CalRecycle

California Waste Tire Market Report 2024

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Acknowledgments

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Executive Summary

This report describes California's waste tire flows in 2024 and includes trends observed through fall 2025, based on an analysis of data from industry surveys, interviews, California Department of Resource Recycling and Recovery (CalRecycle) databases, and other relevant sources.

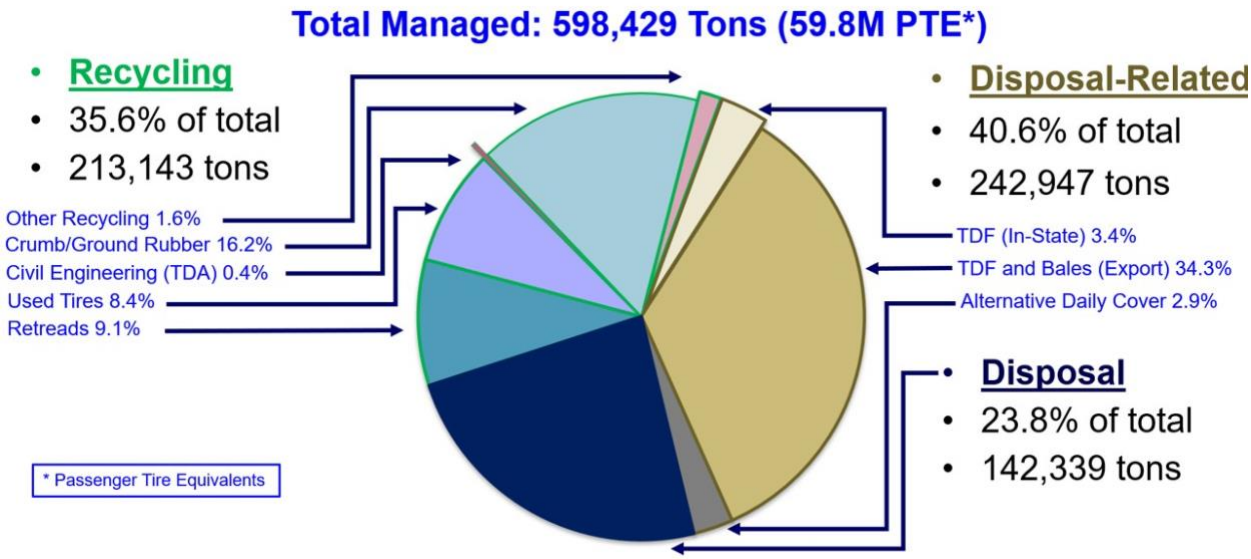
An estimated 598,429 tons, approximately 59.8 million passenger tire equivalents (PTEs)[1], of California-generated waste tires were managed in 2024 (Figure 1). California waste tires flowed to nine different market segments, which are grouped into three subtotal categories: Recycling, Disposal-Related, and Disposal.

CalRecycle has adopted a 75% waste tire recycling goal, consistent with the statewide 75% recycling goal for all waste materials mandated by Assembly Bill (AB) 341 (Chesbro, Chapter 476, Statutes of 2011). California's waste tire recycling rate in 2024 was 35.6%, an increase of 0.5% from 2023. The total waste tires managed in 2024 increased by 5% to 598,429 tons (Figure 2).

In 2024, tire-derived materials (TDM), including tire-derived fuel (TDF), exports increased due to high demand in overseas markets that greatly increased disposal-related exports and decreased disposal tonnage in California. Additionally, the crumb rubber and tire-derived product (TDP) markets experienced modest growth in 2024, in part due to increased crumb rubber usage by Caltrans.

[1] PTE means Passenger Tire Equivalent, defined by CalRecycle (14 CCR § 17225.770) as 20 pounds. The PTE is a useful standardized reporting metric; but actual tire weights vary significantly by type, and passenger tires typically weigh more than 20 pounds.

Figure 1 California-Generated Waste Tire Flows in 2024*



*See source data for Figure 1 in Appendix C.

Looking ahead, California is expected to see continued growth in waste tire generation. This trend is driven by several factors, including the growing number of heavier electric vehicles (EVs), which tend to wear out tires more quickly, as well as rising new vehicle weights and the production of larger original equipment manufacturer (OEM) tires.

In 2024, recycled tire tonnage increased by 6.6%, totaling 213,143 tons (21 million PTEs).

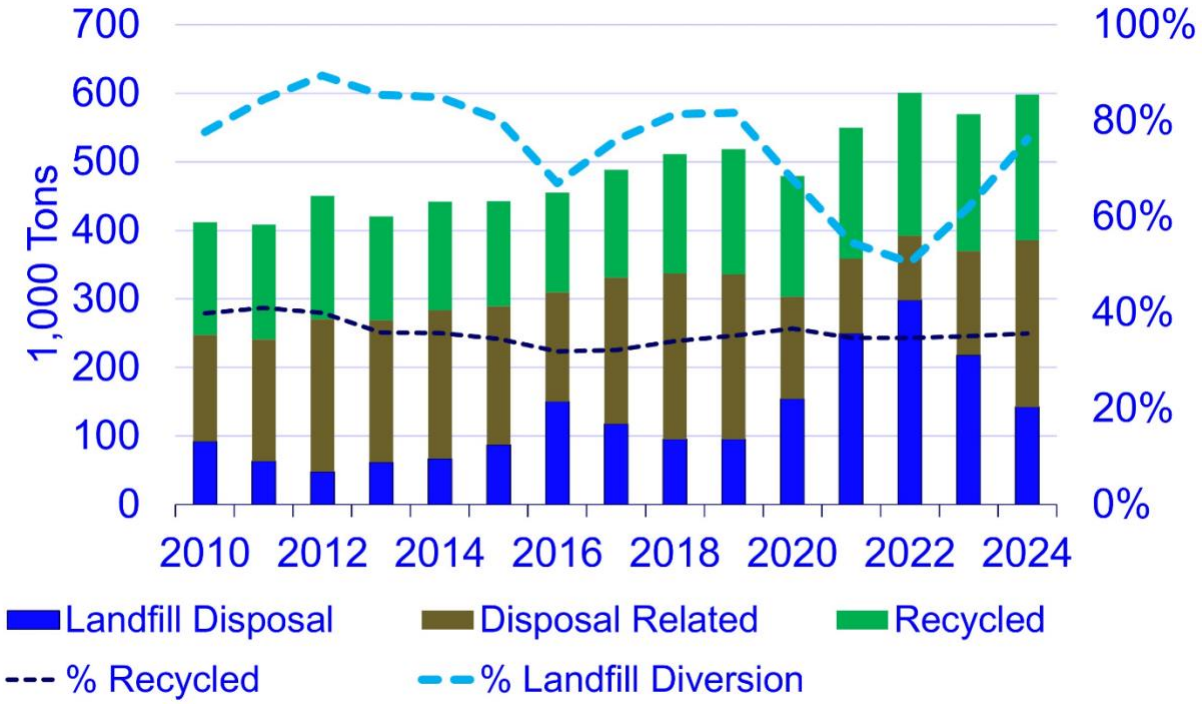
Key market segment trends in 2024 include:

- Crumb/ground rubber production increased by 23.8% compared to 2023, reflecting increased crumb rubber usage by Caltrans in road surface applications.
- Turf infill and playground surfacing installation, which had reached a historical low in 2023, rebounded in 2024, particularly in Southern California, according to manufacturers' reports.
- Retread sales declined slightly by 2% compared to 2023.
- Used tire sales increased by 13.8%.
- The use of tire-derived aggregate (TDA) in civil engineering decreased by 75.2%.
- Landfill disposal decreased to 142,339 tons, down 34.7% from 2023; the decline in landfill disposal was a continuing trend observed into mid-2025.
- Exported TDF increased to 180,055 tons, a 71.3% increase over the 2023 tonnage.
- In-state TDF shipments declined to 20,606 tons, a 1.2% decrease from 2023.

Figure 2 shows California waste tire market segments grouped into three subtotal categories: Landfill Disposal, Disposal Related, and Recycled. Total waste tires managed are presented in thousands of tons. For each year, Landfill Disposal and

Disposal Related tonnages are combined to calculate the total percentage of waste tires diverted from the landfill. This combined yearly percentage is used to show trends over time and is presented as "% Landfill Diversion" trendline. % Landfill Diversion increased from 2023 to 82% in 2024. Similarly, the yearly quantity of Recycled tons, compared with the total tons of waste tires managed, is used to calculate the "% Recycled" trendline. The % Recycled trendline has remained relatively stable since 2020 and is 35.6% in 2024.

Figure 2 California-Generated Waste Tire Recycling, Disposal-Related and Landfill Disposal Trends, 2010-2024*



*See source data for Figure 2 in Appendix C.

1. Introduction

The Department of Resources Recycling and Recovery (CalRecycle) oversees the management of waste tires in California, as authorized by Senate Bill (SB) 876 (Escutia, Statutes of 2000, Chapter 838). CalRecycle's long-term, informal goal is to achieve a 75% waste tire recycling rate, consistent with the 75% statewide recycling rate goal for all materials established in AB 341 (Chesbro, Chapter 476, Statutes of 2011).

This report estimates the 2024 California tire recycling rate and describes current and historical trends in the flow of California-generated waste tires and tire-derived materials (TDM) to different market segments, including tire-derived products (TDP), tire-derived fuel (TDF), and civil engineering (i.e., tire-derived aggregate or TDA). For this report, waste tire sales and imports/exports are tracked through a combination of documented flows, processor surveys, and interview responses. Due to these complexities and data limitations, estimating the number of waste tires in California remains challenging.

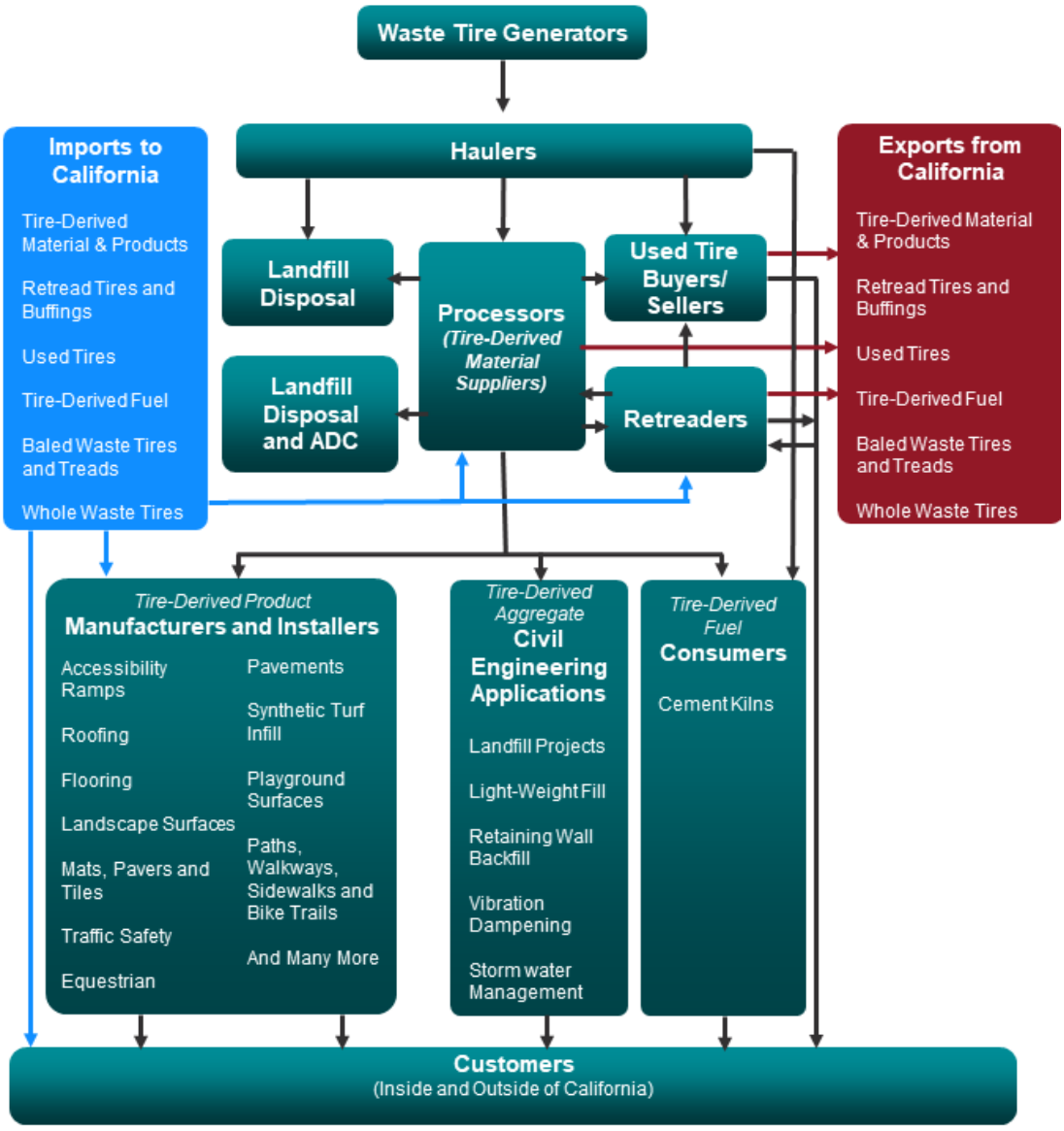
GHD Inc. prepared the report, in partnership with industry specialists DK Enterprises and Boisson Consulting, and with research support from WEC LLC. The findings are based on a detailed analysis of data and information provided by California waste tire management companies, CalRecycle staff and databases, and other relevant sources.

Following this introduction, Section 2 summarizes California's waste tire management infrastructure. Section 3 identifies broad trends influencing waste tire markets, while Section 4 provides detailed findings by market segment. The main report concludes with Section 5, which discusses the outlook for increasing tire recycling. Appendix A is a glossary of key terms and acronyms, while Appendix B covers the report methodology. Appendix C provides notes and source data for graphs and charts. Finally, the End Notes section lists cited information sources.

2. California Waste Tire Management Infrastructure

Figure 3 illustrates the flow of California-generated waste tires and TDM. Table 1 lists the number of distinct types of facilities and companies by category serving California. Waste tire collection and processing companies serve all areas of the state.

Figure 3 California Waste Tire Recycling Industry Flow Chart*



*See detailed description of Figure 3 in Appendix C.

Table 1 California Waste Tire Management: Active Facilities and Companies by Category in 2024

Category	Counts
Registered Waste Tire Haulers	> 1,445[1]
Registered Waste Tire Generators	> 23,000[2]
Waste Tire Shipments (Each documented with a comprehensive trip log in CalRecycle's Waste Tire Manifest System (WTMS))	> 548,000[3]
Retreaders	36[4]
Facilities with a Major Waste Tire Facility Permit (Specified onsite maximums range from 9,960 to 336,300 PTEs)	15[5]
Facilities with a Minor Waste Tire Facility Permit (Allowing up to 4,999 PTEs onsite)	17[6]
Processors Reporting Crumb Rubber or Ground Rubber Shipments	4
Processors Reporting TDA Shipments	2
Processors Reporting In-State TDF Shipments (Includes size-reduced TDF, whole tire TDF, and residual fluff from crumb rubber production)	5
Processors Reporting Exported TDF (e.g., chips, shreds) and/or Baled Tire Shipments	4
TDP Manufacturers	15[7]
TDP Installers	8[8]
California Cement Kilns Consuming TDF	2
California Landfills Disposing Size-Reduced Waste Tire Material On-Site	29

3. Broad Trends Influencing Markets

As in 2023, economic uncertainty contributed to business disruptions that continued to impact tire recycling operations and markets, to varying degrees, through 2024. The following broad trends are from companies that were interviewed and agreed to share their perspective on changes in their businesses.

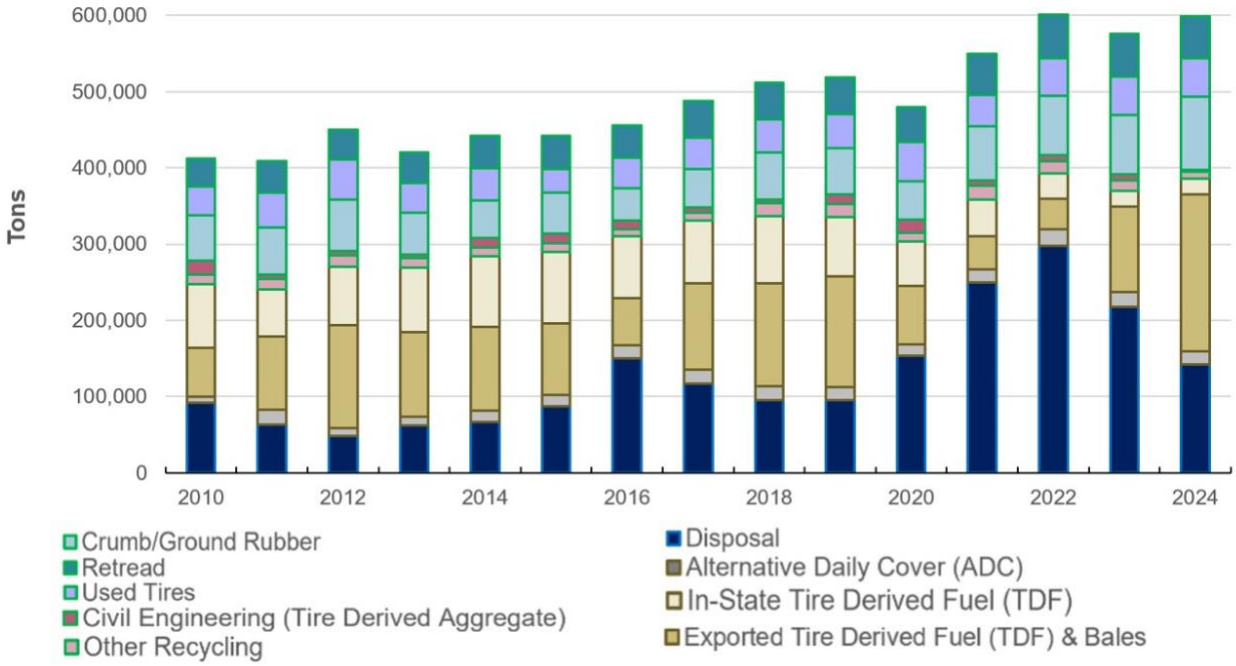
- **Shifting economic outlook**. The year was marked by what some referred to as "2024 Volatility," driven by a presidential election year, business ownership transitions, and broader economic uncertainty. Some businesses reported that they chose not to make additional purchases (e.g., equipment, products), increase inventory, or make future growth business decisions.
- **Federal Reserve (FED) interest rate decrease**. The FED rate fell from 5.25% in 2023 to 4.25% in 2024. In September, the FED cut the rate by 0.5 percentage points, followed by two additional 0.25% cuts in November and December, totaling a 1.0% decrease for the calendar year. Some businesses reported waiting to see if rates would drop further in 2025 before making substantial investments.
- **Staffing challenges**. Election-related uncertainty, coupled with slight rises in unemployment and inflation rates, posed ongoing staffing and hiring challenges across the industry. Many companies also faced rising wages, changes in ownership, and difficulty finding qualified workers, limiting potential business growth during 2024.
- **Trucking and ocean shipping costs and challenges.** Labor and driver expenses continued to climb as workforce and driver availability dwindled. Moreover, TDM processor consolidation persisted on the West Coast in 2024. This resulted in export consolidation by a few large businesses that could move material economically. Other feedstock suppliers reported challenges that included tighter material specifications, seasonal export demand fluctuations that resulted in fewer available containers, higher shipping costs, and lower revenue. Even with these challenges, TDF exports grew in 2024 due to surging overseas demand from cement, chemical, pulp and paper, and other recycling operations.
- **Potential global marketplace changes.** Disruptions and uncertainty are likely to continue affecting the waste tire industry in 2025. International demand for TDM and TDF increased substantially in 2024. Although international demand increased, imported inexpensive TDPs sold online and at big box stores directly compete with California-manufactured TDPs. Imported TDPs from Asia are often made with chemicals that cannot be used in U.S. manufacturing processes. U.S. and international politics can, and often do, change local and global marketplaces, shifting the focus of economic activity. Movements of capital, people, and information, along with the accelerating scope, scale, and economic impact of technology, are felt worldwide, in the U.S., in California, and in local markets.

4. Trends by Market Segment

4.1 Historical Trends

Figure 4 shows the long-term trends in the end uses of California-generated waste tires and TDM, while Table 2 provides additional detail for the past three years. These findings are based exclusively on California-generated waste tires, excluding imports. Similarly, the flow estimates do not include buffing materials from retread operations that go to other markets. Appendix B describes the report methodology. The remainder of Section 4 describes trends within each market segment.

Figure 4 Historical Market Trends for California-Generated Waste Tires and TDM by Segment, 2010-2024*



*See source data for Figure 4 in Appendix C.

Table 2 summarizes the estimated end uses of California-generated waste tires in tons, categorized by market segment, and shows the respective percentage of total managed for 2022 through 2024, along with the percentage change from 2023 to 2024.

As shown in Table 2, the market segments are grouped into the following subtotal categories:

- Recycled: Includes Crumb/Ground Rubber, Retread, Used Tires, Civil Engineering (TDA), and Other Recycling.

- Disposal: Represents altered end-of-life tires (ELTs) sent directly to the landfill without a committed end use.
- Disposal-Related: Includes Landfill Alternative Daily Cover (ADC) and TDF.

Key findings from Table 2 include:

- The Recycled subtotal increased by 6.6%.
- The Total Managed tonnage increased by 5%.
- As a result, the Recycled subtotal accounted for 35.6% of the Total Managed for 2024, a 5% increase from 2023.
- The Disposal-Related subtotal increased by 60%, while the Landfill Disposal decreased by 34.7%, likely due to increased TDM exporting overseas.

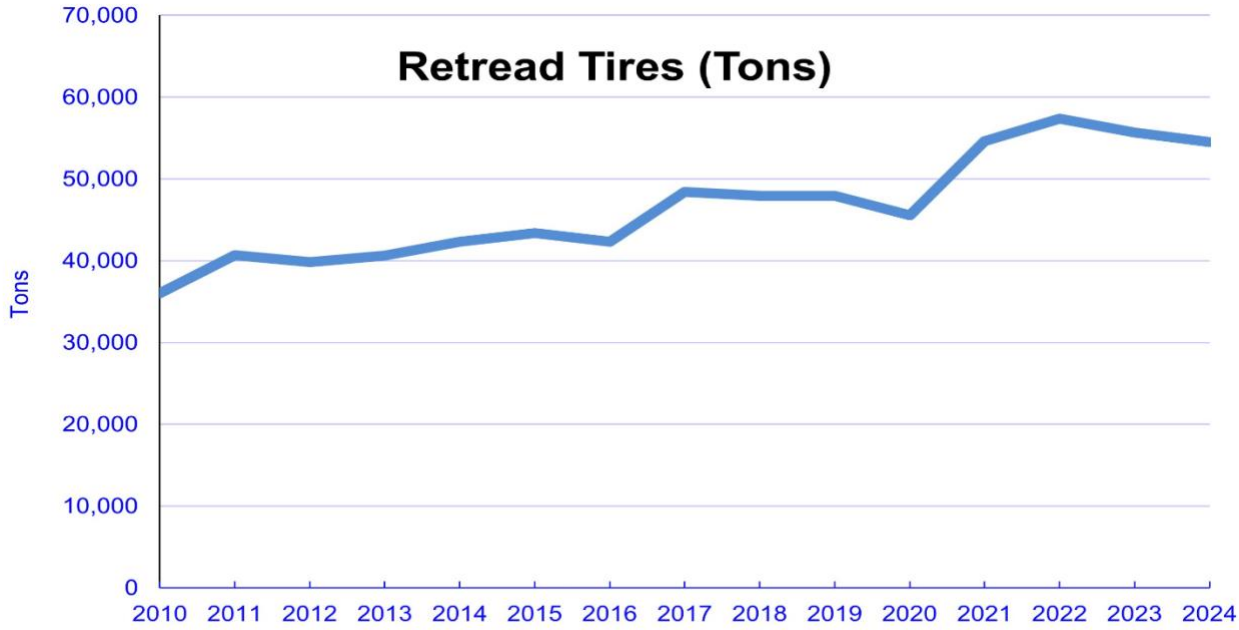
Table 2 Estimated End-Uses for California-Generated Waste Tires, 2022 – 2024

Category	2022 Tons	2022 M PTEs	2022 %Total	2023 Tons	2023 M PTEs	2023 %Total	2024 Tons	2024 M PTEs	2024 %Total	% Tons Change 2023 - 2024
Retreads	57,366	5.7	9.5%	55,645	5.6	9.8%	54,521	5.5	9.1%	-2.0%
Used Tires	49,112	4.9	8.2%	44,203	4.4	7.8%	50,319	5.0	8.4%	13.8%
Crumb Rubber and Ground Rubber	78,341	7.8	13.0%	78,159	7.8	13.7%	96,743	9.7	16.2%	23.8%
Civil Engineering (TDA)	7,371	0.7	1.2%	8,682	0.9	1.5%	2,150	0.2	0.4%	-75.2%
Other Recycling	16,587	1.7	2.8%	13,200	1.3	2.3%	9,410	0.9	1.6%	-28.7%
Subtotal, Recycled	208,777	20.9	34.7%	199,889	20.0	35.1%	213,143	21.3	35.6%	6.6%
Tire-Derived Fuel (In-State)	32,457	3.2	5.4%	20,858	2.1	3.7%	20,606	2.1	3.4%	-1.2%
Tire-Derived Fuel (Export)	37,037	3.7	6.2%	105,091	10.5	18.4%	180,055	18.0	30.1%	71.3%
Baled Waste Tires and Treads (Export)	3,500	0.4	0.6%	6,630	0.7	1.2%	25,000	2.5	4.2%	277.1%
Landfill Alternative Daily Cover	21,169	2.1	3.5%	19,307	1.9	3.4%	17,286	1.7	2.9%	-10.5%
Subtotal, Disposal-Related	94,163	9.4	15.7%	151,886	15.2	26.7%	242,947	24.3	40.6%	60.0%
Landfill Disposal	298,084	29.8	49.6%	217,909	21.8	38.2%	142,339	14.2	23.8%	-34.7%
Total Managed	601,024	60.1	100.0%	569,684	57.0	100.0%	598,429	59.8	100.0%	5.0%
Whole Waste Tire Imports	61,874	6.2	10.3%	63,334	6.3	11.1%	65,201	6.5	10.9%	2.9%

4.2 Retreading

In early 2024, retreaders reported optimism for future sales due to previous business acquisitions and consolidations. Consolidation in the retread industry can allow for economies of scale and increased competitiveness. Potential fleet conversions to EV may result in higher wear rates and increased sales. However, retreaders reported that, because 2024 was a U.S. election year, economic uncertainty related to the change in presidential administration developed as the year progressed. The slight decrease in the California retread market in 2024 was influenced by increased imports of inexpensive truck tires. Figure 5 shows an estimated 2% decrease in the quantity of retread tires in 2024 compared to 2023, totaling 54,521 tons (5.5 million PTEs, or 9.1% of all waste tires managed).

Figure 5 Estimated California-Generated Retread Tire Shipments, 2010-2024*



*See source data for Figure 5 in Appendix C.

4.3 Used Tires

In 2024, an estimated 50,319 tons of used tires (5.0 million PTEs, or 8.4% of all waste tires managed) were culled from the waste tire stream. Under California Vehicle Code section 27465(b), it is a traffic offense to drive a motor vehicle with overly worn tire treads. This statute imposes a minimum tread depth of at least 1/8th inch for front tires and 1/16th inch for rear tires.

Tires that are no longer mounted on a vehicle but remain suitable for use on a vehicle in California and meet the requirements of section 27465(b) are classified as used tires.

Used tires are distributed for resale in tire shops throughout the state. Similarly, some of California's used tires are purchased by importers in Mexico, where they are resold through tire shops there. In 2024, the Mexican government's import quota for used tires was 674,397 tires. Mexican regulations also require importers to be registered and to pay an import fee for each tire. The market for used tires within California is expected to remain consistent in 2025. The used tire market is difficult to track, and the number of used tires is likely underreported. Although used tires are subject to CalRecycle's tracking requirements, not all generators and haulers comply. For this report, used tire sales are tracked through a combination of documented flows, processor surveys, and interview responses. Due to these complexities and data limitations, estimating the number of used tires remains challenging.

4.4 Crumb Rubber and Ground Rubber

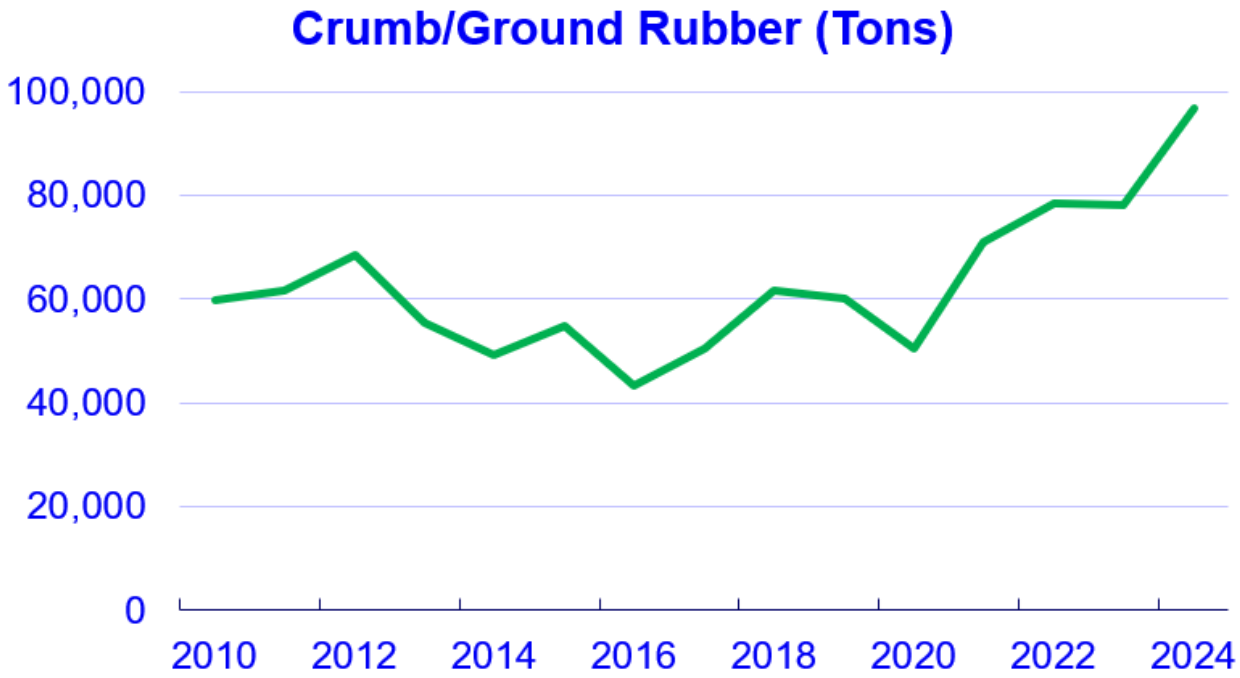
In this report, Crumb Rubber and Ground Rubber categories are combined into a single category to report total quantities shipped, as shown in Figure 6 and Table 2. In 2024, CalRecycle increased the maximum award for its Tire Incentive Program (TIP) from $500,000 to $650,000, which contributed to higher sales and expanded market activity.

There are four primary subcategories of crumb/ground rubber applications:

- Paving and chip seal surface treatments, including usage by Caltrans, other public agencies, and private entities.
- Sport and playground surfacing, such as pour-in-place systems and synthetic turf infill.
- Molded and other products, including flooring, roofing, ADA transition ramps, traffic safety devices, mats, and tiles.
- Miscellaneous products and uses, such as landscape surfaces and other specialty applications.

As illustrated in Figure 6, estimated shipments of California-generated crumb rubber and ground rubber increased by 23.8% in 2024, totaling 96,743 tons or 16.2% of all waste tires managed. This increase follows a slight decrease in 2023 and represents a return to the upward trend observed from 2021 to 2022.

Figure 6 Shipments of California-Generated Crumb Rubber and Ground Rubber, 2010-2024*



*See source data for Figure 6 in Appendix C.

In addition to crumb rubber and ground rubber, raw and screened buffings — a byproduct of the tire retreading process — with different specifications are used in specific TDPs, including molded products, playground surfacing, and landscape mulch. Buffings are produced by removing tread material from tires during retreading. In 2024, demand for buffings among TDP manufacturers and installers continued to grow. However, a 2% decline in California's retread production prompted increased sourcing of buffings from outside the state. Despite this, over 15 million pounds of buffings were produced and sold within California in 2024.

Paving

California producers shipped 65,511 tons of crumb rubber for use in asphalt paving projects in 2024, 16,511 tons more than in 2023. Caltrans reported using 20,301 tons of crumb rubber in its 2024 pavement projects. Approximately 35,000+ tons were used in private roads, airfields, parking lots, and other facilities.

It is important to note that the quantity of crumb rubber used in pavements can vary depending on the application and methodology. Based on Public Resource Code section 42703, Caltrans' published goal[9] is a minimum of 35% of its asphalt contains crumb rubber modifier. In 2024, Caltrans reported that the percentage of asphalt paving mixture containing crumb rubber modifier was 40.9%. This was an increase of 8.6% from 2023.

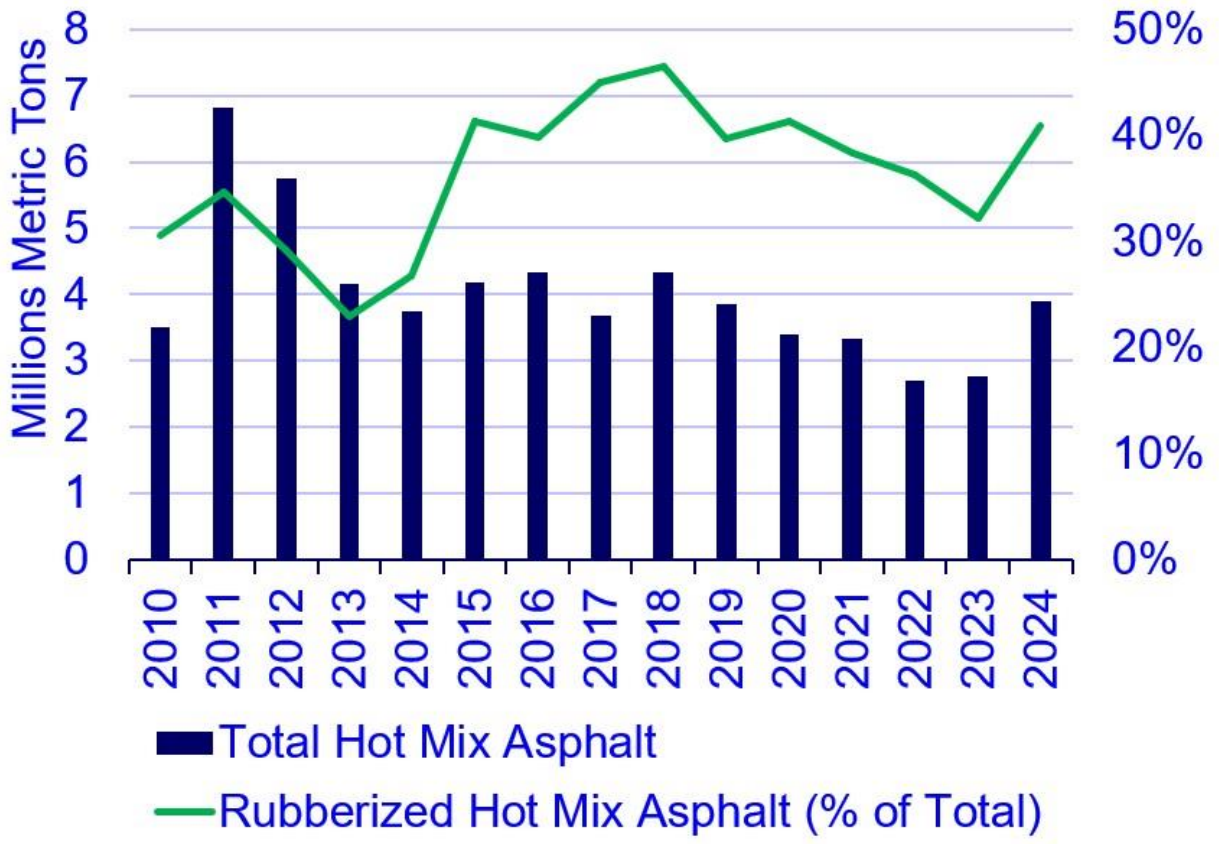
In 2024, Caltrans used 3.9 million metric tons of hot mix asphalt, up from 2.8 million metric tons in 2023. Of the hot mix asphalt used by Caltrans in 2024, 40.9% was rubberized, reflecting 40.6 million pounds of crumb rubber. Caltrans crumb rubber use in 2024 increased 29% from the previous total of 31.4 million pounds.

Figure 7 illustrates the trend in Caltrans rubberized hot mix asphalt (RHMA) usage and its correlation with the total hot-mix asphalt (THMA) placed. The variation in the average percentage of crumb rubber used by Caltrans closely follows the overall trend of THMA usage from 2018 to 2024, showing the correlation between hot-mix asphalt projects reaching construction and the pounds of crumb rubber used in these projects. In 2024, the total pounds of crumb rubber used increased by 29.3% compared to 2023.

CalRecycle has continued its outreach and training efforts to support RHMA, also referred to as Rubberized Asphalt Concrete (RAC) and, more broadly, rubberized pavement. CalRecycle's 2024 Rubberized Pavement Grant Program (TRP) is estimated to have supported the use of 12.2 million pounds of crumb rubber by local governments. CalRecycle has also published a basic introduction to RAC usage guidebook to accompany its outreach and training efforts. The Public Works Standards Greenbook provides standards for RHMA and continues to provide updated guidance based on new, proven technologies and methods.

When project quantities are 1,000 tons or less, the current method of RHMA installation can be more costly than traditional asphalt and involves specific technical placement requirements that may reduce its attractiveness. This is due to the higher costs associated with mobilizing an asphalt rubber blending plant. CalRecycle conducted a Pelletized Rubber Pilot Project in Stanislaus County in fall 2024 to help address this issue and is continuing research and pilot projects with the University of California Pavement Research Center (UCPRC) in Davis in 2025. These efforts show the effectiveness of pelletized rubber usage and are expected to result in an increase in RHMA usage for smaller projects.

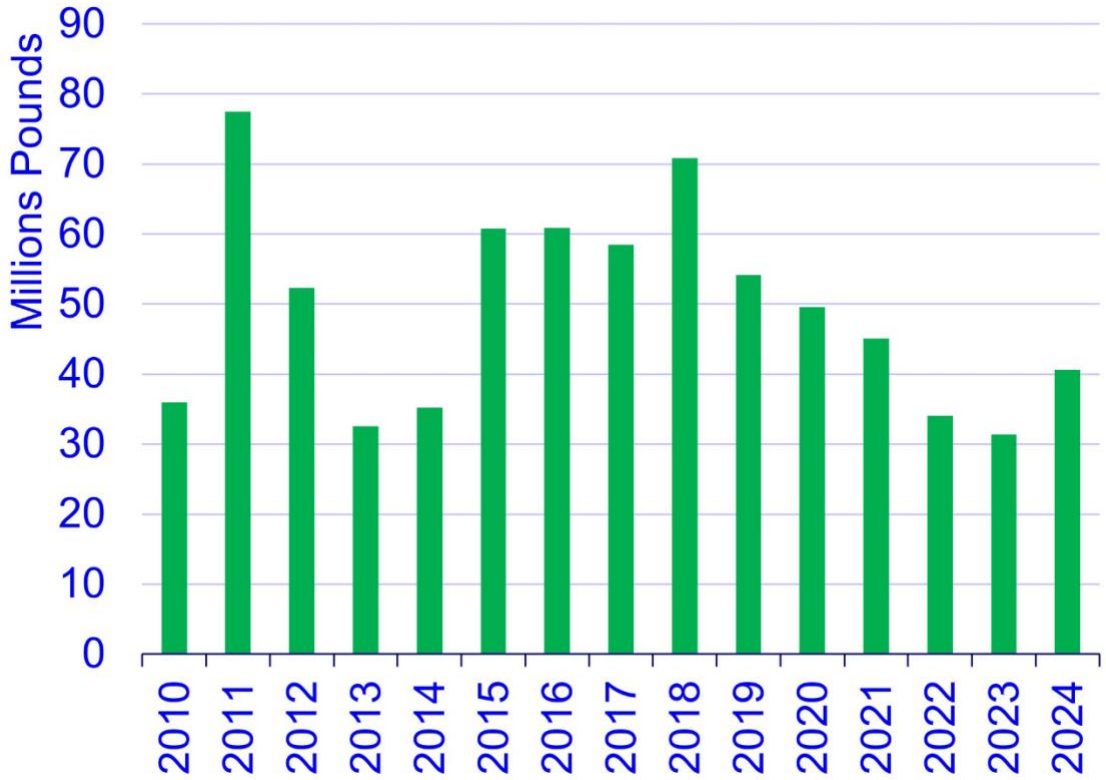
Figure 7 Caltrans Asphalt Placement and Rubberized Asphalt Percent of Total, 2010-2024*[9]



*See source data for Figure 7 in Appendix C.

The net pounds of crumb rubber used are depicted in Figure 8, indicating an increase in the annual Caltrans crumb rubber use to 40.6 million pounds in 2024. Since 2010, Caltrans has used an average of 49.3 million pounds of crumb rubber per year.

Figure 8 Caltrans Annual Use of Crumb Rubber in Paving Applications, 2010-2024*[10]



*See source data for Figure 8 in Appendix C.

Many California local governments use crumb rubber in paving projects. CalRecycle supports a substantial portion of this use through the TRP Grant Program. In the grant cycle for the 2024-25 fiscal year, 23 grantees were approved, with a combined projected total use of 12.2 million pounds of crumb rubber through the grant cycle ending in April 2027. Historically, the program has funded an average of 8.8 million pounds of crumb rubber use each year, based on an analysis of eight years of completed grants. Data from the most recent grant cycles are excluded from this average because actual usage is typically lower than the amount estimated in grant applications due to project changes or cancellations.

Molded and Other Products

California producers shipped over 10,682 tons of crumb rubber to manufacturers and installers of molded and other products in 2024, based on survey responses. This diverse category includes a variety of applications such as roofing, flooring, tiles, traffic sign bases, ADA transition ramps, and other specialty products. The quantity of crumb rubber feedstock consumed by firms in this category ranges widely, with some using less than 50,000 pounds per year, while a few commonly use at least 5 million pounds annually.

CalRecycle's TIP plays a crucial role in supporting this market by offering direct payments to TDP manufacturers, providing:

- 10 cents per pound for new and existing products that use a minimum of 5% crumb rubber in the product.
- 40 cents per pound for new feedstock conversion products using a minimum of 5% crumb rubber in the replacement of other raw materials (e.g., plastics, virgin rubber, other materials) or devulcanized TDM.
- 50 cents per pound for 50-mesh or finer crumb rubber used in the manufacture of a new or existing product.

In the TIP grant cycle for the 2024-25 fiscal year, six grantees were awarded funding with a combined projected use of 17.95 million pounds of crumb rubber. Grant cycles have two-year grant terms, with the current term ending April 1, 2027. Based on an analysis of six years of completed grants culminating in the 2020-21 fiscal year, the TIP program supported an average of 12.9 million pounds per year. As with TRP, data from the most recent grant cycles are not used because actual TDM use is typically less than the amount estimated in grant applications due to changes, postponement, or cancellations of some projects. TIP grantees may purchase and use TDM at any time within the two-year grant cycle.

Turf Infill

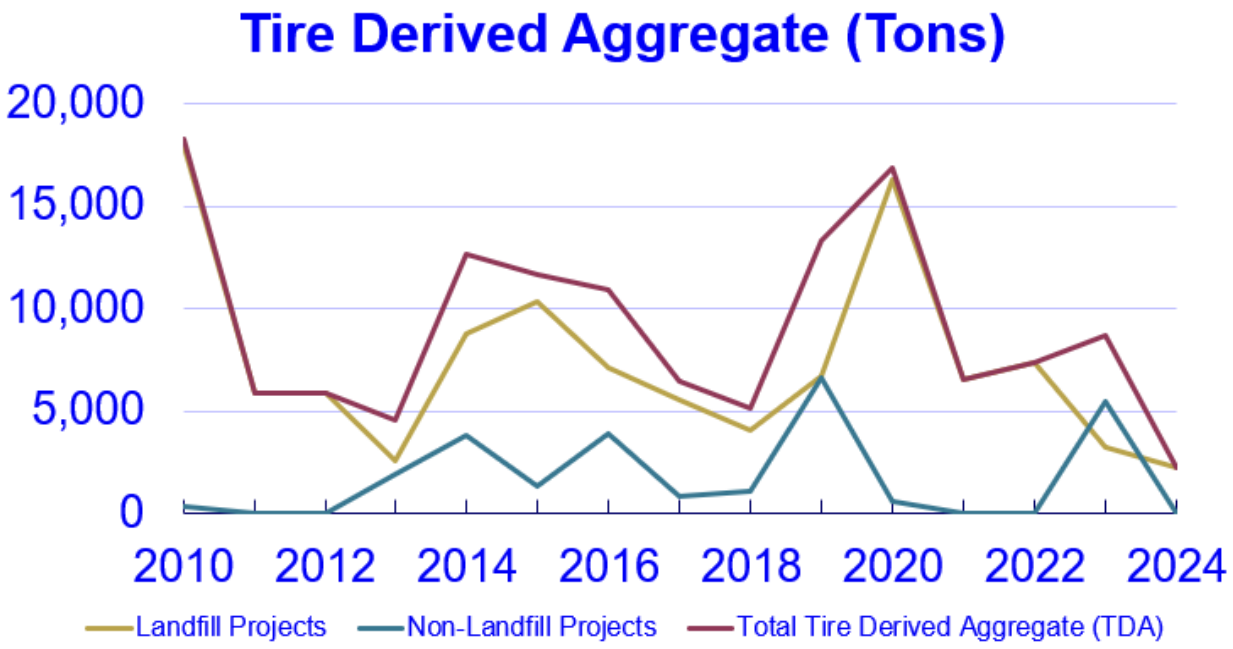
In 2024, California producers shipped 24 million pounds of crumb rubber for use as infill in new and replacement synthetic turf athletic fields, both within and outside of California. Since 2015, the long-term trend has been a decline in the use of crumb rubber in turf infill, largely due to the cautious market response of potential users awaiting the results of the California Office of Environmental Health Hazard Assessment's study on potential health concerns.

4.5 Civil Engineering

Figure 9 shows how the use of California-generated TDA in civil engineering projects has varied in recent years. In 2024, TDA use decreased 75.2%, totaling just two projects and 150 tons (0.2 million PTEs, or 0.4% of all waste tires managed), compared to 2023, when 8,862 tons (0.9 million PTEs, or 1.5% of all waste tires managed) were used. All TDA usage in 2024 was limited to landfill applications. Since 2011, Non-Landfill TDA use has ranged between 1,500 and 4,500 tons annually. In 2023, there was only one Non-Landfill project that used TDA as material for vibration mitigation.

Common Non-Landfill TDA applications include roadside repair and slope stabilization, retaining wall backfill, embankment fill, stormwater infiltration galleries, and light-rail vibration dampening projects, among others.

Figure 9 California-Generated TDA Shipped for Use in Civil Engineering Projects, 2010-2024*



*See source data for Figure 9 in Appendix C.

Historically, based on an analysis of eight years of completed grants culminating in the 2024-25 fiscal year, the TDA Grant Program has supported 5,000 tons per year of TDA use. As with other grant programs, data from the most recent grant cycles are not used because actual TDA use is typically less than the amount estimated in grant applications due to project changes, postponements, or cancellations.

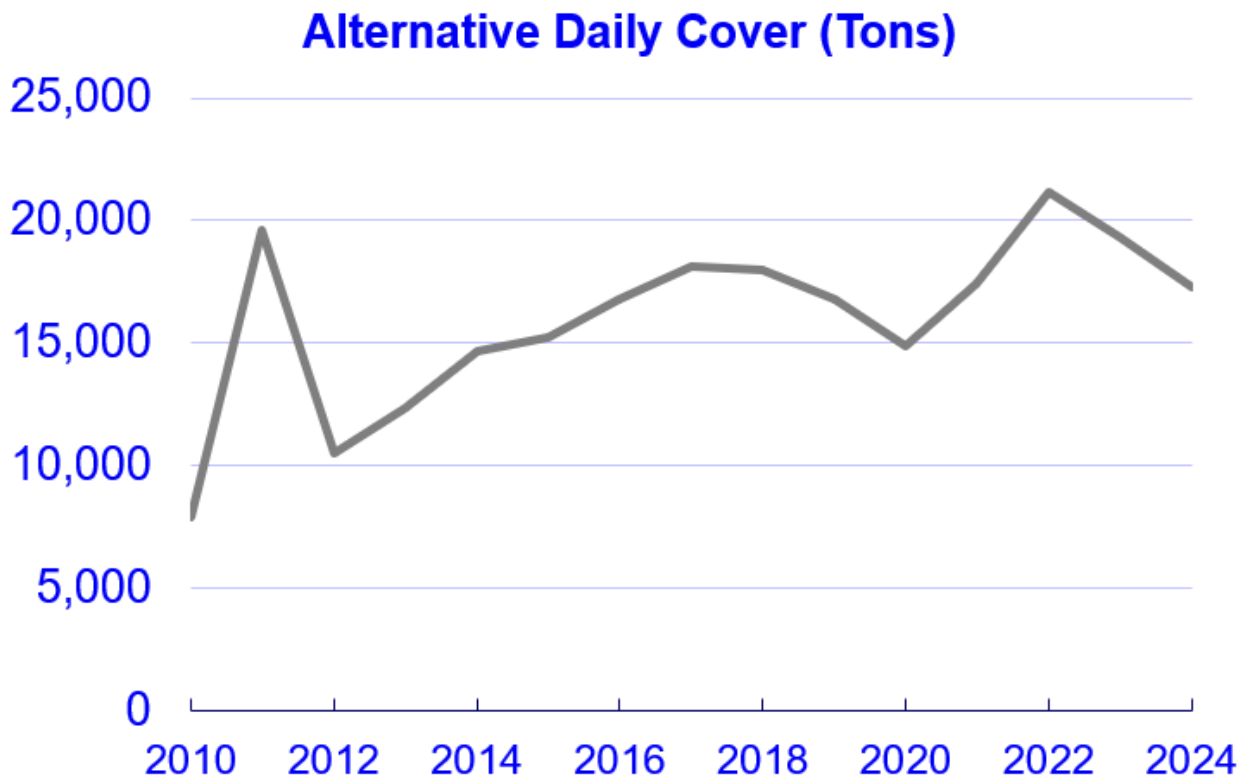
According to CalRecycle's TDA technical assistance team, who based their assessment on talking to potential TDA users, a major contributing factor to the reduced demand for TDA is a 2020 study[11] linking the chemical known as 6PPD — released from tire wear particles — to urban runoff mortality syndrome in coho salmon. In 2023, the California Department of Toxic Substances Control's (DTSC) Safer Consumer Product Program listed motor vehicle tires containing 6PPD as a Priority Product, and in July 2025, DTSC proposed to list all PPD in motor vehicle tires as Priority Products. A Priority Product is a consumer product that contains one or more Candidate Chemicals that have the potential to harm people or the environment and has been formally listed in the California Code of Regulations through rulemaking. CalRecycle is currently conducting investigative research to assess the state of knowledge regarding TDA and its environmental impacts.

4.6 Landfill Alternative Daily Cover

The use of ADC is classified as a disposal-related activity, as shown in Table 2. California landfills must apply an approved type of daily cover to the top of active landfill faces at the end of operations each day, and tire shreds are an approved ADC material

type. There are currently two landfills using shredded ELTs as ADC in California. In 2024, 17,286 tons (1.7 million PTEs, or 2.9% of all waste tires managed) were used as ADC. There are a few landfills that have consistently used tire shreds for ADC in the past; therefore, it is expected this amount will remain relatively stable in the coming years.

Figure 10 California-Generated Tire-Derived Material Used as Landfill Alternative Daily Cover, 2010-2024*



*See source data for Figure 10 in Appendix C.

4.7 Tire-Derived Fuel (In-State)

Two California cement kilns continued to consume TDF in 2024. A third facility ceased using waste tires as a fuel source, while a fourth transitioned to using only tire fluff/fiber — a byproduct of waste tire processing — due to its low cost and high heat value. Cement companies determine whether to accept material based on volume requirements, particle specifications, competing fuel feedstocks, and greenhouse gas (GHG) emission values. Cement plants consistently seek the most economical, high-BTU feedstocks and may change their preferred fuel at any time.

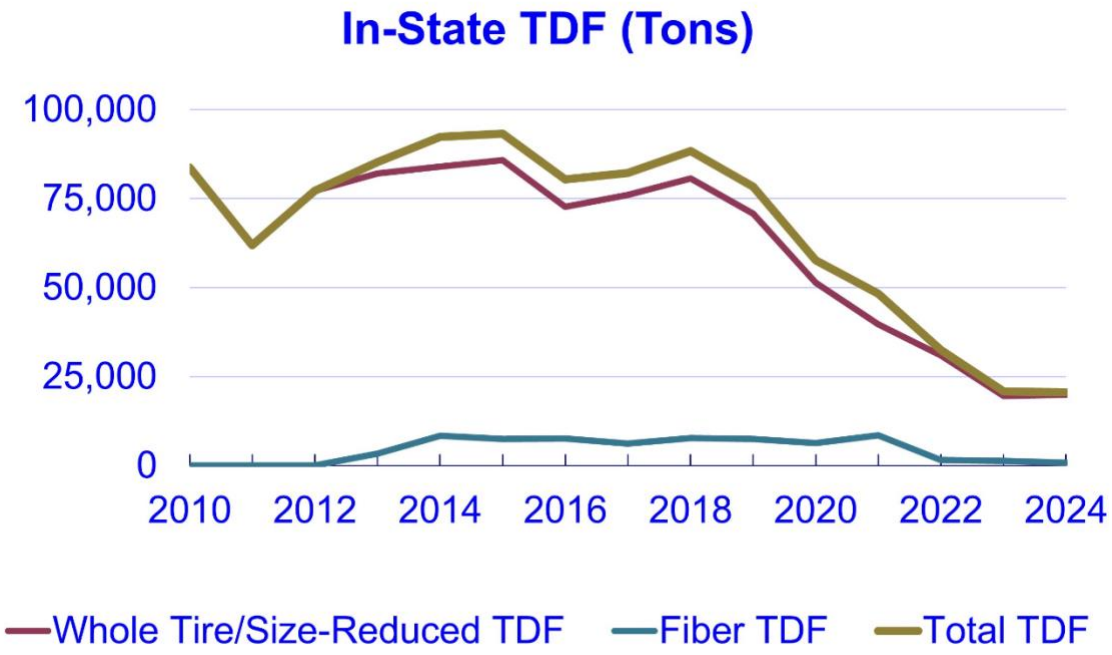
Additionally, environmental constraints are expected to influence this market in 2025 and beyond as the California Air Resource Board (CARB) increases its focus on decarbonization of the cement sector. SB 596 (Becker, Chapter 246, Statutes of 2021) requires CARB to develop a comprehensive strategy for the cement sector to achieve a

greenhouse gas emission intensity reduction of 40% below baseline levels by 2035 and net zero emissions by 2045. According to CARB, the use of alternative fuels with high levels of anthropogenic GHG emissions offers limited value in achieving the aggressive goals of SB 596 for decarbonizing the cement sector. This may affect the future use of TDF in California.

As illustrated in Figure 11, reported shipments of California-generated TDF declined by 1.2%, totaling 20,606 tons (2.1 million PTEs, or 3.4% of all waste tires managed). This includes 19,856 tons (1.39 million PTEs) of whole waste tires and size-reduced TDF, as well as 750 tons of tire fluff/fiber generated as residual material by processors. Despite a national increase of 10% in TDF use across cement, pulp and paper, and industrial boiler sectors, utilization in California has declined.

Tire fluff, or tire fiber, is a component of processed tires and is included in the total TDF tonnage reported. It is increasingly used by cement companies as a cost-effective, high-energy fuel source.

Figure 11 California-Generated Whole Waste Tires, TDF and Residual Fluff/Fiber Consumed at California Cement Kilns, 2010-2024*



*See source data for Figure 11 in Appendix C.

4.8 Tire-Derived Fuel and Baled Waste Tires (Export)

As Figure 12 shows, exports of California-generated TDM (e.g., size-reduced TDF, and baled waste tires) peaked in 2019, declined through 2022, and then rebounded sharply. In 2023, TDM exports increased by 183.7%, and in 2024 rose further by more than

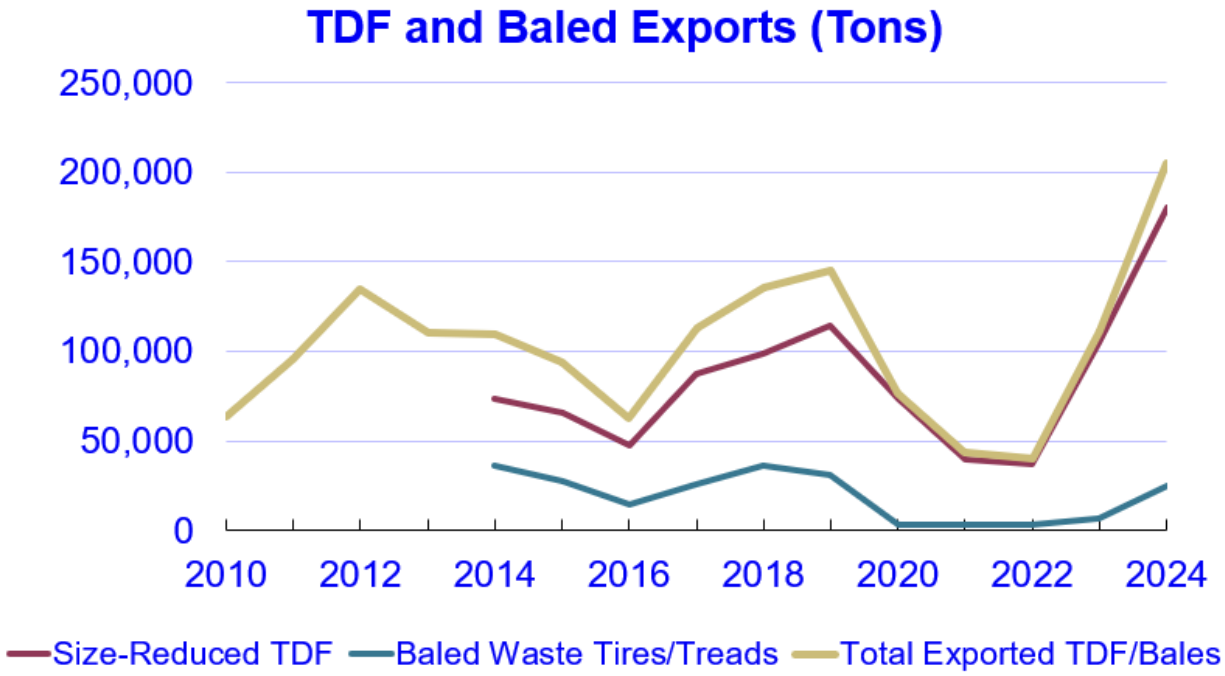
70%, increasing from 111,721 tons to 205,055 tons. According to export broker surveys, Japan (which primarily imported 1 ½" – 2" chipped tires) and India (which imported shreds and baled tires) were the largest users of TDM from California in 2024, with India being the largest driver of export demand. Heightened international demand for TDM feedstock (e.g., chipped tires, shreds, and baled tires) drove significant increases in exports in 2024.

In India, the exported waste tire rubber is reportedly used for TDF and crumb rubber in a wide range of uses and products. However, as reported in many industry news sources, the Indian Automotive Tyre Manufacturers' Association (ATMA) has urged restrictions on waste tire imports to India (ATMA Urges Govt To Limit Import Of Waste Tyres In Pre-Budget Proposal). In its 2024 pre-budget submission to the finance ministry, ATMA highlighted a five-fold increase in imported waste tires from 2021 to 2024. India imported 1.4 metric tons of waste tires in fiscal year 2024.

The United States lacks comprehensive federal regulations that prohibit or severely restrict the export of waste tires to countries like India, primarily because these materials are not classified as hazardous waste under international agreements or U.S. domestic law. This allows exports to continue unabated, driven by economic incentives and limited enforcement mechanisms. Under the Basel Convention, an international treaty regulating the transboundary movement of hazardous wastes, waste tires are not defined as hazardous materials unless contaminated (e.g., toxicity or flammability) as per the United States Environmental Protection Agency. While the U.S. signed the Basel Convention in 1990, the U.S. has not ratified the agreement. As a result, there are few global restrictions on tire trade, enabling the U.S. to export large volumes. Tires destined for recycling, energy recovery, or pyrolysis often fall outside hazardous waste definitions, further facilitating exports. India has accounted for as much as 32% of global waste tire imports in recent years.

Also, as of early 2024, changing European Union (EU) waste shipment regulations made it easier for EU countries to ship materials within the EU but more difficult to export to non-EU countries. The intent is to prevent waste from being processed in facilities that do not meet EU environmental standards. These regulatory changes may have indirect effects on California's TDM export market.

Figure 12 California-Generated Exported TDF and Baled Waste Tires and Truck Tire Treads, 2010-2024*



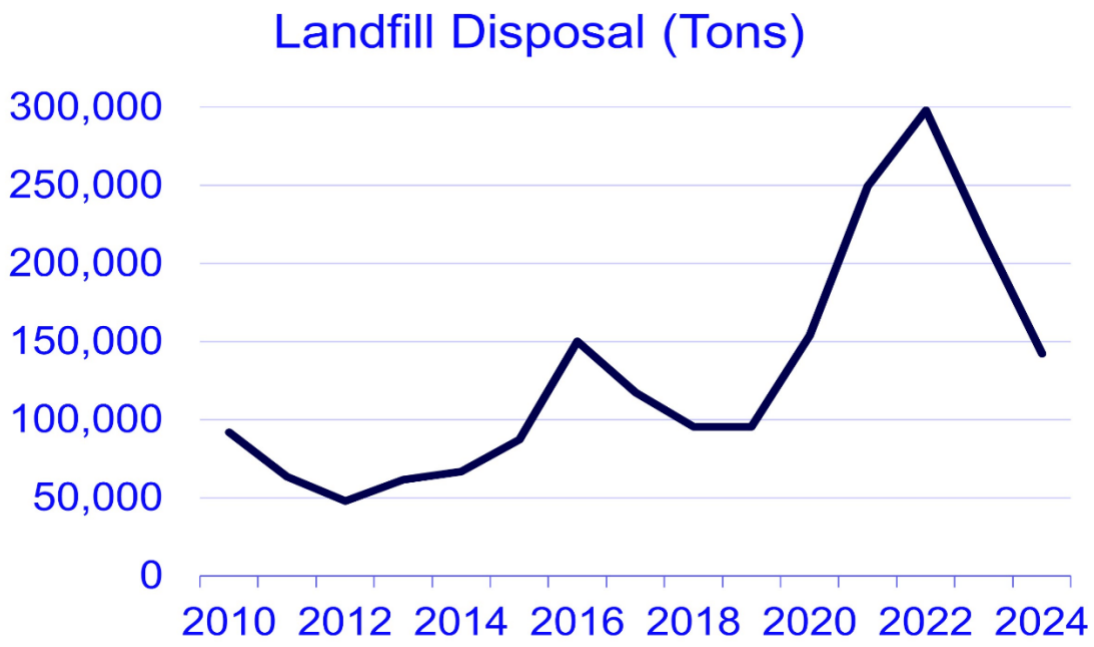
*See source data for Figure 12 in Appendix C.

4.9 Landfill Disposal

As shown in Figure 13, following a 19.5% rise in 2022, landfill disposal of California-generated waste tires has declined significantly over the past two years. In 2023, landfill disposal decreased by 26.5% totaling 217,909 tons (21.7 million PTEs or 38.3% of all waste tires managed in 2023) and in 2024, it further decreased by 34.7%, totaling 142,339 tons (14.2 million PTEs or 23.8% of all waste tires managed in 2024).

In 2023 and 2024, the main cause of the reduction in landfill disposal was a surge in export demand, especially from India. Some California processors rapidly responded to the increased demand by ramping up exports, which directly resulted in decreased landfill disposal. Given the continued strong demand from overseas markets, landfill disposal is expected to continue to decline in 2025.

Figure 13 California-Generated Waste Tires Disposed of in Landfills, 2010-2024*



*See source data for Figure 13 in Appendix C.

4.10 Waste Tire Imports

In 2024, an estimated 65,201 tons of waste tires (6.5 million PTEs, or 10.9% of all waste tires managed) were imported into California from out of state and sent to a limited number of California processors. Most of the imported waste tires originated from Utah, Arizona, and Oregon. To ensure accurate reporting of California-generated waste tire flows, imported tonnages are subtracted from the total managed tonnages for the respective processors. As a result, imported waste tires are not included in the calculation of California's waste tire recycling rate.

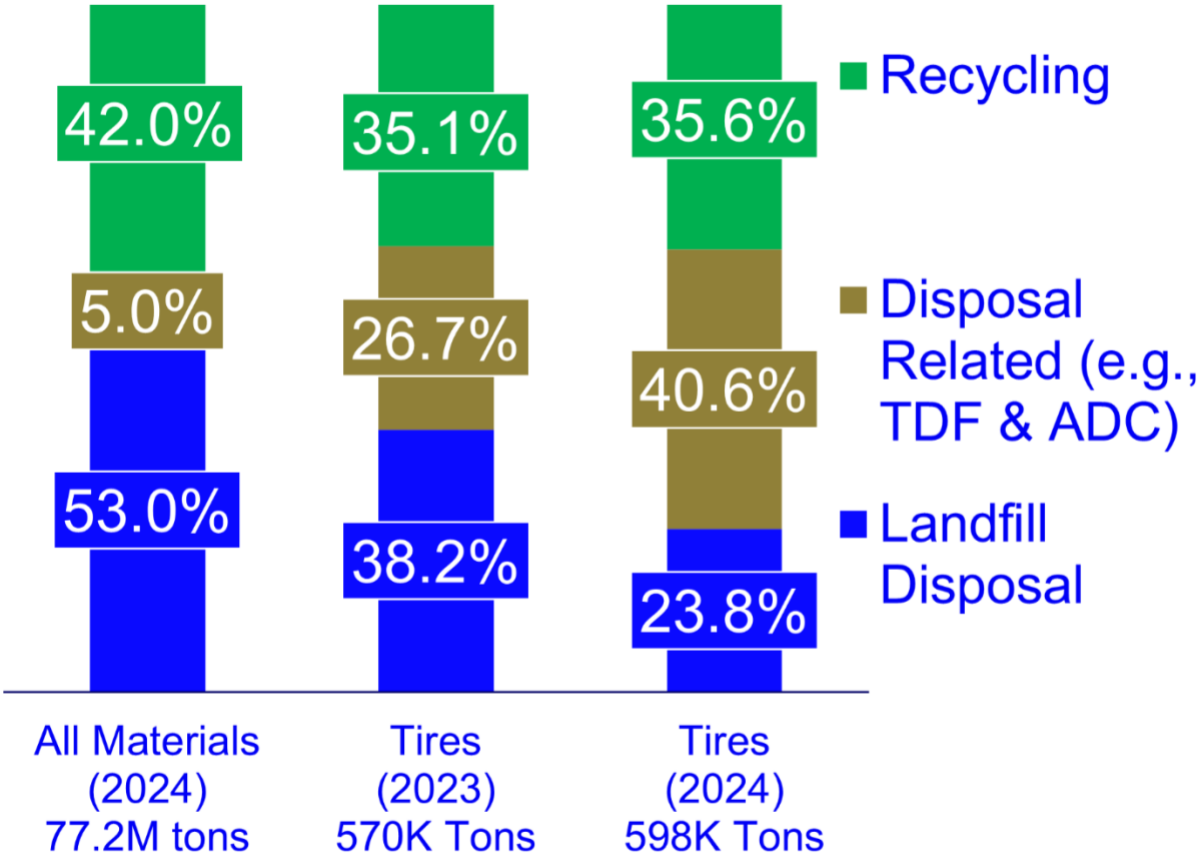
5. The Outlook for Increased Waste Tire Recycling

5.1 Waste Tire Recycling in the California Context

California has a mandatory statewide 75% recycling rate goal for all waste types under AB 341. While not codified in statute, CalRecycle has informally adopted a 75% recycling goal specifically for waste tires. Consistent with AB 341, the recycling rate measurement excludes landfill ADC. Additionally, TDF is included in the “disposal-related” category rather than recycling, to distinguish it from material recovery and reuse pathways.

Figure 14 illustrates how California’s waste tire management compares to the management of the overall waste stream. The figure shows the 2024 breakdown for all waste materials, and the 2023 and 2024 breakdowns for waste tires.

Figure 14 Comparison of All California Waste Materials and California Waste Tires Management*

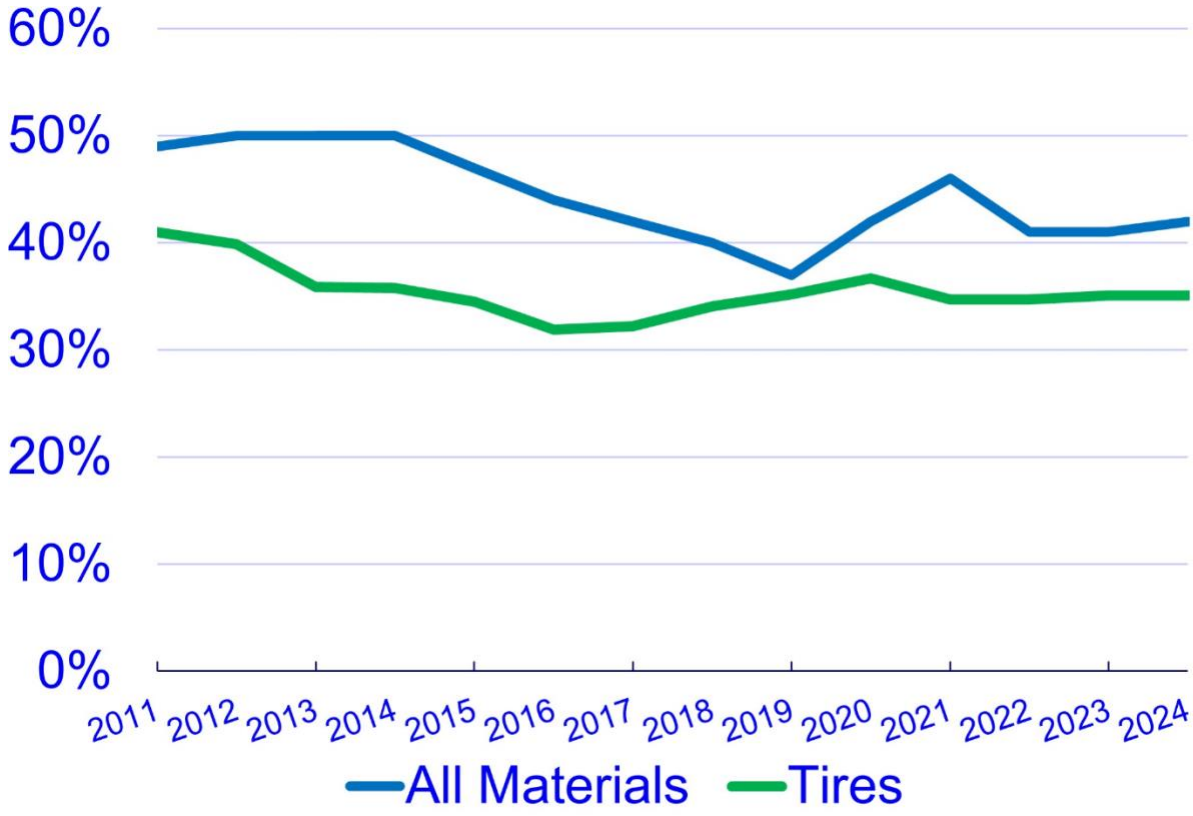


*See source data for Figure 14 in Appendix C. Source for all materials: calrecycle.ca.gov/stateofreport/

Figure 15 shows historical recycling rate percentage for all materials compared to waste tires. The material groups used in CalRecycle's waste characterization studies are first divided by type, then grouped into nine commodity categories. In general, these categories contain types made from the same base material, such as paper, glass, or organics.

Historically, waste tire recycling rates have been lower than those for all materials. However, in recent years, both rates have shown similar trends, reflecting broader market and policy influences. Based on interviews with industry experts, systemic changes — such as economic conditions, regulatory shifts, and infrastructure investments — tend to affect both the general recycling market and the waste tire sector simultaneously.

Figure 15 California All Waste Materials and California Waste Tires Recycling Rates, 2011-2024*

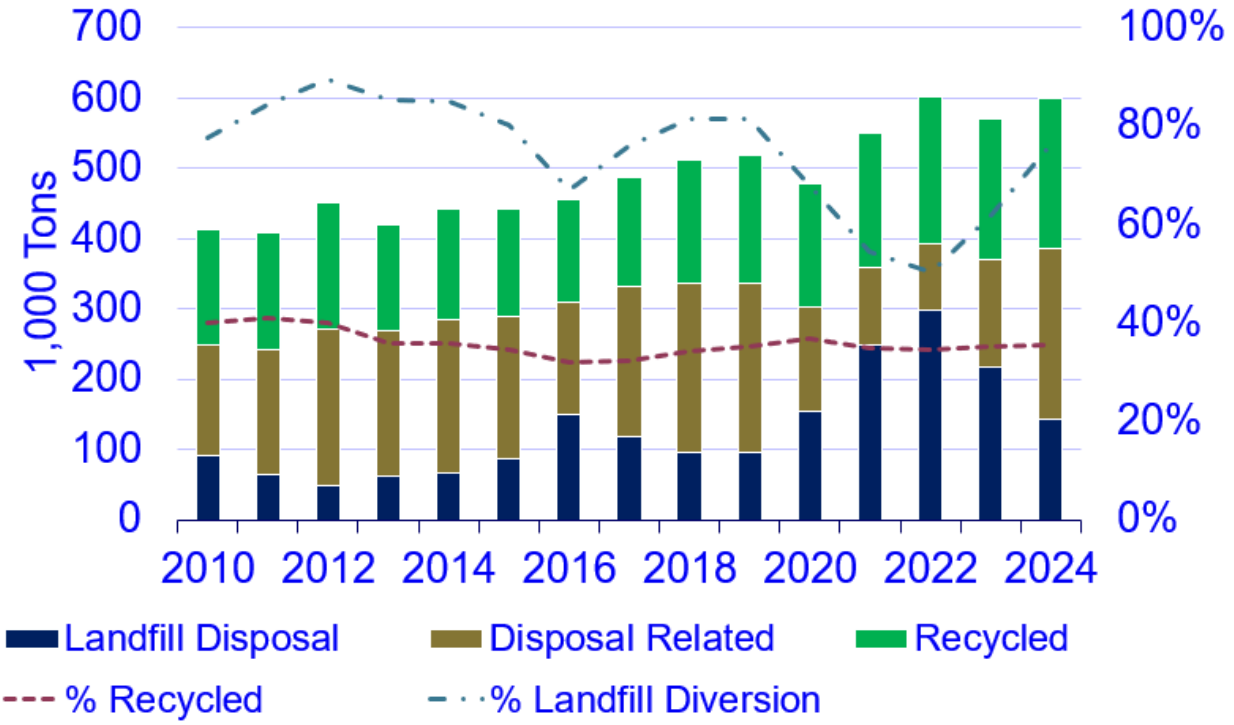


*See source data for Figure 15 in Appendix C.

5.2 Historical Recycling, Disposal-Related and Landfill Disposal Trend

As shown in Figure 16, the California waste tire recycling rate has fluctuated within a relatively narrow range over the past 12 years. The rate reached a low point of 32% in 2016, but has gradually increased, reaching 35.6% in 2024. In recent years, export demand has continued to reshape landfill disposal dynamics. As export markets have expanded, California processors have diverted more material away from landfills, contributing to the decline in disposal tonnage.

Figure 16 California Waste Tire Recycling, Disposal-Related and Landfill Disposal Trend, 2010-2024*



*See source data for Figure 16 in Appendix C.

5.3 Future Tire Recycling Trends and Considerations

Table 3 summarizes the short-term outlook for each market segment in 2024, building on the trends identified throughout this report. While predicting conditions in 2025 presents challenges, here are several considerations:

- **Sustainability of 2024 Recycling.** The report highlights a 2% decrease in retreading and a 23.8% increase in the crumb rubber/ground rubber market segment in 2024. Initial feedback from industry stakeholders suggests retreading is on track to stabilize, with the potential for slight growth in 2025. The crumb rubber markets, especially in the local government paving and molded/other segments, have the potential for continued growth.
- **Emergence of New Products and Markets.** The TIP in 2024 supports manufacturers utilizing crumb rubber in TDPs. Industry professionals recognize new markets and applications that need to be developed for all sizes of TDM, not just for crumb rubber uses. Growth and investment in tire recycling are constrained by California's economic forecasts and by rising regulatory and environmental concerns surrounding TDM use.
- **Continuation of Disruptions.** Persistent challenges in 2024 included staffing shortages, increased wages and benefits, elevated trucking and ocean shipping costs, and inflation. These challenges are likely to continue to constrain business operations and market expansion in most waste tire management and recycling

industry segments through 2025 by adding complications and costs that represent a potential barrier to investment in the development of new products and markets.

- **Impact of Business Ownership Changes and Investments.** In 2024, the industry witnessed continued changes and consolidations in TDM manufacturers, retreaders, and other market segments. The long-term impacts of these changes are yet to be fully realized and will continue to reshape the markets in 2025. Investments that align with customer needs, especially in high-volume applications, have the potential to drive tire recycling expansion. Because of tariff and economic uncertainty, investment opportunities in 2025 may be more limited.

Table 3 The Outlook for California Waste Tire Recycling

Category	2024 (Tons)	2024 (M PTEs)	2024 (% Total)	Outlook Toward 2025
Retreads	54,521	5.5	9.1%	Retread markets saw slight declines (~2% annually) in 2023 and 2024, as businesses paused major investments amid economic uncertainty and tariff instructions. Most sectors expect stable conditions in 2025.
Used Tires	50,319	5.0	8.4%	Used tire sales rose in 2024 due to inflation and election year uncertainty, with continued growth expected in 2025.
Crumb Rubber and Ground Rubber	96,743	9.7	16.2%	California increased crumb rubber and ground rubber use through TIP grants and Caltrans projects increased in 2024; both are projected to hold steady in 2025.
Civil Engineering (TDA)	2,150	0.2	0.4%	California saw a decline in non-landfill TDA project activity and landfill usage in 2024. Stable conditions are expected in 2025.
Other Recycling	9,410	0.9	1.6%	Wire, cut, stamped, agriculture, marine products, etc. are expected to remain stable in 2025.
Total Recycling	**213,143**	**21.3**	**35.6%**	**Crumb and ground rubber usage increased in 2024. Stable usage is expected to continue in 2025.**
TDF (In-State)	20,606	2.1	3.4%	In 2024, one cement plant accounted for most of the use. Stable conditions are expected in 2025.
TDM (Export)	205,055	20.5	34.3%	In 2024, exports to Japan were stable and exports to India increased. Increases are expected in 2025.
Landfill Alternative Daily Cover	17,286	1.7	2.9%	In 2024, two landfills reported using ADC. The outlook for 2025 is stable.
Total Disposal-Related	**242,947**	**24.3**	**40.6%**	**2024 saw increases and 2025 is expected to see increases as well.**

Category	2024 (Tons)	2024 (M PTEs)	2024 (% Total)	Outlook Toward 2025
Landfill Disposal	142,339	14.2	23.8%	Substantial decreases were associated with increased exports, and decreases are expected in 2025.
Overall Diversion	456,090	45.6	76.2%	Increases in 2024 were related to export market demand, crumb rubber products, and Caltrans Rubber Modified Asphalt. Stable or slight increases are expected in 2025.
Waste Tires Managed	598,429	59.8	100.0%	There was an increase in 2024. Stable to slight increases are expected in 2025.

5.4 Concluding Remarks

California has built a robust and diverse waste tire management infrastructure, and the outlook for increased recycling remains positive. With the right environment and conditions, there is potential for growth in recycled tire tonnages, particularly in the retread, paving, and molded/other market segments.

Ongoing business ownership changes, consolidations, and investments aimed at expanding or enhancing waste tire recycling operations may further bolster this positive trajectory. Continued growth will depend on expanding and diversifying in TDP markets. Developing and expanding CalRecycle programs that promote both existing and new markets will contribute to achieving this goal.

CalRecycle has multiple ongoing programs aimed at improving recycling and market development. They include the TRP, TIP, and TDA grant programs. With the continued rise in export demand for TDM, California is expected to see further reductions in landfill disposal through 2025 and beyond.

At the same time, waste tire generation is projected to increase in California due to heavier vehicles, increased EV adoption, and production of larger OEM tires. Heavier vehicles, including EVs, can wear tires up to 30% faster. By the end of 2024, EV sales increased by 22%, contributing to growing annual waste tire tonnages in California and nationwide.

To address this, it may be beneficial for CalRecycle's tire program to explore new strategies for source reduction. These could include promoting proper tire maintenance to extend tire life as well as encouraging carpooling, public transportation, and active transportation (e.g., biking and walking).

While conditions for a transformative leap in tire recycling may not yet be in place, there is potential for incremental progress. Ongoing communications with industry and interested parties will be critical to the success of CalRecycle's programs. California's waste tire management programs remain strong, ensuring effective management of the state's generated waste tires.

Appendix A, Glossary of Key Terms and Acronyms

6PPD: An organic chemical widely used as stabilizing additive (or anti-degradant) in rubbers; all of which are common in vehicle tires. Although it is an effective antioxidant it is primarily used because of its excellent antiozonant performance. It is one of several antiozonants based around p-phenylenediamine.

6PPD-q: 6PPD-quinone is an oxidation product of 6PPD, an additive intended to prevent damage to tire rubber from ozone.

ADC: Alternative Daily Cover used at landfills instead of soil.

Buffings: Tire rubber produced as a by-product of the tire retreading process and use.

California-Generated: As used in this report, this term refers to waste tires generated in California and/or tire-derived materials or products made from waste tires generated in California, excluding any amounts derived from waste tires imported into California.

Caltrans: California Department of Transportation.

CARB: California Air Resources Board.

Circular Economy (CE): An economic system based on the reuse and regeneration of materials or products, especially as a means of continuing production in a sustainable or environmentally friendly way.

Comprehensive Trip Log (CTL): Paper or electronic forms used by haulers and waste tire facilities to document waste and used tire pickup or delivery transactions. Forms are submitted to CalRecycle and entered in the Waste Tire Manifest System database.

Crumb rubber: Tire-derived material equal to or less than 0.25 inch in size, free of wire and fiber. In this report the broad category crumb rubber and ground rubber is defined to include the following three sub-categories of products made from crumb rubber:

- Paving, including rubberized hot mix asphalt and chip seal surface treatments.
- Infill used on synthetic turf athletic fields and other sports surfacing applications.
- Molded and other products that use crumb rubber include flooring mats and tiles, ADA transition ramps, traffic safety related products, plumbing coupling fittings, and roofing.

Disposal-Related Activities: As defined in CalRecycle's annual State of Disposal and Recycling Reports, a set of activities considered as part of overall disposal: alternative daily cover, alternative intermediate cover, other beneficial reuse at landfills (such as construction activities, landscaping, and erosion control), transformation, engineered municipal solid waste, and waste tire-derived fuel.

DTSC: California Department of Toxic Substances Control.

EVs: Electric Vehicles.

End-of-Life Tire (ELT): ELTs are tires that have reached the end of their usable life cycle, typically because they are worn out, damaged, or no longer meet safety standards for use on vehicles. These tires are discarded and require proper management, such as recycling, reuse, or disposal, to minimize environmental impact. ELTs do not include retreads or used tires that meet legally drivable tread depth.

Feedstock conversion: The process whereby a manufacturer converts a portion of the raw materials (e.g., virgin rubber, plastic, aggregate, or other raw material) used to make a product with recycled tire rubber.

Ground rubber: The tire-derived material is larger than 0.25 inch and up to one inch in size. For some applications, the material is referred to as landscape nuggets. It is also used in walkways, playground applications, and ballistic walls. In this report, Ground Rubber is also a sub-category of products within the broader Crumb Rubber and Ground Rubber category that includes any product made with ground rubber.

Landfill disposal: Disposal of waste materials at a landfill, excluding materials disposed of as part of landfill gas and landfill alternative daily cover activities.

Landfill Gas (LFG): LFG can be captured, converted, and used as a renewable energy resource.

OEHHA: California Office of Environmental Health Hazard Assessment.

OEM: Original Equipment Manufacturer.

Passenger Tire Equivalent (PTE): Defined as 20 pounds of tire rubber for the purpose of making consistent comparisons in this and other reports. (The actual weight of waste passenger tires may vary considerably.)

Retread tire: A quality casing satisfying established standards to which a new tread has been affixed to extend the usable life of the tire.

Tire-Derived Aggregate (TDA): Tire-derived material used to replace conventional aggregates like rock in civil engineering applications.

Tire-Derived Fuel (TDF): Whole waste tires or tire-derived material consumed as fuel (referred to as size reduced TDF in this report). Residual tire fiber and tire fluff are used as fuel in a California cement kiln and are also categorized as tire-derived fuel in this report.

Tire-Derived Material (TDM): Tires processed to meet market specifications, for example, crumb rubber, ground rubber, tire-derived aggregate, road infrastructure projects and tire-derived fuel.

Tire-Derived Product (TDP): Product made entirely or in part from tire-derived material.

Tire Fiber: A product separated during the tire grinding process and is used as tire-derived fuel.

Tire Fluff: The textile and reinforcing material that is separated from scrap tires during recycling and is used as tire-derived fuel.

Tire Incentive Program (TIP): A CalRecycle program launched in June 2015 to promote feedstock conversion and the use of crumb rubber as feedstock by California manufacturers.

Used Tire: 30 PRC section 42806.5 defines "used tire" as a tire that:
a) is no longer mounted on a vehicle but is still suitable for use as a vehicle tire;
b) meets applicable requirements of the Vehicle Code and Title 13 of the California Code of Regulations; and
c) meets specified storage requirements.

Vibration Damping: Absorbs or changes energy caused by vibration, reducing the amount of transmitted energy through the material.

Waste Tire Manifest System (WTMS): A CalRecycle database containing information on waste tire management firms, permits, and submitted comprehensive trip log data.

Waste tire: 30 PRC section 42807 defines "waste tire" as a tire that is not mounted on a vehicle and is no longer suitable for use as a vehicle tire due to wear, damage, or deviation from manufacturer original specifications.

Appendix B, Methodology

The main goal of the annual Waste Tire Market Report series is to document California waste tire recycling trends, the recycling rate, and the quantity of California-generated waste tires managed (including used tires and retread tires), along with trends in each segment and their end-use destinations.

Conducting the annual market analysis involves the following steps:

- Update a list of currently operating California waste tire management facilities and companies, including processors, TDP manufacturers and installers, asphalt rubber blender operators, brokers, retreaders, cement kilns, and landfills that dispose of waste tires. Sources include CalRecycle databases, industry networking, and online searching.
- Compile information on these facilities through surveys, interviews, CalRecycle databases (e.g., Waste Tire Manifest System), and online searches.
- Enter facility-specific data into a customized flow model spreadsheet and systematically analyze flows, with emphasis on flows to and from waste tire facilities to end-use market segments. This is an iterative process in which researchers identify issues and follow up with facilities repeatedly to refine and validate analyses. The process continues until researchers conclude the findings are as complete and accurate as possible, while avoiding double-counting.
- Where data are unavailable or contradictory, estimations are made based on the information available and perspectives offered by industry representatives.

Readers should keep the following in mind when interpreting and using findings:

- Findings reported in the main body of the report are rounded to the nearest 100 tons, reflecting a reasonable level of accuracy. However, the underlying source data used to generate charts, as presented in Appendix C, list the exact numerical estimates generated through the customized flow model.
- The findings quantify California-generated waste tires and TDM/TDPs made from waste tires. Imported waste tires and TDM/TDPs made from them are excluded from the California-generated findings, as are buffings from retread operations, since the rubber has already been “counted” as part of the retreading process.
- The findings do not represent estimates of California’s total market for TDM or TDPs.
- The Waste Tire Market Report series employs a consistent methodology that the authors strive to refine and improve over time. This includes extensive data gathering and validation through multiple sources wherever possible, as well as rigorous and systematic data analysis. Because of this, despite the need to address data gaps and inconsistencies, the authors believe the findings provide reasonably accurate information that can be used to evaluate trends over time.

Appendix C, Accessibility Notes and Source Data

The following data are the source for charts and figures in this report. Note that in the body of the report, findings are rounded to the nearest 100, reflecting a reasonable level of accuracy. However, in this appendix, we present the exact estimates as generated in the waste tire flow model used by the study team to produce charts that reflect the best information available.

Supporting data for Figure 7 and 8 are derived from Caltrans' annual Crumb Rubber Reports. (2023 data are draft estimates.)

Table C-1 Source Data for Figure 1 California Waste Tire Flows in 2024

Category	2024 Tons	2024 %
Retreads	54,521	9.1%
Used Tires	50,319	8.4%
Crumb/Ground Rubber	96,743	16.2%
Civil Engineering (Tire-Derived Aggregate)	2,150	0.4%
Other Recycling	9,410	1.6%
Tire-Derived Fuel (In-State)	20,606	3.4%
Tire-Derived Fuel (Export)	180,055	30.1%
Exported Baled and Cut Waste Tires	25,000	4.2%
Alternative Daily Cover	17,286	2.9%
Landfill Disposal	142,339	23.8%
Total Managed	**598,429**	**100.00%**
Total Recycled	**213,143**	**35.6%**
Total Disposal-Related	**242,947**	**40.6%**

Table C-2 Source Data for Figure 2 California Waste Tire Recycling, Disposal-Related and Disposal Trends, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016
Landfill Disposal	92,033	63,444	47,908	61,682	66,770	87,170	150,226
Disposal-Related	155,603	177,500	222,695	207,754	217,043	202,382	159,654
Recycled	164,206	167,516	179,768	150,741	158,094	152,767	145,288
% Recycled	39.9%	41.0%	39.9%	35.9%	35.8%	34.5%	31.9%
% Landfill Diversion	77.7%	84.5%	89.4%	85.3%	84.9%	80.3%	67.0%

Category	2017	2018	2019	2020	2021	2022	2023	2024
Landfill Disposal	117,448	95,401	95,412	154,050	249,377	298,084	217,909	142,339
Disposal-Related	213,707	241,597	240,503	149,099	109,347	94,163	151,886	242,947
Recycled	156,994	174,264	182,438	175,868	193,197	208,777	199,889	213,143
% Recycled	32.2%	34.1%	35.2%	36.7%	35.0%	34.7%	35.1%	35.6%
% Landfill Diversion	75.9%	81.3%	81.6%	67.8%	54.8%	50.4%	61.7%	76.2%

Accessibility Notes for Figure 3, California Waste Tire Recycling Industry Flow Chart

This chart illustrates how California waste tires, TDM, and TDPs flow between various entities. Haulers pick up waste tires from generators and may deliver them to one of several destinations: a landfill for disposal; a processor (which may produce TDM); a used-tire buyer or seller; or a TDF consumer (i.e., one of three California cement kilns). Processors may dispose of size-reduced tires at a landfill or divert the size-reduced TDM for use in the following: civil engineering projects and other beneficial uses; for use as a compound mix in the manufacture of TDPs and installed applications; and TDF use at cement plants in the production of cement. Imports into California and exports from California include whole waste tires, TDM, TDPs, retread tires and buffings, used tires, and TDF (size-reduced tires, baled waste tires, and truck tire treads). Such imports may flow to California processors, TDP manufacturers and installers, TDF consumers, or directly to customers. Such exports may flow from California processors, TDP manufacturers, used tire buyers and sellers, and retreaders.

Categories of manufacturers and installers include:

- Accessibility ramps
- Flooring
- Landscape surfaces
- Mats, pavers, and tiles
- Paths, walkways, and sidewalks
- Pavements
- Playground surfaces
- Sport surfaces
- Synthetic turf infill
- Retreading
- Roofing
- Traffic-related products

Types of civil engineering applications include:

- Landfill projects
- Lightweight fill
- Retaining wall backfill
- Vibration dampening
- Stormwater management

Finally, TDP manufacturers and installers, civil engineering project leads, and TDF consumers sell products directly to their customers, inside and outside of California.

Table C-3 Source Data for Figure 4
Historical Market Trends by Segment, 2010-2024

Category	2010	2011	2012	2013
Landfill Disposal	92,033	63,444	47,908	61,682
ADC	7,928	19,589	10,486	12,316
Exported TDF & Bales	64,000	96,000	135,000	110,144
In-State TDF	83,675	61,911	77,209	85,295
Other Recycling	12,121	13,427	14,059	12,166
Civil Engineering	18,274	5,915	5,844	4,557
Crumb/Ground Rubber	59,850	61,700	68,350	55,350
Used Tires	37,942	45,823	51,678	38,033
Retread	36,018	40,651	39,838	40,635
Total Managed	**411,842**	**408,459**	**450,372**	**420,177**

Category	2014	2015	2016	2017	2018
Landfill Disposal	66,770	87,170	150,226	117,448	95,401
ADC	14,691	15,217	16,798	18,108	17,975
Exported TDF & Bales	110,000	94,000	62,476	113,405	135,236
In-State TDF	92,352	93,165	80,380	82,194	88,386
Other Recycling	11,643	12,114	9,790	10,433	16,791
Civil Engineering	12,632	11,668	10,961	6,431	5,127
Crumb/Ground Rubber	49,200	54,700	43,165	50,345	61,728
Used Tires	42,278	30,927	39,032	41,375	42,692
Retread	42,341	43,358	42,341	48,409	47,925
Total Managed	**441,907**	**442,318**	**455,168**	**488,149**	**511,262**

Category	2019	2020	2021	2022	2023	2024
Landfill Disposal	95,412	154,050	249,377	298,084	217,909	142,339
ADC	16,784	14,876	17,440	21,169	19,307	17,286
Exported TDF & Bales	145,412	76,612	43,664	40,537	6,630	25,000
In-State TDF	78,307	57,611	48,243	32,457	20,858	20,606
Other Recycling	16,442	11,862	18,082	16,587	13,200	9,410
Civil Engineering	13,330	16,911	6,575	7,371	8,682	2,150
Crumb/Ground Rubber	59,985	50,530	70,862	78,341	78,159	96,743
Used Tires	44,757	51,036	43,044	49,112	44,203	50,319
Retread	47,925	45,529	54,635	57,366	55,645	54,521
Total Managed	**518,353**	**479,017**	**551,921**	**601,204**	**569,684**	**598,429**

Table C-4 Source Data for Figure 5 Estimated California-Generated Retread Tire Shipments, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016	2017
Retreads	36,018	40,651	39,838	40,635	42,341	43,358	42,341	48,409

Category	2018	2019	2020	2021	2022	2023	2024
Retreads	47,925	47,925	45,529	54,635	57,366	55,645	54,521

Table C-5 Source Data for Figure 6 Shipments of California-Generated Crumb Rubber and Ground Rubber, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016
Paving	35,206	34,043	30,793	24,806	23,429	27,808	NA
Turf Infill	9,605	11,871	15,089	14,034	11,355	13,415	NA
Molded / Other	7,308	8,357	10,076	6,583	6,719	4,759	NA
Ground Rubber	7,731	7,428	12,392	9,927	7,698	8,718	NA
Total Crumb/Ground Rubber	**59,850**	**61,700**	**68,350**	**55,350**	**49,200**	**54,700**	**43,165**

Category	2017	2018	2019	2020	2021	2022	2023	2024
Paving	NA	NA	NA	NA	NA	NA	NA	NA
Turf Infill	NA	NA	NA	NA	NA	NA	NA	NA
Molded / Other	NA	NA	NA	NA	NA	NA	NA	NA
Ground Rubber	NA	NA	NA	NA	NA	NA	NA	NA
Total Crumb/Ground Rubber	**50,345**	**61,728**	**59,985**	**50,530**	**70,862**	**78,341**	**78,159**	**96,743**

Since 2016, this report has excluded specific quantitative estimates of California crumb rubber shipments by market segment to protect confidentiality and address the growing competitive landscape.

Table C-6 Source Data for Figure 7, Caltrans Total Asphalt Placement and Rubberized Asphalt Percent of Total, 2009-2024

Year	Total Asphalt Placed (Metric Tons)	RHMA % Total
2009	5,589,914	23.60%
2010	3,860,646	30.60%
2011	7,522,354	34.70%
2012	6,333,678	29.20%
2013	4,578,258	22.90%
2014	4,120,457	26.70%
2015	4,602,421	41.30%
2016	4,785,160	39.80%
2017	4,056,991	45.03%
2018	4,767,951	46.43%
2019	3,860,363	39.75%
2020	3,405,088	41.31%
2021	3,280,000	38.00%
2022	2,695,298	36.24%
2023	2,760,226	32.24%
2024	3,908,644	40.92%

Table C-7 Source Data for Figure 8 Caltrans Use of Crumb Rubber in Paving Projects, 2009-2024

Year	Crumb Rubber Used (Million Pounds)
2009	40,103,331
2010	35,919,690
2011	77,543,629
2012	52,286,289
2013	32,514,454
2014	35,220,943
2015	60,775,793
2016	60,892,762
2017	58,456,877
2018	70,839,587
2019	54,133,231
2020	49,611,420
2021	45,092,453
2022	34,030,984
2023	31,382,562
2024	40,602,759

Table C-8 Source Data for Figure 9 California-Generated Tire-Derived Aggregate Shipped for Use in Civil Engineering Projects, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016
Landfill Projects	17,924	5,915	5,844	2,612	8,806	10,374	7,083
Non-Landfill Projects	350	0	0	1,945	3,826	1,294	3,878
Total TDA	**18,274**	**5,915**	**5,844**	**4,557**	**12,632**	**11,668**	**10,961**

Category	2017	2018	2019	2020	2021	2022	2023	2024
Landfill Projects	5,583	4,021	6,682	16,311	6,575	7,371	3,200	2,150
Non-Landfill Projects	853	1,106	6,648	600	0	0	5,482	0
Total TDA	**6,431**	**5,127**	**13,330**	**16,911**	**6,575**	**7,371**	**8,682**	**2,150**

Table C-9 Source Data for Figure 10 California-Generated Tire-Derived Material Used as Landfill Alternative Daily Cover or in Beneficial Reuse Applications, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016	2017
ADC	7,928	19,589	10,486	12,316	14,691	15,217	16,798	18,108

Category	2018	2019	2020	2021	2022	2023	2024
ADC	17,975	16,784	14,876	17,440	21,169	19,307	17,286

Table C-10 Source Data for Figure 11 California Whole Waste Tires and TDF Consumed at California Cement Kilns, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016	2017
Whole Tire/Size-Reduced TDF	83,675	61,911	77,209	81,982	83,934	85,721	72,723	75,989
Fiber TDF	0	0	0	3,313	8,418	7,443	7,656	6,205
Total TDF	**83,675**	**61,911**	**77,209**	**85,295**	**92,352**	**93,165**	**80,380**	**82,194**

Category	2018	2019	2020	2021	2022	2023	2024
Whole Tire/Size-Reduced TDF	80,603	70,807	51,315	39,704	30,915	19,558	19,865
Fiber TDF	7,783	7,500	6,297	8,539	1,542	1,300	750
Total TDF	**88,386**	**78,307**	**57,611**	**48,243**	**32,457**	**20,858**	**20,615**

Table C-11 Source Data for Figure 12 California-Generated Exported TDF and Bales of Waste Tires and Truck Tire Treads, 2010-2024

Category	2010	2011	2012	2013	2014
Size-Reduced TDF	NA	NA	NA	NA	74,000
Baled and Cut Waste Tires	NA	NA	NA	NA	36,000
Total Exported TDF/Bales	**64,000**	**96,000**	**135,000**	**110,144**	**110,000**

Category	2015	2016	2017	2018	2019
Size-Reduced TDF	66,000	47,476	87,317	99,197	114,427
Baled and Cut Waste Tires	28,000	15,000	26,089	36,039	30,985
Total Exported TDF/Bales	**94,000**	**62,476**	**113,405**	**135,236**	**145,412**

Category	2020	2021	2022	2023	2024
Size-Reduced TDF	73,412	40,148	37,037	105,091	180,055
Baled and Cut Waste Tires	3,200	3,516	3,500	6,630	25,000
Total Exported TDF/Bales	**76,612**	**43,664**	**40,537**	**111,721**	**205,055**

Table C-12 Source Data for Figure 13 California-Generated Waste Tires Disposed of in Landfills, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016
Landfill Disposal	92,033	63,444	47,908	61,682	66,770	87,170	150,226

Category	2017	2018	2019	2020	2021	2022	2023	2024
Landfill Disposal	117,448	95,401	95,412	154,050	249,377	298,084	217,909	142,339

Table C-13 Source Data for Figure 14 Comparison of California All Materials and Waste Tires Management

Category	All Materials (2024) 77.20 M Tons	Tires (2023) 0.57 M Tons	Tires (2024) 0.59 M Tons
Landfill Disposal	53.0%	38.2%	23.8%
Disposal-Related (e.g., Fuel & ADC)	5.0%	26.7%	40.6%
Recycling	42.0%	35.1%	35.6%

Table C-14 Source Data for Figure 15 Historical California All Materials and Waste Tires Recycling Rates

Year	All Materials*	Tires
2011	49.0%	41.0%
2012	50.0%	39.9%
2013	50.0%	35.9%
2014	50.0%	35.8%
2015	47.0%	34.5%
2016	44.0%	31.9%
2017	42.0%	32.2%
2018	40.0%	34.1%
2019	37.0%	35.2%
2020	42.0%	36.7%
2021	40.0%	35.0%
2022	40.8%	34.7%
2023	N/A	35.1%
2024	42.0%	35.6%

*** 2023 data is not available**

Table C-15 Source Data for Figure 16 California Waste Tire Recycling, Disposal-Related and Disposal Trends, 2010-2024

Category	2010	2011	2012	2013	2014	2015	2016	2017
Landfill Disposal	92,033	63,444	47,908	61,682	66,770	87,170	150,226	117,448
Disposal-Related	155,603	177,500	222,695	207,754	217,043	202,382	159,654	213,707
Recycled	164,206	167,516	179,768	150,741	158,094	152,767	145,288	156,994
% Recycled	39.9%	41.0%	39.9%	35.9%	35.8%	34.5%	31.9%	32.2%
% Landfill Diversion	77.7%	84.5%	89.4%	85.3%	84.9%	80.3%	67.0%	75.9%

Category	2018	2019	2020	2021	2022	2023	2024
Landfill Disposal	95,401	95,412	154,050	249,377	298,084	217,909	142,339
Disposal-Related	241,597	240,503	149,099	109,347	94,163	151,886	242,947
Recycled	174,264	182,438	175,868	193,197	208,777	199,889	213,143
% Recycled	34.1%	35.2%	36.7%	35.0%	34.7%	35.1%	35.6%
% Landfill Diversion	81.3%	81.6%	67.8%	54.8%	50.4%	61.7%	76.2%

Appendix D, End Notes

[1] CalRecycle, Waste Tire Program, Facilities Search Web Page.

[2] CalRecycle, Who Participates? - CalRecycle Home Page.

[3] Analysis of Waste Tire Manifest Data as provided by CalRecycle to GHD 4/22/2025.

[4] CalRecycle, California Tire-Derived Product Catalog, October 2021 Revision, Appendix A, Business Directories.

[5] Updated list of permitted waste tire facilities as provided to DKE and GHD by CalRecycle on May 5, 2025.

[6] See end note 5.

[7] See end note 4.

[8] See end note 4.

[9] Chart data is based on Caltrans annual Crumb Rubber Reports available online in various locations. The 2022 report is available here. 2023 & 2024 data are unpublished values based on email discussion with Caltrans representatives.

[10] See end note 12.

[11] "A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon." The Journal Science, Vol 371, Issue 6525. December 3, 2020.