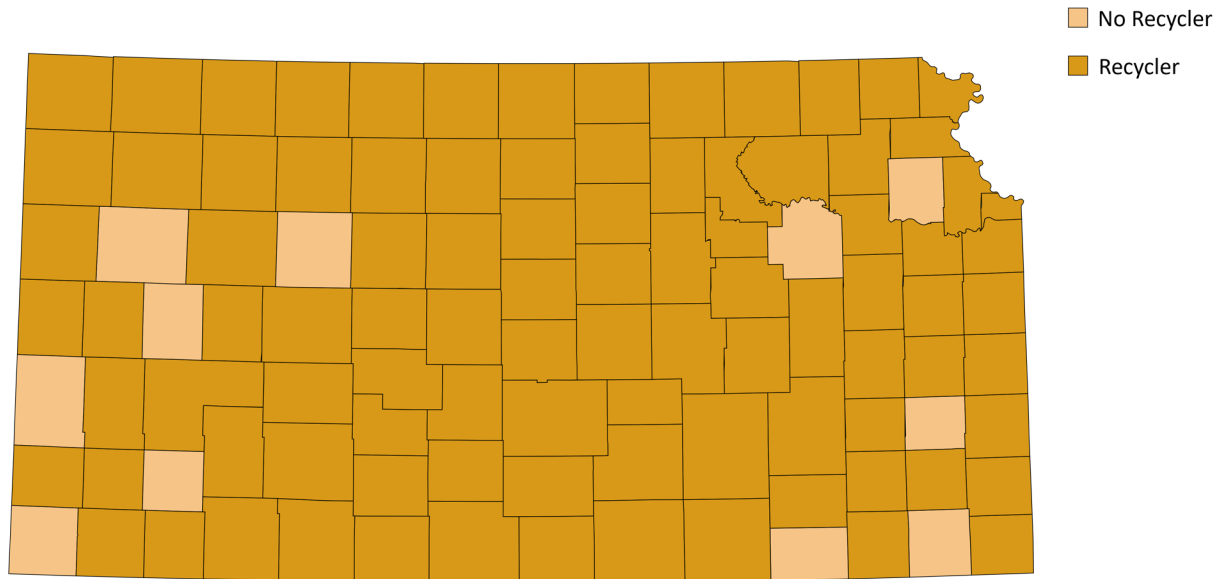
Counties with Cardboard Recycling



Electronics Recycling in the State

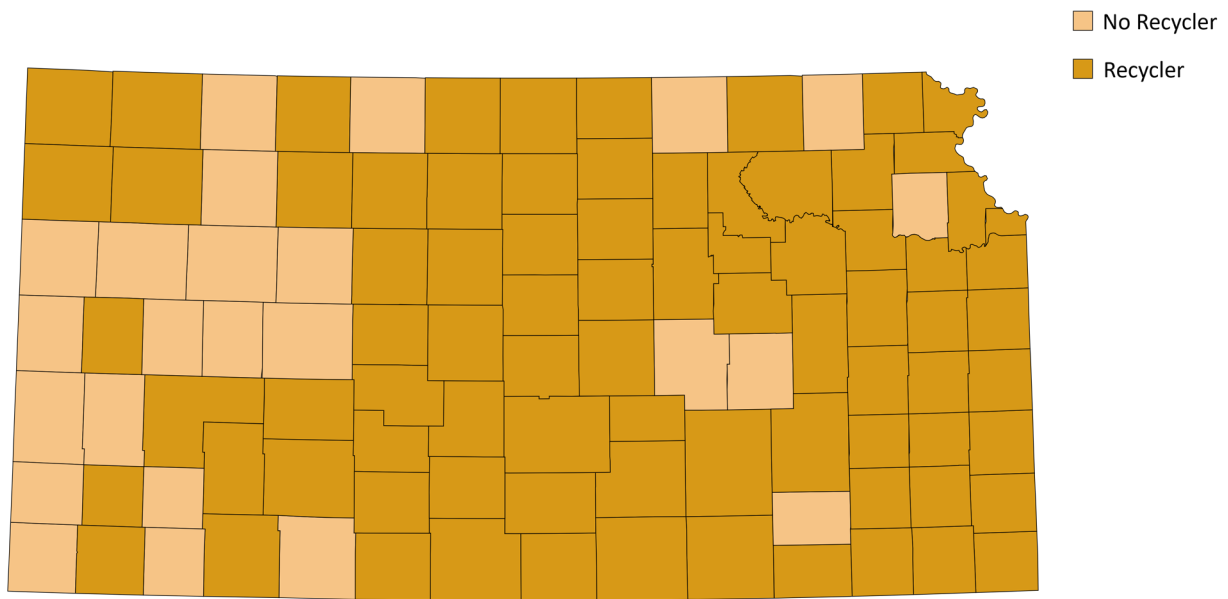


Paper Recycling in the State



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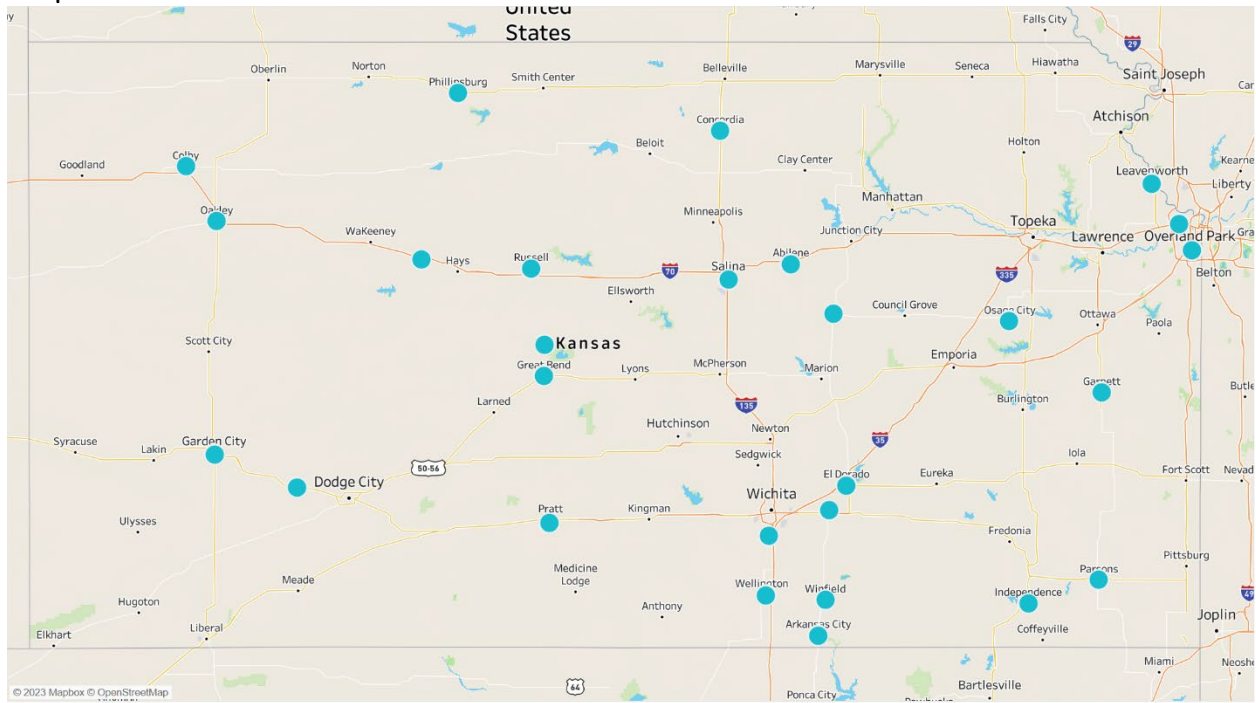
Counties with Metals Recycling



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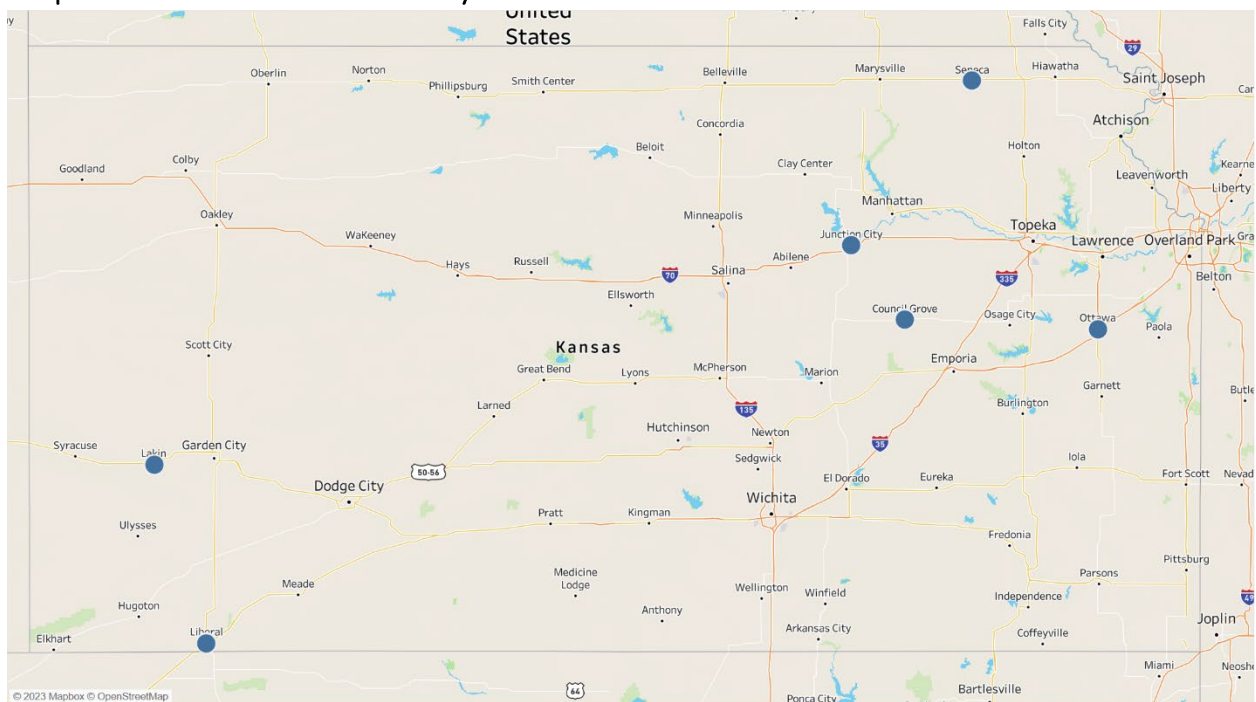
Appendix B: Maps showing types of services available for communities with populations of more than 2,000.

Drop-off locations within communities



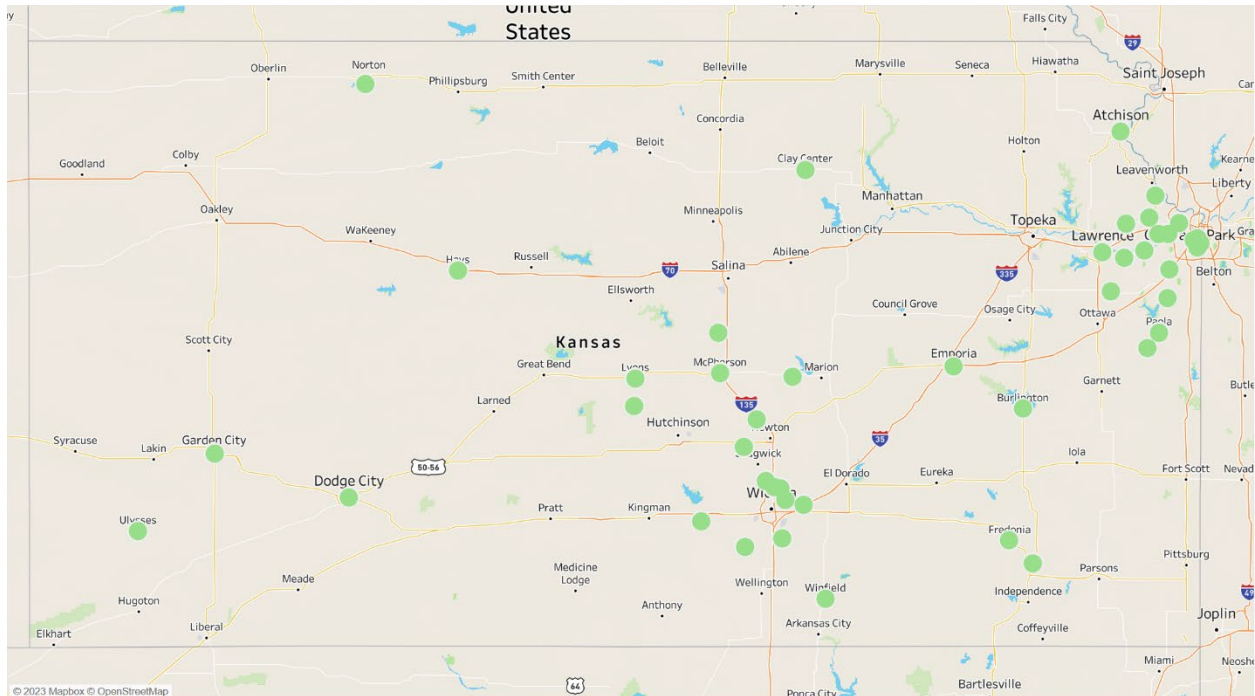
Map based on Longitude (generated) and Latitude (generated). Color shows details about Recycling Service. Details are shown for State and City. The view is filtered on State and Recycling Service. The State filter keeps Kansas. The Recycling Service filter keeps Drop off Site.

Drop-off locations within the county



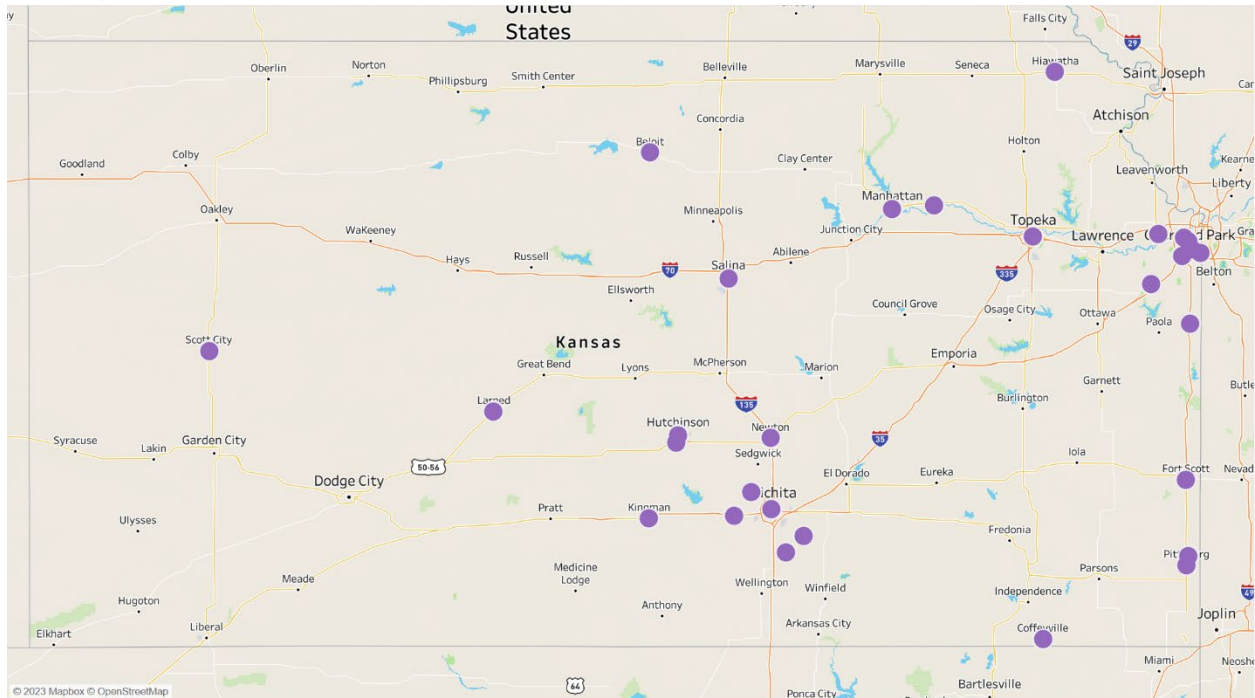
Map based on Longitude (generated) and Latitude (generated). Color shows details about Recycling Service. Details are shown for State and City. The view is filtered on State and Recycling Service. The State filter keeps Kansas. The Recycling Service filter keeps County Drop off Site.

Curbside Recycling



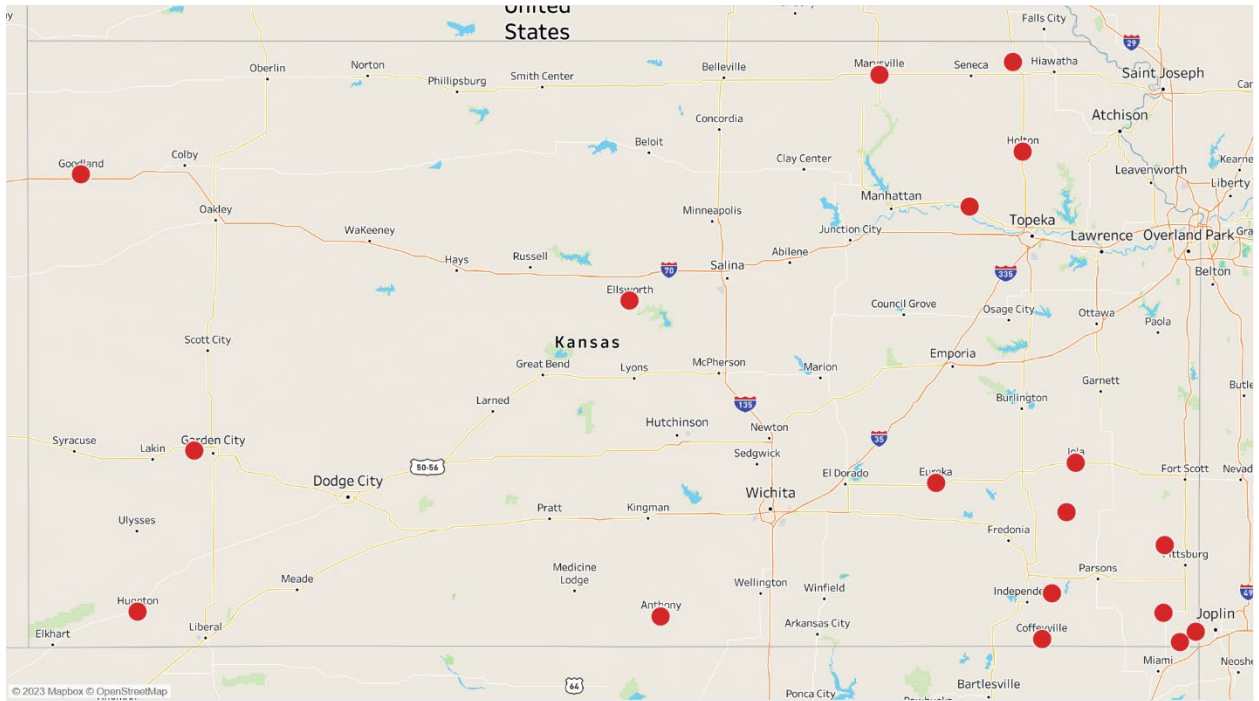
Map based on Longitude (generated) and Latitude (generated). Color shows details about Recycling Service. Details are shown for State and City. The view is filtered on State and Recycling Service. The State filter keeps Kansas. The Recycling Service filter keeps Curbside.

Subscription Service Available



Map based on Longitude (generated) and Latitude (generated). Color shows details about Recycling Service. Details are shown for State and City. The view is filtered on State and Recycling Service. The State filter keeps Kansas. The Recycling Service filter keeps Subscription.

No Recycling Services Available



Map based on Longitude (generated) and Latitude (generated). Color shows details about Recycling Service. Details are shown for State and City. The view is filtered on State and Recycling Service. The State filter keeps Kansas. The Recycling Service filter keeps Unavailable.

Appendix C: Potential new or expanded markets and buyers

Organization Name	State	Materials Accepted
International Paper	multiple	Newspaper, office paper, shredded paper, corrugated containers, books
Sonoco Recycling	Kansas	Paper products
ProKansas Recycling	Kansas	Plastic bottles, colored containers, plastic food containers, bags, mixed paper, scrap metal, glass, batteries, cartridges, aluminum cans, tin/steel cans, cardboard, newspaper, office paper, ledger paper, eye glasses
Power Plastic Recycling	Multiple	Plastic pallets, pipes, film rolls, containers, poly textile products
ABC Recycling	Kansas	aluminum, aluminum cans, computers, appliances, stainless steel, tools, vehicles
TerraCycle	New Jersey	Hard to recycle products: Dunkin coffee bags, skincare products, stationery, takeout containers, coffee capsules
Mid America Recycling	Iowa	paper products, glass, metal
Pioneer Industries International	Multiple	Paper products, plastics, metal
Smurfit Kappa	Multiple	Paper, cardboard
Pratt Industries Recycling	Multiple	Paper, Plastic, Metal
St. Joseph Plastics	Missouri	Mostly post-industrial polyethylene and polypropylene scrap, but will consider certain types of post-consumer scrap plastics
Tri-Rinse Industrial	Missouri	Plastics 2, 4 and 7
Avangard Innovative LP	Texas	Plastics 1, 2, 3, 4, 5 and 6
Berry Plastics Beaumont	Texas	Plastics 2, 4, 5, 6 and 7
Birch Plastics Inc.	Texas	Plastics 2-10
Green Line Polymers	Iowa	Plastics 1 and 2
Greystone Logistics Inc.	Iowa	Plastics 2, 4 and 5