

# 2025

Day 2

Concurrent AM

9:30 AM

Oct 23

Track A

## Rethinking Beverage Containers: From Recycling to Reuse

**Moderator:** Sarah Currie-Halpern

Elizabeth Balkan

**Speakers:** Michael Wasserman

Clare Miflin

NATIONAL  
**ZERO**  
**WASTE**  
CONFERENCE





# Embracing Beverage Reuse



## A LOOK AT GERMANY

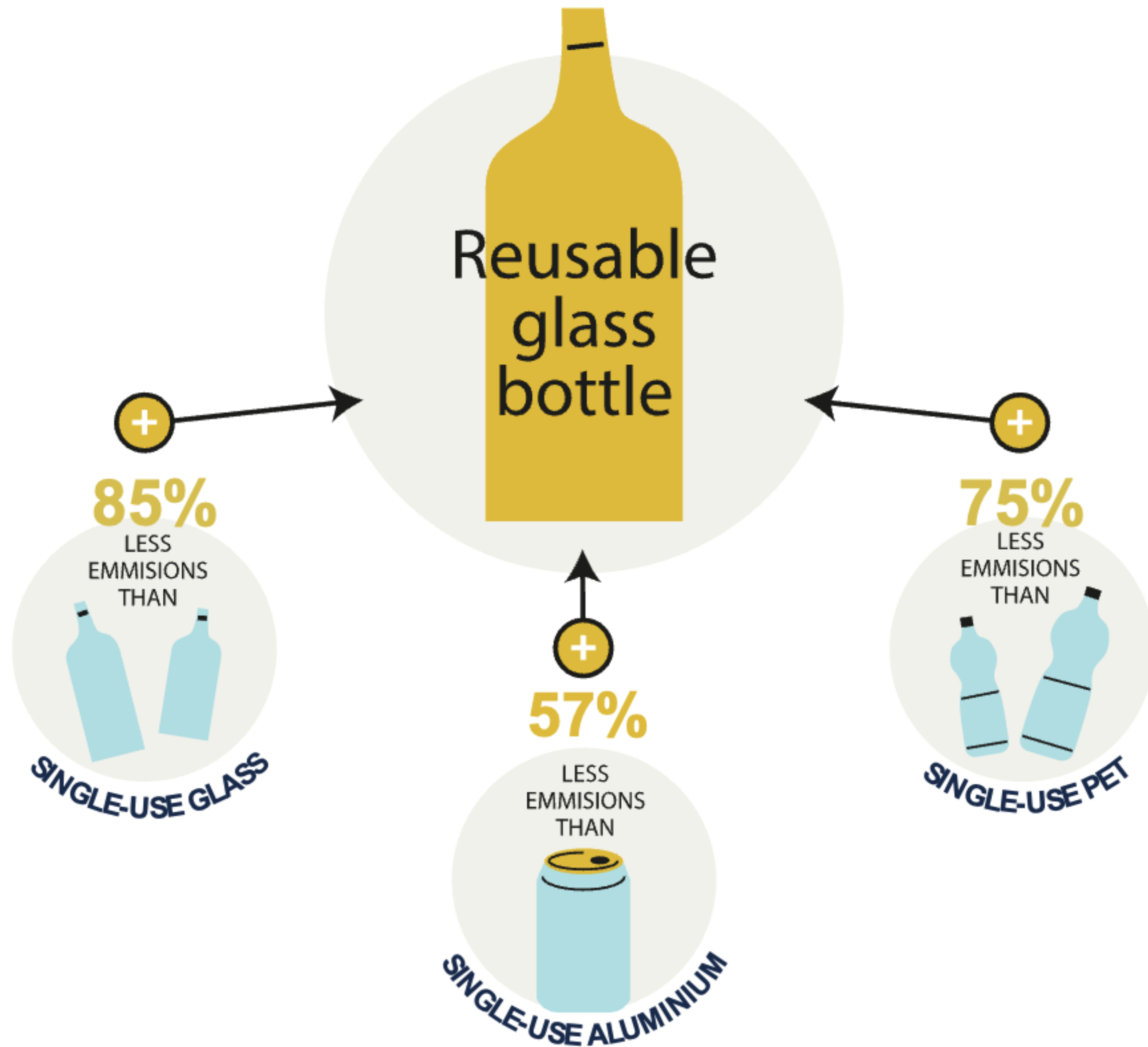
- Refillable beverage bottles make up 54% market share in Germany
  - 87% for beer and cider
  - 42% for mineral water
  - Bottles reused up to 50 times
- Germany's deposit system enables beverage reuse by:
  - Ensuring return infrastructure for taking back reusable packaging
  - Achieving 98% collection rate each year
- German packaging Law: 70% reusable beverage container target (2019)

## ...AND CANADA

- CA beer industry prefers refillable bottles as the least-expensive packaging option
- ~85% of Ontario's beer sales is in refillable bottles, which are returned at >85% return rate
  - Bottles reused 15-20 times
- Prince Edward Island imposed a ban on single-use soda and beer containers
  - It was later repealed and replaced with DRS



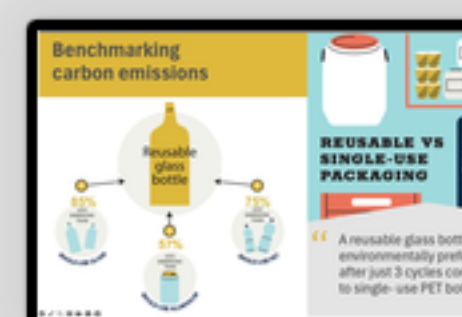
# Benchmarking carbon emissions



## REUSABLE VS SINGLE-USE PACKAGING



“ A reusable glass bottle is environmentally preferable after just 3 cycles compared to single-use PET bottles.



# ELEMENTS OF EFFECTIVE REUSE SYSTEMS

## Design

Design for standardization and durability to maximize the number of cycles, minimize storage and transport space, be recyclable and made of recycled materials

## Ownership

Packaging-as-a-service model means that manufacturers or retailers lease the packaging for temporary use

## User

Identification of the user(s) and the system role they play

## Logistics

Use of reverse logistics processes from package recovery after use, cleaning and washing as well as redistribution and reuse

## Return

High return rates are achieved through use of incentives, like deposits, and tracking technology



# Effective reuse: stakeholder-specific roles



## GOVERNMENT



## INDUSTRY

### Design

- Set clear governance structure with targets on specific packaging types, non-toxic criteria
- Standardize packaging through pre-competitive cooperation and coordination

### Ownership

- Enact requirements and minimum criteria for pooling systems
- Form pooling system which:
  - allows material to move freely within the system
  - has centralized management (ideally); and
  - brands support through collaboration

### User

- Ensure equitable, inclusive system design
- Integrate reuse packaging with single-use packaging (so they are equally available)

### Return

- Facilitate container recovery through a deposit return system centered on access and ease of use
- Collect and manage material / financial flow data

### Logistics

- Set terms and conditions for proper collection, handling, reconditioning and refilling
- Standardize logistics
- Build sufficient operational capacity for storage, delivery and return of reusable packaging

# Understanding pooling: Key advantages

Reduced investment and operating costs

Lower individual risks for companies

Enable SMEs to enter the reuse market

Enhanced Efficiency

Scale up possible in a short timeframe

Defined standards promote competition

# Policies to Support Beverage Reuse

## Taxes / Incentives

- Reuse quotas or single-use container fees
- Multi-tier deposits which subject refillable containers to lower deposit fees than single-use counterparts
- Tax incentives and funding for reusable packaging recovery pilots, to shift behavior in the beverage supply chain

## Deposit Legislation

- Introduction of deposit return system (DRS) on all single-use beverage containers
- Following high-performing DRS principles will promote equitable and inclusive system conditions

## Mandates / Bans

- Key performance indicators help maximize environmental outcomes
- Require all refillable containers to be non-toxic and recyclable
- Where deposit return and refillable beverage systems both exist, interoperation standards help ensure ease of use

# Principles for Effective Reuse Policymaking

## PERFORMANCE


- Implement clear definitions to align what is meant by “refillable,” “reusable,” “returnable,” and “recyclable”
- Establish clear targets and performance criteria, like the minimum number of times an item is reused
- Foster market development and efficiencies in scale through sufficiently ambitious targets which increase over time
- System designed to recover at least 90% of packaging and re-circulate it multiple cycles

## GOVERNANCE

- Establish a strong foundation of governance and government oversight
- Distribute responsibility to actors across the value chain, with each adhering to reuse standards, and enabling verifiable system functionality
- Enable evaluation and improvement through reporting requirements with public access to data

## EQUITY

- Facilitate equal access and fair conditions for all supply chain actors through system requirements
- Incentivize return to ensure systems are easy to use and accessible for all



Start with beverages,  
take-away food & drinks and  
e-commerce  
packaging...[which] offer the  
biggest potential to increase  
reuse rates... and create the  
conditions and  
infrastructure for other  
sectors.

# THANK YOU!

**Elizabeth Balkan**

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Reuse Vanguard Project



# Integrating Reuse Into California's Beverage Container Deposit System



**Excessive consumption of single use beverage containers creates negative impacts on the environment and our health.**



**This report evaluates the benefits of a system in which 25% of California's beverages are sold in reusable formats.**



# The excessive production of single-use beverage containers impacts California's environment and economy.

Californians purchase over **28 billion** single-use beverage containers annually which is approximately **12%** of the U.S. total.

The annual **CO<sub>2</sub> emissions** from beverage container packaging in California is equivalent to

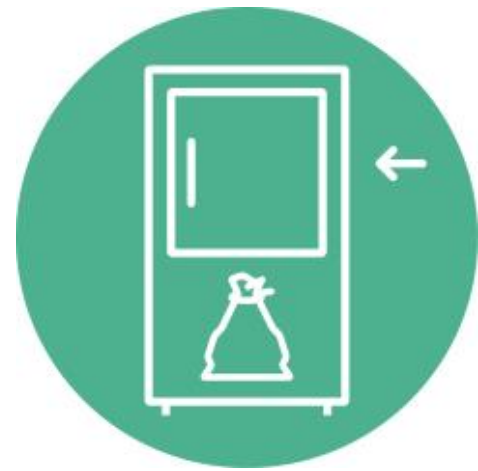
**500,000 cars.**

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 cost of sending beverage containers to landfill is approximately

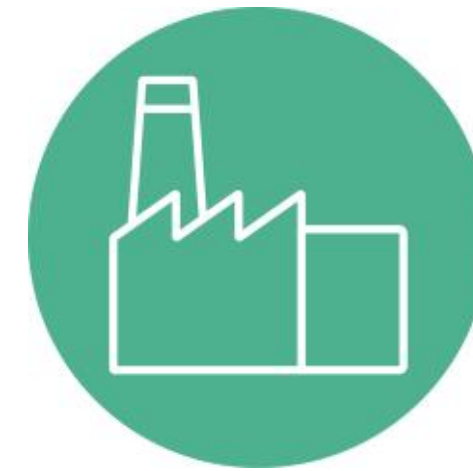
**\$100 million** per year.

# This report evaluated one potential reuse system and included achievable design characteristics.



## **Container Redemption Rate:**

The system achieves a 75% redemption rate.



## **Energy System Performance:**

There is no decarbonization of the energy system beyond today.



## **Reuse Market Share and Targets:**

25% of beverages are sold in reusable containers.



## **Containers Switching to Reuse:**

A portion of all single-use formats (e.g., aluminum cans, PET bottles) switch to reuse.



## **Infrastructure Sharing:**

The companies in the beverage reuse industry share infrastructure.

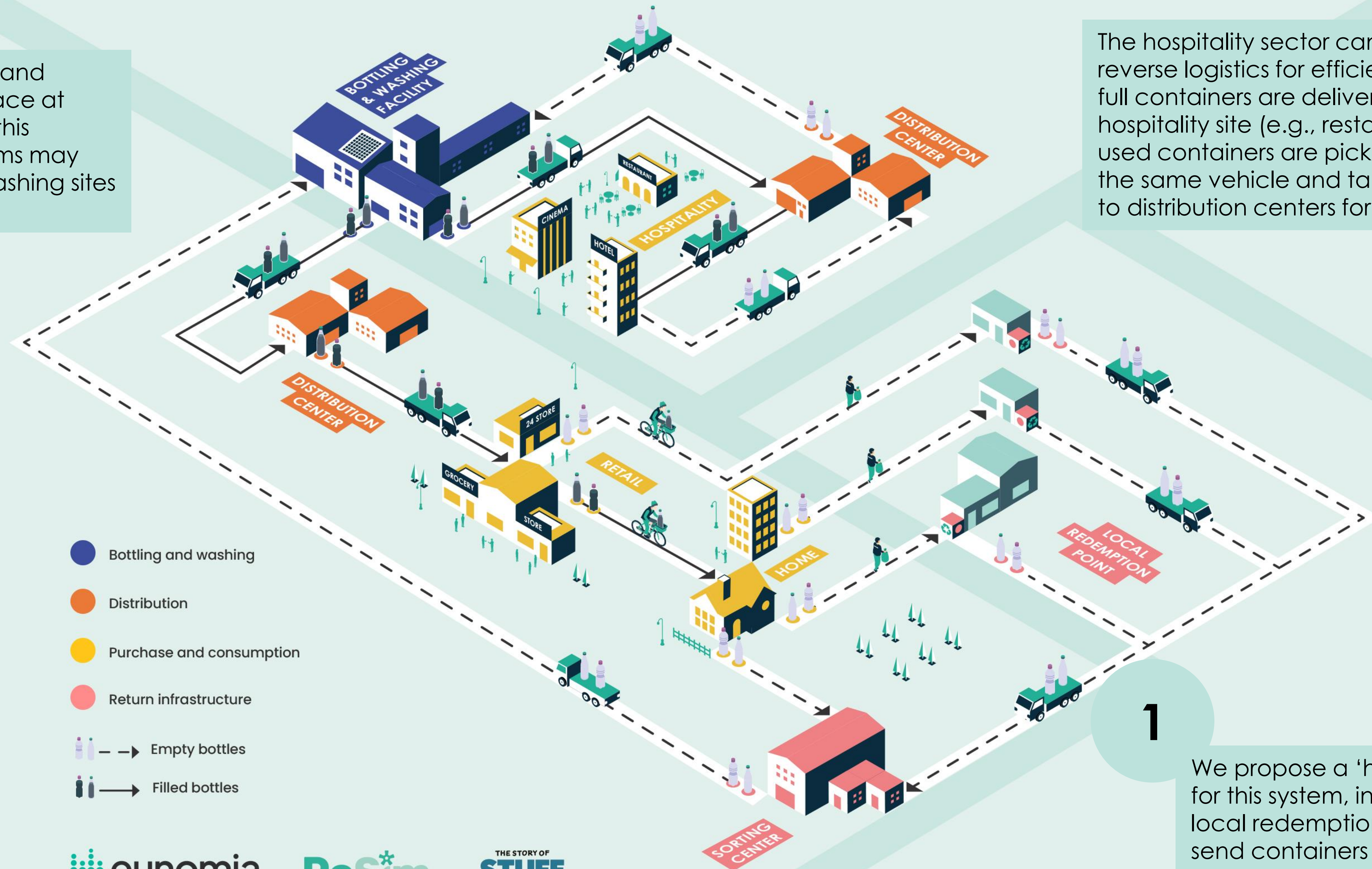
# In a return-on-the-go system, consumers can purchase reusable beverage containers in the same way they do single-use.

Container washing and inspection takes place at bottling facilities in this system. Other systems may have dedicated washing sites instead.

3

The hospitality sector can use reverse logistics for efficiency: when full containers are delivered to the hospitality site (e.g., restaurant), used containers are picked up in the same vehicle and taken back to distribution centers for sorting.

2



1

We propose a 'hub and spoke' model for this system, in which there are many local redemption points ('spokes') that send containers to large sorting sites ('hubs') to be sorted. Consumers can also return containers directly to the sorting sites.

# A 25% reusable beverage container target in California will yield significant environmental and economic benefits.

2.9 billion



fewer plastic bottles produced each year.

32 million



fewer containers littered into the environment each year.

\$75 million



annual waste management cost savings.

11,800



new green jobs in manufacturing, sorting, transport, and bottle washing.

8%



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

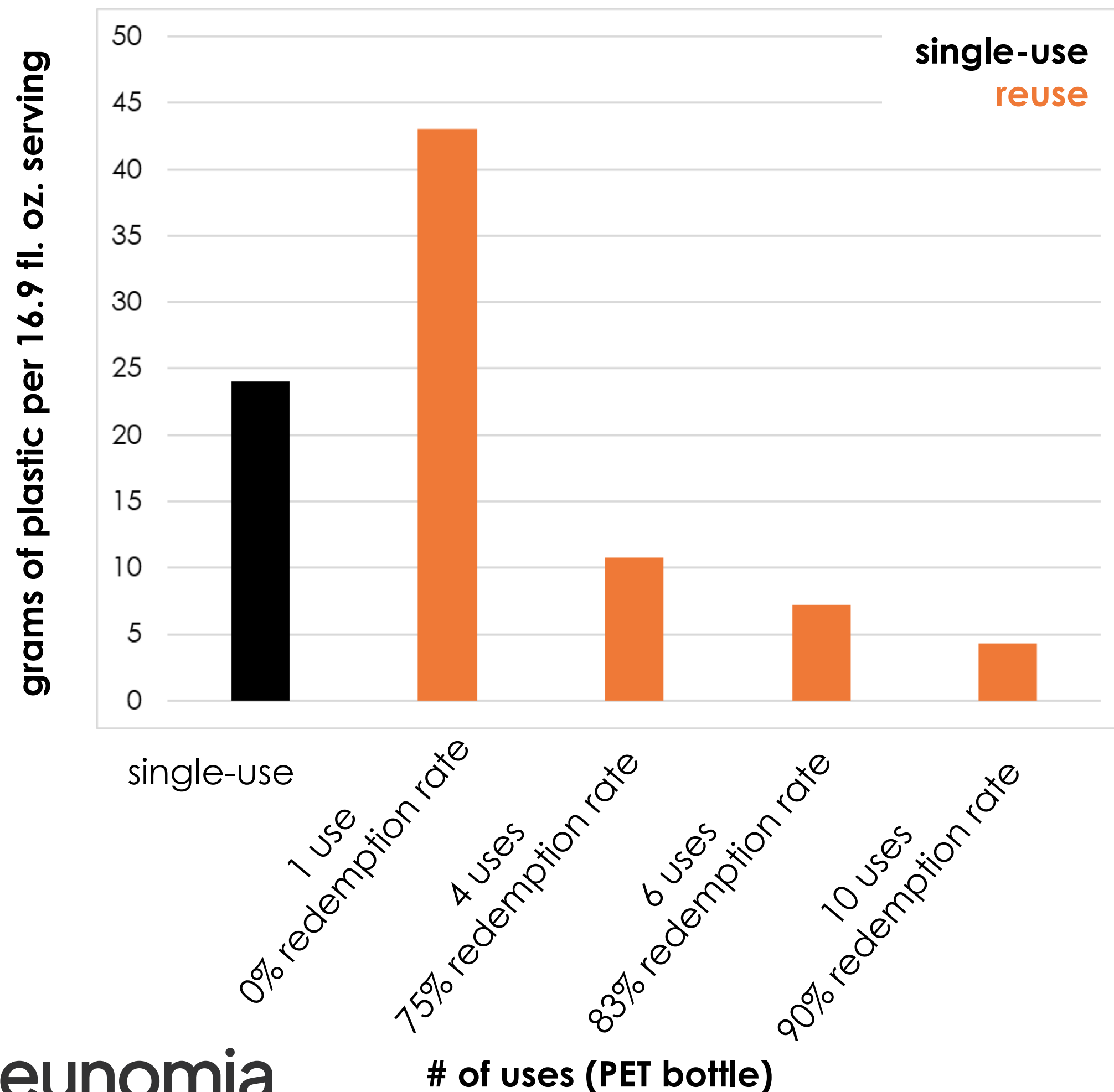
1.1 billion



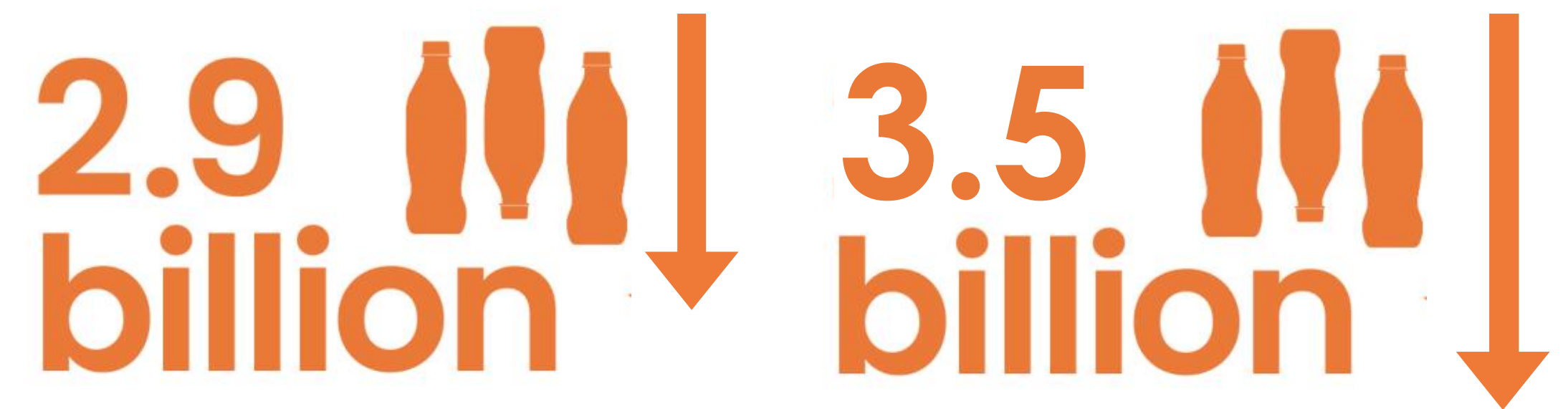
gallons of water saved each year.

# Beverage reuse could reduce plastic packaging by 20% and prevent 32 million littered containers each year.

Returning a reusable plastic bottle four times is enough to halve lifetime plastic use per serving compared to single-use.



The more containers are reused, the less plastic, glass, and metal is needed.



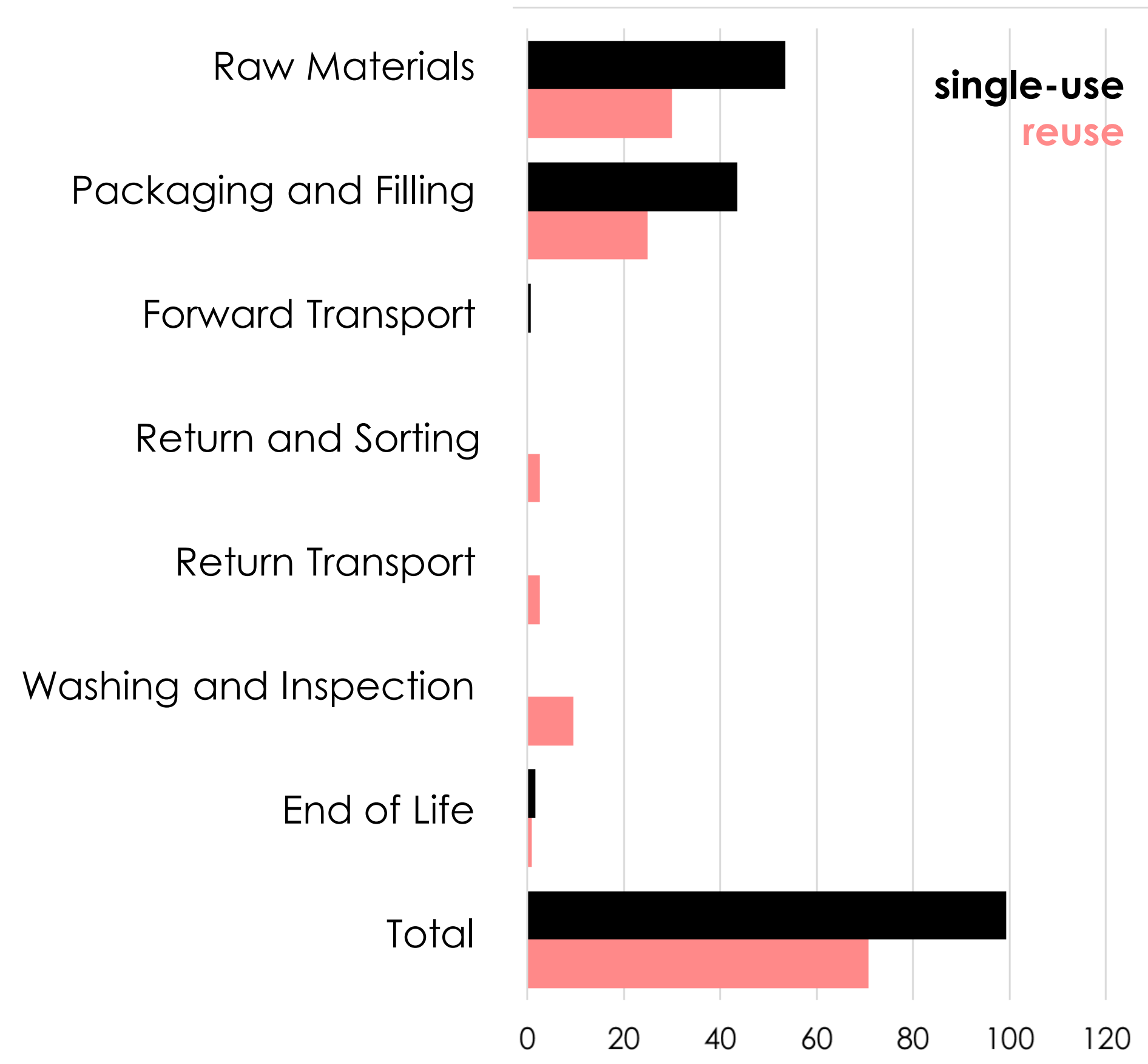
fewer plastic bottles produced each year.

75%  
Redemption Rate

90%  
Redemption Rate

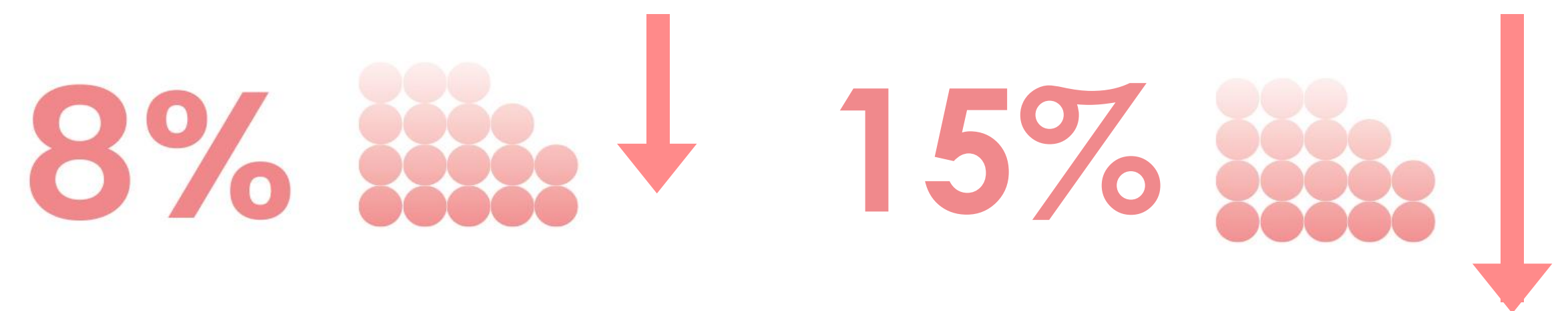
# Reuse could avoid 230-400 thousand metric tonnes of CO<sub>2</sub>e per year.

Reductions in raw material embodied emissions and packaging manufacture energy use drive GHG emissions reductions.



Packaging emissions (grams CO<sub>2</sub>e per 16.9 fl. oz. serving) in PET bottle

Reducing material consumption leads to significant GHG emissions savings.



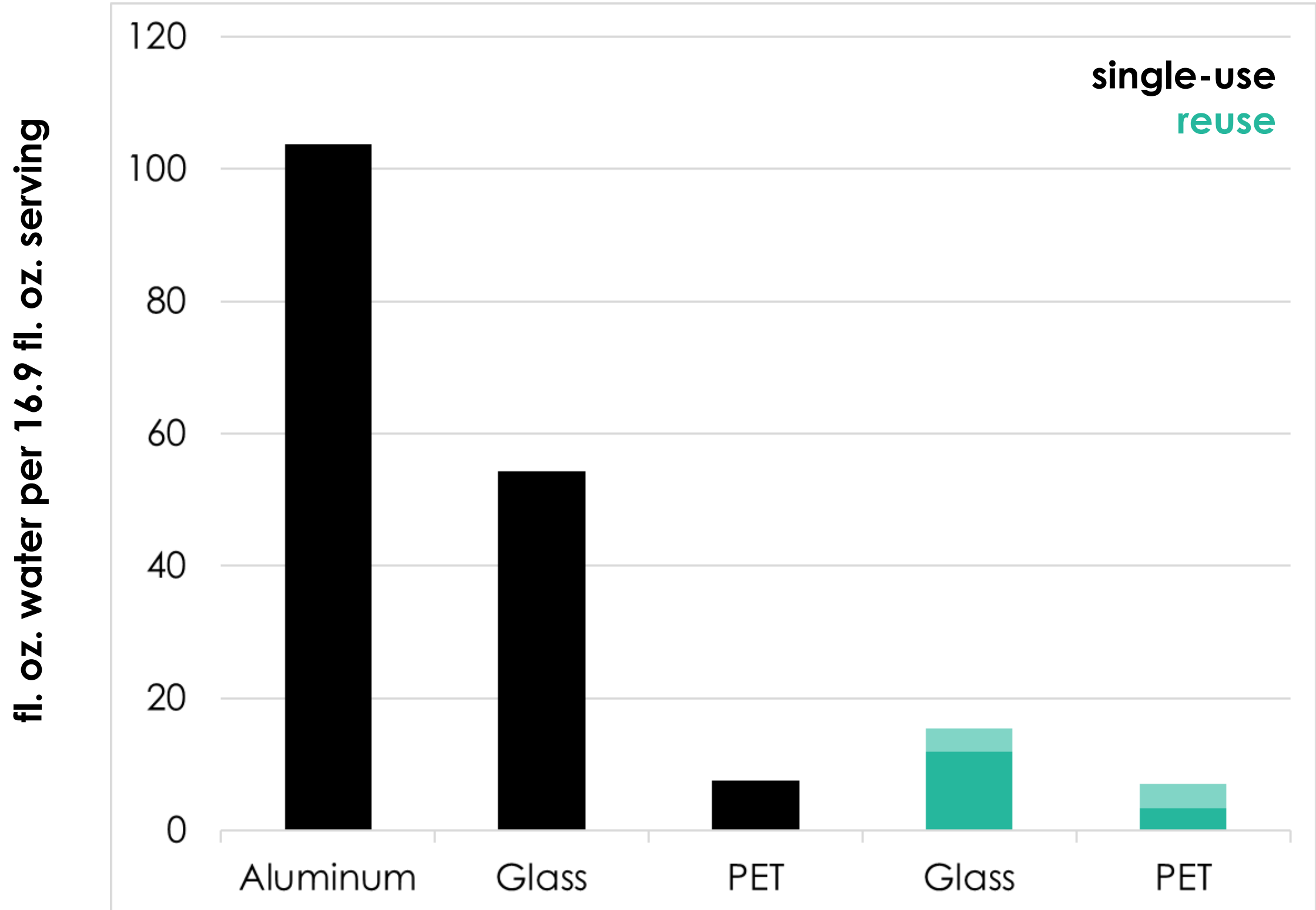
reduction in packaging GHG emissions.

75%  
Redemption Rate

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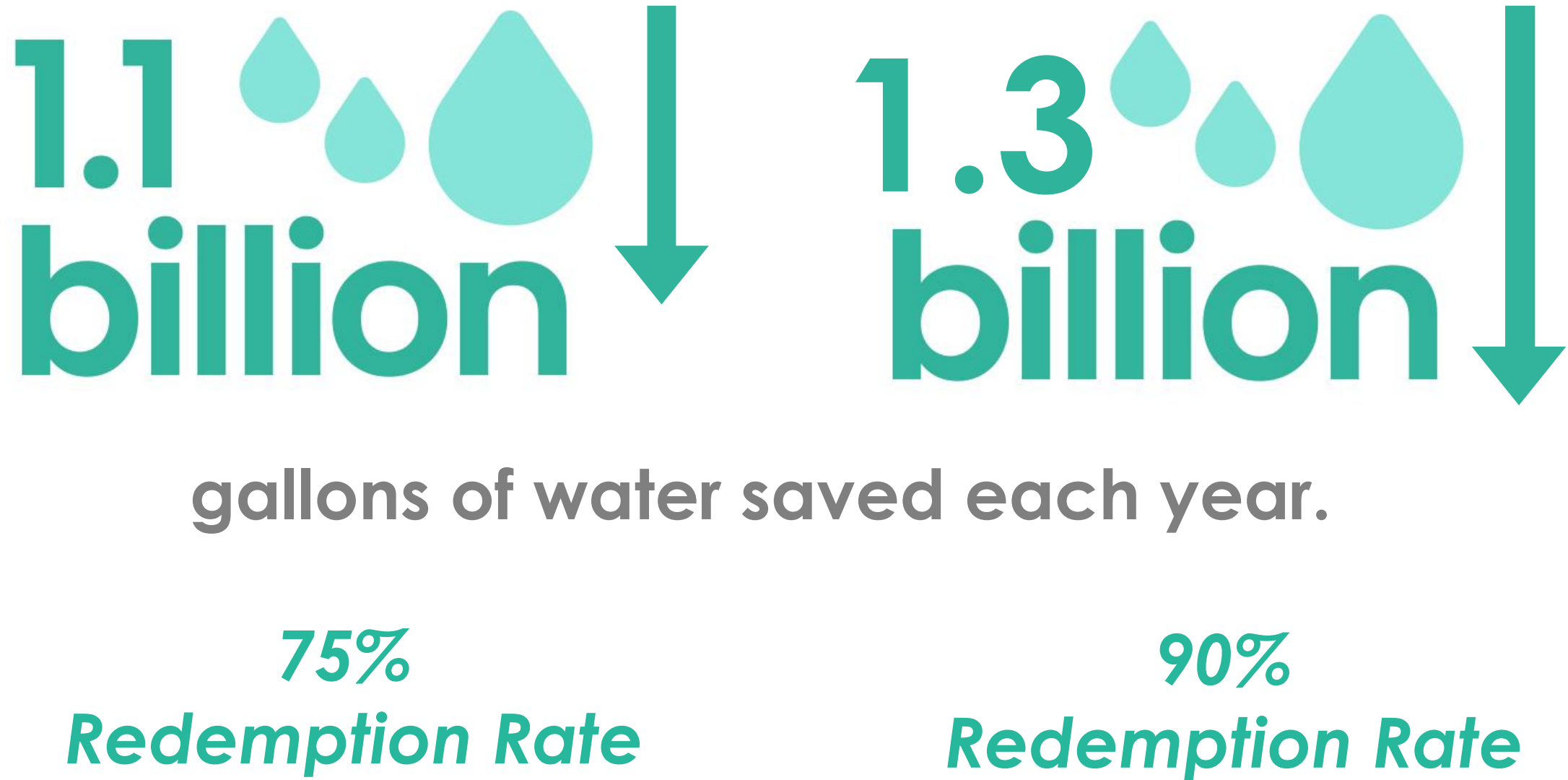
# Reuse could reduce water use by the equivalent of 11,000 California households.

Packaging water use of reusable containers is significantly lower than single-use glass and aluminum, and similar to single-use plastic.

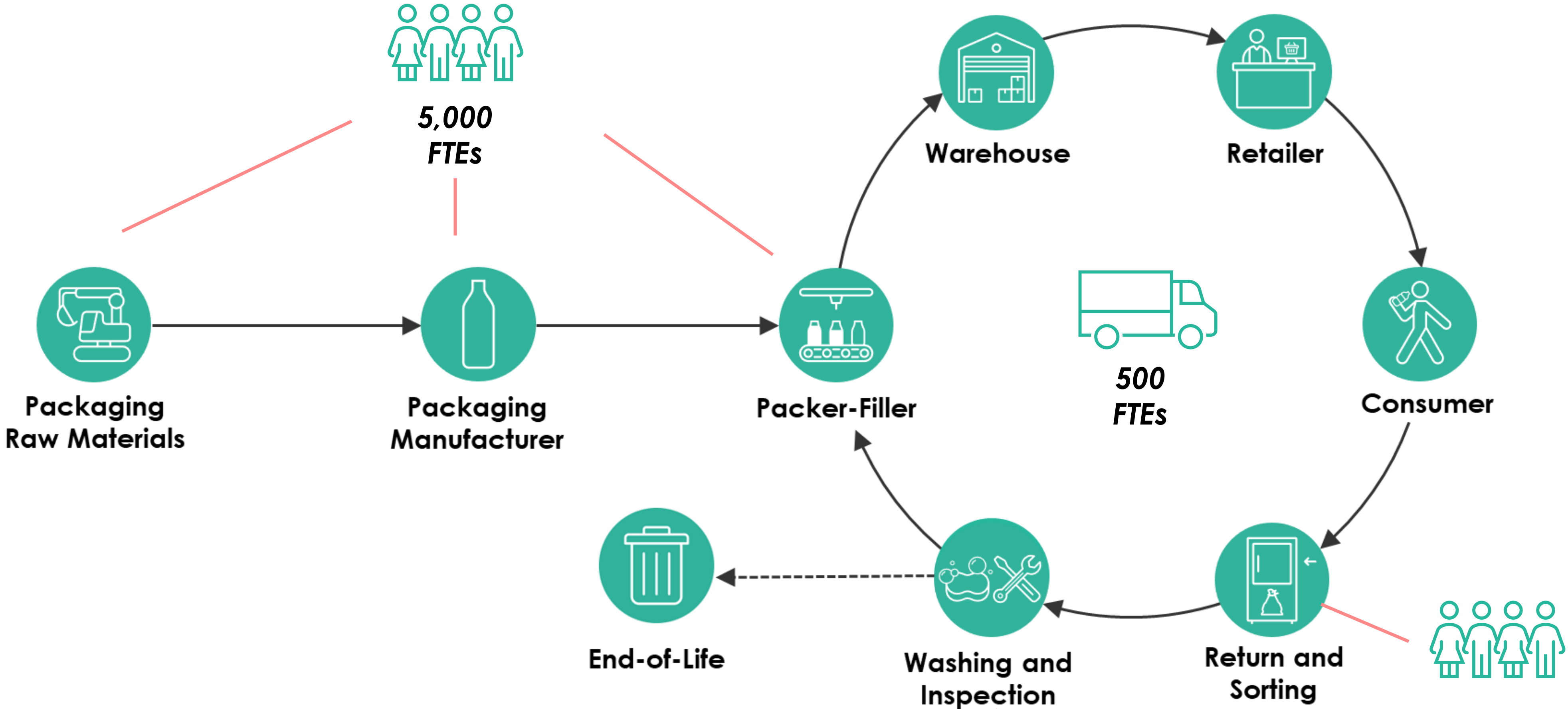


**Note:** the water used for reusable packaging is broken out by **water embodied in raw materials** and **water used in washing**

The water embodied in raw virgin and secondary packaging materials is significant.



# Reuse could create 11,800 green jobs in California.



FTE means full time equivalent

# The net cost of a 25% reusable beverage target is <1% of the California beverage industry's annual revenue.



Reuse will save companies money on raw materials and reduce end of life management costs.

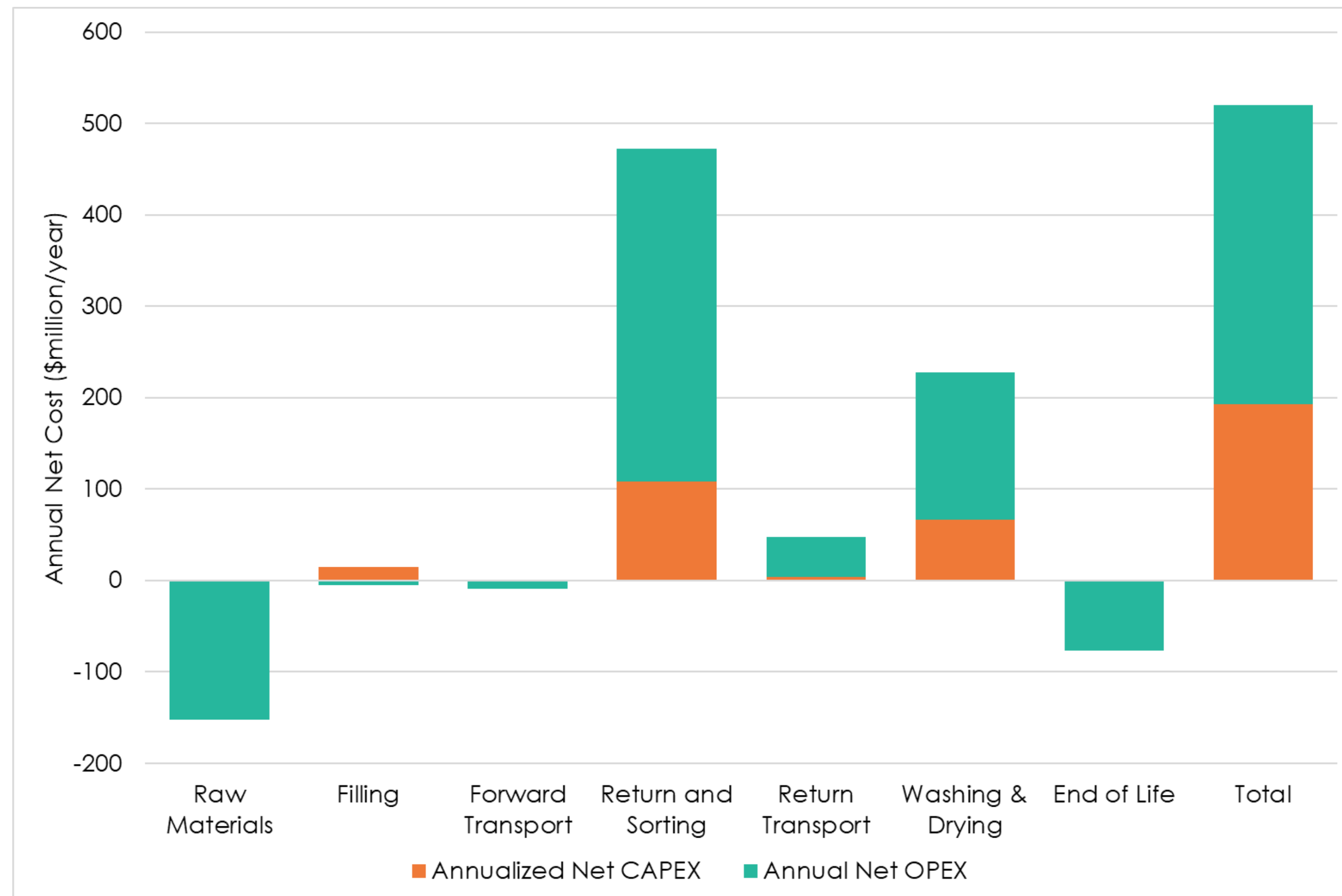


The return, sorting, and washing of reusable containers adds cost overall compared to single use.



However, the single-use system has had decades to become hyper-efficient. As reuse systems become more effective, costs are likely to fall beyond those shown here.

Total net annualized costs are driven by return, sorting and washing infrastructure



# The time for reuse is now.



Now is an opportune and fair time to implement a reusable beverage container system in California.



A 25% beverage container target within 12 years of legislation passing is ambitious but achievable.



A reusable beverage container program would yield environmental and economic benefits for California.



The total net cost of the system is <1% of California beverage industry's annual revenue.



**Thank You**

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## About Eunomia

Eunomia is an independent sustainability consultancy driven by a genuine passion to make a positive change to the clients we work with and the communities they operate in. Founded in 2001, we have been pioneers in the sector – early advocates for helping NGOs as well as leading public and private sector organisations in the UK and overseas to adapt their approach 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.

Each client is treated as an individual, with consultants taking the time to understand their objectives and how best we can support them. This personal service ensures a strong relationship is forged, based on honest and regular communication. It also ensures if these objectives change, there is the flexibility to adapt.

As an established leading independent consultancy, clients can have complete confidence that consultants will offer evidence-led solutions based on robust, impartial thinking that offer both pragmatic and positive outcomes.

## About 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.

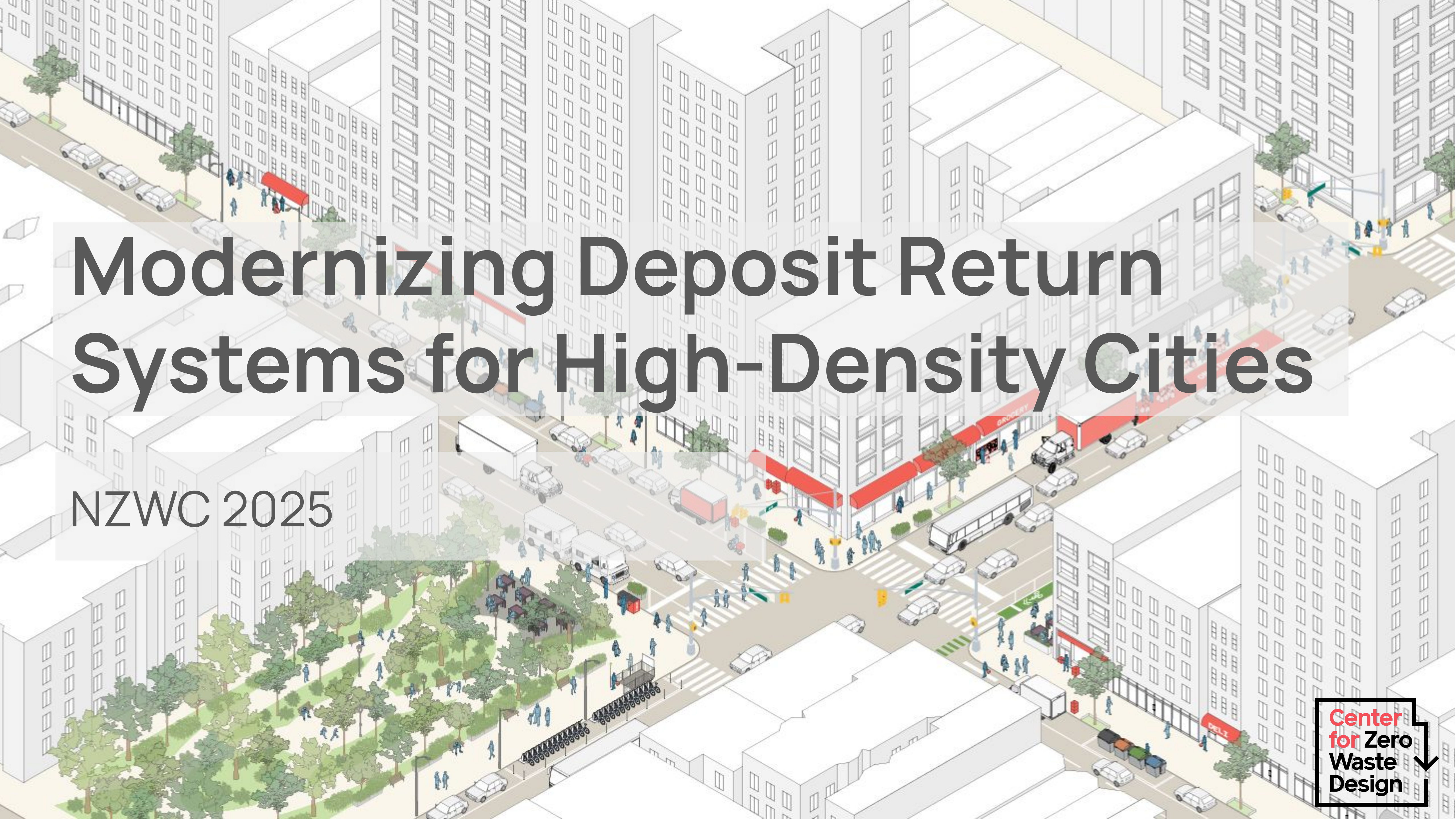
Our Community was instrumental in the passage of the federal Microbeads Free Waters Act of 2015 and we are among the founders of the global Break Free from Plastic movement.

## About 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.

## 11th Hour Project

This report was made possible with the support of the 11th Hour Project, a program of the Schmidt Family Foundation.



# Modernizing Deposit Return Systems for High-Density Cities

NZWC 2025

# Contents

1. Current vs Modernized DRS
2. Infrastructure Upgrades
3. DRS by Density
4. Return Point Matrix

In collaboration with: 

Waste is a design flaw.  
We develop circular  
strategies for cities.



We envision a future without  
garbage, where urban systems  
are woven into ecosystems.

# Current vs. Modernized Deposit Return System (DRS)

New York City's current  
deposit-return system is outdated  
and doesn't meet redeemers'  
needs.

New York City's current deposit-return system is outdated and doesn't meet redeemers' needs. It's:

1. Lacking convenient return points
2. Over reliant on manual labor
3. Requires a lot of storage space



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Independent recyclers, or “canners,” play a significant role in the city’s solid waste management by recovering redeemable containers for high-value recycling and diverting those materials from landfills, yet, they bear the brunt of the inadequacies of the system.



# NY Bigger Better Bottle Bill



**“A stronger bill will increase redemption rates, reduce litter, and support vulnerable New Yorkers, while protecting jobs and businesses” - Bottle Bill Coalition**

An updated bottle bill has been introduced to NY Senate and Assembly and is supported by a large coalition of environmental groups, small business owners, and concerned individuals who are all working to get the bill passed this year in Albany.



**10 cent deposit**



**All bottles included**



**Raise handling fee**



**Introduce refillables**

# Denmark's high-performing, highly accessible DRS



## RVMs and Pantstation, Copenhagen, DK

Denmark's DRS has one of the highest redemption rates in the world, over 92%, with highly accessible return points contributing to the system's success.

Consumers may return their containers through 3 methods: manual return to retail (ie. supermarkets), through RVMs, or at depots called "pantstation". 95% of all returns are collected through RVMs.

The pantstations make deposit returns more convenient and efficient, with bulk returns up to 100 containers at a time and electronic returns.

# Québec's Updated Bottle Bill Legislation



**Consignation Return Location, Montreal, QC**



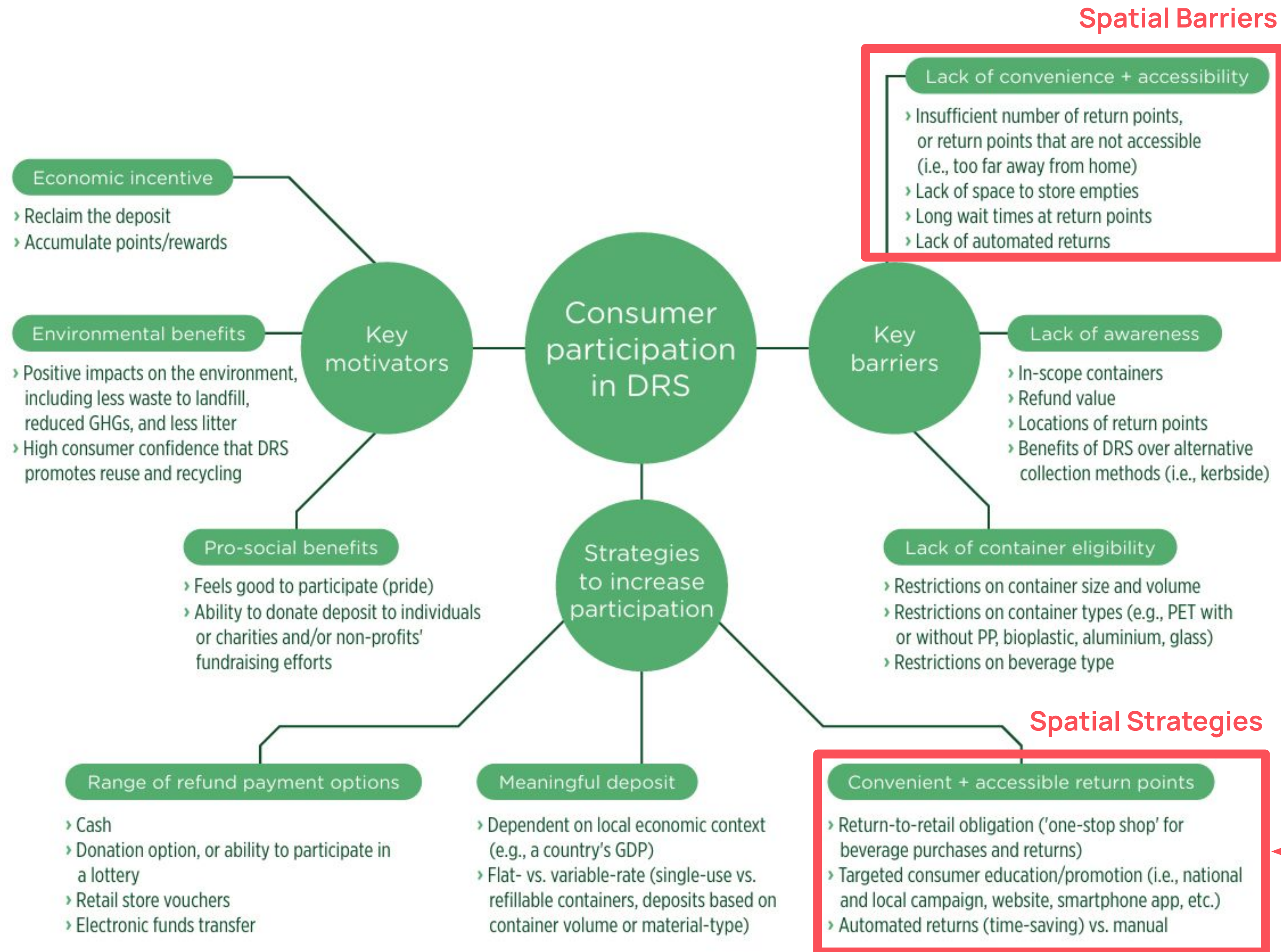
Last updated in 2022, Québec's Bottle Bill expanded to cover all aluminum and plastic beverage containers, while raising the deposit value to \$0.10 for all containers and \$0.25 for wine and spirits.

Name	Zone Consignation spaces	Consignation	Consignation+
Type of return site	Return points for redeemable beverage containers at retailers	Establishment dedicated exclusively to returns of redeemable beverage containers	Establishment dedicated exclusively to returns of redeemable beverage containers
Target user group(s)	Citizens	Citizens	Citizens, industrial, commercial and institutional (ICI) customers, establishments offering on-site consumption
Opening hours	Same as the retailer's	Monday, Tuesday, Wednesday, Saturday and Sunday, 8 a.m. to 6 p.m. Thursday and Friday, 8 a.m. to 7 p.m.	
Shared features	Return sites: – Easy to locate and clearly identified with the Consignation brand colours – Air-conditioned – Accessible by persons with reduced mobility		
Services available	– Single-unit returns: next-generation reverse vending machines	– Single-unit returns: next-generation reverse vending machines – Express returns: bag drop of unsorted containers	– Single-unit returns: next-generation reverse vending machines – Express returns: bag drop of unsorted containers – Bulk returns: drop-off of very large quantities of unsorted containers
Location	At participating retailers	Return sites will be located less than 1 km from a targeted retailer, except in the case of a grouping.* All return sites will be easily accessible and located along the most common grocery-shopping routes.	
Description of equipment	– Next-generation reverse vending machines that crush glass and compact other materials: aluminum, plastic and multi-layer carton	– Next-generation reverse vending machines	– Next-generation reverse vending machines – Conveyor and high-efficiency machine that sorts and counts containers – High-efficiency machine that sorts and counts hundreds of containers in minutes
Volumes	Small volumes: fewer than 2.5 million containers/year	Medium volumes: 2.5 to 7 million containers/year	Large volumes: more than 10 million containers/year

Consignation is the official DRS brand, promoting the recovery of returnable beverage containers and facilitating access to various recovery infrastructures.

Source: Bottle Bill Resource Guide, "Modernized Deposit-Refund" Quebec Ministry of Environment

# Spatial Implications of Modern DRS



CfZWD's scope of work focuses on the **citywide spatial implications for a modernized DRS**, achieving 90% redemption

In New York City, as well as other high density cities, we face an infrastructural challenge.

Every year, **11.6 billion** containers go on the market in NYC.

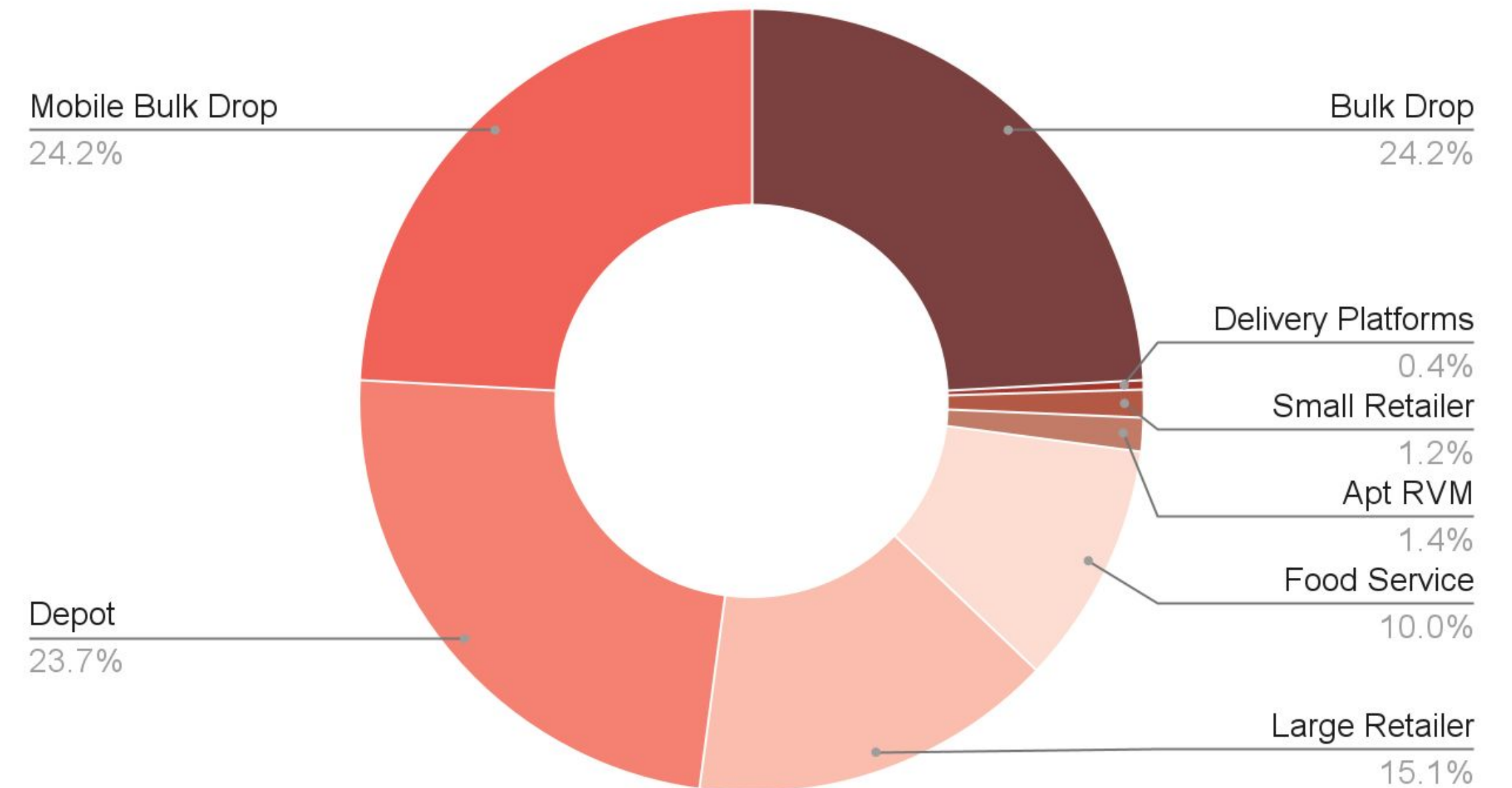
Our current DRS collects **3.4 billion** containers annually, roughly 34%.

If we ramp up to a 90% redemption rate, the city would experience a **385% increase** in materials.

Where can we fit this expanded infrastructure and manage the increased volume of containers?

# Modernized DRS for high density

1. Reduce burden on retailers, especially small retailers who have limited space
2. Expand network of collection points to include reverse logistics from food service businesses and delivery platforms
3. Increase convenience, compaction, and reduce storage area with latest RVM technology
4. Use mobile return points in high density neighborhoods



**Containers Collected by Return Point**

Compaction is an essential component of a modernized system in high-density cities.



vs.



In New York City, mobile bulk redemption **without compaction** would require approximately **>160** full trucks per day

**20** full trucks **with compaction**

Bottles and glass have a compaction rate of **8:1** when flattened and crushed



NYC depots would need **8x** more space to accommodate uncompacted bottles vs. compacted bottles

# Return Point Types - Low Volume

Delivery Platforms



**Redemption Scenario:**  
Consumers using delivery platforms can return containers when receiving grocery deliveries through reverse logistics.

**Target Redeemer:**  
Consumers

Small Retailers



**Redemption Scenario:**  
Consumers manually return a low volume of containers to small retailers

**Target Redeemer:**  
Consumers

Apartment RVM



**Redemption Scenario:**  
Consumers living in large apartment buildings have RVMs for resident use

**Target Redeemer:**  
Apartment Residents

Public Space Bins



**Redemption Scenario:**  
Consumers dispose containers in recycling public space bins, with accessible door for canners to pull for redemption.

**Target Redeemer:**  
Canners

# Return Point Types - High Volume

Food Service Business



**Redemption Scenario:**  
Businesses generate high volumes of containers consumed on-premise and can return some through reverse delivery logistics

**Target Redeemer:**  
Business Owners

Large Retailers



**Redemption Scenario:**  
Consumers return a high volumes of containers to large retailers through RVMs with automated sorting, counting, and compacting

**Target Redeemer:**  
Consumers  
Canners

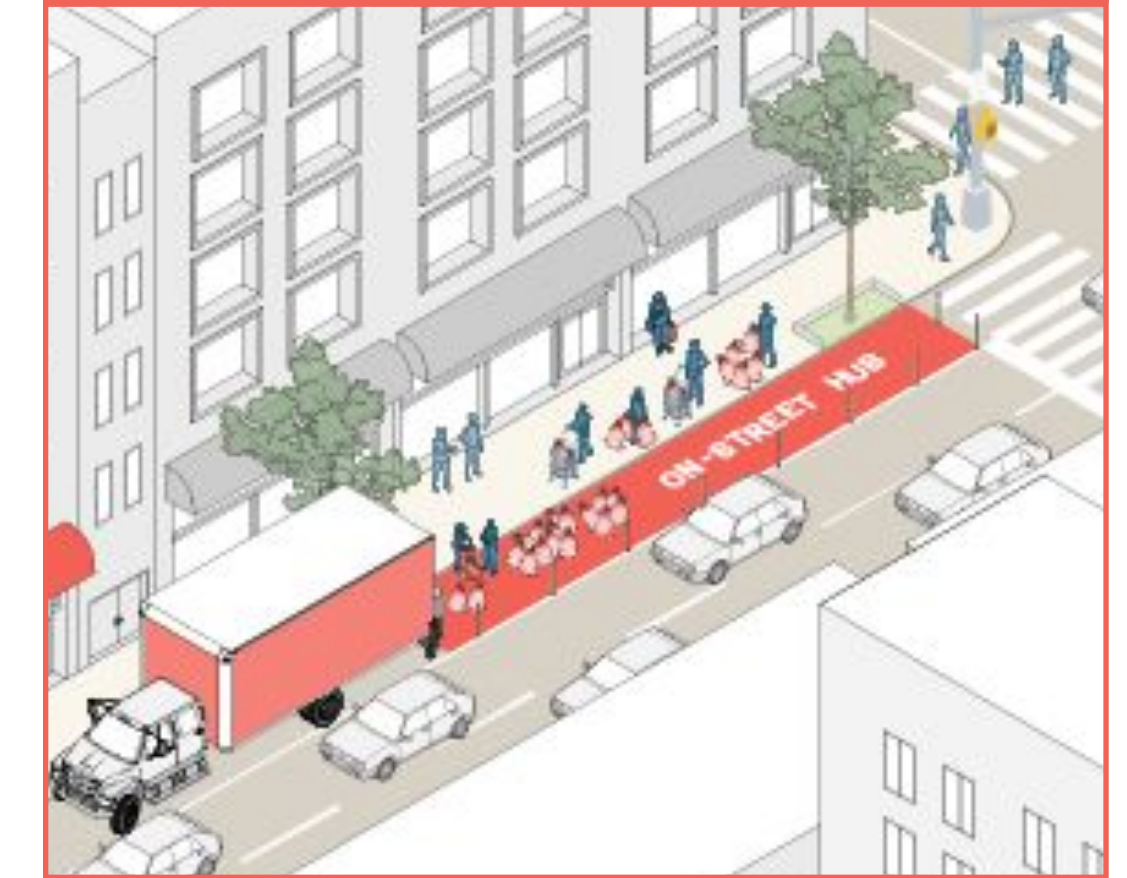
Depot / Redemption Center



**Redemption Scenario:**  
Redeemers can return high volumes of containers through RVMs in dedicated redemption facilities

**Target Redeemer:**  
Consumers  
Canners  
Commercial Haulers

Mobile Bulk Drop



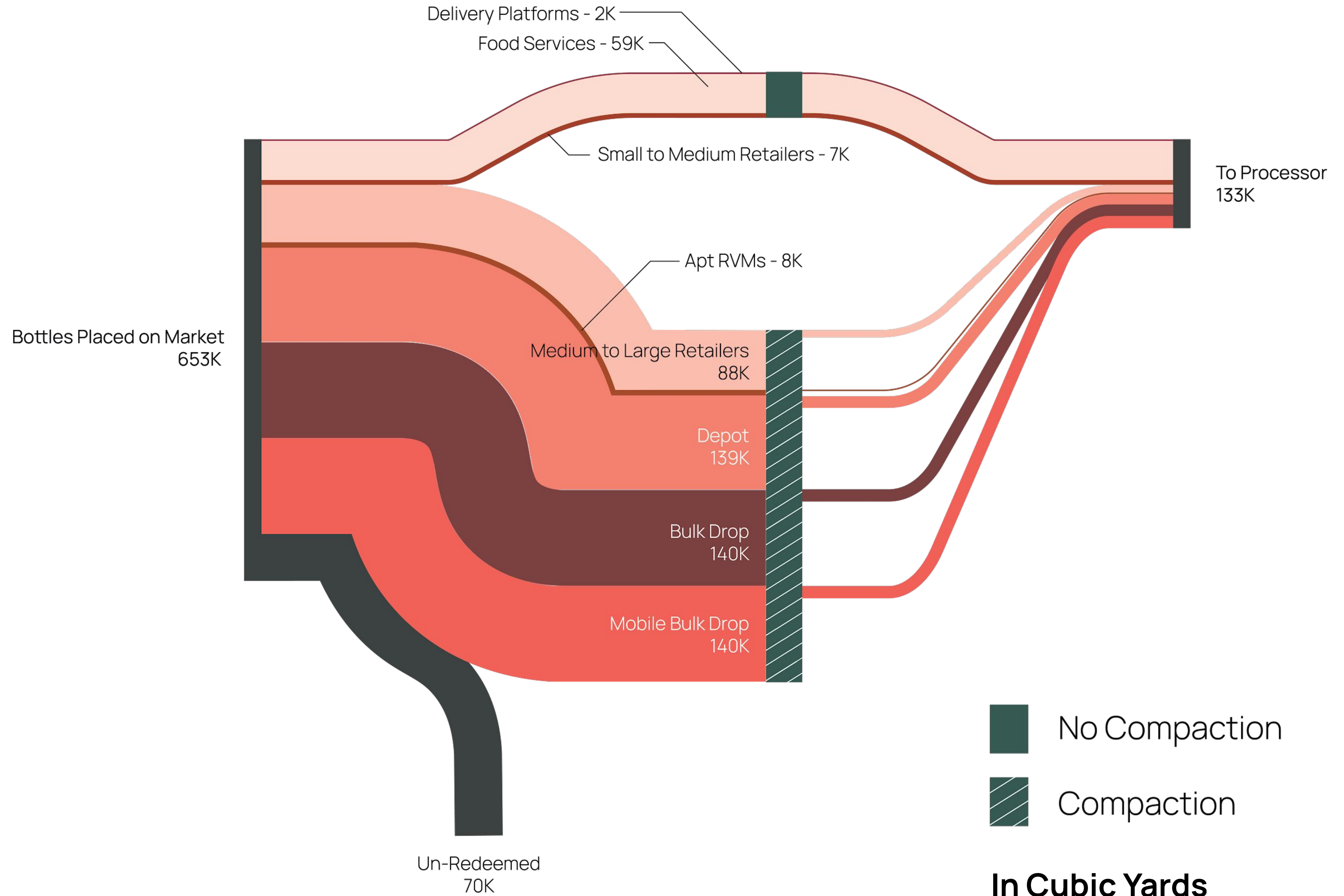
**Redemption Scenario:**  
Mobile bulk return allows canners to return high volumes of containers in on-street microhubs

**Target Redeemer:**  
Canners  
Consumers

Volume outputs are **a quarter the size** of the inputs

Retailers process **sixteen percent** of all containers

Bulk return sites process **over eighty percent** of all containers



■ No Compaction  
▨ Compaction

**In Cubic Yards**

# Infrastructure of a Modernized DRS

# High-Volume Reverse Vending Machines



Tomra R1

- Processes 100 containers/minute
- Accepts bottles, cans (bag drop)
- Accepts bottles, cans, and glass (single-feed)



Envipco Quantum

- Processes 120 containers/minute
- Accepts bottles and cans



Machinex Modular RVM

- Processes 60 containers/minute
- Accepts bottles, cans, cartons, and glass (in a dedicated chamber)

# Bulk Redemption



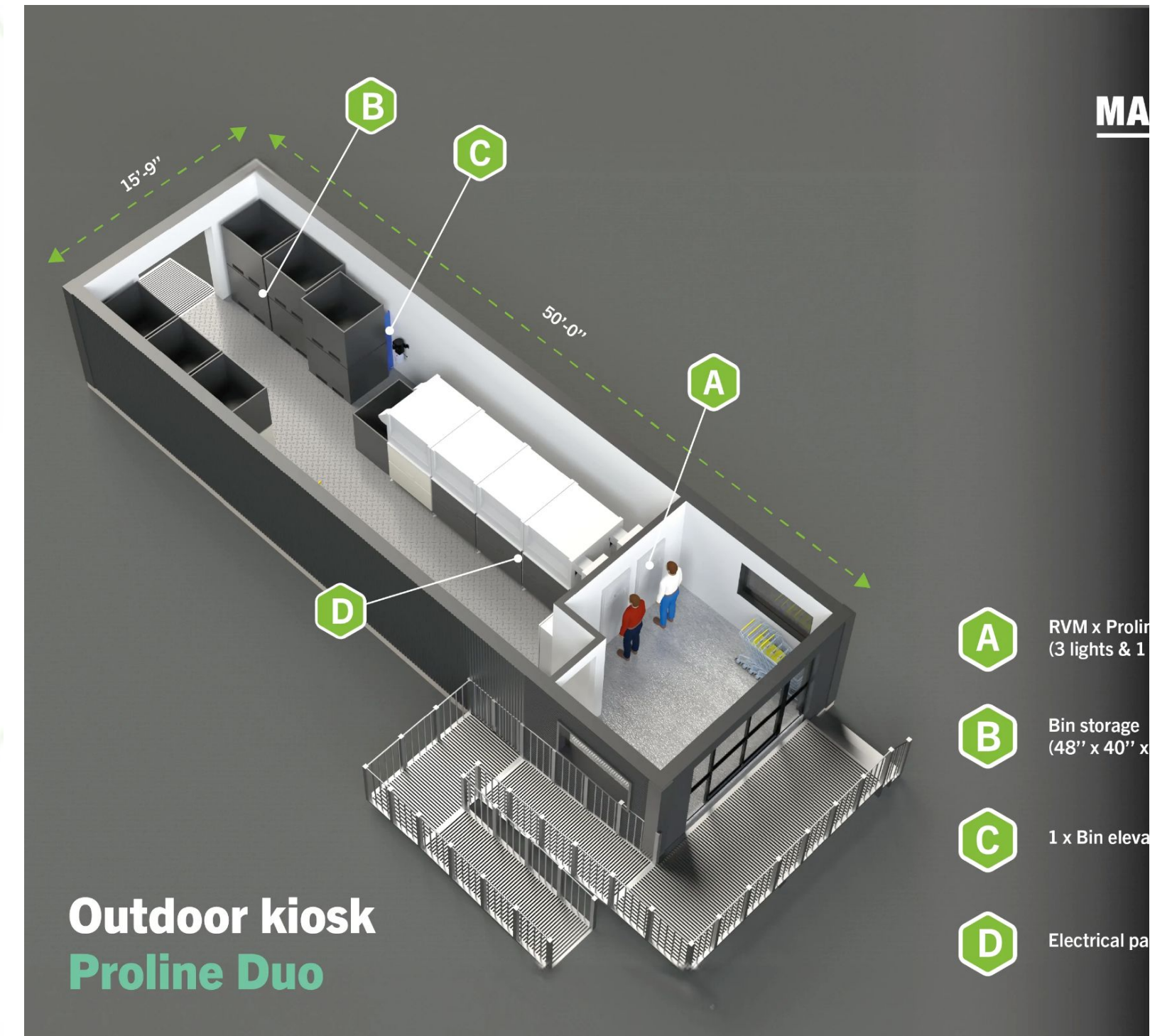
RecycleTek

- Mobile solution



RecycleTek

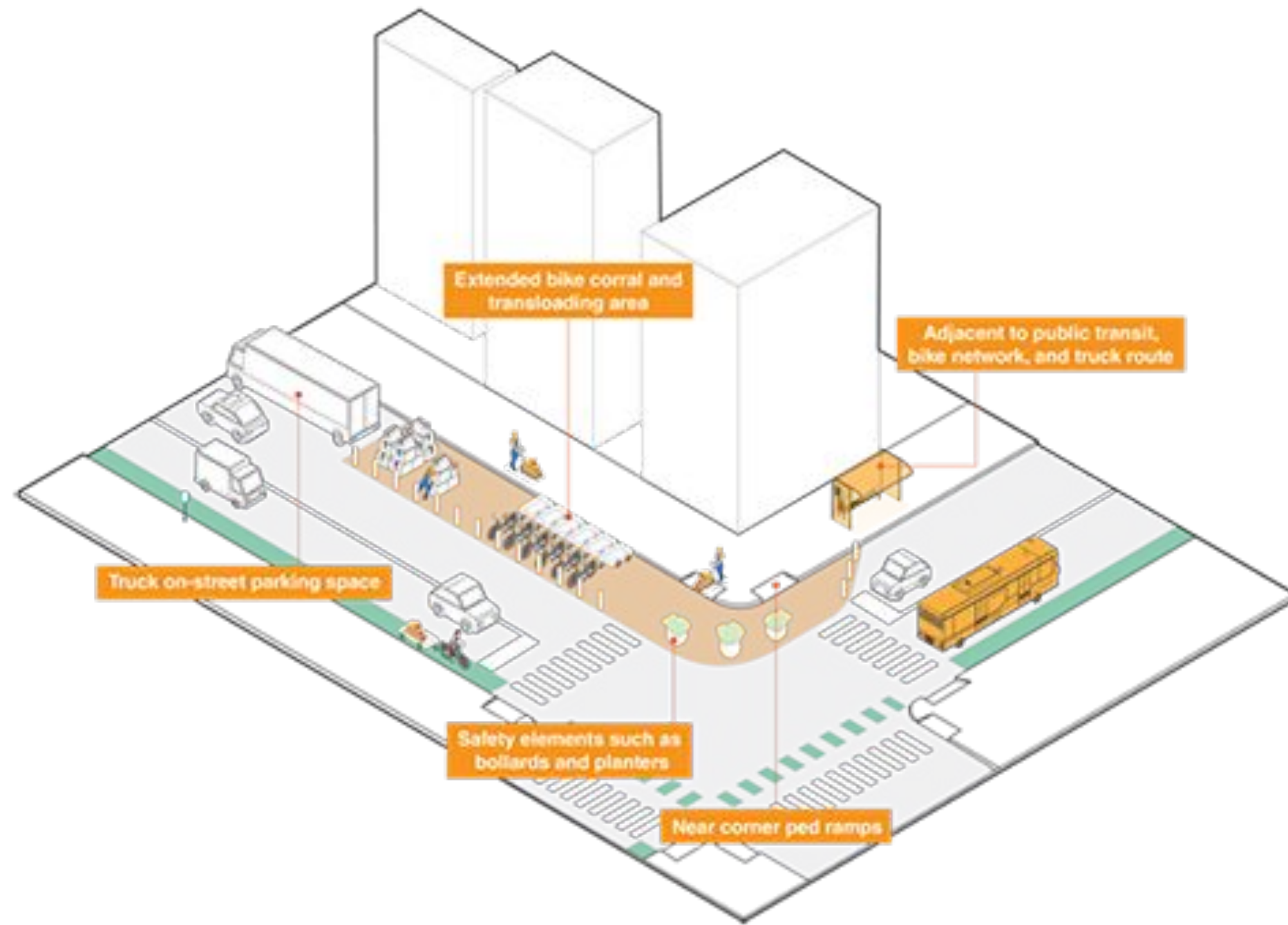
- Stationary kiosk solution



MachineX

- Stationary kiosk solution

# NYC Department of Transportation's Micro-hubs



Design of mobile bulk redemption can be integrated with DOT's Micro-hubs



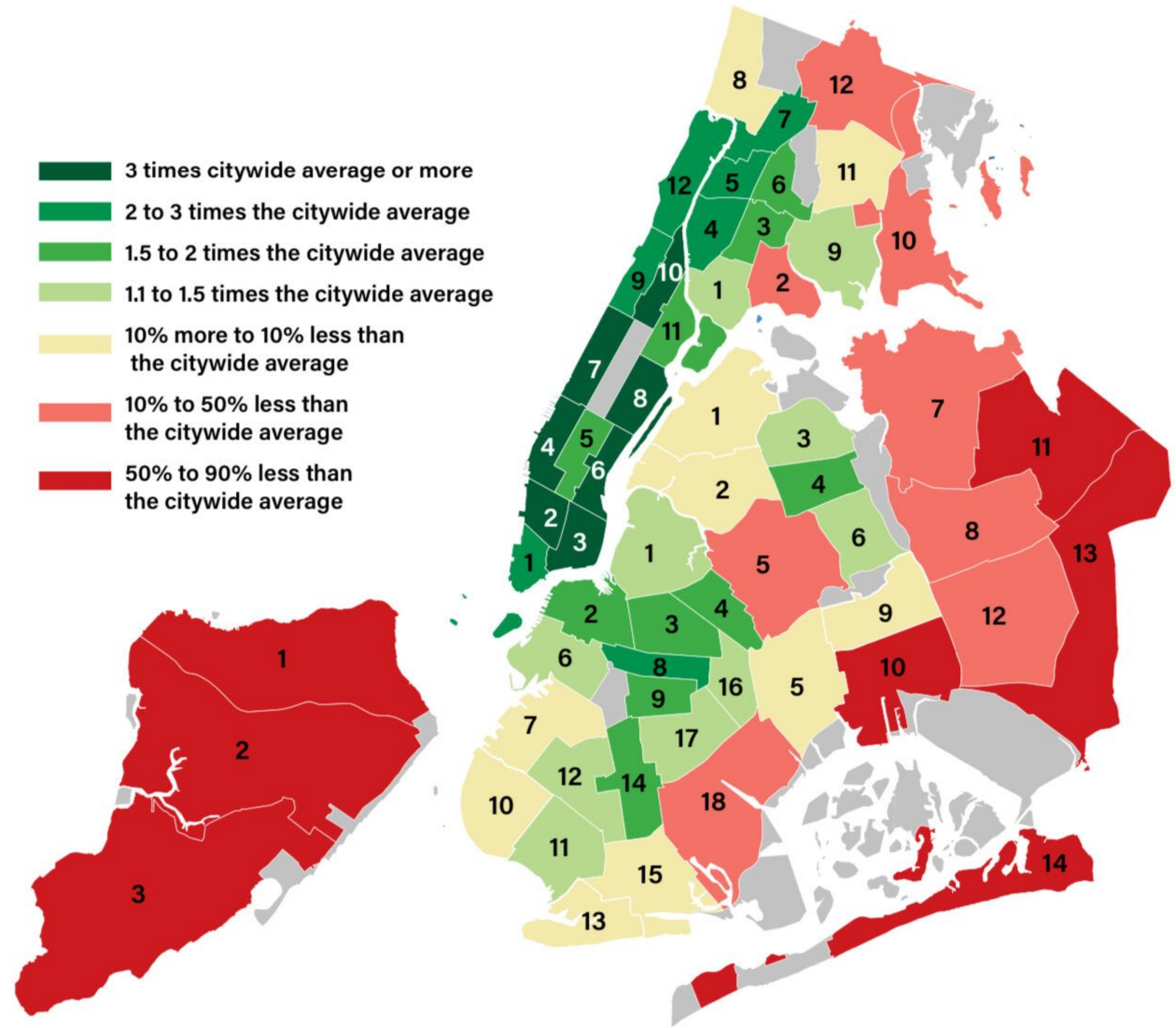
A new micro-hub launching at Amsterdam Avenue and West 85th Street on the Upper West Side. Credit: NYC DOT

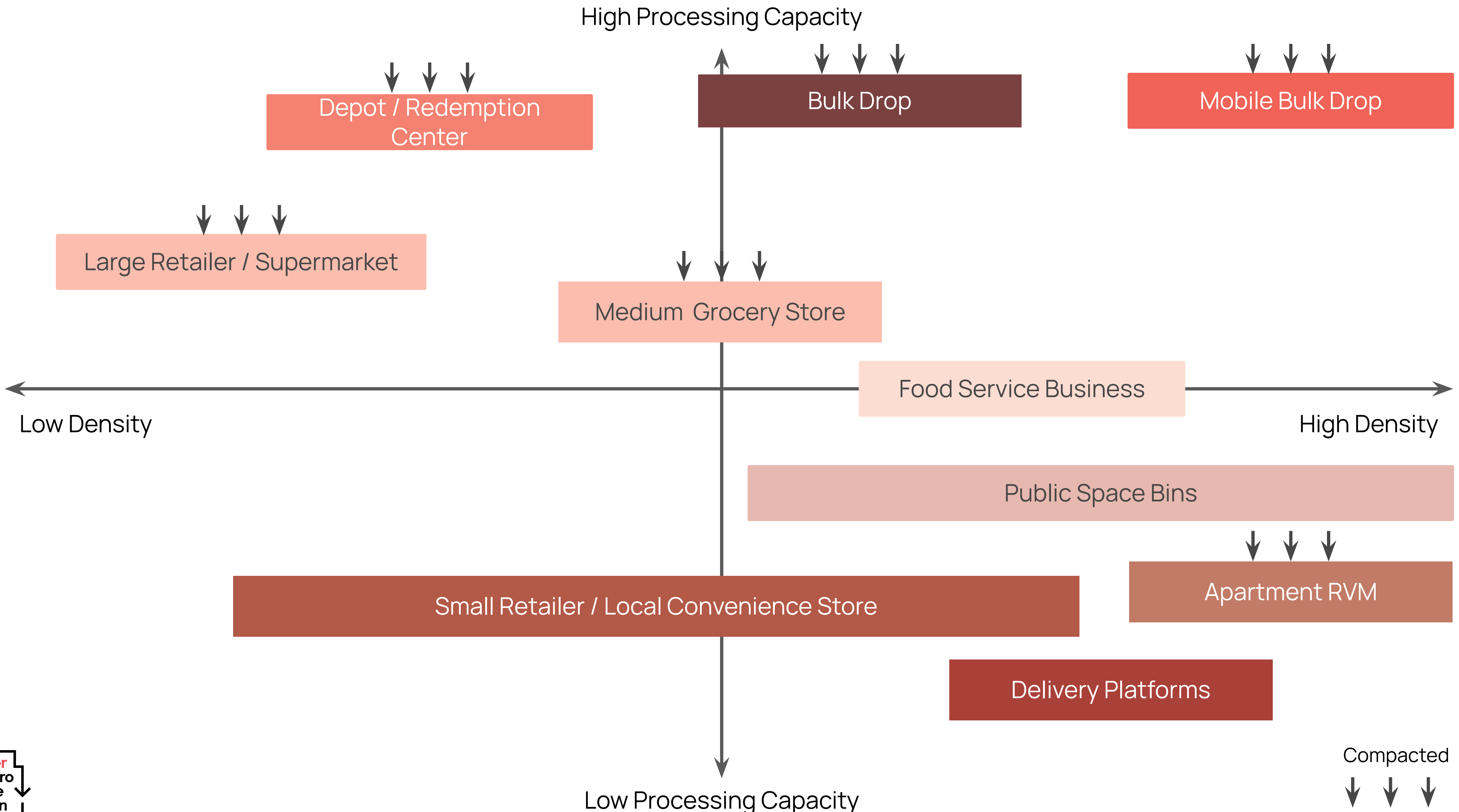
DRS by Density

# Housing Density by Community Board

NYC Population Density 2020

- 3 times citywide average or more
- 2 to 3 times the citywide average
- 1.5 to 2 times the citywide average
- 1.1 to 1.5 times the citywide average
- 10% more to 10% less than the citywide average
- 10% to 50% less than the citywide average
- 50% to 90% less than the citywide average








DRS IN LOW DENSITY NEIGHBORHOOD



Return Point Types  
Average per 1/2 sq mi:

- Retailers  
2 SF Varies
- Depot / Redemption Center  
1
- ★ Food Service Business
- Reverse Logistics

Processing Volumes  
(redeemed per month)

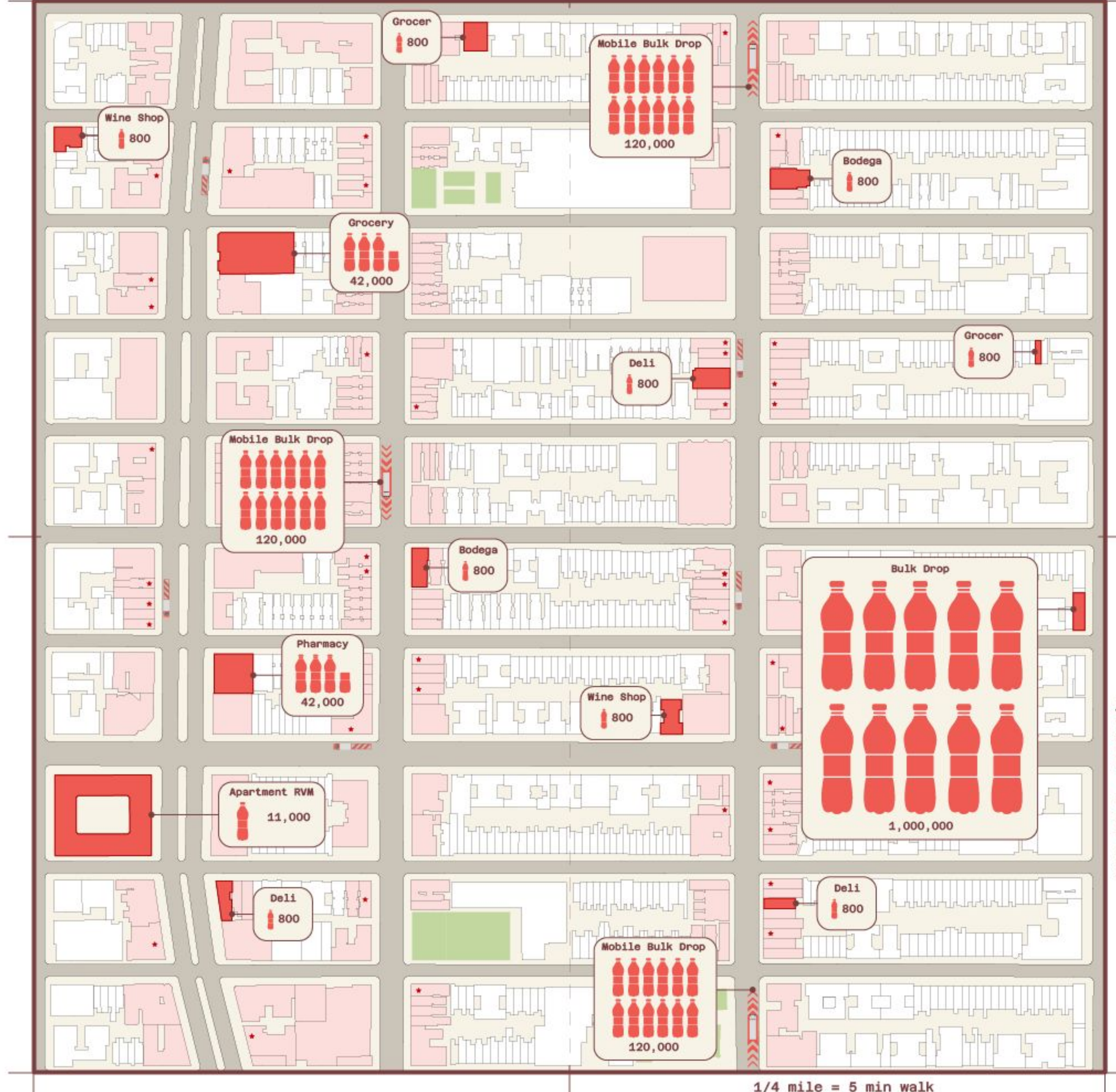
-  = ± 100,000 beverage containers
-  = ± 10,000 beverage containers
-  = ± 1,000 beverage containers

- Zoning Districts
- Commercial District
  - Residence District
  - Parks

1/4 mile = 5 min walk

1/4 mile = 5 min walk

# DRS IN HIGH DENSITY NEIGHBORHOOD



Return Point Types  
Average per 1/2 sq mi:

Retailers  
**12** SF Varies

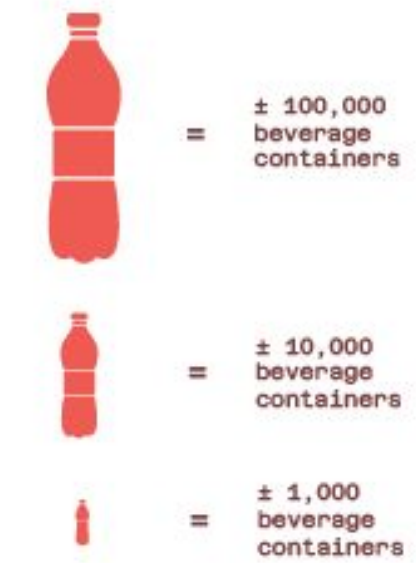
Apartment RVM  
**1** 193+ Units

Mobile Bulk Drop  
**3** approx. every 10 blocks along 3 commercial avenues

★ Food Service Business

Reverse Logistics

Processing Volumes  
(redeemed per month)



Zoning Districts



1/4 mile = 5 min walk

1/4 mile = 5 min walk

# Modernized DRS

**BULK** Mobile solution minimizes strain on retail locations

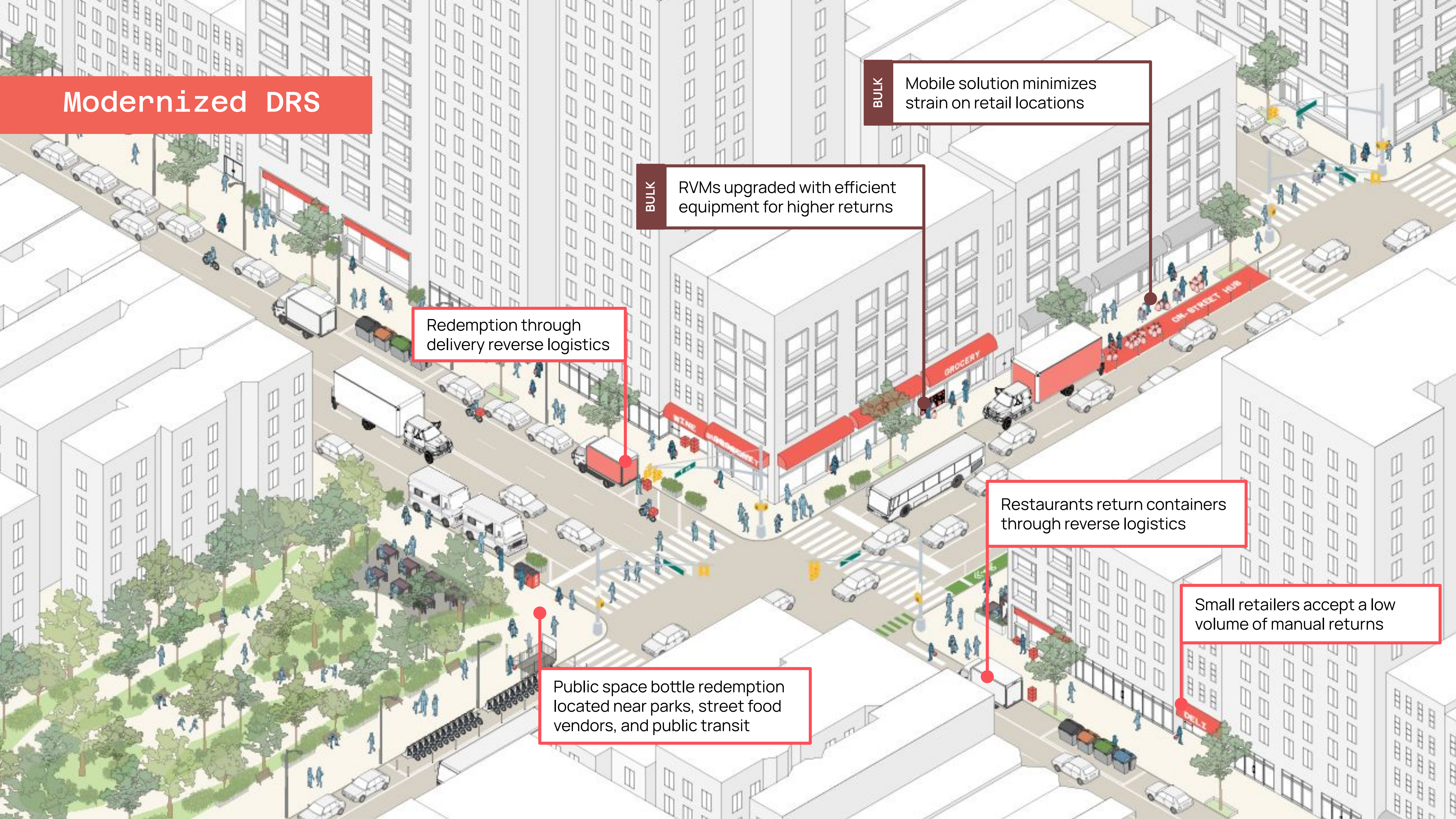
**BULK** RVMs upgraded with efficient equipment for higher returns

Redemption through delivery reverse logistics

Restaurants return containers through reverse logistics

Small retailers accept a low volume of manual returns

Public space bottle redemption located near parks, street food vendors, and public transit



**Return Point Matrix**

# Return Point Matrix

Performance grading:

LOW	MEDIUM	HIGH
-----	--------	------

Return Point Types		Services Available	Target Redeemer	Compaction	Processing Capacity (per location)	Costs	Space Reqs	Access	Suitable Neighborhood Density	Number of Locations Citywide	Bottles Processed/Day /Location
Retailer	Small	- Manual returns	Residents	No	<2,000 containers/month	\$	High	Per retailer operating hours	Med - High	4,444	100
	Small - Medium	- Manual returns - Single-unit returns: reverse vending machines	Residents	Manual - No RVM - Yes		\$-\$	Medium	Per retailer operating hours	All		
	Medium	- Single-unit returns: reverse vending machines - Express returns: bag drop of unsorted containers	Residents Small retailers	Yes	Approx. 120,000 containers/month	\$	Medium	Per retailer operating hours	All		
	Large	- Express returns: bag drop of unsorted containers - Bulk returns: drop-off of large quantities of unsorted containers	Canners Small retailers Building managers	Yes		\$	High	Per retailer operating hours	Low - Med	1,099	3,895
Delivery Platform	At-home Grocery delivery	-Reverse logistics: returns exchanged upon grocery delivery by delivery courier	Residents	No	Approx. 300,000 containers/month	\$	Low	Per platform operating hours	All	—	1,070,027
Food Service Business	Food and Beverage Service Restaurant	-Reverse logistics: returns exchanged upon grocery delivery by delivery courier	Restaurant owners Commercial haulers	No	Approx. 7,000 containers/month	\$	Medium	Per business operating hours	All	17,619	323

# Return Point Matrix

Performance grading:



Return Point Types		Services Available	Target Redeemer	Compaction	Processing Capacity (per location)	Costs	Space Reqs	Access	Suitable Neighborhood Density	Number of Locations Citywide	Bottles Processed/Day /Location
Apartment RVM	≥193 units	- Single-unit returns: reverse vending machines	Residents	Yes	Approx. 30,000 containers/month	\$\$	Medium	24-hour access, for residents only	High	368	1,052
	Stationary	- Bulk returns: drop-off of large quantities of unsorted containers	Residents Canners Small retailers	Yes	Approx. 9,000,000 containers/month	\$\$	Medium	24-hour access	Low - Med	50	48,928
Bulk Drop	Mobile	- Bulk returns: drop-off of large quantities of unsorted containers	Canners Building Mgmt Commercial haulers	Yes	Approx. 10,000,000 containers/month	\$	Low	Per truck pickup schedule	Med - High	133	55,044
Depots/ Redemption Centers	Regular	- Express returns: bag drop of unsorted containers - Bulk returns: drop-off of large quantities of unsorted containers	Canners Small retailers Building Mgmt	Yes	Approx. 3,000,000 containers/month	\$\$	Medium	Per depot operating hours	All	68	99,404