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Integrating Reuse Into California's Beverage Container Deposit System

A Feasibility Study

eunomia ReSim THE STORY OF STUFF PROJECT

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Eunomia Research and Consulting

Eunomia Research & Consulting is an independent sustainability consultancy, driven by a genuine passion to make a positive change to the clients with whom we work and the communities in which they operate. Founded in 2001, we have been pioneers in the sector – early advocates for helping non-profits as well as leading public and private sector organisations globally to adapt their approaches and adopt more sustainable processes. Our consultants are experts in the field, deeply immersed in the subject, with the technical knowledge and skill to offer clients innovative, clear, and practical recommendations. We are committed to finding solutions to better protect the planet while supporting the wider aims and needs of our clients.

ReSim

This project utilizes Eunomia's ReSim tool. ReSim is a pioneering sustainable packaging supply chain simulator. The all-in-one tool evaluates the environmental, financial and social impacts of single-use and reused packaging across whole businesses and industries. This gives decision makers the robust data and system-wide intelligence to make confident and informed choices.

The Story of Stuff Project

The Story of Stuff Project is a California-based non-profit organization that is transforming the way we make, use, and throw away Stuff to be more sustainable, healthy and fair. Founded in 2008 to leverage the short documentary that gave us our name, the Project's award-winning storytelling highlights the systemic nature of the environmental challenges we face, as well as the available solutions; our field-leading campaigns provide opportunities for our Community members to flex their citizen muscles; and our Grassroots Grants and other network support programs unite diverse partners working within and across our core issue areas, including the fight to end plastic pollution. Our Community was instrumental in the passage of the federal Microbeads Free Waters Act of 2015 and we are among the founders of the global Break Free from Plastic movement.

11th Hour Project

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Glossary

Term	Definition
California Beverage Container Recycling Program (BCRP)	A program managed by CalRecycle that aims to encourage the recycling of beverage containers in which consumers pay a small fee when they purchase beverages, and can then redeem this fee when they return the empty containers to a recycling center or retailer.
Carbon Budget	The allowable amount of carbon dioxide emissions that can be emitted while still keeping global temperature rise within a certain limit, such as 1.5°C above pre-industrial levels.
CO_2 Equivalent (CO_2e)	A metric measure used to compare the emissions of various greenhouse gases based on their global warming potential relative to carbon dioxide.
Container Pools	Groups of companies producing similar beverages that could share infrastructure in a reuse system.
Deposit Return System (DRS)	A system where consumers pay a deposit on beverage containers, which is refunded when the container is returned for recycling or reuse. This can apply to single-use or reusable containers.
Environmental Justice Communities	Communities, often low-income or communities of color, that experience disproportionate exposure to environmental hazards and lack access to environmental benefits.
Frontline Communities	Communities that are directly affected by environmental hazards, often located near industrial sites or areas with high pollution levels.
Hospitality	The industry that provides services such as accommodation, food and beverage, and entertainment. It includes businesses like hotels, restaurants, cafes, bars, and event venues.
PET (Polyethylene Terephthalate)	A type of plastic commonly used for beverage containers. Reconditioning PET containers requires specific equipment due to their unique properties.
Reconditioning	The process of cleaning, sanitizing and inspecting used reusable containers to prepare them for reuse.
Redemption Rate	The percentage of reusable products which are returned to the system.
Retail	The industry involved in selling goods and services directly to consumers for personal use.
Reuse Market Share	The percentage of units placed on the market that are in reusable container formats.
Reuse Rate	The percentage of reusable products that are reused rather than recycled or otherwise disposed of after use.
Reuse Target	A specific goal set by legislation or policy to increase the percentage of products that are reusable, often as part of efforts to support a circular economy.

Foreword

The fight to end plastic pollution has made significant progress over the last several years, with the public showing both deepening outrage about the problem and growing enthusiasm for solutions to it. Consumer product companies have responded to this public concern – if not the pollution itself – by promising voluntary, and often wildly insufficient or misleading initiatives, to address the crisis. Governments at all levels have begun to take on the challenging task of regulating plastics production, use and disposal.

The Story of Stuff Project's home state of California has been a standout in this regard: a successful citizen referendum made us the first state to ban plastic grocery bags; our legislature passed SB 54 to hasten the transition to recyclable, compostable and reusable packaging; and municipalities around the state, including Los Angeles, are passing or considering laws that require reusable foodware for dine-in food service, among other changes. In 2024 the state's last remaining solid waste incinerator – located in predominantly Latino Crow's Landing in Stanislaus County – closed its operations.

And yet the proliferation of plastic pollution in our environment and even bodies, behooves us to more meaningfully embrace plastics reduction and invest in alternatives. To that end, California has an opportunity to lead once more by nesting a first-in-the-nation reusable beverage container requirement within the state's deposit return system, or 'Bottle Bill', the California Beverage Container Recycling Program.

In California alone an estimated 4.3 billion plastic bottles are sent to landfills.

Reusable containers were once the standard in the beverage industry, but in the early 1970s Coca-Cola and other companies began a wholesale shift to disposable, single-use containers, saddling communities with the resulting burden of waste management and harm to the environment and public health. Today, reusable bottles are nearly non-existent and single-use plastic bottles have become the industry's predominant method of delivering its products, driving a boom in plastics production in environmental justice communities from Louisiana to Ohio.

In California alone, 28 billion beverage containers are consumed annually, and an estimated 4.3 billion plastic bottles are sent to landfills – more than 80,000 tons of plastic waste. Another roughly 180 million containers are littered in our state, making them one of the most commonly found pieces of trash in coastal and other environmental clean-ups.

In 2022, the Story of Stuff Project and other advocates pushed the California legislature to establish a $25 million fund for investments in beverage container reuse infrastructure and planning, a higher-order solution to the plastics crisis that preserves resources, creates jobs and saves taxpayers money. This report builds on that vision, and demonstrates how such a policy would lay the foundation for a truly circular economy, bringing thousands of jobs to the state and reducing the costs to taxpayers of litter clean-up and waste disposal.

One of the first questions people ask us about the return to reuse is how it will work, what it will cost and what the trade-offs are between single-use and reuse. Those important questions were the driving force behind our decision to commission Eunomia – a well-respected consultancy with a track record of assisting governments in managing environmental and waste challenges – to produce this report.

While we know that dozens of countries around the world – from Germany to Mexico to the Philippines – still bottle a significant portion of their beverages in reusable formats, it is largely a lost practice in the United States and here in California. We hope that by undertaking this rigorous study that we can both alleviate the concerns of those who wonder whether such a system is possible here – it is! – and demonstrate how such a system could be designed and implemented.

Michael O'Heaney
Executive Director,
The Story of Stuff Project

Executive Summary

The Case for Reusable Beverage Containers in California

Despite its environmental and human health impacts, plastic production and plastic waste are rising at a meteoric level: **the global generation of plastic waste is on track to virtually double, from 240 million tons in 2016 to over 470 million tons per year by 2040**.[1] More than 33 billion pounds of plastic are estimated to enter the ocean each year,[2] equivalent to two garbage trucks per minute.[3] It is critical that action is taken now to reverse this trend.

As the fifth largest economy in the world, California has the potential to slow the rapid acceleration of plastic waste generation and model a scalable system of reusable packaging. From a policy and regulatory perspective, actions taken in California have significant national and global impact and influence.

There is certainly precedent for reuse: reusable beverage containers have been used worldwide for hundreds of years. **In 1960, 95% of packaged soft drinks and 53% of packaged beer were sold in reusable containers in the U.S., while today only 1% of beverages are sold in reusable containers.**[4]

The recent passage of Senate Bill 54 (SB 54) in California mandates that non-beverage plastic packaging production be reduced by 25% by 2032, with a portion of this reduction achieved through reuse and refill.[5] The time is ripe to implement a reusable target for beverage containers. **A Californian beverage container reuse target can have significant positive impact as the state's 28 billion annual container sales are equivalent to 12% of national sales**. Approximately half of these are single-use plastic.[6] Furthermore, successful beverage reuse systems around the world have demonstrated the potential to reduce the environmental and social impacts from the beverage sector and strengthen the economy.

California has operated a Beverage Container Recycling Program (BCRP) coupled with a deposit also known in the state as the California Redemption Value (CRV) for applicable single-use beverage containers since 1986; at that time 14% of glass containers and 4% of all containers were still sold in reusable containers.[7] This BCRP provides part of the infrastructure needed and establishes cultural norms of return that a beverage reuse system could build on.[8,9] In the past few years, California has further laid the foundation for a reusable beverage program by passing legislation that allows reusable glass containers to operate in the return

1 Pew Charitable Trust & Systemiq. *Breaking the Plastic Wave*. 2020. https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf
2 Oceana. *Factsheet: Plastic Is a Growing Threat to Our Future*. 2019. https://usa.oceana.org/wp-content/uploads/sites/4/263943_FactSheet_v2-1.pdf.
3 Oceana. "Tackling the Plastic Crisis at the Source." August 14, 2023. https://usa.oceana.org/our-campaigns/plastic/.
4 Container Recycling Institute, "The Decline of Refillable Beverage Bottles in the U.S.," Container Recycling Institute. https://www.container-recycling.org/index.php/refillable-glass-bottles/53-facts-a-statistics/glass/428-the-decline-of-refillable-beverage-bottles-in-the-us#:~:text=Today%20less%20than%201percent%20of,way%2C%20disposable%20cans%20and%20bottles.
5 "SB-54 Solid waste: packaging and products." California Legislative Information. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200SB54#:~:text=The%20bill%20would%20require%20the%20regulations%20department%20to%20achieve%20and,through%20source%20reduction%2C%20recycling%2C%20or
6 2018 Beverage Market Data Analysis, Container Recycling Institute, 2021.
7 CalRecycle. Biannual Report of Beverage Container Sales, Returns, Redemption, and Recycling Rates. 2024
8 CalRecycle. *SB 1013 Addition of New Beverage Containers Informal Rulemaking Workshop* [PowerPoint slides]. 2024. https://www2.calrecycle.ca.gov/PublicNotices/Details/5299
9 CalRecycle. Beverage Container Recycling Program. 2024. https://calrecycle.ca.gov/bevcontainer/programinfo/

system,[10] investing in a grants program to fund the development of reuse infrastructure,[11] and passing legislation to improve the convenience of beverage container returns for consumers.[12]

The Design of a Reusable Beverage Container System

This study compares the environmental performance of the current single-use beverage sector[13] to a system that includes beverages sold in reusable containers. Both single-use and reusable containers will have a deposit attached at the point of sale and that deposit will be redeemable when the container is returned to a conveniently located local recycling, redemption center, or through other return methods.

In a single-use system, a beverage container is manufactured, filled, sent to a distribution center, transported to a retailer, emptied by the consumer, and finally returned for recycling or disposal. A reusable system contains these same elements, but after being returned, containers are instead sorted, washed, sanitized, and checked and then refilled before being delivered to the point of sale.

There are many ways to build a return-on-the-go beverage reuse system. This report considers one possible approach, which is based on the following system factors:

- **25% reuse market share:** Reaching a 25% reuse market share means one in four beverage containers purchased by consumers will be sold in reusable containers. This includes carbonated and non-carbonated soft drinks, water, beer, wine, spirits, juices, and ready-to-drink teas and coffees.
- **75% redemption rate:** Based on the expected impact of SB 1013 requiring all convenience zones be serviced, the deposit remaining at the same level as the current single-use system, and reusable containers reaching return rates seen in other reuse programs (which are typically higher than single-use programs), this system is estimated to have a 75% redemption rate for reusable containers.
- **16 reusable container designs:** Although there are thousands of different bottle types for different beverages, this system considers a harmonized approach where producers collaborate on shared container designs. The system designed includes 16 different bottle designs (replicated across materials and sizes) based on an analysis of producer market share and other systems globally. These designs can realistically cover the needs of producers based on the number of different product types and the market size of large producers.
- **Today's energy system:** Unless otherwise stated, greenhouse gas (GHG) results in this report assume no future decarbonization of electricity, heat, or transport. Although changes in the energy system may happen, they are difficult to predict and likely to impact both single-use and reusable systems in a similar way, therefore limiting impact on the results of this analysis.
- **A mixture of reverse and dedicated logistics routes:** Beverages consumed in the hospitality sector (e.g., restaurants) can be 'backhauled' via reverse logistics to distribution centers, then via dedicated logistics for washing at bottling sites. Beverages returned 'on the go' from the retail sector will be transported using dedicated vehicles from local redemption

10 "AB-962 California Beverage Container Recycling and Litter Reduction Act: Reusable Beverage Containers." California Legislative Information. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240AB962.
11 California Department of Resources Recycling and Recovery (CalRecycle). " Reusable Beverage Containers Infrastructure Grant Program" 2024. https://calrecycle.ca.gov/bevcontainer/grants/rbi/
12 "Bill Text - SB-1013 Beverage Container Recycling." California Legislative Information. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB1013.
13 Beverage sectors include those covered under the BCRP carbonated and non-carbonated soft drinks, water, beer, wine, spirits, juices, and ready-to-drink teas and coffees

points to sorting sites following a hub-and-spoke model. From the sorting sites the bottles are taken via dedicated logistics for washing at bottling sites.

This system design was used to estimate the cost and benefits of a reusable beverage container target in California.

The Investment Needed for a Reusable Beverage Container System

Eunomia used its ReSim modeling tools to determine how much infrastructure will be needed across the sector to support a reusable beverage container target. Achieving a reuse market share of 25%, in which 7.1 billion beverages would be sold in reusable containers each year, requires approximately $1.9 billion in capital investment over 12 years. This will require a large-scale shift from single-use to reuse business models. To make this transition, reconditioning lines, container washing facilities, and local and more centralized return and sorting facilities all need to be built, while brands and bottlers need time to design reusable bottles.

The physical infrastructure, where possible, would be invested locally within California to minimize travel distances (for example) between sorting, washing, filling, and distribution facilities and to convert existing filling lines. Observing systems in other jurisdictions and taking into account the time it takes to implement system changes, **a 25% target within 10 years of a reusable program starting is ambitious but achievable**. Interim targets of 5% within 5 years and 10% within 8 years serve as intermediary goals to measure and monitor progress. Producers may choose to meet the target based on different strategies. Across the entire BCRP in California, the hospitality sector (e.g., restaurants, hotels, and closed campuses for education, sports,

Figure E-1: Single-use beverage container life cycle

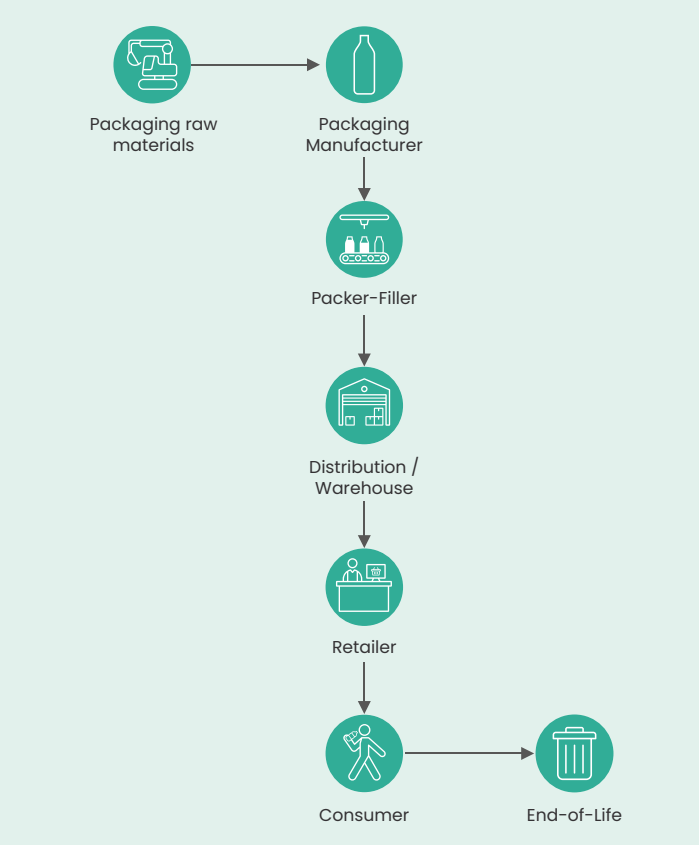
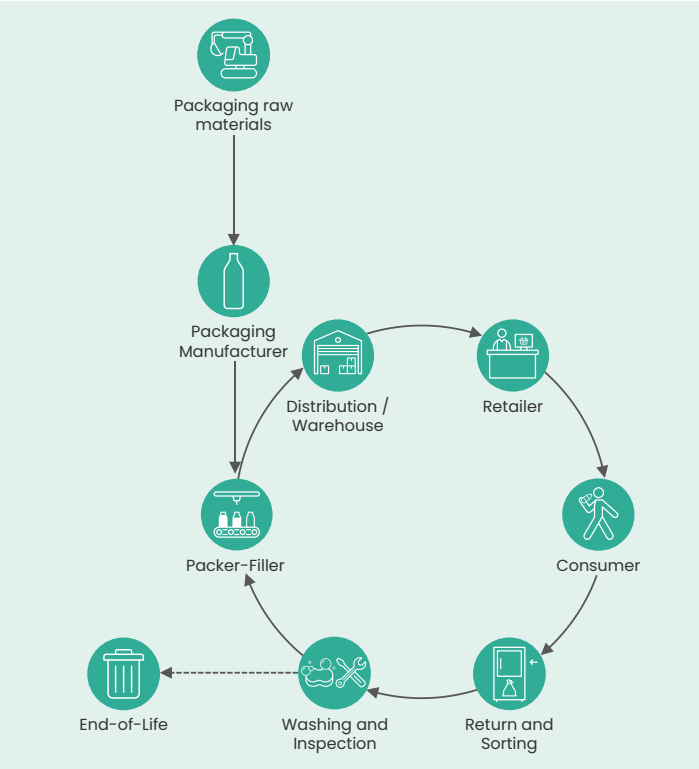


Figure E-2: Reusable beverage container life cycle



events, and corporations) accounts for 18% of sales; by focusing first on scaling significant infrastructure for reuse in the hospitality sector, the industry could meet the lower interim targets by focusing on implementing reuse in the hospitality sector first and moving to retail after several years.

Within a 10-year period, a significant proportion of bottling plant equipment can be expected to be replaced based on their average lifecycle. Therefore, a 25% transition to reusable containers is unlikely to lead to any stranded assets or balance sheet write-offs. The annual net cost of the reuse system, at 25% market share and 75% return rate, is estimated to be approximately $520 million per year. There is increased annual cost associated with the return, sorting, washing, and inspecting of reusable containers, while savings result from lower raw material inputs and end-of-life treatment. This additional cost, representing a 10% uplift in annual investment, will help drive green investment in California's economy. Note that the costs of reuse are modeled *as today* and they do not consider any possible cost reductions as technology matures; the single-use beverage business model has been hyper-optimized over the last six decades, while the reuse system modeled here has significant room for cost reductions.

Although total beverage sector revenue in California is difficult to estimate, it is likely to be at least $50 billion per year across the 28 billion containers sold; the total revenue from soft drinks, beer, and wine in the U.S. is over $500 billion.[14,15,16] **The net cost of reuse equates to less than 1% of Californian beverage industry annual revenue.** Note that the costs of reuse are modeled as today and they do not consider any possible cost reductions as technology matures. The single-use beverage business model has been hyper-optimized over the last six decades, while the reuse system modeled here has significant room for cost reductions.

Table E - 1: Infrastructure and investment requirements for a 25% reuse target

Infrastructure Type	Infrastructure Required	Gross CAPEX ($ million)
Reusable Beverage Washing & Refilling Lines	143	$1,000-1,200
Local Redemption Points	730	$1-2
Sorting Technology at Distribution Centers	70	$10-20
Sorting Centers	365	$750-800
Haulage Vehicles	222	$25-35
Total	**n/a**	**$1,750 - 2,000**

Note: These investments will be made over 12 years and the annual net cost of the system equates to less than 1% of Californian beverage industry annual revenue.

14 Grand View Research. *U.S. Non-alcoholic Beverages Market Size, Share & Trends Analysis Report By Product*. 2022. https://www.grandviewresearch.com/industry-analysis/us-non-alcoholic-beverages-market-report
15 National Beer Wholesalers Association. Industry Fast Facts. https://nbwa.org/resources/fast-facts/
16 Thach. L. *U.S. Wine Industry Surpasses $107 Billion In 2023 Sales, Report Reveals*. 2024. Forbes. https://www.forbes.com/sites/lizthach/2024/05/15/wine-triumphs-us-wine-industry-surpasses-107-billion-in-2023-sales-report-reveals/

The Benefits of a Reusable Beverage Container System

Eunomia's research and modeling shows that building on California's expanding BCRP infrastructure is a logical and cost-effective approach to delivering significant environmental and economic benefits.

A 25% reusable beverage container target in California is estimated to yield significant environmental and economic benefits for the state.

Increasing the redemption rate could further maximize environmental benefits. A 90% redemption rate, common in many systems, could be achieved if the deposit level were raised to at least $0.10 and there was even greater access to redemption centers.

A 90% beverage container redemption rate will further boost the environmental and economic impact of the system, without needing to increase the overall reuse market share of 25%.

The redemption rate improves the environmental and economic impact of the system: a higher redemption rate keeps the containers in use for longer reducing the need for additional material use. At a 25% reuse market share, an increase in redemption rate from 75% to 90% would roughly double GHG reductions to 403,000 metric tons of CO2e and further reduce plastic bottle production to 3.5 billion fewer bottles.

Benefits of a 25% Reusable Beverage Container Target with a 75% Redemption Rate

2.9 billion

fewer plastic bottles produced each year

which is a 20% reduction and nearly double the total number of PET bottles purchased in Oregon each year.

8%

reduction in the beverage industry's annual packaging-related GHG emissions.

This reduction is equivalent to 225,000 metric tons of CO_2e/year avoided, or taking 49,000 cars off the road.

1.1 billion

gallons of water saved

each year, equilvelant to the annual use of around 10,000 American households.

$75 million

annual waste management cost savings

which could help fund additional local programs.

32 million

fewer containers littered

into the environment each year. These would fill more than 7 Olympic swimming pools.

11,800

new green jobs

in manufacturing, sorting, transport and bottle washing would be created. This is almost as many people as work at Apple HQ.

The Time for Reuse is Now

In 2024, Earth reached the global warming tipping point of 1.5 degrees above preindustrial levels, driving home the urgent and unprecedented need to identify solutions to climate change. For too long, California has focused on addressing waste by managing it once it's created. As the 3Rs of the waste management hierarchy (Reduce, Reuse, Recycle) has long recognized, Reduce and Reuse are better ways to address the ever-increasing quantities of single-use packaging waste.

Implementing a reusable beverage container system in California – one that builds on and utilizes the expanding BCRP infrastructure – will displace single-use plastic containers, reducing both the amount of fossil fuel inputs needed to produce this packaging as well as the end-of-life pollution they create, while creating economic benefits for the state.

Voluntary commitments from industry have not meaningfully reduced plastic or GHG emissions; therefore, ambitious legislation is required to effectively tackle these challenges. Recent legislative action – SB 54's mandates on reuse for non-beverage packaging, policies aimed at the improving the accessibility of beverage return infrastructure, and funding reusable beverage infrastructure – mean that now is an opportune time to reprioritize reuse.

Below: Bottle inspection in alcohol bottling facility

1.0 Introduction

The Story of Stuff Project commissioned Eunomia Research & Consulting (Eunomia) to consider how a reusable beverage system could be deployed in California utilizing the state's existing single-use deposit return system (DRS), known as the 'Bottle Bill' or within the state as the California Beverage Container Recycling Program (BCRP). This study compares the environmental performance of the current single-use beverage sector to a sector including varying percentages of beverages sold in reusable containers. This study includes all beverages currently covered by the BCRP (i.e., deposit bearing containers). Beverage container deposits are known in California as the Container Refund Value or CRV. In California, deposits are placed on carbonated and non-carbonated soft drinks, water, beer, wine, spirits, juices, and ready-to-drink teas and coffees, including those consumed at home, on the go, and at hospitality establishments like restaurants.

This report is structured as follows:

Section 1.1 outlines California's beverage market context and discusses the case for reuse;

Section 2.0 describes the system design considerations and the lifecycle of a reusable container;

Section 3.0 outlines the infrastructure that would be required to operate this reuse system, and the capital investment needed;

Section 4.0 presents the environmental and economic benefits of integrating reusable beverage containers into California's BCRP.

1.1 The Case for Reusable Beverage Containers in California

Reusable beverage containers were once the norm. Reusable beverage containers have been used for hundreds of years. In the U.S., it wasn't until 1972 that the majority of soft drinks began to be sold in single-use containers, resulting in the proliferation of litter that inspired the rise of the modern U.S. environmental movement and resulted in the first Earth Day.[17] Reusable containers are virtually non-existent in the U.S. today, representing less than 1% of beverage containers sold .[18] However, signals from consumers, businesses and policymakers indicate an increased appetite to develop policies to reverse the rise of single-use plastic packaging and products and reintroduce reusable packaging.

The United States plays an outsized role in the waste and plastics crises. The United States is the world's largest generator of waste, and is responsible for up to one-quarter of the plastic waste that is released into the environment.[19] The U.S. has historically relied on exports to developing countries to manage its burgeoning waste, but major global shifts such as the China Sword Policy and growing restrictions of the waste trade via the Basel Convention signal a need to create circular materials economies domestically that minimize waste generation at the source.

17 The Story of Stuff Project. *Bring Back Refill Report*. 2023. https://www.storyofstuff.org/wp-content/uploads/2023/10/Story-of-Stuff_Bring-Back-Refill-Report.pdf.
18 Container Recycling Institute, "The Decline of Refillable Beverage Bottles in the U.S.," Container Recycling Institute. https://www.container-recycling.org/index.php/refillable-glass-bottles/53-facts-a-statistics/glass/428-the-decline-of-refillable-beverage-bottles-in-the-us#:~:text=Today%20less%20than%201percent%20of,way%2C%20disposable%20cans%20and%20bottles.
19 National Academies of Sciences, Engineering, and Medicine. *Reckoning with the U.S. Role in Global Ocean Plastic Waste.* Washington, DC: The National Academies Press, 2025.

Reusable beverage containers can help reduce plastic pollution. The annual global generation of plastic waste is set to double between 2016 and 2040, to 470 million tons.[20] More than 33 billion pounds of plastic are estimated to enter the ocean each year,[21] the equivalent to two garbage trucks per minute.[22]

The beverage industry alone produces more than 580 billion PET plastic bottles per year – equal to nearly 1 million per minute.[23] Critically, since beverages are frequently consumed on the go they are prone to being littered and they are the second most prevalent type of marine plastic pollution, accounting for as much as 7%.[24]

Plastic production and disposal also have major human health consequences. The U.S. is a major petrochemicals producer, and the production and disposal of plastics have a disproportionate impact on frontline communities located near polluted production and disposal sites. Residents of petrochemical corridors involved in plastic production are found to have a seven times higher risk for cancer than the national average,[25] and 79% of landfills and incinerators in the U.S. are located in environmental justice communities.[26,27]

Reusable beverage bottles can be a climate solution. Approximately 40% of the plastic produced today is used in packaging, nearly all of which is single-use and produced using fossil fuels.[28] Without intervention, the GHG emissions from plastic production and consumption will exceed plastic's carbon budget by 360%.[29] On the other hand, studies show that reusable glass bottles can generate as much as 85% lower carbon emissions than single-use glass, 75% less than single-use plastic, and 57% less than aluminium cans.[30]

Today

<1%

of beverages are sold in reusable containers in the U.S.

Reuse can support the economy. Despite the significant upfront investments required for washing, sorting, and return logistics, a reusable beverage system avoids the need to purchase new bottles for each filling. Beverage manufacturers with regional production and distribution structures can take advantage of operational cost savings potential.[31] A recent analysis of the return on investment (ROI) for a regional reusable system in Germany found that to establish a 6 million bottle per year system, the ROI would start in year five and by year ten the system operator would have a 16.4% ROI.[32] The beverage industry is already investing in reuse systems in various markets internationally. The global reusable water bottle market was

20 Pew Charitable Trust & Systemiq. Breaking the Plastic Wave. 2020. https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf
21 Oceana. *Factsheet: Plastic Is a Growing Threat to Our Future.* 2019. https://usa.oceana.org/wp-content/uploads/sites/4/263943_FactSheet_v2-1.pdf.
22 Oceana. "Tackling the Plastic Crisis at the Source." August 14, 2023. https://usa.oceana.org/our-campaigns/plastic/.
23 https://www.statista.com/statistics/723191/production-of-polyethylene-terephthalate-bottles-worldwide/ see also- https://www.sciencedirect.com/science/article/abs/pii/S0013935121002681
24 Oceana. "Soft Drink Industry Can Stop Billions of Plastic Bottles from Polluting the Ocean by Switching from Single-Use, Throwaway Bottles to Refillables." 2020. https://oceana.org/press-releases/oceana-report-soft-drink-industry-can-stop-billions-plastic-bottles/.
25 Human Rights Watch. *"We're Dying Here": The Fight for Life in a Louisiana Fossil Fuel Sacrifice Zone.* 2024. "We're Dying Here": The Fight for Life in a Louisiana Fossil Fuel Sacrifice Zone | HRW
26 Global Alliance for Incinerator Alternatives. *U.S. Municipal Solid Waste Incinerators: An Industry in Decline.* 2019.
27 Defend Our Health. 2023. *Hidden Hazards: The Chemical Footprint of a Plastic Bottle.* Pp. 5, 39. https://defendourhealth.org/wp-content/uploads/2023/05/FINAL-DOH-PlasticBottles-Report_5.20.2023.pdf. For 580 billion, DoH cites a forecasted number based on Statista. "Production of Polyethylene Terephthalate Bottles Worldwide." https://www.statista.com/statistics/723191/production-of-polyethylene-terephthalate-bottles-worldwide/.
28 Organisation for Economic Co-operation and Development (OECD). 2022. *Global Plastics Outlook.* Paris: OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/support-materials/2022/02/global-plastics-outlook_a653d1c9/Global%20Plastics%20Outlook%201.pdf?utm
29 Eunomia Research & Consulting. *Aligning the Global Plastics Treaty with 1.5°C.* Bristol: Eunomia Research & Consulting, 2023. https://eunomia.eco/reports/aligning-the-global-plastics-treaty-with-1-5c/.
30 Coelho, P., B. Corona, and E. Worell. *Reusable vs. Single-Use Packaging: A Review of Environmental Impacts.* Reloop and Zero Waste Europe, 2020. https://www.reloopplatform.org/wp-content/uploads/2023/05/zwe_reloop_report_reusable-vs-single-use-packaging-a-review-of-environmental-impact_en-1.pdf-1.pdf_v2-1.pdf
31 Albrecht, et al. *Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective* , 2011. PwC-Study_reading_version.pdf .See also Blumhardt, H. *Reusable Beverage Packaging and Refillable Beverage Delivery Systems in New Zealand: Discussion Document.* Greenpeace, 2020. p. 5
32 Serious Business and Zero Waste Europe. *The Economics of Reuse Systems: A Study into What Makes a Financially Viable Reusable Packaging System.* 2023. https://zerowasteeurope.eu/wp-content/uploads/2023/06/2023-SB-ZWE-The-economics-of-reuse-systems.pdf.

valued at approximately $8 billion in 2018; by 2025, it was projected to reach almost $11 billion.[33] Beverage companies, particularly in Latin American countries, are beginning to grow their utilization of reusable beverage containers. For example, in Brazil, where the reusables market share increased from low single digits to over 20%[34]. Coca-Cola Latin America has invested more than $500 million in expanding its reuse infrastructure (bottle cleaning, labeling, and refilling) to accommodate the universal bottle. As of 2020, reusable bottles (glass and PET) represent 27% of sales for Coca Cola Latin America and were the fastest-growing packaging format in 2018 and 2019.[35]

40%

of the plastic produced today is used in packaging

Consumer demand for sustainable and reusable products is increasing. Consumers are increasingly prioritizing brands that demonstrate a commitment to reducing their waste and carbon emissions. According to the *2024 Buying Green Report* "80% of consumers agree or strongly agree they would be interested in buying products that come in refillable packaging to reduce their environmental impact" and "82% of consumers would be willing to pay more for sustainable products."[36] In one U.S. study of current reuse customers, 47% used the given reusable product or service weekly.[37]

Governments globally are implementing circular economy plans. Governments worldwide such as Germany, Chile, Austria, and Latvia have recognized the importance of transitioning to reuse models and are starting to implement legislation and action plans that support this shift. In Europe alone, there are a number of measures put in place by the European Commission to develop reuse and refill systems including:

- **The Packaging and Packaging Waste Regulation[38] sets ambitious reuse and refill targets. This includes a 10% reuse target for beverage containers sold to consumers at retail by 2030, which will be 40% by 2040 and bans certain unnecessary single-use plastic packaging types**
- **The Packaging and Packaging Waste Directive[39] encourages all the Member States to implement measures to promote reusable packaging, including setting up systems for packaging reuse.**
- **The Circular Economy Action Plan[40] aims to make all packaging reusable or recyclable in an economically viable way by 2030.**
- **Furthermore, single-use plastic and metal beverage containers are required to achieve a 90% collection rate by 2029.**

There are also European national policies encouraging reuse in the retail sector. For example, Austria has set a reuse quota of 25% by 2025 and 30% by 2030 for reusable drink containers sold in retail. The law further mandates that specific beverage categories provide a minimum reusable packaging quota,

33 *Changing Markets Foundation*, 2021 Report, p. 44, citing K. van Gelder, "Value of the Reusable Water Bottle Market Worldwide from 2018 to 2025 (in Billion US Dollars)," Statista, November 24, 2020, https://www.statista.com/statistics/935684/reusable-water-bottle-market-value-worldwide/.
34 Schroeer, A., M. Littlejohn, and Henning Wilts. *Just One Word: Refillables*. Oceana, 2020. https://oceana.org/wp-content/uploads/sites/18/3.2.2020_just_one_word-refillables.pdf.
35 Ellen MacArthur Foundation. *Upstream Innovation*. 2020. https://emf.thirdlight.com/file/24/h_Pf1MahttEqT6h_OwchCrKU2/Upstream%20Innovation.pdf
36 Trivium Packaging. *Buying Green Spotlight: Refill and Reuse*. 2025. https://www.triviumpackaging.com/media/bdahio0s/buying-green-spotlight-refill-and-reuse.pdf.
37 Closed Loop Partners. *Unpacking Customer Perspectives on Reusable Packaging*. 2024. https://www.closedlooppartners.com/wp-content/uploads/2024/01/Unpacking-Customer-Perspectives-on-Reusable-Packaging-.pdf.
38 European Parliament. "Texts Adopted - Packaging and Packaging Waste - Wednesday, 24 April 2024." 2024. https://www.europarl.europa.eu/doceo/document/TA-9-2024-0318_EN.html.
39 Directive 94/62/EC of 20 December 1994 on Packaging and Packaging Waste. Official Journal of the European Union L 365, 31 December 1994. Pub. L. No. 94/62/EC (1994).
40 European Commission. 2024. "Circular Economy Action Plan." Accessed October 29, 2024. https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en.

ranging from 10% to 15% (for beer and water, at least 15% each; for juice, non-alcoholic soft drinks, and milk, at least 10% each).[41]

Companies have made commitments to reuse. Many major corporations have made ambitious voluntary commitments to reuse as part of their sustainability strategies. For example, in 2022 Coca-Cola set an ambitious goal to have at least 25% of its beverages sold in reusable/returnable containers globally by 2030.[42] This included glass or plastic bottles and reusable containers through traditional fountain or Coca-Cola Freestyle dispensers. While the company recently dropped this pledge, the fact that it made it demonstrates a response to the growing demand for higher-order solutions to the plastics crisis. Indeed, PepsiCo also announced in 2022 that it intended to double the percentage of beverage servings it sells in reusable packaging from 10% to 20% by 2030.[43]

California can and must lead. California is the fifth-largest economy in the world and the actions it takes have significant local, national, and global impact.[44] In 1986, California passed the Beverage Container Recycling and Litter Reduction Act which established the California Beverage Container Recycling Program (BCRP).[45,46] The BCRP covers a wide range of beverage types, including wine and distilled spirits, which were added in 2024.[47] In 2023 the overall beverage container recycling rate was 71%, which is less than the 80% non-binding target set in the Act. Since the introduction of the Act, the share of plastic beverage containers has skyrocketed from 4% in 1988 to over 50% in 2022 which leads to over 300,000 tons of plastic production each year.
Despite California having an established DRS and comprehensive curbside system, single-use beverage containers still have significant environmental and financial impacts:[48]

- **An estimated 180 million beverage containers are littered in California making them one of the most predominantly found pieces of litter in local clean-ups;**
- **The combined cost of cleanup and preventing this litter from entering California's waterways is approximately $37 million per year;**
- **An estimated 4.3 billion plastic bottles are sent to landfill every year – more than 80,000 tons of plastic. Single-use beverage containers lead to 2.2 million tons of waste every year in California;**
- **The cost of sending beverage containers to landfill (i.e., those not captured by the deposit return system) is approximately $100 million per year;**
- **Packaging-related emissions covered in this analysis from beverage containers in California are 2.4 million metric tons of CO_2 equivalent (CO_2e) per year. According to the Environmental Protection Agency (EPA), this is the equivalent impact of more than half a million cars on the road every year.**

41 Bundeskanzleramt Österreich. "Geltende Fassung: Bundesgesetz über Verpackungen und Verpackungsabfälle." Rechtsinformationssystem des Bundes (RIS). https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20002086.
42 Coca-Cola Company. "Coca-Cola Announces Industry-Leading Target for Reusable Packaging." *The Coca-Cola Company*, 2024. https://www.coca-colacompany.com/media-center/coca-cola-announces-industry-leading-target-for-reusable-packaging.
43 PepsiCo. "PepsiCo Introduces New Packaging Goal, Doubling Down on Scaling Reusable Packaging." *PepsiCo*, December 5, 2022. https://www.pepsico.com/our-stories/press-release/pepsico-introduces-new-packaging-goal-doubling-down-on-scaling-reusable-packagin12052022/.
44 Eunomia Research & Consulting. *The 50 States of Recycling 2023*. 2023. https://eunomia.eco/reports/the-50-states-of-recycling-2023/
45 CalRecycle. *SB 1013 Addition of New Beverage Containers Informal Rulemaking Workshop* [PowerPoint slides]. 2024. https://www2.calrecycle.ca.gov/PublicNotices/Details/5299
46 CalRecycle. *Beverage Container Recycling Program*. 2024 Retrieved November 20, 2024, from https://calrecycle.ca.gov/bevcontainer/programinfo/
47 CalRecycle. *SB 1013 Addition of New Beverage Containers Informal Rulemaking Workshop* [PowerPoint slides]. 2024. https://www2.calrecycle.ca.gov/PublicNotices/Details/5299
48 Eunomia Research & Consulting. Analysis based on data from:
Keep America Beautiful. Litter Study Summary Report (May 2021). https://kab.org/wp-content/uploads/2021/05/Litter-Study-Summary-Report-May-2021_final_05172021.pdf. and:
California State Water Resources Control Board. Trash Control Program, 2015. https://www.waterboards.ca.gov/water_issues/programs/trash_control/docs/trash_c_040715.pdf#:~:text=The%20current%20annualized%20cost%20of%20compliance%20(Table,is%20calculated%20to%20be%20$81.7%20million%20($12.97. and
CalRecycle. May 2023. "2022 Beverage Container Recycling in California" https://www2.calrecycle.ca.gov/Publications/Details/1726

California's Senate Bill 54[49] establishes source reduction targets that include reuse and refill mandates for all covered products. However, beverage containers are not a covered product under SB 54. The regulation of beverage containers remains in the BCRP. Within SB 54 non-beverage producers are required to reduce plastic packaging and foodware by at least 25% by 2032, with a portion of the reduction achieved through transitioning to reuse and refill systems.

California has already embarked on the journey toward integrating reusable containers in the BCRP; several measures have been put in place in California in recent years making a reusable beverage container regulatory program achievable and timely. First, Assembly Bill 962 (enacted 2021) paved the way for reusable glass containers to operate in the return system. The state has launched the Reusable Beverage Containers Infrastructure Grant for FY 2022-23, aimed at supporting the development of infrastructure for reusable beverage containers.[50] Furthermore, SB 1013 is expected to increase the number of recycling centers so all convenience zones are served in the state, which will likely lead to greater access and improved return rates. **Given this, now is an opportune and fair time to implement a reusable target for beverage containers in California.**

The Pathway towards Reusable Beverage Containers in California:

2021 — Assembly Bill 962 enacted, integrating reusable glass containers into the bottle bill.

2022-2023 — CalRecycle launched the Reusable Beverage Containers Infrastructure Grant to fund the development of infrastructure for reusable beverage containers

2025 — Calrecycle expected to distribute $25 million towards reuse infrastructure via the Reusable Beverage Containers Infrastructure Grant

49 Ocean Conservancy. *Source Reduction Fact Sheet*. Washington, DC: Ocean Conservancy, 2024. https://oceanconservancy.org/wp-content/uploads/2024/02/24.02.25-OC-SB-54-Source-Reduction-Fact-Sheet.pdf.

50 California Department of Resources Recycling and Recovery (CalRecycle). "Press Release 21-08: California Releases New Report on the State of the Plastic Recycling Industry." November 15, 2021. https://calrecycle.ca.gov/2021/11/15/press-release-21-08/.

2.0 Designing and Modeling a Reusable Beverage System in California

This report models the performance of a reusable beverage container system in California. Although there are different types of consumer-facing return and refill reuse models (see Figure 2-1) the focus of this report is a *return-on-the-go* reusable beverage system that will be integrated with California's existing Beverage Container Recycling Program (BCRP).

- This analysis only includes pre-filled and sealed ready-to-serve containers.
- This report does not include the refill of reusable cups filled by 'fountain' beverages as these refillable cup programs are part of food service operations and not regulated as part of the BCRP. They may be more appropriately integrated into SB 54, which addresses food service packaging.

Figure 2-1: Overview of the types of reuse systems

Adapted from the Ellen MacArthur Foundation[51]

A reusable container system that builds on California's expanding beverage container recycling infrastructure is a logical approach to enabling a cost-effective system that yields environmental and economic benefits. Return infrastructure will be shared by single-use and reusable containers, and consumers will already be familiar with the California deposit program. Therefore, consumers will be more likely to participate and return containers from the start of the program.

In a return-on-the-go reuse system, consumers can purchase beverages in reusable containers in the same way as single-use containers: at their normal supermarket, convenience store, restaurant etc. When they are finished with their drink, consumers will be able to return the container to a local redemption point (either at a retail location or a recycling center) to get back their deposit – just as many consumers currently do with single-use beverage containers.

Hospitality locations such as restaurants will be able to return containers when new ones are delivered utilizing reverse logistics. In other words, the beverage distributor who drops off new bottles or cans can pick up the empty reusable containers. The reusable containers will then be washed and refilled, ready to be used again.

51 Plastic Action Centre. "Four Reuse Models - EMF." *Plastic Action Centre.* Accessed January 16, 2025. https://plasticactioncentre.ca/directory/four-reuse-models-emf/.

2.1 System Design Considerations

There are many ways to approach building a return-on-the-go beverage reuse system – this report assesses just one possible approach. Eunomia considered various aspects of the system including return locations and models, the redemption rate of the containers (based on convenience and deposit level), infrastructure, reuse market share, energy system performance, and container switches. These aspects of the system have the greatest impact on both the environmental performance and cost of the system. The main assumptions used in this analysis are as follows:

- **Container Redemption Rate (2.1.1):** The system achieves a 75% redemption rate;
- **Reuse Market Share and Targets (2.1.2):** 25% of beverages are sold in reusable containers;
- **Infrastructure Sharing (2.1.3):** The actors in the beverage reuse market share infrastructure and have 16 reusable container designs;
- **Energy System Performance (2.1.4):** There is no decarbonization of the energy system beyond today;
- **Containers Switching from Single-Use to Reuse (2.1.5):** A portion of all single-use containers from all material types and sectors move to reusable containers.

Each of these factors is explored in further detail in the following sections.

Below: Conveyor belt with beer bottles and machines for production.

2.1.1 Container Redemption Rate

California currently has on average a ~60% redemption rate for single-use containers. The system evaluated in this report is estimated to have a **75% redemption rate** for reusable containers. This is based on the expected impact of: SB 1013 serving all convenience zones; the deposit remaining at its current level; and reusable containers having slightly higher redemption rates than their single-use counterparts.[52]

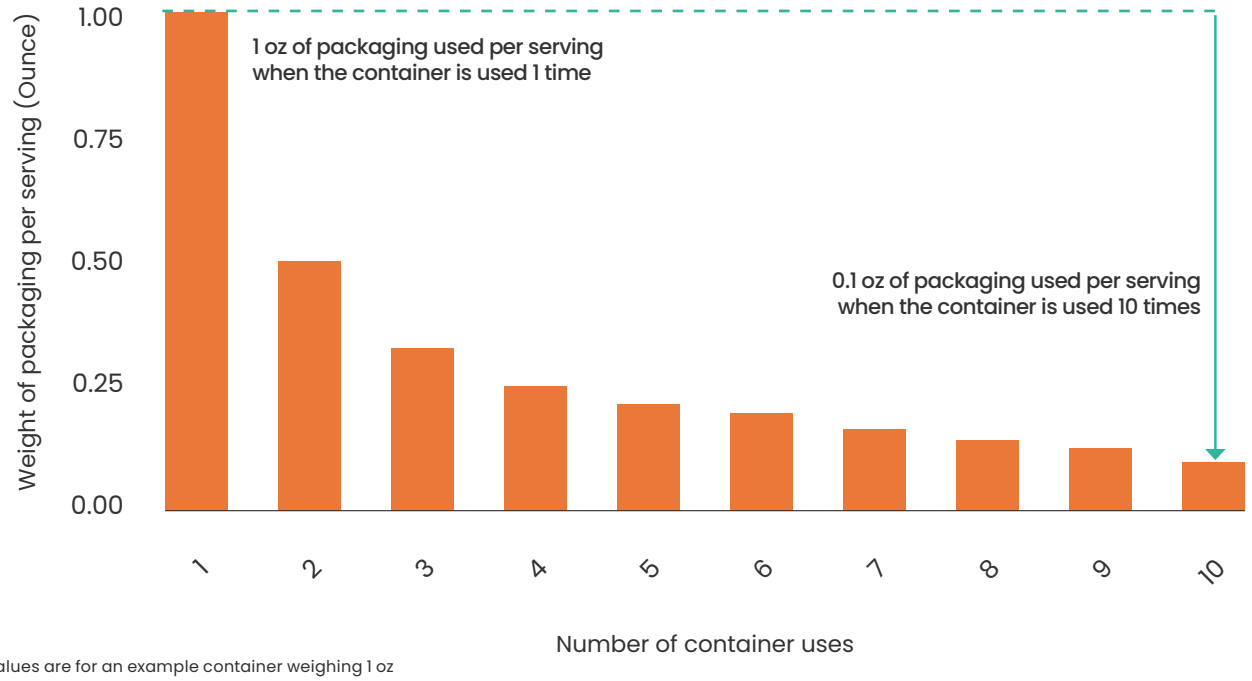
The rate at which containers are returned drives the number of times a container is reused. When a container is reused, it lowers the need for additional virgin material use and in turn reduces the need for additional energy to produce this material. As shown in Figure 2-2, a 1 oz container with one serving of product used once requires all 1 oz of packaging per product serving. If the same container is used 10 times it only requires 0.1 oz of packaging per serving. The number of times a container is reused is a function of the redemption rate. As illustrated in Figure 2-3, a system in which containers are returned 50% of the time means they are used twice on average; when containers are returned 90% of the time they are used 10 times on average.

The convenience of the system (i.e., the distance consumers must travel to return containers) and the deposit level are the two biggest factors that drive a container's redemption rate.[53] These two factors are considered in the following paragraphs in addition to a third factor specific to reusable containers.

Return Point Convenience

The first factor which has the greatest influence on redemption rate is the convenience of return points. Under the current beverage container recycling program, CalRecycle designates a 1-mile radius around qualifying supermarkets as

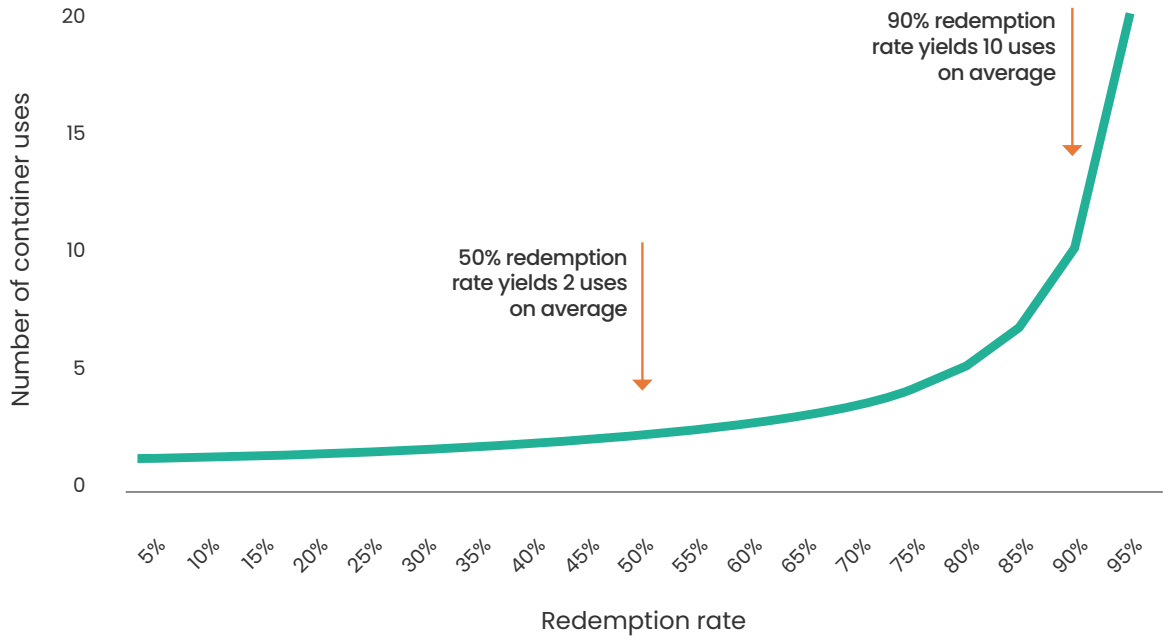
Figure 2-2: Packaging material per serving



Note: values are for an example container weighing 1 oz

52 Reusable containers in Alberta, British Columbia, and Ontario have higher redemption rates than single-use containers of the same size and material type
53 Eunomia Research & Consulting. "Achieving 90% Recovery of Plastic Beverage Containers." 2024. https://eunomia.eco/reports/achieving-90-recovery-of-plastic-beverage-containers/.

Figure 2-3: Reuse rate versus redemption rate of reusable containers



"Convenience Zones" (CZ), and each CZ must be served by a return location.[54] If there is at least one recycling center within a CZ, it is considered served. If a CZ does not have a certified recycling center operating within its boundary, it is considered unserved. Recently passed SB 1013 requires all CZs to be served and all retailers within an unserved CZ must choose one of the following two options according to SB 1013:

- **Pay consumers the refund value for all empty deposit containers they bring to your store for recycling, or**
- **Beginning January 1, 2025, retailers may join a so-called dealer cooperative to provide beverage container redemption opportunities.**

According to the latest CalRecycle data, there are a total of 4,812 convenience zones, only 2,912 of which are currently served by 1,285 return locations. Based on an analysis of population within each CZ, 74% of the population live within a CZ: 47% of the population live within a served CZ and 27% of the population live in a CZ that does not have a return location. When fully enforced, SB 1013 will therefore lead to ~2,000 new CZs being served by an estimated 730 new return locations. Eunomia assumes that SB 1013 will be fully enforced and will lead to an increase in the return rate of covered containers.

The remaining 26% of the population does not live within a convenience zone, meaning this population lives further than one mile from a qualifying supermarket and therefore likely more than one mile from a recycling center. The system designed in this report assumes that current return points/ recycling centers will be updated so they can manage reusable containers. The reusable system will also lead to investment in modern redemption points which can utilize technology to count and sort reusable and single-use containers on site.

Deposit Level

The second factor which has the greatest influence on redemption rate is the deposit level. Eunomia's regression analysis shows that, all

54 California Department of Resources Recycling and Recovery (CalRecycle). "Zones for Beverage Container Redemption." *CalRecycle*. https://calrecycle.ca.gov/BevContainer/Retailers/Zones/.

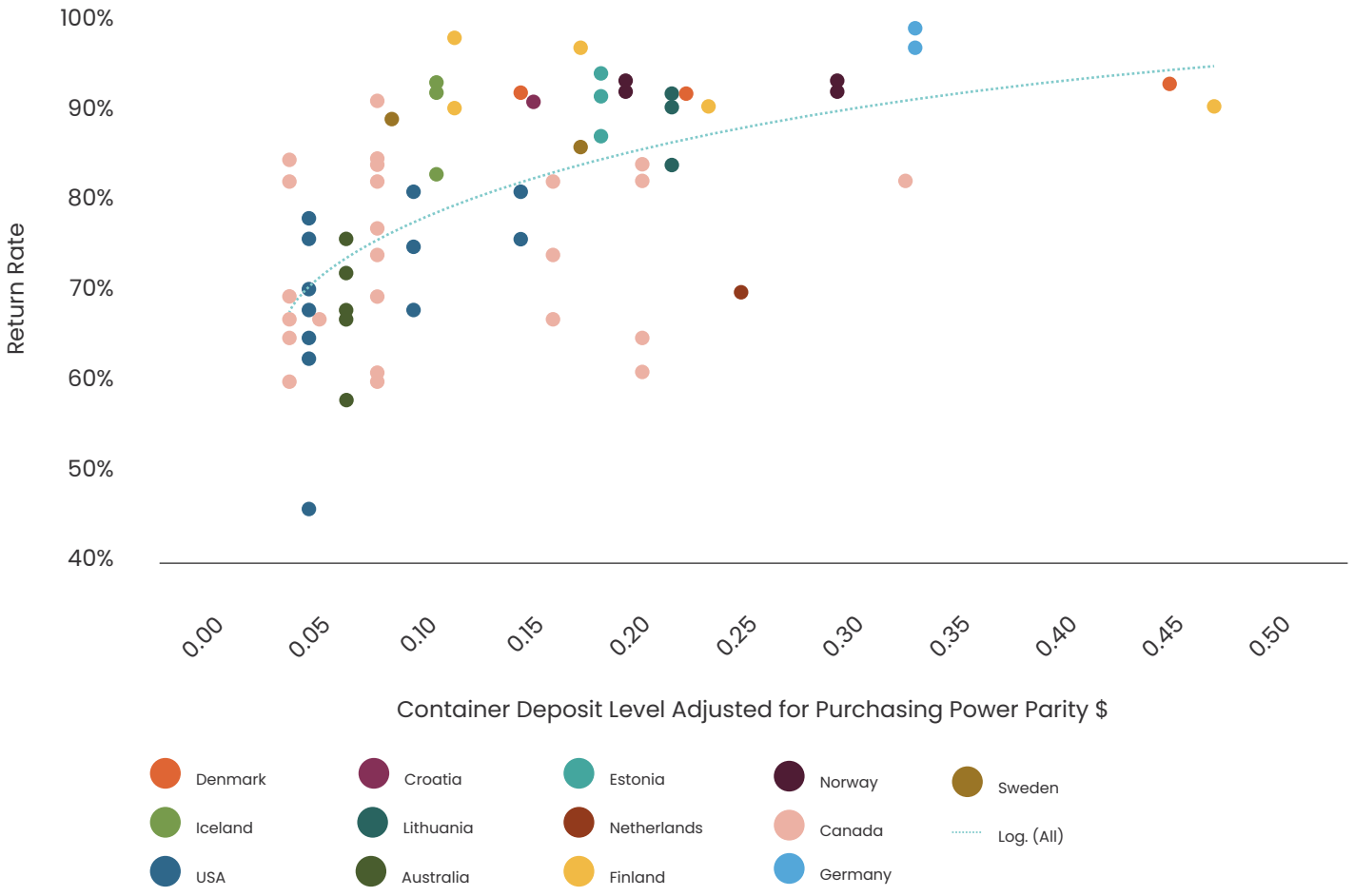
else being held equal, for every 1 cent increase in beverage container deposit, redemption rate will increase by 1-2% (see Figure 2-4).[55] The impact of increasing the deposit level is greater at lower deposits (i.e., increasing the deposit from $0.05 to $0.10 will have a greater impact than increasing the deposit from $0.15 to $0.20). The central scenario of this report does not consider an increase in deposit, but Section 4.1 does consider the potential impact of a higher deposit level.

Reusable Containers Are Returned at Higher Rates Single-Use

The third factor that influences redemption rate is unique to reusable containers and that they will be returned at higher rates than their single use counterparts. Eunomia reviewed deposit return systems that have both single-use and reusable containers. This review showed that reusable containers in Alberta, British Columbia and Ontario have higher redemption rates than single-use containers of the same size and material type.

Based on the review of other systems, the analysis within this report assumes reusable containers will have a higher redemption rate (by approximately 9 points) than their single-use counterparts with all other factors being equal. By combining this effect and the expected increase in consumer convenience due to added return locations, Eunomia modeled an expected redemption rate of 75% at a deposit level of $0.05.

Figure 2-4: Relationship between deposit level and redemption rate



55 Eunomia Research & Consulting. "Achieving 90% Recovery of Plastic Beverage Containers." 2024. https://eunomia.eco/reports/achieving-90-recovery-of-plastic-beverage-containers/.

2.1.2 Reuse Market Share and Targets

Based on the expected benefits of a reuse system with significant market share, and the reusable targets set by governments globally, this report evaluates a beverage sector with **5%, 10% and 25% market share met by reusable containers**, aligning with targets discussed in Section 3.1. A reuse market share of 25% means that one in four beverage containers purchased by a consumer in the retail or hospitality sectors will be reusable. Hospitality includes service industry locations such as hotels and restaurants.

This report assumes that a reuse target would cover the same beverages currently covered by the BCRP, namely: carbonated and non-carbonated soft drinks, water, beer, wine, spirits, juices, and ready-to-drink teas and coffees. Reusable containers would be available both through retail channels (e.g., supermarkets) and hospitality channels (e.g., restaurants or hotels).

A growing reuse market share should lead to financial and environmental economies of scale. This is accounted for in two main ways:

- As reuse market share increases, **utilization of infrastructure** (the number of bottles that each piece of infrastructure, such as return locations, handles in a year) is expected to increase. For example, the number of containers moving through each return location each year will increase with reuse market share, as the total number of containers returned grows but the number of return locations is fixed. Increased infrastructure utilization means that the total cost per beverage served is expected to fall;

- As reuse market share increases, the total amount of infrastructure required across the state will increase. This means that bottles can travel **shorter transport distances** at each leg of the return journey. For example, the average distance between sorting centers and washing locations (i.e., where they are cleaned, sanitized and inspected) will be shorter. As transport distances fall, total costs fall, and environmental benefits increase.

Non-binding recycling targets are used in California's BCRP; while these set a level of ambition for program performance, they are not enforceable. The most effective targets for ensuring a transition to reuse are ones that are mandatory, enforceable, and accompanied by meaningful penalties or other consequences for failure. Furthermore, meeting the target should be the responsibility of the beverage industry itself, so it has the ability to develop a system to meet the targets.

Legislated targets are common in reuse legislation across the globe. The European Union's Packaging and Packaging Waste Regulation (PPWR, 2024) has set ambitious targets for beverage reuse: 10% of primary packaging by 2030, and 40% by 2040 . These targets apply to most alcoholic and non-alcoholic beverages but exclude milk, wine and certain spirits. **Austria** introduced binding targets for refillable beverage packaging of 25% by 2025 and 30% by 2030 with their current market share at 19%. Furthermore, **Latvia** (2021) has set specific reuse targets for glass bottles, aiming for a 5% reuse target by 2024 and gradually increasing it to 15% by 2030, and **Germany** has an ongoing ambitious reuse quota of a minimum of 70% for the beverage industry.

This report evaluates a reusable beverage container system with a **25% market share which would be required by legislation** in addition to interim targets of 5% and 10%. The 25% market share is achieved as a total for all beverages covered and by the following sub sectors: non-alcoholic, wine, beer, and spirits.

2.1.3 Infrastructure Sharing

The extent to which industry share infrastructure and bottle designs will affect system cost and environmental performance. This report assumes that the industry will collaborate to a significant degree and that in total **the system will utilize 16 reusable bottle designs** (replicated across materials and sizes). The report also explores the impact of industry actors taking a more 'fragmented' approach to delivering reuse.

The extent to which system participants share infrastructure and bottle designs impacts the economies of scale that can be achieved by the system. This degree of infrastructure sharing is referred to in this report as 'market harmonization'. Greater market harmonization drives up economies of scale and reduces cost and environmental impact per container.

Market harmonization is modeled in this report using the total number of bottle designs in the market as a proxy.[56] If brands share bottle designs, they can also share the infrastructure used in cleaning and filling. The fewer bottle designs used, the shorter the distance to an applicable washing facility and the shorter the bottle transport distances. These economies of scale drive down cost and environmental impact: the more that bottlers and producers collaborate, the greater the economies of scale.

In reuse systems, it is common for producers to join a container 'pool' or 'managed system.' All bottles in a pool use the same design and there is a shared inventory of reusable containers that are collectively managed. In Canada many beer producers use the Industry Standard Bottle, which currently makes up approximately 15% of alcoholic containers in Ontario. This is also found in Oregon, which has a Universal Bottle that beer producers can use (see Figure 2-5). It is likely that smaller producers will have greater incentive to join a container pool as they do not have the volume to manage the cleaning and filling of their containers cost effectively. Larger producers may have enough volume to have their own container design.

Based on the number of different product types, considering the market size of some large producers, and reviewing similar container pools in other jurisdictions, this analysis considers a harmonized approach to container sharing that includes **16 different container designs**. Carbonated soft drinks would have four container designs, non-carbonated soft drinks would have three container designs, beer/hard cider would have three container designs, and water, wine, and liquor would have two container designs each. These designs are replicated for each bottle size and material, as needed.

Figure 2-5: Universal reusable bottle

Photo Source: Double Mountain Brewery. Used with permission.

56 Each bottle design is repeated across each size and material.

2.1.4 Energy System Performance

Unless otherwise stated, GHG results in this report assume **today's energy system** is used – in other words they assume no future decarbonization of electricity, heat or transport. The impacts of future decarbonization on the GHG benefits of reuse are explored in Section 4.3.

The beverage industry uses energy at various points: to produce materials, convert them into packaging, transport goods, and – in the case of reuse – wash and recondition the bottles. The assumptions around how this energy is provided (the 'energy system') may impact how reuse and single-use compare environmentally.

For example, the electricity grid in California has rapidly decarbonized and is expected to continue doing so. Decarbonization is also likely to be seen in transportation[57] and provision of heat, although the pace of progress in these sectors is slower.

However, it is extremely difficult to predict *how* the energy system will decarbonize. One reason for this is that the beverage industry relies on energy consumption across many geographies – not just California. For example, much of the plastic feedstock used in the U.S. is imported. The pace of decarbonization across the globe is subject to many political, technical, and social factors, making it extremely hard to predict. Therefore, the main results in this report are based on today's energy system, but Eunomia has considered this decarbonization uncertainty by also looking at a possible future decarbonization scenario (which is further explored in Section 4.3).

Below: Machine washing glass bottles.

57 See California 2035 HGV bill.

2.1.5 Containers Switching from Single-Use to Reuse

Eunomia assumed all covered beverage sectors[58] reach reuse targets and a portion of all single-use containers from all material types move to reusable containers.

The environmental benefit of a reuse system depends on which single-use container types are being displaced by reusable containers – i.e., what container 'switches' look like. Different approaches to container switching drive different environmental outcomes.

This analysis has not prioritized any one environmental outcome over another but instead looks to ensure that a reuse system can be designed to drive GHG reductions, plastic and waste reductions, and lower water use.

Furthermore, producers may choose to meet the target based on different strategies. Across the entire BCRP in California, the hospitality sector (e.g., restaurants, hotels, and closed campuses for education, sports, events, and corporations) accounts for 18% of sales; by focusing first on scaling significant infrastructure for reuse in the hospitality sector, the industry could meet the lower interim targets by focusing on implementing reuse in the hospitality sector first and moving to retail after several years.

After a mandated target is set, producers may identify strategies for meeting the target based on cost, consumer preferences, feasibility, and environmental outcomes. These strategies may look different for different producers.

Eunomia aims to be non-prescriptive about how the market will meet targets, and therefore designed a feasible system where each sector and material shares the burden of meeting the target. This analysis shows just one way a target could be met but there are multiple pathways and strategies for meeting a mandated target. The following switching 'rules' were used to show how the mandated target could be met:

- All sizes of single-use container switch to reuse at the same rate – i.e., there is no prioritization of larger or smaller reuse formats;
- There is switching away from single-use aluminum, glass and plastic;
- Any switching away from single-use aluminum or glass moves to reusable glass bottles;
- Any switching away from single-use plastic moves to reusable PET bottles
- The rollout of reusables happens to the same extent in both the hospitality and retail sectors – sales in both these sectors help to reach the target reuse market share at the same time.

58 Carbonated and non-carbonated soft drinks, water, beer, wine, spirits, juices, and ready-to-drink teas and coffees. When applying these targets, carbonated and non-carbonated soft drinks, water, juices, and ready-to-drink teas and coffees are aggregated into one 'soft drinks' category which overall meet the modeled market share as many of the major brands own significant market shares across these sectors.

2.2 The Life Cycle of a Reusable Container

The following paragraphs describe the steps involved in the life cycle of a reusable beverage container, from raw material production to consumption to washing and inspection to end-of-life. The life cycle steps needed in **both single-use and reuse** systems are as follows:

Packaging raw materials: This represents the primary materials that are used to produce packaging (e.g., metal for cans, sand for glass, petroleum for plastic). The processes that occur during this stage, such as the extraction of oil for plastic, have an impact on the environment which can be measured through GHG emissions and water consumption. Reusing packaging can reduce the need for raw materials and minimizes the impact of this stage.

Packaging manufacturer: This is the process that converts raw materials into packaging. The environmental impact of this process includes GHG emissions from electricity use and water consumption.

Packer - Filler: This is where empty packaging and product materials are received, and the bottles are filled with the beverage that's being sold. The environmental impact of this process includes GHG emissions from electricity use.

Distribution/Warehouse: This stage includes all the intermediaries between the producer and retailer/ consumer, such as distribution centers.

Retailer: This is where products are sold to the consumer and includes both hospitality (where beverages are consumed on site) and grocery/ mass sales channels (where beverages are taken off site and consumed such as at the consumer's home). It should be noted that this project does not examine fountain beverages sold in refillable cups at restaurants; this analysis looks at pre-filled and sealed beverage containers.

Consumer: This is where the final product is consumed. Depending on the retail location, consumption might occur at home, on the go, or at restaurants. The model assumes no significant change in consumption behavior between single-use and reuse.

End-of-Life: When containers reach the end of their useful life, they are sent to a waste processor where the packaging is either landfilled or transformed into another product (recycled). For single-use containers, they are sent to end-of-life management after one use. For reusable containers, the packaging is used multiple times before being sent for end-of-life management after breakage or damage.

Figure 2-6 shows the single-use beverage container life cycle while Figure 2-7 illustrates the reusable container system.

Not all of these stages are considered in this report: distribution, retail, and consumption stages are considered to be essentially identical in both single-use and reuse systems and therefore the impacts of these stages are not considered. These are referred to in this report as the 'packaging-related' impacts and costs. Furthermore, the cost and impact of the ingredients (water, corn syrup, etc.) are not considered as this is a packaging analysis.

The following sections provide a closer look at the additional steps in a reuse supply chain shown in Figure 2-7. In a return-on-the-go system, containers go through the following added steps before being refilled with a beverage. This study considers the following two main additional stages, which represent the bulk of the cost and environmental impact:

- **Return and sorting**: bottles are returned into the system after use – i.e., 'redeemed' against the deposit paid by the consumer; and then sorted by brand, size, material etc.;

- **Washing and inspection:** cleaning, sanitizing, and inspecting used bottles in preparation for reuse, which for this study take place at the packer-filler.

The following subsections describe how these stages may be approached in a reuse system, and the features Eunomia took into consideration when modeling them.

Figure 2-6: Single-use beverage container life cycle

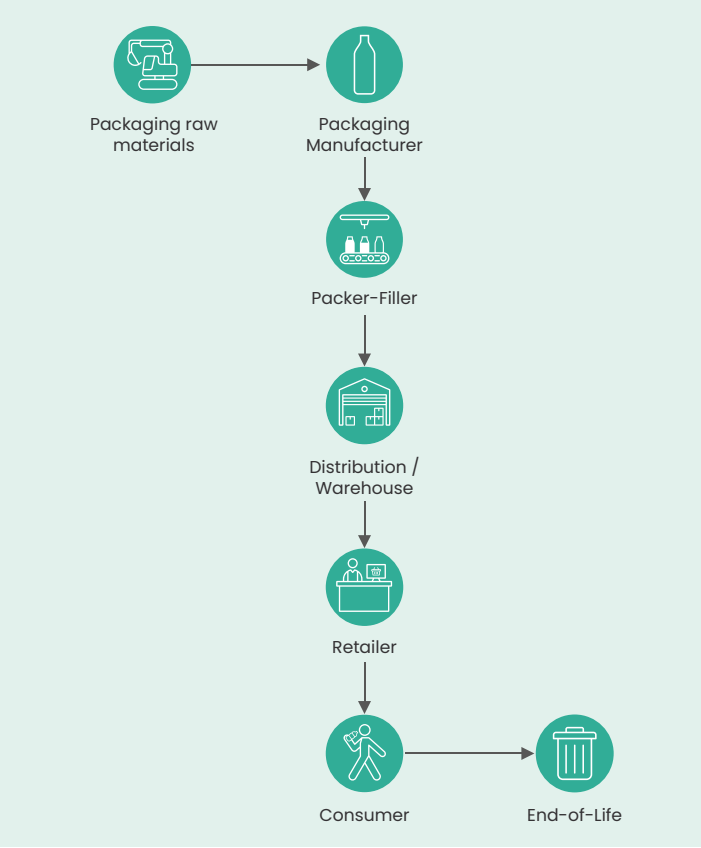
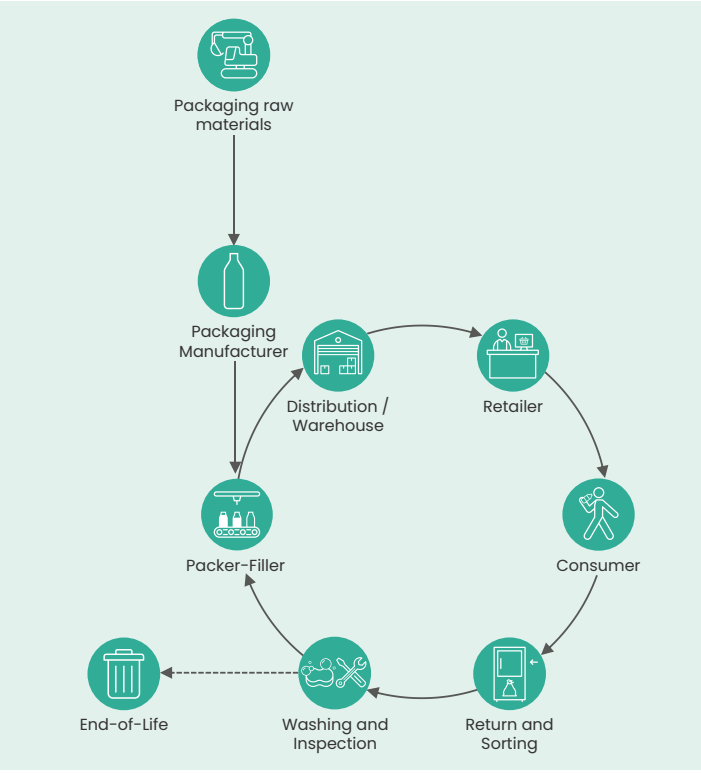


Figure 2-7: Reusable beverage container life cycle

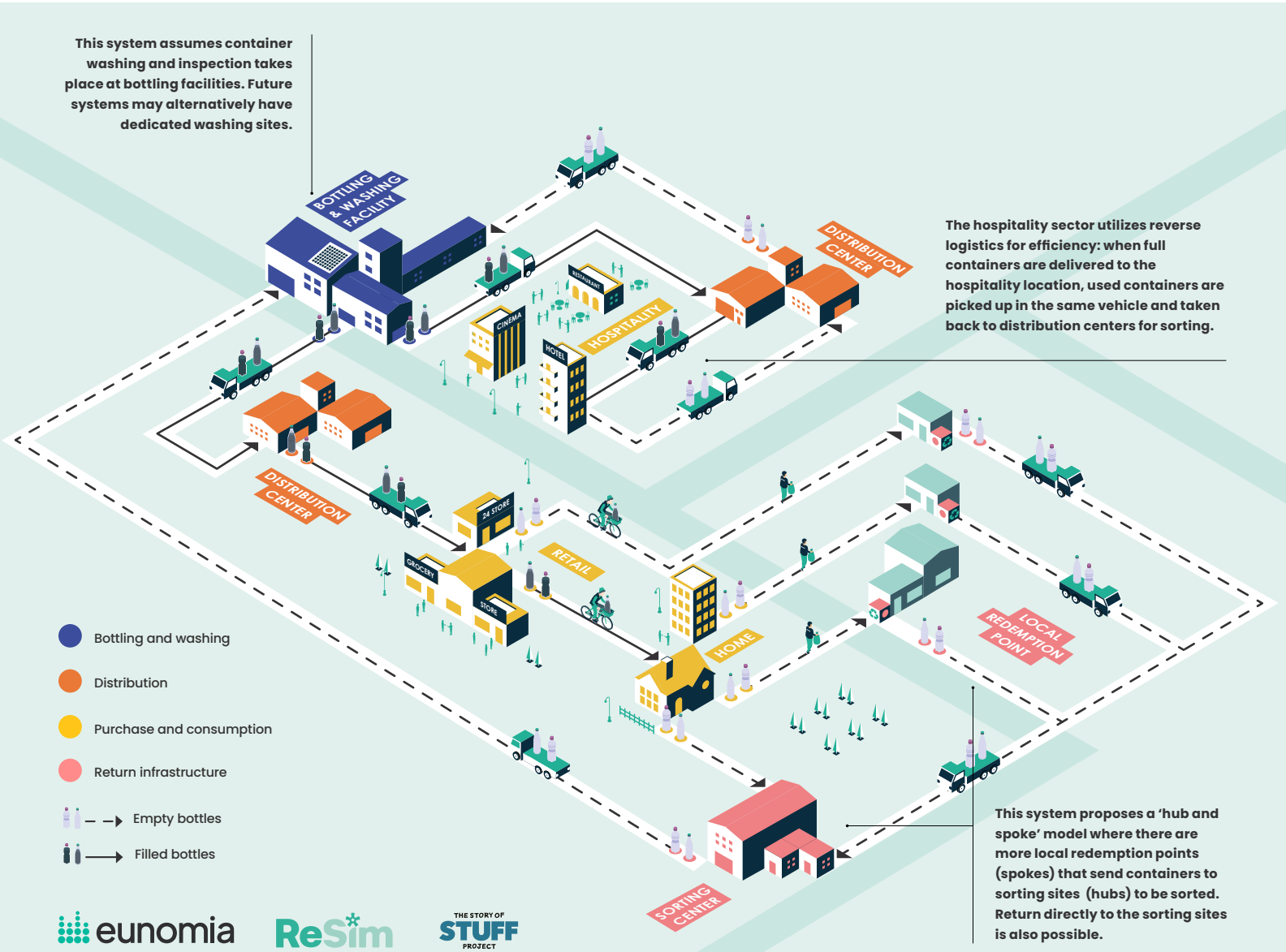


2.2.1 Return and Sorting

After the beverage is consumed, the container must be returned into the system so that it can be prepared for refilling and resale. This requires a return step and a sorting step. In this system, return and sorting infrastructure is assumed to be shared by participating beverage companies.

The reuse target is intended to cover containers consumed both in the hospitality sector (e.g., restaurants, movie theaters, canteens etc.) and the retail sector (i.e., purchased in stores, from vending machines, takeouts etc.) The infrastructure must be built to allow returns of containers purchased from both hospitality and retail sales channels. There are three different 'journeys' that a reusable container can go through in the system analyzed in this report. These are shown at a high level in Figure 2-8 and described in detail below.

Figure 2-8: A reusable container journey in California



Hospitality Sales

Route 1 (points of sale: hospitality sector – returned to: distribution centers)
Bottles consumed in the hospitality sector (e.g., restaurants, hotels, and closed campuses for education, sports, events, and corporations) account for 18% of the containers covered by the BCRP. In this reuse system, these bottles are returned to distribution centers using reverse logistics.[59]

Forward logistics deliver filled containers to the hospitality sites. Reverse logistics harnesses the return leg of forward logistics: used containers that were consumed in the hospitality site are picked up in the same vehicle and taken for sorting. In doing so, dedicated journeys transporting empty reusable bottles can be avoided, leading to environmental and financial savings.

This vehicle returns to the distribution center, where these bottles will then be sorted as needed in dedicated sorting zones so that they can be returned to the correct owner. In this system, they are then hauled, using dedicated logistics journeys, back to beverage companies' sites for washing and inspection. Discussions with logistics experts in the beverage industry show that this is feasible for this portion of the market.

Retail Sales

Any containers not consumed at hospitality sites (i.e., those bought through retail sales channels like supermarkets or convenience stores, which together accounts for 82% of in-scope consumption) will be returned 'on the go' by consumers. Once returned, a dedicated logistics system will be used to return the containers for washing, inspection, refilling and resale.

In the single-use deposit system into which this reuse system will integrate, only a small proportion of returns will be taken through retail locations themselves. Currently, just 3% of BCRP returns are dropped off in stores, which often lack space and staff capacity to handle large numbers of single-use deposit containers.[60] The majority (97%) of 'on the go' returns are processed through recycling/buy back centers.

The system analyzed here therefore proposes a 'hub and spoke' system featuring **local redemption points** (spokes) and larger **sorting sites** (hubs). This allows for the most cost-efficient balance of return and sorting infrastructure that does not rely on retail floorspace.

Route 2 (point of sale: retail sector – returned to: sorting sites)
Sorting sites are needed to ensure that mixed bottles can be returned the correct owner. These are the 'hubs' in the 'hub and spoke' system – this is entirely new infrastructure which is not currently needed in the BCRP. These sorting sites will also have the capacity for consumers to return bottles, either through bag drop style returns or reverse vending machines (RVMs). This return technology will be co-located with sorting capabilities at the same site. These containers are then transferred to the back-end of the facility, where they are sorted and stored ready for transport back to the bottling facility for washing, inspection, and refilling.

As these facilities are significantly larger than most of today's recycling centers in California, they are unlikely to be located in densely populated areas like inner-city neighborhoods. These facilities are used by consumers in Europe and some parts of Canada but note that no such recycling center currently exists in California and will have to be constructed for the reuse system.

Eunomia has determined the approximate number of sorting sites that we will be needed to accommodate reusable containers; this is shown in Table 3-1 in Section 3.2. The cost of

59 Distribution centers are where full, single-use products are stored before delivery to hospitality sites.
60 CalRecycle. May 2023. "2022 Beverage Container Recycling in California" https://www2.calrecycle.ca.gov/Publications/Details/1726

new sorting sites is assumed to fall entirely to the reuse system.

Route 3 (sale point: retail sector – returned to: local redemption points)
The majority of consumers will not have ready access to the sorting sites described above as they will be limited in number. The system modeled here therefore includes many **local redemption points** spread throughout the state. These local redemption points will be sited, where possible, alongside existing single-use recycling/ buy back centers to minimize rental costs and ensure that bottles can be returned to the correct system. These local redemption points will be less mechanized and are only capable of allowing consumers to return containers via a manual bag drop system, redeem their deposit,[61] and store the mixed bottles in crates in preparation for onwards transport.

There is insufficient space at local redemption points for sorting the mixed bottles. The mixed bottles must therefore travel up the 'spoke' to a nearby sorting site, where they are sorted and then transported to the bottling location.

The cost of local redemption points infrastructure is assumed to be split between single-use and reusable containers.

Below: Bags of single-use containers at redemption point in California

Eunomia has modeled cost and energy consumption of local redemption points and sorting sites, based on the required capacity at different reuse market shares, the equipment needed to return and sort these bottles, and the staff and space needed to accommodate this equipment. Further detail is provided in the separate Technical Appendix. The total number of each type of site required to meet reuse targets is shown in Table 3-1 in Section 3.2.

Below: Beverage container returns at Clynk redemption location

61 At bag drop facilities the deposit will not be immediately returned and instead returned at a later date via a digital system after the bottles are counted and verified.

2.2.2 Container Washing and Inspection

Reusable containers will be returned to the bottlers/beverage producers using one of the three container journeys described above. They must then be washed, sanitized, inspected, refilled, and repackaged, ready to be transported forward for sale. Eunomia designed this type of system based on conversations with brands that said they would prefer for this washing and inspection to take place at existing bottling facilities. This may not always be the case – in particular, smaller bottlers located near one another may choose to share washing infrastructure.

New equipment is needed for reconditioning: machines to clean, sanitize, inspect and odor-test the containers; filling machines; and equipment to prepare for sale (e.g., labelling, palletizing). In certain cases, existing single-use infrastructure can be shared (e.g., palletizers). However, in certain cases new equipment is needed (e.g., sorting, bottle washing). In the case of PET, new filling lines are typically needed because single-use lines blow mold PET preforms into the bottle shape before filling (this is not needed for glass reuse lines as the returned bottles are already the correct shape).

The equipment required to take a used reusable bottle and produce a filled and packaged reusable beverage container costs approximately twice as much as the equipment to fill and package single-use containers. This equipment also takes up more space, meaning the technical changes required to 'retool' for reuse at the bottling site is substantial.[62]

Below: Glass bottles at bottling facility

2.2.3 Logistics

The previous sections describe processes that occur at various locations. Between each of these processes, transportation is required to move reusable containers from one location to another. Vehicles are needed to perform this. Note that there is a tradeoff between the amount of storage space available at depots and distribution centers, and the frequency of collection of these bottles: the more storage space available, the less frequently bottle transportation needs to occur. This system assumes that there will be sufficient vehicles readily available to collect containers when storage space is running low.

62 Based on information provided by industry.

3.0 Infrastructure Investment Roadmap

This section discusses how quickly a reuse system can be implemented in California, and how targets should be developed to facilitate this. It then goes on to discuss the estimated capital investment costs, operational expenditure, and total annual costs of reuse at different market shares.

3.1 Reuse Target Timeline

This report evaluates a reusable beverage container system achieving 5%, 10%, and 25% market shares in California, based on mandated targets. These reuse targets cannot be achieved overnight: a reusable container system business model is different to how most companies in the beverage supply currently operate, and companies will need time to adapt and scale this new model. Factors that will inform the timeline for achieving significant reuse market shares include:

- Infrastructure requirements, such as inspection lines, container washing facilities, local redemption points, and sorting sites;
- Time for brands to design new, reusable bottles, considering new technical requirements (e.g., flavor). As discussed later in Section 3.2, system costs and environmental impacts will be lower when brands collaborate in this effort, but collaboration could delay the building of infrastructure;
- The useful lifetimes of existing equipment. Where possible, the transition to reuse should not lead to equipment with significant useful lifetime remaining being written off.

There is relatively little recent precedent for the significant expansion of a reuse market from scratch. Nonetheless, similar attempts are being made by other jurisdictions to expand beverage reuse (see Section 1.1 and 2.1.2). In 2022, a study was performed investigating the implications of transition to reuse for PET bottlers, including stakeholder engagement with this industry. This study found that "bottling lines have an estimated useful life of around 15 to 20 years."[63]

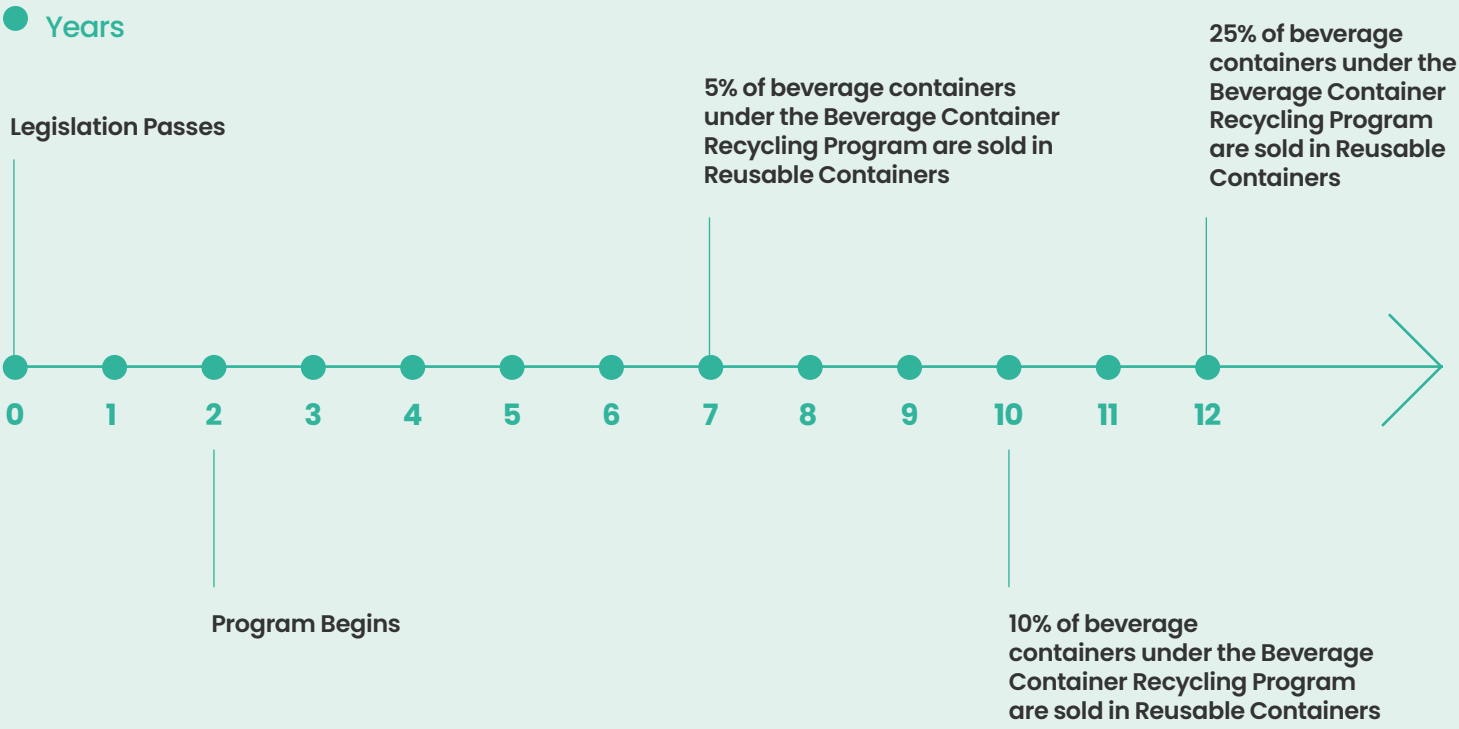
This means that, within a 10-year period, a significant proportion of bottling plant equipment can be expected to be replaced. A 25% transition to reusable containers within 10 years from the start of program implementation is unlikely to lead to any stranded assets or balance sheet write-offs.

After legislation passes, the program will not immediately begin and there is likely to be a 2-3 year period to support effective organization and planning. Evidence suggests that a transition to 5% and 10% reuse market shares within 5 and 8 years from the start of program implementation are achievable for bottlers, and therefore these intermediary targets should be set to facilitate and encourage the expansion of the necessary infrastructure and investment before meeting the ultimate target.

As described in Section 2.1, the system described represents just one way of setting up a reuse system in California – producers may identify alternative strategies for meeting the targets, for example by focusing on particular sales channels. Across the BCRP in California,

63 UNESDA. "Economic Study of Returnable Refillables PET." UNESDA, April 2024. https://unesda.eu/wp-content/uploads/2024/04/PwC-Economic-study-of-returnable-refillables-PET_2022.pdf.

Figure 3-1: Reusable beverage container legislation timeline



the hospitality sector accounts for 18% of sales; the beverage industry could choose to meet an initial 5% target by focusing first on scaling reuse infrastructure in the hospitality sector.

Based on Eunomia's understanding of the reuse system needs, a 25% target to be met 10 years after the program starts is ambitious but achievable. This timeline provides significant time for the industry to expand capacity to the level required to meet a 25% reuse market share.

3.2 Investment Requirements

The key stages in the reusable container system are outlined in Section 2.2 and include new return, sorting, washing, and sanitizing infrastructure. Eunomia used its ReSim modeling tools to determine how much infrastructure will be needed in the beverage industry to support 5%, 10%, and 25% targets.[64] Key input data points for ReSim included:

- **The average cost to build new types of infrastructure (using privately and publicly-available data);**
- **Current beverage infrastructure data from the Beverage Market Corporation (e.g., the number and type of bottling facilities in the state);**
- **Current beverage market data from Global Data and the Container Recycling Institute;**
- **Existing recycling infrastructure in California from CalRecycle.**

64 The results in this section are for a 'harmonized' system with a 75% redemption rate. See section 3.2 for descriptions of the types of infrastructure required in a return-on-the-go reuse system in California.

Table 3-1: Estimated infrastructure that will be required to meet reuse targets

Market Size and Infrastructure Type	5%	10%	25%
Beverages Sold in Reusable Containers per Year	1.4 billion	2.9 billion	7.1 billion
Full-Time Employees in Reuse Industry	3,200	5,200	11,800
Reusable Beverage Washing & Refilling Lines	35	61	143
Local Redemption Points	2,015	2,015	2,015
Sorting Sites at Distribution Centers	70	70	70
Sorting Centers	182	228	365
New Haulage Vehicles	100	142	222

The accompanying Technical Appendix provides a full description of the inputs and modeling methods used to calculate investment requirements.

Table 3-1 summarizes how much infrastructure will be needed at 5%, 10%, and 25% reuse market shares. At 5%, there would be 1.4 billion beverages sold in reusable containers requiring 35 additional reuse filling lines and 182 additional sorting sites for redemption and sorting, alongside the 2,015 local redemption points for redemptions.[65]

At a 25% reuse market share there would be 7.1 billion beverages sold in reusable containers, requiring 143 additional reusable filling lines and 365 additional large redemption points/sorting sites. There are no additional local redemption points beyond those needed to achieve 5% or 10% penetration, as state-wide coverage is required in SB 1013.

The following three subsections describe the costs of this system, as calculated by Eunomia's ReSim model. Two types of costs are discussed:

1. Total gross CAPEX for new reuse equipment. This is the gross capital cost of the new equipment for the reuse system, and does not take into account any savings in the single-use system;
2. Total annual net costs for packaging in the California beverage industry compared to the single-use baseline, including both capital and operations costs. These costs are *net* of any avoided costs in the single-use system. They are 'annualized' i.e., they represent annual net CAPEX and net OPEX requirement above the single-use baseline scenario, averaged over many years.

Note that the values presented in the below sections are **system costs**. This means that they represent the estimated real financial investment needed to develop and maintain the system, *regardless of who will bear these costs*. The costs are related to the packaging system and do not include cost of ingredients or the product. Furthermore, the accrual of any unredeemed deposits by the system operator (which, in the single-use system, help fund operations) are not considered here. Financial transfers between actors in the beverage industry are also out of scope. All costs shown are as real 2024 values.

65 These 'local redemption points' are to be built as part of the expansion of existing single-use deposit return infrastructure under SB 1013. The costs of building this redemption infrastructure are assumed in this analysis to be split evenly between the single-use and reuse systems.

3.2.1 Total Gross CAPEX For New Reuse Equipment

Table 3-2 shows the estimated gross Capital Expenditure (CAPEX) investment required for new beverage reuse equipment, based on the infrastructure needs outlined in Table 3-1.[66] These costs are *gross* – they do not take into account any savings that may be made in the single-use system. Some of these gross costs can be offset by the CAPEX that is no longer needed for maintaining the single-use system (these avoided costs are considered in the next section).

As the upfront costs of purchasing new equipment, these costs are independent of the time needed to roll out the infrastructure and do not consider operating, maintenance, or replacement costs. Investment in reuse infrastructure is more localized than single-use infrastructure, benefiting a local green California economy; the employment benefits of this investment are further described in Section 4.4. At a 5% reuse market share, total industry gross CAPEX in new equipment will be approximately $750 million. This would rise to approximately $1.9 billion at a 25% reuse market share, spread over the 12 years between legislation passing and the ultimate target date.

Table 3-3: Capital expenditure required for a harmonized versus fragmented system ($ million)

System Harmonization	5%	10%	25%
Harmonized System	$750	$1,000	$1,900
Fragmented System	$1,000	$1,300	$2,000

Table 3-3 shows the importance of ensuring that the reuse system in California is developed, from the early stages, in a 'harmonized' way: the CAPEX saved by collaboration could be over $200-300 million at 5-10% reuse market share. The benefits of collaboration are less significant at 25% market share: this is because at low reuse market shares a fragmented system has underutilized infrastructure. For example, many brands may build their own washing lines where they could have shared. These washing lines are underutilized at low reuse market share, leading to cost inefficiencies. At 25% reuse market share this infrastructure can be more fully utilized even in a fragmented system, and so cost inefficiencies are reduced.

Table 3-2: Capital expenditure required for a harmonized system at 75% redemption rate ($ million)

Infrastructure Type	5%	10%	25%
Washing and Refilling Lines	$300-400	$400-500	$1,000-1,200
Sorting Sites at Distribution Centers	$10-20	$10-20	$10-20
Sorting Centers	$350-400	$450-550	$750-800
Local Redemption Points	$1-3	$1-3	$1-3
Haulage Vehicles	$8-15	$15-25	$25-35
Total	**$650-850**	**$850-1,100**	**$1,750-2,000**

66 Ranges are shown to account for uncertainty in costs.

3.2.2 Annual Net Costs Compared to Today

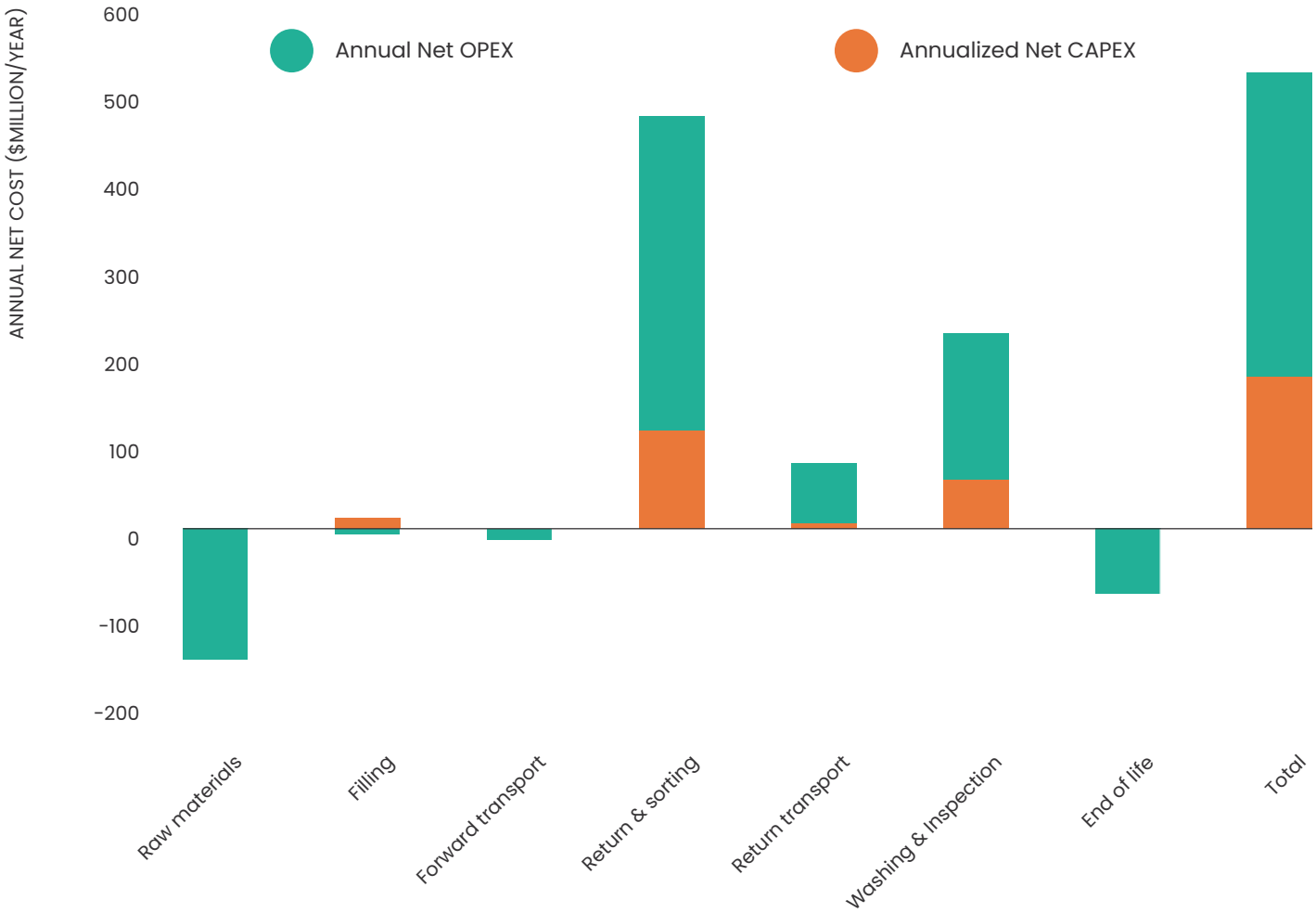
The CAPEX presented in the previous section will be spent over an extended period (roughly 10-15 years from when legislation passes). Some of this CAPEX, such as for reusable filling lines and the manufacturing spaces housing them, will replace existing single-use CAPEX that would have been spent in the single-use baseline scenario.

The system net additional CAPEX can therefore be compared between a scenario with a reuse system and the single-use baseline.

The values here differ from the previous subsection in that they are annual. This allows for a fair comparison between the reuse and single-use scenarios. This is done by 'depreciating' the CAPEX, reflecting the fact that the spending will typically be depreciated in company accounting.

Operating Expenditure (OPEX) can be treated in a similar way: by comparing annual OPEX in today's single-use system to annual OPEX in a system reaching 5%/10%/25% reuse market share, the net annual cost of reuse targets can be understood.

Figure 3-2: Annual net cost of a reusable beverage container system



Note: values are based on a harmonized system with a 25% reuse market share and a 75% redemption rate.

Net additional CAPEX and OPEX can then be summed to show the net total cost of implementing reuse in the California beverage sector. At 5% reuse market share this total net cost will be $240 million per year; this rises to $305 million per year at 10% reuse market share and $520 million per year at 25%. Figure 3-2 breaks down this $520 million figure at 25% reuse market share: return, sorting, washing, and inspection account for the bulk of additional costs. OPEX accounts for two-thirds of the total additional cost.

Reusable containers cannot be crushed, meaning they take up more space at facilities and need to be handled with greater care to avoid breakage. More space and staff are therefore needed for this process and therefore return and sorting of reusable containers is typically more expensive than single-use containers. The equipment needed to wash and inspect reusable bottles will require capital investment, and use relatively high amounts of energy. Neither of these costs is incurred when producing single-use containers.

Therefore, the CAPEX and OPEX of the return, sorting, washing and inspection phases account for a significant portion of additional annual costs. The majority of additional costs come from installing and operating return and sorting equipment ($470 million per year), and from washing reusable bottles ($230 million per year).

There is relatively little change in the cost of filling containers – it is assumed that the same filling lines can be used for single-use and reusable containers.

Each year, roughly $229 million less will be spent on raw materials and on waste treatment as fewer bottles are being manufactured or thrown away each year.

The magnitude of the cost of reuse can be understood by comparing these net annual costs to the industry's current expenditure on its packaging system. Total in-scope industry costs in today's single-use baseline are estimated to be $5.1 billion per year in capital and operating expenditure. This $5.1 billion is spent on new filling equipment and sites, logistics etc. – all to provide single-use beverages.

A 25% reuse market share scenario – leading to an increase in net costs of $520 million each year – would be equivalent to just over a 10% increase in annual spending from California's beverage industry on a packaging system. These additional costs are likely to be invested locally, benefiting the California economy (further discussed in Section 4.0).

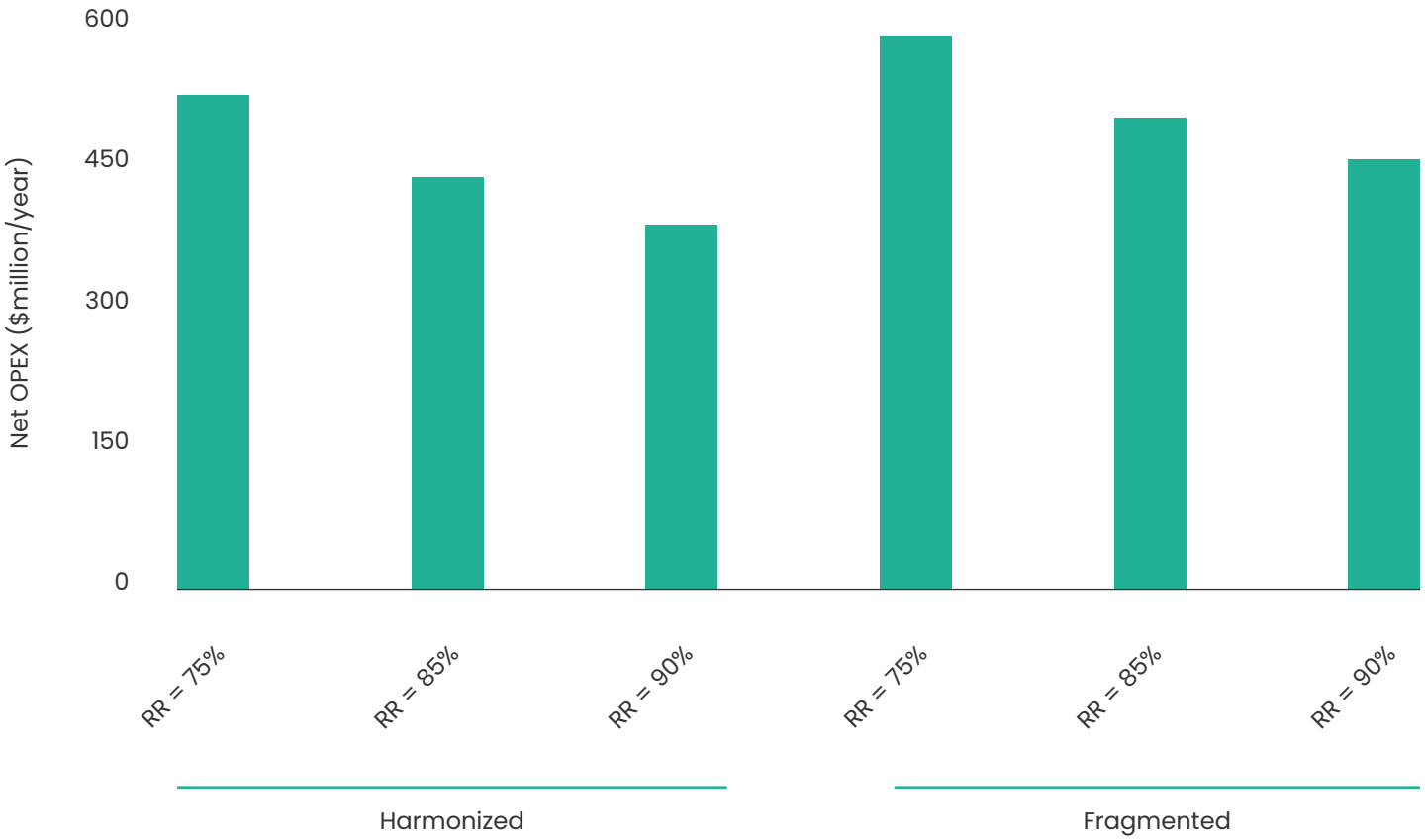
Although total revenue in California is difficult to estimate, it is likely to be at least $50 billion per year across the ~30 billion containers sold as the total revenue from soft drinks, beer, and wine in the U.S. is over $500 billion.[67,68,69] **The net cost of reuse equates to less than 1% of Californian beverage industry annual revenue.** Note that the costs of reuse are modeled *as today* and they do not consider any possible cost reductions as technology matures. The single-use beverage business model has been hyper-optimized over the last six decades, while the reuse system modeled here has significant room for cost reductions.

67 Grand View Research. *U.S. Non-alcoholic Beverages Market Size, Share & Trends Analysis Report By Product*. 2022. https://www.grandviewresearch.com/industry-analysis/us-non-alcoholic-beverages-market-report
68 National Beer Wholesalers Association. Industry Fast Facts. https://nbwa.org/resources/fast-facts/
69 Thach. L. *U.S. Wine Industry Surpasses $107 Billion In 2023 Sales, Report Reveals*. 2024. Forbes. https://www.forbes.com/sites/lizthach/2024/05/15/wine-triumphs-us-wine-industry-surpasses-107-billion-in-2023-sales-report-reveals/

Figure 3-3 demonstrates that reuse system net cost is dependent on:

- **Container redemption rate**. For example, at 25% reuse market size, net costs at 75% redemption rate could be up to $130 million greater per year than at 90% redemption rate ($520 million per year versus $390 million per year, both as 'harmonized' systems). This $390 million per year represents a 7.5% increase in annual industry spending at 90% redemption rate to facilitate reuse, down from 10% at 75% redemption rate;
- **Market harmonization.** For example, at 25% reuse market size, net costs in a fragmented system could be up to $60 million greater per year than in a harmonized system ($580 million per year versus $520 million per year, both assuming a 75% redemption rate).

Figure 3-3: Annual net costs under different reuse system conditions



Note: RR means redemption rate.

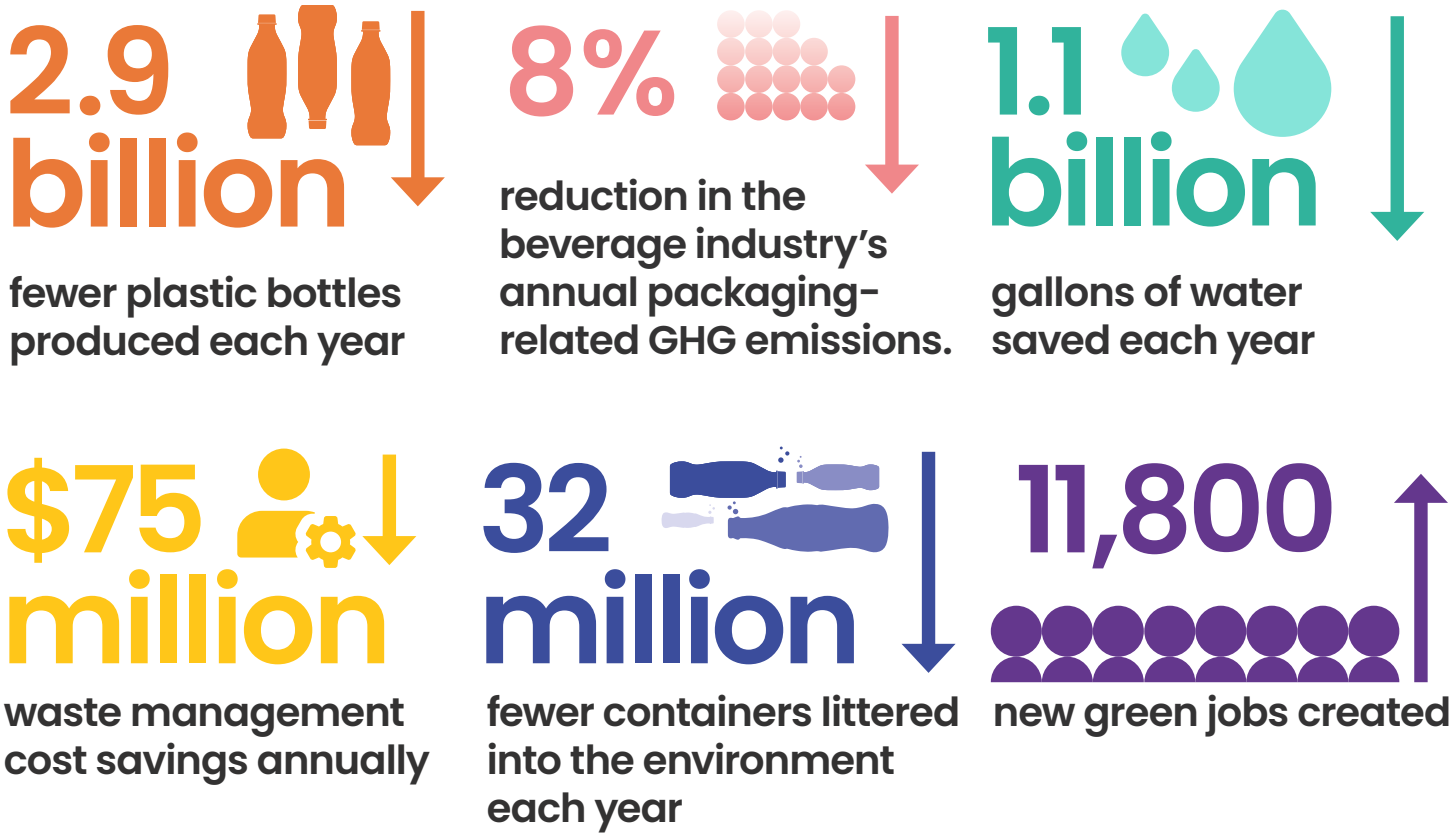
4.0 The Environmental and Economic Benefits of a Reusable Beverage Target in California

Eunomia used its ReSim modeling tool to assess the environmental and economic packaging-related[70] benefits of a beverage reuse system in California, based on the system design outlined in Section 2.1. These are shown in Figure 4-1, for the following scenario:

- The system achieves a 75% redemption rate
- One-quarter of beverages are sold in reusable containers i.e., the 25% reuse market share target is met;
- The market actors share infrastructure in a 'harmonized' way;
- There is no decarbonization of the energy system beyond today;
- All container formats, brands, and beverage types are assumed to meet the target.

The system outlined is one that is integrated with the current California BCRP and harnesses the existing and expanding infrastructure of that system. Figure 4-1 shows that,

Figure 4-1: A 25% reuse target in California would deliver significant benefits



70 See Section 2.2 for a definition of the processes included in packaging-related impacts.

through appropriate investment, significant environmental benefits can be achieved by a viable system under realistic assumptions.

A 25% reusable beverage container target in California would benefit the environment and local communities. If 25% of beverage containers were sold in reusable containers, GHG emissions associated with the production and consumption of beverage containers would be reduced by 8%. This reduction is equivalent to 225,000 metric tons of CO_2e/year avoided, or taking 49,000 cars off the road.[71]

A 25% reuse target would also avoid the manufacture of 25,000 tons of plastic (a 9% reduction), or 2.9 billion plastic bottles (a 20% reduction). This is nearly double the *total* number of PET bottles purchased in Oregon each year.[72]

Total beverage packaging waste would fall by 17% – 370,000 tons each year.

A 25% reusable beverage container target in California would benefit the economy. An expansion of the beverage reuse industry would create roughly 11,800 sustainable jobs in manufacturing, sorting, transport, and bottle washing.

The cost of cleaning up litter – currently paid by local municipalities and state agencies and ultimately born by California's taxpayers – would fall by $7 million each year. The reuse target would help avoid $13 million in annual waste tipping fees at landfill and save CalRecycle over $45 million dollars in the California BCRP processor payments each year.

4.1 A Higher Ambition 90% Redemption Rate Would Yield Further Benefits

The results outlined in Section 4.0 are achievable based on California's planned expansion of access to return locations, the current deposit amount, and by implementing the investment roadmap in Section 3.0. This assumes that consumers return containers at a rate of 75%. This system will have a positive impact on the environment and the economy, but these results do not represent the maximum benefit a 25% reusable beverage container target could achieve.

A 90% beverage container redemption rate will further boost the environmental and economic impact of the system, without needing to increase the overall reuse market share of 25%. The redemption rate improves the environmental and economic impact of the system: a higher redemption rate keeps the containers in use for longer reducing the need for additional material use. Boosting the redemption rate from 75% to 90% will nearly double GHG reduction, equivalent to a total of nearly 90,000 cars off the road.

This increase in redemption rate would also double plastic tonnage reduction by increasing the number of avoided plastic bottles from 2.9 billion to 3.5 billion (this is more than all PET beverage containers sold in California BCRP in 2000). Furthermore, litter would be reduced by an additional 6 million containers and waste management savings to municipalities and Caltrans (the California Department of Transportation) would increase by $46 million.

Proven to be attainable around the globe, a 90% redemption rate for deposit bearing containers is achieved by several jurisdictions including Germany (98%), Norway (92%), and Lithuania (92%), while Oregon nearly achieves this redemption rate

71 Using the EPA's estimate that a typical passenger vehicle emits 4.6 metric tons of CO_2e/year.
72 2018 Beverage Market Data Analysis, Container Recycling Institute, 2021.

Table 4-1: Annual environmental and economic impact of a 25% reusable beverage container target

Metric	75% Redemption Rate	85% Redemption Rate	90% Redemption Rate
GHG reduction	225,000 tons CO_2e (8%)	344,000 tons CO_2e (12%)	403,000 tons CO_2e (15%)
Plastic reduction	25,000 tons (9%)	46,000 tons (14%)	56,000 tons (20%)
Litter	32 million containers	36 million containers	38 million containers
Waste Management Financial Savings	$75 million	$115 million	$130 million
Jobs Created	11,800 jobs	11,800 jobs	11,800 jobs
Water Reduced	1.1 billion gallons	1.2 billion gallons	1.3 billion gallons

(87%).[73] For refillable glass beer bottles, Alberta achieved a 98.7% return rate in 2023.[74]

Two of the most impactful factors related to a system's redemption rate are the deposit amount and the convenience of the system.[75] These are discussed here.

- **Deposit amount:** Currently the deposit collected at sale in California is $0.05 for containers less than 24 ounces, $0.10 for containers greater than 24 ounces, and $0.25 for boxed wine. Studies show that, to reach a redemption rate of 90%, a deposit level of at least $0.10 is required. The California legislature may consider raising the deposit level to at least $0.10 or $0.15 for all containers to maximize redemption rates. This increase in deposit level would not necessarily require additional investment in return infrastructure; costs would be similar to those discussed in Section 3.2. Connecticut, Oregon, and Michigan all have deposit levels of $0.10 which shows its feasibility in the U.S. context. In 2024 the deposit level in Connecticut increased from $0.05 to $0.10 and in the third quarter of 2024 the redemption rate was 74.2% nearly 30 points higher than the same quarter in 2023 when the deposit was $0.05.[76]

- **Accessibility of the system:** The second factor that is most impactful on redemption rates is the accessibility of the system. As discussed in Section 2.1.1, 47% of the population of California currently lives in a served convenience zone and this is expected to increase to 74% when SB 1013 is fully enforced. This will leave 26% of the population living outside of a convenience zone. Increasing the accessibility of the system beyond what is already modeled here would likely require further investment in additional local redemption points, or implementing mobile recycling centers which could collect beverage containers directly from households. The cost of this investment was not evaluated as part of this report, but would be higher than the costs shown in Section 3.2.

The following sections provide more detail on the environmental and economic benefits of reuse, including how each benefit varies

73 Reloop. *Global Deposit Book 2024*. Reloop Platform, December 2024. https://www.reloopplatform.org/wp-content/uploads/2024/12/Reloop-Global-Deposit-Book-
74 BCMB. Annual Report. 2023. https://www.bcmb.ab.ca/uploads/source/Annual_Reports/2024.06.18.BCMB.2023.Annual.Report.Final.web.pdf
75 Eunomia Research & Consulting. "Achieving 90% Recovery of Plastic Beverage Containers." 2024. https://eunomia.eco/reports/achieving-90-recovery-of-plastic-beverage-containers/.
76 Connecticut DEEP. *CT Bottle Bill Redemption Data*. 2024. https://portal.ct.gov/-/media/deep/reduce_reuse_recycle/bottles/bottle-bill-data---nov-2024---thru-q3-2024---table.pdf?rev=1dbc5b44bc524d168eee2f527ab90ed3&hash=869C16F63ECA28930AB7250CC278BDEC

according to reuse system design, reuse market share, and external factors like energy system decarbonization.

4.2 A Reuse Model Reduces Material Use and Litter

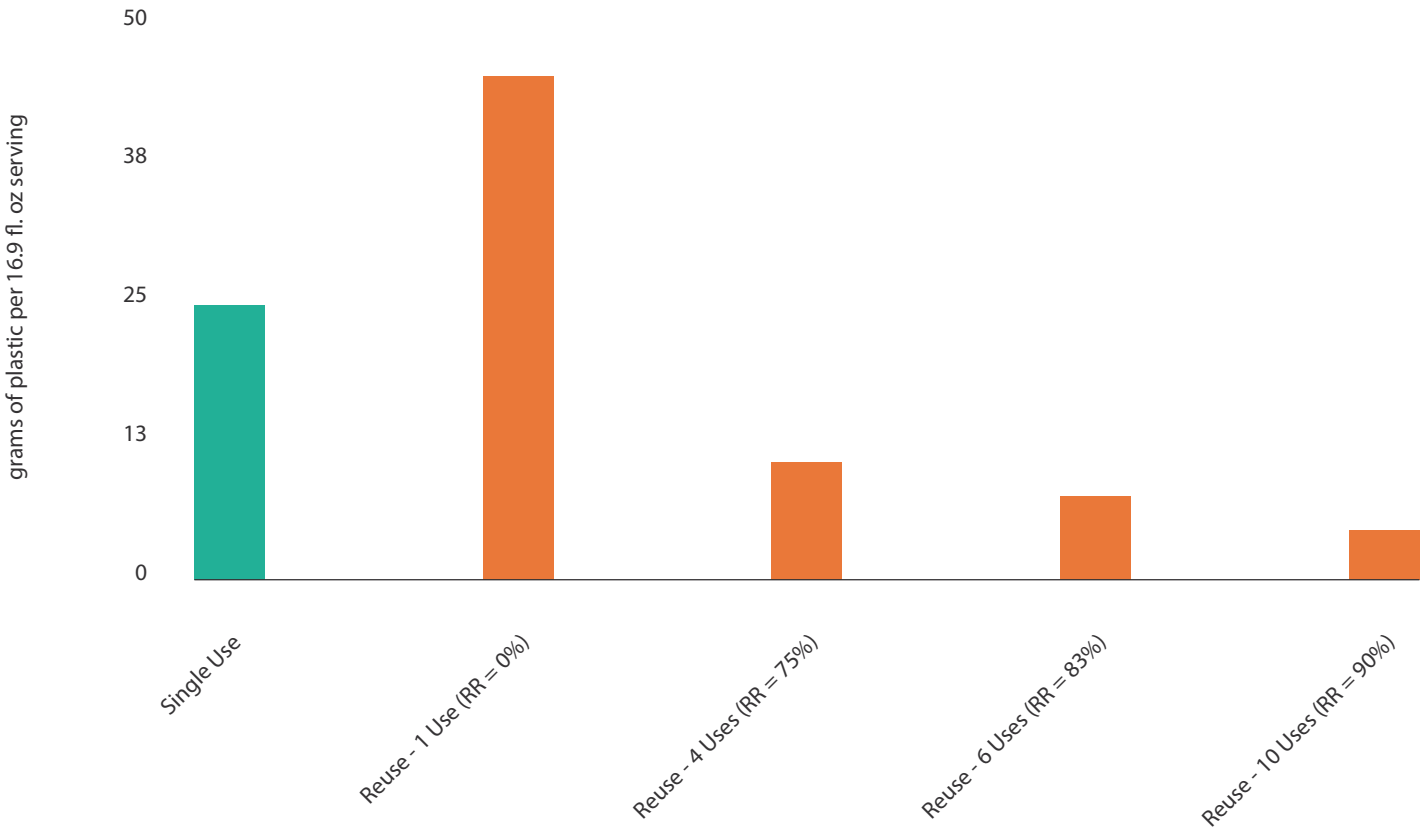
The beverage industry consumes significant amounts of glass, metal, and plastic each year. For the reasons laid out in Section 1.0, cutting plastic use and reducing plastic bottles are two of the key goals of a reusable beverage target in California. While the following paragraphs consider material use generally, they focus largely on plastic use.[77]

Material Use

Nearly 30 billion single-use beverage containers are consumed in California each year, roughly half of which are plastic bottles.[78] This consumption uses roughly 300,000 tons of plastic per year.[79]

Even though reusable containers are heavier than their single-use counterparts (typically around twice as heavy), the total amount of material needed in a reuse system is lower because each container is used several times. The more times the reusable container is used, the greater the reduction in material demand. As shown in Figure 4-2, using a reusable container – i.e., a 75%

Figure 4-2: Life cycle material use of a reusable vs single-use container



Note: values are based on a 16.9 fl. oz serving in a PET bottle.

77 The results shown in this section do not depend to any significant extent on the degree of harmonization/infrastructure sharing in the reuse industry, nor the decarbonization of the energy system. These assumptions are therefore not discussed.
78 CalRecycle data - only including those included in the BCRP.
79 CRI and Eunomia modeling.

Table 4-2: Plastic reduction, shown by reuse market share and redemption rate (tons per year)

Reuse Market Share ▼ / Redemption rate ▶	75%	85%	90%
5%	5,000 (2%)	9,000 (3%)	11,000 (4%)
10%	10,000 (4%)	16,000 (6%)	22,000 (8%)
25%	25,000 (9%)	40,000 (14%)	56,000 (20%)

Note: reduction from baseline shown in brackets.

redemption rate – can roughly more than halve the plastic needed for one serving. Reusing the container 10 times – a redemption rate of 90% – can cut the plastic needed per serving by over 82%.

A reuse system accounting for 25% of the beverage market, with a 75% redemption rate, would avoid more than 25,000 tons of plastic consumption each year. The recycled content of a typical PET beverage bottle is 12%, meaning the reuse target would avoid more than **22,000 tons of virgin plastic per year**.

Table 4-2 shows that the reduction in plastic use in a reuse system depends on the redemption rate of containers being returned into the system:

- at 75% redemption rate and 25% reuse market share, plastic consumption falls by about 9% compared to today;
- at 90% redemption rate and 25% reuse market share, plastic consumption falls by 20% compared to today.

This demonstrates the need to ensure that, in the long term, redemption rates are maximized.

Waste and Litter

Table 4-3 and Table 4-4 show the volume of beverage containers landfilled and littered today in California, as well as the reductions in these values if a 25% reuse target is implemented.

- Total waste is calculated from the total consumption of containers and CalRecycle BCRP data. Note that total waste is slightly higher than total consumption as some wastage occurs in manufacturing and transportation before containers reach the consumer;
- Litter is estimated using data from the Keep America Beautiful 2020 National Litter Study. This study estimates roadway and waterway litter in both Bottle Bill and non-Bottle Bill states, and provides a composition for this litter.[80]

A reuse system achieving a 75% redemption rate would avoid the production of 5.3 billion single-use containers, of which 2.9 billion are single-use plastic bottles. Currently, 6.1 billion beverage containers are landfilled every year in California, and an additional 180 million are littered. A 25% reuse target will reduce the number of landfilled containers by 1.2 billion (18.0%), and the number of containers littered by 32 million (17.7%).

A reuse system achieving a 75% redemption rate would reduce litter by

32 million

single-use containers annually.

80 Keep America Beautiful. *Litter Study Summary Report: May 2021*. May 17, 2021. https://kab.org/wp-content/uploads/2021/05/Litter-Study-Summary-Report-May-2021_final_05172021.pdf.

Table 4-3: Reduction in plastic containers littered and landfilled

	Current state	Reduction @ 25% reuse
Annual plastic bottles landfilled	3.1 billion	600 million (19%)
Annual plastic bottles littered	90 million	17 million (19%)

19%

reduction on the number of plastic bottles littered

Table 4-4: Reduction in litter, shown by reuse market share and redemption rate (million containers per year)

Reuse Market Share ▼ / Redemption rate ▶	75%	85%	90%
5%	6.4	7.2	7.7
10%	12.8	14.5	15.3
25%	32.0	36.2	38.2

4.3 Reusing Beverage Containers Minimizes Greenhouse Gas Emissions Through Efficient Use of Raw Materials

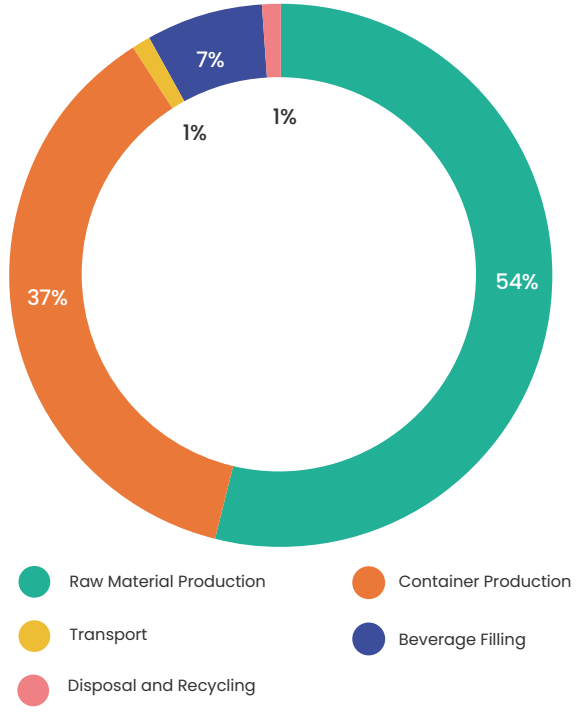
Eunomia estimated total packaging-related emissions[81] from beverages consumed in California to be 2.7 million metric tons of CO_2e/year (mmt CO_2e/year) – *the equivalent of over half a million cars on California's roads*.[82] As shown in Figure 4-3, a significant proportion of these emissions come from the extraction, processing, and conversion of raw materials into containers.[83]

Reusable beverage containers use less raw material per serving because they are reused multiple times. Reusing containers is therefore an excellent way to reduce beverage emissions – as long as the emissions avoided through producing less raw materials outweigh any additional emissions from transporting, cleaning, and refilling reusable containers.

Figure 4-4 shows that packaging-related emissions of beverages provided in reusable containers in California are lower than their single-use counterparts, as modeled by Eunomia's ReSim tool. For a bottle reused four times (i.e., a 75% redemption rate), the raw materials, conversion, and bottler stages (where PET preforms are blown to full size) account for a significant proportion of overall

81 See Section 2.2 for a definition of the processes included in packaging-related impacts.
82 Using the EPA's estimate that a typical passenger vehicle emits 4.6 metric tons of CO_2e/year.
83 Conversion is the process of turning raw materials into finished products.

Figure 4-3: Life cycle packaging-related emissions breakdown

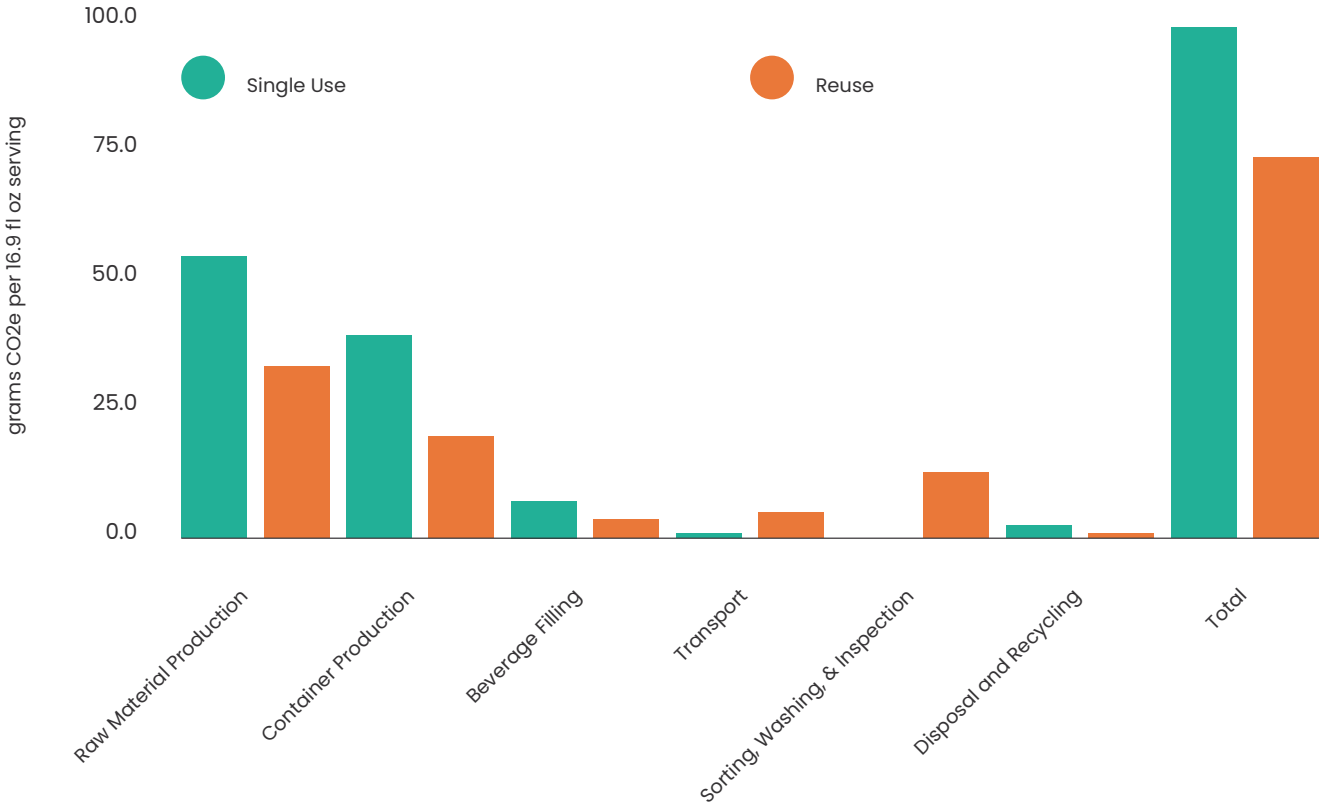


Note: values are based on a 16.9 fl. oz single-use PET bottle.

emissions savings and outweigh the additional emissions resulting from transportation and washing of containers.

When evaluating all beverage types and producers in California, the emissions savings from reuse can accumulate to a significant amount and appreciably reduce the emissions from the beverage industry. Table 4-5 shows the reduction in GHG emissions achieved through a reuse system at various reuse market shares and redemption rates. The values in this table are based on a 'harmonized' system (i.e., shared infrastructure) and today's energy system (e.g., no decarbonization of transport).

Figure 4-4: Life cycle packaging-related emissions of a reusable vs single-use container



Note: values are based on a harmonized system with a 25% reuse market share, 75% redemption rate, and todays energy system.

Table 4-5: Reduction in California's GHG emissions, shown by reuse market share and redemption rate (metric tons per year)

Reuse Market Share ▼ / Redemption rate ▶	75%	85%	90%
5%	22,000 (1%)	47,000 (2%)	59,000 (2%)
10%	73,000 (3%)	117,000 (4%)	143,000 (5%)
25%	225,000 (8%)	344,000 (12%)	404,000 (15%)

Note: reduction from baseline shown in brackets.

Reductions in GHG emissions are highly dependent on the system **redemption rate**. For example, at 25% reuse market share, increasing the redemption rate from 75% to 90% would nearly double GHG reductions from 225,000 to 405,000 metric tonnes/year. This is because each container is being used more times on average (10 times rather than 4 times) before reaching the end of its life, significantly driving down the embodied emissions of each serving.

Reductions in GHGs are also highly dependent on the **reuse market share**. For example, assuming a 75% redemption rate, the total avoided packaging-related emissions at a 25% reuse penetration rate are nearly 10 times greater than at a 5% penetration rate. This is due to the economies of scale discussed in Section 2.1: as the reuse market grows, the number of botting facilities and sorting sites grow, and total transportation distances fall across the system. Therefore, GHG savings do not increase linearly with reuse market share, but increase exponentially as economies of scale are achieved. This reinforces the benefit of setting ambitious reuse targets.

Figure 4-5 shows that a harmonized reuse system will reduce emissions more than a fragmented system.[84] As the system scales, the difference in environmental performance between harmonized and fragmented systems could become significant: at 25% reuse market penetration, a harmonized system would save roughly 70,000 metric tons CO_2e more than a fragmented system – equivalent to about 16,000 passenger vehicles on the road. This reinforces the benefit of ensuring that different actors in the reuse market work together to ensure targets are met.

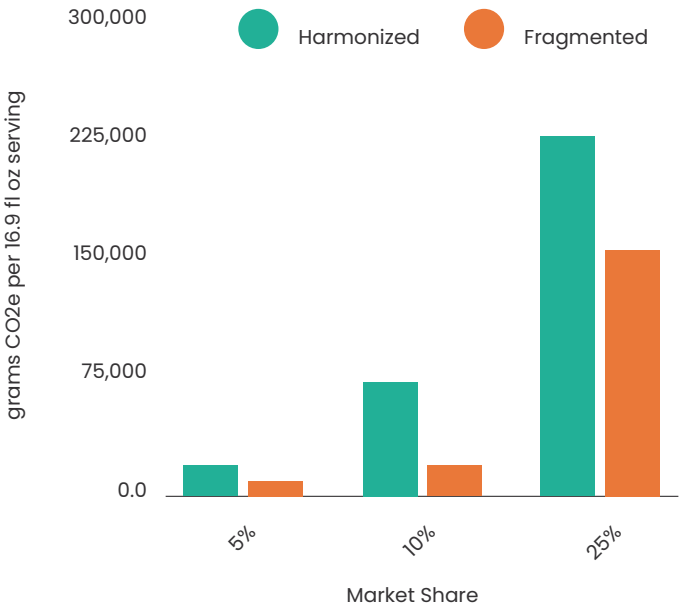
increasing the redemption rate from 75% to 90% would nearly double GHG reductions from 225,000 to

405,000

tonnes/year

84 A 'harmonized' system here assumes that there are 16 bottle designs (repeated across each size and material). This means that there must be at least 16 designs for the washing infrastructure A 'fragmented' system has 48 bottle designs.

Figure 4-5: The impact of infrastructure sharing on GHG savings from reuse



All results shown up to this point assumed no further **decarbonization of the energy system**.[85] As discussed in Section 2.1, this analysis has not assumed any future decarbonization of electricity, heat, or transport provision unless otherwise stated. However, further decarbonization of the energy system is likely and could improve or harm the case for reuse.

Eunomia investigated how the packaging-related GHG savings from reuse may change if the energy system decarbonized as follows:[86]

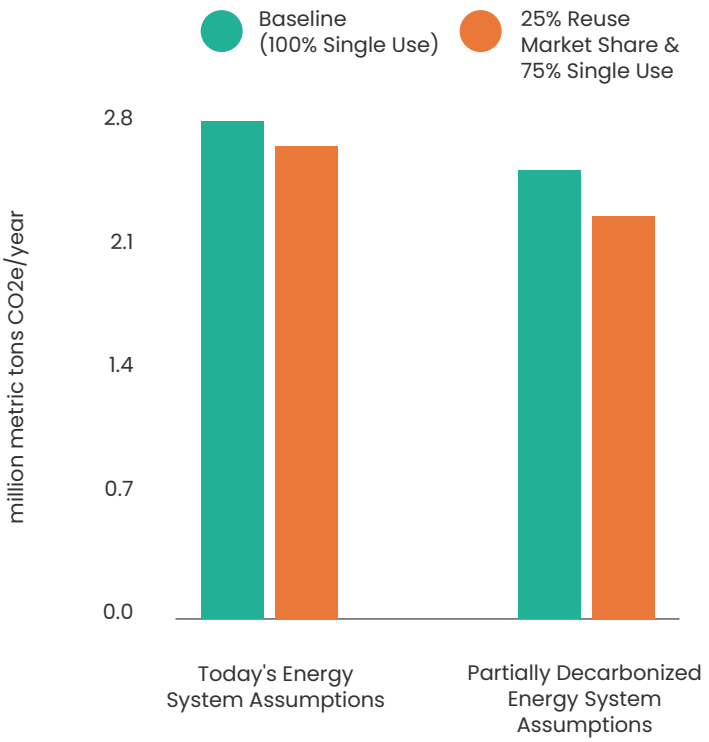
- Transportation: 20% reduction in emissions per unit of fuel energy;
- Electricity: 50% reduction in emissions per unit of electricity;
- Heat: 20% reduction in emissions per unit of heat energy consumed;
- No change to the embodied emissions of raw materials.

Figure 4-6 shows how the emissions benefits of reuse would change if the energy system decarbonized in this way.

Using **today's energy system assumptions**, a 25% reuse market share cuts beverage sector packaging-related emissions by 8%. Under the **future decarbonization assumptions** listed above, this value is slightly higher at 9%. Decarbonization of the energy system should still be a priority in California, but as this decarbonization reduces emissions in both the single-use and reuse system, the case for reuse is not strongly dependent on the energy system assumptions used in the modeling. Reuse can provide additional emissions reduction compared to single-use, irrespective of future decarbonization.

Figure 4-4 above can be used to help explain the relatively small difference in the size of all four bars in Figure 4-6. More than half (54%) of the emissions for a typical 16.9 fl oz single-use PET bottle are embodied in the material, and these emissions are not affected by the energy decarbonization assumptions tested here.

Figure 4-6: Total beverage industry packaging related emissions



Note: values are based on a 25% reuse market share and 75% redemption rate.

85 The energy system here refers to the sources of energy used to power machines, provide heat and transport goods.
86 Note that the baseline single-use system emissions would also fall from 2.7 million to 2.4 million metric tons of CO_2e/year.

4.4 Economic Benefits from Job Creation and Avoided Waste and Litter Costs

The reuse system can drive reductions in waste management costs for citizens and boost economic activity in California by creating sustainable jobs in the reuse system.

Avoided Waste Treatment Costs

Beverage waste in California is either managed through the BCRP infrastructure (when containers are redeemed), through curbside trash and recycling, or it is littered (see 'Avoided Litter Costs' below). Containers managed through the BCRP are primarily sent for recycling, while curbside pickups will be disposed of in landfill or recycling, as relevant.[87] These management routes create costs which are ultimately passed back to the consumer.

As part of the BCRP, CalRecycle paid out over $190 million to recyclers in FY23/24 in 'processing payments' to recycle the waste and anticipates this number to rise by over one-third in FY24/25 with the expansion of the BCRP to include wine and spirits. These processing payments represent the bulk of the waste management costs in the BCRP. Eunomia has estimated that, if SB 1013 is successfully implemented,[88] these processing payments will increase to roughly $300 million per year as the redemption rate of single-use containers increases.

A 25% reuse target would reduce total glass and plastic managed by the BCRP infrastructure by 18% and 10% respectively. This would reduce total processor payments owed by CalRecycle by $46 million dollars each year.

Approximately 650,000 tons of beverage containers go to landfill every year in California. The average landfill tipping fee in California is $45/ton,[89] so a 25% reuse target would reduce landfill trash disposal costs across California by roughly $17 million per year.

Avoided Litter Costs

Litter is a significant problem in California. Section 4.2 discussed how an estimated 180 million beverage containers are littered onto California's roadways and waterways each year. Caltrans is responsible for removing litter from the state's roadways.

The cost of removing trash from California's roadways and preventing it from entering waterways is estimated at $20 per person per year,[90] equating to roughly 21 cents per item littered. Beverage containers therefore cause nearly $40 million/year of cleanup costs statewide. A 25% reuse target would reduce beverage container litter by 32 million items per year and save Caltrans and California's municipalities approximately $7 million in cleanup costs each year.

The cumulative impact of a 25% reuse target on BCRP processor payments, trash management and litter prevention are $75 million per year – savings that could ultimately be passed back to Californians or reinvested in the reuse scheme.

87 This analysis conservatively assumes that 100% of bottles redeemed are recycled.
88 SB 1013 aims to boost the tonnage of material captured in the BCRP, and also expand the scope to wine and spirits, which tend to use heavier glass containers.
89 California Department of Resources Recycling and Recovery (CalRecycle). *California Redemption Value (CRV) Programs: A Guide to CRV Collection and Recycling*. California Department of Resources Recycling and Recovery, February, 2015. https://www2.calrecycle.ca.gov/Publications/Download/1145?opt=dln.
90 California State Water Resources Control Board. *Trash Control: Annual Compliance Costs and Effectiveness of Trash Programs*. California State Water Resources Control Board, April 7, 2015. https://www.waterboards.ca.gov/water_issues/programs/trash_control/docs/trash_c_040715.pdf.

Table 4-6: Cost savings on waste and litter management, shown by reuse market share and redemption rate

Reuse Market Share ▼ / Redemption rate ▶	75%	85%	90%
5%	15	21	23
10%	30	41	47
25%	75	103	117

Note: values represents the cost savings for a harmonized system.

Employment

Section 3.0 described the investment requirements to build a reuse system. This local investment will have a positive impact on the California economy as a reuse system is more localized than a single-use system. For example, it is likely that washing facilities will be invested locally while single-use raw materials may be imported. Jobs will be created in the reuse industry: staff will be needed to produce reusable containers, operate the reuse return infrastructure, drive trucks to transport containers on their return journey, and ensure that bottles are cleaned and refilled correctly. These are local 'green' jobs that are part of a decarbonizing economy, and can be sustained indefinitely.

Table 4-7: Jobs created by reuse market share

Reuse Market Share	Job Creation (FTEs)
5%	3,200
10%	5,200
25%	11,800

A 25% reuse target would support roughly 11,800 jobs in the following areas:

- Nearly 5,000 in bottling (noting that a portion of these jobs are likely to transfer from single-use beverage lines);
- 2,100 operating redemption and return infrastructure (e.g., helping consumers return their containers and redeem deposits);
- 2,200 operating sorting infrastructure and ensuring that bottles are returned to the correct sites;
- 500 in return logistics;
- 2,000 in bottle washing and inspecting.

These jobs would support nearly half a billion dollars in annual wages.

4.5 Minimizing Water Use through Reuse in a Water Stressed State

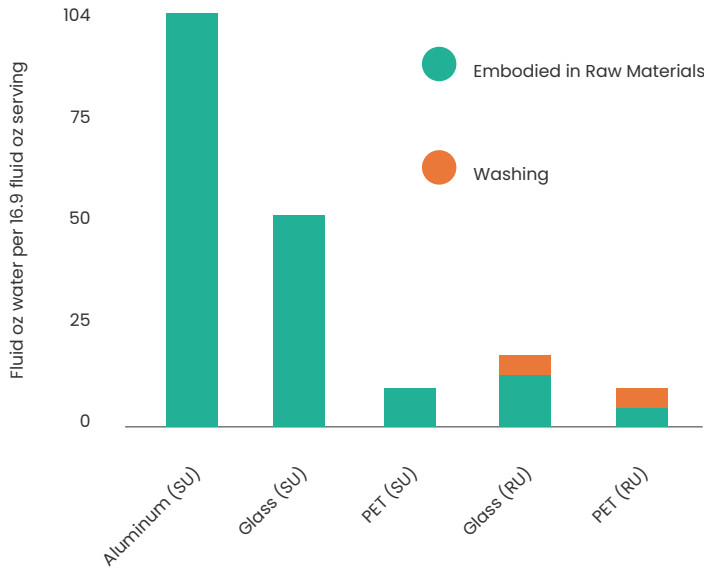
Producing raw materials and converting these raw materials into packaging uses a considerable amount of water. Even though reusable containers must be washed through each cycle, the water needed to do this is typically much less than the water use 'embodied' in the single-use raw material.

As shown in Figure 4-7, the water used to produce aluminum cans and glass bottles is particularly high, and switching either of these formats to reusable glass or plastic is likely to lead to significant water savings.

Table 4-8 shows how a reusable beverage system could contribute to reducing water consumption: at 25% reuse market penetration, at least 1.1 billion gallons of water consumption would be avoided each year. The average

Californian uses 85 gallons of water at home each day.[91]. Therefore, a reuse beverage system achieving 25% reuse market share could reduce the equivalent of around 11,000 of California's homes' worth of water consumption.

Figure 4-7: Water use per serving across different single-use and reusable container formats



Note: values are based on one 16.9 fl. oz beverage serving.

Table 4-8: Water savings, shown by reuse market share and redemption rate (million gallons per year)

Reuse Market Share ▼ / Redemption rate ▶	75%	85%	90%
5%	224	247	259
10%	448	495	518
25%	1,100	1,200	1,300

91 Legislative Analyst's Office. *The 2021-22 Budget: California's Recycling Programs*. Legislative Analyst's Office, March 10, 2021. https://lao.ca.gov/Publications/Report/3611.

5.0 The Time for Reuse is Now

In 2024, Earth reached the global warming tipping point of 1.5 degrees above pre-industrial levels, driving home the urgent and unprecedented need to identify solutions to climate change. Implementing a reusable beverage container system in California – one that builds on and utilizes the expanding BCRP infrastructure – will displace single-use plastic containers, reducing both the amount of fossil fuel inputs needed to produce this packaging as well as the end-of-life pollution they create, while creating economic benefits for the state.

As wildfires increase and temperatures rise in California, the alarm bells are ringing. It's time to find every means possible to reduce the climate footprint of consumption and shed forms of consumption that keep our economy linked to fossil fuels production. **Without interventions the GHG emissions from plastic production and consumption will exceed the plastics carbon budget by 360%.** Globally, plastic waste equivalent to two garbage trucks every minute enters the ocean.

California is the fifth largest economy in the world and the actions taken in the state have significant national and global influence. As the largest U.S. state, California sells 28 billion beverage containers annually, which is equivalent to 12% of all beverage containers nationally. **The recent passage of Senate Bill 54 in California mandates that non-beverage plastic packaging production be reduced by 25% by 2032**, with a portion of this reduction achieved through reuse and refill of consumer packaged goods (not beverage containers).

Reuse provides so many benefits from plastics reduction to climate benefits and reduced water consumption over product lifecycles. There is no more time to wait on setting ambitious goals to bring back the refillable beverage systems that used to be the norm for employment-rich, regionally-centered economic systems.

Voluntary commitments from industry have not meaningfully reduced plastic or GHG; therefore, ambitious legislation is required to effectively tackle these challenges. Legislation that mandates a reusable beverage container target of 25% within 10 years of the program start date, in addition to interim targets of 5% and 10% is an ambitious but achievable approach. This target is estimated to reduce GHG emissions from the beverage sector by 8% (or up to 15% if a 90% redemption rate is achieved), equivalent to taking 49,000 cars off the road. The target would reduce plastic production by 9% (20% at 90% redemption rate), equivalent to 2.9 billion fewer plastic bottles (3.5 billion at 90% redemption rate), and create 11,800 sustainable and green jobs. Action taken now will yield positive environmental and economic benefits for future generations.

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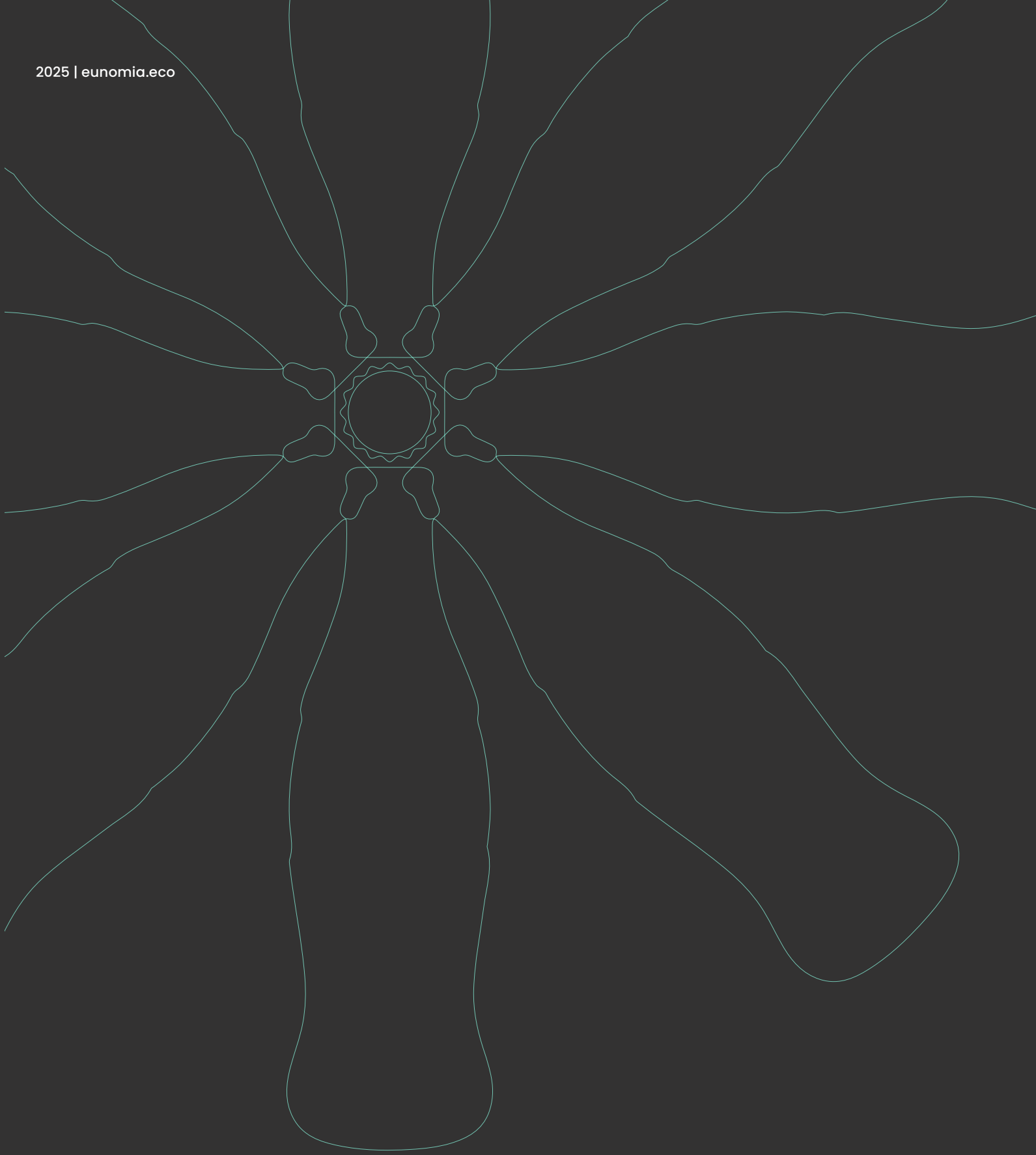

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