2017-2018

SUSTAINABLE COLUMBIA

Annual Progress Report

INTRODUCTION

Last year, we introduced a comprehensive, University-wide Sustainability Plan, designed as a multi-year roadmap to shrink the University's carbon footprint and combat climate change. The plan set clear targets across a range of categories, from reducing greenhouse gas and energy usage to better waste management practices, improving sustainable transportation opportunities and campus behavioral changes.

For any plan to succeed, it must be measurable and accountable. To that end, this year we release our first ever Sustainable Columbia Annual Progress Report, which showcases the important work of many dedicated Columbians to meet the goals and strategies established in the Plan.

There were many impressive achievements during the first operating year of the Plan. We implemented a more rigorous approach to greenhouse gas accounting in accordance with international best practices. We purchased greener fleet vehicles, including replacing diesel-powered campus shuttles with electric buses. We calculated the University's first ever waste diversion rate from landfill and significantly increased the number of buildings participating in organics collection. These are just a few of the highlights.

Of particular significance is the cross-campus collaboration established through the Sustainable Columbia Leaders Network, a network of passionate student, faculty and staff ambassadors that have already, in just a few short months, affected sustainable culture change across Columbia's schools.

One thing is clear: leading in the area of environmental sustainability on our campus is no longer an option; it is an imperative.

I am grateful to the Senior Sustainability Advisory Committee, the Sustainability Plan Focus Teams, the members of the Sustainable Columbia Leaders Network, and all the students, faculty, and staff who help bring us closer to our goals. This report gives just a sampling of what can be achieved when we work together. I look forward to even greater progress in 2018 and beyond.

David M. Greenberg
Executive Vice President for University Facilities and Operations

GREENHOUSE GAS

☑ **Completed** → **On track** ↺ **Pivot**

GOAL

Make public the comprehensive data on our greenhouse gas (GHG) emissions in accordance with best international practices. Reduce GHG from buildings and purchased electricity by 35 percent by the end of 2020.

STRATEGY

Employ internationally accepted emissions accounting and reporting standards and methodologies by joining The Climate Registry. Begin reporting absolute GHG emissions through transitional inventory over a two-year period.

☑ **ACTION**
Compile historical data for GHG inventory, to be submitted to The Climate Registry as Columbia's first transitional inventory.

PROGRESS
Environmental Stewardship built the University's first centralized GHG inventory tool, which will ultimately capture and report emissions from Scopes 1, 2 and 3, and all Kyoto gases. For calendar year (CY) 2017, the University will report Scope 1 from stationary combustion of fuels, Scope 2 from purchased electricity, and all six Kyoto gases for the Morningside campus.

ACTION

Report absolute carbon emissions to The Climate Registry beginning in 2018, and continue to report annual carbon intensity to NYC for the Mayoral Carbon Challenge.

PROGRESS

For CY2017, the University reported a 33.1 percent reduction in absolute emissions from the baseline year 2006. It also reported a 28.36 percent reduction in carbon intensity from 2006, using the Mayor's Carbon Challenge reporting protocol (see Figures 1 and 2). The University made a one-time purchase of renewable energy credits (REC) to contribute to this reduction.
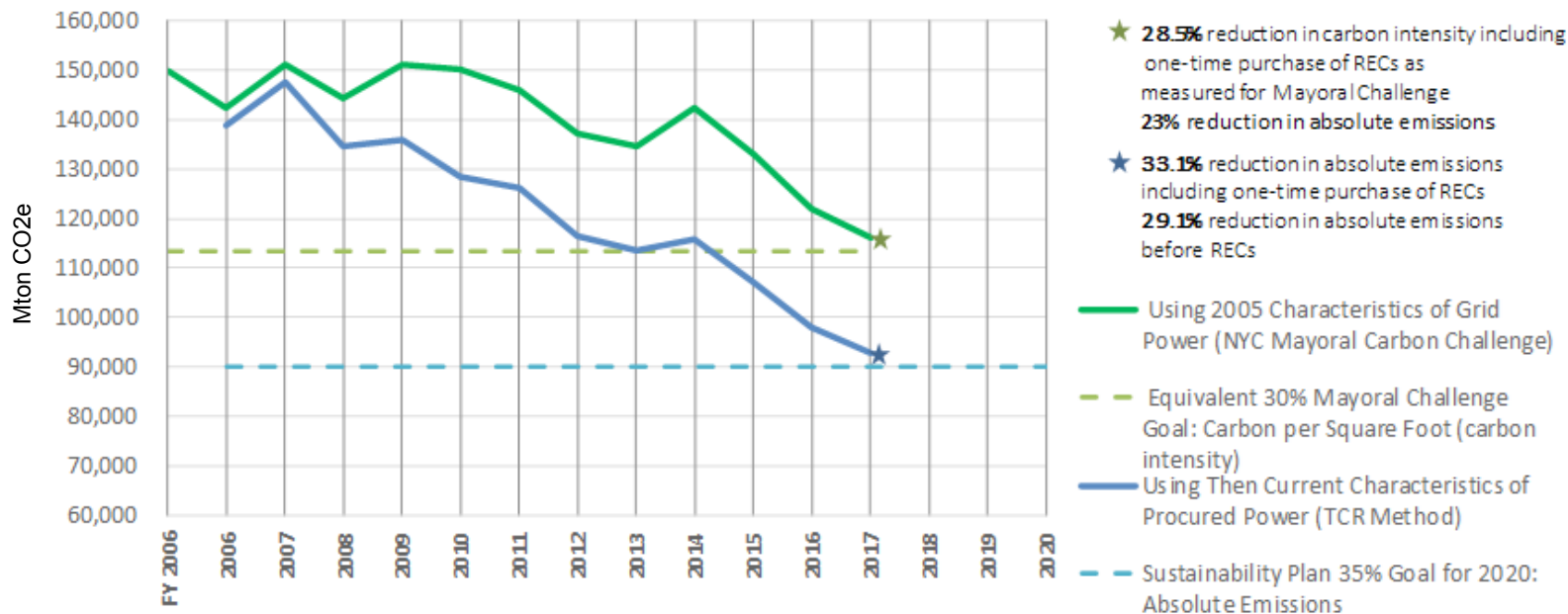
ACTION

Prepare to expand transitional GHG inventory to include Scope 1, Scope 2, and Scope 3 emissions from business travel, commuting and waste from operations.
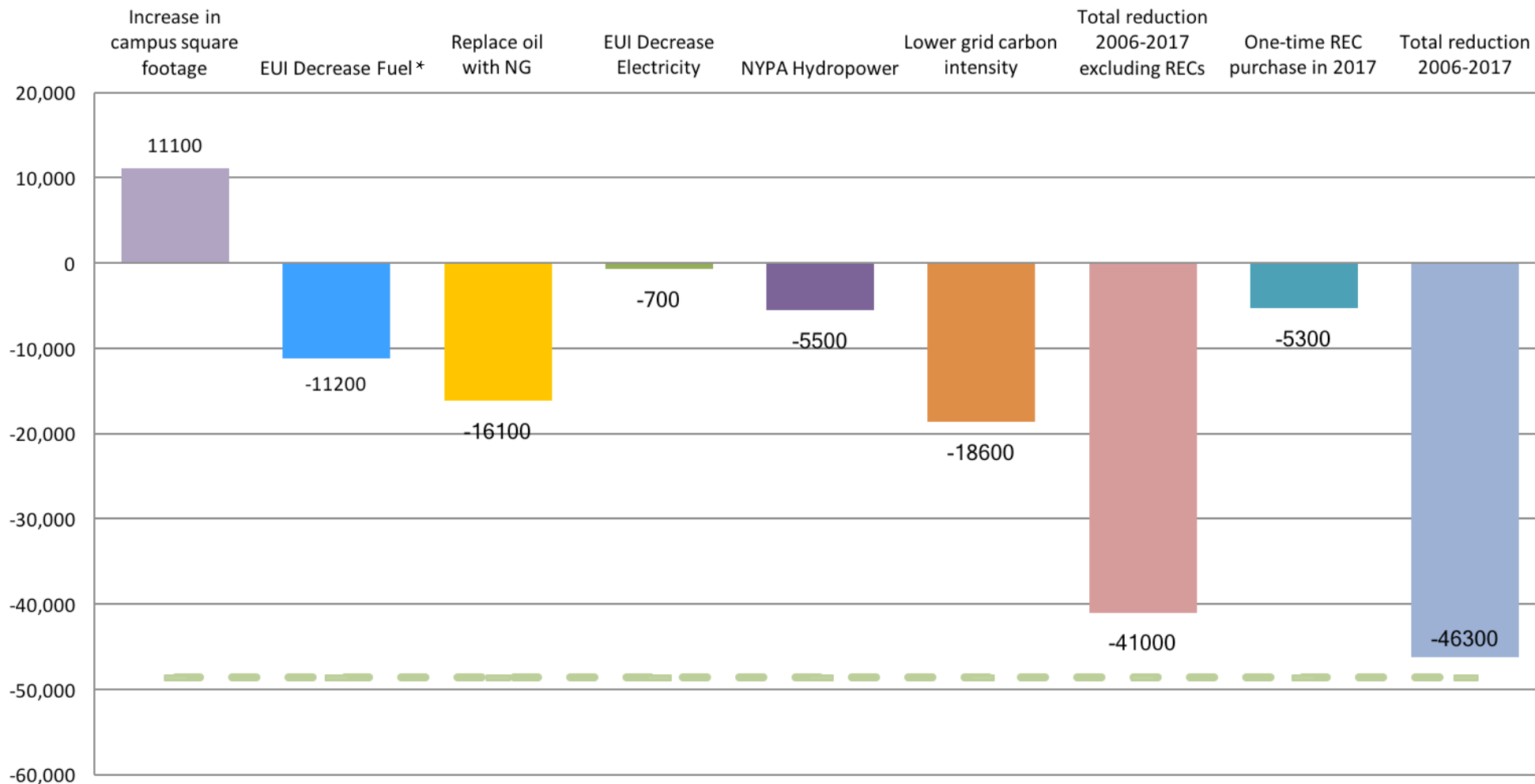
PROGRESS

In 2017, Focus Teams began work to centralize the data that will be required for the 2018 reporting year.

Figure 1: Columbia University Greenhouse Gas Emissions Scope 1 Stationary Combustion and Scope 2 Purchased Electricity

★ **28.5%** reduction in carbon intensity including one-time purchase of RECs as measured for Mayoral Challenge
23% reduction in absolute emissions

★ **33.1%** reduction in absolute emissions including one-time purchase of RECs
29.1% reduction in absolute emissions before RECs

——— Using 2005 Characteristics of Grid Power (NYC Mayoral Carbon Challenge)

– – – Equivalent 30% Mayoral Challenge Goal: Carbon per Square Foot (carbon intensity)

——— Using Then Current Characteristics of Procured Power (TCR Method)

– – – Sustainability Plan 35% Goal for 2020: Absolute Emissions

33%
ABSOLUTE EMISSIONS REDUCTION

Figure 2: Sources of Change in ABSOLUTE GHG Emissions from 2006 to 2017, MTCO2e

* Environmental Protection Agency (EPA) ENERGY STAR defines Energy Use Intensity (EUI) as building energy use as a function of its size or other characteristics, expressed in energy per square foot per year. A low EUI signifies good energy performance.

35% Reduction, 2020 Sustainability Plan Goal

ENERGY

✓ **Completed** → **On track** ↺ **Pivot**

GOAL

Employ energy conservation as a central strategy to achieve a 35 percent GHG reduction by 2020.

STRATEGY 1

Implement identified energy conservation measures/retro-commissioning measures (ECM/RCM) to reduce energy intensity.

✓ **ACTION**
Identify ECM/RCM projects to be completed before 2020.

PROGRESS
A series of 47 ECM/RCM projects have been identified that will enable the University to achieve its goal of 35 percent reduction in absolute emissions by 2020.

→ **ACTION**
Complete 25 percent of selected ECM/RCM projects.

PROGRESS
Columbia has identified a series of ECMs (Energy Conservation Measures) and RCMs (Retro-Commissioning Measures) to implement over the coming three years. In 2017, Columbia began to implement a high-impact ECM/RCM "simultaneous heating and cooling" project that will replace 92 leaking steam control valves across campus. The result of this project will prevent unintentional heating of air that needs to be cooled during the non-heating seasons. An additional 210 ECMs/RCMs (approximately 50 percent of the total ECM and RCMs identified) are estimated to be completed by the close of CY2018.

ACTION

Install energy meters in University academic buildings.

PROGRESS

The campus-wide building utility metering process is 75 percent complete as of December 2017 (See Figure 3). When complete, the project will enable Facilities to benchmark building energy usage in compliance with Local Law 84, which requires annual benchmarking data to be submitted by owners of buildings more than 50,000 square feet. Once user-facing web platforms are developed, this information can ultimately be shared with building owners and tenants, bringing transparency to energy and water usage.

Figure 3: Campus-wide Building Utility Metering Installation Progress

Meter Installation	Meters Complete	Meters Total	Percent Complete
Electric	16	43	37%
Steam	24	53	45%
ChW	6	31	19%
DW	6	34	18%
Total	**52**	**161**	**32%**

Buildings tracked (columns): Broadway Residence Hall, Carman Hall, Casa Hispanica, East Campus, Furnald Hall, Greene Law School, Hartley Hall, Hogan Hall, John Jay, McBain Hall, River Hall, Ruggles Hall, Shapiro Hall, Wallach Hall, Watt Hall, Wien Hall, William Warren, Woodbridge Hall, Northwest Corner Building, 29/35 Claremont, 39 Claremont, 403 W115th St, 404 West 116th St, 411 W115th St, 420 West 116th St, 424 W116th St, 430 W116th St, 438 W116th St, 460/464 Riverside Dr, Avery Hall, Buell Hall, Butler Library, CEPSR, Chandler, Computer Center, Computer Science, Dodge Gym, Dodge Hall, Earl Hall, Engineering Terrace, Fairchild, Fayerweather, Hamilton, Havemeyer & Extension, Pulitzer, Kent Hall, Lerner, Lewisohn, Low Library, Mathematics, Mudd, Philosophy, Pupin, Schermerhorn & Extension, School of Social Work, St. Paul's Chapel, University Hall, Uris.

Legend:
- ✓ Meter Installation Completed
- – Meter Installation in Progress (by 12/31/18)

STRATEGY 2

Create a green revolving fund to support a comprehensive energy conservation program over time.

ACTION

Research and select the best funding mechanism for Columbia to invest in a long-term energy conservation strategy program at the University.

PROGRESS

In 2017 the University created a Green Revolving Fund (GRF) to supporting funding energy conservation projects.

ACTION

Identify seed money and work with key University partners to institutionalize the funding mechanism.

PROGRESS

Facilities Utilities Reserves will contribute $3 million over three years to the GRF ($1 million per year). From fiscal year (FY) 2018 to FY2020, the GRF will support the completion of all ECMs with average simple payback periods of under seven years. Savings generated on an annual basis net of GRF operating expenses will be reinvested in the fund, for the average annual payback period plus two years. These savings will be funded from Central Utilities. After that period, they revert to the central University.

Savings for small projects will be calculated via the Engineering Methodology. For larger projects where savings can be measured, the savings will be retroactively calculated based on actual performance.

A Green Revolving Fund Management Committee, with representation from Facilities Finance, Facilities Operations, Office of Management and Budget (OMB) and Environmental Stewardship, will select the projects.

STRATEGY 3

Develop a GHG master plan through 2050 that will incorporate a standardized rubric for evaluating supply- and demand-side energy decisions, outline anticipated carbon reduction, and enable Columbia to tap into clean and sustainable energy sources as they become available over time.

ACTION

Create a project team to develop and outline the desired goals and usability of a GHG master plan.

Advance request for proposal (RFP) process and engage vendors to build out a plan. Build 25-year GHG master plan with clear, measurable tasks.

PROGRESS

Given that GHG is the common thread that binds all three focus teams, the Office of Environmental Stewardship will coordinate a multi-team effort to set further GHG goals in a coordinated way. They will then coordinate with the Senior Sustainability Advisory Committee (SSAC) to put in motion an approved approach to achieve this strategy.

TRANSPORTATION

☑ *Completed* → *On track* ↺ *Pivot*

GOAL

Baseline GHG associated with all University-related and commuter travel. Reduce transportation emissions through greener campus fleets and encouraging the use of sustainable commute alternatives.

STRATEGY 1

Measure and mitigate GHG emissions from University-owned and contracted fleet vehicles.

☑ **ACTION**
Finalize transportation indicators.

PROGRESS

All Morningside campus fleet managers are now tracking fuel consumption using a standardized tool in a new centralized inventory. This is a step forward in order to prepare the University to report transportation-related GHG emissions to The Climate Registry in 2018. The Lamont-Doherty Earth Observatory (LDEO) and Columbia University Irving Medical Center (CUIMC) campuses are considering the same approach. A new push to collect data on air travel related to University business is under way through a centralized Transportation Survey.

ACTION
Inventory campus-owned fleet.

PROGRESS
Columbia Transportation created a centralized inventory that tracks vehicle fuel types, annual mileage, and vehicle inventory. This enables the University to track the impact of a transition towards greener fleets over time.

ACTION
Analyze the shuttle route system.

PROGRESS
In collaboration with Earth Institute faculty member Radley Horton, a Sustainable Development capstone class project conducted a full evaluation of the shuttle route system at the University. Recommendations on ways to improve the system to eliminate redundancies and increase efficiencies have been incorporated.

ACTION
Develop University-wide vehicle purchasing guidelines.

PROGRESS
Vehicle owners have committed to considering GHG reduction as a major deciding factor when upgrading fleets moving forward. Efforts to formalize the arrangements are under way. There are many examples of this commitment in practice this year: Transportation will transition six shuttle buses to electric buses in 2018. This will have a dramatic impact on the transportation GHG emissions profile, reducing shuttle emissions by an estimated 70 percent (See Figure 4).

E-BUSES WILL REDUCE EMISSIONS
70%

Public Safety upgraded its fleet in three significant areas: purchasing two 100-percent electric patrol vehicles, both Chevy Bolts; converting an evening shuttle bus to a hybrid-electric vehicle that increased its miles per gallon; and replacing an existing Ford shuttle with a more fuel-efficient Mercedes Sprinter van.

Figure 4: Comparison: Annual Reduction in GHG Emissions by Switching to Electric Buses

Existing diesel bus fleet — 360 mt

New electric bus fleet — 90 mt

GHG Emissions (Metric Tons)
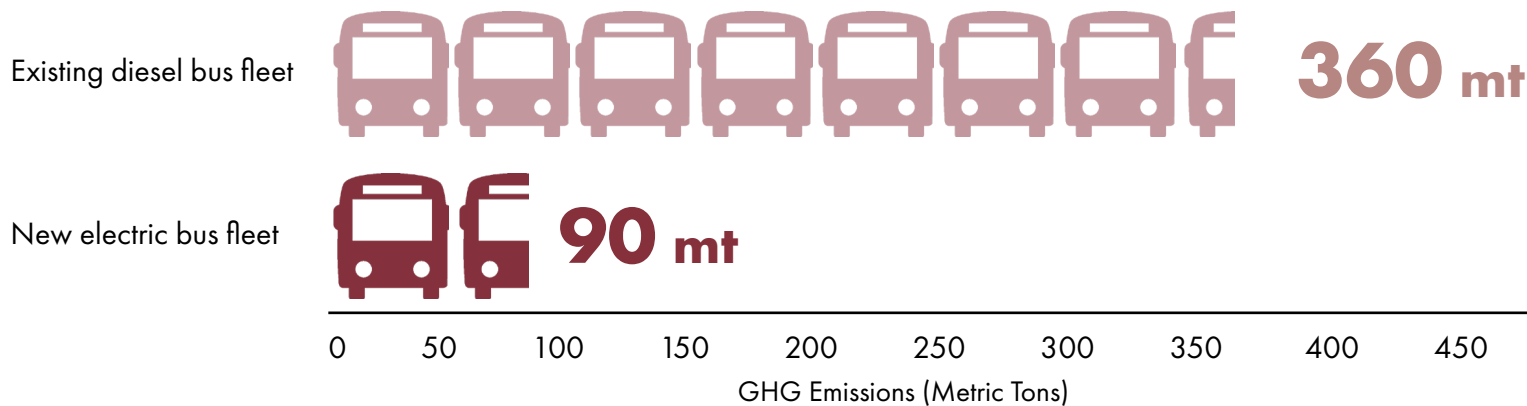
STRATEGIES 2 & 3

Improve access to bicycling, as well as education and engagement; incentivize commuter mode choice to reduce GHG emissions by developing new programs and infrastructure to support cleaner fuel types/transportation modes, e.g., walk, bike, shuttle bus, electric vehicle-charging, public transit subsidies, and ferry services between New Jersey and Harlem (impacts Scope 3 emissions).

ACTION
Incentivize and assist Columbia commuters to experiment and switch to low-emission commute types.

PROGRESS
Columbia Transportation created a park-and-ride option for University affiliates living in or near New York City's northwest suburbs. Manhattan-bound commuters can now park at the LDEO campus in Palisades, NY for a nominal fee and ride the free Lamont-Doherty Shuttle to and from Columbia's Morningside and Manhattanville campuses.

Columbia's bike share system, Zagster, expanded its bike fleet to 20 bikes and opened up a fourth station near the Jerome L. Greene Science Center in Manhattanville.

ACTION
Provide commuters with access to tools that will help reduce drive-alone commuters, such as carpool, vanpool, park and ride, guaranteed ride home, etc.

PROGRESS
Columbia expanded its commuter incentives at Manhattanville by offering parking reimbursement to carpool groups of three or more construction workers. Full-time Manhattanville employees who carpool to work can also receive a carpool parking discount of 25 percent off their monthly parking expenses for public garages in the Manhattanville/Morningside area.

ACTION
Look to progress "League of American Bicyclists" bike-friendly rating, including bicycle infrastructure, bike share, bike parking access, and engagement and education around bicycling on and around campus.

PROGRESS
Columbia is continually working to advance the League of American Bicyclists rating, awarded annually. To advance the rating, the University is looking to provide greater access to on-campus showers for bike commuters by introducing a new Dodge Fitness Center shower pass. Other initiatives include hosting bike appreciation breakfasts for bike commuters, expanding the Zagster bike share fleet, and collaborating with the NYC Department of Transportation (DOT) regarding local street improvements for cyclists and pedestrians.

STRATEGY 4

Reduce GHG from University-related travel beyond Columbia's campuses to neighboring cities or countries abroad, or offset what cannot be reduced (Scope 3 emissions).

ACTION

Conduct best-practice research to evaluate how other institutions are tracking and/or offsetting GHG from related air and other types of travel.

PROGRESS

Two student capstone projects have put forth proposals on how best to track travel-related GHG emissions, as well as curb emissions through offering video conferencing technologies that reduce the need for travel. The results of these proposals are being used to collect and report data to The Climate Registry, in accordance with the University's commitment, as well as to understand what actions can be made at Columbia to ensure alternative options such as video conferencing services are available to Columbia members.

ACTION

Determine how Columbia may pilot best practices for travel to business-related venues (conferences, research, etc.)

PROGRESS

With support from students and faculty, Columbia is researching initiatives to pilot best practices in CY2018, with an eye toward solutions for web-based conferencing.

WASTE

☑ **Completed** → **On track** ↺ **Pivot**

GOAL

Baseline metrics for waste streams, calculate University's first waste-diversion rate, expand composting, recycling and waste management to divert more materials from landfill.

STRATEGY 1

Develop baseline for all waste streams to calculate a comprehensive waste diversion rate by mapping out a process for streamlined data collection and looking to emerging technology.

☑ **ACTION**
Build out waste inventory to map the expansion of key programs.

PROGRESS

As part of a larger strategy to better understand where opportunity lies to expand key waste-diversion programs on campus, the University mapped all buildings to a central inventory. Using this data to engage in an ArcGIS mapping exercise, the team created a number of maps (Figures 5 and 6) to visually depict the recycling streams utilized in each building and the waste flow from generation to staging to disposal. This enables the University to better clarify what waste is included in the "on-campus" (academic building portfolio) diversion rate, and which waste is included in the "off-campus" (residential building portfolio) diversion rate. This effort also enables the University to visually track progress over time.

Figure 5: Recycling Destinations for Columbia's Buildings

Roads

All Recycling Destination (curbside)*

All Recycling Destination (Grove)*

Columbia Buildings

All Buildings

Neighborhoods

*"curbside" refers to Faculty and Graduate Housing; "Grove" refers to academic buildings.

Figure 6: Opportunity to Expand Organics Collection Program

Roads

Compost/Recycling

Recycling

Neighborhoods
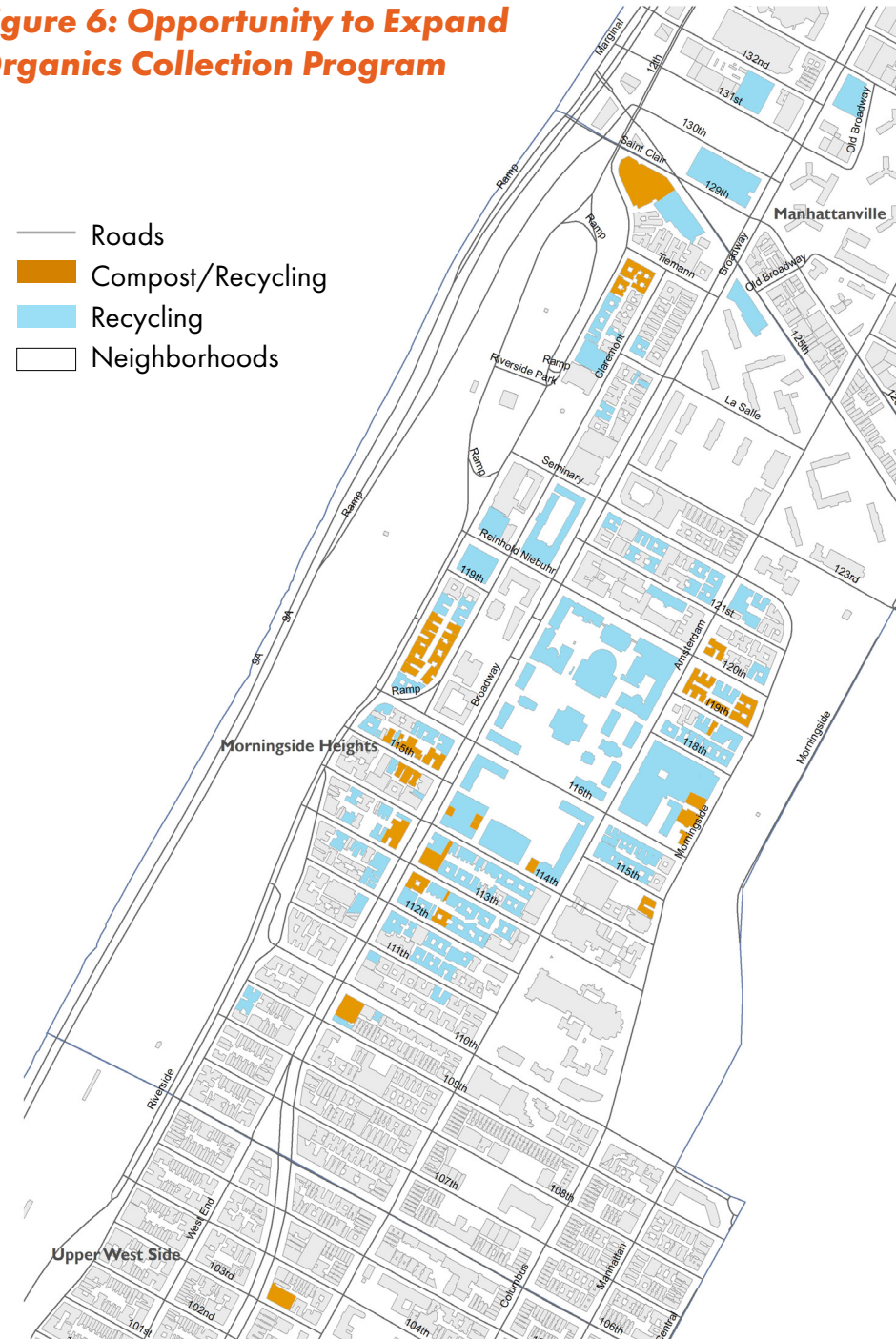
ACTION
Audit "Grove" waste disposal area to determine waste disposal patterns from generators.

PROGRESS
In partnership with the Columbia chapter of Net Impact, an audit of the University's central waste staging area revealed that there is greater opportunity to audit building-specific waste streams to reveal opportunities for increased diversion activity. The Sustainable Leaders Network (SLN) will be a key partner in the effort to better understand how individual schools/departments can improve recycling.

ACTION
Calculate University diversion rate (baseline).

PROGRESS
Columbia first partnered with DSNY to obtain waste and recycling metrics as generated in the academic building portfolio ("on-campus"). The University then centralized this data along with annual tonnage for other major waste streams generated on campus, and calculated the diversion rate by determining each streams' percentage of the combined total tonnage of generated material (See Figure 7). The recycling/reuse streams combined represent the University's first on-campus diversion rate from landfill. The next steps include working to obtain Construction and Demolition (C&D) recycling numbers to include in the diversion rate calculation.

Figure 7: 2017 Campus Academic Buildings Waste Diversion Rate from Landfill

- Municipal: 72.9%
- Bulk Municipal: 11.4%
- Reuse - International Recycling Network: 5.5%
- Metal, Glass, Plastic, Cartons: 3.8%
- Paper: 2.7%
- Organics (John Jay): 2%
- Electronics: 1.4%
- Lightbulbs: 0.2%
- Batteries: 0.1%

16% Diversion Rate
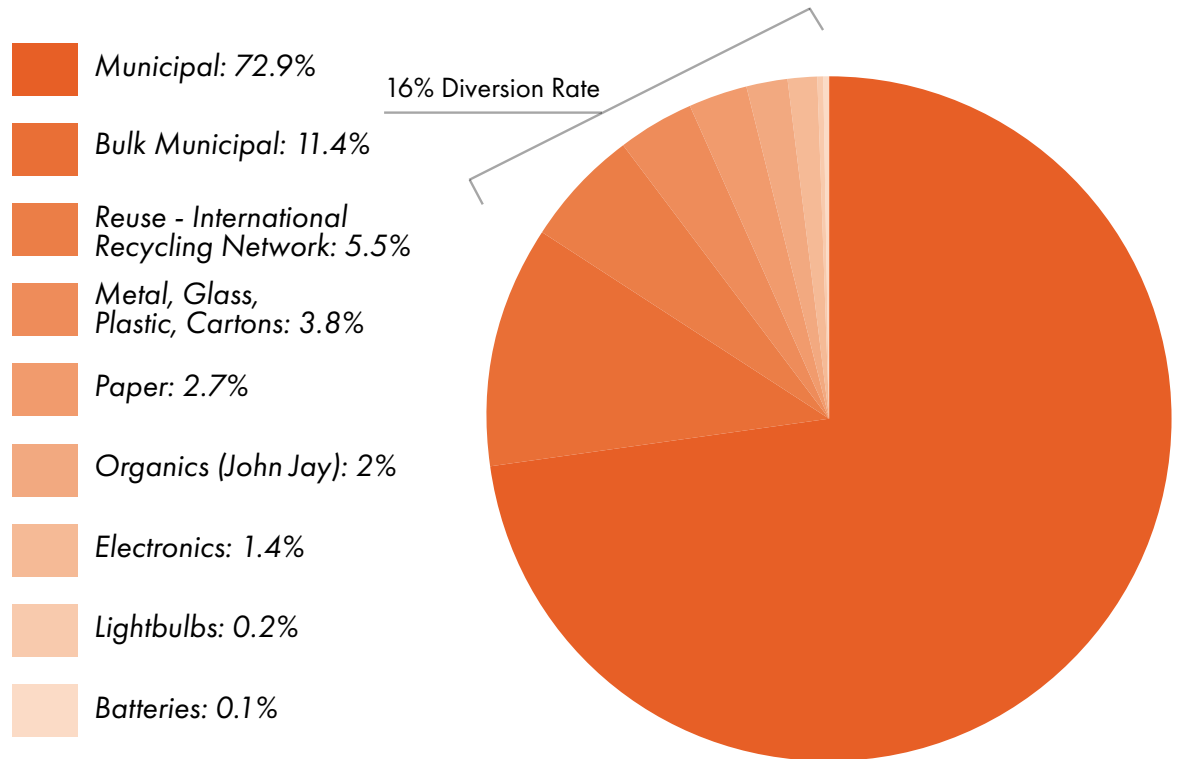
STRATEGY 2

Expand or create programs to increase waste diversion and minimize waste; set a short- and long-term goal.

→ **ACTION**
Conduct a gap analysis to prioritize which programs will have the highest impact. Evaluate success of waste diversion programs and determine feasibility of improving, expanding, or launching new programs.

PROGRESS
Recognizing City of New York's Zero Waste goal, the University remains committed to utilizing available City programs in order to advance both the City's and the University's sustainability efforts. Columbia has continued to leverage its partnership with the DSNY to pilot and continually expand high-impact City-sponsored programs that divert organics (Figure 8), textiles, and electronics from the waste stream. Columbia will continue to partner with the International Recycling Network (IRN) and on-campus stakeholders to divert more used furniture from bulk waste streams.

→ **ACTION**
Based on 2017 baseline year diversion rate, set a 2020 waste reduction/diversion rate goal.

PROGRESS
In order to set an accurate diversion rate goal comprehensive of both the on- and off-campus waste profiles, the University will first pursue a more detailed assessment and study of the residential portfolio ("off-campus") waste profile, including its waste and recycling stream tonnages. This will enable Columbia to calculate an "off-campus" diversion rate.

Figure 8: Organics Program Expansion in Faculty and Graduate Housing

total organics (lbs.)

number of buildings in program
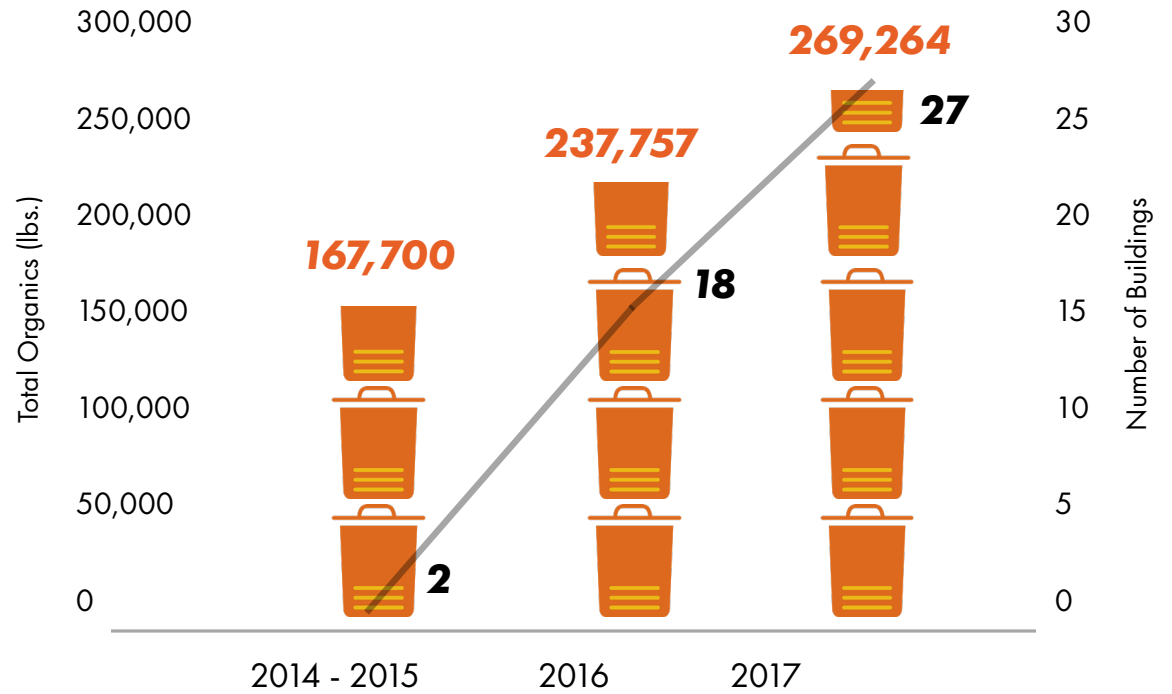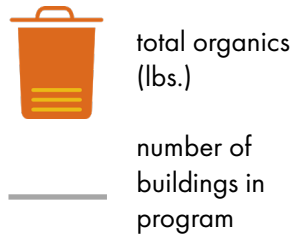
STRATEGY 3

Engage preferred vendors to help support University waste reduction and other sustainability goals, with particular attention to reducing plastic bottle waste on campus; develop user guidelines for socially and environmentally responsible purchasing.

→ **ACTION**
Bring together a work-team around procurement with the goal of developing a set of guidelines; reach out to University vendors and discuss greener product/ packaging options.

PROGRESS
Key stakeholders have organized and begun mapping out a strategy to formally engage vendors for their active support of the University's sustainability and waste reduction initiatives.

17

BEHAVIOR CHANGE

☑ **Completed**   → **On track**   ↺ **Pivot**

GOAL

Engage the Columbia community using the Sustainable Leaders Network (SLN) as a platform to influence change through education and targeted outreach, in order to support the University's goals through behavioral changes.

STRATEGY

Engage a wide range of stakeholders from across the campus to collaborate in developing and endorsing a set of these actions that can serve to guide Columbia's schools to foster a culture of sustainability.

☑ **ACTION**
Create a list of guidelines with proposed actions for schools to reduce their footprint.

PROGRESS
The Office of Environmental Stewardship partnered with the Focus Teams to compile a list of sustainable actions the Columbia community can take to reduce the environmental footprint of their office. These actions cover eight subject areas including "Green Zone," Waste, Purchasing, Energy, Water, Health & Human Wellness, Transportation, and Outreach & Engagement, and include simple behavioral changes like the use of reusable cups, dishware, and utensils.

ACTION

Engage Columbia's schools and departments to empower them to implement sustainable action in their workspaces.

PROGRESS

The Sustainable Leaders Network Liaisons went back to their respective schools and departments to recruit their colleagues as Green Leaders. SLN Liaisons chose individuals who were already sustainability-minded and were interested in taking action toward reducing their workspace footprint. These Green Leaders—one from each business unit within a school or department—came together to form that school or department's Green Council, which is responsible for completing the Workspace Certification Program.

Each Green Council coordinated with Environmental Stewardship to participate in a kickoff presentation introducing them to the Workspace Certification Program. The presentation focused on the differences between the Facilities-focused goals laid out in the Sustainability Plan and the behavior-focused goals; both areas are necessary in order for Columbia to reach its sustainability goals by 2020. *Photo: The School of Nursing Green Council interacts with online learning tools and are instructed on how to complete the Workspace Certification Program in their kickoff meeting.*

ACTION

Schools/departments select an opportunity area from the guidelines to drive measurable culture change over the course of the year.

PROGRESS

Of the nine schools and departments that have received the kickoff presentation and login credentials to the Workspace Certification Program online tool, five have completed their first self-audit. This inital report will act as a baseline for the group to build upon throughout the year, culminating in a certification in either Green Zone, Bronze, Silver, Gold, or Platinum. Every participating Green Council was recognized at a celebratory event hosted by the Office of Environmental Stewardship; at the event, best practices were shared among the group.

SUSTAINABLE COLUMBIA | *Workspace Certification*

On April 11, 2018, the Office of Environmental Stewardship recognized participants of the Sustainable Leaders Network Workspace Certification Program at an event in Faculty House. Schools and departments were presented with certificates displaying the level of certification reached during this pilot year of the program.

Certifications in Progress:

- Facilities & Operations
- Law School
- Mailman School of Public Health
- Physicians and Surgeons

School of Nursing, Gold

General Studies/ School of Professional Studies, Silver

Journalism, Silver

School of Engineering and Applied Science, Silver

Studebaker Building, Silver

Teams within Physicians and Surgeons, Gold and Silver

20

ACKNOWLEDGEMENTS