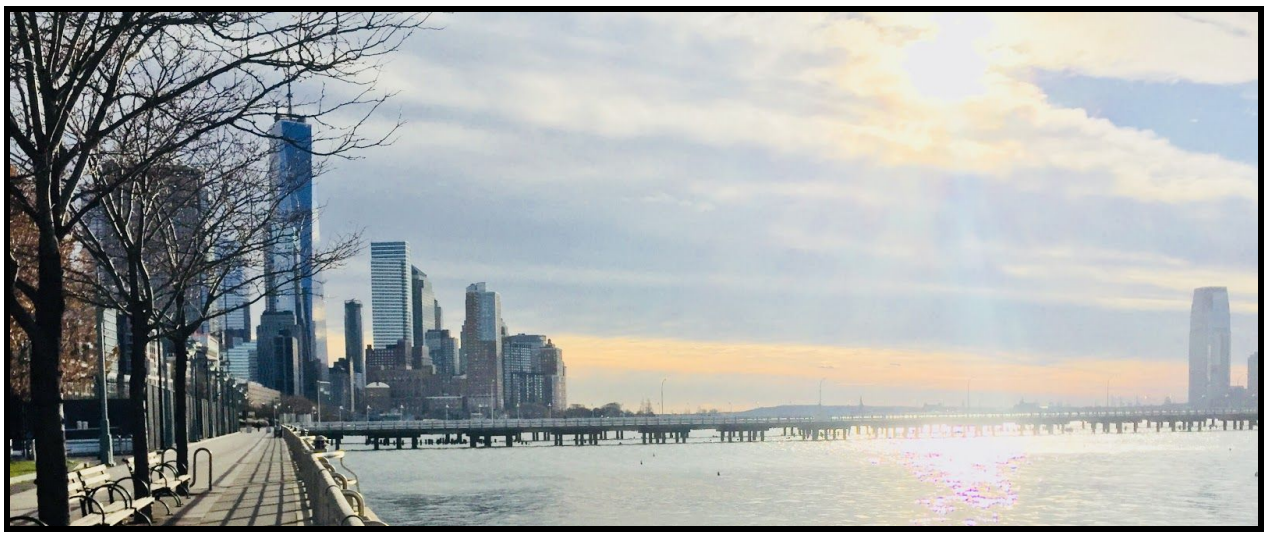
Behavior Change Campaign for Strategic Urban Composting

Insights and Recommendations for Hudson River Park



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SEAS

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Introduction

Interest in urban composting has been gradually increasing, as cities such as San Francisco lead the way and others follow its cue (Hill, 2017; "How Cities Compost Mountains of Food Waste," 2013). Increasing interest is occurring outside of the U.S., as well, including in countries such as Canada and Singapore (Wee, 2017).

Part of the increased interest may be due to interest urban agriculture (Alejandra Cancino 2014). Engaging the many citizens who aren't involved in urban farming or gardening, however, can pose a challenge, as the practice has only recently started to gain visibility in the eye of the general public, despite its existence since centuries ago (Lenkiewicz 2017). We delve further into the challenges of citizen engagement in this report, as well.

Using behavior change campaigns informed by psychology has made research from the field more accessible and applicable, such as when used within a community-based social marketing framework, and has been shown to be valuable when supporting development of sustainable behaviors (McKenzie-Mohr 2000). Collaborating with community-based organizations can be an ideal place to start when developing a behavior change strategy, especially as doing so allows researchers to work in a way that appreciates the value of participatory action research and its emphasis on seeking to understand individuals' context before working toward change (MacDonald 2012).

As such, by partnering with a community-based organization such as Hudson River Park (HRP) (Community Partnerships | Hudson River...), we have been given a superb chance to learn about the Park, the communities it serves, and the opportunity to affect pro-environmental behavior change in a way that supports the Park and its flourishing. As such, the ideas in this report have been developed not only through the formal stages of our research, but also through the ideas that came out of informal conversations during our two site visits and numerous conference calls.

We have laid out the remainder of this report as follows: the Executive Summary provides a high-level description of our project and results while the Project Overview gives more context for this research project. Additionally, the Executive Summary and Project Overview were written largely with and for HRP. Next, the Literature Review, Exploratory Interviews, and Community Survey sections detail our results. Finally, we end with our Recommendations and Conclusion. The sections from the Executive Summary to the Recommendations were previously submitted to HRP and have all been modified, refined, and/or updated to various extents since

the original submission of our report to HRP in February 2018 (Appendix - Report for Hudson River Park, February 2018).

Executive Summary

Context

NYC has 14 million tons of waste each year. Of that, about 30% is organic (Sanitation, 2015). In support of NYC reaching its goal of zero waste by 2030, Hudson River Park (HRP) has procured an industrial composter and developed a Park-wide Community Compost Program (CCP). These efforts will help fill in the gap between existing community drop-off locations and the city's phased approach to rolling out curbside organics pick-up (Roble, 2016) .

Initially, HRP started composting with a focus on horticultural waste in October 2015. By the end of 2016, HRP was able to divert an estimated 32,000 pounds of organic waste (Hudson River Park, n.d.) while saving about $60,000 combined between costs of waste removal and compost that would otherwise need to be purchased ("Hudson River Park Just Got Even Greener | Hudson River Park," n.d.-a). By June 2017, HRP was able to launch its Community Compost Program to the public with the acquisition of its industrial shredder, along with expanded drop-off times at its seven drop-off sites ("Community Composting Kicks off Expanded Sustainability Efforts | Hudson River Park," n.d.-a). By the end of 2018, HRP aims to increase the annual amount of non-horticultural organic waste diverted to 104,000 pounds (HRP Composting Vision 2017).

Opportunity

As one of the longest waterfront parks in the United States, HRP attracts 17 million visits each year and is a symbol of the revitalization of the city. The Park plays a key role in supporting the economic, social, and environmental well-being of the surrounding area ("About Us | Hudson River Park," n.d.), and is uniquely positioned to affect the perceptions of the many residents who frequent its grounds, especially with respect to environmental matters.

Additionally, composting is a relatively new concept for many NYC residents. The act of saving food scraps and supporting community composting efforts is yet to become a city-wide norm. Relative to trash and recycling bins, composting bins are less common on the city's streets; the idea of composting may be off-putting to those who do not practice organics collection. However, a number of residents have begun to develop the practice of composting as a new environmental behavior (C. Roble, personal communication, December 15, 2017).

As a 4-mile park in Manhattan, HRP is working to understand its role in supporting city-wide composting. Given limited resources, the Park is exploring what may be the most effective strategies for outreach, communication and behavior change.

Questions

Considering the above, we framed the questions to address in our research as the following: How might HRP leverage its cultural influence within the city to design and implement a behavior change campaign that increases residential participation in organics collection through increased community drop-offs, and support its goal of diverting at least 104,000 pounds of non-horticultural organic waste by the end of 2018? Moreover, how might the Park do so while being mindful of those who may be underserved or more vulnerable and empower their support as the city works toward its goal of zero waste by 2030?

Methods

As a team of students from the University of Michigan, we partnered with HRP to probe into the Park's potential to affect Pro-Environmental Behavior (PEB) change. We undertook the project in several phases, which were iterative to an extent. We've summarized them below:

- Understand: Academic literature review and onsite visits to Hudson River Park
- Explore: Stakeholder interviews, community survey, toolkit research to draw inspiration from what other organizations have done in recent years to facilitate pro-composting behavior change
- Deliver: Integration of the team's findings and development of recommendations

After submission of an earlier iteration of this report to HRP, we went through additional review of our findings and performed additional secondary research in areas of interest to refine our report and recommendations. We also consolidated the original academic literature review with the (non-academic) toolkit research into one overarching literature review.

Key findings

Given that the success of HRP's CCP and the development of a substantial base of residential participation depends largely on increasing motivation through education and awareness, while lowering barriers to participation in composting, we have highlighted a few relevant key findings below.

Methods of increasing recognition may include:

- Effective education to a broader audience, emphasizing both key environmental benefits and social/community benefits; doing so may include the sharing of literature and other communications materials to educate on on how the compost is benefiting the community. Partnering with groups such as neighborhood garden communities, schools, and champions within communities, to support development of composting as a social norm more quickly
- Providing residents with the opportunity to experience composting firsthand, which may help them understand the ease of compost participation and the impact that they are making

For the barriers, we have identified psychological barriers such as “yuck” factor, concerns about odors/pests, perceived hassle of extra work, confusion over what can be composted, lack of knowledge about accessible drop-off locations.

To lower these barriers, we have identified some examples practiced:

- Practices of freezing food scrap or using worm bins
- Using sealed containers to store food scrap in fridge or freezer
- Improve signage, for example by using 3D signage to indicate what can be composted and by using signage to show directions to the closest drop-off location
- Ensuring accessibility to drop-off sites, such as through physical proximity and operation times

Recommendations

Consider a three-phased approach to reach multiple populations:

Short-term
Use external interventions, such as salient signage and messaging, and work to make composting as easy as possible for households. Combine with internal interventions, such as behavior modeling, and focus Compost Ambassadors’ efforts on the those who are more receptive to composting to help establish the practice as a social norm.

Mid-term
As an external intervention, consider partnering with other organizations to make composting at home easy through provision of composting bins. Combine with internal interventions to increase perceived behavioral control by showing communities the impact of their composting efforts. Also consider hosting events to highlight first-hand the vast amounts of waste that the city generates.

Long-term
Consider further research to target specific populations. Understand what factors led to the successes of the “NYCHA Recycles!” initiative and what takeaways may be applied when considering composting education at New York City Housing Authority (NYCHA) residences. Lastly, consider partnering with schools to understand the potential role that HRP may play in composting education.

Project Overview

HRP background

Hudson River Park is a 550-acre park along the west side of Manhattan ("Vision & Progress | Hudson River Park," n.d.). In October of 2015, the Park opened its Composting Center with the procurement of its automated composter, thanks to Friends of HRP and the generosity of Christopher Fiore & L Brands Inc., in support of NYC's zero waste by 2030 goal, in partnership with DSNY with a focus on horticultural waste ("Hudson River Park Just Got Even Greener | Hudson River Park," n.d.-b).

By the end of 2016, HRP was able to divert an estimated 32,000 pounds of organic waste through office, tenant, and community participation (Hudson River Park, n.d.) while saving about $60,000, from an estimated $40,000 in savings from removal costs and $20,000 of savings from compost that the Park would have otherwise needed to purchase ("Hudson River Park Just Got Even Greener | Hudson River Park," n.d.-b). By June 2017, HRP was able to quickly scale up and announce its expanded Community Compost Program to the public, as the acquisition of its industrial shredder allowed it to increase its composting capacity; along with this expansion came widened drop-off times at its seven drop-off sites to support greater community participation in composting efforts ("Community Composting Kicks off Expanded Sustainability Efforts | Hudson River Park," n.d.-b). For 2018, HRP aims to double the annual amount of non-horticultural organic waste diverted from its 2017 goal to 104,000 pounds, or about 2,000 pounds per week on average, to support the development of a more sustainable community (HRP Composting Vision 2017).

NYC context

To give a rough sketch of the context within HRP's composting efforts are situated, a few notes about greening efforts for the city of New York that are more closely related to this particular project are noted below.

In 2007, New York City launched "PlaNYC", which has evolved into "OneNYC: The Plan for a Strong and Just City". The motivation for this city-wide effort comes largely from the understanding that the city is forecasted to have 9 million residents by 2040, within the context of an evolving economy, aging infrastructure, and changing climate ("Mayor de Blasio Releases One New York: The Plan for a Strong and Just City," 2015). Mayor de Blasio released "OneNYC" largely as it stands now in April 2015, building upon the sustainability efforts started by "PlaNYC" ("Mayor de Blasio Releases One New York: The Plan for a Strong and Just City,"

2015). The fall of 2016 saw the start of the Zero Waste School Initiative, beginning with 100 pilot schools, intended to formally last for five years in total . By the end of 2016, the "NYCHA Recycles!" initiative was completed and gave all NYCHA residents access to recycling ("NYCHA - Recycles!," n.d.). Lastly, by the end of 2018, the City of New York aims to complete its phased rollout of curbside organics pickup for all New Yorkers (#OneNYC: The Plan for a Strong and Ju...).

Project scope

As an integral part of many New Yorkers' lives (About Us | Hudson River Park), HRP aims to support residential participation in organics collection to increase composting and contribute to New York City's goal of reaching zero waste by 2030 (Roble 2016).

Purpose and Justification

As students from the University of Michigan, we are partnering with HRP to design a behavior change campaign to strategically increase urban composting. This project is also being conducted in partial fulfillment of the requirements for the degree of Master of Science from the School for Environment and Sustainability at the University of Michigan.

Scope

Identify how HRP might decrease barriers and increase motivation of residents in the HRP area to participate in organics collection at the Park with an emphasis on developing effective signage.

Stakeholders

Key stakeholders for this project include:

- Project sponsor: Hudson River Park
- Primary audience for the behavior change campaign: Residents of NYC who frequent HRP and visitors of the park; the general public
- Secondary audiences: NYCHA residents who live near HRP; children and their families who live near HRP; other NYC organizations with an interest in composting

Research questions

To develop an effective behavior change campaign, we started by using the questions below to guide our research.

1. What are the primary barriers to organics collection in an urban apartment environment?
2. What are the primary motivations for organics collection in an urban apartment environment?

3. What frameworks are relevant in supporting effective behavior change strategy to encourage organic collection and composting?
4. How might we design effective surveys and interview questions to better understand the urban composting context?
5. How might we design an effective behavior change campaign, rooted in theory and customized for HRP's context per survey results, that empowers residential support and utilizes signage effectively?

Methods

Our initial approach included several phases, as shown below (Figure 1).

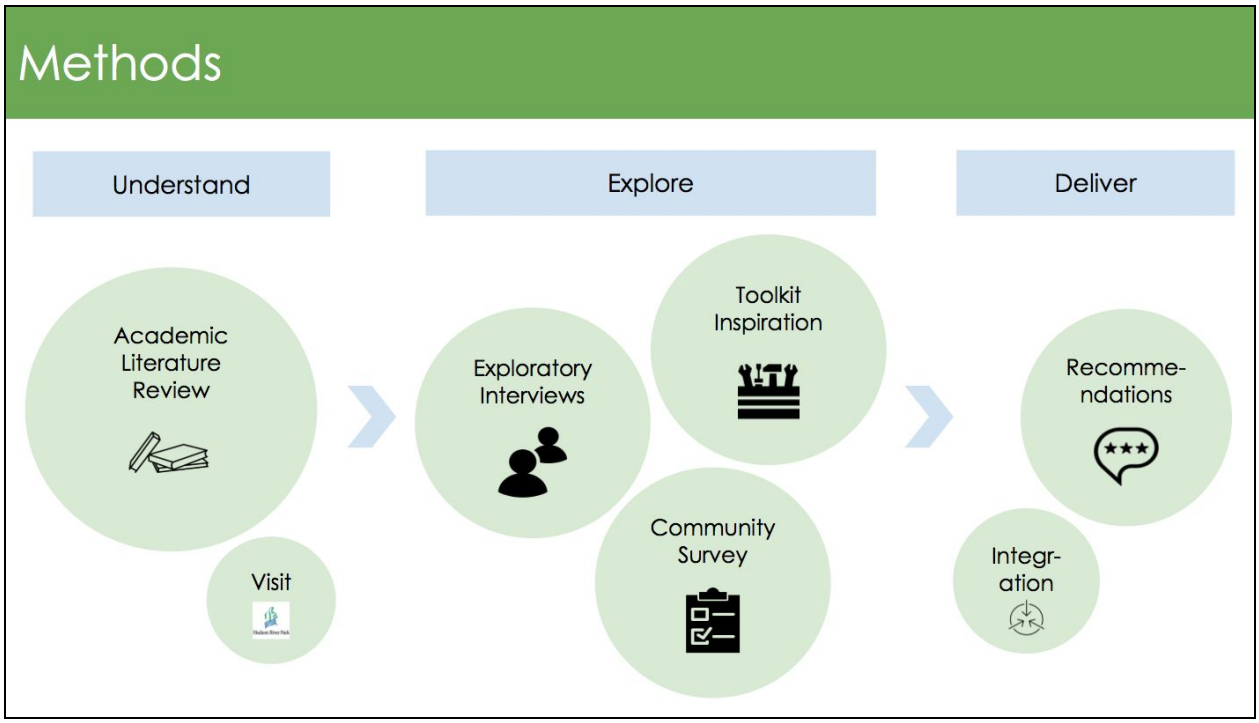

Figure 1. Research methods and phases up to submission of report to HRP in February 2018.

Understand

The first phase of our project, "Understand", consisted largely of secondary research through an academic literature review to gain a high-level sense for the existing body of knowledge for PEB change, particularly with respect to composting. In May 2017, we also had the opportunity to visit HRP in-person for two days to get a tour of the Park and participate in a community meeting to learn more about the residents in the area.

Explore

The second phase of the project, "Explore", included both primary and secondary research, essentially creating a three-legged "stool". The first leg consisted of exploratory interviews with

community stakeholders, such as residents and representatives of pro-environmental organizations in NYC, and subsequent qualitative analysis. The second leg consisted of a community survey to provide the team with deeper information on residents' current beliefs, attitudes, and behaviors with respect to composting, along with quantitative analysis of the results. The third leg consisted of additional secondary research -- this time, including information from non-academic sources with an eye toward what model cities and universities have done in recent years to promote pro-composting behavior change to provide toolkit inspiration.

Deliver

Later, the team integrated findings from the "Understand" and "Explore" phases and used the insights as a springboard for developing strategic recommendations. Project deliverables included developing a strategy to support PEB change with emphasis on how HRP might develop effective signage in the form of this written report, as well as an in-person presentation.

After our second onsite visit to HRP in December 2017 and the submission of our report to HRP in February 2018, we were able to go through somewhat of an iterative process, which involved additional reflections on informal conversations we had had with HRP, further review of our research, and additional secondary research on areas of interest to further refine our research and recommendations. As part of this process, we combined the Academic Literature Review and Toolkit Inspiration into an overarching Literature Review, which follows.

Literature Review

Approach

Reviewing Behavior Change Theories

In reviewing literature to potentially base our project approach on, we looked at various guiding theories regarding behavior change. These theories included ones such as *Theory of Planned Behavior* (Ajzen, 1991), theories regarding injunctive norms and descriptive norms (Cialdini, Reno, & Kallgren, 1990; Cialdini, 2003), and informational interventions and structural interventions (Steg & Vlek, 2009). While our thinking has been influenced by the aforementioned research, and will get touched on to an extent later in this literature review, we ultimately decided to use community-based social marketing (CBSM) to frame our project, because of its pragmatic approach to behavior change and the well-documented case studies regarding its efficacy (D. McKenzie-Mohr, 2000; "Tools of Change - Home," n.d.)**.**

Community-Based Social Marketing Overview

CBSM is a process used to support behavior change and has been increasingly adopted by urban planners in Canada, as it combines the strengths of both psychology and social marketing (D. McKenzie-Mohr, 2000). The process can be outlined through five key steps, described below and summarized in Figure 2.

Step one involves identifying the desired behavior(s), considering the ability of an action to effect a desired change, the barriers associated with the potential actions and whether resources are available to address those barriers, and what class of behavior would be promoted. Classes of behavior may be divided into two: one-time and repetitive. Since repetitive actions are longer-term, changing repetitive behavior can be more difficult as it often involves significant effort in changing behavior initially, as well as effort in maintaining the behavior over time (Mckenzie-Mohr, 2000).

Step two involves identifying barriers. Barriers can be internal (e.g., lack of knowledge on how to perform a given action) or external to an individual (e.g., lack of city infrastructure), and multiple barriers to a behavior can exist (Mckenzie-Mohr, 2000).

Step three entails identifying strategies and developing programming to overcome the barriers found in step two. Methods to overcome barriers can come in a wide variety of formats, including developing community norms and making a behavior more convenient. Commitment can also be an effective tool, utilizing the "foot-in-the-door effect" -- once people agree to a smaller request, the chances of them engaging in more substantial activity often increases greatly. Since many people may not engage in pro-environmental behaviors simply because of forgetfulness, using prompts in the form of a visual or auditory aids can act as reminders and support repetitive behaviors (Mckenzie-Mohr, 2000).

Step four includes piloting a social marketing strategy before it is implemented at a larger scale. Doing so helps planners understand a strategy's potential effectiveness and make appropriate adjustments before wide-scale implementation occurs (Mckenzie-Mohr, 2000).

Step five is implementing the strategy and evaluating it to provide feedback on its efficacy (Mckenzie-Mohr, 2000).

To work within the constraints of the project, our team focused on the first three steps of CBSM and provided recommendations to Hudson River Park to support them in steps four and five. The remainder of this literature review and project use CBSM as a guiding framework to organize our research. Additionally, since the behavior of participating in residential composting was a given for this project, step one of CBSM is acknowledged below, but more attention is given to steps two and three (Figure 2). Primarily for CBSM step three, we also took the liberty of going outside of academic literature and incorporated material that was previously submitted as toolkit inspiration to support a comprehensive understanding of what other organizations and some individuals are currently doing to support PEB as it relates to composting.

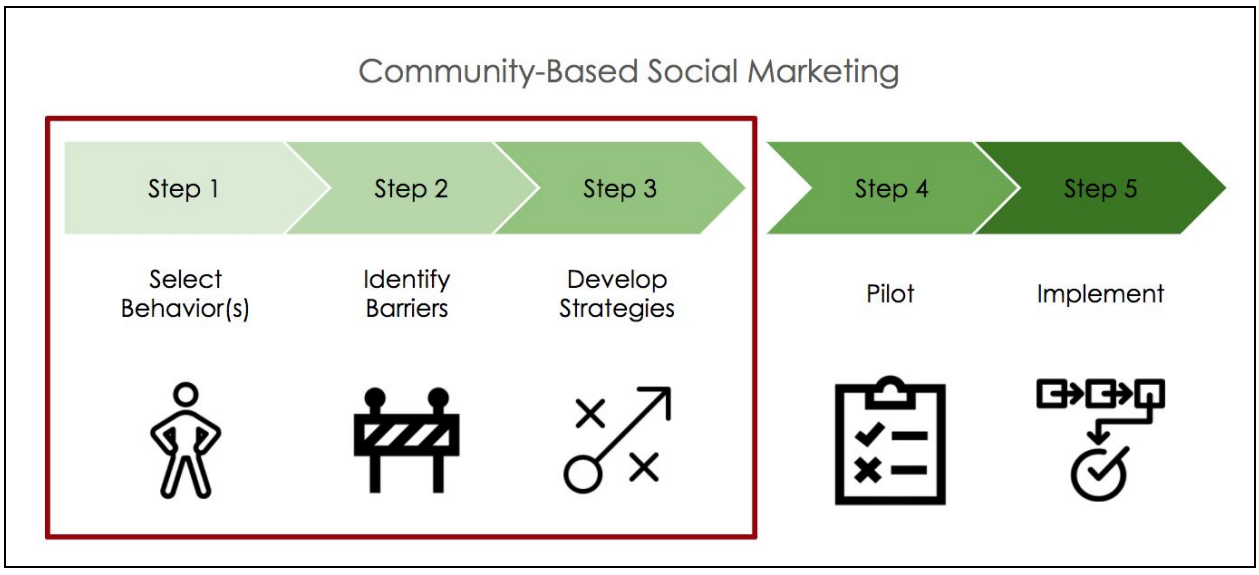

Figure 2. A summary of community-based social marketing. The red box indicates the three steps that our team focused on in order to work within the constraints of this project.

CBSM Step 1: Selecting Behaviors

Residential composting is a selected behavior because of its great potential to divert waste and support Hudson River Park in fostering the health of the environment in a cost-effective manner, while also supporting New York City in reaching its goal of zero waste by 2030, as noted above in the Project Overview. The initial successes of HRP's CCP also give reason to believe that existing barriers to residents' participation in composting can be overcome. Because composting is meant to be a repeated behavior, behavior change efforts may involve supporting people in both making an initial change and supporting that change on an ongoing basis.

CBSM Step 2: Identifying Barriers (Literature Review)

In researching barriers to pro-environmental behavior change and, more specifically, residential participation in composting, we found that the barriers that researchers noted in existing literature could be put into three main buckets: lack of awareness, lack of motivation, and lack of convenience. We detail these three buckets below.

Lack of awareness

Being aware of the negative impact that one's behavior could have on the environment has the potential to support significant pro-environmental behavior change. In one study conducted in a foodservice context, participants randomly assigned to receive information on the negative impact of food waste in landfills substantially reduced the amount of waste generated relative to the control group, which did not receive information on landfills nor composting (Qi & Roe, 2017).

Lack of awareness regarding what materials can and cannot be accepted at drop-off sites can also be a barrier to site utilization. In a study looking at drop-off recycling behavior, recyclers reported high levels of familiarity with materials accepted at drop-off facilities, and were correlated with higher frequency of drop-off site visits (Sidique, Lupi, & Joshi, 2010). Although this study focused on recycling behavior as opposed to composting behavior specifically, we believed that it was still very relevant to this particular project as it examines factors that affect behaviors within the context of waste management and waste reduction.

Another common reason for not participating in pro-environmental behavior can be a simple lack of awareness of the infrastructure that supports pro-environmental behavior. In the same study as above on drop-off recycling behavior, recyclers reported a higher level of awareness of drop-off

recycling facilities relative to non-recyclers. Additionally, familiarity, which was a variable that included both awareness of acceptable materials to drop off and awareness of facility locations, was a significant variable even at the 1% level (Sidique et al., 2010). Thus, communications aimed at increasing residents' awareness of composting drop-off sites, in addition to acceptable materials to drop off, may increase the frequency with which drop-off sites are utilized.

Somewhat ironically, lack of awareness can also come in the form of not being aware of the drop-off sites even when in proximity to them. In a study looking at composting behavior (or lack thereof) in public spaces, including shopping center food courts and a local fast food restaurant, a common reason for not composting even when compost drop-off bins were available at those sites was having not noticed them, despite the signs that were present. The lack of effectiveness of the signs could have been due to design or placement; the researchers hypothesized that the signs could have potentially been more effective if they had been placed closer to the bins themselves, rather than on tabletops (Sussman & Gifford, 2011).

Lack of motivation

Intuitively, many may believe that lack of concern for the environment may correlate directly with lack of pro-environmental behavior. However, studies have shown mixed results. For example, while one study finds that household members with more positive ecological attitudes are more likely to take a greater role in recycling (Meneses & Palacio, 2005), another finds that both recyclers and non-recyclers alike share concerns for the environment (Vining & Ebreo, 1990).

Additionally, for those not currently practicing pro-environmental behavior, lack of incentives can potentially also be a barrier. In one study, non-recyclers were more concerned about rewards and financial incentives to recycle, as well as convenience (Vining & Ebreo, 1990), which we will discuss further in the next section of this literature review.

What appears to be a very significant barrier to motivation, however, is the lack of social norms, as suggested by the multitude of studies that have noted the positive influence of social norms and their ability to decrease reluctance to implement pro-environmental behaviors (Goldstein, Cialdini, & Griskevicius, 2008; Meneses & Palacio, 2005; Nyborg, Howarth, & Brekke, 2003; Sussman, Greeno, Gifford, & Scannell, 2013). We go further into the influence of social norms later in this literature review, as well.

Lack of convenience

Researchers have found that people commonly believe that pro-environmental waste management behaviors such as composting and recycling are inconvenient; this perception of

inconvenience can potentially stem from a number of issues, including those related to time, space, money, and effort required to participate (Sidique et al., 2010).

A common barrier to personal waste management behavior seems to be the belief that the behavior is too time-consuming to partake in (Mckenzie-Mohr, 2000; Doug McKenzie-Mohr, Nemiroff, Beers, & Desmarais, 1995; Sidique et al., 2010).

Additionally, participation in composting requires some level of additional space in the home, which can be an especially relevant challenge to address in high-density residential areas (Barr, Gilg, & Shaw, 2011; Sidique et al., 2010).

Further, traveling longer distances to drop-off sites can also be minimize participation in pro-environmental waste management behaviors (DiGiacomo et al., 2018; Rousta, Bolton, Lundin, & Dahlén, 2015a; Sidique et al., 2010).

Particularly for composting, some people believe that collecting food scraps in one's home is too inconvenient due to the potential for unpleasant odor and the general "ickiness" of collecting food scraps (Metcalfe et al., 2012).

Thus, supporting participation in pro-environmental waste management behaviors from a convenience perspective should maximize ease of implementation, and minimize time, space, and general effort required to participate, including minimizing potential for unpleasant odors and subsequent potential for attracting pests (Sidique et al., 2010).

CBSM Step 3: Identifying Strategies (Literature Review)

As noted earlier, to understand strategies that have been used to overcome barriers to composting, we used academic literature but also went outside scholarly works to find current examples of how organizations are actively supporting pro-composting behavior. We framed the strategies as methods that address the barriers of lack of awareness, motivation, and convenience presented previously.

Before going into specific strategies, however, it may be helpful to acknowledge the role of informational versus structural interventions here to provide some overarching understanding. Informational strategies aim to change perceptions, motivations, knowledge, and norms, without changing the external circumstances under which choices are made. These interventions may include the use of information, persuasion, social support and role models, and public participation in order to facilitate pro-environmental behavior. This type of intervention tends to be more effective when pro-environmental behavior is relatively easy or not costly to implement.

On the other hand, structural strategies are used to minimize barriers in cases where acting pro-environmentally is more difficult or otherwise costly. These interventions aim to change one's environment to make pro-environmental behavior more attractive and may include addressing availability of products or services, legal regulation, and financial strategies (Steg & Vlek, 2009). Most, but not all, of the strategies that follow generally fall under the category of informational interventions.

Increasing awareness

Increasing awareness to support pro-composting behavior may come in the form of increasing awareness of one's negative impact on the environment, familiarity with acceptable materials to drop off, familiarity with locations of drop-off sites, and effectiveness of signage design.

Understanding how one's behavior can negatively impact the environment plays a role in supporting pro-environmental concern and motivation, as well, particularly for those who do not yet have positive ecological attitudes. Underscoring environmental damage information for these populations can help audiences develop environmental concern (Meneses & Palacio, 2005). A potentially very powerful tool to use to support understanding of environmental damage information is 3D visualization. In one study, landscape architecture researchers used technology to model and visualize for residents the impact that climate change has had on their own community (Figure 3). Doing so effectively raised residents' awareness of and concern regarding climate change and increased intentions to implement pro-environmental lifestyle behaviors (Sheppard, Shaw, Flanders, & Burch, 2008).

Figure 3. 3D visualisations of alternative conditions in a coastal community at risk of flooding (Sheppard et al., 2008).

Increasing awareness of acceptable drop-off materials, drop-off locations, and awareness of the drop-off bins themselves can come through a variety of ways, including increasing effectiveness of signage and even bin and drop-off site saliency.

Increasing effectiveness of signage can sometimes mean a method as simple as making signs larger, as researchers found that larger signs versus smaller ones were more effective as visual prompts in support of pro-environmental behavior within the context of turning off lights to save energy (Sussman & Gifford, 2012).

Regarding effective communication of the content displayed on signage, using generally less text and clearer images, particularly of commonly missorted items, can support awareness of appropriate materials to drop off (Clark et al., n.d.; Rousta et al., 2015a). In one study examining the effect of an information intervention wherein residents were given new stickers with less text and clearer images (Figure 4), the fraction of mis-sorted items decreased significantly, by more than 70% (Rousta et al., 2015a).

Figure 4: Left: heavy text and less clear images; right: less text and clearer 2D images (Rousta, Bolton, Lundin, & Dahlén, 2015b).

For the text that is used, including multilingual text in consideration of populations for which English is not a first language can also be another way to support the effectiveness of signage or other visual prompts where multicultural communities are present. For example, the city of San Francisco uses multilingual and colored 2D photos (Figure 5) in composting education posters and has found that this intervention works well for their multicultural populations (Sullivan, 2011).

Figure 5. Sample multilingual signage to support awareness among multicultural populations ("Recycling Signs," 2017).

Regarding the visual display of appropriate drop-off items, while going from black and white 2D images to colored 2D photos of compostable items can be very effective in promoting correct sorting of compostable materials, the inclusion of 3D compostable items as samples (Figure 6) can potentially support greater saliency, hence supporting correct sorting further, though the differences in sorting accuracy when using 2D images only versus 2D plus 3D images has not consistently been statistically significant (Foster, 2016; Zelenika, Moreau, & Zhao, 2018a).

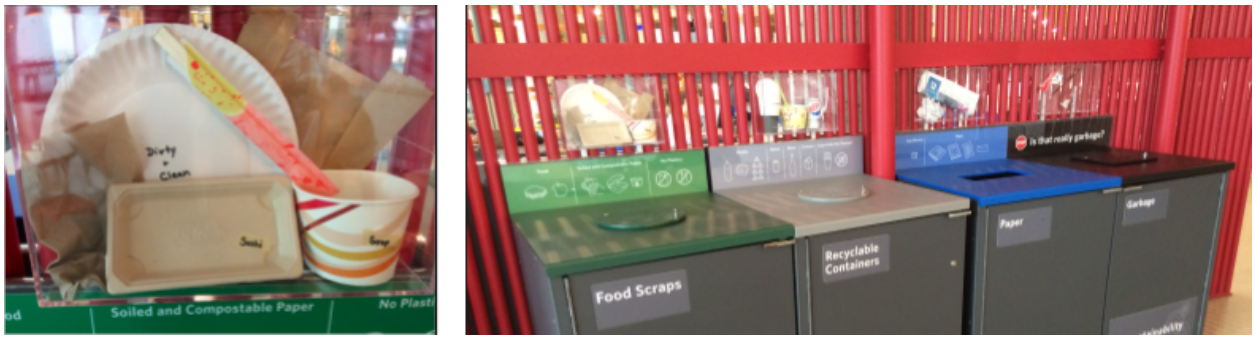

Figure 6. Left: close-up image of sample 3D compostable items; right: 3D displays included above the original 2D displays (Foster, 2016; Zelenika, Moreau, & Zhao, 2018b).

Effective bin design to support saliency can also mean the use of bright colors and patterns. In a study done in Shanghai, China, one intervention testing the use of regular compost bins with the addition of volunteers manning the drop-off sites and a second intervention using compost bins that had a bright yellow sunflower pattern and no volunteers manning the sites (Figure 7) showed similar high capture rates (44% and 32%, respectively -- these results were both significant

relative to the control group, which had a capture rate of 7%, but were not significantly different from each other in this study) and low contamination rates, suggesting that the latter may be an effective low-cost, scalable intervention to support participation in composting (Lin, Wang, Li, Gordon, & Harder, 2016).

Figure 7. Intervention using bright yellow compost bins with sunflower pattern and no volunteers manning the site (Lin et al., 2016).

Moreover, using visual prompts to turn pro-environmental activity into a fun experience can support higher participation rates (Lee & Kotler, 2011; Matsumura, Fruchter, & Leifer, 2014; Shih, Wu, & Wang, 2016; Smets, 1995; Sweden, 2009). As an example, a "Cookie Monster" recycling bin created by an unknown artist adds an unexpected element of fun to the behavior of recycling and can attract positive attention when used to target an appropriate audience (Figure 8).

Figure 8. Cookie monster recycling bin, design from unknown artist ("Cookie Monster Recycling Bin - 101qs," n.d.).

In putting together several elements of effective signage and drop-off site design, a waste management center in Charlotte, Virginia shows what we believe to be an interesting example of a well-designed and salient drop-off site, although we have not come across an empirical study verifying its effectiveness. The main color of the site is a bright orange, which can be noticed from afar. The size of the sign above the bins is relatively large and the text is bold and easy to read. The site also uses a 3D area which includes a 3D display to clearly show common items that cannot be accepted and even provides composting bags for residents' convenience (Figure 9).

Figure 9. Mcintire Recycling center, Charlotte, Virginia ("Composting in Charlottesville | City of Charlottesville," n.d.).

Increasing motivation

As alluded to earlier, strategies to increase motivation to implement pro-environmental behavior can include the use of powerful visualization to increase awareness of one's impact on the environment, subsequently fostering development of motivating environmental concern (Sheppard et al., 2008); incentives, whether financial or non-financial (Vining & Ebreo, 1990); and methods that cultivate pro-environmental behavior as a social norm (Goldstein et al., 2008; Meneses & Palacio, 2005; Nyborg et al., 2003; Sussman et al., 2013). Below, we focus primarily on ways to turn pro-environmental behavior into a social norm, since its importance came up repeatedly in our research.

To start, a number of studies note that individuals are more likely to to practice pro-environmental behavior when others, including family members, close friends, or neighbors, have a general expectation that they do so (Clarke, 2004; Sidique et al., 2010; Sussman et al.,

2013; P. Tucker, Speirs, Fletcher, Edgerton, & Mckechnie, 2003). Turning a behavior into a social norm or expectation can involve the use of both injunctive and descriptive norms, which influence beliefs about what others generally approve or disapprove of, and what others generally do, respectively (Cialdini, 2003; Cialdini et al., 1990).

Developing that expectation can come through messaging and visual prompts; more specifically, messaging focused on appeals to social norms through descriptive norm messaging as opposed to environmental protection can be significantly more effective (Goldstein et al., 2008; Sidique et al., 2010). For example, a study examining standard environmental messaging versus descriptive norm messaging showed that the latter was significantly more effective at influencing hotel guests to reuse towels. As reference, the standard environmental message printed on door hangers said, "HELP SAVE THE ENVIRONMENT. You can show your respect for nature and help save the environment by reusing your towels during your stay." In contrast, the descriptive norm message focused on what others were doing: "JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay" (Goldstein et al., 2008).

Additionally, using a combination of both injunctive and descriptive norms can be especially effective (Cialdini, 2003). Studies in school cafeteria and public shopping mall settings have found the highest rates of composting to come when using a combination of signage and role modeling; modeling, especially with two individuals as opposed to only one, has been noted as an effective intervention that can influence people to start composting (Sussman & Gifford, 2011; Sussman et al., 2013). Researchers hypothesize that the signage noting the importance of composting may have activated an injunctive norm, while modeling through two volunteers (as opposed to only one volunteer) could have activated a descriptive norm, leading study participants to infer that seemingly "everyone" was composting, thus increasing social pressure to participate in the same behavior (Sussman et al., 2013).

Furthermore, using messaging that focuses not necessarily on static norms that describe what people are doing at a given point in time but instead on dynamic norms that describe others' behavior over time can also be effective in promoting pro-environmental behavior, even in cases in which the behavior is counternormative. For example, despite the norm of consuming meat, the use of dynamic norm messaging in one study was particularly effective in increasing interest in lowering meat consumption and doubling meatless orders at a cafe. Static-norm messaging communicated that: "Recent research has shown that 30% of Americans make an effort to limit their meat consumption. That means that 3 in 10 people eat less meat than they otherwise would." This message contrasts with the more active framing of the dynamic-norm message:

"Recent research has shown that, in the last 5 years, 30% of Americans have now started to make an effort to limit their meat consumption. That means that, in recent years, 3 in 10 people have *changed their behavior* and begun to eat less meat than they otherwise would." Similarly, dynamic framing versus static framing was more effective at decreasing water use during a drought (Figure 10) (Sparkman & Walton, 2017).

Figure 10. Left: framing the norm as static -- "Most of Stanford Residents use Full Loads"; right: framing the norm as dynamic -- "Stanford Residents Are Changing: Now Most Use Full Loads" (Sparkman & Walton, 2017).

Going into demographics briefly, children who participate in environmental education programming at school may also positively influence parents to adopt pro-environmental behavior such as composting (Evans, Gill, & Marchant, 1996; Ng, 2016). However, there is still much room for research in this area (Perks, 2015).

Moreover, as the social norm of pro-environmental behavior develops and becomes more widely accepted, it is possible for individuals to show herd behavior if their actions are guided by social norms that have been internalized (Nyborg et al., 2003).

Increasing convenience

As noted, increasing convenience by making it easier for people to start composting, addressing space issues (particularly for high-density areas) and minimizing time and general amount effort (including hassle from unpleasant odors and general "ickiness") involved in participating can effectively support participation in pro-environmental behavior (Sidique et al., 2010).

As a structural intervention, installing equipment for food waste collection under kitchen sinks, as opposed to encouraging residents simply collect organic waste using existing countertop or refrigerator space, can support compost participation in high-density residential areas. A study conducted in high-density residential areas in Sweden found that installing a hanger under the sink to store composting containers (Figure 11) substantially increased residents' participation in composting as the option minimizes the space required to participate and provides a default

option every time people want to toss the food scraps. Of note is that this intervention to increase convenience was more effective than an informational intervention whereby leaflets educating on composting were distributed to residents. As such, the intervention ends up having a secondary benefit, in addition to providing convenience -- the presence of such an installation represents emphasis of a norm or expectation that all, not only some, households should participate in composting (Bernstad, 2014a).

Figure 11. Bin installations under the sink can help save space in high-density residential areas (Bernstad, 2014b).

Even in cases where the structural intervention is less salient -- for example, simply providing food waste collection bins to use, as opposed to going to the lengths of installing kitchen equipment -- the intervention can still give the additional benefit of reinforcing or developing a social norm by activating injunctive norms, as noted when residents may express feelings of guilt if they do not participate in composting by using the bins provided to them (Metcalfe et al., 2012).

In cases where existing space needs to be used (i.e., when installation of bin equipement is not feasible), placing food waste bins in non-food zones of the kitchen can help residents in managing space when it cannot be created; doing so can also minimize general “ickiness” of composting for some residents by more saliently separating food from food waste (Metcalfe et al., 2012).

In other cases where placing food waste near food does not present an “ickiness” barrier to residents, and where residents are looking for ways to save counter space, one solution can also be storing food waste in any available space in the freezer or refrigerator; an additional benefit of doing so is prevention of unpleasant odor (Legere, 2011).

If fridge or freezer space is a barrier, residents may also be directed to the multitude of space-saving fridge and freezer tips (Figure 12) that can be found online (Mobley, 2016) as a next step.

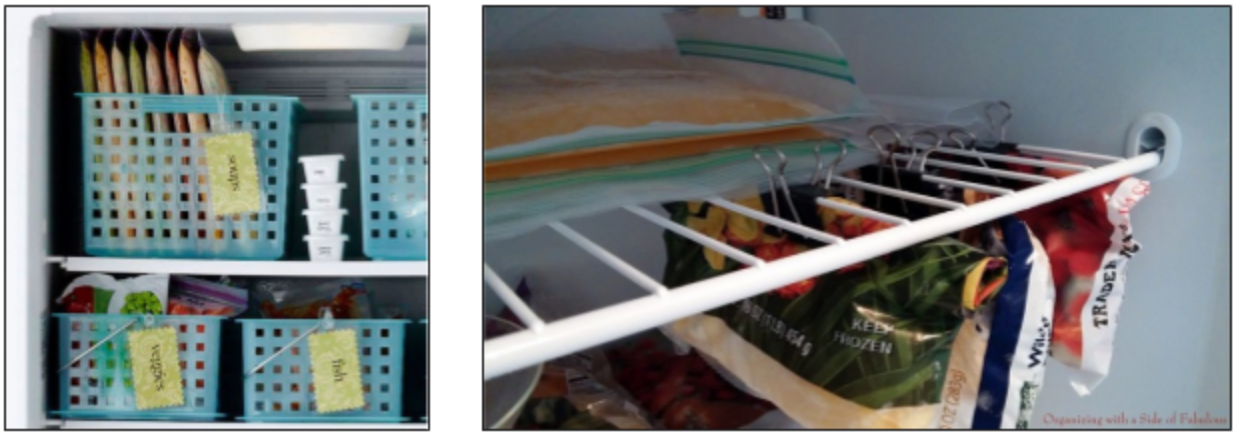

Figure 12. Left: Sample method of saving fridge/freezer space by storing items flat and in containers; right: sample method of saving fridge/freezer space by hanging items (Mobley, 2016).

Additional ways to minimize unpleasant odor include placing newspaper at the bottom of the collection bin to contain smell and general "ickiness" (Metcalfe et al., 2012) and focusing on collecting plant-based waste (as many composting systems traditionally do), including coffee grounds (Fitzjarrald, 2015).

Households that adopt regular cleansing and emptying routines may also find compost participation to be manageable and acceptable (Metcalfe et al., 2012) -- for example, a household may have a designated person or two be responsible for handling the household's food waste collection system at least once or twice per week.

When it comes to dropping off organic waste, shortening the traveling distance required get to the drop-off site can also significantly increase convenience and subsequent compost participation rates in high-density residential apartment settings. In one study, decreasing travel distance by adding drop-off bins on each apartment floor, instead of having only one drop-off location on the ground floor of multi-family residences or basement of a student apartment, resulted in composting rates that increased dramatically by 70% and 139%, respectively (DiGiacomo et al., 2018).

On a somewhat tangential but not insignificant note, researchers have also found that recyclers tend to be older than non-recyclers. The age difference may be due to lifestyle differences (e.g., having more time as retirees and thus minimizing the barrier of composting being perceived as too time-consuming), greater education and income levels and, by implication, increased access

to information, or some combination of those factors. However, the takeaway is that locating drop-off bins near older, higher-income populations as opposed to areas with families who are busy with young children (who may or may not have gone through educational environmental programming at school) may support increase use of drop-off bins (Edgerton, McKechnie, & Dunleavy, 2008; Sidique et al., 2010; Vining & Ebreo, 1990).

Summary

In considering the above barriers to composting and strategies to overcome them, program designers may consider the following adapted five steps as guidelines to consider when putting together a cohesive strategy for pro-environmental behavior change ("Tools of Change - Choosing Tools," n.d.):

1. Decide how you will motivate people to implement the desired behavior (e.g., by appealing to norms, using effective communication)
2. Choose method(s) to help people remember to do the action (e.g., provide decals or use signage as reminders in places where the behavior occurs)
3. Find ways to make it easier for people to take each step (e.g., address specific barriers such as concerns about space and odor)
4. Decide how you will build motivation for sustaining the action over time (e.g., increase the visibility of participation)
5. Select communication channels) to reach your audience (e.g., social media, volunteers)

By doing so, program managers may facilitate increased and sustained implementation residential participation in composting over time.

Exploratory Interviews

Introduction

To help us understand the experience of current residents in supporting residential participation in composting in New York City, our team conducted interviews with key stakeholders. In hearing from them, we aimed to learn about the context in which they work; their perspectives on barriers to participation in composting; strategies that have helped in overcoming those barriers; and any particular recommendations they may have for the Park.

Interview method

HRP provided recommendations on stakeholders to learn from, and our University of Michigan team contacted them to schedule interviews. Simultaneously, we developed the interview questions and guidelines that were used to conduct the semi-structured interviews. After confirming the interviewees' availability, we conducted 30-minute calls with the interviewees; given permission from the interviewees, we recorded the conversations and transcripted and coded it them. We then grouped the findings into different categories and analyzed what themes and concepts were most salient.

A summary of our interviewees' organizations and our question topics is below.

Interviewees' organization

- DSNY, Bureau of Recycling and Sustainability
- Chelsea Waterside Park Association
- Hudson River Park Trust
- NYC Compost Project
- Gowanus Canal Conservancy
- Fulton Houses Tenants Association

Interview question topics

- Landscape of their current community composting experiences
- Barriers the interviewees faced in promoting composting
- Strategies that were helpful in overcoming those barriers
- Recommendations and what opportunities they see for HRP in promoting composting

The full interview guide can be found in the Appendix. Interviewee names have been anonymized.

Findings

NYC Composting Landscape

Since the Department of Sanitation New York (DSNY) plays a highly visible role in the City and is the world's largest sanitation department (DSNY - The City of New York Departmen...), we start with this stakeholder here to provide understanding of the organization's influence in supporting some of the larger-scale waste management initiatives that are in place. Currently, multiple initiatives are focused on reducing waste in landfills. In addition to managing refuse and recyclables, reducing the amount of compostables going into the waste stream is also a major focus of DSNY. Given that residential participation in composting is voluntary, DSNY uses multiple programs to recognize and increase visibility of participation in composting efforts. Additionally, to provide infrastructure for composting, DSNY started the launch of curbside pickup for organics in low-density residential areas in 2017. To support high-rise areas, DSNY initiated programs that provide composting bins and operational services to buildings that opt in to increase access to organics waste management. Further, since curbside pickup is not yet available to all NYC residents, a number of non-profit community-based organizations have stepped in to help provide organics management infrastructure by making organics drop-off bins available throughout the city. Simultaneously, these organizations are also working to educate and bring awareness to residents and decrease their barriers to participation.

Similar to the smaller community-based organizations, DSNY has also stressed the importance of bringing education and awareness to residents to change their perceptions about composting. Programs such as ones for compost distribution, compost giveback, and education on how to compost in home gardens are some successful cases. Our interviewee from DSNY also noted that messaging on how composting can potentially minimize the City's rat problem by separating food scraps from other waste has been a strong motivator for citizens to participate in composting.

The greater composting effort in NYC has been supported through numerous partnerships on the ground; community gardens, urban farms, green markets, and other community-based organizations have been working together to support PEB in the City. For example, the NYC Compost Project is a program in which DSNY, New York Botanical Garden, Brooklyn Botanical Garden, Queens Botanical Garden, Snug Harbor Cultural Center & Botanical Garden, Lower East Side Ecology Center (LESEC), Earth Matter NY, and Big Reuse partner together to promote composting and provide accessible drop-off locations to local communities. DSNY supports these organizations in compost outreach/education efforts, such as by giving demonstrations on how to make and use compost, and aims to grow mid-size composters in the city.

Despite the active community outreach at the grassroots level, the City still has much room to grow in matters of composting. One interviewee noted that the U.S. has many green cities, such as Seattle, Chicago, and Portland, that are leading the way in supporting community participation in composting, and that New York may look to these cities as it seeks to be more green. This interviewee also expressed the belief that making composting mandatory could help the city significantly in becoming as green as possible. This sentiment highlighted for us the great challenge of engaging citizens in composting, and the importance of doing so.

CBSM Step 2: Identifying Barriers (Interviews)

Throughout the interviews, we asked interviewees what they perceive to be barriers to residential participation in composting. Responses were roughly categorized into education challenges, psychological concerns, and logistical issues, though some responses could potentially fall into multiple categories. These categories align well with the barriers found through the Literature Review (lack of awareness, lack of motivation, and lack of convenience).

Education challenges (lack of awareness)
One of the main challenges that interviewees perceived is getting residents to understand the community and environmental benefit. An interviewee noted that it is important to show residents what happens to their food scraps after they go to landfills, and the significant negative impact that food scraps in landfills can have. On a more positive note, residents can then be more receptive to the idea that a better use of food scraps is to to repurpose them to create soil resources for the local community.

Tying in with logistical issues, understanding what can and cannot be composted is another challenge that arose, in particular from an interviewee who had had experience in working with others who championed composting and encouraged other residents to start.

Psychological concerns (lack of motivation)
Tying in with the above, as composting is not yet commonly practiced, interviewees also noted the importance of social influence. In one interviewee's experience, other residents the interviewee was familiar with started to compost more so because the interviewee was composting and encouraging the practice through social influence, and less so for environmental reasons. This example highlighted for us the importance of compost champions or influencers -- those who actively participate in composting and encourage others to do so.

Logistical issues (lack of convenience)
Logistical issues that interviewees noted ranged from organizational-level challenges with infrastructure to individual-level challenges of food scrap collection at home.

Regarding infrastructure, residents may not have a composting drop-off in their building, or the closest drop-off site to the resident may still be considered too far to be convenient. Operating hours also came up as an issue, since some residents may not be able to drop off organics within given time frames.

Regarding food scrap collection at home, due to the City's high density and the often small apartment sizes in Manhattan, interviewees highlighted the challenge of residents finding space in their kitchens to store food scraps. For some residents, putting food scraps in the freezer has been a viable solution. For others, the freezer space may be too valuable to give up for food scraps, or the idea of putting food scraps with other food in the freezer is perceived as offensive.

Interviewees also mentioned that residents often have concerns about food scraps causing foul odor and leakage, and attracting rats or pests to living spaces.

On a finer point, an interviewee also noted that compostable bags are not widely accepted and can cause extra hassle for residents looking to participate in composting.

Finally, demographics also came up as a potential factor to consider with regards to logistical challenges of residential participation in composting. An interviewee noted that New York City Housing Authority (NYCHA) has focused recent efforts on increasing participation in the recycling efforts of metal, glass, plastic, and paper with its residents. Composting education efforts with NYCHA residents have not yet been formally initiated.

CBSM Step 3: Identifying Strategies (Interviews) - General

To support overcome the noted barriers, interviewees provided a variety of high-level, strategic recommendations, as well as more tactical, specific ones to support residential participation in composting.

Overcoming education challenges (increasing awareness)
As a general approach to supporting education and awareness surrounding composting, an interviewee noted the importance of assuming that the audience is not familiar with composting and wants to be educated, believing that every person makes a difference. Another overarching recommendation was to understand not only the general population but also the nuances of each neighborhood being targeted for educational outreach, including the specific issues each community is concerned about.

Tying in increasing awareness with increasing motivation, an interviewee stressed the power of environmental motivation, especially once citizens learn about how much waste is generated daily by New Yorkers and the extent of the negative impact the City's waste can have. An interviewee also mentioned Robin Nagle, a professor from NYU, who is an expert on waste and was noted as a fascinating educational speaker whose talks have inspired many people and motivated them to be more active in participating in zero waste initiatives. Additionally, those with interest in environmental sustainability can tend to have greater participation in composting.

Tying in awareness with motivation again, an interviewee noted that for residents who are less interested in the environment, bringing awareness to the amount of resources that could be generated through composting would be more effective. People are often astounded by how much energy could be saved by treating food waste locally and turning waste into compost that goes back to the community to replenish soil in parks and urban farms. Thus, awareness of how food waste can be reused to support the local community is a key issue for those who are less motivated by environmental issues.

Bringing in the idea of using experiential learning to increase motivation, one interviewee noted that one of the most effective ways to motivate residents to start composting is to have them experience the process of composting for themselves. When people stand in front of a big pile of

food scraps and make compost out of it, they can be astonished by how much waste is created, especially when they realize that the pile in front of them merely a small fraction of the waste that gets produced across the City, becoming even more motivated to support zero waste initiatives.

An interviewee also mentioned the importance of using education to minimize bias, especially over logistical/convenience-related concerns and the perception that composting may exacerbate rodent issues. In addressing this issue, the Department of Health performed a preliminary study on the rat population in a neighborhood that started composting, and was able to say that the rat population did not increase.

When asked about tools for communication and education, an interviewee noted that literature is still the most common communication tool. For example, the DSNY produces a piece of literature that they call a "tenant flyer", housed on its website, that has suggestions on how residents can store organics at home and what they can do once they've stored them. DSNY also distributes hardcopy literature to households as part of a package that includes a checklist that residents can post on their refrigerator or in their recycling area to remind themselves about the different waste management streams. Coupons are also included in the package so that residents can get a starter supply of compostable bags for free.

For DSNY, other channels for educating include public events where information is posted on tables in public spaces, and other community organizations that they partner with to deliver literature. Aside from the general public, the DSNY also aims to educate high-level stakeholders, such as building management companies, local elected officials, and other real estate industry groups, to bring awareness to composting.

Overcoming psychological concerns (increasing motivation)

Interviewees noted a number of ways to help residents overcome psychological barriers and increase motivation to compost; as alluded to above, many of these strategies relate to overcoming barriers in the other two buckets of awareness and convenience, as well.

Underscoring the role of social influence, one interviewee highlighted the ability of community composting champions within various social groups. Champions are those who have been practicing composting for some amount of time and have influenced those around them to start composting, too. Composting champions have expressed:

- "They like me and they know that this is something that is important to me. And so they started trying it because of me and a lot of these people are still doing it."
- "Absolutely, I'll put it in my apartment. I'll talk to people. I'll get my neighbors to do it."

Additionally, some of the messages that they have used to influence others to start composting have focused on increasing convenience:

- "My trash doesn't smell anymore because there's no food waste in there."
- "They started separating out their food waste to keep it in their freezer and it helps them deal with their pets. You know, they have dogs and their dogs used to dig through their

trash to get food waste out, so now they're keeping it in their freezer and they don't have that problem anymore."
- "I hardly have to take my garbage out because there's not as much being collected. You know, I'm not collecting as much."

Fun social events that integrate educational elements also motivate residents to start composting. For example, the annual Pumpkin Smash hosted by Lower East Side Ecology is a very popular event -- LESEC provides trucks, barrels, tools, and worm bins to teach children about worm composting, residents bring jack-o-lanterns to be composted, and the community enjoys time together while learning about composting.

To develop a more sizeable population of residents that compot regularly, interviewees brought up several potential target audiences who may potentially be early adopters who then encourage others to join in composting. One group brought up is community gardens as gardening allows citizens to easily see the connection between composting and soil health. Another target audience brought up is the school system, as many students are already familiar with composting and have experience with worm bins schools all over the city. Additionally, some of schools have zero waste stations, through which students are learning about living sustainably. Some organizations are already developing educational material for students to learn about composting and are working with local stakeholders to distribute compost so that organizations, including schools and community gardens, can use the compost.

Emphasizing the value of reaching out to children, interviewees have observed how children can influence their parents by saying something along the lines of, "I saw a worm bin, and these worms eat apples! Isn't that so cool? Mom and Dad, can you get one?" Additionally, children teach and help other children sort food waste in schools, helping to cultivate a generation that practices composting. In particular, an interviewee noted that a school to potentially tap into is Avenues, a very well-resourced private school in the HRP area.

Lastly, using commitment can also be a motivational tool that helps residents overcome personal barriers such as perceptions of composting being too much of a burden, by encouraging them to simply give composting a try. DSNY, for example, manages an initiative called the "Zero Waste Pledge", which encourages residents to pledge zero waste and receive a small gift in return.

Overcoming logistical issues (increasing convenience)
A number of suggestions for overcoming logistical challenges and increasing convenience were similar to ones uncovered in the Literature Review. One interviewee also remarked that lowering logistical barriers has been faster than using environmental concern to motivate residents to start composting.

One such way to overcome logistical barriers is to create easier access to composting infrastructure, such as on-site locations within residential buildings. Additionally, for those who may not live close to a drop-off site, and to potentially address space issues for the many residents living in small apartments, one interviewee suggested promoting small worm composting bins to help make composting more accessible. Another idea was to use the freezer

to freeze food waste or air-tight containers in a refrigerator, particularly if residents are concerned with counter space and/or concerned with odor. Another idea brought up was putting food scraps on fire escapes, as many apartments have fire escapes right outside their windows.

Notably for New York, and related to the messaging that compost champions have promoted to encourage composting, an interviewee asserted that a strong motivator is noting how separating food scraps is helping the City reduce rat and other pest populations, as well as odors in the trash.

CBSM Step 3: Identifying Strategies (Interviews) - HRP-Specific

HRP has a unique role to play in supporting composting efforts, and has already seen success in early composting efforts, such as with events at the Park. One interviewee mentioned that HRP's location is certainly one conducive to having a successful drop-off program with its unique position simultaneously next to many subway stops and nature; the Park only needs to identify and specific sites and locations most convenient for nearby residents. (Since the time of the Interview, the Park has extended operating times for residents' convenience.) Additionally, an interviewee articulated that success for a drop-off site in the City could mean having at least 50 residents participating on a regular basis; this simple metric could help benchmark and evaluate a drop-off site's effectiveness.

Some organizations suggested for HRP to work with included DSNY, NYCHA, Lower East Side Ecology, and other community-based organizations active in promoting composting. An interviewee expressed that DSNY can provide more resources for the education sector, in particular. Another interviewee suggested that NYCHA would be good to work with since its partnership with DSNY is currently focused on recycling.

PEB Community Study Example: An interview with NYCHA Fulton Housing

In addition to learning about the general landscape of composting efforts, we were also able to interview with and learn from the Fulton Houses NYCHA housing project. By learning about the project's efforts to promote recycling behavior, we hope that takeaways here may support any future composting promotion efforts at NYCHA.

As context, NYCHA receives funding from the federal government and provides housing for low to moderate income families. In terms of life stage, about 50-60% of tenants are from families and 25% are senior citizens. In terms of race and ethnicity, about 40-50% of tenants are Hispanic, 30-40% African American, and 10-15% Asian. Additionally, an estimated 15% of residents have dogs.

NYCHA launched its recycling program in 2015 and gained some useful experience throughout the process. The infrastructure was set up so that recycling bins were available throughout different areas of the first floor. At monthly NYCHA Tenant Association meetings, residents were introduced to or reminded of the recycling program. Initially, it was difficult to get residents to recycle, as they were in the habit of throwing all waste into the trash. Residential participation has grown to about 50%, though, where it hovers now. Some residents do not

appear to understand what the recycling bins are for and still put garbage bags near them; however, some residents will actively teach their neighbors about recycling. The interviewee noted that there wasn't necessarily a particularly strong presence or lack of excitement when the program launched, but residents were curious about how the program works.

As the conversation turned to composting, several questions and concerns came up: Where would the compost bins be placed? How would the rodent problem be minimized? How would we educate the tenants on what they can compost? How do you get tenants used to composting/ Since NYCHA is still working on getting tenants to get into the habit of recycling, some concern arose over whether introducing composting now would be too much for residents. Our interviewee also expressed concern over NYCHA's current manpower and ability to handle the additional burden of managing an additional waste stream. Partnering with a third party such as Grow NYC to handle pick-ups may make composting more feasible for NYCHA.

Summary

Though New York may still have a lot of room to grow in becoming more green, the City is moving in a positive direction. Many social sector organizations have been partnering with the public sector (namely, DSNY) and with the private sector to an extent to increase the visibility of computing and encourage residents to participate in it.

As a relatively new behavior for many citizens, composting still comes with a number of salient barriers on multiple fronts, including the educational, psychological, and logistical. Interviewees were hopeful and enthusiastic, though, about strategies to overcome the barriers.

Many barriers and strategies to overcome them overlapped with findings from our Literature Review. Interviewees noted, for example, the role of education in increase awareness of environmental challenges, especially when existing concern for environmental issues is low, to help residents develop concern for the environment. Increasing awareness of community benefits to composting may be helpful, too. Flyers, both online and hardcopy versions, are commonly used for raising awareness. Hardcopy versions may be given to residents during visits and at informational tables at events.

Tapping into composting champions and using social influence is another strategy that came up to help motivate residents to start composting. Additionally, residents in garden community groups and schools may be reasonable audiences to target early on, since many of them have already been primed to understand the benefits of composting already. Potentially, as earlier adopters, residents from these groups can be the ones to help spread awareness to others through their social influence.

Logistically, locations close to residents with accessible operating hours are key for supporting residential participation. Addressing challenges with space (or lack thereof) was also brought up as another critical issue.

A few points that were particularly relevant for composting in New York as opposed to any other urban area is the very salient concern over rodents and the idea that composting can help minimize rodent issues; focusing messaging on the latter may be an appropriate strategy to overcome barriers to composting, particularly for New York's residents.

For HRP specifically, interviewees pointed out the unique location that it has between dense city life and nature that it could potentially use to its advantage; also, organizations to consider partnering with include DSNY, NYCHA, and Lower East Side Ecology, to increase the impact of community composting efforts.

Community Survey

Introduction

We designed the "Hudson River Park Community Compost Questionnaire" to understand current composting behaviors and local residents' perspectives on composting. We also wanted to verify whether data collected from our Literature Review and Exploratory Interviews could be applied to the Hudson River Park audience. This section will tell how the survey questions were constructed and the method used in data analysis. More importantly, this section will focus on step two of the CBSM process to aid in identifying composting barriers perceived by survey respondents after interpreting survey results, and comparing findings with those from the Literature Review and Exploratory Interviews. We will also follow step three of CBSM to gain some insights of developing strategies by summarizing the survey findings.

Methodology

Survey Design

The survey questions were developed based on the following themes: 1) Geography and demographics of the Hudson River Park audience, 2) residents' awareness of and perspectives on composting, 3) composting as a social norm, 4) concerns and desirability regarding composting, 5) awareness and perspectives on storing organic waste in the freezer, and 6) current composting behavior.

Geography and demographics
To verify whether survey responses were submitted by residents from the Hudson River Park area, we asked survey respondents to indicate their zip code. We also asked demographic questions including age and whether respondents have kid(s) at home to help us determine whether certain groups of people were more likely to participate in composting.

Awareness of and perspectives on composting
Low awareness and negative perspectives on composting results in a lower composting participation rate. Therefore, survey respondents were asked to indicate whether they knew what composting is and their perspectives on composting in terms of environment and daily management.

Social norm of composting
From our Literature Review and Exploratory Interviews, we found that establishing composting as a social norm through practicing composting was one of the most successful strategies in increasing composting participation. Thus, we asked respondents if they felt people around them were promoting composting or encouraging others to participate in it.

Concerns and desirability of composting
The survey study focuses on verifying whether residents near the Park have barriers and motivations similar to those we found in literature and interviews. Hence, the survey provided a series of questions regarding concerns over composting and benefits that can be realized from it.

Awareness of and perspectives on composting
As we learned from our research, freezing food scraps can be an effective and affordable way to prevent them from causing foul odor and attracting rodents and pests at home; in the survey, respondents were asked to indicate their awareness regarding the benefits of freezing food scraps and their perspectives on storing food scraps in the freezer.

Composting behavior
Survey participants were provided with an open-ended question to indicate any composting drop-off sites they are currently using, if any. Also, they were asked to indicate whether the drop-off sites were convenient for them.

Measurement
The awareness of composting and benefits of freezing food scraps were indicated by checking either “Yes” or “No”. Perspectives, social norm, concerns, and desirabilities of composting were measured by asking respondents to indicate the extent they agreed on a series of statements, which were constructed around aforementioned themes. The extent was set in a 7-point Likert scale, where 1 meant “ Not at all” and 7 meant “Extremely”. Perspectives on storing food scraps in the freezer was measured by checking one or more statements describing positive or negative attitudes. Respondents were also provided an open-ended choice to describe any other opinions they had in mind (Table 1).

Themes	Questions	Question Nature
Geography	Your zip code	open-ended
Demography	Do you have a(ny) child(ren) living in your home?	open-ended
	Your age	
Awanress to composting	Do you know what composting food scraps is?	Closed-ended (Yes/No)
Perspectives to composting	Its worth my time and effort to collect food scraps.	Closed-ended (7 pts likert scale)
	I think composting food scraps* benefits the natural environment.	
	I think composting food scraps is easy to do.	
Social Norm	My family/people I live with encourage composting food scraps.	
	There is at least one close friend/family in my apartment building who encourages others to compost food scraps*.	
Concerns	Separating food scraps at home is too confusing.	
	Separating food scraps at home is too time-consuming.	
	Separating food scraps at home is too disgusting.	
	Im worried that having a separate bin for composting would cause odor.	
	Im worried that having a separate bin for composting would attract pests/rodents.	
	I dont have enough space to keep a separate container for food scraps.	
Desireblity	I want to minimize pests/rodents in and around my home.	
	I would like to not have to take out my trash so frequently.	
	I would like to get rid of odors from the waste bin.	
	I want to help create a healthier environment.	
	I want to reduce the amount of waste going to landfills.	
	I want to help fight climate change.	
	I want to help my community become healthier.	
	I want to help my community become stronger.	
	I want future generations to grow up in a healthy environment.	
	I want my pet(s) to stop going through my trash bin. (Please choose N/A, if you dont have pets.)	
	I don't want to deal with cleaning a container for food scraps.	
Awareness of freezing compost	Have you heard of people freezing their food scraps to decrease odor and pests/rodents?	Closed-ended (Yes/No)
Perspectives on freezing compost	What do you think of freezing food scraps? 1. Gross 2. Why would I do that? 3. I wish I had thought of that earlier! 4. That could work for me 5. That would be nice, but I don't have space in my freezer	Closed-ended
	6. Other	Open-ended
Composting Behavior	What compost drop-off site do you currently use, if any?	open-ended
	Is the compost drop-off site conveniently located for you?	Closed-ended (Yes/No)

Table 1. Survey question themes, content, and nature.

Survey Collection and Data Processing

Survey collection

From May to October 2017, we collected 157 survey responses from three sources: 1) 34 from a Chelsea Waterside Community Meeting by SEAS students, 2) 110 at Hudson River Park by Park staff and volunteers, and 3) 13 from the web.

Data processing and analysis

As our target audience is the general public living in Manhattan, we first examined zip code responses and filtered out respondents who were either living in areas outside of Manhattan or

didn't provide zip code information. In the end, 99 survey responses were used in the survey data analysis, which were completed by Manhattan respondents.

For every reponse, a question with a missing answer was treated as a missing value. Answers to questions measured in Likert scale and respondents ages were condensed for data analysis (Table 2).

Question	Original	Collapsed
Age	under 30	Young
	Between 30 and 50	Midde
	Over 50	Senior
Likert Scale	1~3	Disagree
	4	Neither Disagree Nor Agree
	5~7	Agree

Table 2. Questions measurements collapsed for data analysis.

To summarize the response pattern, we generated descriptive statistics with Excel, where missing values were excluded from the sample size of each question.

We also built a binary logistic regression model with respondents' composting behavior as the response variable and their demographics, environmental interest, social norms, and concerns over composting as independent variables to assess the role of those factors in the composting behaviors that we studied (Table 3). The binary logistic regression computes the log odds of the outcome (e.g., compost or not compost) based on a linear combination of the independent variables. We ran the logistic regression model via statistical software R, which provided the coefficient and the p-value of each independent variable. The coefficient can tell us the direction and strength between a predictor and the response. The p-value indicates whether an independent variable has significant effects on the response (Peng, Lee, & Ingersoll, 2002).

	Themes	Variables	Questions	
Response	Composting	Composting behavior	What compost drop-off site do you currently use, if any?	
Independent variables	Demographics	Age	Your age?	
		Family structure	Do you have an(y) child(ern) in your home?	
	Environmental Interests	Believe composting benefits the Environment	On a scale from 1 to 7 to what extent do you agree with the following statements?	I think composting food scraps benefits the natural environment
	Social Norm	Experience the social norm of composting		My family/people I live with encourage composting food scraps
	Concern	Think composting is confusing		Separating food scraps at home is too confusing
		Think composting is time-confusing		Separating food scraps at home is too time-consuming
		Think composting is disgusting		Separating food scraps at home is too disgusting
		Believe composting would cause odor		I'm worried that having a separate bin for composting would cause odor
		Believe composting would attract animals		I'm worried that having a separate bin for composting would attract pests/rodents.
		Concern about no space for a composting bin		I don't have enough space to keep a separate container for food scraps
		Unwilling to cleaning composting bin		I don't want to deal with cleaning a container for food scraps
	Desire	Want to minimize rodents/pest		I want to minimize pests/rodents in and around my home.
		Want to takie out trash less frequently		I would like to not have to take out my trash so frequently.
		Want to minimiz trash odor		I would like to get rid of odors from the waste bin.

Table 3. Questions involved in logistic regression analysis.

Results

Geography & Demographics

Geographic information of survey respondents was obtained through zip codes. Locations are visualized in the "Geographic Information of Survey Respondents" map (Figure 13). Respondents centered around Midtown Manhattan; others were from neighborhoods such as West Village, Chelsea, and Hell's Kitchen. Also, some survey respondents were from the west riverside area including the Upper West Side, Lincoln Square, and Hamilton Heights.

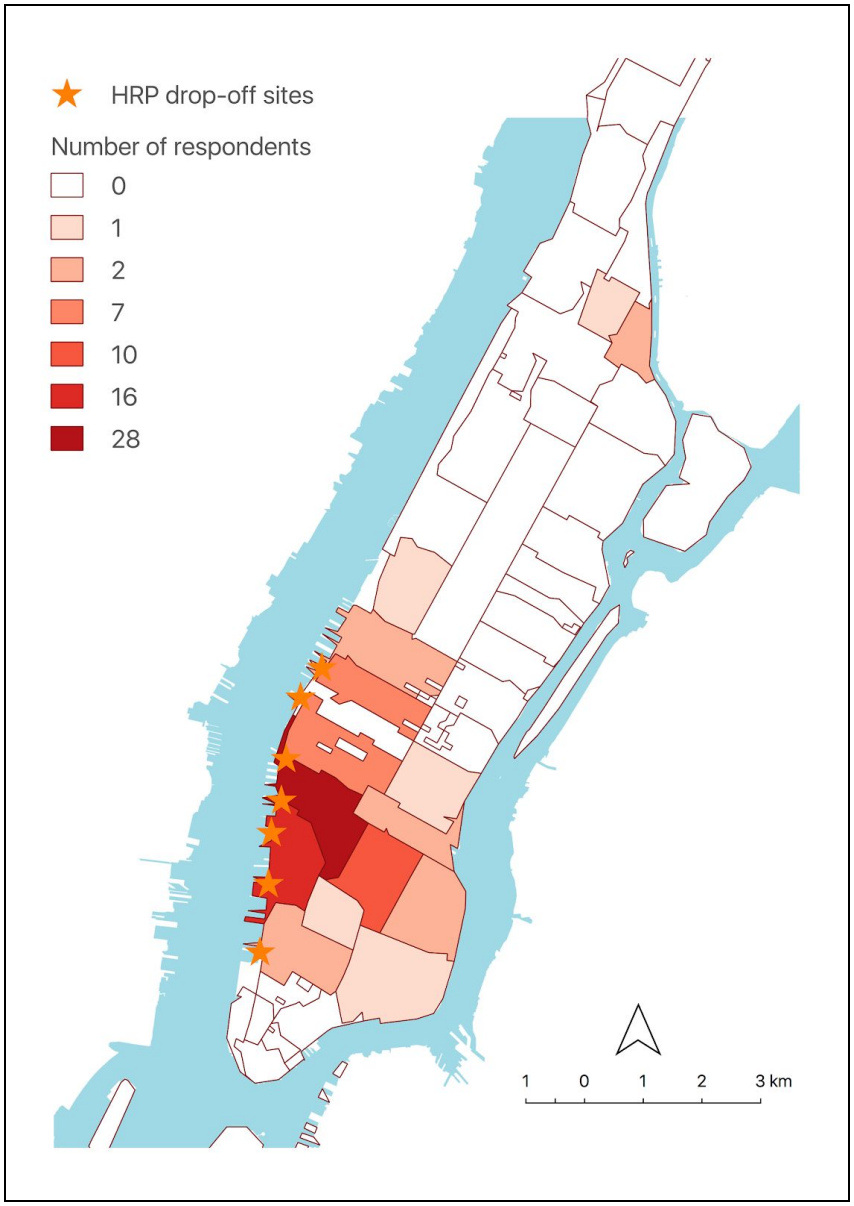

Figure 13. Geographic information of survey respondents by zip code.

The mean and median age of our respondents population are both 47 years. Almost half of the respondents are above 50 years. One third of respondents are between 30-50 years. Only 23% of the respondents are under age 30. Most households (86%) indicated no children at home. Most respondents who reported compost participation are seniors (above 50 years); also, respondents who compost are slightly more likely to come from families with children than from those without (Figure 14).

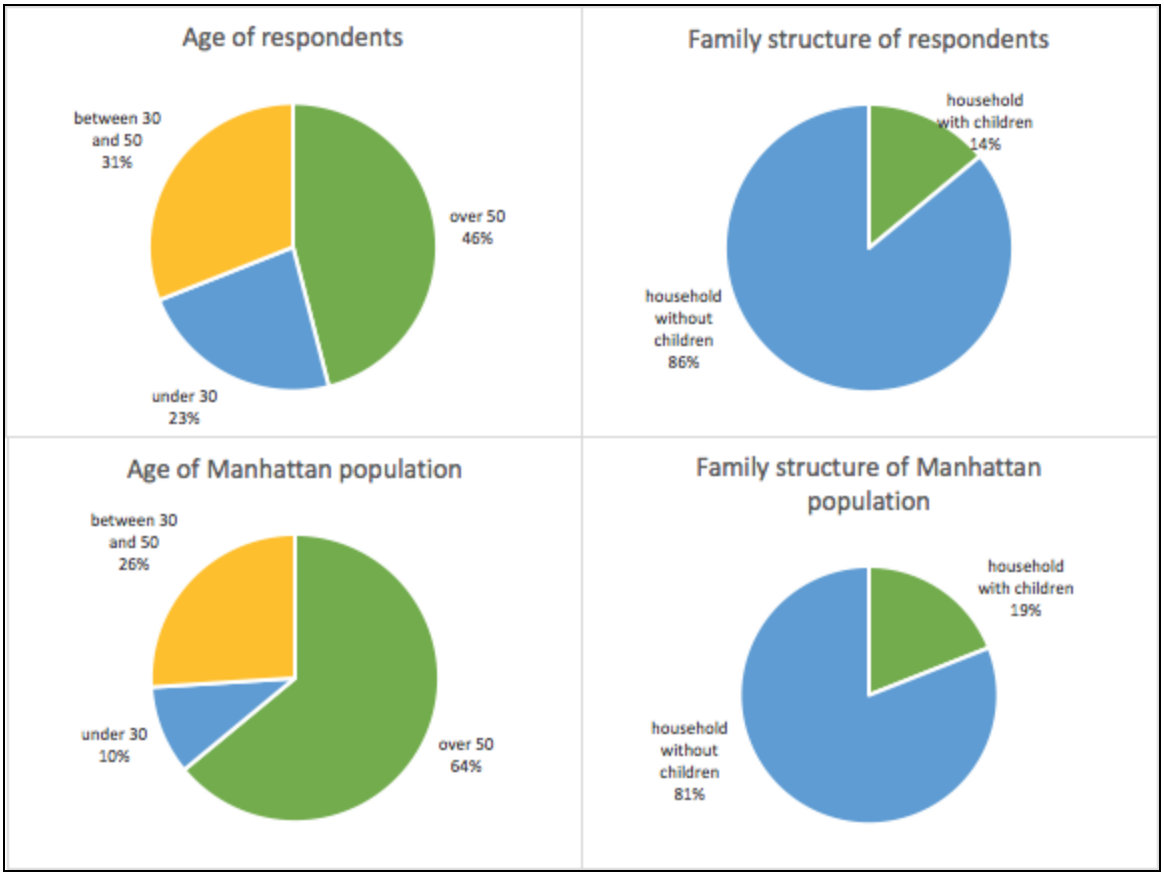

Figure 14. Top left: family structure of respondents(n =97), top right: family structure of respondents (n =97), bottom left: age of all manhattan population (data source: US Census Bureau), bottom right: family structure of all Manhattan population (data source: US Census Bureau).

CBSM Step 2: Identifying Barriers (Survey)

Awareness of and perspectives on composting

Only 2% of respondents reported not being aware of what composting means (Figure 15). Most respondents (86%) thought composting was benefiting the environment. When it comes to logistics, two thirds thought composting is worth the time and effort to participate, and less respondents (52%) thought composting is easy to do (Figure 16).

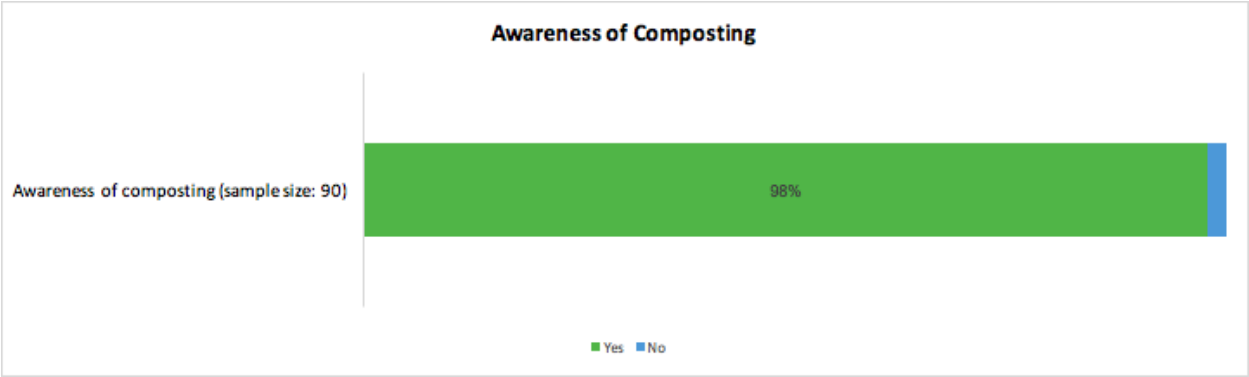

Figure 15. Awareness of composting among respondents.

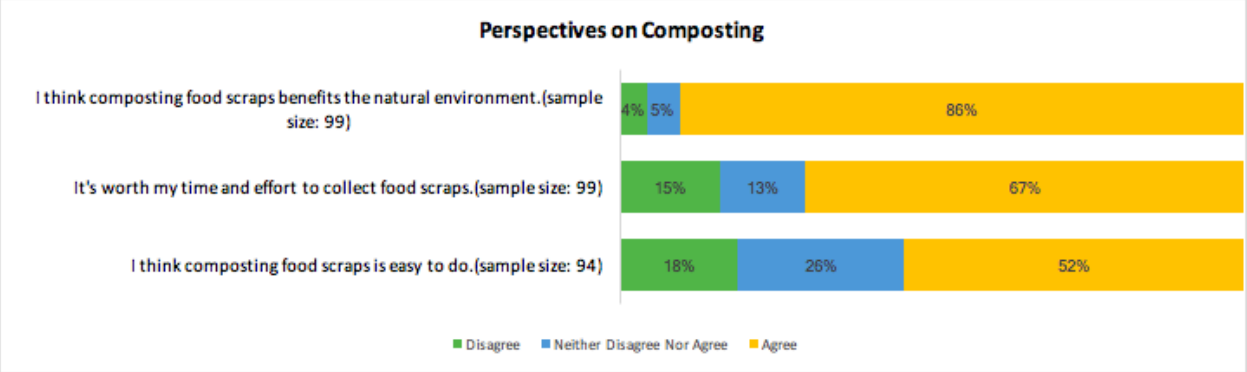

Figure 16. Perspectives on composting among respondents.

Social Norm of Composting

Over a third of respondents felt that people living close to them were encouraging composting. But fewer respondents (24%) observed close family or friends directly encouraging others to participate in composting (Figure 17).

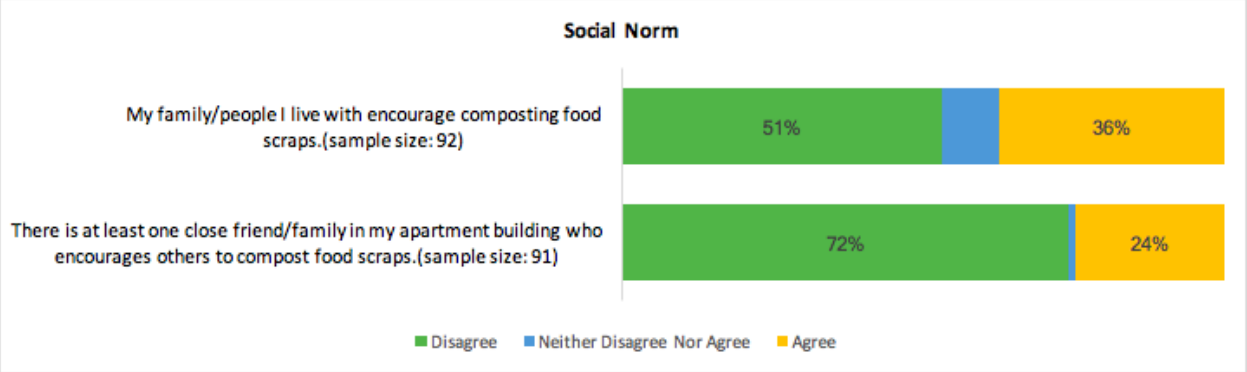

Figure 17. Current social norm of composting.

Concerns about composting

From a visual standpoint, it is easy to see from Figure 15 below that the concerns listed are not as significant as they otherwise could be. A few of the top concerns, however, turned out to be more closely tied to negative affect (worries about attracting pests/rodents and causing orders, with 38%, significant at $p = 0.04$, and 35% of respondents agreeing, respectively). The next group of concerns centered around logistics and to a lesser extent, education (not having enough space, not wanting to clean an extra container, not having enough time, and confusion) with 33%, 26%, 26%, and 23% of respondents agreeing, respectively). The least significant concern per our survey results turned out to be another concern tied with negative affect, which we are calling the "ickiness" factor (with 13% of respondents noting that "separating food scraps at home is too disgusting") (Figure 18).

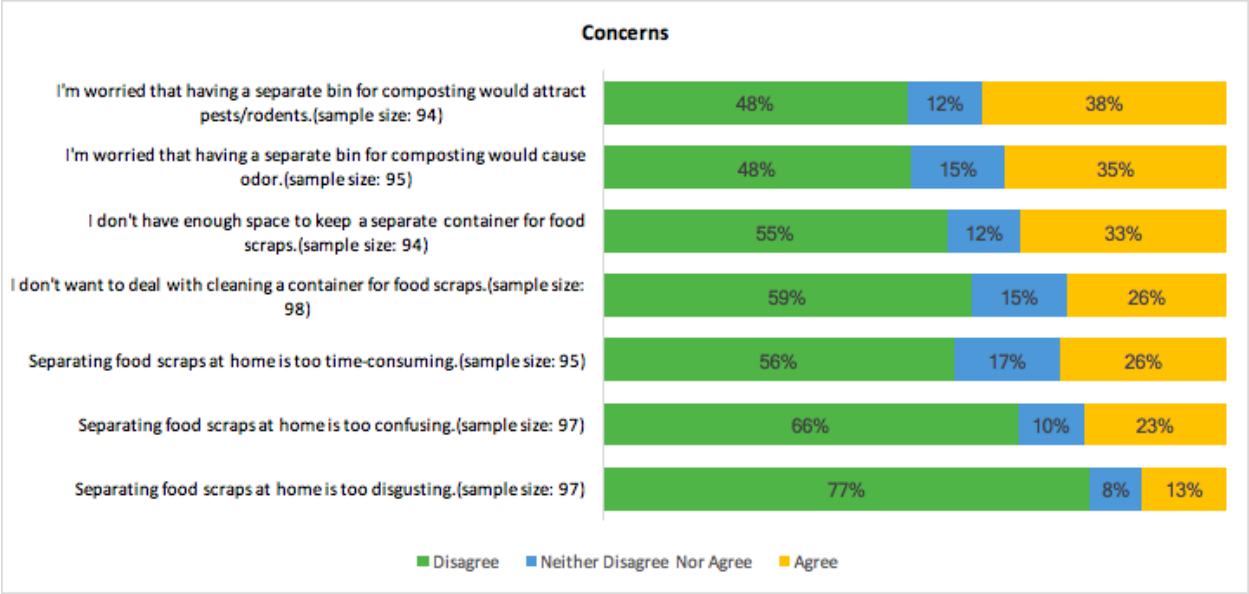

Figure 18. Concerns about composting at home.

Desirability

More than 95% people agreed on a series of statements, noting sentiments including wanting a better environment for future generations, less waste going to landfills, and a stronger community (Figure 19).

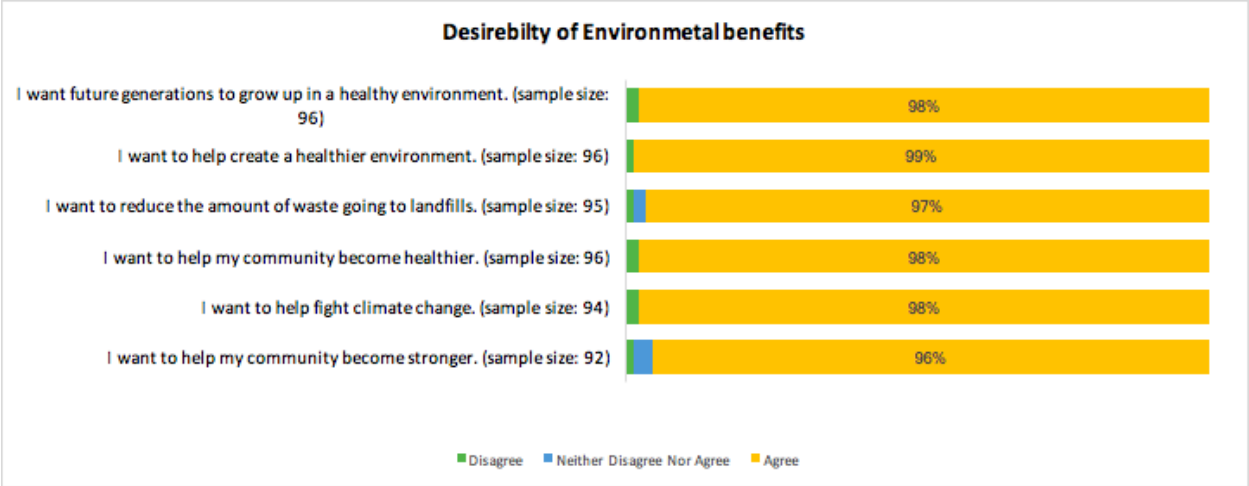

Figure 19. Desirability regarding environmental interests.

When it came to everyday life, the most urgent problem respondents wanted to solve was the rodent and pests problem, as 90% of respondents agreed with wanting to minimize pests/rodents in and around their homes. Getting rid of odors from the waste bin was the second most attractive benefit (79%). Desirability of " I want my pet(s) stop going through the trash" and "I would like to not have to take out my trash so frequently" was less but still substantial as 50% of respondents agreed with those statements (Figure 20).

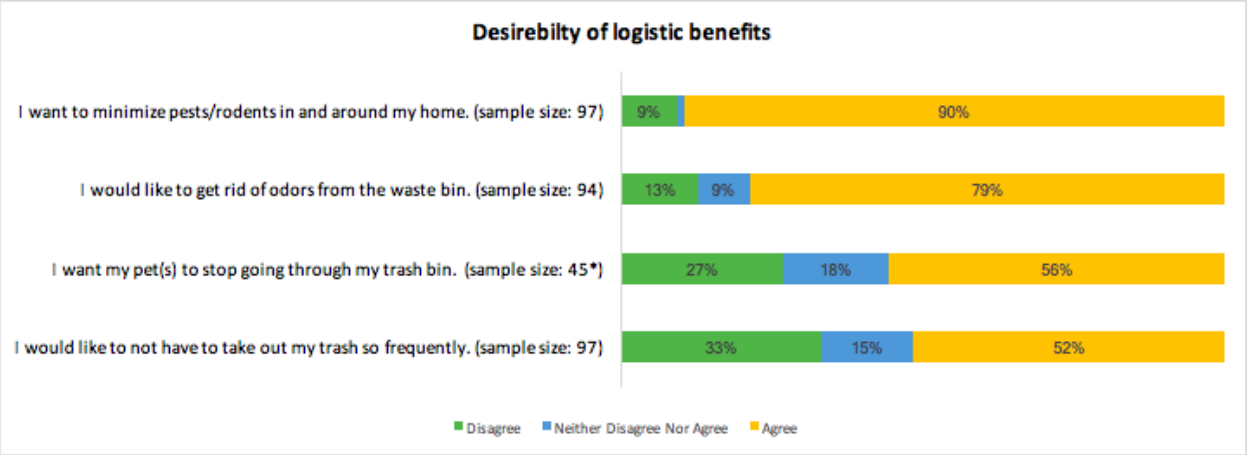

Figure 20. Desirability of logistical benefits.
*The small sample size was due to the small portion of respondents who had at least one pet at home.

Half of the respondents reported awareness of freezing as a way to minimize odor and pest issues (Figure 21). Additionally, 10% of respondents stated they had being doing composting in the open-ended choice. Although freezing food scraps was acceptable by 40 % of respondents as they checked the statements: "That could work for me" (25%) or "I wish I had thought of that earlier!" (14%), 30% people were concerned about they didn't have enough space in the freezer. Whereas, only 5% of respondents thought freezing food scraps was gross (Figure 22).

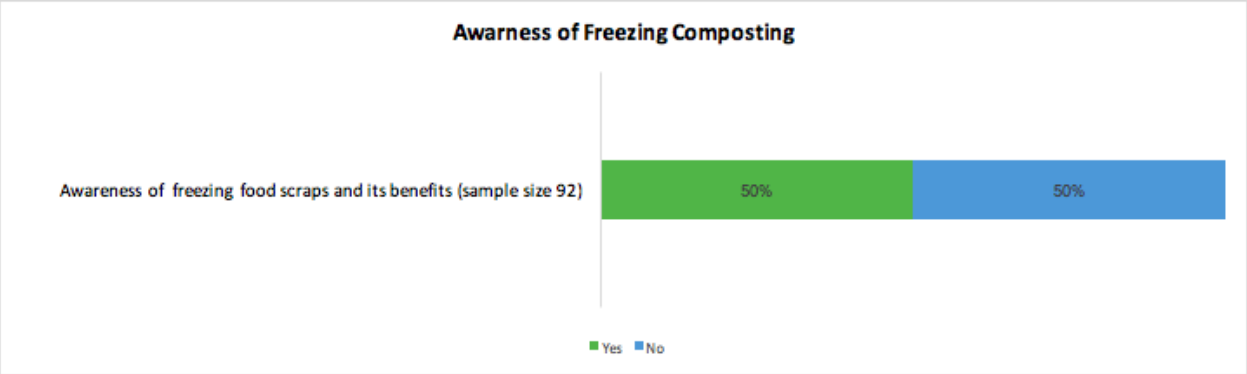

Figure 21. Awareness of freezing composting as a storage option.

Figure 22. Perspectives on freezing food scraps (N=93).

Composting Behavior

Among 99 respondents, 31 of them were composting. Among respondents who were participating in composting, about 80% of them were doing so by using organics drop-off sites, and 4 respondents were using Hudson River Park drop-off sites during the time we conducted the survey (May, 2017 - October, 2017). Half of those composting were using their freezers for food scrap storage before dropping off (Figure 23).

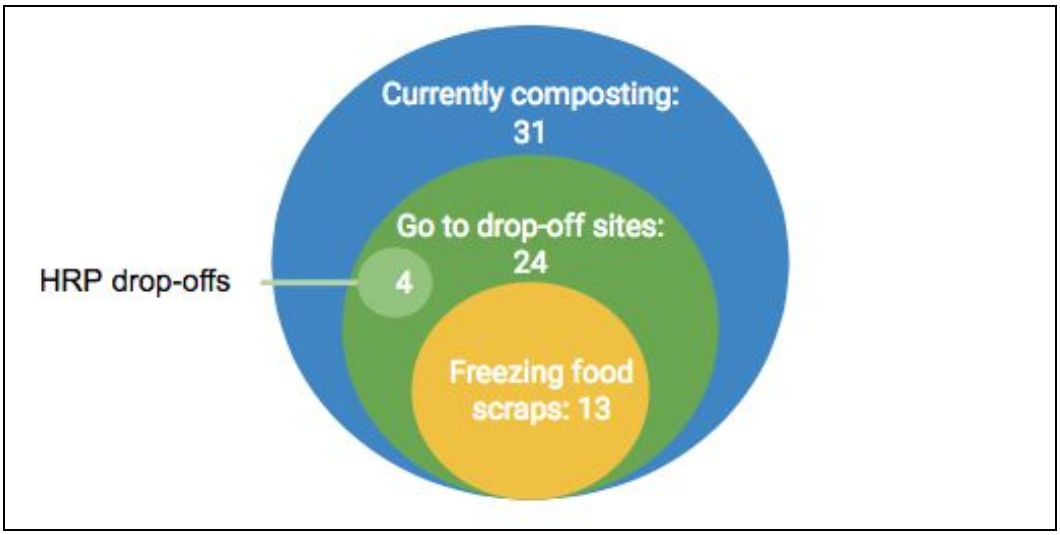

Figure 23. Composting behavior among respondents (n=99).

The majority of those composting are those who are seniors (above 50 years), and those who compost are slightly more likely to be in families with at least one child (Figure 24).

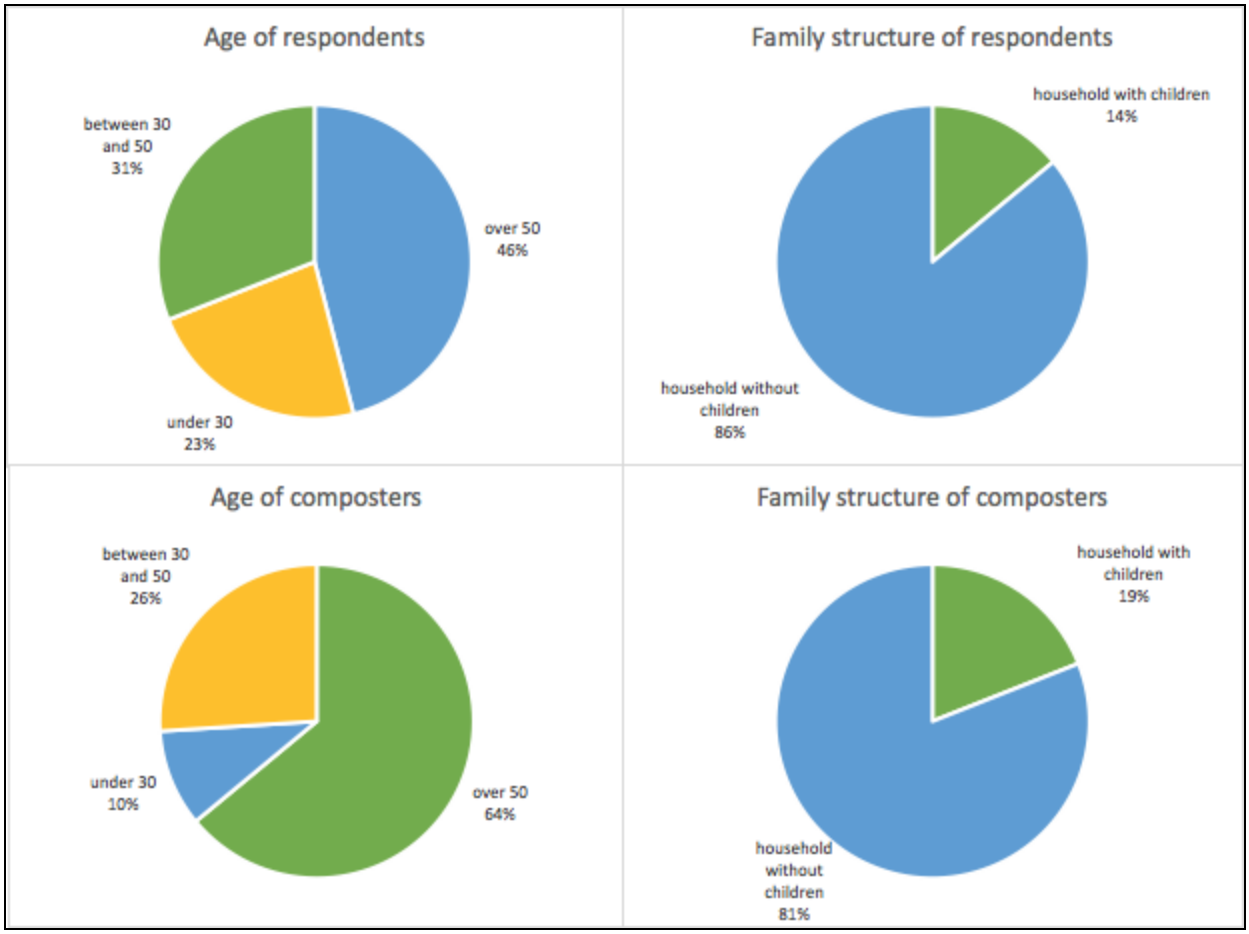

Figure 24. Top left: age of all respondents (n =97); top right: family structure of all respondents (n =97); bottom left: family structure of respondents who compost (n =31); bottom right: family structure of respondents who compost (n =31).

Logistic Regression Model Result

The logistic regression results (Table 4) show that age (Coef. = 1.39, z = 2.53, p=0.01) and social norm (Coef. = 1.36, z = 2.46, p = 0.01) are the only two factors that significantly affect composting behavior among respondents at the 0.05 level. Exponentiating the logit coefficient, we can say that the odds of senior respondents (above 50 years) that were composting were 4.01 times greater than respondents of other ages. Also, the odds of those who experienced composting as a social norm were 3.90 times more likely to compost than those who had not experienced composting as a social norm (Table 4).

Independent variables	Coef.	SE	z	Pr(>|z|)
Age	1.39	0.55	**2.53**	0.01
Family structure	1.34	0.84	1.60	0.11
Believe composting benefits the Environment	0.09	1.04	0.09	0.93
Experience the social norm of composting	1.36	0.55	**2.46**	0.01
Think composting is confusing	1.67	1.32	1.27	0.20
Think composting is time-confusing	-2.29	1.23	-1.87	0.06
Think composting is disgusting	-1.22	1.03	-1.18	0.24
Believe composting would cause odor	0.14	0.95	0.14	0.89
Believe composting would attract animals	-0.78	0.89	-0.87	0.39
Concern about no space for a composting bin	0.01	0.68	0.02	0.99
Unwilling to cleaning composting bin	-0.25	0.96	-0.26	0.79
Want to minimize rodents/pest	-0.08	1.17	-0.07	0.94
Want to takie out trash less frequently	-0.37	0.60	-0.63	0.53
Want to minimiz trash odor	1.18	0.90	1.31	0.19
Age class: 0 = age under 50, 1= age above; Family structure: 0 = having no kid at home; 1 = having at least one kid at home; Others: 0 = disagree/neither disagree nor agree on the regarding survey statement; 1 = agree on the regarding survey statement				
Bold values are significant at the 0.05 level				

Table 4. Logistic regression result for predicting composting behaviors.

CBSM Step 3: Identifying Strategies (Survey)

Interest in the environment

Almost every respondent reported familiarity with the concept of composting. Most people claimed they had the environmental interest and thought composting benefited the environment. But only one third of respondents were participating in composting. We found that the claimed environmental interests couldn't lead to composting behavior. This finding aligns with what we found in literature (Sidique et al., 2010; Sussman et al., 2013; Peter Tucker & Speirs, 2003). On one hand, some assert that environmental interest may result from social expectation (Sussman et al., 2013). On the other hand, concerns and inconvenience related to composting may have stronger negative effects on residents' behavior than the the positive effects of environmental interest. Thus, composting education should focus on minimizing residents' concerns.

Social norm

No strong social norm of composting was observed. However, social norm was a statistically significant factor in our logistic regression, indicating that those who did experience composting as a social norm would be more likely to participate in composting. This finding also reflects our findings from literature and interviews, affirming that establishing composting as a social norm can be achieved by having multiple people demonstrate appropriate composting behavior in public areas (Sussman & Gifford, 2011; Sussman et al., 2013), having community composting champions promote composting by sharing their personal experience, and using dynamic framing to enhance the social norm (Sparkman and Walton 2017).

Concern and desirability

Echoing with what we found from literature and interviews, the greatest concern among survey respondents was that composting food scraps would generate odor attract pests. Our logistic regression shows that the fear of pests is the significant factor negatively related to composting behavior. Similarly, the most wanted benefit among respondents is minimizing pests and trash odor at home. Besides odor and rodent problems, people were also afraid that they didn't have enough space to collect food scraps in a separate bin or in the freezer. To ease concerns about pests and odors, education efforts should include messaging on freezing food scraps or using airtight bins at home as ways to minimize and prevent those problems. To address concerns regarding space, education efforts may also include suggestions on how to maximize use of space in the kitchen and freezers (or refrigerator). Survey results did not show a strong distaste for managing food scraps through freezing, which contradicts our findings from literature (Metcalfe et al., 2012) and interviews.

Composting behavior

One of third respondents were participating in composting. Freezing food scraps at home and dropping food scraps at composting drop-off sites were prevalent among them. Tapping into them as composting champions can be a way to establish composting as a social norm and support education efforts to help residents manage food scraps efficiently at home, especially as ones who have had experience with freezing food scraps in tight freezers.

Demographics

Our logistic regression results predict that people over age 50 are more likely to participate in composting among all respondents. Circling back to our findings from literature, several studies also show a positive relationship between age and pro-environmental waste management behaviors (Casaló & Escario, 2018; DiGiacomo et al., 2018; Edgerton et al., 2008). One hypothesis for that is that retired populations have more time and look forward to new activities to participate in (Edgerton et al., 2008). Another study shows that people who are employed part-time are more likely to recycle than people who are employed full-time, as they are more easily able to spend time separating waste (Sidique et al., 2010). Thus, composting campaigns may consider targeting retiree communities as a place to start, where barriers to having enough time to compost are lower.

Summary

Much of our survey data affirmed or underscored the importance of certain findings from our literature and interview research. Survey data indicate that residents are most concerned about attracting pests and having odors when considering composting. Space is the another common concern, whether storing food scraps in freezers or kitchens more generally. Thus, communication efforts should focus on addressing those issues. Additionally, establishing composting as a social norm may be one of the most promising strategies, as it was not only a significant predictor of composting behavior from survey data, but also supported by key stakeholders during interviews and by a number of previous studies. Senior residents are a

potential target audience, as they have shown significantly more pro-composting behavior than those in other age groups.

Recommendations

Overview

The recommendations have been developed through our research and are presented here as suggestions for HRP to consider and adapt as appropriate. The immediate goals of the recommendations are to lower barriers to composting and support residents in participating. As a result of greater residential participation in composting, we anticipate that behavior modeling (as well as dynamic framing) will help establish composting as a social norm and further increase participation.

The recommendations are broken into two main types of interventions and three phrases, based relative degree of impact and ease of implementation. A chart is attached below for a brief view of the phasing while more detailed recommendation will be discussed in each phase (Figure 25).

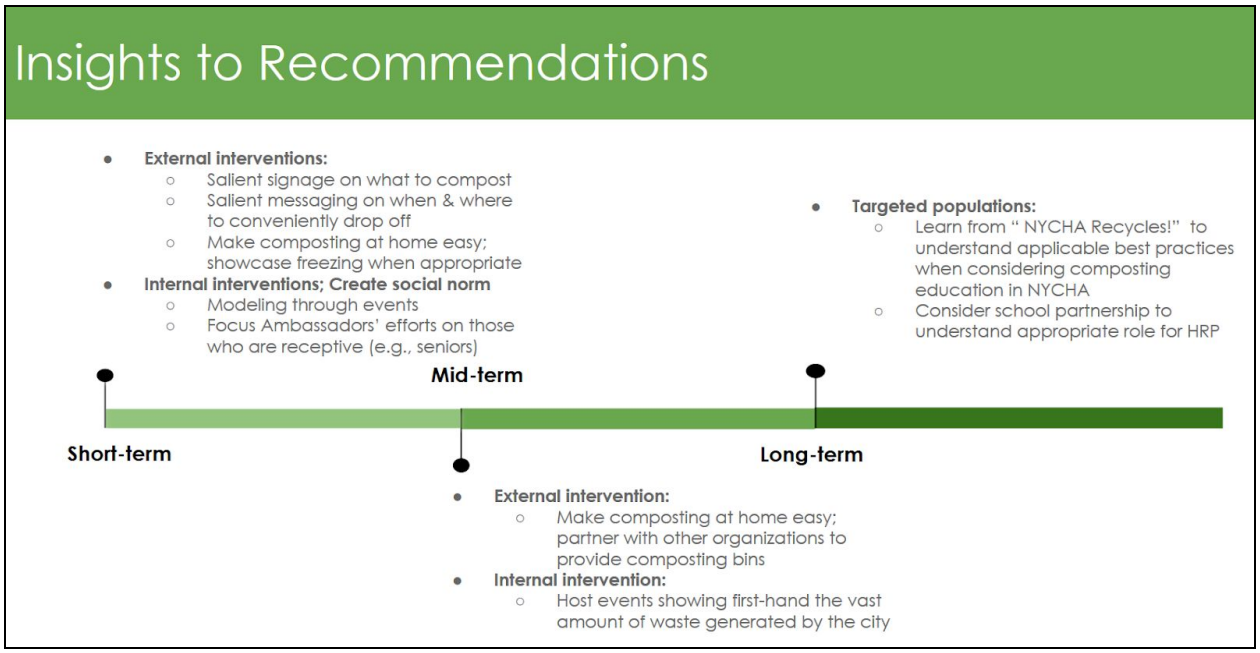

Figure 25: Recommended intervention during each phase.

Short-term

As HRP has already installed multiple drop-off locations, communicating the drop-off locations to a broader audience and having them understand what can be composted is an essential step. Educating residents on how to store compost at home before dropping off would also enable more participation in composting. Finally, having events that establish composting as a social norm through behavior modeling can increase awareness of composting and encourage more residents to start composting.

Use salient signage & messaging

After visiting one of the Park's drop-off sites, we found that site's current signage can be further improved to be more salient and effective in communicating the critical messages. Regarding the overall appearance and content, we suggest adjusting the signage to have brighter colors (Clark et al., n.d.) and multilingual text (Sullivan, 2011). To communicate key messages, we recommended images and less text (Rousta et al., 2015a) to clearly show examples of what can and cannot be composted (Figure 26), particularly for items that are more frequently missorted at the HRP drop-off sites (this information would need to come from the Park's composting operations team). As an additional communication tool, flyers may be used to educate and remind residents about important information such as 1) locations of sites, presented visually with a map (we discuss locations in the following section), 2) composting champions' top tips for making space to store compost in the freezer, 3) how to minimize the "ickiness" factor (e.g., include coffee grounds, shredded newspaper in food scrap collection), and 4) how composting can help minimize rodent issues.

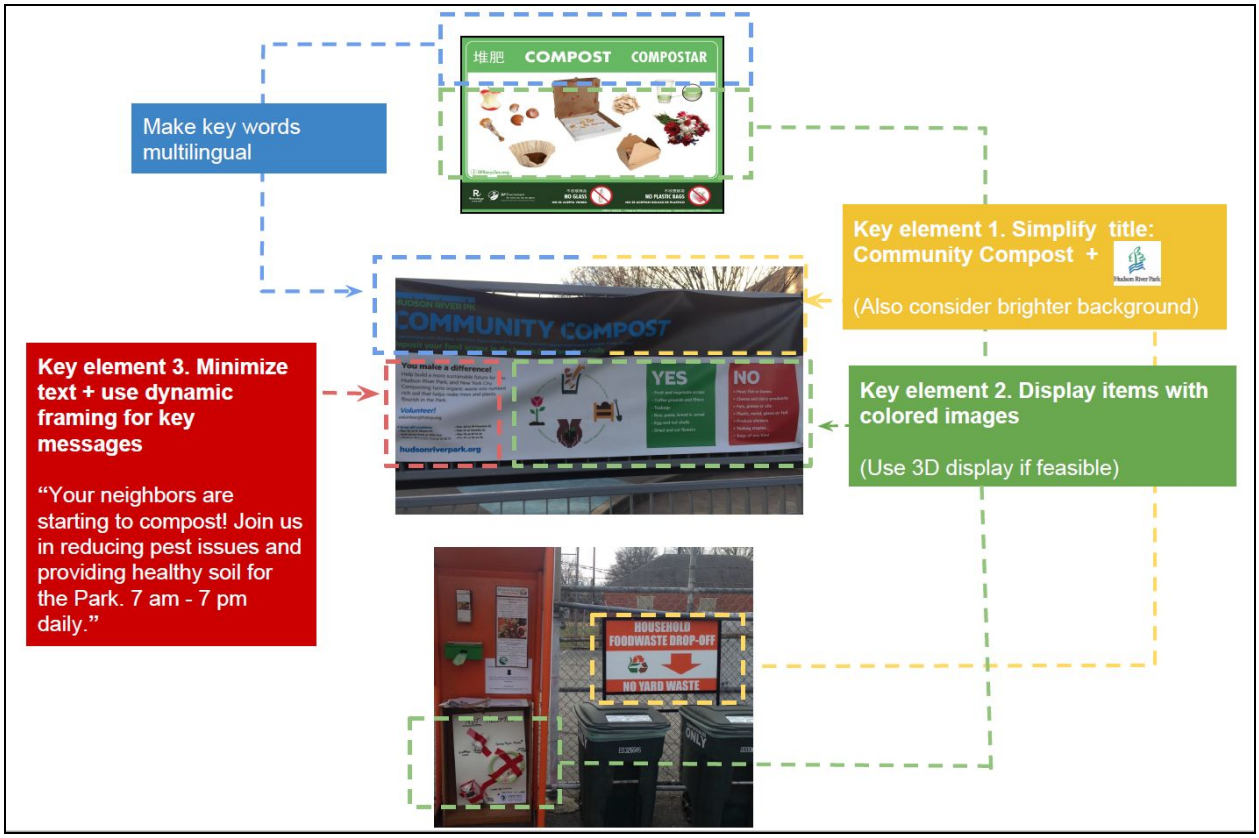

Figure 26. Suggestions for improving current Hudson River Park drop-off signs.

Highlight locations

Few people were visiting Hudson River Park drop-off sites during the survey collection period, suggesting that local residents had a relatively low awareness of the composting program and its drop-off sites; this low awareness was likely simply due to the fact that the Park's CCP had just

launched around the same time. To ensure awareness of locations, include directions online and offline. Drop-off locations should be integrated and put on the Park's website and social media, and perhaps the "Playflags" and/or "Summer of Fun" app to support greater awareness. Consider adding directions or highlighting drop-off sites visually on the maps stationed in the Park.

Make food scrap storage easy

In our survey, one of the biggest concerns for residents in collecting food scraps is that it would attract pests and generate odor. Promoting the concept of freezing or refrigerating food scraps in a sealed container could overcome these barriers. As some residents expressed concerns over limited freezer/fridge space, Hudson River Park might provide tips of better utilizing freezer's space which can be found online (Figure 12).

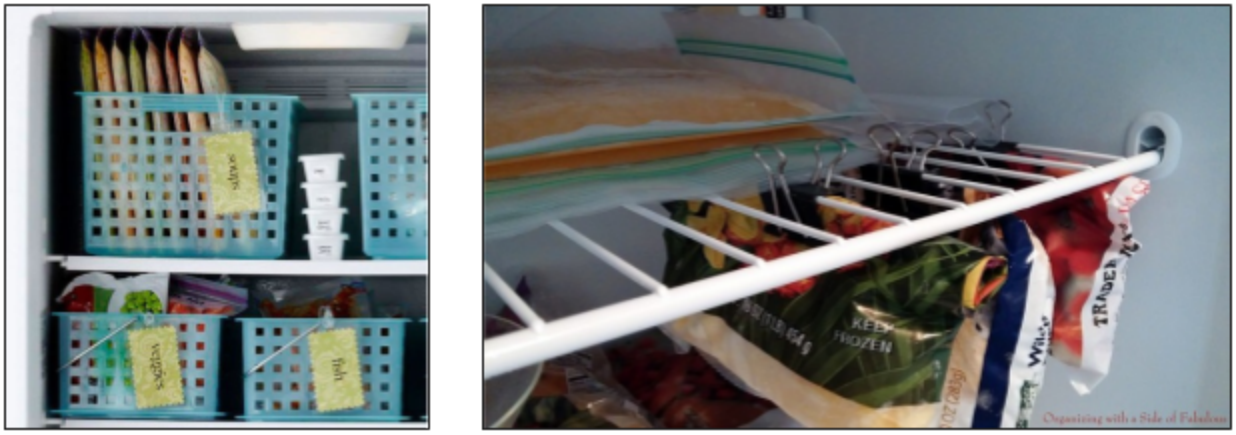

Figure 12. Left: Sample method of saving fridge/freezer space by storing items flat and in containers; right: sample method of saving fridge/freezer space by hanging items (Mobley, 2016).

Another idea is to use composting bins made of high-quality materials (e.g., metal or thick plastic) with a tight-fitting lid to prevent rats from chewing through the bin. Also, it is important to emphasize not storing meat to prevent pest and odor issues (Epa, OSWER, & ORCR, 2013). HRP can pilot the promotion of these ideas and gauge what approaches are effective for local residents. Using the "foot-in-the-door effect" (encouraging individuals to start with food scraps that have little to no "ickiness" factor such as coffee grinds, banana peels, or orange peels, then adding on other food scraps) can be another effective approach to get residents started on composting and gradually increase and sustain participation (Mckenzie-Mohr, 2000).

Establish social norm

To establish composting as a social norm, take advantage of the influence of behavior modeling. An example of an event that HRP can host is a "Show us your compost!" event. It can be a periodic event through HRP encourages residents to drop off their food scraps (perhaps starting with less offensive ones such as coffee grounds) at the Park; composting champions and other participants can also share tips on how to better manage food scraps at home. Encouraging multiple community members to participate in composting at the same time will help residents perceive composting as a social norm (Sparkman & Walton, 2017). Composting events may also include small giveaways, sponsored by HRP's partner organizations, so that the sponsoring

organizations may support community composting efforts while promoting their organizations or products.

Focus on seniors
Previous studies show that senior residents are more likely to participate pro-environmental waste management activities such as recycling and composting (Casaló & Escario, 2018; DiGiacomo et al., 2018; Edgerton et al., 2008), perhaps due in part to being retirees and having more free time to participate in new activities (Edgerton et al., 2008). Our survey data also showed a strong correlations between those over 50 years old and participation rates in composting. Therefore, we suggest targeting this audience when feasible.

Mid-term

To further increase the participation rate of composting, there are two approaches we developed for the mid-term. HRP may increase motivation by visualizing for residents the amount of food waste generated daily. To lower barriers, HRP may consider providing composting bins so that more residents can start collecting food scraps with less hassle. These approaches can help bring about environmental concern and motivation for those who may not have it and further encourage participation in composting.

Providing composting bins
Based on our findings from literature, we found that providing individuals composting bins or installing food scrap storage infrastructure not only provides convenience but also helps develop composting as a norm (Bernstad, 2014a; Metcalfe et al., 2012) and can result in a higher adoption rate of composting than information interventions. Once behavior change is established, individuals who practice the behavior often influence those around them through behavior modeling. HRP can partner with DSNY or other organizations to align on funding and logistics for such an initiative.

Food waste visualized
An insight we gained through interviews is that when people participate and see visually how much food waste is generated, many would be shocked by the amount and start taking action in reducing food waste. A study shows that by showing environmental impacts on a community visually, residents are be more likely to take pro-environmental actions (Sheppard et al., 2008). Workshops for people to participate in food scrap handling in Park would allow people to see first-hand how much waste is generated as they stand in front of the piles of waste. When they recognize that this is only a fraction of the waste in NYC, they more likely to have a more salient impression of the positive environmental impact they can create by putting the food waste to good use.

These action steps are designed to further enhance the community's understanding of composting and increase participation. These recommendations are in the mid-term phase since these actions may either need time to take effect or require collaboration with other organizations.

Long-term

For the long-term, consider further research regarding specific target populations to further increase adoption of composting as a social norm.

Considerations for targeted population: NYCHA
As noted earlier in this report, NYCHA residents have access to recycling drop-off bins but not organics drop-off bins. As compost curbside pickup continues to roll out in the City, HRP may consider partnering with "NYCHA Recycles!" or other organizations such as GrowNYC to understand and implement best practices to fill in the gap of organics pickup and support education on organics drop-offs. As an alternative or an addition, HRP may also consider partnering with the named organizations after curbside organics collection is rolled out to the entire city after the end of 2018 in order to assess what the most fitting role for the Park may be in supporting new and sustained behavior change regarding NYCHA residents' participation in organics collection.

Considerations for targeted population: Children
Our findings from the Literature Reviews indicate that children may influence their parents to take pro-environmental activities (Evans et al., 1996; Ng, 2016). Our survey data show that 14% of respondents have children at home. However, according to US Census data from 2016, the "family with children" rates are only 6% - 10% for neighborhoods that most respondents come from (Figure 27), suggesting that there may perhaps be a correlation between households with children and affinity for Hudson River Park. Since the Battery Park area has an even higher percentage of households with children (33.8%) , HRP may consider partnering with them and other relevant city organizations to understand what the best role for HRP may be in supporting pro-composting behavior changes in the city. As the Zero Waste School Initiative continues, HRP may also consider partnering with schools, the Department of Education and/or the NYC Department of Sanitation to explore what appropriate role HRP can play in educating children and their families on composting behavior. Possible roles and activities could include being a educational composting site to visit, conducting composting workshops, and other experiential learning activities.

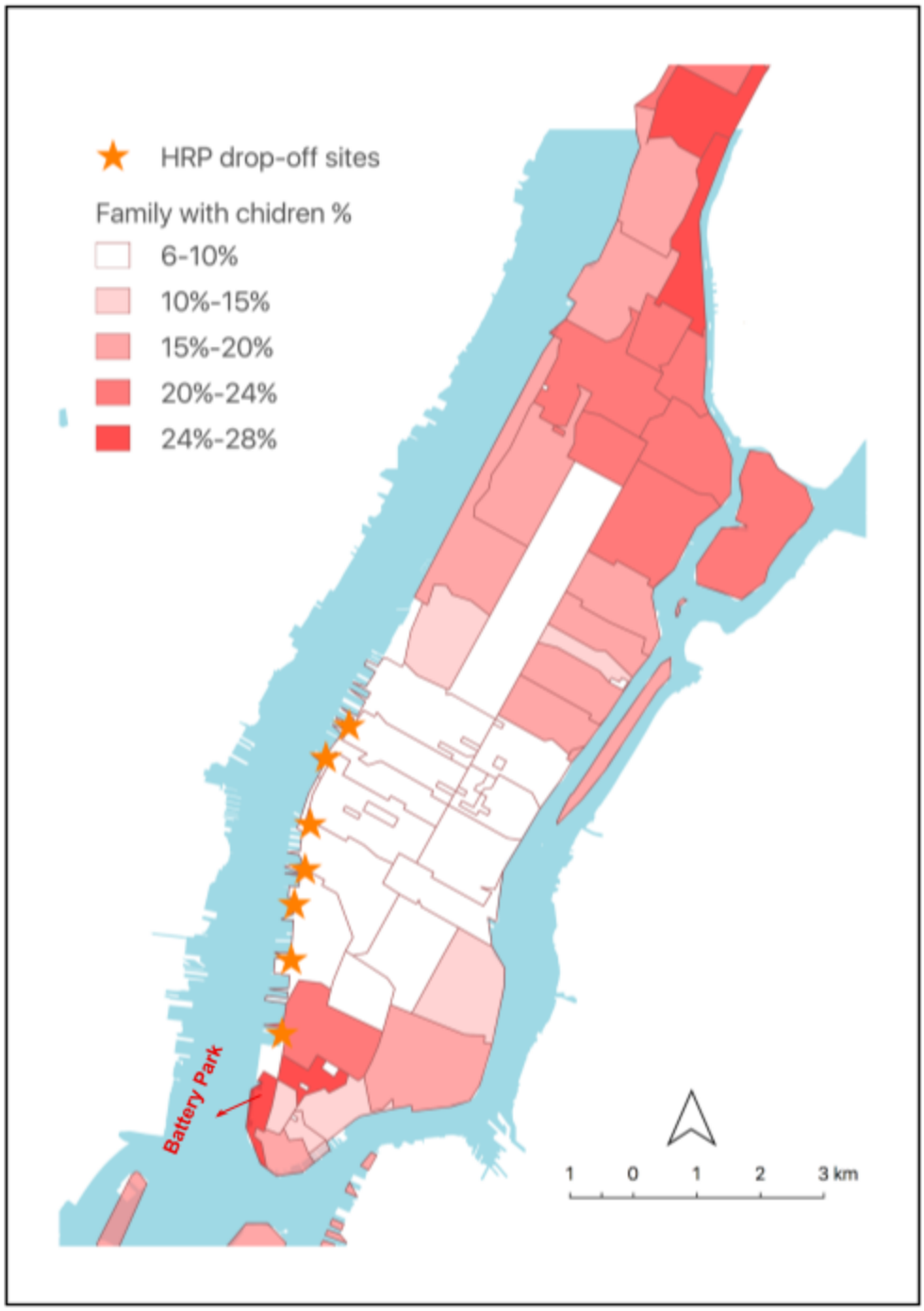

Figure 27. Map of the intensity of household with children by zip code (data from US Census Bureau).

Conclusion

As noted, urban composting has been gaining visibility in the public space. As we researched various barriers and strategies to overcome barriers to composting, we found many similarities between composting in New York relative to other metropolitan areas, but also several differences, including the particularly salient challenge of having enough space to store organics and the extra attraction of reducing pest issues as a benefit.

As community organizations continue to partner together and increase infrastructure for and awareness of composting, we are optimistic about the Park's and the greater City's environmental well-being. Our hope is that the results and conclusions of this research will be useful to HRP and perhaps other researchers and practitioners seeking to share best practices to protect the Park's environment, minimize waste, and cultivate more sustainable communities.

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Appendices

Logic model

Logic Model updated periodically to guide project progression

Logic Model for Hudson River Park Project

Overarching Goal: Support Hudson River Park (HRP) in helping NYC reach its goal of zero waste by 2030 by scaling up composting.
Sub-goal 1: Identify barriers to organics collections in an high-rise environment
Sub-goal 2: Develop strategy to help run effective behavior change campaign and potentially increase composting participation rate in HRP
Sub-goal 3: Provide examples of effective signage for composting and ways to increase awareness of drop-off locations

Inputs	Activities & Duration	Outputs	Outcomes and Impacts
Program Budget • University of Michigan SEAS Master's Project Funding ($1500 / member) **Researchers** • University of Michigan SEAS Master's Project Team • Dr. Victoria Campbell-Arvai, SEAS Advisor **Steering Committee** • Primary: Hudson River Park (HRP) **Existing Information** • Food Composting, Environmental Behavior, and other relevant peer-reviewed research • Hudson River Park Environment Education Program • Documents about services and benefits provided by Hudson River Park	**Meetings (ongoing):** •Meeting with HRP approximately every two weeks or as needed • Meeting with faculty adviser every two weeks or as needed • Weekly team meeting **Literature Review (tentatively through April with revisions past April on an as-needed basis):** • Overview of behavior change models and strategies • Overview of urban composting projects in other cities **Data Collection (tentatively March through September):** • Interview with HRP-related stakeholders • Survey residents within the community about composting • Survey feedback and results of current composting program **Data Analysis (tentatively April through October):** • Quantitative and Qualitative of current survey results **Solution Brainstorming and Prototyping/Testing (tentatively April through November):** • Develop potential solution(s), incorporating design thinking methodology to the extent appropriate **Presentation (tentatively September and December):** • Develop and present final presentation to SEAS and HRP **Final Report (December):** • Write up project results and discussion • Create tools and recommendation plans for behavioural change actions in targeted community **Project Duration:** • January 2017-December 2017	• Literature review findings • Strategies for driving behavior change in community to increase composting • Data from interviews, observations, and surveys • Mid-Point Presentation to HRP the finding on current composting result and finding • Final Written Report for HRP/SEAS and Presentation for HRP	**Short-term** • HRP has increased understanding of and research on NYC residents' barriers to food waste collection / composting and behavior change management • HRP has increased focus on targeting key stakeholder group(s) • HRP has better understanding on signage designing concept • HRP can reach their 2018 target of 104,000lb of office/tenant/community drop-off waste **Mid-term** • HRP implements recommendations developed with the Team with any appropriate adjustments • Target audience(s) have more positive affect toward food waste collection / composting **Long-term** • HRP implements behavior change strategies and programming with greater effectiveness, with ongoing evaluation to effect continual improvements • HRP is more equipped to support NYC in reaching its goal of zero waste by 2030 • HRP health improves

Interview

Sample interviewee outreach email

Sample interviewee recruitment email message below:

Hi [Potential research subject],

We are reaching out to you per the recommendation of [Recommender].

By way of introduction, we are a group of Master's students from the University of Michigan's School of Natural Resources and Environment. We are working with Hudson River Park Trust on a project with the goal of developing an effective behavior change campaign to increase residential participation in organics collection and composting efforts in the Hudson River Park area.

[Recommender] has spoken highly of you and thinks you would be a great person for us to learn from. Would you be willing and able to have a 30-minute phone call to help us understand residents' sentiments toward organics collection and composting?

Topics we would love to get your input on include:

1. What residential organics collection looks like in your community today
2. Barriers to participation in organics collection
3. Any recommendations you may have for Hudson River Park to increase your community's participation in organics collection
4. As an extension of the above, any recommendations you may have for us as a student research team on the best way(s) to communicate with others in your community
5. Any other individuals or groups you'd recommend we speak with to gather additional relevant information

We look forward to the opportunity to speak with you! Please let us know what times may be most convenient for you.

Thank you so much!

Best,

Alexander Ho, Anita Lin, and Yili Luo
SNRE.HRPP@umich.edu
School of Natural Resources & Environment
University of Michigan
440 Church Street, Ann Arbor, MI 48109

Interview script for exploratory interviews

Interview Guide

Introduction:
Thank you again for your time. As we mentioned in our email, we are graduate students from University of Michigan. We are working with Hudson River Park on their organics collection project. We would like to know more about your experience with organics collection -- how you started collecting organics, the difficulties you see in organics collection (particularly in an apartment environment), and how to make organics collection easier. We will use your feedback to develop a plan with Hudson River Park to see how can we make organics collection easier and increase composting in support of NYC's zero waste by 2030 goal.

Opening Questions:
1. Can you tell us about yourself and why you started organics collection?
2. What are some of the challenges you faced when you started organics collection?
3. Do you still face these challenges? If not, how did you overcome them?

General Questions:
4. Have you ever tried convincing people around you to start organics collection?
5. For those who do not compost or collect organic waste, what are some of the reasons that they don't want to?
6. For those who started collecting organic waste, what has kept them doing so?
7. Is there anyone you know who tried collecting organic waste but gave up later?

"Behavioral" Questions:
8. What are some of the strongest reasons that kept you organics collection?
9. Are there any community events practicing organics collection together?
10. New York City has started organics collection programs in schools; have you heard about them? Have you heard of any parents participating more because of it?

Closing Questions:
11. Is there anyone whom you would recommend us talking with?
12. Thank you so much for your time. Before we end, is there anything we haven't talked about that you would like us to know?

Closure:
Thank you again for your time, we have learned so much through our conversation today. We will go through our notes and write a summary. If you do not mind, can we email it to you to check that everything in it is accurate?

Thank you again for your time!

Survey

Hudson River Park Community Compost Questionnaire

Hudson River Park

SCHOOL OF NATURAL RESOURCES & ENVIRONMENT
UNIVERSITY OF MICHIGAN

Hudson River Park Community Compost Questionnaire

Please complete only one survey per household. The purpose of this survey is to gain a better understanding of residential perspectives on composting food scraps. Your survey responses will inform the development of Hudson River Park's Community Compost program and they will remain anonymous. You do not need any specialized knowledge to complete the survey; we are interested in your opinions and experiences related to food scrap collection. You are free withdraw the survey at any time, without penalty. If you have any questions on this survey, please contact us at SNRE.HRPP@umich.edu. By continuing with this survey you indicate that you have read and understood the survey instructions. Thank you!

1. Do you know what composting food scraps is?

❑ Yes ❑ No

2. On a scale from 1 (Not at all) to 7 (Extremely), to what extent do you agree with the following statement?

	Not at all 1	2	3	4	5	6	**Extremely** 7	N/A
It's worth my time and effort to collect food scraps.								
I think composting food scraps* benefits the natural environment.								
I think composting food scraps is easy to do.								
My family/people I live with encourage composting food scraps.								
There is at least one close friend/family in my apartment building who encourages others to compost food scraps.								
Separating food scraps at home is too confusing.								
Separating food scraps at home is too time-consuming.								
Separating food scraps at home is too disgusting.								
I'm worried that having a separate bin for composting would cause odor.								
I'm worried that having a separate bin for composting would attract pests/rodents.								
I don't have enough space to keep a separate container for food scraps.								
I don't want to deal with cleaning a container for food scraps.								

*Composting food scraps means collecting fruit and vegetable waste, plus other food waste such as coffee grounds, tea bags, and eggshells, to be decomposed into a rich soil known as compost.

3. Have you heard of people freezing their food scraps to decrease odor and pests/rodents?

❑ Yes ❑ No

4. What do you think of freezing food scraps?

❑ "I wish I had thought of that earlier!" ❑ "That would be nice, but I don't have space in my freezer."

❑ "That could work for me." ❑ "Gross."

❑ "Why would I do that?" ❑ Other _____

5. On a scale from 1 (Not at all) to 7 (Extremely), to what extent do you agree with the following statements?

	Not at all						**Extremely**	
	1	2	3	4	5	6	7	N/A
I want to minimize pests/rodents in and around my home.								
I would like to not have to take out my trash so frequently.								
I would like to get rid of odors from the waste bin.								
I want to help create a healthier environment.								
I want to reduce the amount of waste going to landfills.								
I want to help fight climate change.								
I want to help my community become healthier.								
I want to help my community become stronger.								
I want future generations to grow up in a healthy environment.								
I want my pet(s) to stop going through my trash bin. (Please choose N/A if you don't have pets.)								

6. What compost drop-off site do you currently use, if any?

_____

7. Is the compost drop-off site conveniently located for you?

❑ Yes ❑ No

8. Your zip code_____

9. Do you have a(ny) child(ren) living in your home?

❑ Yes ❑ No

10. Your age_____

Thank you for your time!

If you want to fill it out later, please email your response to SNRE.HRPP@umich.edu, Thank you!

The University of Michigan Institutional Review Board has determined that this study is exempt from IRB oversight.

Report for Hudson River Park, February 2018

Behavior Change Campaign for Strategic Urban Composting

Insights and Recommendations for Hudson River Park

By University of Michigan School for Environment and Sustainability
Alexander Ho, Anita Lin, Yili Luo
Faculty Advisor: Victoria Campbell-Arvai

Hudson River Park

SEAS

Contents

1. Executive Summary

Context

NYC has 14 million tons of waste each year. Of that, about 30% is organic.[1] In support of NYC reaching its goal of zero waste by 2030, Hudson River Park (HRP) has procured an industrial composter and developed a Park-wide Community Compost Program. These efforts will help fill in the gap between existing community drop-off locations and the city's phased approach to rolling out curbside organics pick-up.[2]

Initially, HRP started composting with a focus on horticultural waste in October 2015. By the end of 2016, HRP was able to divert an estimated 32,000 pounds of organic waste[3] while saving about $60,000 combined between costs of waste removal and compost that would otherwise need to be purchased.[4] By June 2017, HRP was able to launch its Community Compost Program to the public with the acquisition of its industrial shredder, along with expanded drop-off times at its seven drop-off sites.[5] By the end of 2018, HRP aims to increase the annual amount of non-horticultural organic waste diverted to 104,000 pounds.[3]

Opportunity

As one of the longest waterfront parks in the United States, HRP attracts 17 million visits each year and is a symbol of the revitalization of the city. The Park plays a key role in supporting the economic, social, and environmental well-being of the surrounding area,[6] and is uniquely positioned to affect the perceptions of the many residents who frequent its grounds, especially with respect to environmental matters.

Additionally, composting is a relatively new concept for many NYC residents. The act of saving food scraps and supporting community composting efforts is yet to become a city-wide norm. Relative to trash and recycling bins, composting bins are less common on the city's streets; the idea of composting may be off-putting to those who do not practice organics collection.

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[6] Friends of Hudson River Park and Hudson River Park Trust. (2017). About Us. Retrieved from https://www.hudsonriverpark.org/about-us

However, a number of residents have begun to develop the practice of composting as a new environmental behavior.[7]

As a 4-mile park in Manhattan, HRP is working to understand its role in supporting city-wide composting. Given limited resources, the Park is exploring what may be the most effective strategies for outreach, communication and behavior change.

Questions

Considering the above, how might HRP leverage its cultural influence within the city to design and implement a behavior change campaign that increases residential participation in organics collection through increased community drop-offs, and support its goal of diverting at least 104,000 pounds of non-horticultural organic waste by the end of 2018? Moreover, how might the Park do so while being mindful of those who may be underserved or more vulnerable and empower their support as the city works toward its goal of zero waste by 2030?

Methods

HRP has partnered with a team of students from the University of Michigan's School for Environment and Sustainability to probe into the Park's potential to affect Pro-Environmental Behavior (PEB) change. The team undertook the project in several phases, summarized below:

- Understand: Academic literature review and onsite visit to Hudson River Park
- Explore: Stakeholder interviews, community survey, and toolkit research to draw inspiration from what other organizations have done in recent years to facilitate pro-composting behavior change
- Deliver: Integration of the team's findings and development of final recommendations

Key Findings

The success of this program and development of a reliable participation base is dependent on increasing motivation through education and awareness while also lowering barriers for participation in composting.

Methods of increasing recognition may include:

- Effective education to a broader audience, emphasizing both key environmental benefits and social/community benefits; doing so may include the sharing of literature and other communications materials to educate on on how the compost is benefiting the community. Partnering with groups such as neighborhood garden communities, schools, and champions within communities, to support development of composting as a social norm more quickly
- Providing residents with the opportunity to experience composting firsthand, which may help them understand the ease of compost participation and the impact that they are making

[7] (C. Roble, personal communication, December 15, 2017)

For the barriers, we have identified psychological barriers such as "yuck" factor, concerns about odors/pests, perceived hassle of extra work, confusion over what can be composted, lack of knowledge about accessible drop-off locations.

To lower these barriers, we have identified some examples practiced:

- Practices of freezing food scrap or using worm bins
- Using sealed containers to store food scrap in fridge or freezer
- Improve signage, for example by using 3D signage to indicate what can be composted and by using signage to show directions to the closest drop-off location
- Ensuring accessibility to drop-off sites, such as through physical proximity and operation times

Recommendations

Consider a three-phased approach to reach multiple populations:

Short-term
Use external interventions, such as salient signage and messaging, and work to make composting as easy as possible for households. Combine with internal interventions, such as behavior modeling, and focus Compost Ambassadors' efforts on the movable middle to work toward developing composting as a social norm.

Mid-term
As an external intervention, consider partnering with other organizations to make composting at home easy through provision of composting bins. Combine with internal interventions to increase perceived behavioral control by showing communities the impact of their composting efforts. Also consider hosting events to highlight first-hand the vast amounts of waste that the city generates.

Long-term
As an external intervention, consider increasing awareness through saliency further, and consider design partnerships for compost collection bins and waste visualization. Also consider working specific target populations. Understand what factors led to the successes of the "NYCHA Recycles!" initiative and what takeaways may be applied when considering composting education at NYCHA (New York City Housing Authority) residences. Lastly, consider partnering with schools to understand the potential role that HRP may play in composting education.

2. Project Overview

HRP background

Hudson River Park is an 550-acre park along the west side of Manhattan.[8] In October of 2015, the Park opened its Composting Center with the procurement of its automated composter, thanks to Friends of HRP and the generosity of Christopher Fiore & L Brands Inc., in support of NYC's zero waste by 2030 goal, in partnership with DSNY with a focus on horticultural waste.[9]

By the end of 2016, HRP was able to divert an estimated 32,000 pounds of organic waste through office, tenant, and community participation[10] while saving about $60,000, from an estimated $40,000 in savings from removal costs and $20,000 of savings from compost that the Park would have otherwise needed to purchase.[11] By June 2017, HRP was able to quickly scale up and announce its expanded Community Compost Program to the public, as the acquisition of its industrial shredder allowed it to increase its composting capacity; along with this expansion came widened drop-off times at its seven drop-off sites to support greater community participation in composting efforts.[12] For 2018, HRP aims to double the annual amount of non-horticultural organic waste diverted from its 2017 goal to 104,000 pounds, or about 2,000 pounds per week on average, to support the development of a more sustainable community.[10]

NYC background: a few contextual notes

To give a rough sketch of the context within HRP's composting efforts are situated, a few notes about greening efforts for the city of New York that are more closely related to this particular project are noted below.

In 2007, New York City launched "PlaNYC", which has evolved into "OneNYC: The Plan for a Strong and Just City". The motivation for this city-wide effort comes largely from the understanding that the city is forecasted to have 9 million residents by 2040, within the context of an evolving economy, aging infrastructure, and changing climate.[13] Mayor de Blasio released

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[8] Hudson River Park. (n.d.). *Vision & Progress*. Retrieved from https://hudsonriverpark.org/vision-and-progress

[9] Hudson River Park. (2015, October 22). *Hudson River Park Just Got Even Greener*. Retrieved from https://hudsonriverpark.org/news-and-updates/hudson-river-park-just-got-even-greener

[10] Hudson River Park. (2017). *HRP Composting Vision 2017*. Unpublished internal document, Hudson River Park.

[11] Hudson River Park. (2015, October 22). *Hudson River Park Just Got Even Greener*. Retrieved from https://hudsonriverpark.org/news-and-updates/hudson-river-park-just-got-even-greener

[12] Hudson River Park. (2015, October 22). *Community Composting Kicks Off Expanded Sustainability Efforts*. Retrieved from https://hudsonriverpark.org/news-and-updates/community-compost-program-kicks-off-expanded-sustainability-efforts

[13] The City of New York. (n.d.). *About*. Retrieved from https://onenyc.cityofnewyork.us/about/

"OneNYC" largely as it stands now in April 2015, building upon the sustainability efforts started by "PlaNYC".[14] The fall of 2016 saw the start of the Zero Waste School Initiative, beginning with 100 pilot schools, intended to formally last for five years in total.[15] By the end of 2016, the "NYCHA Recycles!" initiative was completed and gave all NYCHA residents access to recycling.[16] Lastly, by the end of 2018, the City of New York aims to complete its phased rollout of curbside organics pickup for all New Yorkers.[17]

Project scope

As an integral part of many New Yorkers' lives, HRP aims to support residential participation in organics collection to increase composting and contribute to New York City's goal of reaching zero waste by 2030.

Purpose and Justification of the Project
As students from the University of Michigan, we are partnering with HRP to design a behavior change campaign to strategically increase urban composting. This project is also being conducted in partial fulfillment of the requirements for the degree of Master of Science from the School for Environment and Sustainability at the University of Michigan.

Scope Description
Identify how HRP might decrease barriers and increase motivation of residents in the HRP area to increase residential participation in organics collection at the Park with an emphasis on developing effective signage.

Stakeholders
Key stakeholders for this project include:

- Project sponsor: Hudson River Park
- Primary audience for the behavior change campaign: Residents of NYC who frequent HRP and visitors of the park; the general public
- Secondary audiences: NYCHA residents who live near HRP; children and their families who live near HRP; other NYC organizations with an interest in composting

Research questions

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[14] City of New York. (2015, April 22). *Mayor de Blasio Releases One New York: The Plan for a Strong and Just City*. Retrieved from http://www1.nyc.gov/office-of-the-mayor/news/257-15/mayor-de-blasio-releases-one-new-york-plan-strong-just-city#/0

[15] New York City Department of Sanitation & New York City Department of Education. (2016, February 25). *Zero Waste Schools*. Retrieved from schools.nyc.gov/NR/rdonlyres/D8A3AE2F-50C1-4D66-929B-C4AC64975ACE/0/ZWSOverview_V1.pdf

[16] City of New York. (n.d.). *NYCHA Recycles!*. Retrieved from http://www1.nyc.gov/site/nycha/about/nycha-recycles.page

[17] The City of New York. (n.d.). *OneNYC Progress*. Retrieved from https://onenyc.cityofnewyork.us/progress/#sustainability

To develop an effective behavior change campaign, we are using the questions below to guide our research.

1. What are the primary barriers to organics collection in an urban apartment environment?
2. What are the primary motivations for organics collection in an urban apartment environment?
3. What frameworks are relevant in supporting effective behavior change strategy to encourage organic collection and composting?
4. How might we design effective surveys and interview questions to better understand the urban composting context?
5. How might we design an effective behavior change campaign, rooted in theory and customized for HRP's context per survey results, that empowers residential support and utilizes signage effectively?

Methods

Our approach included several phases, as shown below in Figure 1.

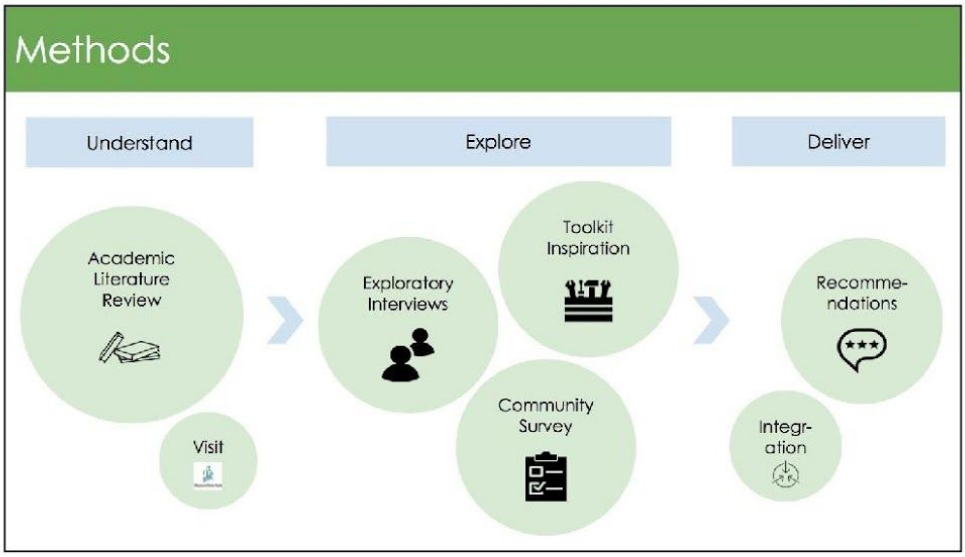

Figure 1. Research methods and phases.

Understand

The first phase of our project, "Understand", consisted largely of secondary research through an academic literature review to gain a high-level sense for the existing body of knowledge for PEB change, particularly with respect to composting. In May 2017, we also had the opportunity to visit HRP in-person for two days to get a tour of the Park and participate in a community meeting to learn more about the residents in the area.

Explore
The second phase of the project, "Explore", included both primary and secondary research, essentially creating a three-legged "stool". The first leg consisted of exploratory interviews with community stakeholders, such as residents and representatives of pro-environmental organizations in NYC, and subsequent qualitative analysis. The second leg consisted of a community survey to provide the team with deeper information on residents' current beliefs, attitudes, and behaviors with respect to composting, along with subsequent quantitative analysis. The third leg consisted of additional secondary research -- this time, including information from non-academic sources with an eye toward what model cities and universities have done in recent years to promote pro-composting behavior change to provide toolkit inspiration. Although the toolkit research was done during the "Explore" phase, we've incorporated key findings from that phase into the "Recommendations" section of this report.

Deliver
Lastly, the team integrated findings from the "Understand" and "Explore" phases and used the insights as a springboard for developing strategic recommendations. Project deliverables included developing a strategy to support PEB change with emphasis on how HRP might develop effective signage in the form of this written report, as well as an in-person presentation.

This research aims to support understanding of the primary drivers of and barriers to organics collection in an apartment environment and how to design an effective behavior change campaign with an emphasis on signage in a way that empowers residential support. Our hope is that the results and conclusions of this research will be useful to HRP as it seeks to protect the Hudson River Park environment, divert compostable waste into organics collection to support a more sustainable city, and share best practices with other parks or other researchers seeking to strengthen pro-composting behavior.

3. Academic Literature Review

Introduction

To help increase participation in Hudson River Park's Community Compost Program, our team conducted a literature review with a focus on understanding PEB change theories and exploring strategies that succeeded in promoting community-based composting or recycling program. This section introduces PEB change theories, and compare different strategies by reviewing several composting or recycling pilot studies. In the end, this section summarizes each strategy, and provide suggestions about how to better apply those strategies to Hudson River Park's Community Compost Program.

Behavior change theories

Theory of Planned Behavior
According to the Theory of Planned Behavior, humans behaviors are guided by attitude, subjective norm, and perceived behavioral control. "Attitude" refers to the beliefs about the consequences of the behavior[18], for example people believe that doing composting will benefit the environment. "Subjective norm" includes injunctive norm and descriptive norm[19]. Injunctive norm is what people think they are expected to do; descriptive norm is what people think is actually happening. If individuals experienced composting as the norm, the injunctive norm would be they thought they were expected to do the composting, while the descriptive norm would be they saw people around them were doing composting. When the injunctive norm and descriptive norm align with each other, people are more likely to perform composting[20]. The perceived control is the ease or difficulty of performing a particular behavior[21]. The perceived difficulty would decrease the likelihood that people behave.

Informational Intervention & Structural Intervention
To encourage more residents to do composting, therefore, we can make people develop a positive attitude of composting, establish the social norm of composting, and lower the barriers of doing composting. And the three strategies could be achieved by informational and structural interventions.

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[18] Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.
[19] Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of personality and social psychology*, *58*(6), 1015.
[20] Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current directions in psychological science*, *12*(4), 105-109.
[21] Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.

Informational intervention aims to increase people's knowledge so they will become more aware of environmental issues, the consequence of their current behaviors, and effects of the behavior change. It therefore changes people's attitude and creates the social norm of the behavior change. Examples of information interventions include distributing educational materials, using the signage, and having role models to do the demonstration. The information interventions would efficient when the behavior change was convenient and affordable. But when the perceived barriers are too high, the informational intervention becomes inadequate. In this circumstance, structural intervention is needed to minimize the negative effects of perceived behavior control, such as changing the default setting and making the pro-environmental an easier option[22].

Study reviews

Education Material vs. Supportive Infrastructure

A study implemented in a residential area in Sweden showed distributing educational materials was less effective than providing supportive Infrastructure in promoting household composting behavior. This study compared the effects of two interventions: (1) distributing composting education leaflets among households and (2) installing food scraps sorting equipment in the kitchen sink (figure 2) of each household in the study area. The result showed distributing education leaflets failed to increase the community composting rate. But the composting rate was significantly increased after the sorting equipment was installed.

Figure 2. Equipment installed under the kitchen sink aiming to facilitate food waste sorting inside the household.

It was concluded that education leaflets failed to attract residents' attention because (1) it was written in Swedish but half of the residents were not born in Sweden and (2) the information about environmental benefits might not be the interests of the target audience. Whereas

[22] Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of environmental psychology*, *29*(3), 309-317.

providing the sorting equipment succeeded because it provided people with supportive infrastructure that making composting an easy choice everytime people wanted to dispose of food scraps in the kitchen[23].

Signage vs. Modeling

Signage and modeling are two informational interventions used in promoting PEBs. Signages provide audience educational information and behavior cues supporting the behavior decision making[24]. Modeling refers to having people demonstrate target behaviors and encourage audience to engage in such behaviors.

Researchers conducted a experiment in a college cafeteria (the college has approximately 18,000 full-time and part-time students) to understand the the effectiveness of signage and modeling in promoting composting behavior.[25] The waste station in the cafeteria (study area) had a composting bin placed beside the trash bin and recycling bin. A sign simply listed acceptable and unacceptable composting materials was attached on the top of the composting bin (figure 3). The ideal composting (disposing all compostable items in the composting bin) rate was significantly increased from 12.5% to 20.5% after researchers improved the sign over the composting bin (figure 3) and provided tabletop signs showing region-specific landfill fact in that cafeteria (figure 4) . The rate slightly increased to 24.5% when researchers used one volunteer to demonstrate the appropriate composting behavior, but this increase was not significant. When researchers used two volunteers to conduct the demonstration, the ideal composting rate surged to 42%. The increase was even sustained after the composting models were removed. However, the ideal composting rate was increased by reducing the number of imperfect composting behavior (only composting food leftovers but disposing unusual compostable items such as napkins and boxes in the garbage), the non-composting rate (failing to compost an obviously compostable item such as a piece of food) remained the same whenever the signage was improved or the composting behavior was modeled by the volunteers.

[23] Bernstad, A. (2014). Household food waste separation behavior and the importance of convenience. *Waste management*, *34*(7), 1317-1323.

[24] Geller, E. S. (1989). Applied behavior analysis and social marketing: An integration for environmental preservation. *Journal of Social Issues*, *45*(1), 17-36.

[25] Sussman, R., Greeno, M., Gifford, R., & Scannell, L. (2013). The effectiveness of models and prompts on waste diversion: A field experiment on composting by cafeteria patrons. *Journal of Applied Social Psychology*, *43*(1), 24-34.

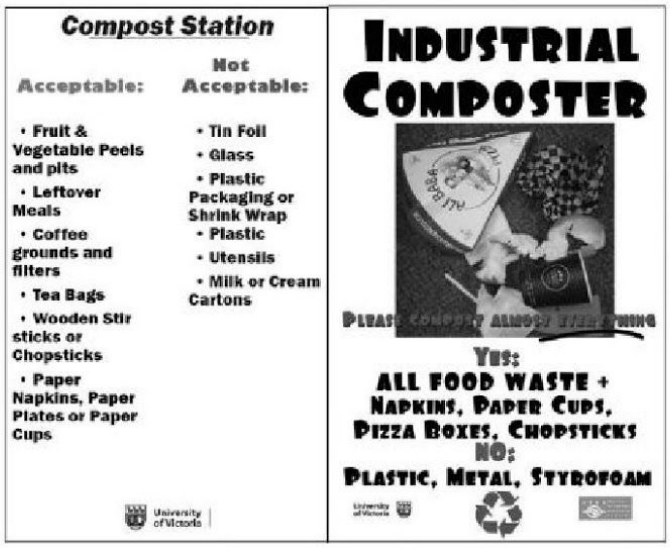

Figure 3. Standard (left) and upgraded (right) sign over compost bin.

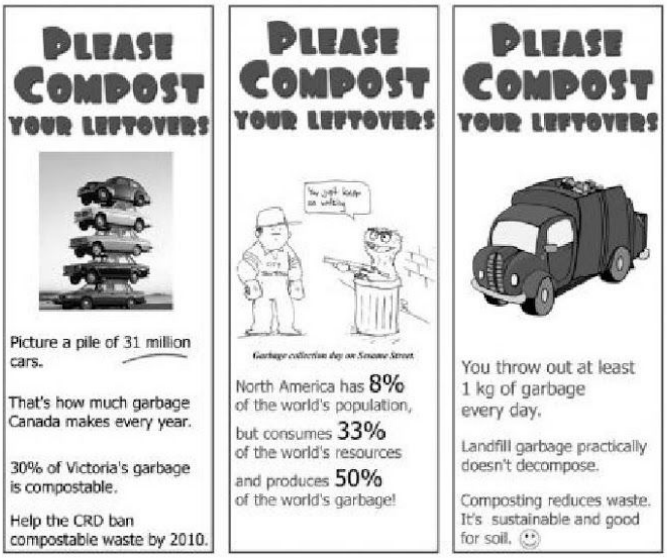

Figure 4. Tabletop sign.

From this study, we learned signage with more salient and persuasive information successfully influenced people to do more correct composting. Researchers thought it is possible that the

signages played the role in establishing the injunctive norm by describing the importance of composting. We observed using both the improved signage and multiple composting models maximized ideal composting rate in this study, which might be resulted from the consistency of injunctive norm and the descriptive norm. Researchers believed diners were more likely to observe the composting behavior when it's modeled by multiple people and probably inferred this as "everyone is doing the composting". Therefore, diners would see composting not only the injunctive norm but also the descriptive norm. Once the social was established, it had long lasting effects, so the ideal composting wasn't drop after the composting role models were removed. In this study, we found diners who didn't compost were barely influenced by any intervention. Although all experiment participants hold a positive attitude of composting food waste as they stated in the interview that they thought composting is important, the unchanged non-composting rate indicated people's answer would be influenced by social expectation but the deeper feeling that "composting is not important" remained unknown.

Another study, conducted in a residential area in Shanghai, China also examined the effectiveness of signage and modeling. The study site covers 23 blocks with similar apartments and demographics. Researchers divided it into to two experimental sites. One site was introduced with a composting bin, which was decorated with bright yellow flower papers (figure 5). The other site was introduced with volunteers standing beside a normal bin (no decoration) to demonstrate the appropriate composting behavior. The two interventions increased composting rate 32% and 44%, respectively. But the those increases were not significantly different. In the site with the signage intervention, among nine residents who participated in the interviews, four interviewees stated they noticed the function of the bin from its decoration. Researchers learned from a previous study that cheerful and funny visual prompts could convey a positive emotion to the reader[26]. Therefore they used the bright yellow flower design to develop the positive attitude when residents brought their food scraps to or passed by the composting bin. While in the site with modeling intervention, volunteers only presented two hours a day. This probably resulted inadequate interaction between residents and composting models and caused the insignificant difference from the signage effect[27].

[26] Bennett, R. (1998). Customer recall of promotional displays at supermarket checkouts: Arousal, memory and waiting in queues. *The International Review of Retail, Distribution and Consumer Research*, *8*(4), 383-398.
[27] Lin, Z. Y., Wang, X., Li, C. J., Gordon, M. P., & Harder, M. K. (2016). Visual Prompts or Volunteer Models: An Experiment in Recycling. *Sustainability*, *8*(5), 458.

Figure 5. Flowered composting bin in Shanghai.

Studies conducted in a college cafeteria and Shanghai residential area both confirmed that well-designed signage worked well in promoting composting behavior. They also indicated the effects would more salient when using multiple volunteers to demonstrate the appropriate composting behavior for a long period of time.

Attitude vs. social norm

A study conducted through in-person interviews at multiple recycling drop-off locations in Lansing, Michigan showed that age, social pressure, location, and familiarity were the factors positively correlated to recycling behavior at drop-off sites. That is to say, seniors were more likely to participate in recycling; pressure from peers and family had positive effects on the recycling drop-off sites visit times, and people would use a drop-off site more frequently when they lived close to the drop-off site location and were familiar with the accepted materials. In contrast, negatively correlated factors were waste sorting times and working hours: if a waste management activity were to require more sorting time, people would be less likely to visit the waste drop-off sites. Additionally, those who had full-time employment would spend less time on recycling than those who had part-time employment. In accordance with previous composting

pilot studies, holding the belief that "recycling benefits the environment" does not necessarily lead to a higher rates of participation in dropping off recyclable waste.[28]

Researchers conducted a study in Myanmar, aiming to find effective ways to increase public participation in solid waste management. This study found that awareness of environmental problems was inadequate to drive PEB. Researchers believed such behavior would be dismissed in favor of accustomed behavior or comfort. However, the participation rate significantly increased after residents got involved in the decision-making process for solid waste management. Researchers concluded that having residents participate as decision makers gave them a greater sense of ownership and increased motivation to participate in recycling, helping to develop the concept of solid waste management into their own cultural norm.[29]

Summary

By reviewing those studies, we found that PEB changes were fulfilled through heightening of positive attitudes toward composting, establishing the injunctive and descriptive norm of composting, and lowering barriers to participation in composting.

Attitude
Being aware of the relevant environmental benefits contributes to positive attitude toward composting. However, studies conducted in Lansing, Michigan and Myanmar showed that the relationship between knowledge of environmental benefits and composting behavior was not strong. On the one hand, some people might not have any environmental interest. Even though people claim PEB to be important, their actions might result from social expectation, and their actual intentions are difficult to know. On the other hand, perceived barriers can repress the willingness to compost, even for people who care about the environment and hold a positive attitude toward composting.

Barriers
Overall, we found that people were hesitant to compost and recycle at drop-off sites because they thought such activities were time consuming, they were confused about what would be accepted by the drop-off sites, and they were unwilling to travel long distance from home to the drop-off sites. To minimize the time-cost and confusion, it would be better if we can have the well-experienced compostors share their experience. It is great that Hudson River Park has 7 drop-off sites located throughout four-miles long riverfront parkland. Those sites can provide services covering large residential areas. To make sure each drop-off site will reach maximum usage, the location promotion should target its nearby neighborhoods.

Social Norm
People may feel pressured if they acted in the opposite way from the expectations from people lived around them. The pressure will be more salient if people think they are suppose to make the

[28] Sidique, S. F., Lupi, F., & Joshi, S. V. (2010). The effects of behavior and attitudes on drop-off recycling activities. *Resources, Conservation and Recycling*, *54*(3), 163-170.
[29] Minn, Z., Srisontisuk, S., & Laohasiriwong, W. (2010). Promoting People's Participation in Solid Waste Management in Myanmar. *Research Journal of Environmental Sciences*, *4*(3), 209-222.

behavior change (injunctive norm) and also sees others performing such behavior (descriptive norm).

The injunctive norm is established by distributing information about the landfill issues and the benefits of composting, such as distributing informational leaflets and the using signage at the drop-off sites. However signage might be better option than informational leaflets. Unlike informational leaflets, which might end up being discarded without being read, signages are constantly exposed to people and attract their attention whenever they pass by. The descriptive norm is developed through using composting models. When using the composting models, we should notice that it takes time and efforts to create the modeling effective. It requires multiple volunteers working in shifts for a long period of time for their work to be observed by a certain amount of people and ultimately establishing a descriptive norm.

A visual representation of some key findings from our literature review is below (Figure 6).

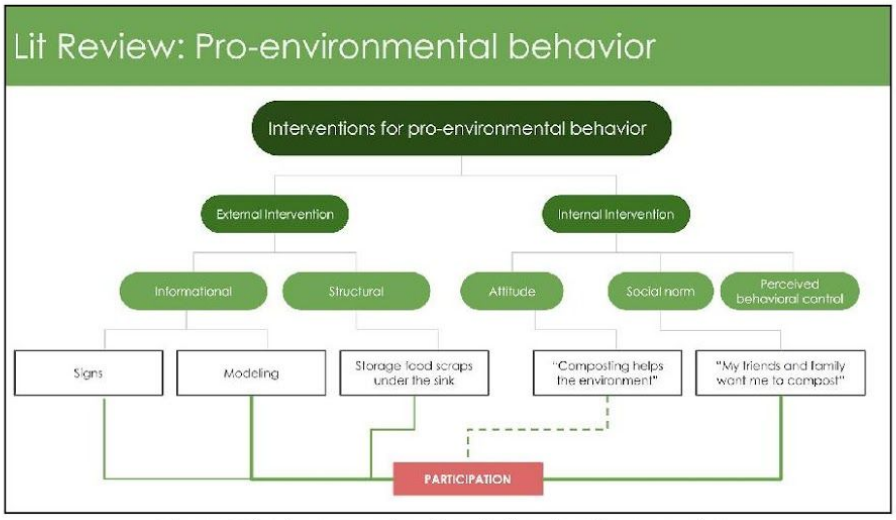

Figure 6. Visual representation of key findings from literature review.

4. Exploratory Interviews

Introduction

To understand more about the experience of promoting composting in New York City, our team conducted interviews with multiple stakeholders to learn about their background of composting practice in NYC, their perspective on barriers and challenges in composting, recommendation and lessons they have learned throughout the process, and opportunities they would give to Hudson River Park. Interviewees will be referred to with initials.

Interviewees

- 1 Deputy Director, DSNY, Bureau of Recycling and Sustainability
- Urban Gardener, Chelsea Waterside Park Association
- Prior SCA/HRP Compost Manager and Current GIS Analyst at Hudson River Park Trust
- Senior Coordinator, Organics Outreach, DSNY, Bureau of Recycling and Sustainability
- Project Manager NYC Compost Project
- Education Director, Gowanus Canal Conservancy
- President, Fulton Houses Tenants Association

Interview question topics

- The landscape of the composting effort
- The barriers that the interviewee faced in promoting composting
- Experience they learned to overcome these barriers
- What they see as opportunities for HRP in promoting composting.

The full interview guide can be found in Appendix 3.

Background of current NYC composting landscape

The Department of Sanitation New York (DSNY) has multiple initiatives to reduce landfill. Beside refuse and recyclables, composts has also been a major focus. Currently, composting hasn't been mandatory for citizens to participate, but DSNY has multiple programs to increase recognition and participation in the composting effort. In 2017 DSNY has launched curbside pickups in the low-density residential areas. As for high-rise areas, buildings could enroll in composting programs with DSNY providing the composting bins and logistic services. Another composting effort that has been seen throughout the city is the drop-off location where multiple non-profit organizations have been working together to educate and decrease barriers for composting.

Interviewee Z, one of our interviewees and also an active citizen in composting has expressed that she thinks there is a lot of green cities within the US such as Seattle, Chicago, and Portland, and they are just doing better jobs than New York. She thinks New York should be as green as possible and making composting a law could really help.

DSNY has expressed that education is one of the key approaches that they have been working on to change people's perceptions about composting. They have found that environmental drivers such as concerns about New York's rat problem, rodent management, have been some of the forces to encourage citizens in participating in composting. Programs such as waste management practice, compost distribution, compost giveback, clean fill for NYC, and educating how to compost in your backyard are some successful cases. People can apply to the compost giveback program to receive composts, wood chips, or double shredded chips, which are better mulch for community garden or urban farms, through NYC.gov/getcompost.

The composting effort in NYC is done through a lot of partnerships. Community gardens, nonprofits, urban farms, green markets and others work together in a joint effort in changing the city. The NYC compost project, is a program where DSNY, New York botanical garden, Brooklyn botanical garden, Queens botanical garden,Snug Harbor Cultural Center & Botanical Garden, Lower East side Ecology, Earth Matter NY, and Big Reuse work together to promote composting and also providing accessibility to composting locations. DSNY works with these organizations to increase compost outreach and education, demonstrate how to use composts, how to make composts, and to grow mid-size composters in the city.

Interviewees' perceptions on barriers to composting behavior

Throughout the interview, interviewees were asked what they think are barriers for people to start composting. Based on the interviewees' responses, the findings are categorized into psychological concerns, logistic issues, and education challenges.

Psychological concerns
Interviewees mentioned people generally have concerns about food scraps creating odor and attracting rats or pests to their living space. The handling of food scrap can be messy and putting them into the freezer might give people pause. For people who don't compost, they usually see composting as complicating.

Logistics
Interviewees mentioned champions who are promoting composting concepts in communities have received feedback from people that ran into barriers when they started to practice food scrap separation. General feedback includes perception that it's complicated to understand what could be composted. People couldn't find ideal ways of storing the food scraps in their apartment due to the size. Other residents who hear about freezing food scraps expressed that they don't have enough space in their freezer. People have also given feedback that compostable bags are not widely accepted. Some people think it's challenging to arranging the logistics. For example, they may not have composting drop-off in their building or the drop-off site's location might be too far and the operating schedule doesn't work for them. The demographics of community is another factor that have resulted in different participation rates. For instance, NYCHA is still trying to increase participation in the recycling efforts of metal, glass, plastic, and paper. There is also feedback on concerns about leakage and odor.

Education challenges

The biggest challenge of composting is to have more people understand the community and environmental benefit. It is important to show people what happens to their food scraps after it goes to the landfills. A better use of the food scrap is to create community soil resources. The idea of repurposing and integrating the food waste into the local community is important in the educational approach.

Interviewee perceptions on supporting composting behaviors

Motivators
According to Interviewee C, one of the biggest motivation people have perceived is the environmental motivation, especially when people learn about how much waste is produced by New Yorkers. For those that have shown interest in sustainability have also shown higher participation rate in composting to help promote the zero waste goal. There are a lot of environmental drivers, such as interests in methanes, landfills, commitment to reuse, and improving local watershed conditions.

However, for residents who are not as interested in the environmental message, motivators on how many resources could be generated through composting would be more effective. People were astounded by how much energy could be saved by treating food waste locally and turning it into composts that goes back to the community. For instance replenishing and fertilizing soil in parks and urban farms. So the awareness on how food waste can be reused locally is a key issue for those that doesn't get motivated by environmental issues.

Another direct benefit to the city is when people start separating food scraps from their regular trash, they're helping reduce the rat populations, pests, and odors in their trash.

Education
When designing education approaches, the two key things to consider are the demographic and overall perspective on composting. It's about customizing the education outreach for that neighborhood, and addressing the issues they're concerned about.

During the education process it is important to remove biases from the audience. One problem that people associate with composting is the rat and rodent problems. The Department of Health did perform an initial study of rat population around a neighborhood that started to compost, while their findings were inclusive the DoH were able to say that the rat population did not increase.

Interviewees mention it is better to assume the audience are not familiar with concepts of composting and want to be educated, believing that every person makes a difference.

Interviewee C has mentioned one of the most successful ways to motivate people to start composting is to have experience of composting. When people stand in front of a big pile of food scraps, and make compost out of it, they are astounded by how much waste is created. When they realize that this is just a small fraction of the waste that gets produced across the city they become even more motivated.

"I think as a volunteer, when you're asked to pick up a shovel or a pitchfork and make the compost pile, and you feel the labor that goes into it, and you understand that it's really small fraction of the issue, that's what puts it into perspective."

- Interviewee C

Interviewee R has mentioned as most New Yorkers live in small apartments there should be strategic thoughts in motivating these communities in composting. To lower the barrier in composting, promoting the concept of using little worm composting bins would help make composting more accessible. Using the freezer to freeze food waste or air-tight container in refrigerator is another solution if residents are concerned with odor. She has also heard of people putting their food scraps on fire escapes as most apartments have fire escapes right outside their window.

Groups to approach

There are multiple groups that would work effectively to act as early adopters in effecting others to start composting.

One of them is the garden community group as they would see the connection between composting and soil health.

Others include school system, as there are worm bins all over the city in schools and students are familiar with them already. Additionally some of the schools have zero waste stations, where they're trying to send no trash to landfills, so a lot of those kids are getting education on how to live sustainably. Some organizations are already developing educations for local schools to learn about the composting system. They will also work with local stakeholders for distribution of the compost so that organizations, schools, and community gardens can use the compost.

Interviewee Z mentioned that one school HRP could work with is the Avenues. Interviewees have seen the influence of kids can have on and have heard conversation, such as "I saw a worm bin, and these worms eat apples! Isn't that so cool? Mom and dad, can you get one?". Also kids help other kids sort out food waste. The key of this approach is to cultivate a whole new generation of practicing composting.

Interviewee A said that community champion has been seen within different groups. These people usually have been practicing composting and have influenced people around them to start composting too. Some of the strong argument that they have used to motivate their friends are below:

- "My trash doesn't smell anymore because there's no food waste in there."
- "I hardly have to take my garbage out because there's not as much being collected, you know I'm not collecting as much."
- "Absolutely, I'll put it in my apartment. I'll talk to people. I'll get my neighbors to do it."
- "They like me and they know that this is something that is important to me and so they started trying it because of me and a lot of these people are still doing it and is not for me anymore so I have one to reference to, they started separating out their food waste to

keeping it in their freezer and it help them deal with their pets, you know they have dogs and their dogs use to dig through their trash to get food waste out, so now they're keeping it in their freezer and they don't have that problem anymore."

Accessibility
Interviewee C has said lowering barriers has shown faster result than promoting environmental motivation. Creating easier access is one such way. Usually on-site locations within the building are popular. So integrating drop-offs in community might be an possible approach.

Examples of events
Different kind of community and education events have helped promote the concept of composting. The Jack O'Lantern composting is a very popular event as Lower East Side Ecology provides the trucks, barrels, tools, and set up worm bins to show the children worm composting and has became a really great neighborhood activity.

A campaign called the "Zero Waste Pledge" allows residents who can commit to give composting a try, which can help them get over the psychological barrier that composting is too much hurdle.

Interviewee Z mentioned Robin Nagel, a professor from NYU, who is a garbage expert and a fascinating speaker and who has given speeches to educate on garbage. Her talks have inspired many people and motivated them to be more active in zero waste initiatives.

Marketing approach/materials
Interviewee A mentioned that literature is still the most-used communication tool. There DSNY produces a communication tool called the "tenant flyer" on its website that has suggestions on how residents might store their organics at home and what they can do once they've stored them. DSNY also distributes hardcopy literature to each household and with a package that includes a checklist that residents can post on their refrigerator or recycling area to remind themselves about the different waste management streams. Coupons are also included in the packet so that residents can get an initial supply of compostable plastic bags for free.

For marketing, there are broad-based community outreach information tables. There are also public events where DSNY posts information tables at public spaces, and work with other community organizations to deliver literature.

DSNY also reaches out to high-level stakeholders, such as building management companies, local elected officials, and other real estate industry groups.

Interviewees' recommendations for HRP

HRP has a unique strength and character in the composting effort. The result of HRP internal composting event went beyond expectation, making most HRP's staff strong advocates of composting. HRP have events within the park, and a niche location between the subway stop and green market.

Interviewee D mentioned where HRP are located can definitely create successful drop offs. HRP just need to figure out where are the locations, what are the hours, what are the conveniences they need to integrate to get residents right along Hudson River Park to participate. The operating hours not necessary align with peoples drop-off hour (HRP has already adjusted operating time). Also a successful drop-off site for the city is at least 50 residents participating, this might be a good benchmark to use as evaluation.

Some of the organization that HRP can work with includes DSNY, NYCHA, Lower East Side Ecology, and other organization the city has been working with. DSNY can provide more resources in the education sector. Interviewee R mentioned NYCHA would be good to work with as the DSNY effort is more focused on recycling, while the organic waste collection still needs some organization to participate in.

Community Study Example: NYCHA Housing

The New York City Housing Authority receives funding from the Federal government and provides housing for low to moderate income families. The residents mixture is 50-60% family oriented and 25% senior citizens, and the demographic is 40-50% Hispanic, 30-40% African American, and about 10-15% Asian. Around 15% of the residents have dogs.

NYCHA launched the recycling program in 2015, and gained some experience throughout their process. Currently there are around 50% of the residents that participate in the program and the user number basically stagerated. Initially it's a behaviour challenge as people were used to throw all the trash through the hop on each floor, and now they are told to try recycling. It wasn't as if people were excited or not, they just wanted to see how it works. NYCHA have monthly tenant association meetings, and it is through these meetings where residence are repeatedly introduced to the recycling so they can get used to it. The recycle bins are placed around the first floor in multiple locations but some tenants never understand what the bins are for and still put garbage bags near them. But it's good to see that there are some residences in the community that would actively tell other neighbors how to separate recycling and participate.

For composting, some concerns were brought up during the conversation. Where should the compost bins be placed? How can the rodent problem be prevented? How do educate the tenants what they can compost? How do you get tenants used to composting? As NYCHA is still working on having residents used to recycling, they are not sure if it would be too much to introduce composting right now. There are also concerns of the limited resources as NYCHA won't be able to assign more people to do the task, so they think having a third party such as Grow NYC to come and help pick up daily will be a more feasible approach for the composting project to work in NYCHA projects.

Summary

Barriers can be seen in multiple aspects, such as the psychological concerns, logistics and education challenges. To overcome these barriers interviewees have mentioned increasing resident's motivation through education on both environmental benefits and community/social benefits.

Some stakeholders such as schools and garden community groups can be the first groups to work with in spreading the education concepts, as most of them understand the benefits of composting already. Champions, who are people that practices composting and influence people around them, are also effective figures in spreading the composting practices. Materials should be provided on the internet and physical flyers for people to receive through visits, informational tables, and events.

On the logistic side, an easy access to the composting location is important. A physical location that are closer to the resident and more accessible operating hour would increase the audience base in participating in composting.

There are recommendations given to HRP to leverage the advantage of the park being in niche location of subway stops and green location. Other organizations such as DSNY, NYCHA, Lower East Side Ecology can also be potential groups that HRP can work with.

5. Community Survey

Introduction

We designed the "Hudson River Park Community Compost Questionnaire" to understand current composting behaviors and local residents' perspectives of composting as well as to verify if information collected from literature review and stakeholder interviews could be applied to the Hudson River Park audience. This section will tell how the survey questions were constructed and the method used in data cleaning. More important, this section describes the data analysis result and compared it with findings from literature review and key stakeholders' interviews. Finally, recommendations will be provided based on the survey findings and scientific strategies we learned from previous studies.

Methodology

The survey questions were developed in the following themes: (1) Geography and demographics of the Hudson River Park audience, (2) people's awareness and perspectives on composting, (3) social norm of composting, (4) concerns and desirability regarding composting, (5) awareness and perspectives on storing composting in freezer, and (6) current composting behavior.

Geography and demographics
To verify if survey responses were answered by the Hudson River Park audience, we asked survey respondents to indicate their zip code. We also asked questions including age and whether having kid(s) at home to understand respondents' demographics. The demographic information was further used in determining if certain groups of people were more likely to do composting.

Awareness of and perspectives on composting
Low awareness and negative perspectives on composting results in a lower composting participation rate. Therefore, survey respondents were asked to indicate whether they knew what was composting and their perspectives on composting in terms of environment and daily management.

Social norm of composting
From our literature review, we found that creating social norm through practicing composting was one of the most successful strategies in increasing the composting rate. Therefore, we ask respondents if they felt people around them were promoting composting or actually encouraging others to do composting.

Concerns and desirability of composting
The survey study was focused on verifying Hudson River Park audience has barriers and motivations we collected from literature review and interviews. Thus, the survey provided a series of questions regarding the concerns with composting and desirabilities that can be realized from composting.

Awareness of and perspectives on composting

As freezing food scraps is an effective and affordable way to prevent food scraps from being smelly and attracting rodents and pests at home, in the survey, respondents were asked to indicate the awareness of the benefits of freezing food scraps and their perspectives on storing food scraps in the freezer.

Composting behavior

Survey participants were provided with an open ended question to indicate any composting drop-off sites if they are currently using. Also, they were asked to indicate whether or not the drop-off sites were convenient for them.

Measurement

The awareness of composting and benefits of freezing food scraps were indicated by checking either "Yes" or "No". Perspectives, social norm, concerns, and desirabilities of composting were measured by asking respondents to indicate the extent they agreed on a series of statements, which were constructed around aforementioned themes. The extent was set in 7 points likert scale, where 1 meant " Not at all", 7 meant "Extremely". The perspectives on storing food scraps in freezer was measured by checking one or more statements describing positive or negative attitudes. Respondents were also provided a open-ended choice to describe any other opinions they had in mind (Table 1).

Themes	Questions	Question Nature
Geography	Your zip code	open-ended
Demography	Do you have a(ny) child(ren) living in your home?	open-ended
	Your age	
Awanress to composting	Do you know what composting food scraps is?	Closed-ended (Yes/No)
Perspectives to composting	Its worth my time and effort to collect food scraps.	Closed-ended (7 pts likert scale)
	I think composting food scraps* benefits the natural environment.	
	I think composting food scraps is easy to do.	
Social Norm	My family/people I live with encourage composting food scraps.	
	There is at least one close friend/family in my apartment building who encourages others to compost food scraps*.	
Concerns	Separating food scraps at home is too confusing.	
	Separating food scraps at home is too time-consuming.	
	Separating food scraps at home is too disgusting.	
	Im worried that having a separate bin for composting would cause odor.	
	Im worried that having a separate bin for composting would attract pests/rodents.	
	I dont have enough space to keep a separate container for food scraps.	
Desireblity	I want to minimize pests/rodents in and around my home.	
	I would like to not have to take out my trash so frequently.	
	I would like to get rid of odors from the waste bin.	
	I want to help create a healthier environment.	
	I want to reduce the amount of waste going to landfills.	
	I want to help fight climate change.	
	I want to help my community become healthier.	
	I want to help my community become stronger.	
	I want future generations to grow up in a healthy environment.	
	I want my pet(s) to stop going through my trash bin. (Please choose N/A, if you dont have pets.)	
	I don't want to deal with cleaning a container for food scraps.	
Awanress to composting	Have you heard of people freezing their food scraps to decrease odor and pests/rodents?	Closed-ended (Yes/No)
Perspectives to composting	What do you think of freezing food scraps? 1. Gross 2. Why would I do that? 3. I wish I had thought of that earlier! 4. That could work for me 5. That would be nice, but I don't have space in my freezer	Closed-ended
	6. Other	Open-ended
Composting Behavior	What compost drop-off site do you currently use, if any?	open-ended
	Is the compost drop-off site conveniently located for you?	Closed-ended (Yes/No)

Table 1. Survey question themes, content, and nature.

Survey Collection and Data Processing

Survey collection

From May to October 2017, we collected 157 survey responses from three sources: 1) 34 responses were collected from a Chelsea Waterside Community Meeting by SEAS students, 2) 110 were collected at Hudson River Park by Park staff and volunteers, and 3) 13 were collected online.

Data processing and analysis

As our target audience will be residents living in Manhattan, we first examined the zip code information provided in the survey and filtered out respondents who were either living in areas outside of Manhattan or didn't provide the zip code information. In the end, 99 survey responses were used in the survey data analysis, which were completed by Manhattan respondents.

For every reponse, a question with missing answer was treated as the missing value. Answers to questions measured in likert scale and respondents ages were condensed for data analysis (Table 2).

Question	Original	Collapsed
Age	under 30	Young
	Between 30 and 50	Midde
	Over 50	Senior
Likert Scale	1~3	Disagree
	4	Neither Disagree Nor Agree
	5~7	Agree

Table 2. Questions measurements collapsed for data analysis.

To summarize the response pattern, we generated the descriptive statistics with Excel, where missing values were excluded from the sample size of each question. we also performed a logistic regression model with people's composting behavior as response and their demographic, environment interest, social norms, and concerns to composting as predictors to assess the role of those factors in the composting behaviors that we studied. (Table 3).

Variable Type	Themes	Variable name	Questions	
Response	Composting behavior	Composting behavior	What compost drop-off site do you currently use, if any?	
Predictor	demographics	Age	Your age?	
		Family structure	Do you have a(ny) child(ren) living in your home?	
	Environment Interest	Environment Benefit	On a scale from 1 to 7 , to what extent do you agree with the following statements?	I think composting food scraps benefits the natural environment.
	Social Norm	Social Effect		My family/people I live with encourage composting food scraps.
	Concern	Confusion		Separating food scraps at home is too confusing.
		Time-Consuming		Separating food scraps at home is too time-consuming.
		Gross		Separating food scraps at home is too disgusting.
		Odor		Im worried that having a separate bin for composting would cause odor.
		Rodents/Pests		Im worried that having a separate bin for composting would attract pests/rodents.
		Space		I dont have enough space to keep a separate container for food scraps.
		Cleaning		I don't want to deal with cleaning a container for food scraps.

Table 3. Questions involved in logistic regression analysis.

Results

Geography & demographics

Geographic information of survey respondents was obtained through zip codes. Locations are visualized in the "Geographic Information of Survey Respondents" map. Most respondents centered around Midtown Manhattan, from areas such as West Village, Chelsea, and Hell's Kitchen. Also, some survey respondents were from the west riverside area like the Upper West Side, Lincoln Square, and Hamilton Heights (Figure 7).

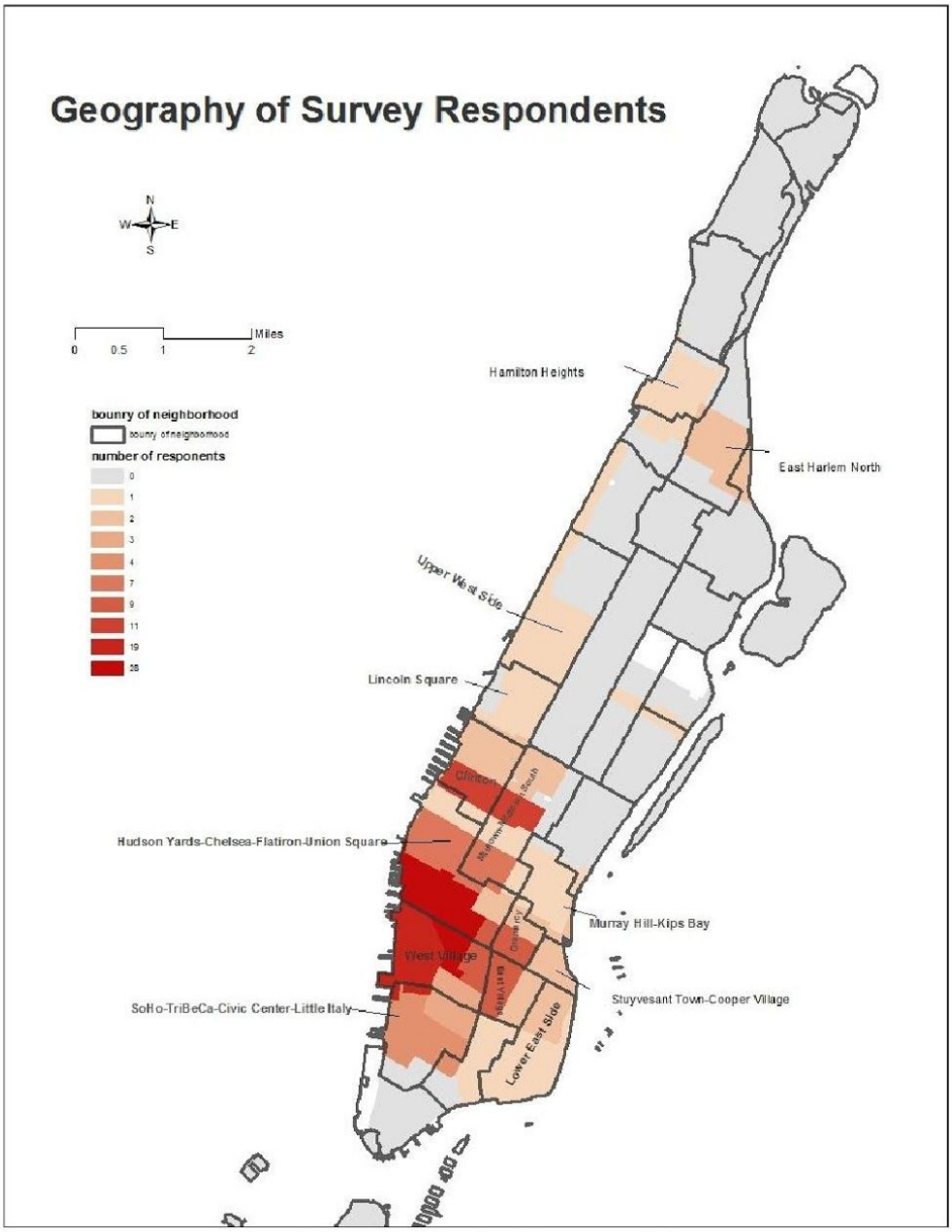

Figure 7. Geographic information of survey respondents.

The mean and median age of our respondents population are both 47 years. Almost half of the respondents are above 50 years. One third of respondents are between 30-50 years. Only 23% of the respondents are under age 30. Most of household (86%) didn't have children at home. Comparing overall respondents, it's major senior respondents (above 50 years) composting (Figure 10) and respondents who composts are slightly more likely from families with at least one kid (Figure 11). Our logistic regression showed respondents above 50 years were more likely to perform composting than other ages respondents ($p = 0.02$).

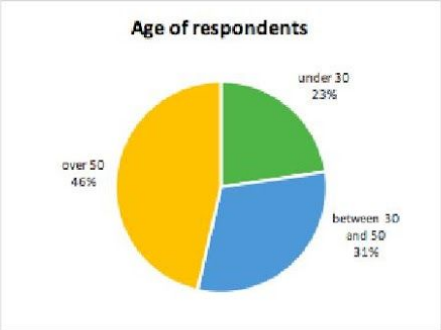

Figure 8. Age of overall respondents (N=97).

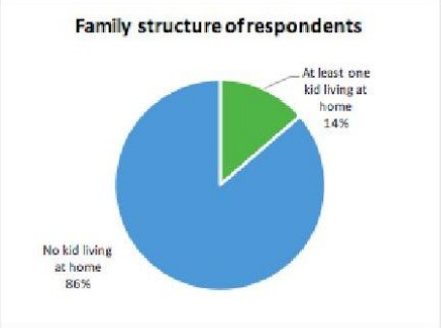

Figure 9. Children living in household (N=97).

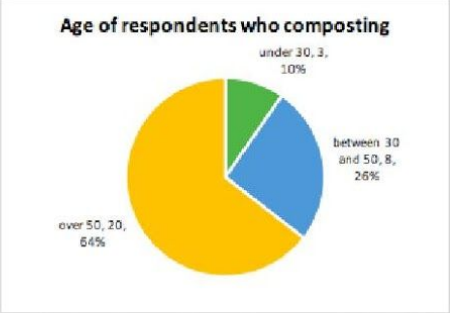

Figure10. Age of respondents who composting (N=31).

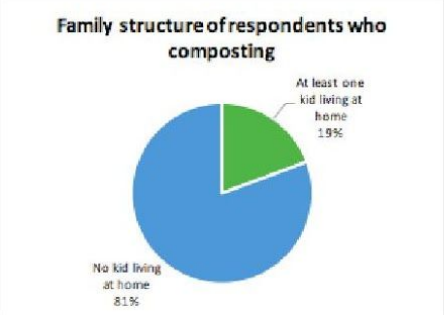

Figure 11. Family structure of respondents participating in composting (N=31).

Awareness of and perspectives on composting

Only 2% of respondents didn't know what is composting. And most respondents (86%) thought composting was benefiting the environment. However, when it comes to logistic, only two third of people thought it worth their time and effort to do composting. And fewer people (52%) thought it was easy to do composting.

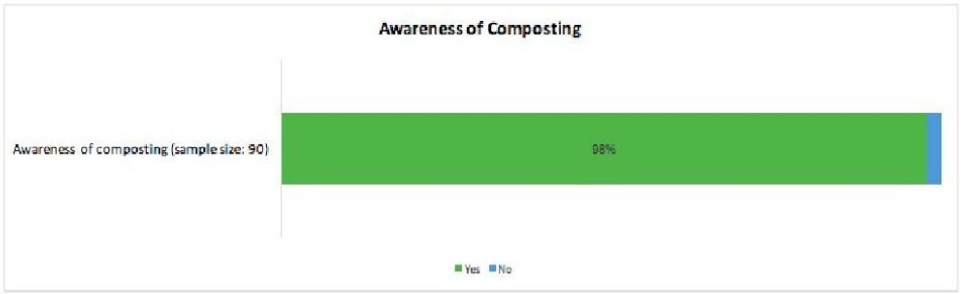

Figure 12. Awareness of composting among respondents.

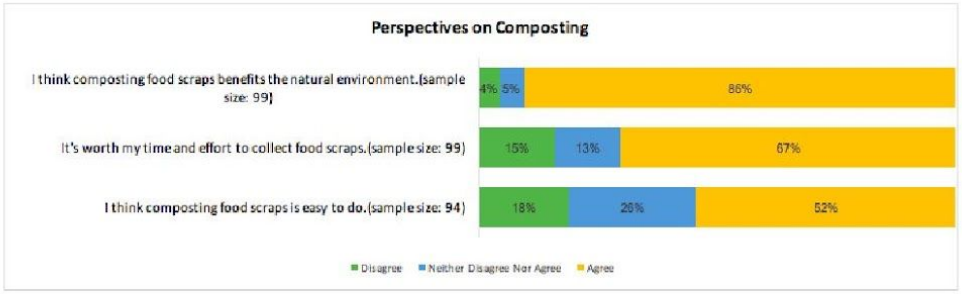

Figure 13. Perspectives on composting among respondents.

Social Norm of Composting

Over a third of respondents felt that people living close to them were encouraging composting. But fewer respondents (24%) observed close family or friend were directly encouraging others doing composting. Logistic regression showed respondents who agreed on "My family/people I live with encourage composting food scraps" were more likely to perform composting ($p = 0.01$).

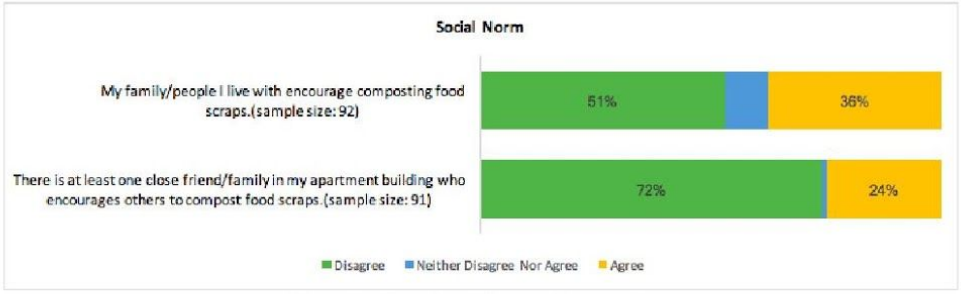

Figure 14. Current social norm of composting.

Concerns about composting

From a visual standpoint, it is easy to see from Figure 15 below that the concerns listed are not as significant as they otherwise could be. A few of the top concerns, however, turned out to be more closely tied to negative affect (worries about attracting pests/rodents and causing orders, with 38%, significant at $p = 0.04$, and 35% of respondents agreeing, respectively). The next group of concerns centered around logistics and to a lesser extent, education (not having enough space, not wanting to clean an extra container, not having enough time, and confusion) with 33%, 26%, 26%, and 23% of respondents agreeing, respectively). The least significant concern per our survey results turned out to be another concern tied with negative affect, which we are calling the "yuck" factor (with 13% of respondents noting that "separating food scraps at home is too disgusting").

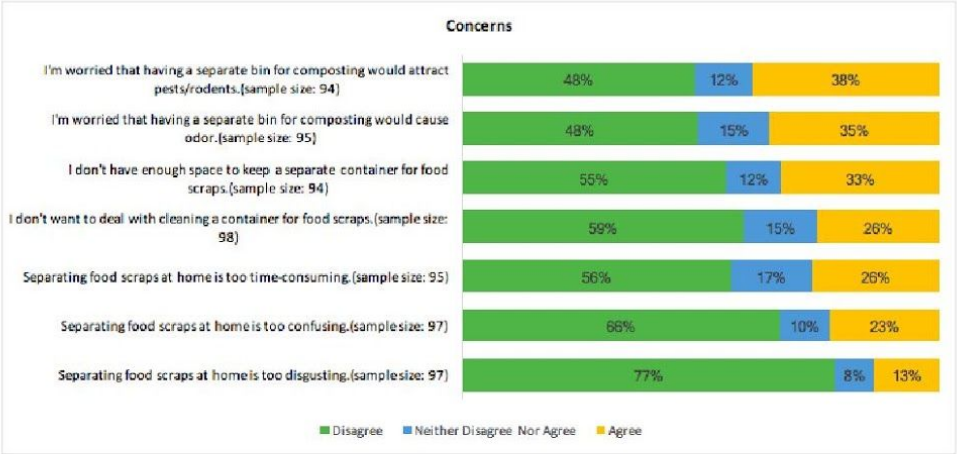

Figure 15. Concerns of composting at home.

Desirability

More than 95% people agreed on a series of statements, noting sentiments including wanting a better environment for future generations, less waste going to landfills, and a stronger community.

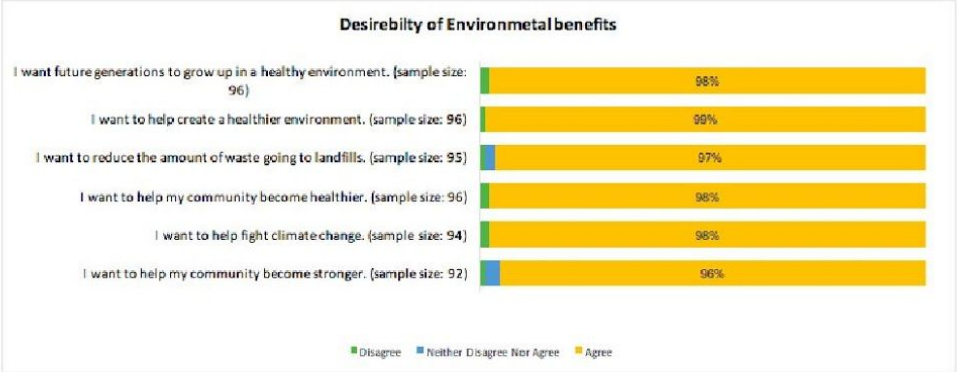

Figure 16. Desirability regarding environmental interests.

When it came to everyday life, the most urgent problem respondents wanted to solve was the rodent and pests problem as 90% respondents claimed that. The odor problem came to the second place (79%). Desirability of " I want my pet(s) stop going through the trash" and "I would like to not have to take out my trash so frequently" shown as less obviously but still worth to address as 50% of respondents agreed on those statements.

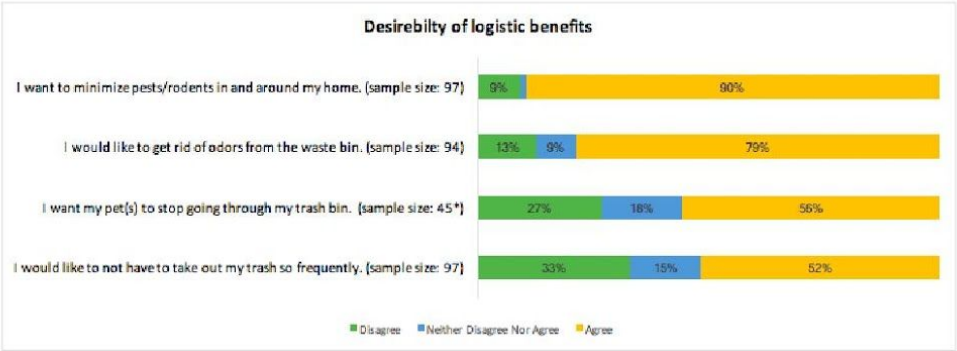

Figure 17. Desirability of logistical benefits.
*The small sample size was due to the small portion of respondents who had at least one pet at home.

Half of the respondents had already knew freezing composting as a way to prevent composting from being smelly and attracting rodents or pests. 10% of respondents stated they had being doing composting in the open-ended choice. Although freezing food scraps was acceptable by 40 % respondents as they checked the statements: "That could work for me" (25%) or "I wish I had thought of that earlier!" (14%), 30% people were concerned about they didn't have enough space in the freezer. Whereas, only 5% of respondents thought freezing food scraps was gross.

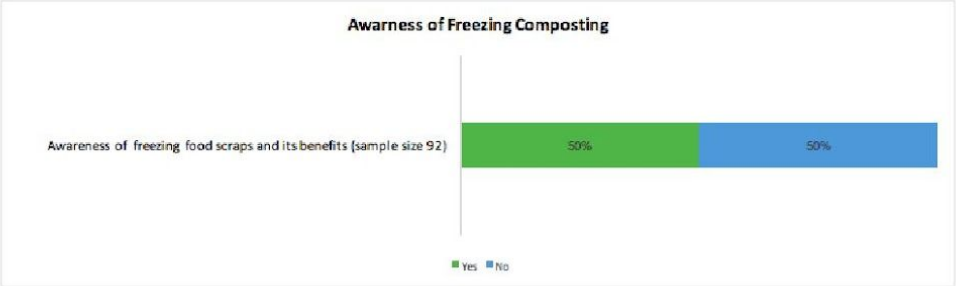

Figure 18. Awareness of freezing composting as a storage option.

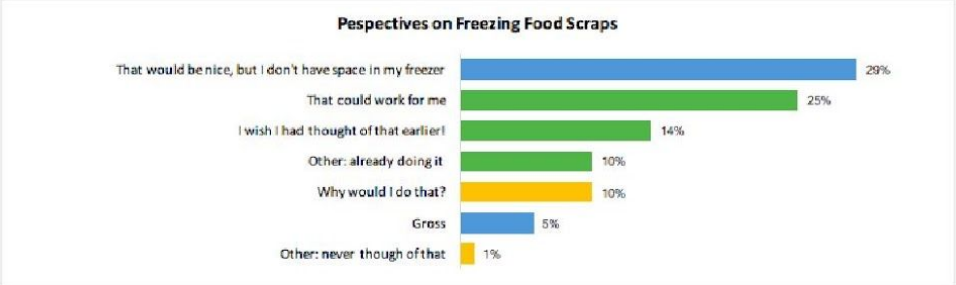

Figure 19. Perspectives on freezing food scraps (N=93).

Composting Behavior

Among 99 respondents, one third of them were composting. Among respondents who were participating in composting, about 80% of them were doing so by using organics drop-off sites, and half of those respondents were using their freezers for food scrap storage before dropping off.

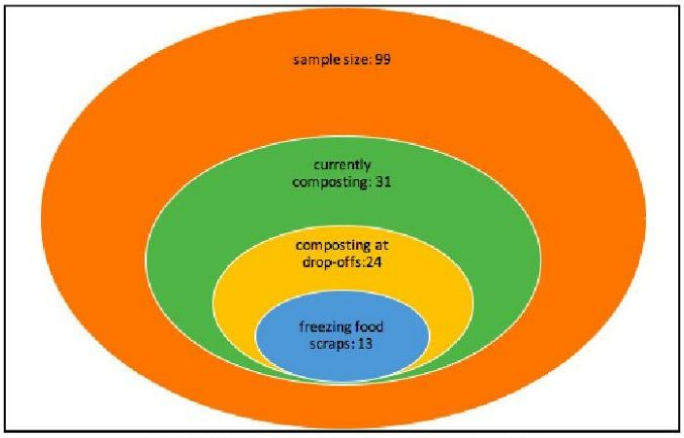

Figure 20. Composting behavior among respondents.

Summary

Interest in the environment

Almost every respondent knew the concept of composting. Most people claimed they had the environmental interests and thought composting benefited the environment. But only one third of respondents were participating in composting. We found that the claimed environmental interests couldn't lead to composting behavior. This finding aligns with literature review results. On the one hand, people claimed environmental interests might result from social expectation. On the other hand, the concerns and inconvenience of doing composting would have stronger negative effects on people's behavior than the the positive effects of environmental interest. Thus, the composting education should focus on minimizing residents' concerns.

Social norm

No strong social norm of composting was observed. However, it is statistically significant showed in our logistic regression that people who experienced it would be more likely to perform composting. As learned from literature and interview findings, establishing composting social norm can be achieved by having volunteers to demonstrate appropriate composting behavior in the public area and having community composting champions promoting composting by sharing their personal experience.

Concern and desirability

In accordance with interview findings, the greatest concern among survey respondents was that composting food scraps would attract unpleasant animals and generate odor. Our logistic regression showed that the fear of unpleasant animals was the significant factor negatively related to composting behavior. Similarly, the most wanted among respondents was minimizing the unpleasant animals and trash odor at home. Besides the odor and unpleasant animal concern, people were afraid there's no room for collecting food scraps in a separate bin or freezing food

scraps. To ease residents' concerns about odor and unpleasant animals, we should promote freezing food scraps as a economical way to prevent the problems. But instructions should be provided to residents for better utilizing kitchen and freezer as to minimize the space concern. We should also recommend airtight bins to prevent odor and unpleasant animals as an alternative to the freezer.

There's no strong perspective that managing food scraps and storing food scraps in freezers were disgusting, which contradicts the interview findings.

Composting behavior

One of third respondents were doing composting. Freezing food scraps at home and dropping food scraps at the composting drop-off sites were prevalent among them. Therefore, it's likely we can find such composting champions who had experience with freezing food scraps in packed freezers. They can educate people how to manage food scraps in a smart way at home, meanwhile, they can create composting social norm.

Demographics

Our logistic regression results, predict that people over age 50 are more likely to participate in composting among all the respondents. One study showed people hired as part-time were more likely to recycle than people who hired as full-time as they can spend more time in separating trash.[30] It might explain why senior people doing more composting as they were retired and had more free time. Therefore, the composting campaign can target retired community, where the time concern is lower.

[30] Sidique, S. F., Lupi, F., & Joshi, S. V. (2010). The effects of behavior and attitudes on drop-off recycling activities. *Resources, Conservation and Recycling*, *54*(3), 163-170.

6. Toolkit Inspiration from Model Cities & Universities

Introduction

This section introduces several examples of live drop-off sites and signage design from other cities and universities. We found these examples to be particularly relevant in light of our aforementioned research findings and hope that they provide helpful implementation ideas for HRP as it develops its own program toolkit.

Site design
Our literature review revealed that bright and colorful composting bins could help mitigate negative impressions associated with composting and convey positive emotions to the audience, instead.[31] Although changing the default design of the Park's composting bins may not make sense at this time, as they should be in consistent with the city's composting bins, HRP may consider adjustments to its composting sites to help foster positive attitudes toward composting.

In 2014, the Illinois Recycling Association published the "Best Operations for Recycling Drop-Off Operation" report, which provides guidelines for effective management of community-based recycling drop-off sites. The report notes that site appearance is crucial for ensuring that users are inclined to return and provides suggestions that are also applicable to managing composting drop-off site operations: (1) the sites should be clean and litter-free; (2) the sites can be decorated with a small a demonstration garden using its compost, which makes the drop-off more attractive and can serve as an educational opportunity; (3) unstaffed sites are ideally visited daily to check for contamination and provide any necessary site maintenance; (4) keep the area free of snow or ice in the winter and provide adequate lightning in the evening; (5) add signage to guide the public toward drop-off site locations and remind them of the ongoing recycling (or in this case, composting) program.[32]

Signage design
Our literature review findings indicate the well-designed signage is effective in encouraging composting behaviors.[33] Signage can also increase people's awareness of the composting program.[34] Our survey showed that respondents had limited awareness of HRP's drop-off sites at the time that the survey was conducted, highlighting the importance of salient signage. (Note, however, that some of the limited awareness was also due in part to the fact that a portion of the survey responses were collected before the Park's Community Compost Program launched publicly during the summer of 2017.)

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[31] Lin, Z. Y., Wang, X., Li, C. J., Gordon, M. P., & Harder, M. K. (2016). Visual Prompts or Volunteer Models: An Experiment in Recycling. *Sustainability*, *8*(5), 458.
[32] *Best Operational Practices For Recycling Drop-off Operations* (Rep.). (n.d.).
[33] Sussman, R., Greeno, M., Gifford, R., & Scannell, L. (2013). The effectiveness of models and prompts on waste diversion: A field experiment on composting by cafeteria patrons. *Journal of Applied Social Psychology*, *43*(1), 24-34.
[34] Lin, Z. Y., Wang, X., Li, C. J., Gordon, M. P., & Harder, M. K. (2016). Visual Prompts or Volunteer Models: An Experiment in Recycling. *Sustainability*, *8*(5), 458.

To make the the signs salient and attractive and also to convey the positive emotions,[35] we can decorate it with fun element. In United Kingdom, an unknown artist made a "cookie monster" trash can on the street, which attracted a lot of attention (Figure 21).[36] Another example of fun trash bin that attracted attentions and increase the PEB is an experiment that sponsored by volkswagen. A normal trash bin on a street was installed a audio device. Everytime people toss trash into the bin, it would produce a sound which like a stone fell very deep under the ground. It did attract a lot of people's attention on the bin and encouraged people pickup the trash fell out of the bin and finally threw it back.[37]

Figure 21. Cookie Monster bin created by unknown artist.

Signage that posting on the drop-off sites plays the main role of educating the audience on what can be accepted at the drop-off locations. From previous studies we learned if people are more familiar with acceptable and unacceptable materials of a drop-off sites, they will use the site more frequently. Therefore, we should make those information with more detail and be more straightforward. Considering some of Hudson River Park park audience are tourism and immigrants, the information should be written in multiple languages to attract the attention of people whose native language are not English and making the information more easier for them to understand. San Francisco Recology also highlights the importance of designing the signage with multiple languages base on the demographic that would increase the participation rate of composting.[38]

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[35] Bennett, R. (1998). Customer recall of promotional displays at supermarket checkouts: Arousal, memory and waiting in queues. *The International Review of Retail, Distribution and Consumer Research*, *8*(4), 383-398.

[36] Sophie | April 8, 2016 | Viral |. (2016, April 07). WHOEVER DESIGNED THIS COOKIE MONSTER BIN IS A PURE GENIUS. Retrieved December 19, 2017, from http://www.clearlifestyles.com/whoever-designed-cookie-monster-bin-pure-genius/

[37] Fun Theory, The: The World's Deepest Bin (September 21, 2009), http://www.thefuntheory.com/worlds-deepest-bin

[38] Zero Waste On San Francisco's Horizon. (2012, February 12). Retrieved October 20, 2017, from https://www.biocycle.net/2011/07/18/zero-waste-on-san-franciscos-horizon/

Figure 22. Compost sign with multiple languages.

An experiment conducted by UBC college student found that signage displayed in 3D was effective in increasing the correct sorting rate among composting, recycling and trash at a waste sorting station in the campus (Figure 23). The 3D displays were effective probably because it provides intuitive information to guide the correction waste sorting behavior.[39]

[39] Foster, K. (2016, April 19). The Effectiveness of 3D Display Cases In The AMS Nest. doi:http://dx.doi.org/10.14288/1.0343156

Figure 23. Compostable items displayed in a disposable containers as 3D signage . Upper right: 3D display of acceptable food scraps. Upper left: 3D display of acceptable recycling materials. Bottom: full view of waste-sorting station.

In July, 2017, City of Charlottesville, Virginia built a composting site for the community-based composting purpose. It is a great example that reflects most of the our academic suggestions for developing a composting program.: (1) It has a eye-level signage attached on the wall (2) It provides additional intuitive 3D signage under a shelter displaying acceptable composting materials. (3) Moreover, the site offers composting bags that provides the infrastructural support and decreases the inconvenience of composting.

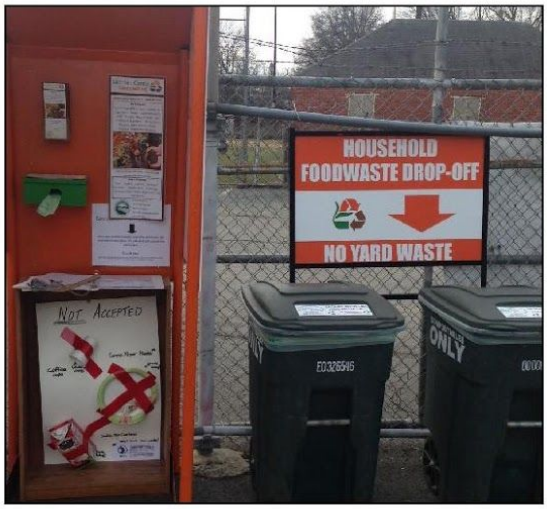

Figure 24. Composting site in Charlottesville, Virginia that have eye level signage, booth containing 3D signage, information on composting, and compostable bags people can take after writing down their information

7. Recommendations

The recommendations are ideas that we have gathered throughout our study and should be regarded as suggestion, detailed implementation plan should be formulated by HRP in the future. The goal of the recommendation is to increase residents' knowledge of composting and lower the barriers of practicing it,. Ultimately we are expecting throughout time these composting actions can internalize into behaviors. With more people practicing composting it will create a modeling effect to have more people pickup the practice. Once tipping point is reached, composting would then become a social norm that the majority of the population would practice.

The recommendations are broken into two main intervention and three phrases base on the impact and easiness to deploy the strategies. A chart is attached below for a brief view of the phasing while more detailed recommendation will be discussed in each phase (Figure 25).

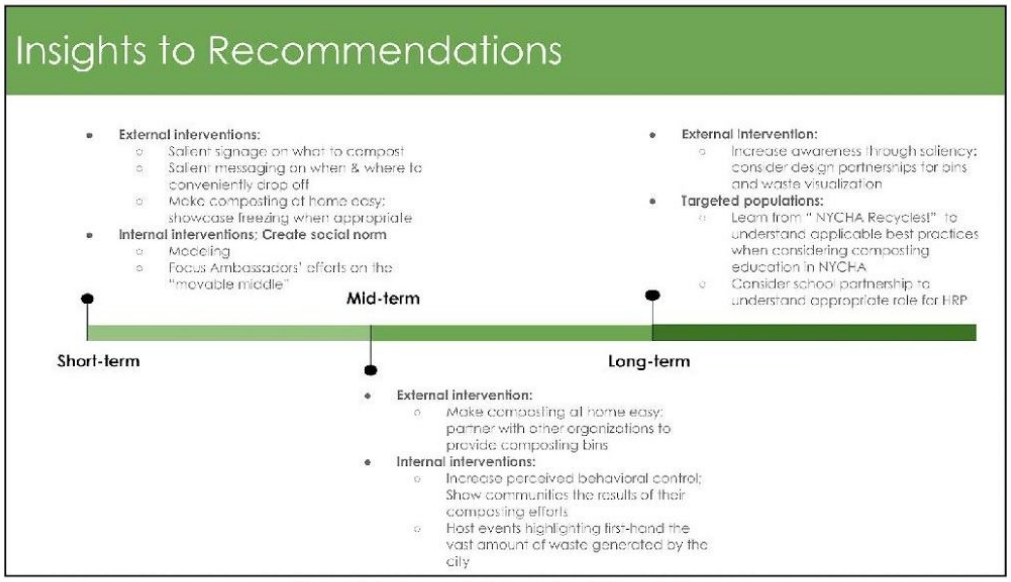

Figure 25. Recommended intervention during each phase

Short-term

As HRP has already installed multiple drop-off locations, marketizing the drop-off location to a broader audience and have them understand what can be composted would be an essential step. Teaching residents how to store composts at home before bringing it to the drop-off location would also enable more participation in composting. Finally, having events that fosters social norm through modeling effect can increase awareness of composting and have more residents start trying composting. Base on our survey, we found that there are demographic group practices composting more than other groups. Hence, targeting these audience to reach the

tipping point of social norm is suggested, as it may create spillover effects that encourages more residents around them to practice composting.

Signage

We have found that currently residents have relatively low awareness of the composting program and understandings of what can be composted. As mentioned in the previous section, signage plays an important role in delivering messages, and we see increasing the salience of messaging on the signage to be a first step. For the appearance, we recommend HRP to have the signage eye catching and attention drawing. Some examples are the 3D signage mentioned in the earlier section. For the context, the sign should be clear in showing examples of what could be composted, something to pay extra attention is to customize the list adding in compostable items that shows up more frequently in the HRP area. This would need to be consulted with HRP's composting operation team to see what items are currently often discarded wrong.

Location

Another barrier that was identified is the logistical inconvenience residents perceive in composting. There are two potential reason we see causing this problem. The first is that residents are not aware of the closest drop-off location around them. The second is that there aren't actually any high accessible drop-off location near them. To solve the first case, we need more directions online and offline. Drop-off locations should be integrated and put on website, social media, "Playflags" app, "Summer of fun" app. Directions should be added within the maps in the park, and floor indicator or directions can also be considered to be installed in strategic areas. For the second case, the example of locked compost bins from Minneapolis could be referred to and placed in selected areas.

Storing food scrap at home

In our survey, residents have express the challenge of storing food scrap and agreed freezing would be a good approach. Promoting concept of freezing or refrigerating food scrap in sealed container to a broader audience may have them find it easier to overcome this problem. As some residents expressed concerns of limited freezer/fridge space, another idea is to promote using airtight container on or under sink with a water resistant paper bag. HRP can promote these ideas and see which one have a better adoption rate. HRP's successful experience in the step-up approach (encouraging people to start with coffee grind, then adding banana peels, then food scraps) can be another approach for people to try out at home.

Creating social norm

To have more people recognize composting as a social norm, the modeling effect would be what we want to create. An example of event that HRP can host is "Show us your compost!" event. It can be a periodic event where HRP host events to encourage residents bring their food scraps and drop it off at the park. Small giveaways can be provided by sponsoring company that HRP partners with. This would be a great opportunity for the companies in marketing while encouraging PEB of residents.

Targeting "movable middle"

We have seen people who have neutral perspective toward composting may have lower resistance of adopting the practice. Volunteers promoting composting should have this in mind and understand when facing resistful audience they shouldn't be discouraged and should refocus their effort on the neutral audiences. There are also some demographic that have higher participation in composting and could be better initial targeted audience of HRP. According to our survey, demographics over 50 years old have a much higher participation rate in composting. The reason behind this phenomenon wasn't a part of our research, however, we still think they would be a good initial audience in promoting composting. Education events targeted toward this audience is suggested.

Mid-term

To further increase the participation rate of composting, there are three approaches we developed for the mid-term. HRP may increase motivation, through two approaches. The first is to let people know how their actions are benefiting the community; the second is to let people see visually how much food scraps are generated daily. To lower barriers, HRP may consider providing composting bins so that more residents can start collecting food scraps easier. These approaches should increase cognition of composting and help facilitate PEBs.

Exhibiting personal impact
To increase motivation, studies have shown people will participate more when they see their action impactful. So when neighborhoods start to compost and see how these composts are going back to parks, trees, and other public areas they tend to have a stronger social tie to the actions and have greater perceived behavioral control. It will be most effective if results can be shown visually. For instance, signage and videos showing *x* amount of composts from this site helped these plants flourish and reduced *y* amount of carbon emission and *z* amount of dollars.

Seeing the amount of food waste
Another insight we gained through interviews is when people participate and see visually how much food scraps are generated, many would be shocked by the amount and start taking action in reducing food waste. Workshops for people to participate in food scrap handling in HRP park would allow people to see how much waste are generated when they stand in front of the piles of waste. When they recognize that this is only a fraction of the waste in NYC, they will be able to have a more salient impression of the environmental impact they can create.

Providing composting bins
Based on our findings from the literature review we found that providing individuals composting bins have faster adoption rate of composting practice than education. Once the behavior change is established people tend to continue the behavior and influence people around them through modeling effects. HRP can participate with DSNY or other organizations to see how the fundings and logistics could work out.

These action steps are designed to further enhance the community understanding of composting and increase participation rate. The reasons that these recommendations are in the mid-term phase is that these actions either need more time to take effect or need more communication with other organizations.

Long-term

For the long-term, consider a mix of an external intervention and recommendations regarding specific target populations to further increase adoption of composting as a social norm.

External intervention: increase bin salience
As an external intervention, since salient bins can support higher participation in composting, consider increasing collection bin salience through bin appearance and/or experiential factors of the bin. See Figures 21, 23, and 24 as examples.

Considerations for targeted population: NYCHA
As noted earlier in this report, NYCHA residents have access to curbside recycling but not yet organics pickup. As curbside organics continues to roll out in the City, HRP may consider partnering with "NYCHA Recycles!" and or organizations such as GrowNYC to understand and implement best practices to fill in the gap of organics pickup and support education and behavior change focused on organics drop-offs. As an alternative or an addition, HRP may also consider partnering with the named organizations after curbside organics collection is rolled out to the entire city after the end of 2018 in order to gauge what the most fitting role for the Park may be in supporting new and sustained behavior change regarding NYCHA residents' participation in organics collection.

Considerations for targeted population: Children
Our survey respondents over-indexed on households with children (19% vs. 8.8% - 10.4% for the general population for neighborhoods in the HRP area where many respondents are from),[40] suggesting that there may perhaps be a correlation between households with children and affinity for Hudson River Park. Since the Battery Park area has an even higher percentage of households with children (33.8%), HRP may consider partnering with them and other relevant city organizations to understand what the best role for HRP may be in supporting pro-composting behavior change as significant parks in the city. As the Zero Waste School Initiative continues, HRP may also consider partnering with schools, the Department of Education and/or the NYC Department of Sanitation to explore what an appropriate role for HRP may be in educating children and their families on composting behavior, perhaps as a host for visits, workshops, and other experiential learning activities.

[40] Statistical Atlas. (2015, April 17). *Household Types in Manhattan, New York County, New York (Borough).* Retrieved from https://statisticalatlas.com/county-subdivision/New-York/New-York-County/Manhattan/Household-Types#data-map/neighborhood

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9. Appendices

Appendix 1. Logic Model updated periodically to guide project progression

Logic Model for Hudson River Park Project

Overarching Goal: Support Hudson River Park (HRP) in helping NYC reach its goal of zero waste by 2030 by scaling up composting.
Sub-goal 1: Identify barriers to organics collections in an high-rise environment
Sub-goal 2: Develop strategy to help run effective behavior change campaign and potentially increase composting participation rate in HRP
Sub-goal 3: Provide examples of effective signage for composting and ways to increase awareness of drop-off locations

Inputs	Activities & Duration	Outputs	Outcomes and Impacts
Program Budget • University of Michigan SEAS Master's Project Funding ($1500 / member) **Researchers** • University of Michigan SEAS Master's Project Team • Dr. Victoria Campbell-Arvai, SEAS Advisor **Steering Committee** • Primary: Hudson River Park (HRP) **Existing Information** • Food Composting, Environmental Behavior, and other relevant peer-reviewed research • Hudson River Park Environment Education Program • Documents about services and benefits provided by Hudson River Park	**Meetings (ongoing):** •Meeting with HRP approximately every two weeks or as needed • Meeting with faculty adviser every two weeks or as needed • Weekly team meeting **Literature Review (tentatively through April with revisions past April on an as-needed basis):** • Overview of behavior change models and strategies • Overview of urban composting projects in other cities **Data Collection (tentatively March through September):** • Interview with HRP-related stakeholders • Survey residents within the community about composting • Survey feedback and results of current composting program **Data Analysis (tentatively April through October):** • Quantitative and Qualitative of current survey results **Solution Brainstorming and Prototyping/Testing (tentatively April through November):** • Develop potential solution(s), incorporating design thinking methodology to the extent appropriate **Presentation (tentatively September and December):** • Develop and present final presentation to SEAS and HRP **Final Report (December):** • Write up project results and discussion • Create tools and recommendation plans for behavioural change actions in targeted community **Project Duration:** • January 2017-December 2017	• Literature review findings • Strategies for driving behavior change in community to increase composting • Data from interviews, observations, and surveys • Mid-Point Presentation to HRP the finding on current composting result and finding • Final Written Report for HRP/SEAS and Presentation for HRP	**Short-term** • HRP has increased understanding of and research on NYC residents' barriers to food waste collection / composting and behavior change management • HRP has increased focus on targeting key stakeholder group(s) • HRP has better understanding on signage designing concept • HRP can reach their 2018 target of 104,000lb of office/tenant/community drop-off waste **Mid-term** • HRP implements recommendations developed with the Team with any appropriate adjustments • Target audience(s) have more positive affect toward food waste collection / composting **Long-term** • HRP implements behavior change strategies and programming with greater effectiveness, with ongoing evaluation to effect continual improvements • HRP is more equipped to support NYC in reaching its goal of zero waste by 2030 • HRP health improves

Appendix 2: Sample interviewee outreach email

Sample interviewee recruitment email message below:

Hi [Potential research subject],

We are reaching out to you per the recommendation of [Recommender].

By way of introduction, we are a group of Master's students from the University of Michigan's School of Natural Resources and Environment. We are working with Hudson River Park Trust on a project with the goal of developing an effective behavior change campaign to increase residential participation in organics collection and composting efforts in the Hudson River Park area.

[Recommender] has spoken highly of you and thinks you would be a great person for us to learn from. Would you be willing and able to have a 30-minute phone call to help us understand residents' sentiments toward organics collection and composting?

Topics we would love to get your input on include:

1. What residential organics collection looks like in your community today
2. Barriers to participation in organics collection
3. Any recommendations you may have for Hudson River Park to increase your community's participation in organics collection
4. As an extension of the above, any recommendations you may have for us as a student research team on the best way(s) to communicate with others in your community
5. Any other individuals or groups you'd recommend we speak with to gather additional relevant information

We look forward to the opportunity to speak with you! Please let us know what times may be most convenient for you.

Thank you so much!

Best,

Alexander Ho, Anita Lin, and Yili Luo
SNRE.HRPP@umich.edu
School of Natural Resources & Environment
University of Michigan
440 Church Street, Ann Arbor, MI 48109

Appendix 3: Interview script for exploratory interviews

Interview Guide

Introduction:
Thank you again for your time. As we mentioned in our email, we are graduate students from University of Michigan. We are working with Hudson River Park on their organics collection project. We would like to know more about your experience with organics collection -- how you started collecting organics, the difficulties you see in organics collection (particularly in an apartment environment), and how to make organics collection easier. We will use your feedback to develop a plan with Hudson River Park to see how can we make organics collection easier and increase composting in support of NYC's zero waste by 2030 goal.

Opening Questions:
1. Can you tell us about yourself and why you started organics collection?
2. What are some of the challenges you faced when you started organics collection?
3. Do you still face these challenges? If not, how did you overcome them?

General Questions:
4. Have you ever tried convincing people around you to start organics collection?
5. For those who do not compost or collect organic waste, what are some of the reasons that they don't want to?
6. For those who started collecting organic waste, what has kept them doing so?
7. Is there anyone you know who tried collecting organic waste but gave up later?

"Behavioral" Questions:
8. What are some of the strongest reasons that kept you organics collection?
9. Are there any community events practicing organics collection together?
10. New York City has started organics collection programs in schools; have you heard about them? Have you heard of any parents participating more because of it?

Closing Questions:
11. Is there anyone whom you would recommend us talking with?
12. Thank you so much for your time. Before we end, is there anything we haven't talked about that you would like us to know?

Closure:
Thank you again for your time, we have learned so much through our conversation today. We will go through our notes and write a summary. If you do not mind, can we email it to you to check that everything in it is accurate?

Thank you again for your time!

Appendix 4: Community surve

Hudson River Park

SCHOOL OF NATURAL RESOURCES & ENVIRONMENT

Hudson River Park Community Compost Questionnaire

Please complete only one survey per household. The purpose of this survey is to gain a better understanding of residential perspectives on composting food scraps. Your survey responses will inform the development of Hudson River Park's Community Compost program and they will remain anonymous. You do not need any specialized knowledge to complete the survey; we are interested in your opinions and experiences related to food scrap collection. You are free withdraw the survey at any time, without penalty. If you have any questions on this survey, please contact us at SNRE.HRPP@umich.edu. By continuing with this survey you indicate that you have read and understood the survey instructions. Thank you!

1. Do you know what composting food scraps is?

❑ Yes ❑ No

2. On a scale from 1 (Not at all) to 7 (Extremely), to what extent do you agree with the following statement?

	Not at all 1	2	3	4	5	6	Extremely 7	N/A
It's worth my time and effort to collect food scraps.								
I think composting food scraps* benefits the natural environment.								
I think composting food scraps is easy to do.								
My family/people I live with encourage composting food scraps.								
There is at least one close friend/family in my apartment building who encourages others to compost food scraps.								
Separating food scraps at home is too confusing.								
Separating food scraps at home is too time-consuming.								
Separating food scraps at home is too disgusting.								
I'm worried that having a separate bin for composting would cause odor.								
I'm worried that having a separate bin for composting would attract pests/rodents.								
I don't have enough space to keep a separate container for food scraps.								
I don't want to deal with cleaning a container for food scraps.								

*Composting food scraps means collecting fruit and vegetable waste, plus other food waste such as coffee grounds, tea bags, and eggshells, to be decomposed into a rich soil known as compost.

3. **Have you heard of people freezing their food scraps to decrease odor and pests/rodents?**
   ❑ Yes ❑ No

4. **What do you think of freezing food scraps?**
   ❑ "I wish I had thought of that earlier!" ❑ "That would be nice, but I don't have space in my freezer."
   ❑ "That could work for me." ❑ "Gross."
   ❑ "Why would I do that?" ❑ Other _____

5. **On a scale from 1 (Not at all) to 7 (Extremely), to what extent do you agree with the following statements?**

	Not at all 1	2	3	4	5	6	**Extremely** 7	N/A
I want to minimize pests/rodents in and around my home.								
I would like to not have to take out my trash so frequently.								
I would like to get rid of odors from the waste bin.								
I want to help create a healthier environment.								
I want to reduce the amount of waste going to landfills.								
I want to help fight climate change.								
I want to help my community become healthier.								
I want to help my community become stronger.								
I want future generations to grow up in a healthy environment.								
I want my pet(s) to stop going through my trash bin. (Please choose N/A if you don't have pets.)								

6. **What compost drop-off site do you currently use, if any?**
   _____

7. **Is the compost drop-off site conveniently located for you?**
   ❑ Yes ❑ No

8. **Your zip code**_____

9. **Do you have a(ny) child(ren) living in your home?**
   ❑ Yes ❑ No

10. **Your age**_____

Thank you for your time!

If you want to fill it out later, please email your response to SNRE.HRPP@umich.edu, Thank you!

The University of Michigan Institutional Review Board has determined that this study is exempt from IRB oversight.