2023 Campus Race to Zero Waste Case Study
Harvard University

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Focus of Case study:
Harvard GSD's Zero Waste Project consolidated unmarked bins into zones at campus events to improve diversion rates, reduce contamination, and initiate a discourse on waste.

Detailed description of campaign or effort:

The GSD Zero Waste Project is a student-led pilot program that challenges wasteful practices in design schools by leveraging new infrastructure to influence behavior change. The Zero Waste Project was born out of Harvard University's Graduate School of Design (GSD), a 900-person graduate program with seven master's and doctoral programs. The GSD is particularly poised to test new approaches to waste infrastructure given its innovative community of designers, fabrication lab, and production capability to prototype ideas. While broader project tackles waste GSD-wide, this case study is about the impact of consolidating free-standing and unmarked waste bins into zones at campus events to dramatically improve diversion rates, reduce contamination, and create conversations around waste.

The Zero Waste Project proposed testing concepts to reinvent waste infrastructure at weekly GSD events. The pilot program used the weekly happy hour, Beer & Dogs, as its testing ground. Beer & Dogs is a longstanding student-run happy hour popularly attended by over 400 students per event. The project also partnered with GSD Building Services to understand prior waste reduction efforts and the limitations of the existing infrastructure.

Beer & Dogs historically managed waste by placing 96-gallon Toter bins throughout the GSD's Backyard. The Toter bins lacked adequate signage and had unconstrained openings resulting in nearly everything being sent to the landfill. This equated to roughly 800 aluminum cans, 50 pounds of paper, and 10 gallons of liquid at each event. The Zero Waste Project built four zero-waste zones using found materials and custom signage. The first zones were created in October 2022 using five 23-gallon Rubbermaid bins, interlocking plastic carts, scrap lumber, and leftover foam core for signage. Lids were designed to cover the recycling and compost bin openings, and a custom 8-inch funnel "pour zone" was Computer Numerical Control (CNC) milled for collecting liquid waste.

The zero waste zones immediately impacted Beer & Dog's footprint. Waste to landfill dropped by 70% at the first event, and nearly 7 gallons of discarded liquid were diverted from landfill and recycling streams. The second phase of the pilot occurred in February 2023. The initial zones built in the Fall evolved into CNC-milled plywood

cabinets used at all GSD events. These rolling zones contain a modulating counter surface to distinguish each waste stream, helping reduce contamination and waste sent to landfill by over 90%. Testing design-influenced waste infrastructure modifications, like custom openings and signage, have supported broader zero-waste efforts at Harvard University.

Planning steps & timeline to implement:

Pre-Event Planning

- Examine waste infrastructure challenges at the GSD's weekly happy hour, Beer & Dogs.
- Liaise with event coordinators to understand event goals and limitations.
- Estimate waste capacity needed at each 400–500-person event.
- Work with GSD Custodial and Building Services to find existing waste bins and other materials to construct the event waste carts.
- Construct four waste carts containing five leftover 23-gallon Slim-Jim waste bins, rolling carts, and scrap wood and foam core.
- Purchase green Busch lift lids for compost bins.
- Reuse blue circle-cut Busch lid for recycling bins.
- Design custom signage with imagery specific to the food and beverage items served at the event.
- Plot print waste cart signage 60" x 14" and cut to size.
- Draft a floorplan for GSD Building Services denoting the locations of the four waste carts in well-lit, central areas to facilitate set-up.

Day of Event

- Roll out four waste carts before the event.
- Monitor waste streams during the event for overflow.
- Roll waste carts together in areas that are high-traffic or at risk of overflowing.
- Ensure all waste streams (except landfills) have corresponding lids to reduce contamination.
- At the end of the event, perform a visual waste audit of one of the waste carts to understand commonly misplaced materials.
- Measure liquid waste and dispose of it down the drain.

Post-Event

- Alter signage based on findings of waste audit if necessary.
- Track behavior patterns to inform the design of revised waste carts.

Resources and stakeholders involved:

The GSD's Zero Waste Cart and waste tracking system utilized various in-kind campus resources and purchased items.

<u>Zero Waste Cart Budget:</u>

Specified budget for the V4 Zero Waste Cart

Item	Cost	Reused / New
N10 Plastic Screws	$11	New
Concealed Hinges	$68	New
Wood Screws 3/8"	$7	Reused from the GSD Fabrication Lab

Self-Tapping Screws 3/8"	$11	Reused from the GSD Fabrication Lab
Corner Brackets for Lids	$32	New
Metal Funnel	$13	New
White Acrylic for Signage	$13	Reused from the GSD Fabrication Lab
Caster Wheels	$265	New
Bolts	$9	New
Flat Washers	$7	New
Lock Washers	$24	New
Nuts	$6	New
3/4" Plywood	$85	50% reused from the GSD Fabrication Lab, 50% new
1/2" Plywood	$0	50% reused from the GSD Fabrication Lab, 50% new
3/4" HDPE	$104	Purchased new due CNC requirements, but is 100% recoverable
1/2" HDPE	$122	Purchased new due CNC requirements, but is 100% recoverable
Rubbermaid 6.4-Gal Bin	$12	New
Rubbermaid 23-Gal Bin	$248	Reused from building services
Purell Hand Sanitizer Unit	$34	Reused from building services
TOTAL: ZW Cart (V4)*	**$823**	**Excludes reused items*
ZW Cart (V3)	$700	
ZW Cart (V2)	$550	
ZW Cart (V1)*	$14	**Excludes reused items*

Other Resources:

1. Graphic Design
    a. Gathering and editing of imagery of items commonly served at GSD events.
    b. Designing visually cohesive signage using Adobe InDesign and Illustrator.
    c. Plotted paper sign: $14
    d. Adhesives for signage: $10
2. Labor
    a. The GSD Zero Waste Project relied on GSD FabLab interns to help manufacture and construct each waste cart.
        i. V 1: 3 Hours to build
        ii. V 2: 20 Hours to build
        iii. V 3: 60 hours to build
        iv. V 4: 50 hours to build

Describe the Results of this campaign component:

General results: The Zero Waste Project has the full backing of the Dean of the Graduate School of Design, Sarah Whiting.

- The Zero Waste Carts have received high praise from Harvard's Custodial Services, who have requested the design be shared campus-wide for use at other waste-intensive events.

- The majority of the GSD's 900+ person student body is aware of the Zero Waste Project. Four waste-related pop-up projects and gallery exhibitions in the Spring of 2023 occurred as a direct result of the project and the Zero Waste Carts. This included a plastic bag installation, a collection of trace-paper drawings stitched together, and an exploration into the material afterlives of physical models.
- The GSD Zero Waste Project and the Zero Waste Event Carts are part of a broader collaboration between the GSD's sustainability efforts and Harvard's overall climate agenda. Harvard University is working to develop a strategic Zero Waste plan by 2024. This partnership hopes to funnel findings on waste behavior patterns to the Office for Sustainability and other actors at Harvard to improve its zero-waste efforts.

Specific measurable impact:

- The average waste diversion rate at Beer & Dogs since implementing the Zero Waste Carts is 95% diverted from landfill (92% Recycle, 5% Landfill, 3% Compost). These values are based on weights measured after each event using the scale system specifically designed to help estimate the GSD's waste footprint.
- Recycling contamination dropped by almost 100%. Before the Zero Waste Carts, nearly 90% of all waste generated at Beer & Dogs was sent to landfills due to liquids, food waste, and trash contaminating recyclables.
- ~6 to 10 gallons of liquid waste is diverted from landfill and recycling streams at each event.
- An adjoining social media campaign about zero waste at Beer & Dogs reached an audience of over 1,000 people with nearly 50 direct engagements.
- An estimated 300 – 500 students interacted with the Zero Waste Carts each Friday.

What would you do differently in the future?

1. Place a higher emphasis on designing flexible and adaptive waste infrastructure. Events at the GSD are highly variable. Versions 3.0 and 4.0 of the waste carts were aesthetically pleasing and durable, but they lacked the flexibility to expand the waste capacity of each stream at a moment's notice.
2. Use images on waste-related signage that depict the actual item being thrown away. At the GSD's Commencement, signage on the carts had imagery that mirrored what was being served, and contamination was dramatically reduced.
3. Establish the behind-the-scenes infrastructure and framework for zero-waste events before investing in front-of-house infrastructure. It took five months for the pilot to set up a zero-waste measurement zone to benchmark progress.
4. Create a zero-waste purchasing guide for events to reduce potential contamination and streamline the types of disposables used at each event.

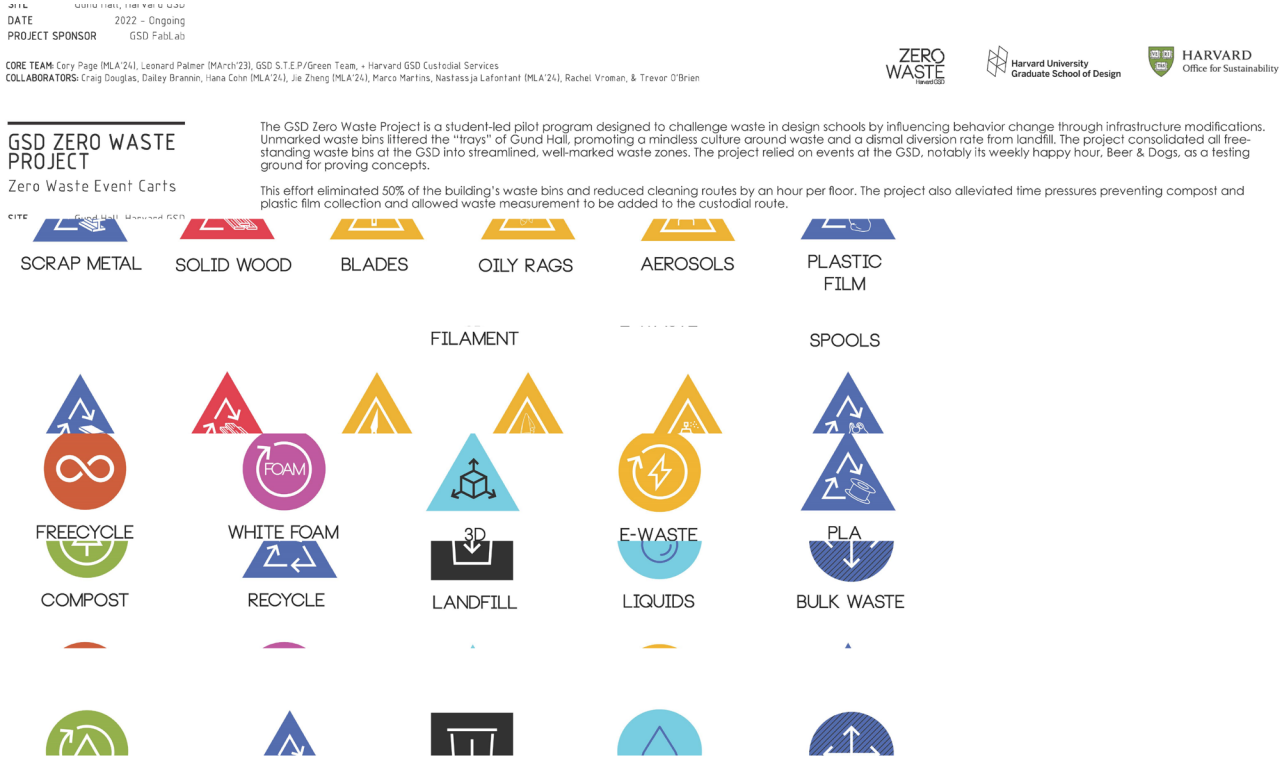
What advice would you give to another college that wanted to do a similar effort?

1. <u>Lids are not created equal:</u> Quickly into the pilot, we learned that lids on waste bins were essential, but they do not all have the same effect. Flap lids provide a minimal deterrent to tossing the wrong item into a recycling or compost bin. When the lid requires someone to lift it, there was a dramatic reduction in contamination, particularly in the compost waste stream. The pause required to lift a lid expands the chance that someone will read the waste zone signage, which might otherwise be ignored.
2. <u>Work closely with the custodians and building services:</u> The custodians know the waste footprint of a building or event better than any numeric values derived from a waste audit. The custodians are active

voices in the GSD Zero Waste Project. They help guide placement of the zones, capacity, and use requirements which promoted human-centered design thinking in the construction of the waste carts.

3. Infrastructure is everything: Almost immediately into the pilot we realized that infrastructure was the ultimate driver of success of the project. Building a moveable cart cut set-up time in half and vastly improved the user interface over free-standing waste bins. As the semester progressed continued investment in the event's infrastructure helped us get closer and closer to zero waste.

Photos and Graphics:



GSD EVENTS: BEFORE + AFTER

BEFORE FREESTANDING UNMARKED BINS

ISSUES:

- ✖ Waste bins were inadequately marked
- ✖ Recycling bins were often separated from landfill bins
- ✖ Bins frequently overflowed due to inadequate capacity
- ✖ Recycling was so contaminated all waste was landfilled

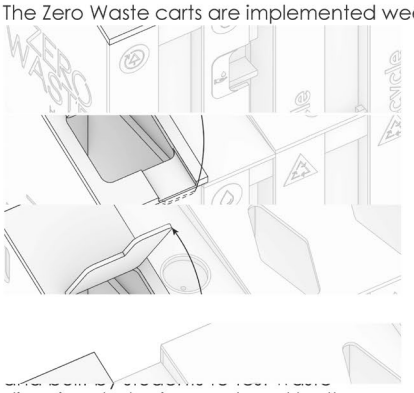
AFTER CENTRAL WASTE ZONES

SOLUTIONS:

- ✔ Central zones have clear, color-coded signage
- ✔ All waste streams, including liquid collection, are together
- ✔ Zones allow for varied capacity and easier servicing
- ✔ Lids on recoverable waste streams reduced contamination

After three 400+ person events, waste sent to landfill dropped by 90%. Waste Contamination has also been nearly elimnated.
The Zero Waste Project aims to open-source all design files to other Harvard schools and Universities to encourage easy adoption.

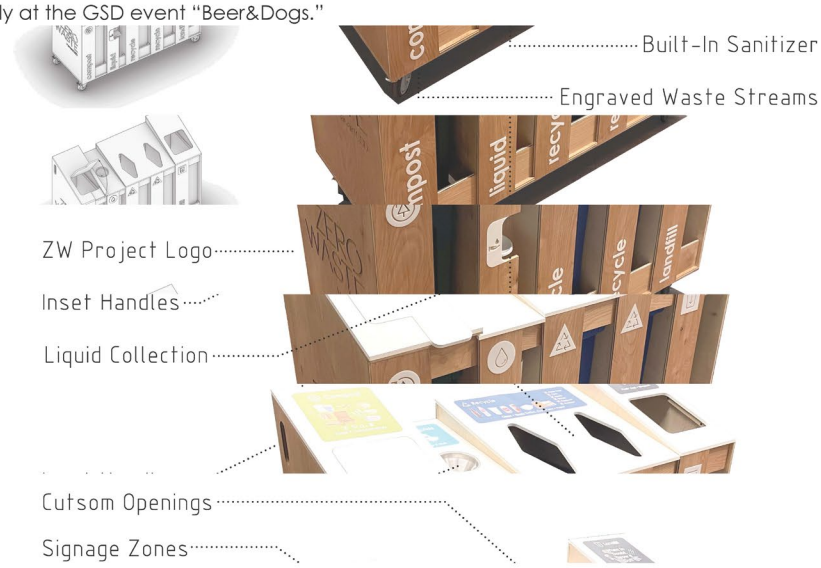
The Zero Waste carts are implemented weekly at the GSD event "Beer&Dogs."



diversion strategies employed by the ZW Project and to divert nearly all waste from landfill at GSD events.

ZERO WASTE EVENT CARTS

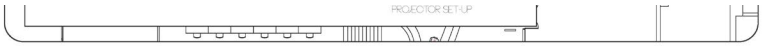
Zero Waste carts were designed and built by students to test waste

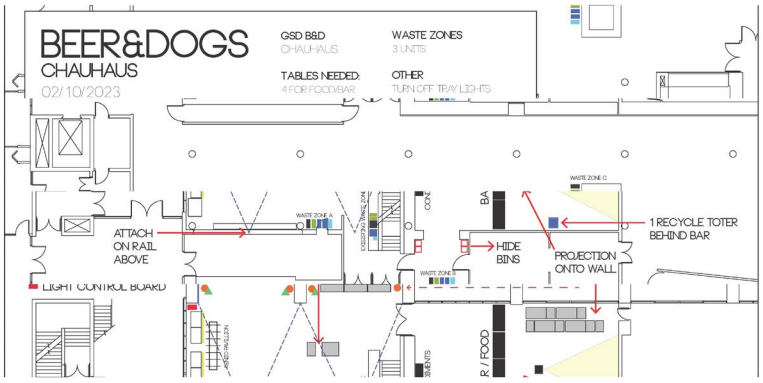


	$	$$	$$$	$$$$
EASE OF USE:	●●●○○	●●●●●	●○○○○	●●○○○
DURABILITY:	●○○○○	●●●○○	●●●●○	●●●●●
	DECONTSTRUCTABLE	DECONTSTRUCTABLE	DECONTSTRUCTABLE	DECONTSTRUCTABLE
	MUST BE PLACED AGAINST A WALL	MUST BE PLACED AGAINST A WALL	MUST BE PLACED AGAINST A WALL	MUST BE PLACED AGAINST A WALL
	COLOR-CODED BINS/BAGS	COLOR-CODED BINS/BAGS	COLOR-CODED BINS/BAGS	COLOR-CODED BINS/BAGS
	INTERCHANGEABLE BINS + SIGNAGE	INTERCHANGEABLE BINS + SIGNAGE	INTERCHANGEABLE BINS + SIGNAGE	INTERCHANGEABLE BINS + SIGNAGE
	SUITABLE FOR UPSCALE EVENTS	SUITABLE FOR UPSCALE EVENTS	SUITABLE FOR UPSCALE EVENTS	SUITABLE FOR UPSCALE EVENTS
	CUSTOM LIDS + OPENINGS	CUSTOM LIDS + OPENINGS	CUSTOM LIDS + OPENINGS	CUSTOM LIDS + OPENINGS
	LARGE FORMAT SIGNAGE	LARGE FORMAT SIGNAGE	LARGE FORMAT SIGNAGE	LARGE FORMAT SIGNAGE
	COLOR-CODED BINS/BAGS	COLOR-CODED BINS/BAGS	COLOR-CODED BINS/BAGS	COLOR-CODED BINS/BAGS

ZERO WASTE EVENT CARTS: CONSTRUCTION

V1 V2 V3 V4





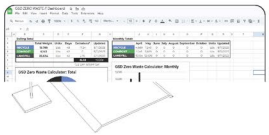
A CUSTOM FLOOR-PLANS

RESPOND TO PREDICTED EVENT DEMAND + WASTE TYPES

ZERO WASTE EVENT PILOT: BEER & DOGS



3 TRAIN STAFF + TRACK PROGRESS



2 DEVELOP GOOGLE SHEETS + iPAD TRACKING PROGRAM

1 INSTALL FREIGHT SCALE

WEIGHT ZONE: TRACKING OUR PROGRESS