Stanford Sustainability Goal: Zero Waste by 2030

Zero Waste: the industry term that implies less than 10% waste goes to landfill, synonymous to a 90% diversion rate or higher.

Prepared by Office of Sustainability
February 2020

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Executive Summary

Stanford has one of the longest running university waste diversion programs in the country, with roots going back to the 70s. Today, Stanford's diversion rate is 64% (meaning 36% going to landfill). The total amount of material that Stanford sends to the landfill has significantly declined over time due to robust efforts to minimize campus waste, however per capita waste generation remains high.

In 2017, the university began to develop a zero waste feasibility study, which included in-depth analysis and planning to provide more detailed understanding of its waste streams, develop strategies to further reduce overall waste generation, increase diversion (material sent to recycling or composting instead of landfill), and work toward the ultimate goal of zero waste – defined as 10% or less going to landfill.

These efforts synergistically aligned with Stanford's Long Range Planning process, which university leadership undertook to engage the community in establishing a future vision for Stanford and culminated with an official target to achieve zero waste by 2030 as a component of the sustainability plans, announced in May 2018.

Stanford created a detailed planning model to collect and analyze the data associated with Stanford's waste portfolio and propose solutions toward reaching zero waste. The planning included developing an extensive model, conducting a detailed waste characterization, and utilizing third-party peer reviews. The process took a detailed review of the sources of waste by category, coupled with proposed diversion solutions and costs that align with the sustainable materials management and circular economy principles. This planning process spanned the course of more than two years, and involved a multi-step, data-driven effort to systematically outline a path to zero waste. The steps included:

- Gathered waste source data and diversion solutions with associated costs from stakeholders
- Created new Waste-Cost Model through 2030
- Solicited concept approval, aligning with President's long-range vision announcement
- Enlisted peer review of Waste-Cost Model
- Presented to Academic Senate
- Conducted a comprehensive waste characterization study to verify internal audits
- Refined business case and financial planning
- Set up implementation pilots
- Hired Zero Waste Manager
- Launched pilot programs in 2020

Executive Summary (continued)

Stanford is taking a holistic approach to reducing waste, incorporating principles of zero waste, sustainable materials management, and circular economy philosophies to implement plans and programs that will have the largest impact as it works toward the target. The cumulative work, analysis, and peer reviews demonstrate that the university can improve its waste diversion to 90% or higher by 2030 by maintaining the best practices of today and introducing new solutions for the coming decade.

Looking ahead from year 2020 onward, the journey to zero waste will move forward involving multiple stakeholders, infrastructure expansion, contract alignments, and extensive communication to the campus community. Through the year 2023, priorities will focus around piloting zero waste programs across campus to ensure that the holistic program meets the needs of the micro-cultures across Stanford, depending on building type, academic programs, and community needs.

This report summarizes the steps and processes behind the feasibility study that led to the adoption of the goal, as well as the zero waste planning and implementation pathway. The pathway chart (Figure 1) summarizes how the diversion rate would increase (and landfill rate would decrease) over time. This pathway is subject to change as pilots reveal additional efficiencies, but can be used as a broad framework for communication.

Grouped Reduction Options	Cumulative Percent Diverted	Estimated Completion Year
Current programs	64%	2020
Enhanced reuse programs	65%	2022
Improved recycling & composting in Stanford cafes	71%	2023
Convert to single stream recycling	73%	2025
Expanded recycling infrastructure & programs	76%	2026
Athletics event recycling & composting	77%	2027
Food rescue and donation programs	78%	2028
Procurement programs	82%	2029
Expanded composting programs	86%	2030
Expand common area waste stations in offices	90%	2030
Lab recycling & composting programs	91%	2030
Expanded R&DE infrastructure & programs	93%	2030

Figure 1. Diversion rate pathway chart

Background and Concepts

While zero waste may represent a specific target for Stanford, it is also an emblem and representation of a finely interlinked process rooted in the principles of sustainable materials management. The concept of zero waste has emerged as the leading strategy in the waste management field, yet the programmatic building blocks aimed at minimizing extraction and pollution, while maximizing conservation and reuse, pre-date the second industrial revolution following World War II.

In the face of a rapidly changing climate rife with pollution, especially plastics, and a shift toward a demand for environmental justice as society increasingly becomes aware of—and desires—solutions to address these challenges, the principles of sustainable materials management is increasingly being incorporated into the basic tenets of sustainability programs.

Student participates in zero waste event on Stanford campus

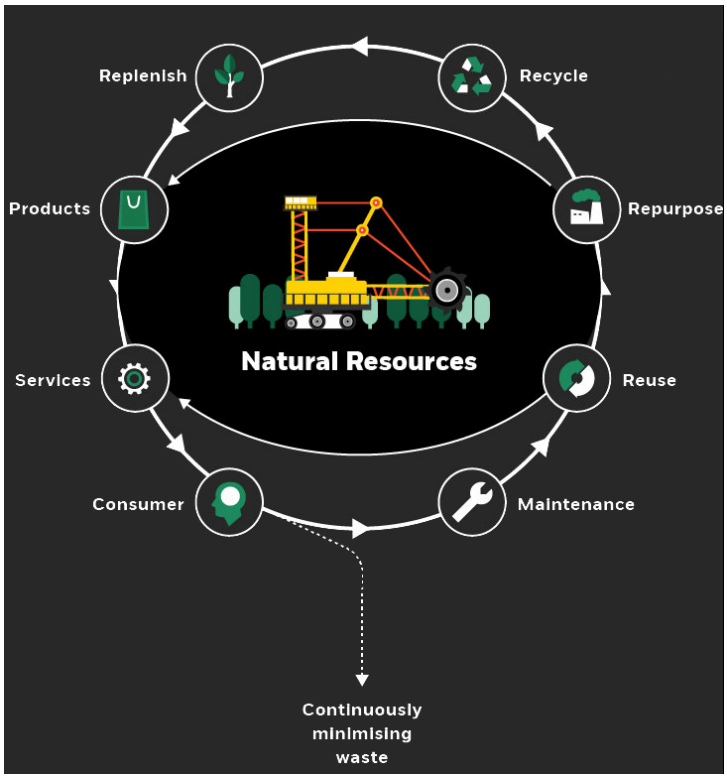
This approach is more holistic than most historic solid waste management programs. The Zero Waste Plan was designed around three key approaches: zero waste, sustainable material management, and circular economy, explained next. This means that we looked at the upstream, mid-stream, and downstream impacts and associated behaviors around the waste that is generated, and then designed programs to reduce waste in each of those areas.

Zero Waste

Zero waste refers to the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health. (The Zero Waste International Alliance)

Sustainable Materials Management

Sustainable materials management is a systemic approach to using and reusing materials more productively over their entire life cycles. It is based on the foundation that a product should have multiple uses over the course of its lifetime, and be designed with the goal of avoiding disposal in the landfill.



Graphic illustration of the circular economy
(Source: Black Rock)

Circular Economy

In a circular economy, products and processes are designed in such a way that goods can be used longer, and repurposed or recycled more economically to reduce cost and waste. Looking beyond the current take-make-waste extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It gradually decouples economic activity from the consumption of finite resources and designs waste out of the system. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, and social capital. (Ellen MacArthur Foundation)

Stanford University's Progress

Stanford has long managed its waste in keeping ahead of local and state regulations (See Appendix A). While the university's diversion rate is higher than the state of California and many other institutions, its per capita waste is one of the highest among its peer institutions in higher education. In the annual RecycleMania contest, the national recycling and composting competition that Stanford has participated in for over 12 years, the university regularly scores very high in the recycling rate and pounds recycled category. However, Stanford's waste per capita (See Figure 2) shows that the university has room for improvement, along with the desire to transition to a circular economy baseline in its treatment of waste.

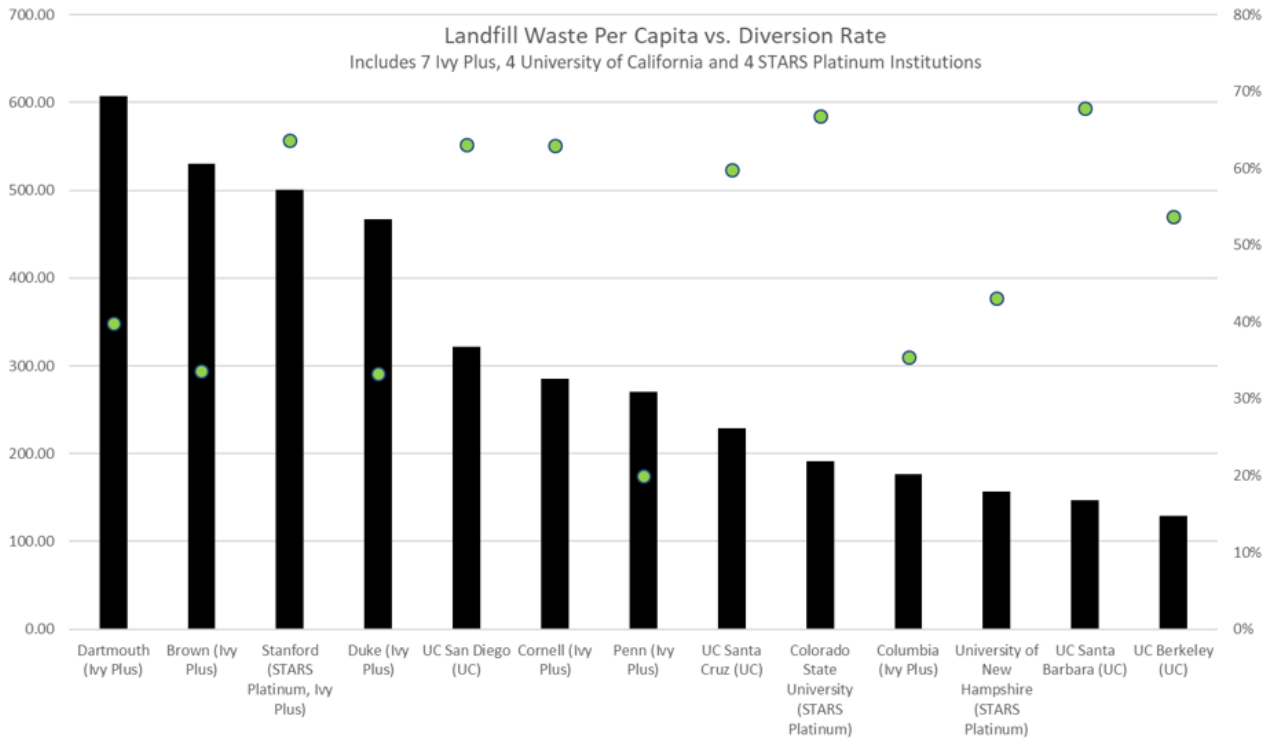


Figure 2. While Stanford's diversion rate (green dot) is in the middle of the range of peer institutions, the university landfills higher waste per capita than many of its peer institutions. (Source: 2018-19 STARS Report with the Association for Advancement of Sustainability in Higher Education [AASHE])

To determine what was going to landfill, Stanford worked with PSSI to perform over 30 waste audits of various locations on campus. The audits revealed that more than 55% of landfill collected was either reusable, recyclable, or compostable, which indicated that the university needed to address key infrastructure and educational needs to accomplish its goals. The campus either had insufficient bins to sort correctly, a lack of understanding about sorting best practices, or minimal motivation to participate.

Stanford University's Progress (continued)

Stanford recognized the need to continue improving efficiencies and expanding programs. This encouraged initiation of a feasibility study, which then led to a more formalized Zero Waste Plan. In addition to the university's aspirations for advanced sustainability and social good, in May 2018, university leadership set a goal of zero waste by 2030, based on the results of the feasibility study and planning that started in 2017.

Stanford students and staff help conduct a waste audit of the Haas Center's waste streams

While there is no zero waste goal mandated by federal or state regulations, a number of laws have passed in California to encourage reduction of waste overall. For example, the Mandatory Commercial Organics Recycling Law (AB 1826, 2014) requires businesses that generate four cubic yards or more of solid waste per week must arrange for composting services. In addition, the Short-Term Climate Pollutants Act (SB 1383, 2016) requires edible food rescue programs and a 75% reduction in organics in the landfill by 2025; the act also requires standardization of the color of recycling, composting, and landfill bins by 2025. At that point, no new bins in the old colors can be purchased, with the goal of full implementation by 2036. Stanford's zero waste goal not only supports compliance with these regulatory requirements, but it also enables the university to further its progress as a living lab of sustainability.

Zero Waste Feasibility Study and Planning

Stanford engaged in a long-range campus waste management feasibility study from April 2017 through June 2019, setting the planning horizon from 2018 to 2030. A working group comprised of key stakeholders from the departments of Buildings and Grounds Maintenance, Residential and Dining Enterprises, Property Management Office, Department of Athletics Physical Education and Recreation, Sustainability and Energy Management, and PSSI drafted the zero-waste plan in 2017-2018.

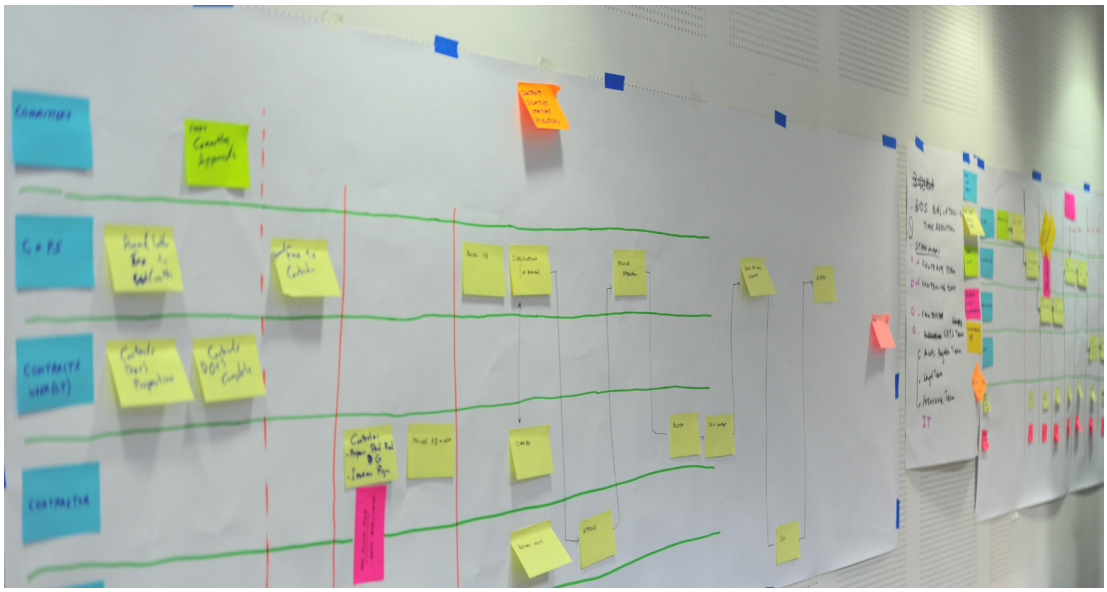
Providing multi-stream collection at events helps to minimize waste

The team created a detailed plan to collect and analyze the data associated with Stanford's waste portfolio and propose solutions toward reaching zero waste. The planning included developing an extensive model, conducting a detailed waste characterization, and utilizing third-party peer reviews. The process took a detailed review of the sources of waste by category, coupled with proposed diversion solutions and costs that align with the sustainable materials management and circular economy principles. Findings revealed that the university can increase its waste diversion to 90% by 2030 by maintaining the best practices of today and finding efficiencies and introducing new solutions for the coming decade.

A Summary of Steps to Date

1. Gathered waste source data and diversion solutions with associated costs from stakeholders
2. Created new Waste-Cost Model through 2030
3. Solicited concept approval, aligning with President's long-range vision announcement
4. Enlisted peer review of Waste-Cost Model
5. Presented to Academic Senate
6. Conducted a comprehensive waste characterization study to verify internal audits
7. Refined business case and financial planning
8. Set up implementation pilots
9. Hired Zero Waste Manager
10. Launched pilot programs in 2020

A detailed overview of each step follows.



Sample image of a planning process (Souce: Pexels)

1. Data collection, with diverse solutions and associated costs

The zero waste management plan began in April 2017 with the formation of a stakeholder working group comprised of partners from the departments of Buildings and Grounds Maintenance, Residential and Dining Enterprises, Property Management Office, Department of Athletics Physical Education and Recreation, Sustainability and Energy Management, and PSSI.

Stanford student composting food waste

The working group began by evaluating historical data from 1998 to 2016 to understand the sources of waste and their evolution over time. The group utilized a centralized, common framework based on best practices studied in other zero waste and waste management plans, incorporating the best practices of Stanford planning principles, data collection methodology, and systems thinking. Members then collected solutions to minimizing waste in all categories (reduce, reuse, recycling, compost, and landfill) from subject matter experts.

This ground-up exercise included infrastructure and programs already in operation that allowed Stanford to achieve its 64% diversion rate, expansion of these programs, and implementation of new programs.

2. A new Waste-Cost Model

The team built out a composite waste-cost-diversion model, with the data from 1998 onward. For all solutions, the working group estimated potential tons diverted and total costs for implementation, including one-time and annual investment, additional operational costs to departments, and full-time employees required for success. Then, the historical waste data and the solutions were linked together to form the comprehensive Waste-Cost Model, which enabled the working group to project future waste reduction and associated costs for a multitude of scenarios. The group applied an annual cost escalator of 3.5% to future years.

After this calculation, analysis, and fact checking with various departments, a total of near 40 solutions (see Appendix B) were identified for the comprehensive zero waste program, with each solution mapped to the key categories associated with the industry definition for zero waste: reduce, reuse, recycle, rot/compost, and finally refuse/landfill.

3. Concept approval, aligning with President's long-range vision announcement

All strategic plans need to follow the flow of the university decision-making cycle. Once the data and analysis was in place, the working team participated in the university's long-range planning forum. In a supportive campus environment, this alignment was necessary for ultimate campus approval. Milestones include:

- **June 2017:** The zero waste planning effort was summarized and submitted as part of the university's long-range planning process initiated in 2017. The proposal was accepted and reviewed by faculty members and committees with great support and enthusiasm.
- **March 2018:** Subject Matter Experts (SME) appointed by the President and the Provosts reviewed all 2,800 long-range planning proposals, which included the zero waste proposal as well as many others that supported or alluded to a need for a zero waste program at Stanford. Due to the comprehensive nature of the zero waste proposal, full preparation and scope of work, this proposal was accepted by the review cabinet.
- **May 2018:** President Marc Tessier-Lavigne made his first announcement of the many outcomes of the long-range planning process, and particularly highlighted sustainability with two key targets: 80% carbon-free by 2025 and zero waste by 2030.

President Marc Tessier-Lavigne presents to Academic Council in 2018 (Image credit: L.A. Cicero)

The commitment that university leadership made toward zero waste helped galvanize campus interest on the topic, especially as it came at the heels of much controversy and speculation around the Chinese waste ban, which drastically affected the markets for scrap paper and plastics and the economics of recycling.

4. Peer review of the Waste-Cost Model

In fall 2018, Stanford University commissioned a peer review and analysis of its Zero Waste Plan. To strategically manage and effectively reduce waste generation and flows, the working group sought to incorporate benchmark information, refine assumptions, and analyze the model from multiple angles.

Through an open Request for Proposal process, Stanford solicited a peer review of the internal management plan and waste audit from industry experts who understand materials management in a university setting. Stanford collaborated with a consultant team who:

- knew the ins and outs of Bay Area collection and processing options and opportunities;
- had familiarity with new and emerging recycling solutions on the rise following the Chinese waste ban;
- could translate state and regional regulations for institutional planning; and
- could assess the reliability of data collected, based on the written methodology and findings.

The peer review also included a general assessment of the best practices at Stanford, along with the operation and location of the materials recovery facility. The process not only validated and expanded upon the strategies included in the Waste-Cost Model, but it also identified significant cost saving opportunities from streamlining existing waste programs and practices. These findings were incorporated into the model in advance of a series of presentations for business plans and other interdepartmental communications.

September 2018 site visit by Cascadia Consulting Group

5. Academic Senate presentation

Fahmida Ahmed Bangert, Director of Sustainability and Business Services, speaking to the Faculty Senate on Thursday. (Image credit: L.A. Cicero)

The Waste-Cost Model shows that the university can improve its waste diversion to 90% by 2030 by maintaining the best practices of today, introducing new solutions for the coming decade, and realizing additional opportunities throughout the implementation process. A 'pathway to zero waste' framework (See Appendix C) highlighted the major solutions that could be implemented to gradually improve diversion rates over time. A full presentation of this framework was shared for the Academic Senate Meeting in November 2018. This presentation became a platform for further conversation with faculty leaders, building campus-wide consensus on the importance of the zero waste initiative.

During this time, university leadership highlighted sustainability, including the zero waste target, under the "Research" category as a component of the broader University Vision and Long Range Planning. Subsequently, the President and Provost set up a research-focused Design Team for Sustainability on these issues. During the design team process, the faculty committee decided that the 80% carbon-free (completed by the Stanford Energy Systems Innovation Project) and zero waste by 2030 targets were being appropriately handled by campus operations and provided support to carry the mission forward.

6. Comprehensive Waste Characterization Study to verify internal audits

To refine Stanford's existing Waste-Cost Model, Cascadia Consulting conducted a campus-wide waste characterization audit of the landfill, recycling, and compost streams, with detailed quantitative analysis of university waste generation and flows. During this process, teams collected waste from six generator areas on campus that represented groups of buildings or locations with similar usage type, waste generation profiles, and disposal patterns:

- Academic and administrative buildings
- Cafes and mixed-use buildings
- Labs
- Residential dorms
- Residential apartments
- Residential row houses

Cascadia Consulting onsite in April 2019 for detailed waste characterization study

The consultants carefully sorted landfill waste from each area into over 50 categories, with visual sampling recorded from the recycling and compost streams. From this study, the university determined contamination rates by generator area, as well as capture rates of the different material types.

Zero Waste Feasibility Study and Planning (continued)

The study concluded:

- **More than one third of Stanford's landfill stream could be composted.** Improved composting efforts could keep over 2,000 tons of material out of the landfill annually.
- **Bathroom waste accounts for over 11% of the campus-wide landfill stream.** Cascadia's Field Manager noted that over 90% of bathroom waste was composed of potentially compostable paper towels, and that installing compost containers in bathroom areas could eliminate most of this landfill component.
- **Some waste enclosures are difficult for students to access or do not have signage consistent with the rest of campus.** Ensuring that all containers have the same signage and color code will help to reduce contamination across streams and keep recoverable material out of the landfill.
- **Much of the remaining non-recoverable and recoverable waste in the landfill falls in the furniture, packaging, and electronic waste categories.** Expanding material reuse programs, developing a strong Environmentally Preferable Purchasing (EPP) policy that bans certain materials such as Styrofoam or plastic film, and strengthening existing difficult-to-recover material collection programs will all help to reduce the amount of waste generated overall.

The Waste Characterization Study showed in detail how much of Stanford's materials that shouldn't end up in the landfill still do, because of incomplete infrastructure and programs or improper sorting. The Study indicated that approximately 62% of materials going to landfill can either be recycled or composted (See Figure 3).

A detailed report of the study can be found here.

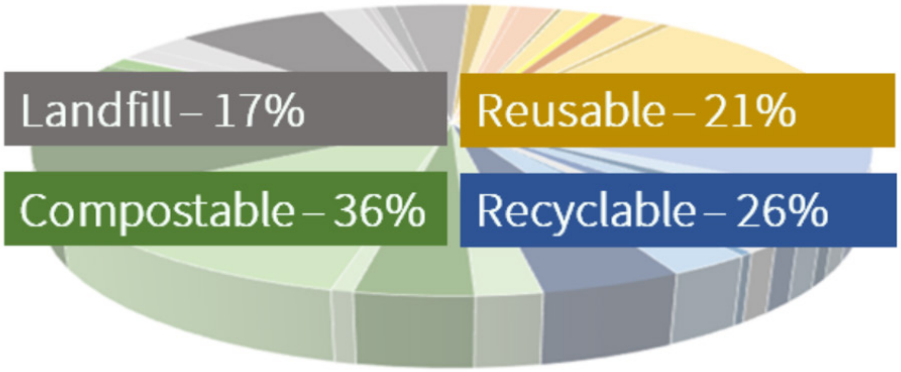


Figure 3. Waste Characterization Study Results of Landfilled Trash

7. Business case refinement and financial planning

With the data, solutions, and waste sources verified and refined through peer review, Stanford then revisited the financial outlook and budget implications for the zero waste plan. The working group prepared a ten-year financial summary supported by a final visualization to highlight the business case for implementation of the zero waste plan. This step, while tactical, represented the culmination of numerous studies, strategies, and analyses to mark the formal approval of the plan to move Stanford toward its zero-waste campus ambitions, planned across a decade-long implementation timeline.

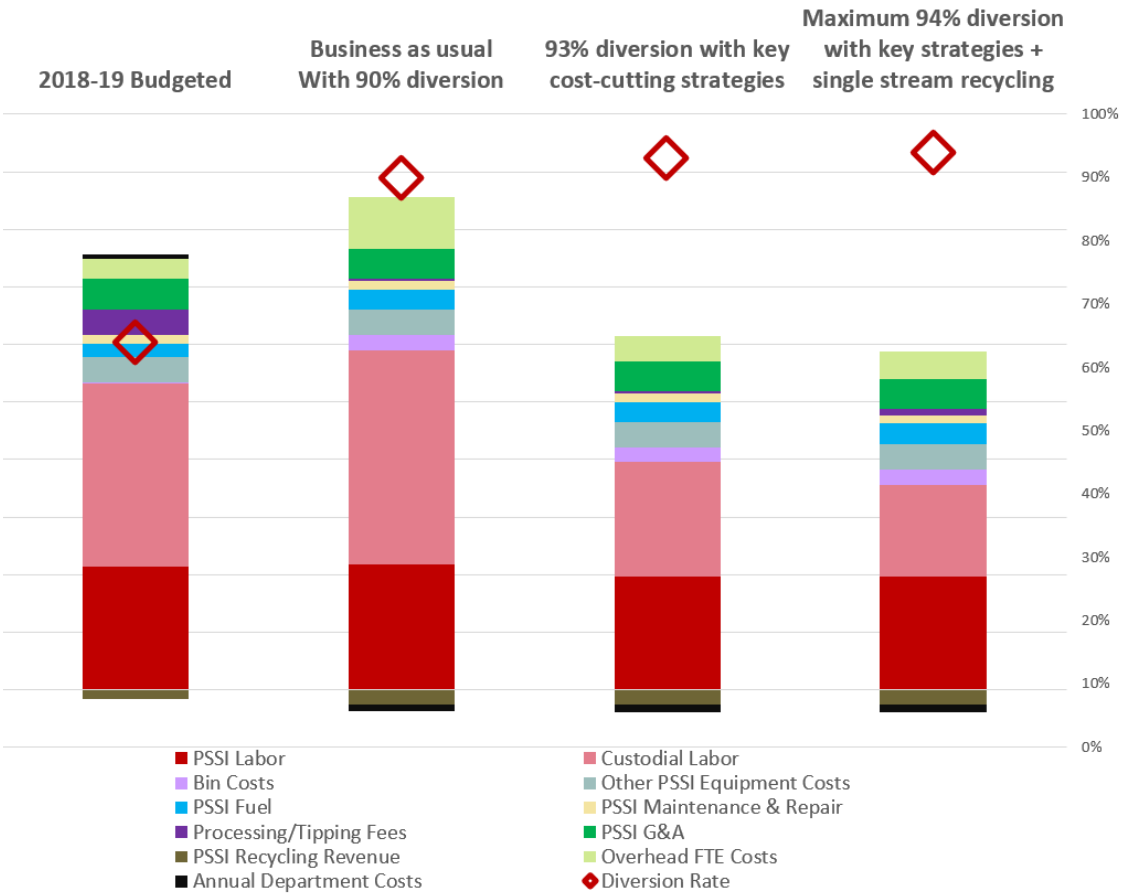


Figure 4. Sample Business Case: Data not current

Creating a summary-level business case for long-term program strategy is a best practice at Stanford. The team utilized the known information to model scenarios and showcase choices and tradeoffs for a multi-criteria decision, so that leadership and implementation teams could start to visualize and plan for the kind of diverse needs required for the zero waste program to succeed.

8. Establish implementation pilot spaces

Simultaneous to the financial planning, the sustainability working team helped to establish zero waste pilots in various locations, with a unique opportunity emerging at Stanford's new Redwood City campus, which welcomed its first occupants in April 2019.

The campus is Stanford's first large-scale expansion in its history, and presented the opportunity to implement and test some of the primary strategies for increased diversion identified in the Waste-Cost Model. Key components that were implemented include:

- centralized waste stations that eliminate desk-side bins;
- single-stream recycling (paper combines with plastics, metal, and glass);
- bathroom composting for paper towel collection;
- an outreach campaign focused on reduction before occupancy.

The university undertook an extensive change management campaign in advance of the move, during which Stanford was able to provide a vast suite of educational tools, including trainings, e-mail signage, and incentives for reducing personal items all aimed at increasing diversion in the new buildings.

Graphic to educate pilot spaces about centralized waste stations

Approaching a year from initial occupancy, contamination has remained below the required threshold, and occupants have reported feeling adjusted to the new practices of their workspace. Additional pilot spaces are now set up on campus, with some additional buildings and departments requesting central stations. The campus pilot space, located at Bonair Siding, also went through an occupancy shift during the transition to Redwood City. This provided the opportunity to explore the change management needed for occupants who do not physically relocate, and establish best practices for infrastructure adjustments in existing spaces. Continued outreach and education will help to reinforce best practices so that diversion continues to increase.

Graphic that educates Redwood City staff about changes to waste sorting

9. Recruit for a Zero Waste Manager

In September 2019, Stanford hired a Zero Waste Manager to oversee implementation of the Zero Waste Plan. This position will continue to update the Waste-Cost Model, develop budgets, and create detailed plans with various departments and buildings to accomplish the waste reduction programs identified in the plan, monitoring progress toward the goals.

Stanford students on a tour of the Stanford Recycling Center.

Julie Muir, Stanford's Zero Waste Manager (Image credit: L.A. Cicero)

10. Pilot Programs in 2020

With the target established and the plan approved, Stanford is following an action plan for near-term implementation of its Zero Waste Plan (See Appendix B). The next three years will serve as the crucial time for testing and piloting the various solutions revealed through the Waste-Cost Model. This will involve extensive community engagement to ensure proper education and change management, as well as continued assessment and evaluation after program implementation to verify the success of each strategy.

In this timeframe, the implementation team and working group partners also plan to strategically re-evaluate contracts that impact the zero waste target, to refine the services provided by vendor groups, and to maximize efficiencies.

Planning Summary and Outlook

The cumulative work, analysis, and peer reviews demonstrate that the university can improve its waste diversion to 90% or higher by 2030 by maintaining the best practices of today and introducing new solutions for the coming decade. The journey to zero waste will move forward involving stakeholders, infrastructure expansion, contract alignments, and extensive communication to the campus community.

Figure 5 shows the historic waste tonnage data from 1998 to 2017, and how the diversion will improve, and landfill would reduce (purposely drawn on negative axis for visual ease) from 2018 onward.

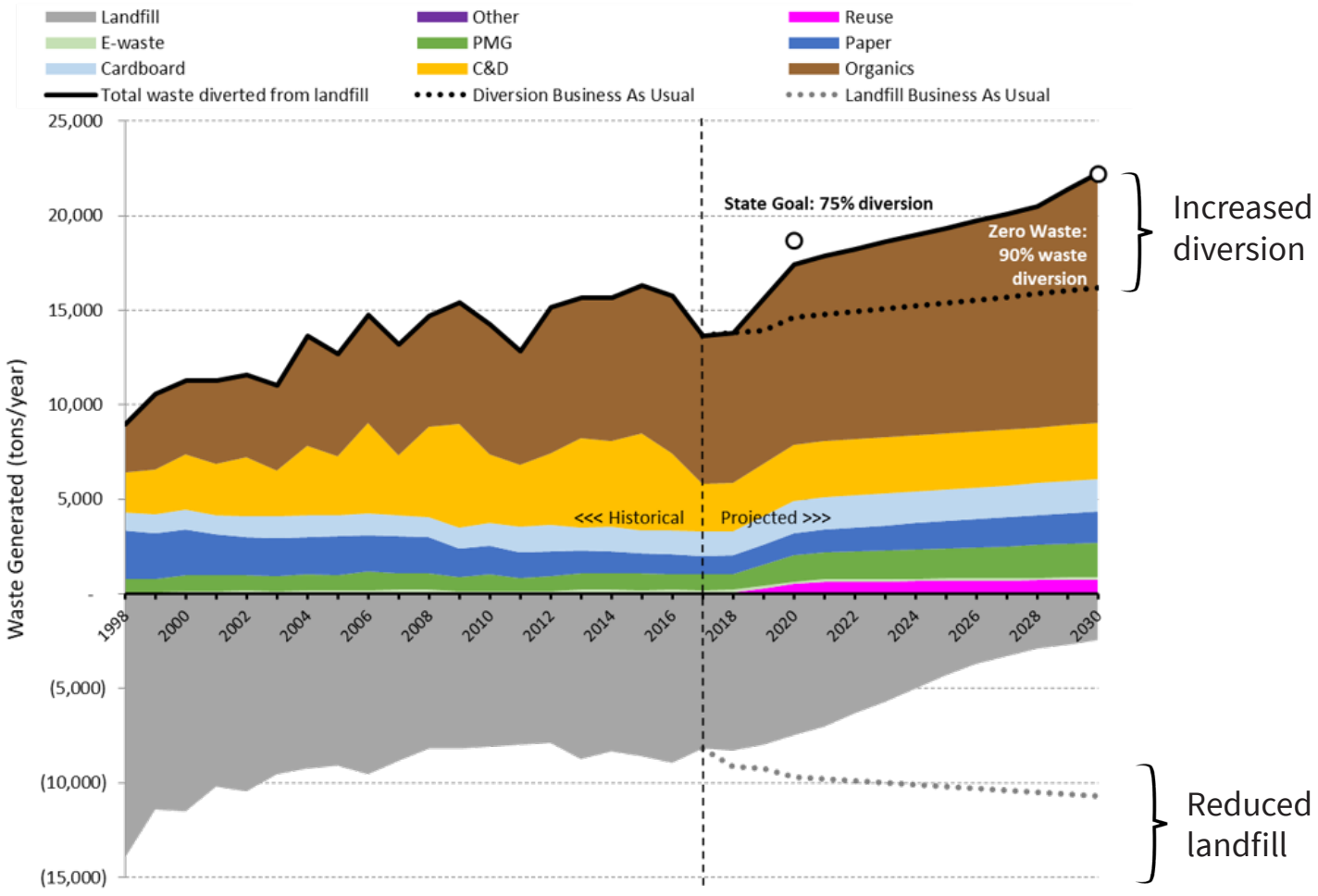


Figure 5. Stanford campus waste by source (1998-2030)

Planning Summary and Outlook (continued)

In 2020-2023, the zero waste manager and partner implementation teams will engage in the following implementation steps:

- Convene a campus-wide Zero Waste Working Group to discuss and vet details of zero waste programming.
- Monitor and improve the zero waste programs at Stanford Redwood City and Bonair pilot spaces by collecting data on contamination and using it to further target outreach, education, and procurement programs. Implement zero waste pilot programs in additional pilot spaces, monitor progress, resolve issues, and plan for future expansion. Increase efficiencies in waste removal within buildings and optimize custodial contracts. Programs to test include moving to single stream recycling, having one contractor handle all of the recycling, cardboard, and compost collection, and removing desk-side service.
- Develop case studies on integrating reusable plates, cups, and utensils into breakroom areas.
- Continue to find ways to work with, and expand, partnerships with food rescue organizations.
- Expand recycling and lab glove recycling in laboratories.
- Partner with Procurement to update café contracts to focus on reuse and better sorting of recyclables and compostable.
- Expand recycling and composting programs in Athletics venues.

Waste decisions are made by individuals on campus several times per day. The journey to zero waste will take everyone's participation on a personal, department, and school level. Stanford is uniquely qualified to reach this goal based on its preparation and data-driven planning, along with a decades-long history of sustainable program implementation and advancement.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Appendix A: Waste Management at Stanford University: Background

Students began the official recycling program in 1970s, providing collection and sorting services and raw materials to local markets. In 1993, as the program grew and expanded, Stanford partnered with its recycling and waste hauler, Peninsula Sanitary Service Inc. (PSSI), to develop a more comprehensive program. Stanford currently recycles paper, cardboard, metals, glass, electronics, yard trimmings, food scraps, horse manure, wood, construction and demolition waste, and some plastics.

In 1994, the first year that Stanford began comprehensively tracking waste metrics, the university diverted 30% of its waste from landfill. Since then, in partnership with PSSI, Stanford has implemented several programs to increase its landfill diversion rate to 65% in 2019. Some of these successful programs include:

- Paper and plastics, metal, glass recycling bins on every floor of every building
- Desk-side paper recycling and mini trash cans in 107 buildings
- Cardboard collection outside every building
- Food and compostables collection at dining halls and cafes, as well as 48 academic buildings
- Yard trimmings composting
- Event recycling and composting
- Stadium and athletic venue recycling and composting
- Student housing recycling, composting, and reuse
- Curbside recycling, composting, and yard trimming collection in the Faculty Staff Housing area
- Robust surplus sales and furniture reutilization
- Construction and demolition recycling
- Electronic waste collection in almost every building
- Recycling drop-off collection
- Material recovery facility and direct transfer station on campus
- Outreach, education, and training, including participation in a national recycling competition
- Annual waste audits

Appendix A: Waste Management at Stanford University: Background (continued)

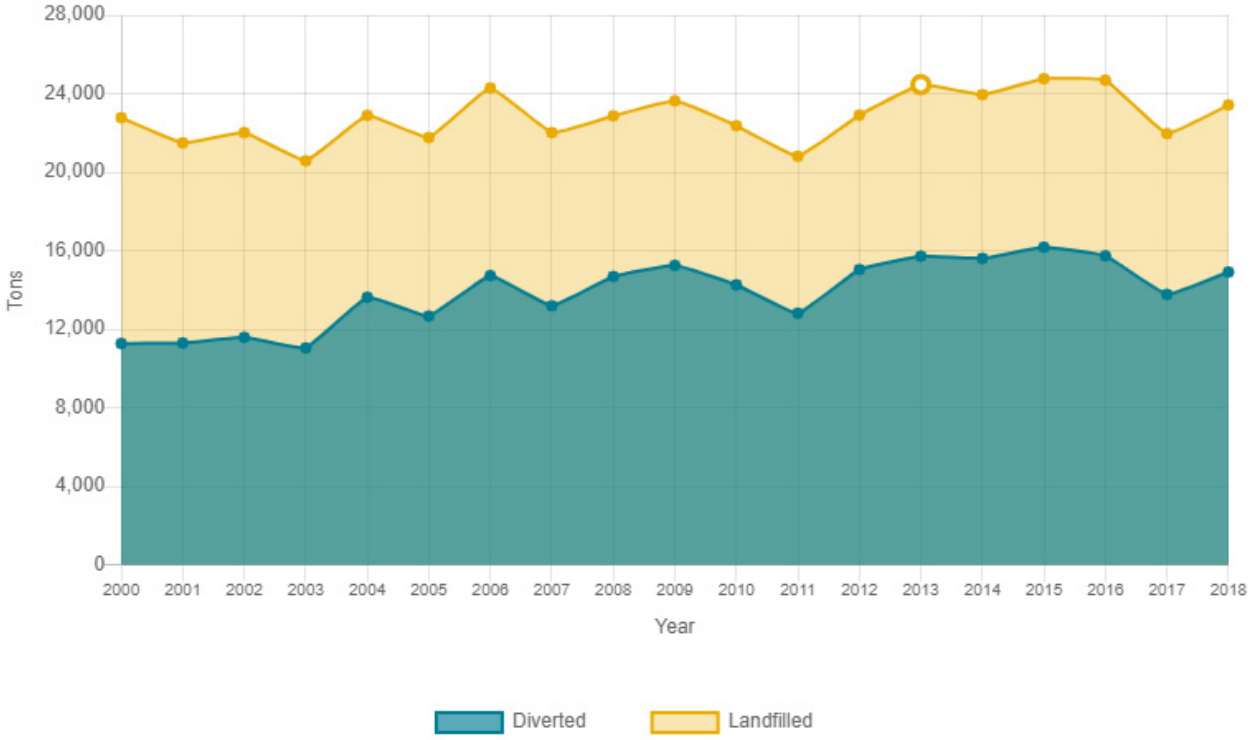

Figure 6. Annual tons of waste generated by Stanford (2000-2018)

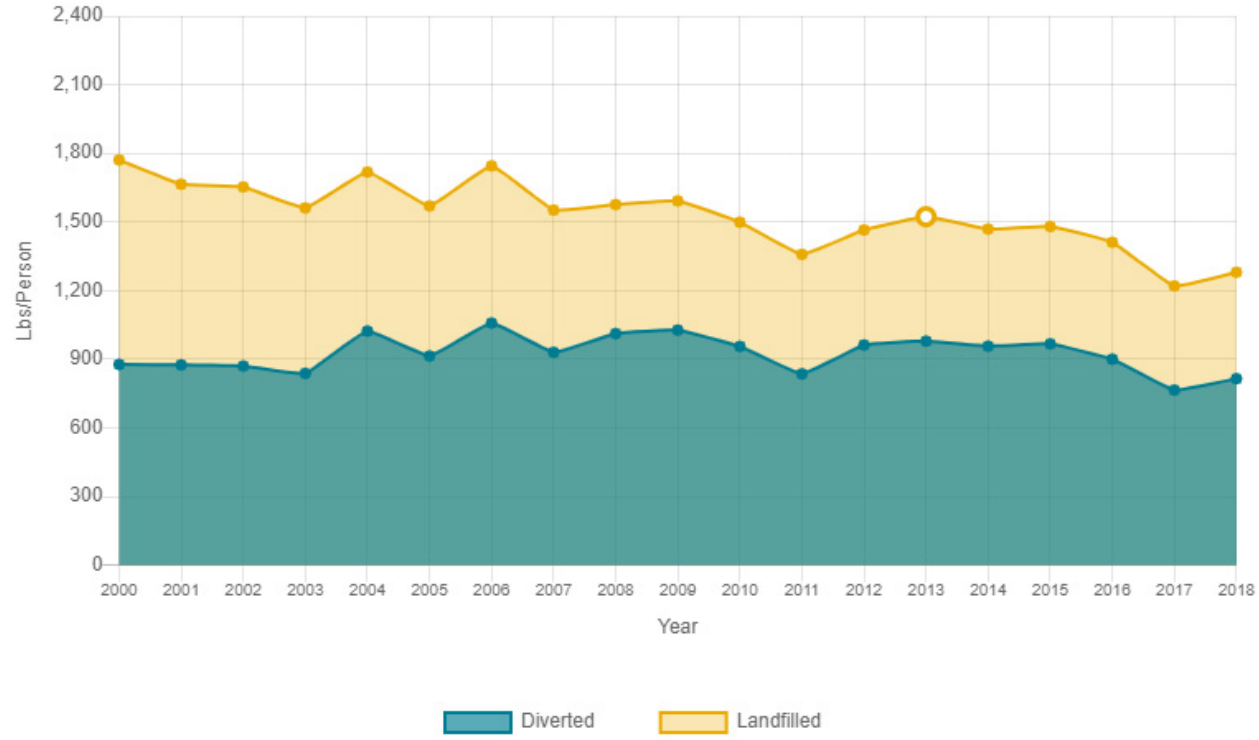

Figure 7. Annual pounds of waste per capita generated by Stanford (2000-2018)

Appendix B: Program Solutions Identified in Waste-Cost Model

Below are the top 45 programs in the Zero Waste Plan sorted by their estimated diversion potential.

- Existing programs refer to programs currently in place with enhanced best practices.
- Expanded programs are current services intended to expand campus-wide or to a greater audience.
- New programs are new services identified in the Zero Waste Plan.

The current diversion rate is 64%. If these programs are successfully implemented, there will be an estimated increase of 26% in the diversion rate, leading to an overall diversion rate of 90% or more.

	Program Category	Program Establishment	Program Name	Estimated Tons of Waste Diverted by 2030
1	Compost	Existing	Hauler Program - Compostables	4,159
2	Recycle	Existing	Hauler Program - Construction and Demolition Recycling	4,101
3	Procurement	New	Procurement Program for Cafe Contracts	1,527
4	Compost	Existing	Hauler Program - Agricultural Material Storage Facility (Horse Manure from The Red Barn)	1,497
5	Recycle	Existing	Hauler Program - Corrugated Cardboard	1,258
6	Recycle, Compost	Existing	Hauler Program - Special Event Composting	912
7	Compost	Existing	Hauler Program - Yard Trimmings Collection and Composting	832
8	Infrastructure	New	Custodial Program for Office Common Waste Stations (Eliminate Deskside Containers)	802
9	Recycle	Existing	Hauler Program - Paper Recycling	768
10	Recycle	Existing	Hauler Program - Plastic, Metals, and Glass	542

Appendix B: Program Solutions Identified in Waste-Cost Model
(continued)

11	Compost	New	Hauler Program - Custodial Compost Collection in Academic Breakrooms and Kitchens	492
12	Procurement	New	Procurement Program - Vendor Reporting on Waste	485
13	Recycle	New	Hauler Program - Convert to Single Stream Recycling	400
14	Procurement	New	Procurement Program - Behavioral Campaign Using Responsible Purchasing Guidelines	317
15	Infrastructure	Expanded	R&DE Program - Update Dumpster Enclosures and Corrals	314
16	Recycle, Compost	Expanded	Athletics Event Venues Recycling and Composting	292
17	Compost	Expanded	R&DE Program - Residential Bathroom Paper Towel Composting	262
18	Recycle	Expanded	R&DE Program - Additional R&DE Programs	205
19	Procurement	New	Procurement Program - Vendor Negotiations According to Responsible Purchasing Guidelines	195
20	Recycle, Compost	Expanded	R&DE Program - Interior Bin Systems for Grad Apartments	169
21	Compost	New	Custodial Paper Towel Composting Collection in Restrooms	166
22	Recycle	Existing	Hauler Program - Electronic Scrap Collection	158
23	Education	New	Sustainability Program Education and Outreach	150
24	Recycle	Expanded	Hauler Program - Voluntary Lab Paper and Plastics Recycling	141
25	Reuse	Expanded	Furniture Reutilization Program in Surplus Property	118
26	Reuse	Expanded	Furniture Reutilization Program in Surplus Property	118
27	Recycle, Compost	Expanded	R&DE Program - Common Area Waste Stations	113
28	Reuse	Expanded	Food Rescue in Non-Dining Halls	109

Appendix B: Program Solutions Identified in Waste-Cost Model
(continued)

29	Procurement	New	Procurement Program - Specific Bans and Mandates	103
30	Reuse	Expanded	Campus Cleanup in Buildings	100
31	Reuse	Expanded	Food Rescue in Dining Halls	94
32	Assessment	New	Hauler Program - Inspections, Enforcement, and Building-Level Data	71
33	Recycle, Compost	Expanded	Hauler Program - Public Recycling and Composting Bins	65
34	Compost	Expanded	Primary and Nursery Schools Reuse, Recycling, and Composting	58
35	Recycle	Existing	Hauler Program - All Other Diversion	47
36	Compost	New	Hauler Program - Multi-Family Housing Composting at Peter Coutts and Pearce Mitchell	46
37	Recycle	New	Custodial Indoor Cardboard Collection	37
38	Recycle	Expanded	Collection of Lab Gloves for Recycling	23
39	Procurement	New	Cardinal Print Program	18
40	Reuse	New	Student Program - Student-to-Student Reuse Sale	14
41	Reuse	New	Reuse Tool - Integrated Reuse/Disposal Electronic App by Surplus Properties	11
42	Procurement	New	Custodial Program - Paper Towel Procurement	10
43	Reuse	New	Communications - Reuse Website	7
44	Reduce	Expanded	Procurement/Custodial Program for Green Cleaning	6
45	Recycle	New	Hauler Program - Carpet Recycling During Building Renovations	2

Total Tons Reduced/Diverted	**21,335**
Compared to Current Tons Reduced/Diverted	**15,749**
Increased Tonnage	**5,586**
Improvement in Diversion	**26%**

Appendix C: Pathway to Zero Waste

Stanford developed a Pathway to Zero waste for day to day communication. The chart below shows the key grouped programs (See Appendix B) that will steadily improve our diversion rates and reduce landfill rate overtime by 2030. This pathway is subject to change as pilots reveal additional efficiencies but can be used as a broad framework for communication.

Grouped Reduction Options	Cumulative Percent Diverted	Estimated Completion Year
Current programs	64%	2020
Enhanced reuse programs	65%	2022
Improved recycling & composting in Stanford cafes	71%	2023
Convert to single stream recycling	73%	2025
Expanded recycling infrastructure & programs	76%	2026
Athletics event recycling & composting	77%	2027
Food rescue and donation programs	78%	2028
Procurement programs	82%	2029
Expanded composting programs	86%	2030
Expand common area waste stations in offices	90%	2030
Lab recycling & composting programs	91%	2030
Expanded R&DE infrastructure & programs	93%	2030

Figure 1. Diversion rate pathway chart


EMERGENCY
FUEL
SHUT-OFF
DANGER
HIGH VOLTA