SCRAP TIRES

2022

Scrap Tire Management and Available Alternatives in Texas' Lower Rio Grande Valley Development Council Region

This report was prepared by
Texas State Institute for Government Innovation

About the Institute
The Institute for Government Innovation is a unique consultancy leveraging university resources to solve our clients' problems and help students successfully transition to careers. We combine student enthusiasm and faculty expertise to develop innovative solutions to real-world challenges. Our mission is to improve today's decisions and tomorrow's decision makers. For more information, please visit http://igi.txstate.edu/.

Authors
Dr. Rebecca Davio
Matthew Pantuso
Molly Allred
Irlenia Hermosillo

Special thanks to the Lower Rio Grande Valley Development Council (LRGVDC) for the opportunity to work on this project. We would specifically like to thank Rick Carrera and Brenda Salinas with LRGVDC and the members of the Solid Waste Advisory Committee for their guidance and feedback in the development of this plan.

Delivered on
December 13, 2022

This report is based on the best information available during the primary time of data collection for this study, January 2022 through September 2022, including 2020 scrap tire reports from the Texas Commission on Environmental Quality. The quality of these data depends on the reports from specific scrap tire transporters and processors. Additional information about all data sources can be found in the Methods section.

TEXAS STATE UNIVERSITY

MEMBER THE TEXAS STATE UNIVERSITY SYSTEM

Contents

CONTENT

Executive Summary

Scrap tires present a significant waste management challenge for which there is no easy answer. These products were designed to be difficult to destroy. Scrap tires must be processed for almost every end use. They must be quartered or split before they can be landfilled, and even then, they can take up significant space there. Additionally, transporting tires for the required processing and end uses is costly. If mismanaged, scrap tires may end up illegally dumped which causes health and safety issues.

To explore the best available options to deal with scrap tires generated in their region, the Lower Rio Grande Valley Development Council of Texas (the Region) hired the Institute for Government Innovation at Texas State University (the Institute). The Institute used various methods, including online research, interviews, data analysis, and surveys to assess scrap tire management and the available alternatives in the Region.

This summary will highlight findings and recommendations related to data quality, scrap tire generation, processing, end uses, and transportation.

Better quality data is important. Data about scrap tire management is problematic almost worldwide. There is no reliable and complete estimate for any aspect of scrap tire management—not generation, transportation, processing, or end uses at the State or regional level. For example, various scrap tire generation estimates for the Region range from 1.1 million and 2.1 million. Available Texas Commission on Environmental Quality (TCEQ) data indicates the only processing capability and end use in the Region for these tires is landfilling but there is wide variation in the estimated volumes of tires which end up there. Additionally, state scrap tire transportation data shows destination but not point of origin data.

The City of Pharr has adopted a scrap tire management ordinance which includes steps for improving data quality and scrap tire management. The

North Central Texas Council of Governments (NCTCOG) has created a similar ordinance that they recommend everyone in their region adopt. In fact, they are attempting to create State legislation that would implement the ordinance statewide. Evaluating the feasibility of adopting a scrap tire management ordinance in municipalities throughout the Region and supporting the NCTCOG's legislative effort could not only help the Region itself, but also Texas more generally.

Scrap Tire Processing and End Uses. There are several uses for processed scrap tires. Presented from most desirable to least desirable, according to the waste management hierarchy, these uses include reselling used tires, retreading tires, including used tire material in new tires and other rubber products, pyrolysis, tires as carbon input, Tire-Derived Fuel (TDF), Land Reclamation Projects Using Tires (LRPUT), and landfilling. All but the first two of these uses require scrap tires to be processed in some fashion to reduce them from whole tires to smaller size pieces.

The Region needs to engage with major scrap tire transporters with established end user contracts or try and attract existing processors to the Region. Because most end users the Institute spoke to throughout this process stressed the importance of consistency and quality in the processed tire pieces they require for their processes, contracting with major transporters will be critical. Attracting processors to the Region will be challenging without significant end users in the area.

With only landfill processing capacity in the Region, the Region can consider outsourcing scrap tire processing to other regions in the State. This effort is expected to be more economical if scrap tires can be consolidated and processed in one location. This would require a Region-wide effort, including reorganization of current practices and collaboration between waste haulers, landfills, counties, and municipalities.

During this project, the Institute learned of significant increase to landfill scrap tire processing capacity in Hidalgo County. This new capacity

enables the Region to annually shred over 3 million tires to 3- to 4-inch pieces. This processing capacity could be used for LRPUTs. These projects are like landfills but are a more preferred method of management with significantly faster permitting than landfills. LRPUTS expand landfill life, restore disturbed land to natural grade for other land uses.

Scrap Tire Transportation. Based on informal conversations with a major tire transporter, the Region's shredding capacity could also significantly reduce transportation costs to get these tires to the nearest processing facilities to the Region. For instance, transporting 10 tons of whole tires to Bexar County (where the nearest processing facility to the Region is) would cost about $4,000 per load whereas transporting 22 tons of shredded tires to Harris County (where shreds could be processed for a wider variety of end uses) would cost the same.

The Institute used these transportation costs to develop a rough estimate of the cost to transport all the Region's currently landfilled tires. Assuming a highly coordinated effort to consolidate and process the Region's scrap tires in a single location, the Institute estimates the annual cost of transporting tires to Harris County would be about $900,000. This would save an estimated $250,000 worth of landfill space annually. The remaining gap could be made up by increasing tire drop-off fees, but that may lead to increased illegal dumping. Other options include raising landfill tipping fees by an estimated $0.50 – $2.00 or exploring increasing solid waste services fees on utility bills by a nominal amount.

To summarize the recommendations in the full report, the Region should:

1. Engage with scrap tire transporters who have end users
2. Engage with scrap tire processors and end users
3. Pursue Land Reclamation Projects Using Tires efforts
4. Consider adopting a model ordinance throughout the Region and supporting statewide scrap tire management legislation
5. Stay abreast of changes in the scrap tire industry

Introduction

Scrap tires present a unique waste management challenge. Tires were created by chemists and engineers to withstand thousands of miles of driving on various surfaces and in all kinds of weather conditions. In other words, these products were purposefully made to be nearly indestructible. Adding to this, society's reliance on transportation means that used tires will continue to accumulate and remain a waste management challenge. Following the development of the Lower Rio Grande Valley Development Council's (the Region) 2022 – 2042 Regional Solid Waste Management Plan, the Institute for Government Innovation at Texas State University (the Institute) was engaged to conduct a study to assess the available options for scrap tire management in the Region.

The Region includes Cameron, Hidalgo, and Willacy Counties. This report will focus on the tires generated and managed within this Region. Because of the nature of scrap tire management, some of the solutions for future tire management may be outside of this Region. Those options will also be explored in this report. Any cost estimates will be based on rough approximations due to the need for detailed specifications and competitive bidding for determining final costs.

Scrap tire management is critically important because these bulky items can occupy significant landfill space over time when not managed properly. Additionally, poor management can lead to increased illegal dumping activity and all the poor environmental outcomes related to illegally dumped tires, including creating breeding grounds for mosquitoes that carry disease. Still, there is no easy answer.

The purpose of this report is to identify the economic costs and benefits of diverting scrap tires from landfills within the Region.

With a lack of scrap tire recycling processing in the Region, there are a few options for reducing the number of tires landfilled annually. The Region can outsource processing to other regions in the state, attract processors to the Region, and process scrap tires for Land Reclamation Projects Using Tires (LRPUT). It is estimated that transporting the Region's landfilled scrap tires to recycling processors in other regions will cost roughly $1,000,000 annually. This cost would be offset by approximately $250,000 in saved landfill space. This gap would most likely be made up by raising area landfill tipping fees by $0.50 – $2.00 per ton or increasing solid waste service fees on utility bills.

In the remainder of this report, we will provide background and context related to scrap tire management before presenting estimates of Regional scrap tire generation, a review of current scrap tire transportation, processing, and end uses in the Region. Following these descriptive sections of the report, we will present our evaluation of the options available to the Region for managing scrap tires.

Background

To properly understand our findings, it is important to contextualize them with a conceptual understanding of scrap tire management in general. We also looked at scrap tire management outcomes both internationally and nationally.

Scrap Tire Management Basics

To present our findings, we established a conceptual framework that is consistent with other solid waste management principles and consistent with the Texas Commission on Environmental Quality's management of the State's scrap tire program.

Scrap tire management begins with *generation*, then aggregating all those generated tires requires *transportation*, and the tires can then be *processed* for their eventual *end use* (Figure 1).

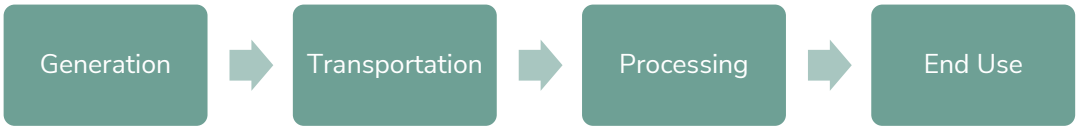

Figure 1. Conceptual Scrap Tire Management Framework

To best understand the scrap tire management options the Region has available, it is useful to look at the process in reverse order.

End Use

To understand end uses, it is helpful to look at the waste management hierarchy. The EPA uses the waste management hierarchy to show the most preferred and least preferred methods of waste management. These

methods can be used to understand the preferability of different scrap tire management options and their related end uses.

Figure 2 shows the waste management hierarchy from most preferred to least preferred and the associated tire end uses.

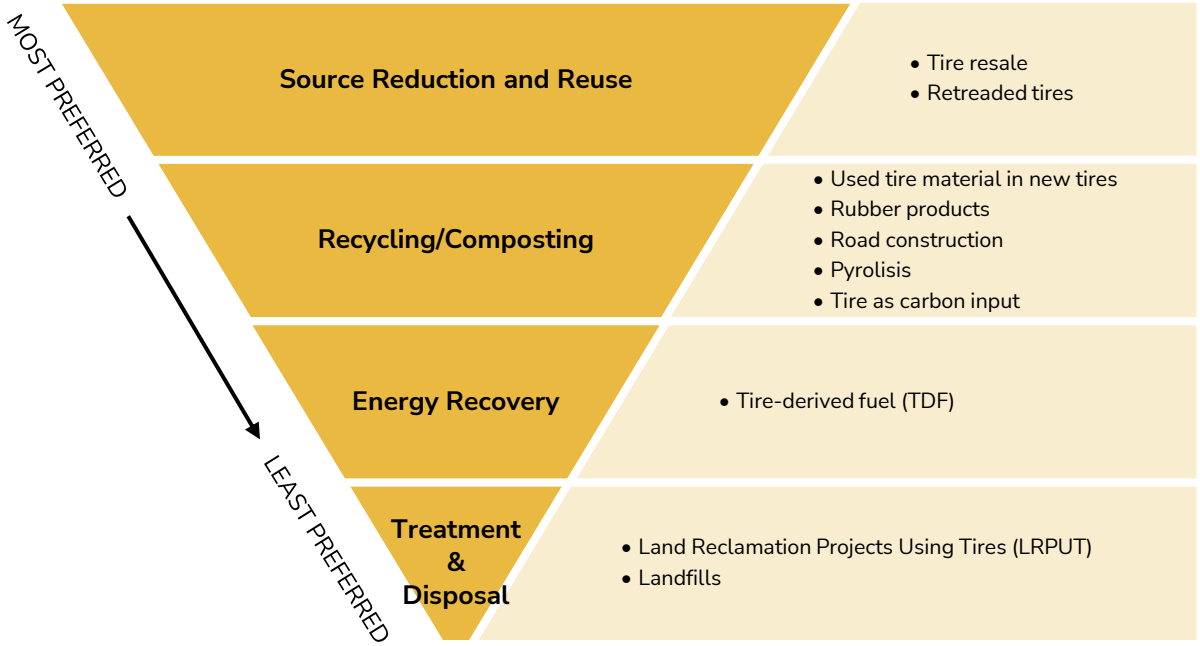

Figure 2. Environmental Protection Agency (EPA) Waste Management Hierarchy and Associated Tire End Uses

The most preferred option is **Source Reduction and Reuse**. The reuse management option is easy to understand because reuse refers to any time used tires are sold on the resale market. Tires—particularly large truck tires—can also be retreaded and sold for reuse. Source reduction is a little more difficult to imagine, but this involves finding ways for people to use less tires. This would include very broad efforts to improve public transportation, for example, to reduce the number of cars on the road and therefore the tires used.

After source reduction and reuse comes **Recycling and Composting**. In our research, we did not identify any instances of tires being composted. This makes sense because tires were created to be a nearly indestructible product. For that reason and others—like their inability to be landfilled without first being processed by cutting or shredding—tires present a challenge for waste managers. Recycling, though, is an option. The best and highest recycling option is still in its infancy. Ideally, used tires could be ground up and used as a feedstock for new tires. Though tire companies have been slow to adopt this new practice for fears of producing an unsafe product. Still, one tire manufacturing company has begun incorporating recycled rubber material in new tires and plans to continue to increase their use over time. More commonly, tires are recycled into other products. Those products are exclusively created by shredding scrap tires into various sizes of rubber to create inputs for products like rubber mats for horse trailers, crack sealant for road repair, crumb rubber modified asphalt, garden mulch, and filler for synthetic turf athletic fields. There are even instances of tires being used as a carbon input as an alternative to coal when steel is recycled, though, that form of recycling requires incineration and ultimately produces additional waste products to be managed. Because it requires incineration, it is somewhat less preferred than other options according to the waste management hierarchy.

Energy recovery, which is the next waste management method, happens when Tire-Derived Fuel—or TDF—is used, often in cement kilns. These cement kilns are typically located near limestone quarries, so in Texas, they are mostly found along the I-35 corridor from Midlothian in North Texas to San Antonio. These locations are important because transportation is a significant cost when managing scrap tires.

The least desirable method for managing scrap tires is **Treatment and Disposal**. Treatment in this case means splitting, quartering, or shredding the tires so that they can be placed in a landfill, or more desirably in a Land Reclamation Project Using Tires (LRPUT). LRPUTs combine scrap tires and other inert materials to restore the grade of previously mined areas.

Processing

Scrap tire processing is very closely related to the possible end uses. In fact, all end uses require processing.

Reuse requires sorting and grading tires based on their ability to be sold in the used tire market. Retreading tires requires significant processing, but, according to a major tire retreading company, takes 20% of the energy required to produce new tires, reduces the amount of raw material used compared to new tires, and reduces the amount of CO_2 produced during the industrial processes.

Recycling, energy recovery, and treatment and disposal all require similar processing. The differences are based on the anticipated end use and specifications required for that end use. Typically though, all of these end uses require cutting or shredding the scrap tires. Sometimes those shreds are larger for uses such as garden mulch or rendered down to small particles, also referred to as crumb rubber, for use in recycled products. Depending on a facilty's design, shreds or crumb may also be used for TDF. Tires can even be ground down to fine powders. Of course, the smaller the shreds, crumb, or powder, the more expensive the product will be for the end user.

An emerging process is tire pyrolysis, which applies heat in the absence of oxygen to whole, halzed, or shredded tires to decompose them and produce pyrolysis oil, carbon black, steel, or gas. We were unable to locate

active tire pyrolysis processors near the Region, and the TCEQ does not have data on facilities that process tire pyrolysis oil.

Transportation

Transportation is a critical aspect of scrap tire management. Scrap tires are bulky and difficult to pack into a container for transport. Transport can take a few different forms and depends on who is managing the transportation. For example, private individuals may transport their own scrap tires directly to a drop-off facility or landfill. In other cases, local governments may arrange services where individuals can leave their scrap tires out for route collection. These options are typically for small volumes of tires.

Once a significant number of tires is gathered, transportation options change. The three options are:

- Drop-and-hook,
- Route collection, and
- Gate service.

Drop-and-hook is a common option where a trailer is left at a location that, when filled, is picked up and transported away with a new trailer left at the location for additional tires. Route collection is where a location sets up a staging area that is collected as appropriate. This option is typically more expensive than drop-and-hook. Gate service is available in some cases where local governments, for example, could use their own fleets to transport tires to a processing facility.

Generation

Understanding generation is a critical first step to understanding the magnitude of the management challenge. Data around generation can be difficult to compile, but there are many methods that can be used to get a general sense of the number of scrap tires that are generated each year.

With sufficient background understanding of scrap tire management, we will now turn our attention to examples of scrap tire management from around the world.

International and National Scrap Tire Management

We researched management practices in other states and in other countries to learn about how scrap tires are managed in places other than Texas. Doing this research allowed us to get a better idea of scrap tire management across the world.

We used internet searches to find information about international and national management. For states, we searched all 50 states' websites for any scrap tire data or plans, and all Texas data came from the TCEQ's website. For countries, we searched for any available data related to scrap tires, primarily focused on developed countries so that we could better compare them to the U.S. We used the U.S. Tire Manufacturers Association (USTMA) website for U.S. data. We used the most recent data available for states and used 2019 data for Texas to facilitate better comparison with the other states.

While doing this research, we continually ran into problems with data availability. Very few states had scrap tire data available in a format that we could easily present, and even fewer countries had it. Additionally, some of the other states or countries used scrap tire use categories differently than Texas does, making it difficult to do a side-by-side comparison. However, with these limitations in mind, we were still able to make reasonable comparisons and show the pie charts for four states and four countries (Figure 3 and Figure 4).

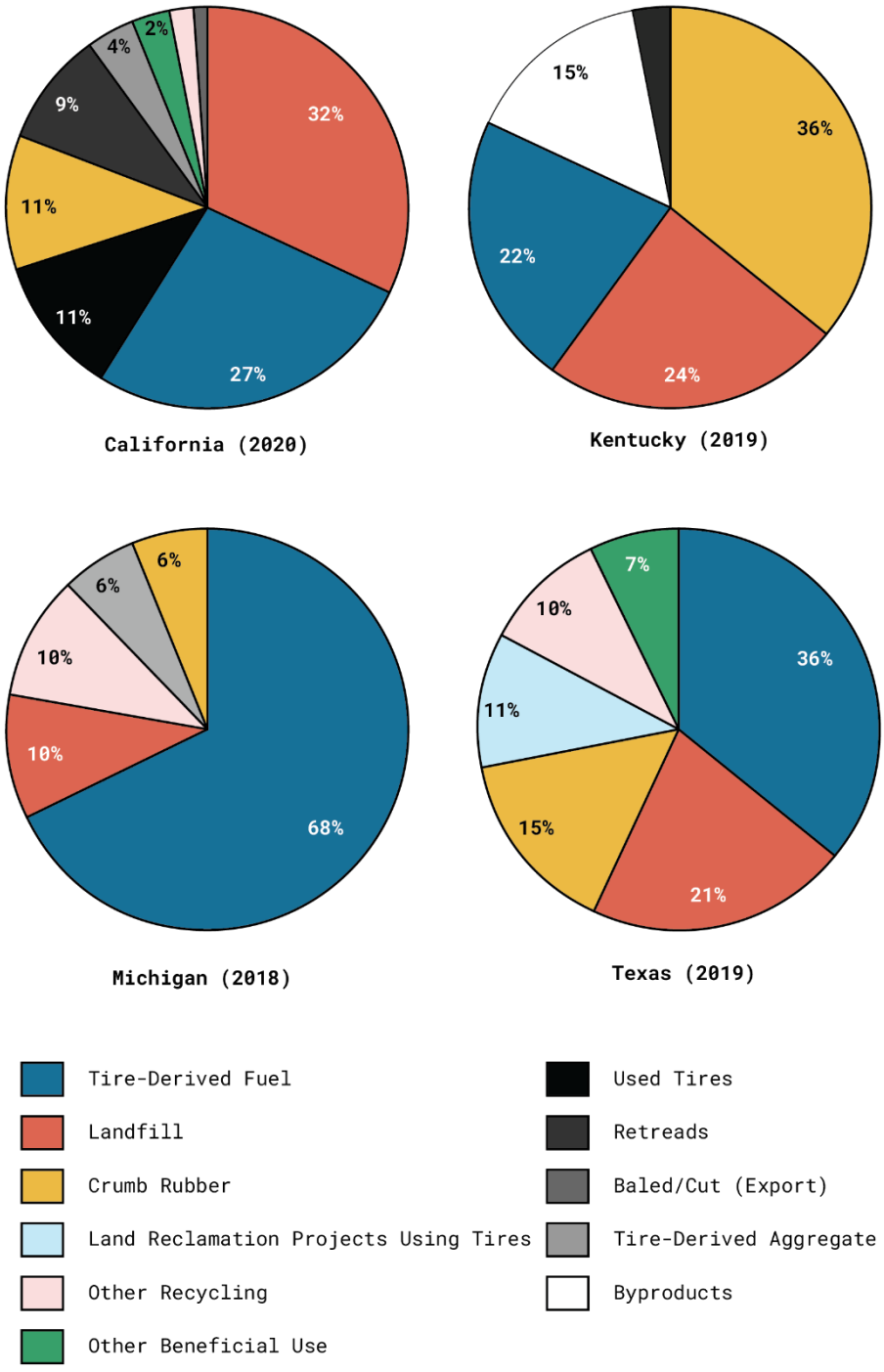

Figure 3. State Tire Usage

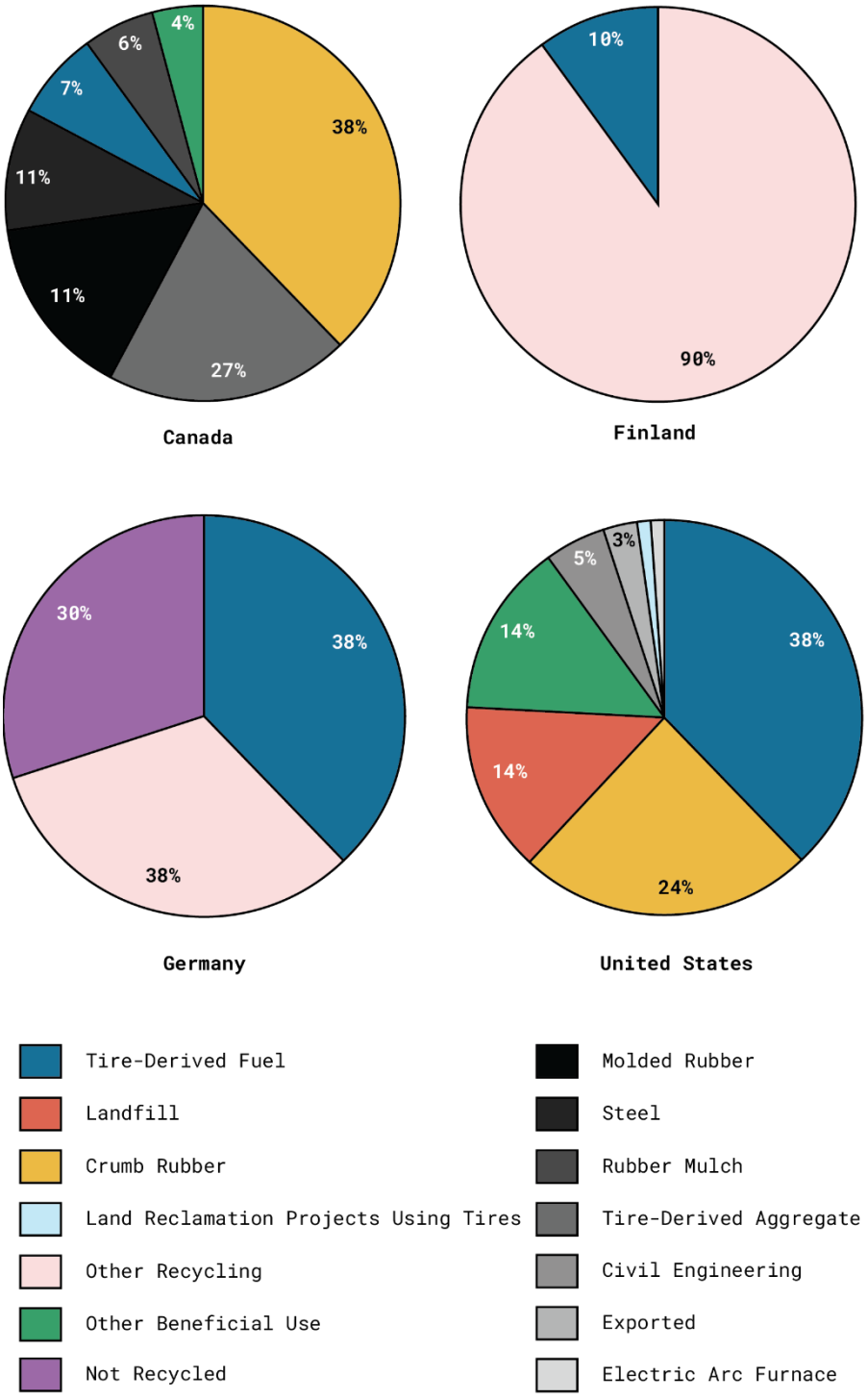

Figure 4. International Scrap Tire Disposition

The top three uses of scrap tires in Texas are the same as the top three uses in the U.S. Although Texas is still recycling less and landfilling more than the U.S., the rates of usage are still very similar, indicating that Texas is not far behind the national standard.

Texas is also comparable to the three other states we looked at. Texas is recycling a higher percentage of tires than California and Michigan and a higher percentage of energy production than California and Kentucky. As for disposal, Texas is landfilling a lower percentage than California and Kentucky.

In general, the U.S. is disposing of a greater percentage of their tires than European countries we found data for, but this is expected since Europe generally takes a more robust approach to waste management. For state scrap tire disposal fees, we found that 33 states have a designated fee, with the average fee being $1.57. Texas does not have a state scrap tire disposal fee.

The impact of scrap tire disposal fees is unknown, but they are generally thought of as a good method to generate more funds for tire management. Texas once had a disposal fee in place, but now it is the only southern state without one. The Texas Recycling Market Development plan recommends reinstitution of a disposal fee in the state (https://www.tceq.texas.gov/downloads/p2/recycling/recyclable-materials/2021-recycling-market-development-plan.pdf, page 211).

Figure 5 shows the change in Texas tire disposition over time. The amount of scrap tires managed in the state comes close to doubling in this nearly 10-year span. TDF, Landfill, and Crumb Rubber are the top uses throughout the years.

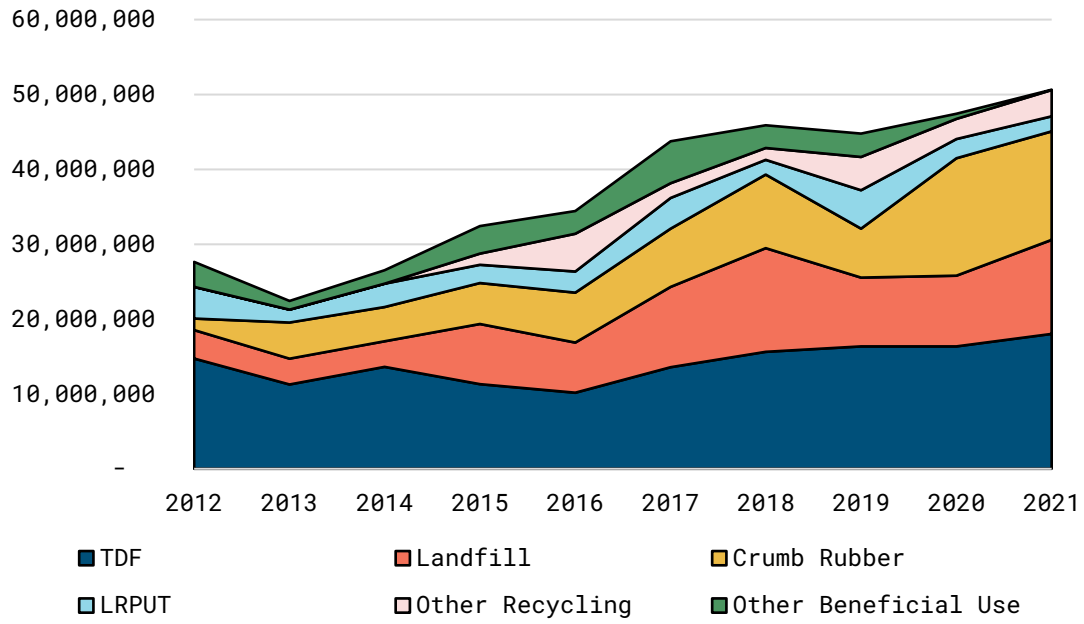

Figure 5. Scrap Tire End Uses in Texas over Time

For easier comparison of these data, we classified all uses into three categories: Tire Recycling, Tire Energy Production, and Tire Disposal. The first category includes all uses except for Landfill and TDF, and the second category only includes TDF or other Energy Production. The third Tire Disposal Rate category includes landfilled tires. Table 1 shows these rates for the states and countries we had data for. Tire use rates in Texas are not drastically different from rates in other states.

Table 1. Tire Recycling Rates and Tire Energy Production Rates for Countries and States

Country/State	Tire Recycling	Tire Energy Production	Tire Disposal
Canada	93%	7%	<1%
Finland	90%	10%	<1%

Country/State	Tire Recycling	Tire Energy Production	Tire Disposal
Germany	30%	32%	Not Available[1]
U.S.	48%	38%	14%
California	41%	27%	32%
Kentucky	54%	22%	24%
Michigan	22%	68%	10%
Texas	43%	36%	21%

[1] Due to the data reported by Germany it is not clear if the tires that were not recycled were disposed of or if those tires were exported to another country for processing.

Methods

A mixed-method approach was used to ensure as clear an understanding as possible. In general, in addition to online research, the quantitative and qualitative methods used to develop our recommendations included:

- Data analysis
- Surveys and data collection
- Interviews with subject matter experts

Interviews

The interviews conducted for this report included interviews with key personnel at the TCEQ, conversations with members of the Region's Solid Waste Advisory Committee, and 10 interviews with various scrap tire transporters and processors throughout the State of Texas.

Specifically, interviews with Liberty Tire Recycling were critical to our overall understanding of tire transportation, processing, and end use. Information from these interviews and our analysis will be presented separately in the transportation results section.

Scrap Tire Generation Methods

To get a sense of the range of possible generation rates, we explored three different options for calculating generation, which will be explained here. All data used for these generation methods are from 2019.

Population Estimate

This method uses the assumption that scrap tires are generated at a rate of one tire per person per year (Equation 1). We used the TCEQ 2019 Scrap

Tire Annual Report Summary and a regional population projection from the Texas Demographic Center.

Equation 1. Regional Tire Generation Population Estimate

$$Regional\ Population = Number\ of\ Tires\ Generated\ in\ the\ Region$$

Texas Commission on Environmental Quality Estimate

The second method to estimate scrap tire generation uses the Texas Commission on Environmental Quality's (TCEQ) statewide number and apportions it to the population of the Region (Equation 2). We used data from the TCEQ 2019 Scrap Tire Annual Report Summary. For statewide population we used data from the U.S. Census Bureau, and for the Regional population we used a projection from the Texas Demographic Center.

Equation 2. Regional Tire Generation TCEQ Estimate

$$\frac{Texas\ Tire\ Generation}{Texas\ Population} \times Regional\ Population = Number\ of\ Tires\ Generated$$

U.S. Tire Manufacturers Association Estimate

In the third method, we evaluated the U.S. Tire Manufacturers Association (USTMA) framework, which estimates the number of tires scrapped nationally. Like our approach with the TCEQ estimate, we apportioned the USTMA estimate to the Region's population (Equation 3).

Equation 3. Regional Tire Generation USTMA Estimate

$$\frac{\text{USTMA Tire Generation}}{\text{U.S. Population}} \times \text{Regional Population} = \text{Number of Tires Generated}$$

Scrap Tire Transportation Methods

In addition to interviews, the Institute used three primary methods to create our understanding of transportation practices: analysis of TCEQ data, a survey of local leaders, and a survey of major local tire retailers.

TCEQ Data

To calculate the average distance per tire we requested annual scrap tire report data from TCEQ. We received the annual scrap tire report data for 2018, 2019, and 2020, but we primarily used the 2020 data, which was the most recent year of report data available at the time of our evaluation. We also used the list of active scrap tire registrations from the TCEQ website.

Using available TCEQ information and internet searches, we found latitude and longitude coordinates for each transporter and processor in the dataset.

For easier analysis, we converted tire tonnage to the Passenger Tire Equivalent (PTE). Equation 4 shows the calculation TCEQ uses.

Equation 4. Tire Tons to Passenger Tire Equivalent (PTE) Tires Conversion

$$\frac{\textit{Weight of Tire Pieces} \times \textit{2000 pounds}}{\textit{20 pounds}} = \textit{PTE}$$

With the coordinates, we used ArcGIS Pro to map the locations of the transporters and processors. Based on TCEQ data, we used facility registration numbers to connect each transporter to the processing facility it recorded transporting tires to. We also included other relevant data such as the number of tires each facility reported transporting/processing and the facility type of each location, when available. Using the Generate Desire Lines tool in ArcGIS, we generated an output table combining transporters and processors and measuring the straight-line distance between the points. This straight-line distance does not use road networks and underestimates total distance as a result.

With the output table generated by ArcGIS, we calculated the average distance per tire. First, for each transporter-processor interaction, we multiplied the straight-line distance by the number of tires transported to find the cumulative transportation distance. Then we divided the sum of the cumulative transportation distance by the sum of the total tires transported to get the average distance per tire.

Equation 5. Distance per Tire Calculation (Step 1)

$$\text{Distance (miles)} \times \text{Number of Tires Transported} = \text{Cumulative Transportation Distance}$$

Equation 6. Distance per Tire Calculation (Step 2)

$$\frac{\text{Cumulative Transportation Distance}}{\text{Sum of Total Tires Transported}} = \text{Average Distance per Tire}$$

Survey of Local Leaders

We created a survey using ArcGIS Survey123 and sent it to relevant representatives from cities and counties in the Region. Along with basic

identifying information like respondent name and the city/county represented, respondents were asked several questions related to scrap tires. In some cases, we spoke to local leaders on the phone to get more information.

Survey of Major Local Tire Retailers

Google maps was used to locate and obtain contact information for Discount Tires and Walmart Auto Care Centers in the Region.

In the first round of phone calls, we asked each location these two survey questions:

- *What is the tire disposal fee for your facility?*
- *Who is the transporter company for the scrap tires?*

In a second round of phone calls, we asked the locations this question:

- *On average, how frequently does the scrap tire container get emptied?*

Road to Recycling Data

We reviewed data about the Region's reoccurring Road to Recycling events to understand local participation and coordination. These events, organized by the LRGVDC Solid Waste Advisory Committee, aim to reduce illegal dumping and promote better scrap tire management.

Scrap Tire Processing Methods

To better understand scrap tire processing, we evaluated TCEQ data and surveyed selected scrap tire processors that met our criteria.

Texas Commission on Environmental Quality Data

The TCEQ annual scrap tire report data helped us to analyze the activities of statewide processors. We also assigned each processor to its Council of

Government (COG) so we could compare the other regions in Texas to the LRGVDC.

To make the data easier to conceptualize, we again used the TCEQ's calculation to convert tons of tires to the Passenger Tire Equivalent (PTE), as shown in Equation 4.

Scrap Tire Processor Survey

All non-municipal scrap tire processors who reported processing scrap tires for purposes other than landfilling and Land Reclamation Projects Using Tires (LRPUT) to TCEQ were contacted by phone and asked whether they were "interested in discussing locating a scrap tire processing facility in the Region." Of the 50 facilities who reported processing tires for purposes other than landfill or LRPUT in the TCEQ data, 21 met our criteria and were contacted. Some facilities were owned by one company. Those companies were only contacted once.

Scrap Tire End Use Methods

We used the draft 2022 – 2024 Regional Solid Waste Management Plans for each of the 24 COGs to compare the number of tires landfilled in each region. These draft plans were available on the TCEQ's website. We also used TCEQ landfill data for any data not available in these summary reports.

Based on the potential of Land Reclamation Projects Using Tires (LRPUT), we identified possible sites. To do this in the Region, we used the TCEQ's Aggregate Processing Operations (APO) site registration search. Using the Advanced Search feature of the site, we first searched for sites within the Region's three counties.

Through an interview with an industry expert, we learned that transportation costs are usually the same within 100 miles of a site. We chose the location of the Edinburg Landfill to be the starting site as the most central landfill location in the Region, and then we searched for APO registrations within 100 miles of it. We also used Google Maps in satellite mode to verify each location.

We included all APO registrations in our search regardless of the authorization status. We found Active, Cancelled, and Expired sites within the 100-mile search area.

Results

To present the results in the most easily understood way, we will first detail scrap tire generation in the Region. This will allow us to set a baseline understanding of the number of tires that will need to be managed annually. Following the detailed results of our generation analysis, we will jump to the end of scrap tire management and identify end uses and users available to the Region. Following this, we will work backwards through the scrap tire management process by presenting our analysis of processors and finish with our analysis of transportation.

Regional Scrap Tire Generation

Regional scrap tire generation covers the scrap tires that are accumulated from sources within the Region. While there are state and national estimates of scrap tire generation, there is no published regional tire generation rate for the Region. Still, there are multiple methods to calculate regional generation to estimate the extent of scrap tire generation in the Region.

The estimated tire generation ranged from the low USTMA method estimate of 1,070,568 to the high TCEQ estimate of 2,130,389 scrap tires annually. The population method estimate is between these two estimates at 1,309,018 scrap tires. To be clear, this number is the same as the estimated population of the Region in 2019. The average of these estimates is 1,503,391, as shown in the orange line in Figure 6.

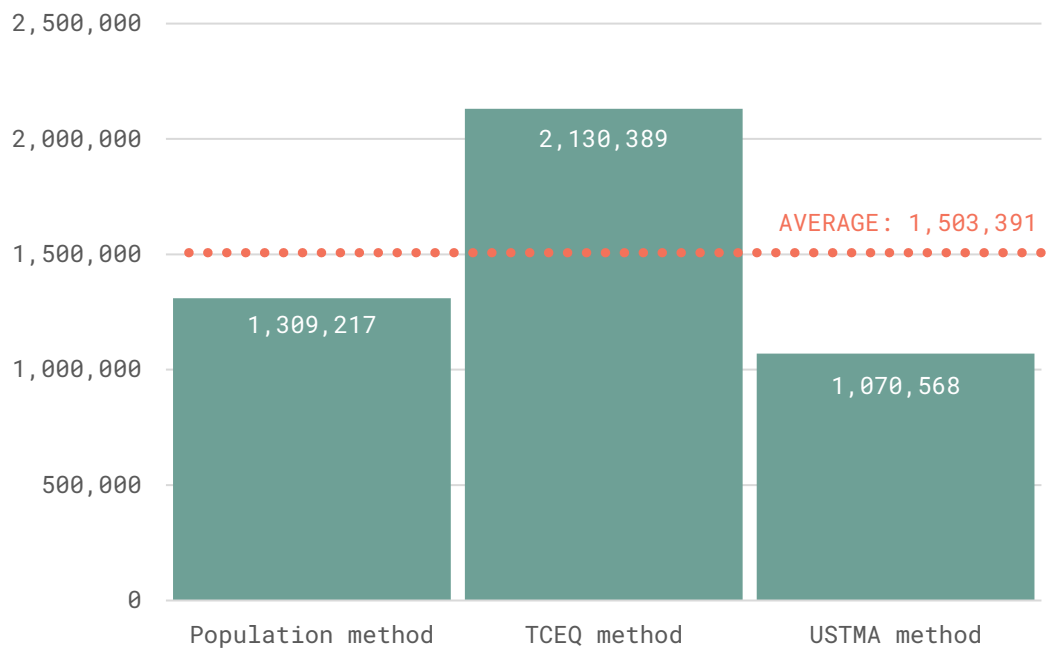

Figure 6. Comparison of Three Regional Scrap Tire Generation Estimates

Regional Scrap Tire End Uses

Based on the waste management hierarchy, we evaluated scrap tire end uses. It is important to acknowledge that data is limited for end users. The only end users that are required to report data are users of Tire-Derived Fuel (TDF). Though, by using TCEQ permitting data, we were also able to identify the locations of landfills and Land Reclamation Projects Using Tires.

Landfill

The most common end use in the Region, though the least preferred, is landfilling. Three landfills in the Region accept tires (Figure 7).

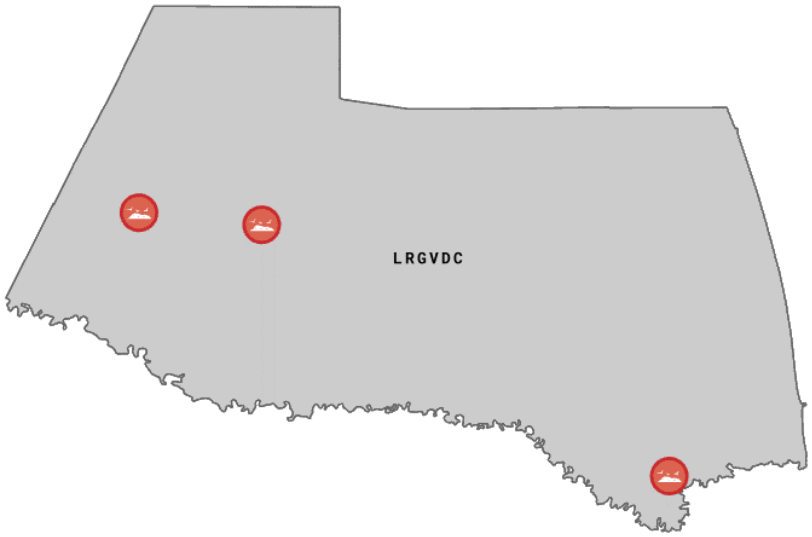

Figure 7. Regional Landfills Accepting Tires

These three landfills reported landfilling approximately 622,700 tires in 2019. Compared to other regions in Texas, this amount of landfilling could be considered moderately high. Figure 8 shows all the Councils of Government (COGs) of Texas, with the darker colors indicating higher amounts of landfilled tires.

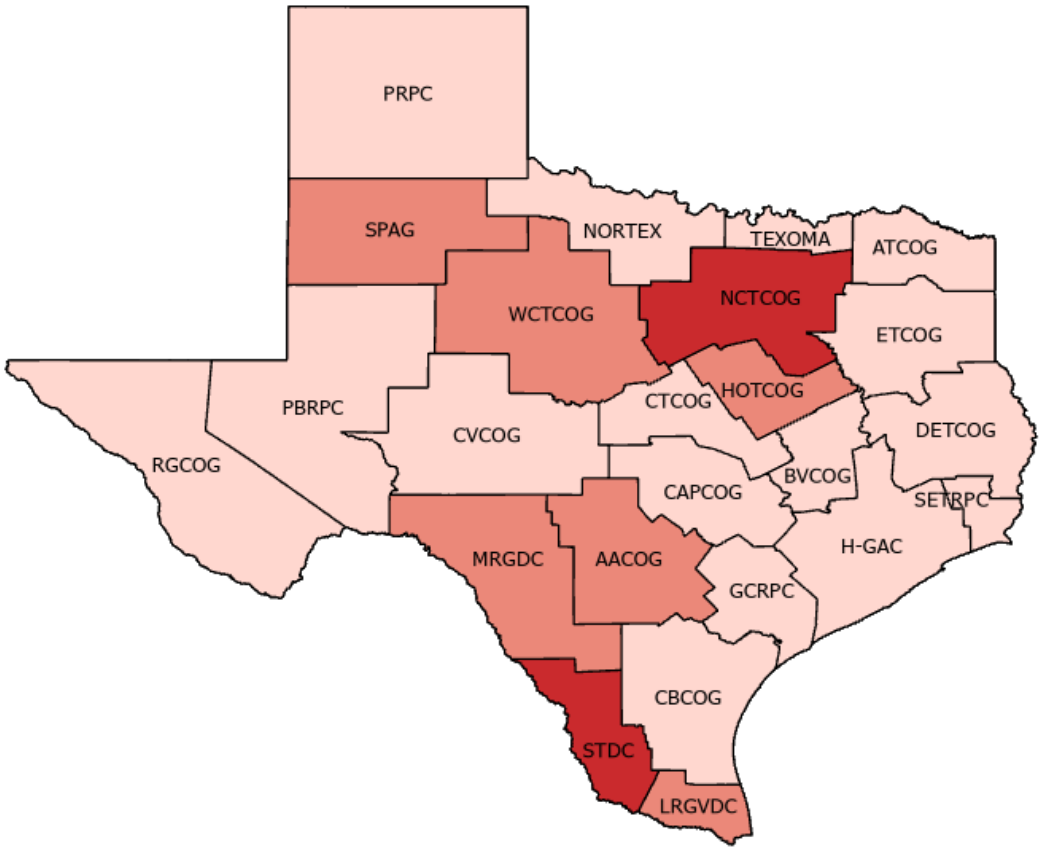

Figure 8. Landfilled Tires by Region (2019)

The LRGVDC Region is ranked third in the State for the number of landfilled tires (Table 2).

Table 2. Landfilled Tires by Region (2019)

Rank	Region Name	Region Abbreviation	Landfilled Tires
1.	North Central Texas COG	NCTCOG	1,202,800
2.	South Texas Development Council	STDC	1,015,000

Rank	Region Name	Region Abbreviation	Landfilled Tires
3.	Lower Rio Grande Valley Development Council	LRGVDC	622,700
4.	Heart of Texas Council of Government	HOTCOG	341,153
5.	Middle Rio Grande Development Council	MRGDC	291,300

To account for the various populations of each region, the same data can be viewed as total tires landfilled per capita (Figure 9).

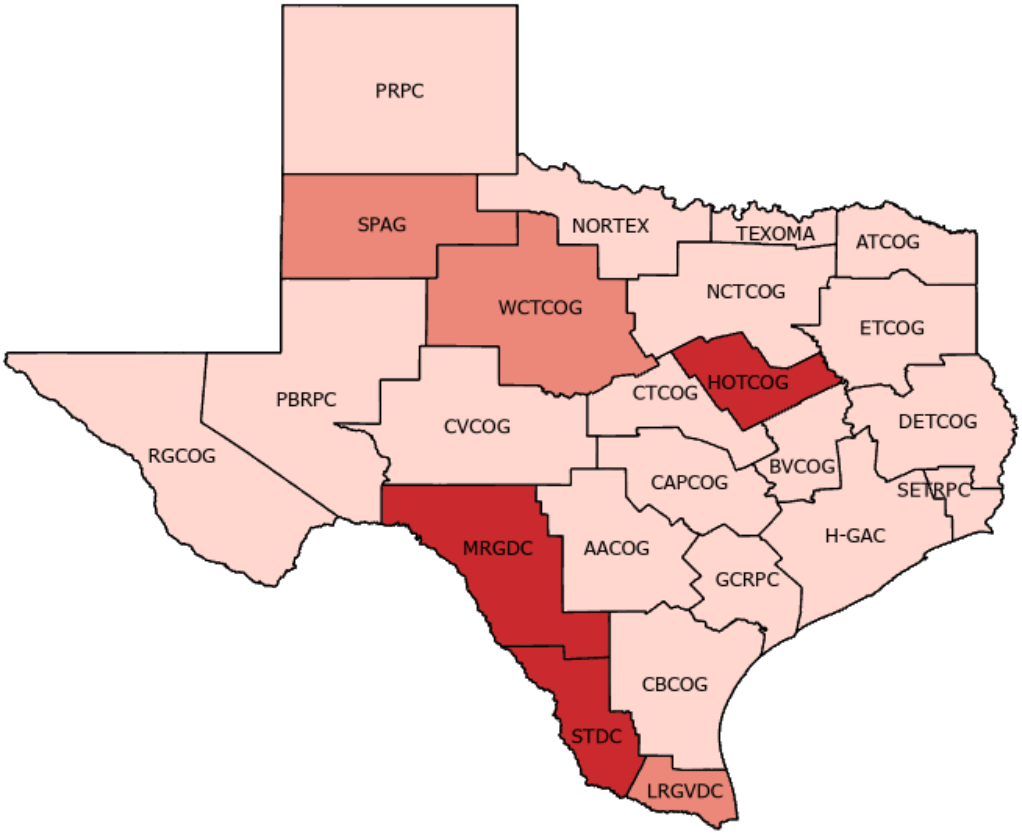

Figure 9. Landfilled Tires per Capita by Region (2019)

While the Region moves from third to fifth, it does remain in the top 5 regions for most scrap tire landfilling (Table 3).

Table 3, Landfilled Tires per Capita by Region (2019)

Rank	Region Name	Region Abbreviation	Landfilled Tires per Capita
1.	South Texas Development Council	STDC	2.8
2.	Middle Rio Grande Development Council	MRGDC	1.7

Rank	Region Name	Region Abbreviation	Landfilled Tires per Capita
3.	Heart of Texas Council of Government	HOTCOG	0.9
4.	West Central Texas Council of Government	WCTCOG	0.8
5.	Lower Rio Grande Valley Development Council	LRGVDC	0.5

Land Reclamation Projects Using Tires

Following the analysis of landfills, we turned our attention to Land Reclamation Projects Using Tires (LRPUTs)—which are very similar to landfills, but still more preferred according to the waste management hierarchy. No permitted LRPUTs were identified in the Region. As a result, we identified all the active, cancelled, and expired permits for Aggregate Production Operations (APO)—where a LRPUT could be possible—within approximately 100 miles of the Region (Table 4) and mapped their locations (Figure 10). According to our interview with the TCEQ, active sites are more preferred because they have the necessary heavy machinery on site to help make a successful project.

Table 4. Number of Sites by Authorization Status

Authorization Status	Number of Sites
Active	24
Cancelled	6
Expired	19
Total	49

Figure 10 shows the possible LRPUT locations. For more information, see Appendix 1: Land Reclamation Projects Using Tires Locations.

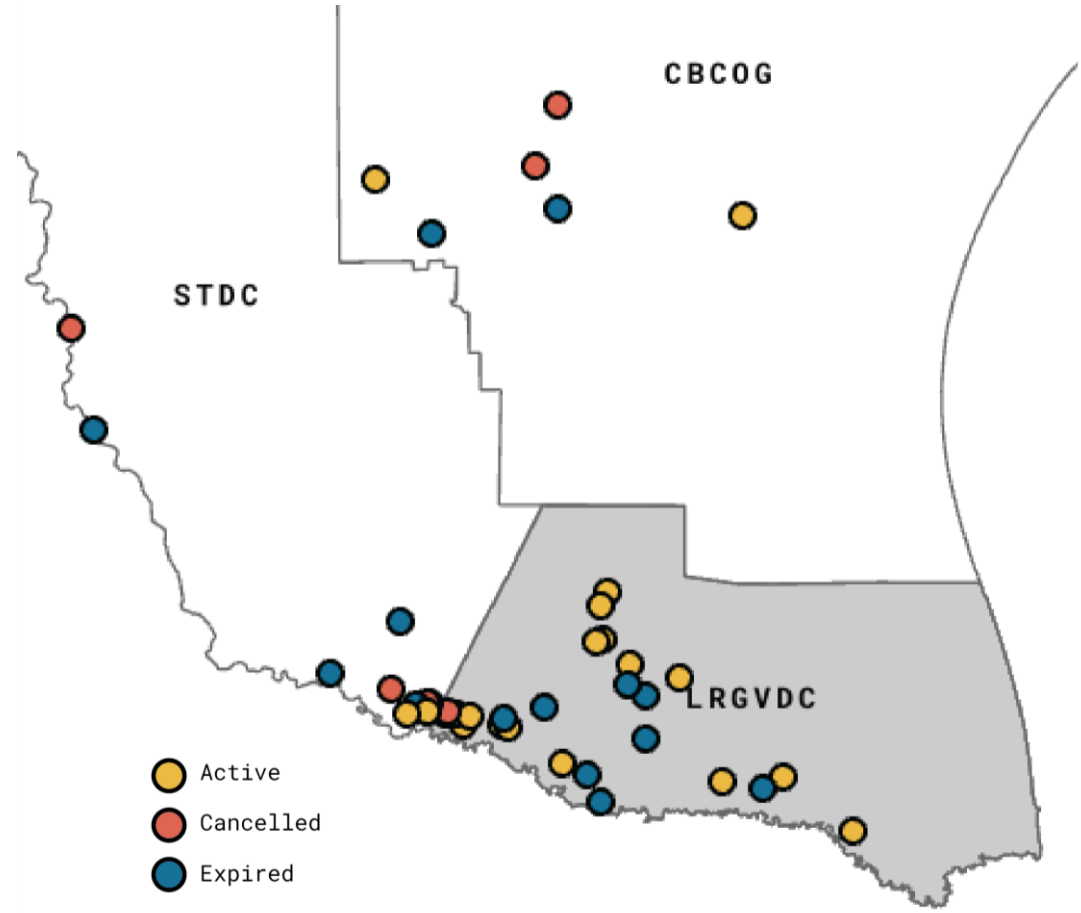

Figure 10. Aggregate Production Operation Permit Locations

These APO locations represent the next most proximal end use option for the Region.

Although LRPUT is more preferred than landfilling, they do not come without challenges. We learned from the TCEQ that there can be community pushback about new LRPUTs because of the way they are perceived. Also, certain parts of the permitting process can be challenging,

such as the groundwater or engineering permit requirements. On the other hand, LRPUT permits can be completed in as few as 60 days, which is much faster than landfill permits that can take up to several years.

Case Study: Land Reclamation Project Using Tires

Based on a detailed interview with the operator of a Land Reclamation Projects Using Tires (LRPUT), we developed this account of how LRPUT works. Our interview was with a family-owned business (the Business) primarily focused on LRPUTs. The owner of this business owns land with a 7 acre, 40-foot-deep hole, which was created by a road construction project over 10 years ago.

To get the tires needed for the LRPUT, the Business leaves a trailer at a car dealership for them to fill up. Once the trailer is full (1,000 – 1,200 whole tires), the Business picks up the full trailer and leaves an empty one. Additionally, they send out trucks on route collections in the surrounding areas. If the location is within 100 miles of their location, they will charge the same price for route collection.

About one third of the tires collected by the business are taken to another company for processing. The remaining tires are used in the LRPUT, after being shredded. Additional inert materials are needed for LRPUTs, and they get some of these materials from the local municipality. They commonly bring him concrete, road millings, and dirt. The Business charges for concrete drop offs, but they do not charge anything for clean dirt because it is the easiest to use. Other inert materials can be used in LRPUTs, but no wood materials or anything else that will rot can be used.

In the case of this specific project, the Business is able to be profitable by charging for transportation of scrap tires to processors, acting as a drop-off for concrete, and charging for the space the waste will occupy in the LRPUT. This model has been profitable for the Business for years.

As this pit fills up, the Business has also explored new ways to be profitable. In addition to the pit the Business owns, they have begun working with another landowner to help them fill another hole. In this case, the landowner will manage the LRPUT with the help of the business and they will share in the profits from the project.

Tire-Derived Fuel

Other than landfills and LRPUT opportunities, no other dedicated end use facilities or locations were identified in the Region. Based on the way data are reported to TCEQ, we identified two other possible end use cases: cement kilns and steel mills. Cement kilns can use Tire-Derived Fuels (TDF) and steel mills can use tires as an alternative to coal to generate carbon in the steel manufacturing process.

We identified seven cement kilns in TCEQ processor data, five of which indicated that they used TDF. Two of these cement kilns, located in Central Texas, did not report using any TDF. The nearest cement kiln is about 230 miles away from the Region. Based on our interviews of cement kiln facility operators, tires are shredded to be used as fuel chips, but in limited cases whole tires can be used.

The nearest cement kiln is about 230 miles away from the Region.

In Figure 11 the dark blue dots are the cement kilns that reported using TDF, and these are also in Table 5. The light blue dots are the two cement kilns that did not report any TDF usage.

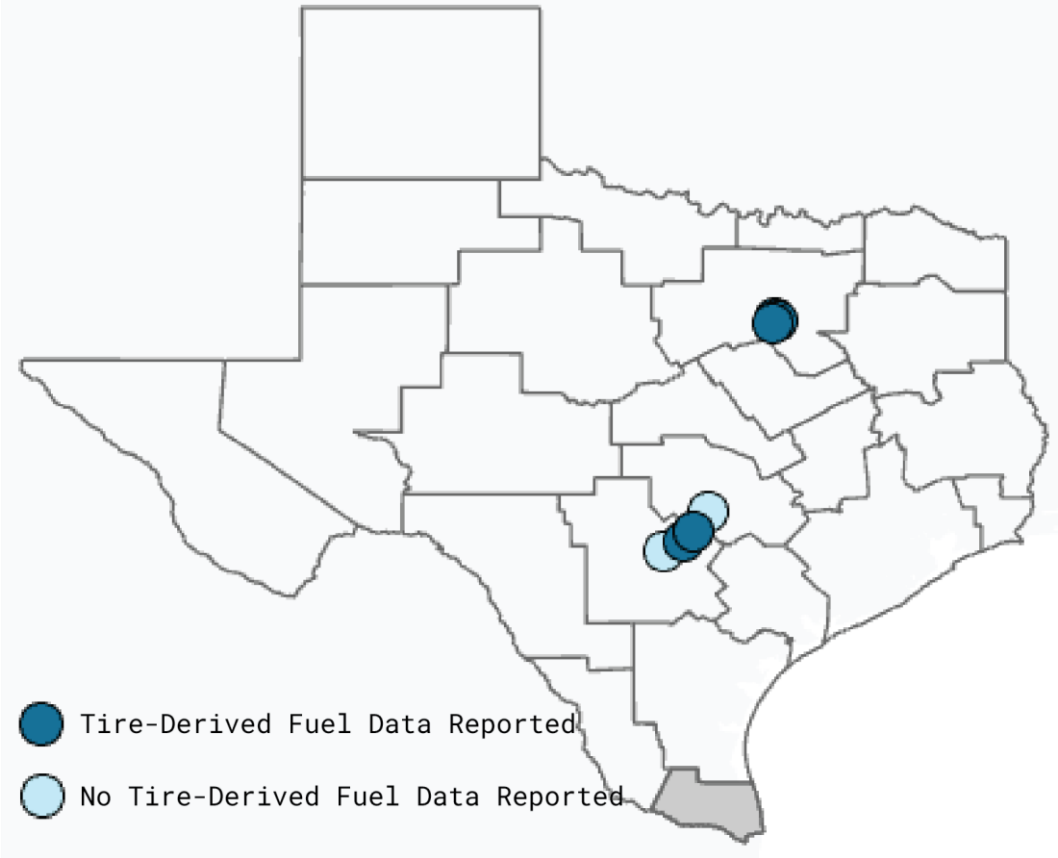

Figure 11. Cement Kilns in Texas

These facilities reported using a combined total of almost 15 million estimated tires in 2020.

Table 5. Cement Kilns in Texas Tire-Derived Fuel Usage

Region	Facility Name	Estimated Tires Used
NCTCOG	TXI OPERATIONS	7,919,893

Region	Facility Name	Estimated Tires Used
AACOG	HUNTER FACILITY	2,415,200
NCTCOG	HOLCIM TEXAS	2,304,700
AACOG	CEMEX CEMENT OF TEXAS	1,181,824
NCTCOG	ASH GROVE CEMENT	1,023,066
	TOTAL	14,844,683

The steel manufacturing process can use tires through incineration, which is similar to TDF but technically recycling. This incineration generates carbon to attach to oxygen molecules to remove them from the steel, maintaining the necessary quality for steel. This results in Carbon Dioxide as a waste product. One steel manufacturing facility was identified in the TCEQ data as a user of tires and three additional facilities were identified that could potentially become users in the future. The active location is approximately 430 miles away from the Region and is shown by the red dot in Figure 12. The facilities that could potentially use tires are shown by the lightly colored dots, the closest of which is about 230 miles away from the Region.

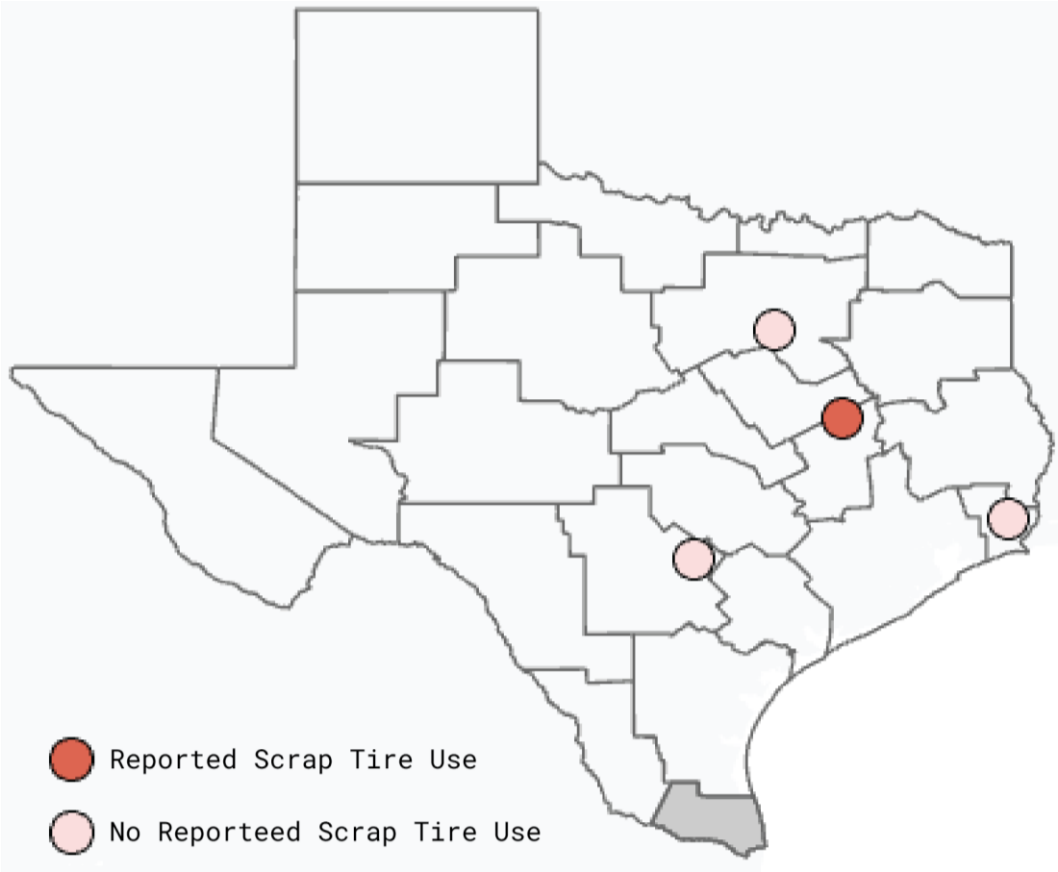

Figure 12. Steel Manufacturers in Texas

Table 6 shows the one TCEQ registered steel manufacturer and the almost 700,000 tires used in 2020.

Table 6. Steel Manufacturer in Texas that Recycles Tires

Region	Facility Name	Estimated Tires Used
BVCOG	NUCOR STEEL TEXAS	699,330

Regional Scrap Tire Processing

Texas Commission on Environmental Quality Data

Scrap tire processing is required for all end uses. Even for landfilling, tires must first be processed by cutting, quartering, or shredding.

According to the data, there are six registered tire processors in the Region (Table 7). Of these six, two did not report to TCEQ, one reported all 0s, and then three locations reported processing tires. Based on the data, 100% of scrap tire processing in the Region was for landfilling.

Table 7. Regional Processors and Reported Tires Processed for Landfill

Facility	Tires Processed for Landfill
City of Brownsville Municipal Landfill	97,041
Eco Tire Processing	66,035
Texas Tires	403
Terrabella Environmental Services Edinburg	0
Dario's Tires	*No data*
UTW Transportation	*No data*
Total	163,479

Since the time these data were reported, additional processing capacity has been brought into the Region by a municipality in Hidalgo County. The equipment is capable of shredding tires to 3- to 4-inch pieces. This equipment has an expected capacity of 100 tons of tires per day—or 10,000 passenger tire equivalents.

No other processing capacity is currently in the Region. However, in an interview a crumb rubber processor expressed interest in further discussions with local leaders about locating a new processing facility in the Region.

A crumb rubber processor expressed interest in further discussions with local leaders about locating a new processing facility in the Region.

To better understand the Region's processing capacity, we also looked at other regions in the state. Several other regions in the state are also only processing tires for landfilling (Figure 13). The size of the pie charts relates to the total tires processed. The nearest area with processing capacity other than for landfilling is San Antonio at about 230 miles away, followed by Houston at about 350 miles away. Regions without a pie chart did not have registered tire processors.

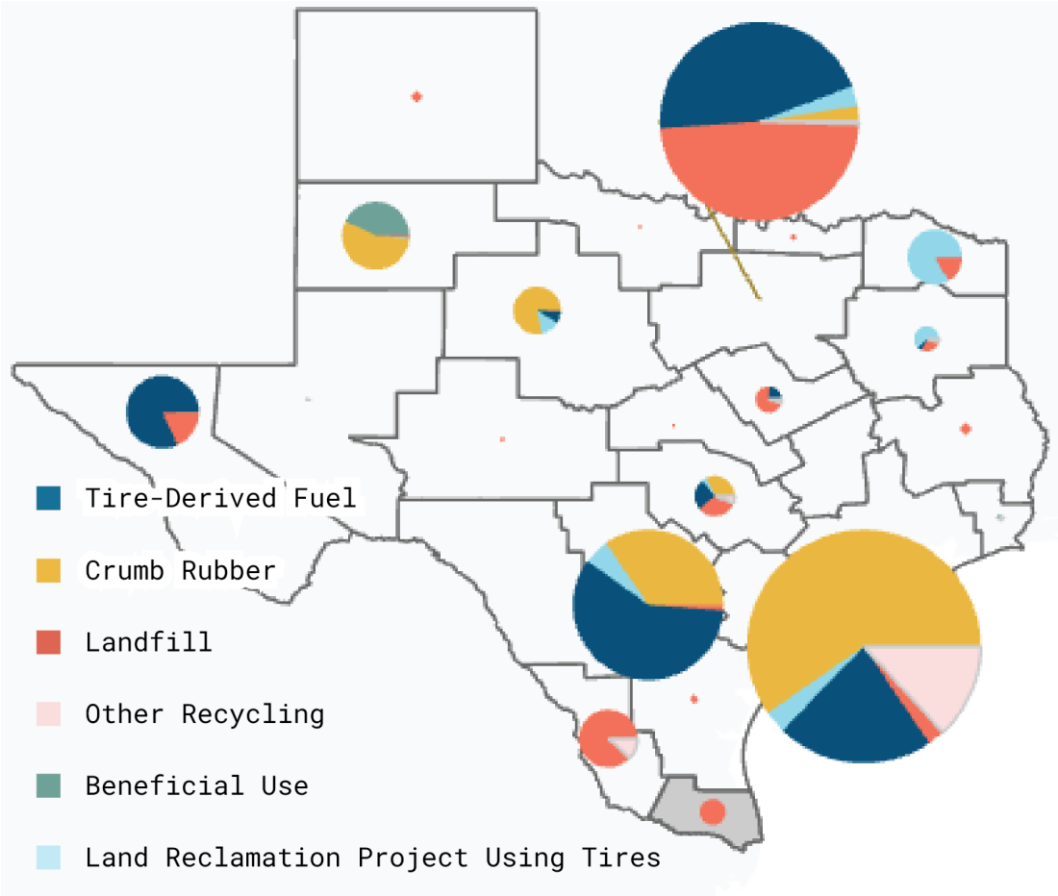

Figure 13. Regional Tire Market

Figure 14 shows the facilities that process scrap tires for TDF. These processers are concentrated in the major metro areas of Dallas, Houston, San Antonio, and El Paso.

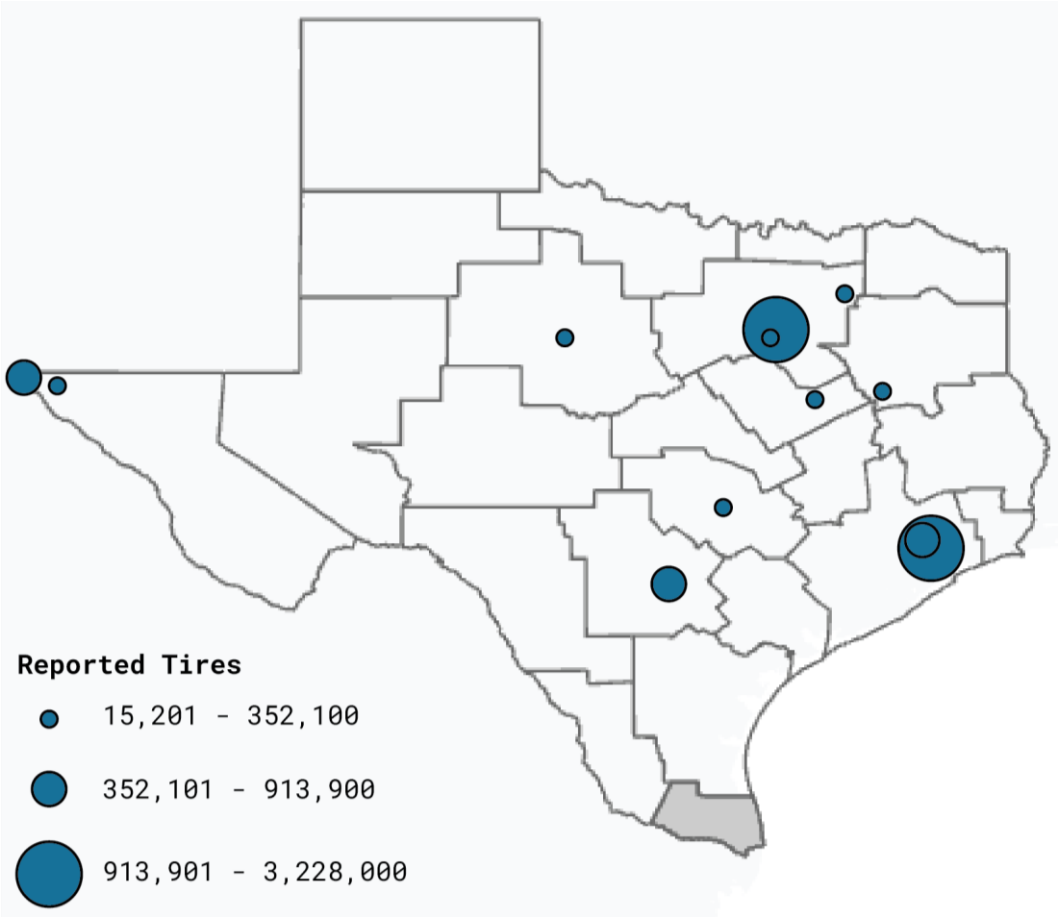

Figure 14. Tire-Derived Fuel Processing Facilities

Table 8 shows the top five processors of TDF based on the number of tires processed. The processors closest to the Region are Liberty Tire Recycling (Bexar and Harris Counties) and Genan Houston Granulation Plant.

Table 8. 2021 Statewide Tire-Derived Fuel Processing

Facility	Tires Processed
Genan Houston Granulation Plant – Harris County	4,276,623
Liberty Tire Recycling – Ellis County	3,228,000
Liberty Tire Recycling – Harris County	3,108,400
Liberty Tire Recycling – Bexar County	913,900
Road Master I G – El Paso County	559,827

Figure 15 shows where crumb rubber processors are in the state. Again, larger circles indicate a larger volume of tires.

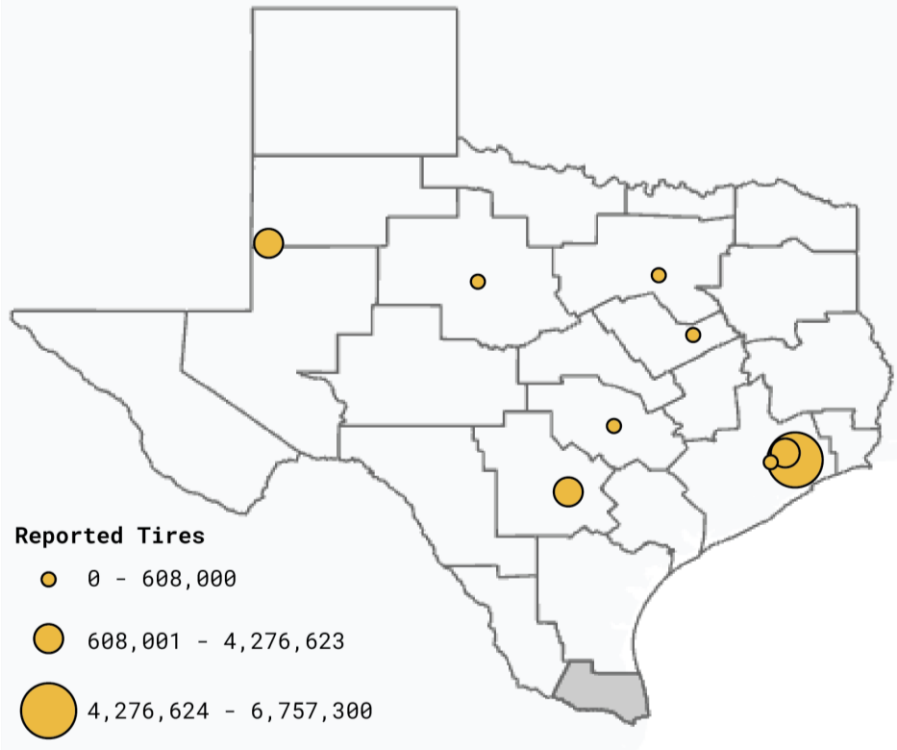

Figure 15. Crumb Rubber Processing Facilities

As shown in Table 9, similar to TDF processing, Liberty Tire Recycling is the largest crumb rubber processor, with three of its locations making the top 5. Again, the nearest locations to the Region are in Bexar County and Harris County.

Table 9. 2021 Statewide Crumb Rubber Processing

Facility	Tires Processed
Liberty Tire Recycling – Harris County	6,757,300
Genan Houston Granulation Plant	4,276,623
Liberty Tire Recycling – Bexar County	2,658,000
State Rubber and Environmental Solutions	868,652
Liberty Tire Recycling – Taylor County	608,000

Scrap Tire Processor Survey

Of the 21 scrap tire processors that were surveyed, 14 did not respond, 6 said they were not interested in discussion locating a scrap tire processing facility in the Region, and 1 said that they were willing to have those discussions (Table 10).

Table 10. Scrap Tire Processor Survey Results

Response	Count of Companies
No Response	14
Not Interested in Discussion	6
Interested in Discussion	1
Total	21

Regional Scrap Tire Transportation

Scrap tire transportation is all about getting the tires from the source of generation to processors because even if the tires will end up in landfills, they first have to be processed.

Transportation is a critical component of scrap tire management as it represents one of the largest costs to local areas. As discussed in other sections of this report, the processors' locations are generally tied to their access to end users. As such, the distance to those processors will be the principal aspect driving the cost of alternatives to landfilling.

This portion of the report will focus on various aspects of scrap tire transportation and will be organized by our various analyses, including an analysis of TCEQ transportation data, the Region's Road to Recycling data, a survey of local leaders, and a survey of major local tire retailers.

TCEQ Data

Transportation plays a large role in scrap tire management as all tires must be transported to processors and end users. To better understand this transportation process, we determined the average distance each tire travels from a transporter to a processor using TCEQ data.

Regional Transporters

There were 18 regional transporters in the TCEQ data, only 6 of which reported to TCEQ. The 6 that reported are shown in Table 11. These 6 facilities reported collecting a combined 222,252 tires. The available data only show destination but not point of origin data, so we do not know where these tires were picked up.

Table 11. Regional Transporters

Facility	Estimated Tires
Grupo Reciclados Mexicanos	200,015
Eco Tire Processing	10,924
Villarreal's Tire Shop	6,373
Mr. C	4,940
El Tigre Tire Shop	0
Terrabella Environmental Edinburg	0
Total	222,252

Transportation Distance

Because the Region is geographically isolated from scrap tire processors (other than for landfilling), tires must be transported hundreds of miles before they reach processors. Knowing the average distance traveled per tire in the state can help the Region begin to understand where they can economically transport their tires.

Only transporters that reported transporting tires to a known destination facility were included in this analysis so that we could estimate the distance the tires travelled. Data were available for 169 transporter-to-processor interactions. The average distance tires were transported statewide was 77 miles.

> The average distance tires were transported statewide was 77 miles.

This average is congruent with data we compiled in our interviews that tended to indicate 100 miles as a cutoff for a reasonable transportation distance before costs would increase.

Unfortunately, a similar analysis could not be relied upon for a regional understanding due to a lack of sufficient data. Only 5 transporter-to-processor interactions were identified regionally.

Road to Recycling Data

The Region regularly holds scrap tire collection events known as the Road to Recycling. These events help residents properly dispose of their scrap tires and avoid illegally dumping the tires.

Road to Recycling started in 2017 with 24 cities and counties within the Region participating. These participants designate at least one site, or multiple sites, for their residents to drop off tires during the event. The event takes place once a year, or sometimes twice a year depending on available funding. Tires that are collected are landfilled, and the Region covers the cost of the disposal fees. Other costs are the responsibility of the cities and counties, and they can choose which hauler to use. Since the first event in 2017, nearly 150,000 tires have been collected, and the number of participating cities and counties has increased (Table 12).

Table 12. Road to Recycling

Year	Estimated Tires Collected	Total Drop-Off Sites	Total Participants (Cities and Counties)
2017	42,000	63	24
2018	16,800	42	24
2019	46,000	57	35
2020	20,000	44	29

Year	Estimated Tires Collected	Total Drop-Off Sites	Total Participants (Cities and Counties)
2021	23,000	52	35
Total	147,800		

Survey of Local Leaders

We conducted an online survey to better understand elements of scrap tire management at the most local level possible.

Getting insight into how individual cities within the Region handle their scrap tires is important for better understanding how tire management really works at the local level.

We received 15 responses to the survey. Any use of “you” or “your” in the questions refers to the respondent’s city or county.

Figure 16 indicates that most respondents do participate in the annual Road to Recycling event put on by the LRGVDC. In some cases this participation is simply promoting the event.

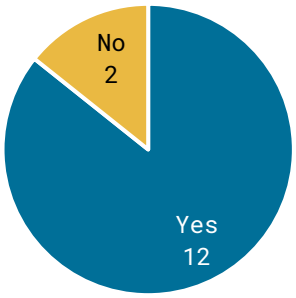

Figure 16. Do you participate in LRGVDC’s annual Road to Recycling tire recycling event?

Figure 17 shows that most respondents do not offer places for residents to regularly drop off tires. For the most part, the 4 respondents that answered 'yes' indicated that dropped off tires end up landfilled.

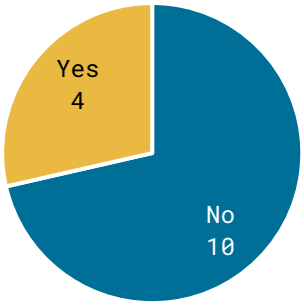

Figure 17. Do you operate a location for residents to regularly drop off tires (other than Road to Recycling event)?

From our phone interviews we learned that the City of McAllen Recycling Center has a tire drop-off area and tires are transported to a processing facility in Donna. After processing, the tires are taken to the City of Edinburg Landfill.

Figure 18 shows that most respondents do not offer curbside collection of tires in their city of county. One respondent skipped this question.

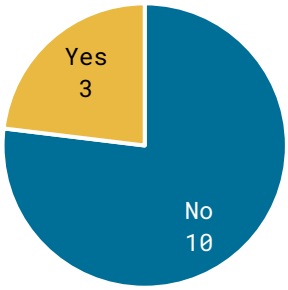

Figure 18. Do you offer curbside tire collection for residents as part of bulk collection?

Survey of Major Local Tire Retailers

One of the more common ways people handle their scrap tires is through tire retailers, who will manage the scrap tires for an additional fee when customers buy new tires. Unlike some states, the state of Texas does not have a standardized tire disposal fee.

We conducted a phone survey to find out the tire disposal fees and the transporter vendors for Discount Tires and Walmart Auto Care Centers in the Region—two of the largest tire retailers in the Region. Discount Tires and Walmart Auto Care Centers are large companies expected to have standardization in their disposal fees, and they are expected to receive a large number of scrap tires in the aggregate. For ease of obtaining information, we chose these companies to talk to rather than smaller, locally owned businesses.

Knowing the disposal fees and transportation vendors used at these locations gives us an idea of common rates and a better sense of where scrap tires are being transported to for processing to complement the TCEQ data.

We found 23 major tire retail locations in Hidalgo and Cameron counties. Of these, 6 were Discount Tires and 17 were Walmart Auto Care Centers. There are no Discount Tires or Walmart Auto Care Center facilities in Willacy County. In Figure 19, Discount Tires are represented by red dots, and Walmarts are blue dots.

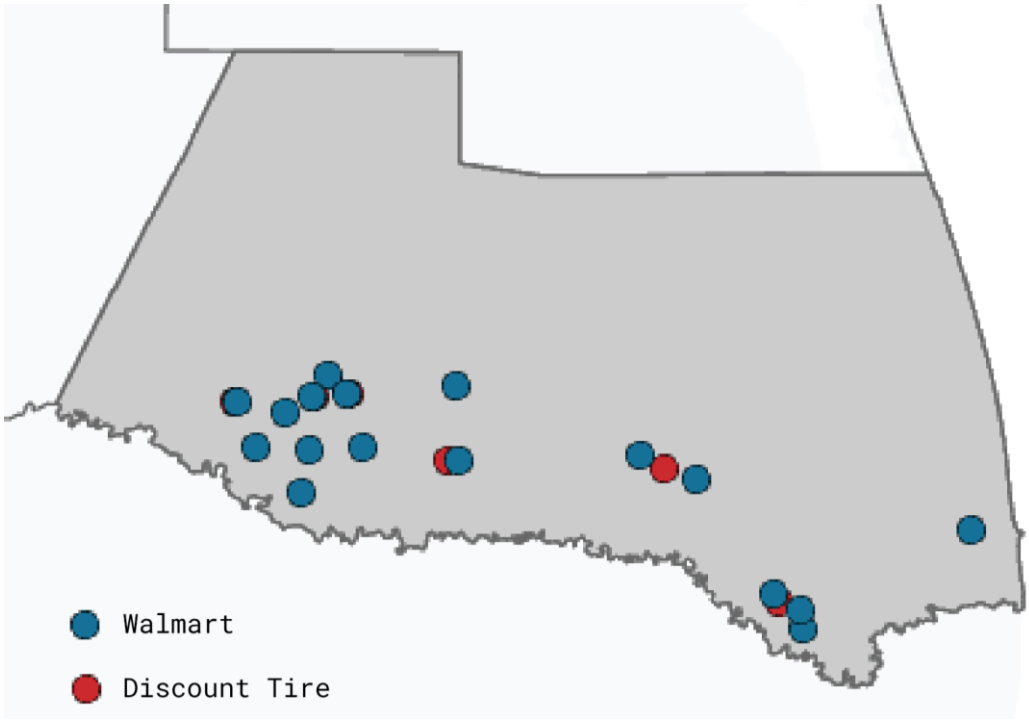

Figure 19. Discount Tire and Walmart Auto Care Center Locations

In the first round of calls to these retailers, 14 out of 23 answered and told us their tire disposal fee. Additionally, 7 of those facilities told us the name of the vendor they use to transport tires. In the second round of calls, 11 facilities gave their average disposal frequency.

Discount Tires in both counties reported a $3 per tire disposal fee, while Walmart Auto Care Centers reported a $2 per tire disposal fee (Table 13). Of the 7 known transporter vendors from these locations, 3 are Liberty Tire Recycling, 3 are Mendez Tires, and 1 is Mares Tires. In some cases, these companies may be subcontracted by a larger company. The other 7 facilities either did not know their vendor, could not give out any further information, or management was not available.

Table 13. Reported Disposal Fees for Discount Tires and Walmart Auto Care Centers

Retailer	Reported Disposal Fee
Discount Tires	$3
Walmart	$2

For frequency, most major tire retailers in the Region have their scrap tires transported away once per week. In some cases, tires are even transported daily (on Saturdays when they are busiest, for example). Based on other interviews, we learned that about 1,000 tires can fit on a typical trailer. For the 23 facilities, if we assume 1,000 tires per week, we estimate about 1.2 million tires are being transported annually from these locations.

For the 23 facilities, if we assume 1,000 tires per week, we estimate about **1.2 million tires** are being transported annually from these locations.

Transporting Tires out of the Region

First and foremost, we learned that Liberty is the largest scrap tire transporter in the U.S. Because they have national contracts with Discount Tire and Walmart, we talked to them about options for transporting other scrap tires out of the Region.

We also learned more about the tire transportation methods used. The retailer model for transportation is done using what is called *drop-and-hook.* Drop-and-hook means that an empty trailer is left at a location and when it is full, the location notifies the transporter. A new empty trailer is brought to the location, and the full trailer is hauled off.

More specifically, when Liberty transports tires out of the Region from Discount Tire and Walmart, they first take them to a facility in Bexar County. There, tires are sorted and any tires that have resale value are set aside to sell into the secondary market. The Liberty facility in Bexar County does have processing capacity and remaining tires may be processed into various scrap tire products, for example, crumb rubber. Some tires are also sent to the Liberty facility in Harris County for processing.

Critically, in the cases of Discount Tire and Walmart, the cost of transportation is covered by individual customers who pay the tire disposal fee. When we talked to someone from Liberty about transporting the tires currently being landfilled in the Region to Bexar County, there was significant concern about the cost based on the distance. However, when we informed them of the processing capacity in Hidalgo County, the approach to possible transportation changed.

In our interviews we learned that when transporting whole tires, about 900 – 1,000 tires—or 10 tons—can be transported at one time. It was estimated the cost to transport these to Bexar County would be about $4,000 per load. Alternatively, about 2,200 passenger tire equivalent tires—or 22 tons of shredded tires—could be loaded onto a single 40 ft. open-top container. This same container was also estimated to cost about $4,000 but could go directly to Harris County.

This amounts to two options—with an obvious choice—for transporting scrap tires out of the Region for purposes other than landfilling:

- $4,000 per 10-ton load of **whole tires** to Bexar County or
- $4,000 per 22-ton load of **shredded tires** to Harris County.

Based on these rough estimates, we calculated the combined Regional transportation cost to divert all tires to Harris County from the three

landfills that accept tires for processing. For simplicity, calculations used the most central landfill (Edinburg) as the departure point.

In 2020, these three landfills reported landfilling a total of 4,931 tons of tires. At 22 tons per load of tires, that is about 224 annual loads of tires and would cost approximately $900,000 (224 x $4,000).

Further, based on the tipping fees at each landfill, we estimated the approximate landfill value of the space saved by diverting these tires from those landfills (Table 14).

Table 14. Estimated Regional Landfill Value of Scrap Tire Diversion

Landfill	Landfilled Tires (Tons)	Tipping Fee	Estimated Landfill Value
Brownsville	891	$30/ton	$26,730
Edinburg	522	$30/ton	$15,660
La Gloria	3,518	$60/ton	$211,080
Combined Estimated Regional Landfill Value			$253,470

Based on these calculations, the estimated net cost of transporting all the landfilled tires in 2020 to Harris County would be roughly $650,000 for the Region (Equation 7).

Equation 7. Estimated Net Cost Calculation

$$\$900,000 \text{ (cost to transport)} - \$250,000 \text{ (estimated landfill value)} = \$650,000 \text{ (estimated net cost)}$$

This estimate assumes a highly coordinated effort that centralizes tire collection and shredding. Currently, this coordination may not be present in the Region.

Furthermore, there are multiple ways to consider making up the cost of transportation. One way could be increasing the per tire disposal fee at Regional drop-off locations, but this could potentially lead to increased illegal dumping. Another way is to increase tipping fees at the landfills. Based on prior total landfill tons, we estimate tipping fees would need to rise by $0.50 to $2.00. Alternatively, increases to solid waste service fees on utility bills could be explored to make up the shortfall.

Discussion

In the early stages of this project, we researched the basics of scrap tire management and waste management generally. Then, we established our conceptual model of how scrap tire management works (Generation > Transportation > Processing > End Use).

With this background and model, we explored how countries and states manage their scrap tire waste. Generally, we found a consistent lack of data and were only able to use data from a handful of other countries and states. For these areas, we found a variety of end uses for their scrap tires. Canada appeared to be a model of scrap tire management both in terms of the quality of their reporting but also their management of scrap tires using more preferred methods. For example, the country reported no landfilling and the most common product produced from scrap tires was crumb rubber.

When looking at Texas in relation to other states, it was comparable. Texas does rely heavily on Tire-Derived Fuel (TDF) and landfills a higher percentage of scrap tires than some states, but there are also states that landfill a higher percentage of their scrap tires than Texas.

When looking at the Region in comparison to other regions in Texas, the first thing we identified was the processing capacity in the Region. According to the available data, the only processing capacity in the Region is for landfilling. Based on our conversations with many experts, the processing capacity in the Region is also suitable for Land Reclamation Projects Using Tires (LRPUT). Any other processing, for the foreseeable future, will need to be outsourced to other regions in Texas, which will

require transportation. Though, we also learned some of this outsourcing is already occurring through major tire retailers.

In the remainder of this section, we will address the major themes of data quality, outsourcing processing to other regions of the state, attracting processors to the Region, and processing scrap tires for LRPUT. Following this thematic analysis, we will present our recommendations.

Data Quality

There are significant quality issues related to scrap tire management data. Estimates of scrap tire generation in the Region range from 1.1 million to 2.1 million annually, which is a significant difference. In another example, regional landfills reported disposing of roughly 500,000 tires, which is dramatically greater than the 163,000 tires reported by processors who processed tires for landfilling.

Even though origin and destination data for scrap tire transportation are not consistently available, through interviews and rough estimations, we believe around a million scrap tires are likely being exported to other regions of Texas for processing through major retailers such as Discount Tire and Walmart. This would help close some of the significant gaps in the reported data.

The common management expression, “If you want to improve something, measure it” applies in this case. The City of Pharr has adopted a scrap tire management ordinance which includes steps for improving data quality. The North Central Texas Council of Governments (NCTCOG) has created a similar ordinance that they recommend everyone in their Region adopt. In fact, they are attempting to create legislation that would implement the ordinance statewide. Evaluating the feasibility of adopting a scrap tire management ordinance in municipalities throughout the Region and

supporting the NCTCOG's legislative effort could not only help the Region itself, but also Texas more generally. The better we understand scrap tire management, the more we would expect alternatives to landfilling.

Outsourcing Processing to Other Regions

Some processing outsourcing is already occurring. For example, scrap tires taken off cars to be replaced by new tires at major retailers are left at these retailers for a nominal fee. These scrap tires are taken to the San Antonio area and processed there. Some of these tires also travel on to the Houston area for further processing.

Because the Region has significant shredding capacity, the ability to make the scrap tires considerably smaller can greatly reduce transportation costs. In fact, it more than cuts the costs in half.

Transporting shreds through a contract with Liberty is expected to cost an estimated $900,000 annually and save approximately $250,000 in landfill space. The remaining cost could be made up by raising tipping fees at area landfills by $0.50 – $2.00 or by increasing local solid waste service fees typically found on utility bills. These costs do not consider ongoing illegal dumping costs or significant one-time costs. For example, during this project, TCEQ visited a scrap tire dump site in the Region and required a local jurisdiction to provide clean up assistance, which significantly impacted their annual budget.

The rough estimates found in this document provide a baseline understanding but will need to be further refined with more detail from both the Region and any transportation partners. Ultimately, these details would form the basis of a competitive bid contract. The main takeaway

from this report is that alternatives to landfilling are possible but are expected to cost money for the Region. This effort would also be more economically feasible if scrap tires could be consolidated in one location with significant processing capacity. This would require a region-wide effort, including reorganization of current practices and collaboration between waste haulers, landfills, counties, and municipalities.

Processing Scrap Tires for Land Reclamation Projects Using Tires

The processors in the Region that are currently processing scrap tires to be landfilled could also be used to process scrap tires for Land Reclamation Projects Using Tires (LRPUT). Ultimately, a LRPUT is landfilling the tires but with a couple of additional benefits. Still though, the rubber that could be used for new products or as fuel is buried and no longer usable for those purposes.

For these projects to work, the tire pieces must be mixed with other inert construction waste and be well managed to avoid community pushback.

There are several TCEQ requirements for LRPUTs outlined in Texas Administrative Code 328.66. Some of these include:

- Fill a previously existing hole;
- Develop a plan including intent, legal property description, approximate volume of tires pieces, estimated start and finish dates, etc. certified by a professional engineer;
- Notify local officials, firefighting officials, and the public; and
- Place 50% or less tires by volume.

TCEQ's Aggregate Production Operation (APO) site registration database provided a centralized place to search for disturbed land following

activities involving extraction of construction materials such as limestone, gravel, or sand. From conversations with TCEQ personnel, we learned that active sites may be better suited for getting a LRPUT permit because of the presence of heavy machinery. For example, a quarry could fill in part of the degraded land using equipment that is already on site, all while being able to continue extraction in other parts of the land.

Though LRPUTs are low on the EPA's waste management hierarchy, they still have benefits that make them more desirable than landfilling.

First, diverting tires from the regional landfills will help preserve landfill life. Additionally, since LRPUTs use other inert materials such as concrete and dirt, these materials would also be diverted from landfills. These materials are clean and will not degrade in the ground, making LRPUTs a more environmentally sound option than regular landfills.

Second, LRPUTs restore disturbed land to its natural grade, making it usable for development or other land uses.

Third, no additional investments in machinery would be necessary. Tires used in LRPUTs must be split, quartered, or shredded—just like landfilled tires. The Region already has a large tire grinder that can shred tires into the appropriate size for LRPUTs.

And finally, the permitting process for a new LRPUT is much faster than it is for a landfill. The TCEQ has made improvements to the process and only approves permits they believe can be successful. The LRPUT permitting process can be completed in as few as 60 days, and in contrast landfill permits can take several years. Because of this, LRPUTs can be a method of reducing the Region's volume of tires in the short term while other end uses are being set up, such as by attracting processors to the Region.

Attracting Processors to the Region

Through our interviews we spoke to several established scrap tire processors and end users in the State. Often, end users are looking for reliable and consistent products to use in making their own products. For example, specifications for the size of crumb rubber or powder can be very detailed and require precision to ensure consistent, quality products can be made with them. Most end users we talked with expressed that they prefer products that come from their trusted partners rather than from myriad different sources.

For that reason, attracting established processors to the Region would be the best way to create new avenues for scrap tire use. Of course, attracting a processor to the Region would reduce transportation costs related to scrap tires generated in the Region. On the other side of that equation, for the processor, is the transportation distance to end users of their products. It is not expected that significant tire-derived fuel use will come to the Region based on a lack of proximity to natural limestone areas, which is where cement kilns are typically located. So, depending on the economics of transporting processed scrap tire products to end users, this effort may also require attracting crumb rubber users to the Region. Attracting processors to the Region may be difficult based on scrap tire processors responses to our survey regarding whether or not they would be interested in having discussions about locating a new facility in the Region.

Recommendations

From our research we have identified five recommendations.

1. **Engage with scrap tire transporters who have end users**
   Our first recommendation is to engage with a tire transporter with established end users about the possibility of transporting tire shreds out of the Region. To negotiate the best possible transportation costs, processing and consolidating scrap tires in a single location within the Region may be necessary.

2. **Engage with scrap tire processors and end users**
   Next, we recommend you talk to interested scrap tire processors in the State about the possibility of locating a new processing facility in your Region. We spoke with one processing company that was willing to discuss the possibility of putting a crumb rubber processing facility in your Region.

   Another consideration here is offering to supply sample scrap tires pieces to cement kilns or other potential end users who have not yet committed to using scrap tires in their processes. For example, we spoke with representatives at a steel recycling facility who had heard about another company's use of tires as a substitute for coal and an alternative source of carbon. Anything that will increase the end users of scrap tires allows more chance to keep tires out of landfills.

3. **Pursue LRPUT efforts**
   Third, we recommend exploring potential partners for land reclamation projects using the location of quarries and sand and gravel pits we identified in or near your Region as a starting place.

4. **Consider adopting a model ordinance throughout the Region and supporting statewide scrap tire management legislation**
   Our fourth recommendation is to consider implementing a consistent ordinance throughout the Region. Evaluating the feasibility of adopting a scrap tire management ordinance in municipalities throughout the Region and supporting the NCTCOG's legislative effort could not only help the Region itself, but also Texas more generally.

5. **Stay abreast of changes in the scrap tire industry**
   And finally, we recommend you stay abreast of changes in the scrap tire industry. One publication to track is *Scrap Tire News*. This might also include tracking grants. Currently, we have not seen significant grant opportunities that might support your efforts, but it is always important to keep an eye out as new sources of grant funding may become available in the future. We have identified some potential places you could monitor grants.

   While no current funding opportunities were identified for the Region, it is suggested that monitoring funding websites may aid in supporting project efforts.

   The Institute conducted online research through:

   - Federal Government Grants | grants.gov
   - U.S. Department of Agriculture | rd.usda.gov
   - U.S. Department of Transportation | transportation.gov/grants
   - Texas.gov eGrants | https://txapps.texas.gov/tolapp/egrants/

Appendix 1: Land Reclamation Projects Using Tires Potential Locations

Status	Responsible Party	Site Name	Area Disturbed	Material to be Extracted	County	Registration	Expiration
Active	Alamo Concrete Products Company	Alamo Concrete Products Pipeline Road Pit	10	Gravel, sand	Starr	2/8/2013	10/29/2022
Active	Anderson Columbia Co. Inc	Plant 17, Hebbronville	218	Gravel, limestone, sand	Duval	10/19/2016	10/19/2022
Active	Cepeda, Jesus	Filegonia-Cibolo	50	Sand, Soil	Hidalgo	6/21/2022	6/21/2023
Active	Cepeda, Jesus	Filegonia-Texan	80	Caliche, Gravel, Sand,Soil	Hidalgo	6/18/2017	1/16/2023
Active	Frontera Materials Inc.	490 Pit	101	Limestone	Hidalgo	8/23/2022	8/23/2023
Active	Frontera Materials Inc.	Reavis Pit	101	Limestone	Hidalgo	8/23/2022	8/23/2023

Status	Responsible Party	Site Name	Area Disturbed	Material to be Extracted	County	Registration	Expiration
Active	Kingsville Material Corporation	Kingsville Materials	100	Caliche, soil	Duval	10/11/2017	10/11/2022
Active	L & R Aggregates, LLC	L & R Aggregates La Grulla	302	Caliche, gravel, sand	Starr	6/15/2018	6/15/2023
Active	L&G Materials, LLC	La Joya Lake Pit	168	Gravel, Other, Sand, Soil	Hidalgo	12/16/2014	5/25/2023
Active	Martin Marietta Materials Southwest, LLC	Greco Pit	393	Caliche, Limestone	Hidalgo	10/30/2012	10/30/2022
Active	Martin Marietta Materials Southwest, LLC	Listos Pit	99	Caliche, Limestone	Hidalgo	10/7/2020	10/7/2022
Active	Martin Marietta Materials Southwest, LLC	Redding Pit	456	Caliche, Limestone	Hidalgo	10/31/2012	10/31/2022
Active	Mid Valley Paving, Inc.	491 Pit	25	Sand	Hidalgo	4/26/2016	4/26/2023
Active	Olmito Sand Pit, LLC	Olmito Sand Pit	35	Sand, soil	Cameron	8/17/2017	10/20/2022
Active	Reynaldo Munoz JR	Victorianna Pit	10	Sand, other (select fill)	Kleberg	8/30/2016	7/10/2023

Status	Responsible Party	Site Name	Area Disturbed	Material to be Extracted	County	Registration	Expiration
Active	Samuel Trevino, DBA Samson Enterprises	Samson Enterprises	200	Soil	Cameron	4/1/2020	4/1/2023
Active	Santa Rosa Farms LP	Filegonia-Monte Alto	80	Sand, Soil	Hidalgo	10/19/2016	1/25/2023
Active	South Texas Mining, LLC	South Texas Mining	95	Caliche, gravel, sand, soil	Starr	7/7/2016	8/23/2023
Active	South Texas Sand and Gravel, LLC	South Texas Sand and Gravel	175	Caliche, gravel, sand, soil	Starr	8/26/2020	9/8/2023
Active	Terra Firma Materials LLC	Terra Firma Materials	400	Caliche, Gravel, Sand, Soil	Hidalgo	9/5/2018	9/14/2023
Active	Terra Firma Materials LLc	Terra Firma Materials Pit 1	50	Caliche, Gravel, Sand, Soil	Hidalgo	6/7/2017	6/11/2023
Active	The Gulf Group LLC	The Gulf Group	50	Caliche, Gravel	Hidalgo	5/27/2016	1/18/2023
Active	Valley Caliche Products, Inc.	Beck Pit	705	Caliche, Gravel, Sand, Soil	Hidalgo	9/22/2017	9/22/2022

Status	Responsible Party	Site Name	Area Disturbed	Material to be Extracted	County	Registration	Expiration
Active	Vulcan Construction Materials LLC	Fordyce Showers Plant	900	Gravel,Sand	Hidalgo	10/4/2017	3/20/2023
Cancelled	Alamo Concrete Products Company	Alamo Concrete Products La Burrita Pit 1900	455	Gravel, sand	Starr	<Null>	9/30/2016
Cancelled	Anderson Columbia Co. Inc	Anderson Columbia Asphalt Plant & Rock Crushing Plant 1	163	Gravel, limestone	Zapata	10/19/2016	9/26/2018
Cancelled	Fordyce Holdings, Inc	Fordyce San Carlos Plant	50	Gravel, sand	Starr	9/28/2021	2/25/2022
Cancelled	Martin Marietta Materials Southwest, LLC	Hoffman Pit	89	Caliche, Limestone	Duval	10/30/2012	8/27/2021
Cancelled	Superior Asphalt, Inc	Garcia Pit	35	Limestone	Duval	<Null>	1/16/2014
Cancelled	Superior Asphalt, Inc	Sullivan City Site	278	Gravel, limestone	Hidalgo	2/27/2017	12/6/2018
Expired	A C Pit	A C Pit	4	Soil	Hidalgo	6/23/2016	6/23/2017
Expired	Alamo Concrete Products Texas Gravel 1800	Alamo Concrete Products Texas Gravel 1800	349	Gravel, sand	Hidalgo	<Null>	10/29/2014

Status	Responsible Party	Site Name	Area Disturbed	Material to be Extracted	County	Registration	Expiration
Expired	Concrete Mobility, LLC	Las Brisas Ranch Crusher 2 Site	0	Caliche	Starr	<Null>	10/25/2014
Expired	Concrete Mobility, LLC	Zapata Pit	9	Limestone	Zapata	1/22/2020	4/14/2022
Expired	Hdz1 Services LLC	HDZ1 Services	20	Sand, soil	Cameron	9/8/2020	9/8/2022
Expired	Jesus Cepeda	Filegonia Pharr Pit	25	Sand, soil	Hidalgo	7/4/2016	7/4/2017
Expired	Jesus Cepeda	Filegonia Site Contractors LLC	10	Sand, soil	Hidalgo	5/5/2015	5/5/2016
Expired	Jesus Cepeda	Filegonia Trosper	20	Sand, soil	Hidalgo	9/27/2016	9/27/2017
Expired	Jesus Cepeda	Filegonia-Ramseyer	15	Soil	Hidalgo	6/18/2017	6/18/2019
Expired	Jesus Cepeda	Jesus Cepeda	10	Other (fill dirt)	Hidalgo	3/2/2014	3/2/2015
Expired	Liberty Transport & Construction LLC	Caliche Pit 1724	40	Caliche	Hidalgo	<Null>	1/28/2015
Expired	Lopez Ready Mix Concrete	Lopez Ready Mix Concrete	2	Gravel, sand	Starr	<Null>	10/31/2013
Expired	Ram RGV Inc	Ram Pit	180	Gravel, other, sand	Hidalgo	3/22/2013	2/25/2014

Status	Responsible Party	Site Name	Area Disturbed	Material to be Extracted	County	Registration	Expiration
Expired	San Jacinto Enterprises, LLC	San Jacinto Caliche Pit	197	Caliche	Duval	10/30/2012	10/30/2013
Expired	Starr Aggregates, LLC	Starr Aggregates	370	Gravel, sand	Starr	<Null>	7/31/2014
Expired	Starr Aggregates, LLC	Starr Aggregates	37	Caliche, gravel, sand, soil	Starr	1/30/2017	1/10/2018
Expired	Sunbelt Rock Crushing, LLC	Mesteno Pit	10	Caliche, gravel, limestone, sand	Starr	11/8/2018	11/8/2019
Expired	Thomas W Hanka	S Jackson Soil	23	Sand	Hidalgo	8/28/2019	8/28/2020
Expired	Wright Materials Inc	Wright Materials Realitos Plant No 2	183	Gravel, sand	Duval	<Null>	10/29/2012