

**UCLA**

**UCLA Previously Published Works**

**Title**

The Circular Economy: Motivating Recycling Behavior for a More Effective System

**Permalink**

<https://escholarship.org/uc/item/4h20v1w5>

**Authors**

Barnosky, Emma  
Delmas, Magali A  
Huysentruyt, Marieke

**Publication Date**

2019-10-08

Peer reviewed

THE CIRCULAR ECONOMY:  
MOTIVATING RECYCLING BEHAVIOR FOR A MORE EFFECTIVE  
SYSTEM

Emma Barnosky

UCLA

barnosky@g.ucla.edu

Magali A. Delmas

UCLA

delmas@ucla.edu

Marieke Huysentruyt

HEC Paris

[huysentruyt@hec.fr](mailto:huysentruyt@hec.fr)

**Abstract**

In the last few years, the circular economy has come to the foreground as a promising means through which to achieve sustainable development. In removing inefficiencies in production, many argue, a circular economy is beneficial not only for the environment, but also for the economy at large. However, there are still many barriers to overcome to move to a true circular economy. Among other things, because the circular economy concept stems from the engineering and economics literature, there has been much focus on the role of technology, governments and corporations in setting up and transitioning to circular economy policies and infrastructure. However, the human behavior aspect of the circular economy is often left out. In this paper, we categorize key barriers to individual recycling and propose promising solutions to motivate recycling based on behavioral science. Specifically, we find a promising model of behavior change in Mutual Health Organizations (MHOs), which allows individuals to act as their own experts and lead transition neighborhood habits on their own rather than being pressured by external forces. We describe parallels between the change mechanisms highlighted in well-known MHOs such as such as Alcoholics Anonymous and Weight Watchers and a French recycling start-up, Yoyo.

Keywords: Circular economy, recycling, behavioral science, Mutual Health Organizations, plastic, sustainability, entrepreneurship, social infrastructure

# Table of Contents

- Introduction..... 3
- Barriers Described in the Literature..... 5
  - Lack of knowledge..... 5
  - Inconvenience ..... 7
  - Lack of personal responsibility..... 8
- How can Barriers in Recycling be Addressed?..... 11
- Change Mechanisms in Other Contexts..... 14
- How Yoyo Addresses Recycling Barriers ..... 18
  - Reward infrastructure..... 19
  - Social infrastructure ..... 19
  - Logistical infrastructure ..... 21
- Next Steps & Takeaways ..... 24
- Conclusion ..... 26
- References..... 27

## Introduction

Across the globe, the benefits of transitioning to a circular economy have become clear. A 2015 McKinsey report conducted for the Ellen MacArthur Foundation found that a move to a circular economy would generate a total of €1.8 trillion in direct and indirect benefits to Europe's economies,<sup>1</sup> and a 2016 study of 7 European nations found that a shift to a “circular economy would reduce each nation's greenhouse-gas emissions by up to 70% and grow its workforce by about 4% — the ultimate low-carbon economy” [1]. With potential economic and environmental benefits of this scale, many countries have begun focusing their efforts on moving away from the historical take-make-dispose system. Japan, given its large economy and relatively little land space, was one of the first countries to adopt circular economy-based ideas, advancing three R policies (Reduce, Reuse, Recycle) as early as 2000 [2]. China, too, has been at the forefront of circular economy implementation as a means to maintain economic growth and address the needs of the country's growing population, with early policies dating back to 2002 and the ‘Circular Economy Promotion Law of the People's Republic of China’ implemented in 2009 [3] [4] [5]. More recently, the European Union has begun seriously considering circular economy implementations, with a primary initiative on resource efficiency introduced in 2011, with Closing the Loop—An Action Plan for the Circular Economy introduced by the European Union in 2015 [6].<sup>2</sup>

While these initial plans and calls to action are an exciting start at rethinking the global economic system, we are still far from a true circular economy. Gregson et al (2015) note that, while the circular is widely known and discussed as a concept in the EU, “its actual enactment is limited and fragile.”[7] There are numerous reasons for this, spanning across disciplines and industries. Ritzén & Sandström (2017) code barriers as financial, structural, operational, attitudinal, and technological, while Kirchherr et al. (2018) code barriers to implementation as

---

<sup>1</sup> [https://www.mckinsey.com/~/\\_media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/Growth%20within%20A%20circular%20economy%20vision%20for%20a%20competitive%20Europe/Growth\\_Within.ashx](https://www.mckinsey.com/~/_media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/Growth%20within%20A%20circular%20economy%20vision%20for%20a%20competitive%20Europe/Growth_Within.ashx)

<sup>2</sup> [http://ec.europa.eu/environment/circular-economy/index\\_en.htm](http://ec.europa.eu/environment/circular-economy/index_en.htm)

cultural (e.g., lack of consumer interest, hesitant company culture), regulatory (e.g., obstructing laws and regulations), market (e.g., low virgin material costs, high circular economy implementation costs), and technological (e.g., limited circular designs, lack of data on impacts) [8] [9]. However, because the circular economy concept stems from engineering and economics, the literature as a whole has been focused on implementation at a macro scale, including the role of technology, governments and corporations in setting up and transitioning to circular economy policies and infrastructure [10]. Beyond the cursory level mention of lack of consumer interest as a potential barrier by Kirchherr et al (2018) [11], no studies to our knowledge look at how individual behavior habits from consumers tie in to make a circular system effective. This means that the way that individual human behavior fits into the system has been little discussed [12] [13] [14]. We argue that this is an important oversight, and that emphasizing the role of the individual within the system is an important way to ensure long-term success of new programs.

Of course, the circular economy is a large and vastly expansive topic, touching everything from government regulations, business operations, and land management, among other industries. From a human/individual perspective, there are three facets that are often highlighted: Reduce, Reuse, and Recycle. At the individual level, Reduce refers to consumption patterns - the less that individuals choose to consume, the fewer resources must be extracted to keep up with demand. Reuse refers to taking existing items and repurposing them within the home - using a yogurt container, for example, as a flowerpot. The final way individuals can contribute items that have already been purchased to the circular economy is to Recycle them. In this paper, we have chosen to focus on this third element.

We focus on recycling because, although significant efforts to incorporate recycling systems have been implemented since the 1990s, overall recycling rates are still quite low. In the EU in 2016, for example, only about 42% of plastic waste was recycled despite existing infrastructure to receive these goods.<sup>3</sup> As of 2017, 94% of EU citizens reported personally caring about the environment.<sup>4</sup> Why, then, are recycling rates so low? Further, heated controversy about America's plastics exports to poorly regulated developing countries urgently calls for more

---

<sup>3</sup> <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20181129-1>

<sup>4</sup> Special Eurobarometer 468 [https://ec.europa.eu/europeaid/special-eurobarometer-report-eu-citizens-viewsdevelopment-cooperation-and-aid\\_en](https://ec.europa.eu/europeaid/special-eurobarometer-report-eu-citizens-viewsdevelopment-cooperation-and-aid_en)

‘short loop’ recycling systems.<sup>5</sup> Can more locally embedded recycling systems not only help redress the inequity in the recycling business, but also help, by strengthening feelings of personal responsibility, improve actual recycling behaviors?

## **Barriers Described in the Literature**

Despite the wealth of literature and action plans centered around the circular economy, large barriers for individuals to recycle still exist. These barriers have been observed since the 1980s, yet initiative to resolve them is slow-moving, hindering the potential success of existing and future recycling systems. Building off of the literature review conducted by Strydom (2018) [15], we have broadly categorized key barriers to action as falling into one of three categories: (1) lack of knowledge, (2) inconvenience, and (3) lack of personal responsibility (Table 1).

### *Lack of knowledge*

Of these barriers, perhaps the biggest is lack of awareness or knowledge about waste issues and recycling strategies. Even when recycling facilities and systems are available, individuals are confused about how and what to recycle. This leads either to incorrect recycling habits—which, in many cases, can sully even those items which are recyclable (i.e., when food scraps contaminate all of the recyclables in a bin)—or avoidance of the behavior altogether.

While “abstract” knowledge about environmental problems, such as awareness of waste issues, might motivate recycling behavior, “concrete” knowledge about recycling might be even more important [16]. Concrete knowledge is essentially knowledge for action, for example knowing what and where to recycle waste [16]. For example, Simmons and Widmar (1990) [17] note that, when using lack of knowledge as a predictor, those who were confident in their recycling knowledge “recycled significantly more than those who felt that they lacked knowledge.” Similarly, Read (1999) [18] finds lack of practical recycling knowledge to be the primary reason for low participation in local recycling programs in the UK. Kennedy et al (2009) find similar results—in their study, 60.2% of respondents felt they were unable to participate in environmental supportive behavior at the desired level due to lack of knowledge or information

---

<sup>5</sup> <https://www.theguardian.com/us-news/2019/jun/17/recycled-plastic-america-global-crisis>

[19]. They suggest that it may not be that the information does not exist in the world, but that it is not available enough, “particularly to a public that feels time-compressed.” This highlights the importance of not only making information available—but also the importance of making it accessible and easy for the average, busy person to understand and act upon.

Beyond specific understanding of why recycling is important and how to do it, individuals must also have a better understanding of how they specifically fit into the recycling system as a whole. In general, individuals have a very poor understanding of the recycling infrastructure—even simple actions such as deciding which bin to put a used plastic bottle into can feel complex and confusing. Indeed, the recycling infrastructure is immense and interdisciplinary, yet it is only a small example of the vast, complex system on which circular economy is predicated. As a result, the full expanse of the system, and an individual’s role within it, is extremely hard to gage for non-experts. This lack of understanding can contribute to mistrust that prevents individuals from attempting to engage with recycling programs (e.g. Keramitsoglou, 2013 [20]). Further, while some may think that it is beyond consumer purview to understand their role in the larger system, Orion (2002) argues that a lack of understanding of full systems and their connection to other systems is detrimental to a citizen’s ability to contribute meaningfully to environmental challenges [21]. This assertion is supported by Kempton’s 1986 finding that incorrect mental models of how thermostats work can cause unnecessarily high-energy use by encouraging high heat settings to heat a home quickly [22]. Similarly, Gentner and Gentner (1982) find that helping to develop clear mental models of how electrical circuits work (via analogies) improved participant performance in solving electricity problems [23].

More recently, Attari et al (2017) found that only 7.2% of university students had a complete understanding of the water system in the United States, and note that “a greater understanding of the water system among lay people will be necessary in order for municipalities and larger levels of government to confront new and exceedingly complex risks to the water system” [24]. A similar lack of knowledge is likely to be pervasive with regard to recycling, as well as the larger implementation of the circular economy. In order to address current apathy, resistance, and poor sorting practices due to lack of knowledge, the individual’s place within these systems should be addressed. Not only may additional system knowledge trigger a cognitive response, but it may also trigger an emotional response such as feelings of awe which,

in turn, may inspire individuals to become more invested in the greater good and do more to minimize their impact on the environment [25].

### *Inconvenience*

The second key barrier to participating in recycling is convenience and access to facilities. Even those who care very much about the environment are less likely to recycle if they must go out of their way to do so. Derksen and Gartrell demonstrate this well in their 1993 study, in which they found that overall concern about the environment was only a predictor of recycling behavior when some form of recycling program was already in place [26]. In other words, even people who care deeply about the environment are unlikely to recycle if they must go significantly out of their way to do so. This is supported by Omran et al (2009), who found that 99.5% of survey respondents listed “collection points / station placed in more convenient locations” to be the most important next step that the Malaysian government could take to increase recycling rates. “Provide recycling bins in every residential area” was ranked second most important [27]. McCarty and Shrum (1994), focused on values and attitudes as antecedents to recycling, found similar results, noting that “as expected, attitudes about the inconvenience of recycling had a negative relationship with recycling behaviors.”[28] Finally, in addition to the simple inconvenience associated with going out of one’s way to recycle, survey responses from Katzev et al’s 1993 study suggest that feelings of disgust as a result of visiting smelly, unkempt facilities can act as a further deterrent [29].

Perrin and Barton (2001) go a step farther and compare two curbside recycling schemes of differing convenience levels [30]. The first is a paper collection service (PC) in which participants are instructed to put paper products into a government-issued plastic bag. On collection day, which is different from their regular trash collection day, they are instructed to place the paper bag outside. The second service (MRS) provides wheeled bins (similar to trash bins) to participants, who are told to place the bin at the curb on their regular trash pickup day. The schemes are similar in that they both provide solutions for recycling at home and present a simple message to explain to users how to recycle. However, the PC program is less convenient as it requires users to adopt a new receptacle (a bag instead of a bin) and remember to put it out on a different day than their regular refuse pickup.



Prior to the introduction of the schemes, “inconvenience / lack of time” was the number one reason participants stated for not engaging in recycling, and 98% of those surveyed in each community predicted they recycle more if a curbside program were available. However, only 48% of those exposed to the PC recycling scheme ultimately participated. In contrast, household participation rate in the MRS scheme was measured at 91%. The authors thus conclude that “Recycling behaviour would appear to be related to the level of inconvenience caused by: (1) the type and design of scheme offered; (2) the material being recycled; and (3) the level of change required in existing household behaviours in order to participate within a scheme and recycle each material.”

Even with a perfect curbside system in place, though, some level of inconvenience is likely to be present whenever one is asking a group of people to break habits. This is typically a result of the status quo bias. Initially named by Samuelson and Zeckhauser (1988), the status quo bias states that, whether or not it is the “best” thing for them, people often tend to stick with their current situation [31]. Thaler and Sunstein (2009) present a key cause of the status quo bias as the “yeah, whatever” heuristic—or a “mindless” choice to stick with whatever option is default. In order to combat this bias, one must make recycling as easy (if not easier) as the behavior that citizens were engaging in before the curbside system is put in place [32].

In that vein, recycling rules and regulations that require extra effort on the part of an individual can be cited as inconvenient or costly in terms of time. In a survey of 1,162 respondents, Halvorsen (2008) finds that the opportunity cost that comes from needing to spend time recycling over choosing another household production or leisure activity has a significant negative effect on household recycling rates [33]. Similarly, in 2017, Klaiman et al surveyed 1,500 respondents to glean how different types of food packaging affect recycling rates. They found that the material the packaging was made of had little effect on recycling rates, but that the need to wash food packaging before recycling caused individuals to recycle less [34].

### *Lack of personal responsibility*

Another key barrier to motivating recycling behavior lies in individuals’ lack of a sense of personal responsibility. In other words, the internal values of an individual are equally as important in promoting recycling behaviors as the external infrastructure provided. De Young (1985) finds that the most popular reasons individuals give for engaging in recycling behaviors

are intrinsic, stemming from a personal desire to “do good,” because of the personal pleasure or joy, also referred to as the “warm glow,” this brings [35]. Viscusi et al (2011), in a similar vein, confirm that private values (that is, individual attitudes with respect to both the environment and actions that others should take) strongly predict individual recycling behavior. Furthermore, they note that social norms as a motivator have “little independent effect.” [36] Hopper and Nielsen (1991) offer an explanation for the lack of social pressure as an effective motivator on its own, arguing that recycling is consistent with the properties of altruistic behavior guided by norms [37]. Consistent with Schwartz’s (1973) social-psychological model of altruistic behavior, the authors evidence that the perceived social norm to recycle influences behavior only when it is also a personal norm and there is clear individual awareness of the consequences of inaction [38]. As such, to inspire personal responsibility, the behavior must be defined and relevant to the individual, and the consequences of not participating in the behavior must be clearly indicated.

Simmons and Widmar come to a similar conclusion in their 1990 study, which looks at recycling behavior within, among other things, those who had a sense of “responsible action”—meaning individuals who go beyond just understanding the connection between actions and their ultimate environmental impact, but who also feel a sense of personal responsibility with regards to recycling [17]. They found that survey respondents who aligned with values consistent with those the researchers deemed “responsible action” were significantly more likely to regularly recycle than those who did not. Furthermore, those who had a sense of “conservation ethic”—in other words, who understood the earth as a resource and saw recycling actions as contributing to maintaining that resource— were also more likely to recycle than those who did not.

A lack of trust in the institutions responsible for the recycling process has also been shown to be an important factor underlying a lack of sense of personal responsibility towards recycling. Keramitsoglou and Tsagarakis (2013) found that a lack of trust in the recycling institution was cited by 17% of survey respondents as a major barrier towards recycling [20]. The main concern cited was the credibility of institutions involved in the recycling program implementation. This highlights the importance of the reliability and transparency of relevant stakeholders and their actions as pertaining to the recycling process.

**Table 1 - Factors affecting recycling behavior presented in the literature**

<b>Factors</b>	<b>Description</b>	<b>Components</b>	<b>References</b>
Knowledge	Not enough awareness or knowledge about recycling and recycling initiatives	How to recycle	Simmons & Widmar (1990), Read (1999), Kennedy et al (2009), De Young (1988)
		Why is it important	Omran et al (2009)
		How does the system work	Orion (2002), Kempton (1986), Genter & Genter (1982), Attari et al (2017)
Inconvenience	Perceptions of recycling (in)convenience	Time cost	Kennedy et al (2009), Perrin & Barton (2001) Omran et al (2009), McCarty & Shrum (1994), Perrin & Barton (2001), Halvorsen (2008), Klaiman et al (2017)
		Perception of dirtiness	Perrin & Barton (2001), Katzev et al (1993)
		Lack of effective facilities and/or storage space	Zhang et al (2016), Omran et al (2009), Derksen & Gartrell (1993), Keramitsoglou (2013)
Responsibility	Lack of a sense of personal responsibility	Lack of intrinsic motivation	De Young (1985), Viscusi et al (2011), Simmons & Widmar (1990)
		Lack of collective action ("Just me" won't make a difference)	Hopper & Nielsen (1991)
		Lack of trust in the other actors in the system	Keramitsoglou (2013)

## How can Barriers in Recycling be Addressed?

While addressing the barriers discussed above on a large scale may seem daunting, there are many promising small-scale solutions that have been studied. Of course, the best way to address lack of knowledge is simply to teach people how to correctly recycle and why it is important. These education campaigns do not need to be extremely costly, and have been shown to be very effective ways to increase recycling behaviors. For example, Smith et al (1997) tested the effect of two classroom presentations on recycling on 4-6th graders' knowledge of and participation in recycling behaviors [39]. One set of children was exposed to a presentation on the importance of recycling and how to do it. The second group was exposed to a similar presentation, which also discussed the detriments of landfills and included a field trip to a landfill. While the second presentation was the most effective, the research team found *both* education programs to significantly increase students' recycling knowledge, attitude, and overall number of recycling behaviors. These findings hold true for adults as well as children - Vining and Ebero (1989) measured the effects of a three year recycling education campaign in the midwestern USA on recycling behavior and find that "a comparison of pre- and post-program survey results indicated that residents' knowledge of recycling issues was more accurate, their motives reflected greater concern for the environment, and their recycling behavior increased after the education campaign." [40]

Within educational campaigns, however, it is important to keep in mind the *type* of information that is presented. As described by Johansson (2016), information appears to comprise of two aspects; one theoretical and one practical [41]. In the case of recycling, the theoretical aspect describes the environmental benefits of recycling, while the practical aspect helps individuals understand how and where to recycle. Both are important to include—the theoretical side is integral to the understanding of the bigger picture, and is possibly the basis for moral or natural incentives, while the practical information provides logistical details that can facilitate the actual recycling behaviors.

However, as noted above, even those who know what to do and care deeply about the environment are unlikely to recycle if they must go out of their way to do so. Thus, the most

important first step to increasing recycling rates is increasing recycling convenience. Implementing at-home recycling pick up such as curbside recycling schemes is both one of the most ubiquitous and most effective ways to address convenience—Domina and Koch (2002) find that access to a curbside recycling program significantly increases both the amount and type of materials ultimately recycled [42]. However, even areas with curbside recycling systems in place might have room for improvement. For example, Ando and Gosselin (2007) find that decreasing time cost of recycling within multifamily dwellings by making bins and storage space for recyclables more accessible to residents has a positive effect on recycling rates [43].

The importance of requiring minimal effort to recycle holds true in a laboratory setting as well—Zhang et al (2016) tested how often study participants recycled their questionnaires based on total distance to / accessibility of the recycling bin vs the trash can. They found that, as they moved the recycling bin away from the most convenient location, the likelihood that participants would recycle their questionnaires decreased from 86.9% to 62.8% [44].

More challenging to address (and elicit) are a sense of personal responsibility or moral duty, individual feelings of trust and a greater willingness to incur personally costly effort despite the marginal, even negligible, effect of an individual's action alone on the environment at large. To address these barriers, one must consider factors both at the personal and at the community level.

At a personal level, individuals will be most likely to participate in recycling schemes if they derive some sense of personal satisfaction or pleasure from fulfilling their civic duty to recycle and from avoiding the potential displeasure of having failed to act. Likewise, demonstrating to individuals that they are part of a community-wide effort to recycle can help emphasize feelings of being part of something rather than feeling powerless or alone, intensifying feelings of guilt from not behaving in a way that is consistent with a community norm, and, especially given strategic complementarities between individual contributions, heightening the perceived marginal benefits of recycling alone. For example, Hopper & Nielson (1991) sought to test the importance of community-level norms [37]. The researchers introduced a program of block leaders designed to model recycling behaviors and encourage neighbors to participate in recycling schemes. Not only did this program increase the strength of a community norm, but it also created an environment in which individuals received information on why it

was important to recycle through face-to-face interactions with trusted connections (such as neighbors or individuals who are socially similar), as well as social status rewards and personal praise from these connections for adopting the desired behavior. Taken together, these community-level factors have the potential to further increase “warm-glow” and more generally inculcate a sense of personal responsibility, which, in turn, has been shown to have a positive effect on recycling rates [45]. As a result, the researchers found this program to increase overall recycling rates even more so than a simple information dump, in which instructional fliers were distributed to households by individuals who were not part of the community.

Another way to remind individuals of their personal norms or responsibility is to have them self-predict whether they will perform a behavior in the future or pre-commit to a certain behavior. Baca-Motes et al (2013) tested this strategy with hotel goers, asking them to commit to eco-conscious decisions at the start of their stay, and giving those who said yes a pin to wear. They found this type of “self-signaling,” which they argue informs one’s perception of self and thus guides behavior to stay within the lines of a perceived self-identity, to increase eco-conscious behaviors such as hanging up towels during the guests’ stays [46].

Finally, for those who simply cannot be bothered or are completely uninterested in recycling, external motivations may be helpful. Viscusi et al (2011) suggest that economic incentives are another effective way to encourage recycling behaviors [36]. This can be done, for example, through bottle-deposits and other take back programs, or through discounting monthly utilities charges for percentage of waste diverted from landfills. Of these, bottle deposits and take back systems are particularly popular. As of mid-2011, there were about 10 US states and 8 Canadian provinces that had implemented some form of bottle bill [47]. Take back systems typically award consumers a small amount of money (in the US, most programs offer ~5 cents) for returning plastic bottles or cans after use. Viscusi et al (2013) find that “both water bottle deposits and recycling laws foster recycling through a discontinuous effect that converts reluctant recyclers into diligent recyclers.” [48] In particular, they find recycling laws and bottle bills are most successful at engaging households who did not already recycle, were lower income, and did not consider themselves to be environmentalists.

Some regions opt to fine consumers for failing to recycle or for using environmentally unfriendly products, rather than rewarding them when they do choose to use them. One example of this is Rwanda's plastic bag ban. Introduced in 2008, the ban introduces significant fines and even jail time for those found with unapproved plastic. It has been largely successful in cleaning up the country and limiting the use of plastic [49]. On a smaller scale, cities and states in the United States have implemented similar types of bans, such as banning the use of plastic straws in California or plastic water bottles in San Francisco [50] [51]. However, such aggressive policies require strong political will and are still uncommon.

## **Change Mechanisms in Other Contexts**

While the above interventions are promising, most have only been tested on relatively small and select [52] populations, with little follow-up after the initial study. Others, such as curbside recycling and incentive systems, have been implemented in many places, but still need to be finessed in order to make them as effective as possible. In addition, these systems can be time consuming, costly, and politically challenging to implement. In addition, there is some evidence that financial incentive programs are only effective so long as the financial incentive is in place [53] [54]. Thus, in order to make lasting change, systems must inspire a long-term commitment from individuals. While beneficial to society, this type of long-term commitment can be individually costly—in order to overcome the barriers discussed above, community members must exhibit self-control and make a conscious effort to transition their daily patterns of behavior towards more sustainable action. How, then, can communities encourage and sustain this long-term individual commitment, especially when widespread infrastructure change is slow-moving, and rarely garners trust or excitement from a public perspective?

As we saw in Hopper and Nielson's 1991 block leader study, involving known individuals and community members can often be more effective than inviting strangers into communities or mandating certain behaviors [37]. Given this fact, one possible approach to complement governmentally implemented systems such as those described above is through mutual help organizations (MHOs). An MHO is a community-led group which helps individuals "[adjust] to a status that is viewed as unchanging, [...] change a problem that is seen as intra-individual, [or][...] change problems that are seen as being caused by larger political forces" [55].

MHOs can encompass a wide variety of subjects and though all MHO's share the above common goal, one's topic of interest or specific vision of success may not align with another's. However, one of the most fundamental parts of an MHO is that it is led by community members rather than professionals. This, according to Humphreys and Rappaport (1994), empowers members by allowing them to act autonomously and exist as the sole experts on the problem they are trying to solve [55].

One of the most well-known, and most effective, MHOs is Alcoholics Anonymous (AA). AA is "an international fellowship of men and women who have had a drinking problem. It is nonprofessional, self-supporting, multiracial, apolitical, and available almost everywhere."<sup>6</sup> The program, as well as other MHOs, is comprised of voluntary face-to-face affiliations among individuals who rely on the expertise of other members rather than that of health-care specialists to facilitate increases in well-being. Started in the 1930s as an alternative to traditional medical treatments of alcoholism, it has since garnered widespread recognition for its effectiveness in encouraging and maintaining sober living in its constituents. In fact, AA has been shown to be not only a useful complement to primary medical treatment, but, in some cases, even an effective primary treatment itself [56] [57].

Given its success, AA has been the focus of numerous studies to better understand the mechanisms it uses to bring forth lasting behavioral change. One key factor of success is AA's treatment of motivations as fluid or dynamic—treatment patterns focus both on increasing the motivation of beginners, or so-called 'new initiates', and on evolving and maintaining motivation over time [58]. As part of increasing and sustaining motivation, the importance of community and social networks is frequently highlighted. Florentine and Hillhouse (2000) even go so far as to liken the power of social network to religious power: "the need to give oneself over to a higher power may facilitate recovery. The present findings, however, suggest that rather than God or some spiritual entity, the higher power may be the social group itself" [59]. Much of the power of the social connections within an MHO comes from the fact that members are joined by a common goal. In the case of AA, that goal is better personal health—namely, getting and staying sober. By making new connections within AA, members are able to integrate people with similar goals and values into their friend networks [60]. However, while the ultimate desired outcome is

---

<sup>6</sup> [https://www.aa.org/pages/en\\_US/what-is-aa](https://www.aa.org/pages/en_US/what-is-aa)



shared, members of AA are not all equal distance along in their journeys. As a result, newcomers can also learn and adapt models of sober behavior by observing long-term members. More directly, newcomers can solicit advice from others with real-life experience in avoiding situations and people which may encourage relapse, and are given resources to lean on any time of day or night [61].

In addition to directly benefiting members, social connections and face-to-face interactions provide a powerful personal conduit through which empowering information is transferred. One of the strongest predictors of long-term success is self-efficacy—an individual's confidence that she is able to avoid drinking in stressful settings or parties [56]. In order to build greater self-efficacy, members need a non-judgmental space to practice these behaviors before employing them in the outside world, as well as a way to share and work through feelings of shame and guilt when sobriety-serving choices are not made. The shared ideology between AA members facilitates feelings of trust and thus allows for this space to be [62] [63].

The idea of leaning on community to increase one's feeling of confidence and self-control is equally clear in another well-known MHO: Weight Watchers (WW). Moisio and Beruchashvili (2010) find that, while WW markets itself as an educational approach to achieving behavior change, it acts most effectively as a therapeutic agent [64]. Through focusing on open communication, group celebration of personal progress towards weight-loss goals, and supportive relationships between members, WW sets itself up to be a "legitimate forum for openly sharing transgressions and providing an account to oneself and to others" [64]. This, in turn, allows members to fully share their weight loss journey and feel excited, empowered, and motivated not only by their own goals, but by the desire to share successes with the larger social group.

The impact of MHOs on social networks, however, extends beyond the organizations, especially in the case of AA. AA recommends transitioning friend networks away from frequent alcohol drinkers and towards those who drink rarely if at all (or, even better, those already deeply established in recovery). This supports the benefits of the internal AA network as discussed in the preceding paragraph—by surrounding oneself with those who participate in behavior that aligns with one's future goals, there is decreased chance of situation-related relapse. In fact, in the case of young adults, it is perhaps these external shifts which are the strongest indicators of

recovery success—Kelly et al (2014) found that the number of high-risk vs low-risk friends that a young adult had was shown to be a strong predictor of ultimate recovery outcome [65].

Another important aspect of MHOs is that they allow more experienced members to take on helper positions. In the case of AA, members who are established in recovery have the opportunity to become sponsors, meaning that they take charge of helping newer members. In the case of WW, “lifetimers”—members who have succeeded in achieving and maintaining their weight loss goals—continue to attend meetings, demonstrating that success is possible to newcomers and offering advice on how to get there. While, as discussed above, the presence of sponsors/lifetimers certainly aids newcomers by providing individualized attention, role modeling, and access to support at any time of day or night, it also likely has a positive effect on the lifetimer/sponsor themselves. The helper therapy principle states that, regardless of the impact on the receivers, the act of helping is beneficial for the *giver* of the help [66]. By helping, Reissman (1965) argues, the giver is herself benefitted in that she (1) has improved self-image by doing something worthwhile for someone in need, (2) persuades herself in the act of working to persuade another, (3) feels part of a ‘system’ or something bigger than herself, (4) receives improved status and importance associated with being in the role of a leader or teacher, (5) subscribes to the idea “I must be well if I am able to help others” and (6) is distracted from unwanted behavior as a result of having a “project” [66]. As a result, continued attendance at AA/WW meetings can serve as a way to maintain sobriety/weight loss long term.

While the above discussion focuses on MHOs that, by subject, are far from recycling, there are some interesting parallels to consider in terms of how these organizations overcome barriers to motivate change. In our setting, the overall goal is to take better care of the planet, of future generations, and of other humans, while in the settings described in WW and AA, the goal revolves around taking better care of oneself. To achieve either outcome, individual habits and learned responses must be reprogrammed. In order to do so, (1) the consequences of continuing to participate in the undesirable behavior must be understood, (2) the desired behavior must be made more convenient (e.g. through removing alcohol/unwanted food or adding a separate recycling bin in the home), and (3) the value of participating in the desired behavior must be elevated above the value of an opposite choice (e.g. through being held socially accountable).

## How Yoyo Addresses Recycling Barriers

Given the success of AA and WW in bridging the gaps within, and serving as a complement to, state-supported, expert-led medical treatments, so too do MHO structures have an opportunity to facilitate solutions to recycling barriers that are difficult to address or require slow-moving solutions. In fact, one start-up in France is already doing just that.

Yoyo (<http://yoyo.eco>) was founded in early 2017. Present in six major cities in France (Paris, Lyon, Bordeaux, Marseille, Reims, and Mulhouse), the company is aiming to make recycling not only more convenient in France, but also more fun. Through a system of Sorters and Coaches, Yoyo participants receive points for diverting plastic bottles from landfills. This bottom up, individual driven system presents a convenient, social, incentive-based approach to encourage better recycling behavior, and it's working—in just two years, the community has grown to almost 400 Coaches and over 12,000 Sorters and collected almost 3.7 million plastic bottles in France.<sup>7</sup>

Upon signup, Sorters receive an orange Yoyo bag and are assigned to a Coach. Coaches are individuals or local businesses dedicated to welcoming, encouraging, and training Sorters, as well as collecting and storing full Yoyo bags. Similar to the above programs, signup is voluntary, and members share a common goal — in this case, that of mitigating environmental damage caused by the excessive use of plastic bottles. While regular group meetings are not held, regular interactions between the Coaches and Sorters are an important piece of the organizational model, as Sorters must drop full bags off with their Coach in order to complete the first step in the recycling process and receive points.

Building on Strydom (2018)'s categorization of barriers to recycling behavior, we've classified the ways Yoyo facilitates better environmental choices (Table 2) [15]. Broadly, Yoyo's effective design choices can be broken down into three categories: reward infrastructure, social infrastructure, and logistical infrastructure.

---

<sup>7</sup> <https://yoyo.eco/>

### *Reward infrastructure*

As mentioned above, when a Sorter fills up a Yoyo bag, they turn the bag into their Coach. Once the bag has been registered, the Sorter receives 125 points, and their Coach receives 25. The points (which are redeemable via Yoyo’s platform for cultural experiences such as tickets to local movie theaters, concert venues, and sports centers, or for physical goods such as reusable water bottles) serve as an extrinsic motivator, increasing the value of the recycling action. As a result, the opportunity time cost of recycling is decreased—while it may still take time or be a hassle to recycle, the individual is aware that they will be rewarded for their time, thus making it worth it to spend the extra effort engaging in recycling behaviors. In addition, those who are uninterested in recycling as an activity or concept may be enticed by the ability to gain rewards, thus providing a new incentive to recycle beyond feelings of warm-glow or more broadly, personal responsibility or civic duty.

Another important aspect of Yoyo’s reward infrastructure is that they increase overall commitment to and trust in the system. First of all, rewards for socially good behavior allow Sorters to feel “seen” for work is usually considered thankless. Secondly, as experience-based rewards tend to be local, the reward infrastructure has the potential to increase the number of community connections an individual makes and local activities she participates in, and thus strengthen a shared belief in the power of the group or community.

### *Social infrastructure*

In addition to a robust reward infrastructure, Yoyo provides a solid foundation for a motivating social infrastructure. As discussed above, community is a key part of motivating lasting behavior change, and this holds true for Yoyo’s community as well.

From the start, members of the Yoyo community are addressed face-to-face, with characteristically inclusive, excited, empowering language about their ability to make a difference. These face-to-face, personal interactions likely render targets more receptive to their appeals, and engage people’s empathy and their fundamental desire for acceptance, to behave in socially desirable ways [67]. While Yoyo does have a team of City Managers on staff who are tasked with encouraging new membership, many Coaches are also involved in recruiting new Sorters. In either case, an important aspect of the recruitment approach is positivity — rather

than shame potential new members into joining or share depressing stories about the state of the environment, Yoyo members assume everyone they approach has already been exposed to the depressing stories and is doing their best for the environment. As a result, recruitment often focuses on the fun, empowering aspects that come with being a Yoyo community member, including the ability to “win gifts” (rewards). This mentality increases excitement and motivation to participate in a task that was once deemed a chore.

Once a new Sorter joins, they are assigned a Coach that lives nearby. For those who don't already have a curbside recycling system in place, the simple proximity of their Coach can reduce the time it takes to recycle by providing an alternative to other, further drop off points. Furthermore, a key piece of the role of Coach is training newcomers and providing feedback on their first few bags of recycling. In turn, newcomers slowly internalize how to effectively recycle, lowering the knowledge/understanding barrier. The final piece of the onboarding and recruitment process is motivation and encouragement. Coaches can help answer questions and assure Sorters that they, as individuals, are making a difference and contributing to the larger community-level impact that Yoyo has.

After a Sorter is on-boarded, they continue to go back to their Coach each time they fill a Yoyo bag to drop off the bag, gain their points, and receive new, empty bags. These continued interactions allow time and space to begin to develop and deepen a relationship. Thus, the Coach is seen as an expert or authority, but also a known community member, meaning that, like the block leaders in Hopper & Nielson's 1991 study, they hold even more power to incite change and motivate action than an external expert [37]. These continued interactions also serve as reminders that the Coach is aware of, and invested in, the long term progress of their Sorters, increasing accountability and responsibility for each one.

In addition to individual interactions between Sorter and Coach, there are opportunities for larger-scale meetings. Some Coaches organize monthly or weekly get-togethers for their Sorters, and Yoyo facilitates group meetings as well, such as organizing lunches and visits to local recycling factories where the bottles are recycled. Beyond specifically planned meet-ups, the Yoyo team is present at a wide range of community events, such as block parties, flea markets, and festivals. At these events, Sorters and Coaches who might not normally interact can come together and connect. Ultimately, these types of face-to-face interactions outside of the

normal routine of one's life can serve as a way to re-inspire community members, reminding them of their potential to make a difference, and the importance that they can have by participating in recycling behaviors. Meeting with the rest of the employed Yoyo team can also reaffirm those relationships, increasing the level of trust in the company and thus in the recycling system they have put in place.

The final pillar of the social infrastructure facilitated by Yoyo is the overall visibility and social status that comes with being a part of a community. Yoyo bags are bright orange and large, so they are not easy to hide, and often attract curiosity and inquiries. By answering questions and explaining the goals behind Yoyo, members of the community are given the ability to show their knowledge about a given subject, which allows them and others to perceive Yoyo members as experts. This feeling of expertise is further highlighted when inquiries come from the media, which is increasingly common as Yoyo grows. When media opportunities arise, Coaches/Sorters are often given the chance to be interviewed or speak about Yoyo, which can further motivate action—beyond the external validation that can come from appearing in newspaper articles or on television, the overall recycling work is internally validated when it is deemed “newsworthy.” From an external point of view, viewers are given insight into a community that is making a difference, and, by seeing members of their own community talking about an issue (rather than experts in suits), the barriers to entry are lowered.

### *Logistical infrastructure*

Yoyo has set up the logistics of moving within its platform to minimize barriers to the desired action, as well. For example, as discussed above, Sorters are assigned Coaches as close as possible to their homes to minimize the time cost and inconvenience of recycling. In addition, before even visiting their Coach, each new recruit is given a pamphlet explaining, with words and images, which items can and cannot go in the Yoyo bags. This is something Sorters can continuously refer back to, regardless of whether or not they have an established relationship with their Coach, and thus empowering the individual with increased knowledge of how to properly recycle.

Yoyo also has personalized dashboards for each Coach and Sorter. On the dashboard, an individual is able to see the total number of bottles she has recycled to date, as well as the total number of bottles the Yoyo community as a whole has recycled (which is also expressed as how

many tons of plastic have been stopped from ending up in the ocean). This clearly shows the individual's impact on the total number of bottles recycled by the community, further inspiring her to contribute. The visibility of number of bottles recycled also increases trust in the system, as it is clear that all recycled bottles are being recorded, rather than simply disappearing after drop off.

Even more beneficial is the fact that all bottles are recycled via short circuit. In other words, the bottles are recycled as close to the community as possible, keeping the economic flow local. Once again, knowledge of this process allows individuals to feel powerful, as they (1) have knowledge of the exact factory the bottles are recycled at (as mentioned above, Yoyo occasionally even organizes factory tours, (2) can picture themselves as individuals clearly within the recycling system (2) understand the direct, positive impact the existing system as on the well-being of their own community.

Finally, as mentioned above, Yoyo bags themselves are bright orange, with Yoyo's logo clearly displayed. The color both serves as a visual reminder to those using the bag to recycle their bottles, and a commitment device—by taking and displaying a Yoyo bag, Sorters are signaling their commitment to use it. Similar to the commitment pins discussed in Baca-Motes et al (2013) [46], the bags signal to the Sorter the kind of person she has committed to be, and encourages her to make behavior choices in line with that self-identity.

**Table 2. Yoyo’s Design Choices and Key Barriers to Recycling**

Yoyo Design Choices	Convenience		Understanding		Motivation		
	It takes time to recycle	It is inconvenient to recycle	I doubt I can make a difference	I don't know how to recycle	It is not my responsibility to recycle	I can't be bothered to recycle	I don't trust the system
<b>Reward Infrastructure</b>	√	√				√	√
Points/rewards	x	x				x	x
Rewards sourced locally							x
<b>Social Infrastructure</b>	√	√	√	√	√	√	√
Peer-to-peer recruitment and initiation: nearby Coach assigned to a Sorter, who helps newcomers socialize, internalize rules and processes	x		x	X	x	x	x
Positive, repeated face-to-face exchange: Praise and recognition for a job well done, provided by Coach and Yoyo staff , drop-off face-to-face encounters			x	X	x	x	x
Testimonials and volunteering events: authenticating events for Coach and Sorters, strengthening altruism			x		x		x
Visibility and social status locally, in local community: media attention, customers’ attention			x		x	x	
<b>Logistical Infrastructure</b>	√	√	√	√	√	√	√
Simple and clear rules on what can be recycled (PET 1 plastic); Short pamphlet with clear, easy to read instructions				X			
Online, personalized and transparent dashboard to see progress and gage overall impact			x		x		x
Convenient drop off points and regular pick-up of bags from Coaches	x	x					
Bright orange bags increase visibility, bags as a commitment device				X		x	
Short circuit/chain recycling			x				x



## Next Steps & Takeaways

Of course, the system described above is not a panacea for inciting environmental change. Significant challenges still exist. For example, this approach is only effective if a given individual has an interest in joining the MHO and pursues an individual choice to do so—while a government or business can facilitate community action, communities cannot be forced to come together to act. Furthermore, feeling “part” of a community like Yoyo is a great motivator once an individual is part of the system, but a close knit, passionate group may also serve as a deterrent if one is on the outside looking in, as individuals may perceive the community to be exclusive or worry about the possibility of rejection. Similarly, taking a leadership role (such as that of Coach) often requires more time and investment than simply signing on as a group member. Thus, recruiting new Coaches can be especially challenging. This is important to keep in mind, as the system described above cannot work without some form of Coach. As evidenced in Hopper & Nielsen (1991), the most effective leaders tend to be members of a given community, so the Coach position is unlikely to be as effective if it is filled simply by a Yoyo employee [37]. Thus, casting a wide net through ongoing thorough and inspiring recruitment efforts to encourage individuals to join in either capacity is absolutely necessary as a means of maintaining a community-based system.

Even once individuals have decided to join, there remains the challenge of maintaining their commitment long-term. New members of organizations such as Yoyo may feel excited about the concept and sign up, only to have life get in the way, ultimately causing them to fail to recycle long-term or even at all. There is some argument to be had to allow those who fall dormant to stay that way, and come back only when they are ready to do so. However, it is possible that those who become inactive do so as a result of insufficient support within the organization. Thus, some exploration as to why members drop off, and even light attempts to re-engage them, can serve as a useful means of improving existing systems.

As is demonstrated by the preceding sections, the current recycling crisis is not the result of one single barrier at the individual level, but rather a collision of different barriers which interact and shape the way citizens interact with recycling systems. Thus, the answer to better recycling rates lies not in one single solution, but rather in the interaction of different solutions.

Barring significant societal change, many of these solutions will fall directly under or be managed in partnership with governments. However, as discussed, governmental action can be extremely costly and time consuming to enact, meaning that new initiatives are slow to come to fruition. Businesses, on the other hand, do not suffer from these same roadblocks. Their nimble nature and ability to reach large groups of people quickly put them in a unique position to act — in the short term as a stopgap in addressing recycling barriers before governments can act, and in the long terms as a complement to government programs.

By and large, the barriers mentioned above can be broken down into three categories: knowledge, convenience, and responsibility. Companies looking to help increase recycling rates may choose to focus on one barrier, or on many—in either case, there is a suite of potential solutions to further engage citizens in recycling behavior:

1. *Knowledge.* To address gaps in knowledge about what and how to recycle, one must simply explain. As shown in section 3, educational campaigns directed at both adults and children have been shown to be effective ways of increasing recycling habits. Similarly, Yoyo’s use of handouts to remind people in the moment what can and can’t be recycled, and of coaches to provide immediate feedback once a bag has been turned in, both serve as ways for its Sorters to learn over time how to be a more effective recycler. Ultimately, ways to address the information gap can be broken down into three groups: (1) long term learning systems and educational campaigns, (2) clear instructions about what can be recycled in the moment a user is in front of the trash can, and (3) feedback after a user has made a recycling choice.
2. *Convenience.* As cited above, consumers are unlikely to recycle if they feel the behavior is too difficult, too unpleasant (i.e., smelly facilities), or takes too much time. To address barriers caused by inconvenience, one must ensure there is a system in place that makes recycling as easy, quick, and as pleasant as throwing items away (if not more so). In cases where it is not possible to make recycling behavior easier or less time consuming, providing a “reward” such as financial incentives or positive social interactions can help increase desire to act.
3. *Responsibility.* To feel a sense of responsibility to recycle, users must understand that their behavior has impact on at least one of the following: the environment,

their own social standing, or their view of themselves. This can be accomplished by (1) designing transparent recycling systems that emphasize impact, (2) investing in an MHO and/or community leader approach that provides social acceptance or belonging for participating in recycling behaviors, (3) increasing personal responsibility and incentives by asking users to self-report whether they would recycle, and (4) providing financial or other incentives for users who choose the desired behavior.

## **Conclusion**

In this report, we have reviewed the key barriers to recycling (knowledge, convenience, and responsibility) and discussed some solutions to address these barriers. Primarily, we have described the system employed by French start-up Yoyo, which bears many similarities to a mutual help organization approach. Like other MHOs, Yoyo's system underlines the importance of ease and knowledge, and focuses on empowering individuals to act as "experts" so they are able to lead the charge in making change in their own communities.

While the approach described has many benefits, there are still areas for improvement and questions that remain. As discussed above, this approach requires individuals to be motivated to join an MHO, and stay part of it over the long term. Thus, two important areas of inquiry are (1) to better understand how to reach those who are not already interested in helping others or the environment, and (2) how to keep members active in the long term.

In addition, Yoyo currently works exclusively with plastic bottles. As such, it would be useful for future studies to seek to understand whether the approach described above works in additional recycling contexts. For example, might clothing, which, to many, has more emotion and stories attached to it than plastic bottles, require a greater emphasis on the coaching side? Similarly, are expensive objects, such as electronics, able to be recycled using the same system as described above, or will they require greater financial incentives given the greater cost of the items? While the Yoyo's current approach is an exciting start at rethinking the recycling system, the questions above are important to understand in order to design long term, scalable solutions to the current recycling crisis.

## References

1. Stahel, W.R., *The circular economy*. Nature News, 2016. **531**(7595).
2. Takiguchi, H., & Takemoto, K., *Japanese 3R policies based on material flow analysis*. Journal of Industrial Ecology, 2008. **12**(5-6): p. 792-798.
3. Li, H., Bao, W., Xiu, C., Zhang, Y., & Xu, H., *Energy conservation and circular economy in China's process industries*. Energy, 2010. **35**(11): p. 4273-4281.
4. Yuan, Z., Bi, J. and Moriguchi, Y. , *The Circular Economy: A New Development Strategy in China*. Journal of Industrial Ecology, 2006. **10**(4-8).
5. Su, B., Heshmati, A., Geng, Y., & Yu, X. , *A review of the circular economy in China: Moving from rhetoric to implementation*. . Journal of Cleaner Production, 2013. **42**(215-227).
6. McDowall, W., Geng, Y. , Huang, B. , Barteková, E. , Bleischwitz, R. , Türkeli, S., Kemp, R. and Doménech, T., *Circular Economy Policies in China and Europe*. Journal of Industrial Ecology, 2017. **21**: p. 651-661.
7. Gregson, N., Crang, M., Fuller, S. & Holmes, H., *Interrogating the circular economy: the moral economy of resource recovery in the EU*. Economy and Society, 2015. **44**(2): p. 218-243.
8. Ritzén, S., and Gunilla Ölundh Sandström, "Barriers to the Circular Economy - Integration of Perspectives and Domains." In Procedia CIRP, 2017. **64**: p. 7-12.
9. Kirchherr, J., Reike, D., & Hekkert, M., *Conceptualizing the circular economy: An analysis of 114 definitions*. Resources, Conservation and Recycling, 2017. **127**: p. 221-232.
10. Kalmykova, Y., Sadagopan, M., & Rosado, L, *Circular economy - From review of theories and practices to development of implementation tools*. Resources, Conservation and Recycling, 2018. **135**: p. 190-201.
11. Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M, *Barriers to the circular economy: evidence from the European Union (EU)*. Ecological Economics, 2018. **150**: p. 264-272.
12. Bocken, P., de Pauw, I., Bakker, C., & van der Grinten, B., *Product design and business model strategies for a circular economy*. Journal of Industrial and Production Engineering, 2016. **33**(5): p. 308-320.
13. George, D.A.R., Lin, B. C., & Chen, Y., *A circular economy model of economic growth*. Environmental Modelling and Softwar, 2015. **73**: p. 60-63.
14. Leontief, W., *The economy as a circular flow*. Structural Change and Economic Dynamics, 1991. **2**(1): p. 181-212.
15. Strydom, W.F., *Barriers to Household Waste Recycling: Empirical Evidence from South Africa*. Recycling, 2018. **3**(3).
16. Schahn, J., & Holzer, E, *Studies of individual environmental concern: The role of knowledge, gender, and background variables*. Environment and behavior, 1990. **22**(6): p. 767-786.
17. Simmons, D.W., R., *Recycling: Toward a Strategy for Public Education*. The Journal of Environmental Education, 1990. **22**(1): p. 13-18.

18. Read, A.D., "A weekly doorstep recycling collection, I had no idea we could!": Overcoming the local barriers to participation. *Resources, Conservation and Recycling*, 1999. **26**(3-4): p. 217-249.
19. Kennedy, E.H., et al., *Why We Don't "Walk the Talk": Understanding the Environmental Values/Behaviour Gap in Canada*. *Research in Human Ecology*, 2009. **16**(2): p. 151-160.
20. Keramitsoglou, K.M., & Tsagarakis, K. P., *Public participation in designing a recycling scheme towards maximum public acceptance*. *Resources, Conservation and Recycling*, 2013. **70**: p. 55-67.
21. Orion, N., *An Earth systems curriculum development model*, in *Global science literacy 2002*, Springer. p. 159-168.
22. Kempton, W., *Two Theories of Home Heat Control\**. *Cognitive Science*, 1986. **10**: p. 75-90.
23. Gentner, D., & Gentner, D. R. , *Flowing waters or teeming crowds: Mental models of electricity* , in *Mental Model*, D.G.A.L. Stevens, Editor. 1983, Erlbaum: Hillsdale, NJ. p. 99-129.
24. Attari, S.Z., Poinatte-Jones, K., & Hinton, K. , "Perceptions of Water Systems. ". *Judgment & Decision Making*, 2017. **12**(3): p. 314-327.
25. Piff, P.K., Dietze, P., Feinberg, M., Stancato, D. M., & Keltner, D., *Awe, the small self, and prosocial behavior*. *Journal of Personality and Social Psychology*, 2015. **108**(6).
26. Derksen, L. and J. Gartrell, *The Social Context of Recycling*. *American Sociological Review*, 1993. **58**(3): p. 434-442.
27. Omran, A., Mahmood, A., Aziz, H.A. and Robinson, G.M., *Investigating Households Attitude Toward Recycling of Solid Waste in Malaysia: a Case Study*. . *International Journal of Environmental Research*, 2009. **3**(2): p. 275-288.
28. McCarty, J.A.S., L.J., *The recycling of solid wastes: Personal values, value orientations, and attitudes about recycling as antecedents of recycling behavior*. *Journal of Business Research*, 1994. **30**(1): p. 53-62.
29. Katzev, R., Blake, G. and Messer, B., *Determinants of Participation in Multi-Family Recycling Programs*. *Journal of Applied Social Psychology*, 1993. **23**: p. 374-385.
30. Perrin, D., & Barton, J.R., *Issues associated with transforming household attitudes and opinions into materials recovery: a review of two kerbside recycling schemes*. *Resources, Conservation and Recycling*, 2001. **33**(1): p. 61-74.
31. Samuelson, W.Z., R. J., *Status Quo Bias in Decision Making*. *Journal of Risk and Uncertainty*, 1988. **1**(1): p. 7-59.
32. Thaler, R.H., & Sunstein, C. R, *Nudge: Improving decisions about Health, Wealth, and Happiness*. 2009, New York, New York: Penguin Books.
33. Halvorsen, B., *Effects of Norms and Opportunity Cost of Time on Household Recycling*. *Land Economics*, 2008. **84**(3): p. 501-516.
34. Klaiman, K., Ortega, D.L., & Garnache, C., *Perceived barriers to food packaging recycling: Evidence from a choice experiment of US consumers*. . *Food Control*, 2017. **73**(B): p. 281-299.
35. De Young, R., *Encouraging Environmentally Appropriate Behavior: The Role of Intrinsic Motivation*. *Journal of Environmental Systems*, 1985. **15**(4): p. 281-292.
36. Viscusi, W.K., Joel Huber, and Jason Bell., *Promoting Recycling: Private Values, Social Norms, and Economic Incentives*. *American Economic Review*, 2011. **101**(3): p. 65-70.

37. Hopper, J.R., & Nielsen, J. M. , *Recycling as Altruistic Behavior: Normative and Behavioral Strategies to Expand Participation in a Community Recycling Program*. Environment and Behavior, 1991. **23**(2): p. 195-220.
38. Schwartz, S.H., *Normative explanations of helping behavior: A critique, proposal, and empirical test*. Journal of Experimental Social Psychology, 1973. **9**(4): p. 349-364.
39. Smith, J.M., Rechenberg, C., Cruey, L., Magness, S., & Sandman, P., *The Impact of Recycling Education on the Knowledge, Attitudes, and Behaviors of Grade School Children*. Education, 1997. **118**(2).
40. Vining, J., & Ebreo, A., *An evaluation of the public response to a community recycling education program*. Society & Natural Resources, 1988. **2**(1): p. 23-36.
41. Johansson, K., *Understanding recycling behavior: a study of motivational factors behind waste recycling*. WIT Transactions on Ecology and the Environment,, 2016. **202**: p. 401-414.
42. Domina, T., & Koch, K., *Convenience and Frequency of Recycling: Implications for Including Textiles in Curbside Recycling Programs*. Environment and Behavior, 2002. **34**(2): p. 216-238.
43. Ando, A.W.a.G., A. Y., *Recycling in Multifamily Dwellings: Does Convenience Matter?* Economic Inquiry, 2005. **43**(2): p. 426-438.
44. Zhang, S., Zhang, M., Yu, X., & Ren, H. , *What keeps Chinese from recycling: Accessibility of recycling facilities and the behavior*. Resources, Conservation and Recycling, 2016. **109**: p. 176-186.
45. Abbott, A., Nandeibam, S., O'Shea, L, *Recycling: Social norms and warm-glow revisited*. Ecological Economics, 2013. **90**: p. 10-18.
46. Baca-Motes, K., Brown, A., Gneezy, A., Keenan, E.A., Nelson, L.D, *Commitment and Behavior Change: Evidence from the Field*. Journal of Consumer Research, 2013. **39**(5): p. 1070-1084.
47. Walls, M., *Deposit-refund systems in practice and theory*. Resources for the future 2011: p. 11-47.
48. Viscusi, W.K., J. H., Bell, J., and Cecot, C., *"Discontinuous behavioral responses to recycling laws and plastic water bottle deposits."*. American Law and Economics Review, 2013. **15**(1): p. 110-155.
49. Danielsson, M., *The Plastic Bag Ban in Rwanda: Local Procedures and Successful Outcomes*, in Department of Government. 2017, Uppsala University. p. 349-364.
50. Calderon, A.B., A, *An act to add Chapter 5.2 (commencing with Section 42270) to Part 3 of Division 30 of the Public Resources Code, relating to food facilities*, in Assembly Bill No. 1884. 2018: California.
51. Supervisors Chiu, M., Kim, and Cohen, *San Francisco, CA City Ordinance Number 28-14*. 2014.
52. Allcott, H., *Site selection bias in program evaluation*. Quarterly Journal of Economic, 2015. **130**(3): p. 426-438.
53. Asensio, O.I., & Delmas, M. A. , *The dynamics of behavior change: Evidence from energy conservation*. Journal of Economic Behavior & Organization, 2016. **126**(196-212).
54. Gneezy, U., Meier, S., & Rey-Biel, P., *When and why incentives (don't) work to modify behavior*. . Journal of Economic Perspectives, 2011. **25**(4): p. 191-210.

55. Humphreys, K., & Rappaport, J., *Researching self-help/mutual aid groups and organizations: Many roads, one journey*. Applied & Preventive Psychology, 1994. **3**(4): p. 217-231.
56. Kelly, J.F., Magil, M & Stout, R.L., *How do people recover from alcohol dependence? A systematic review of the research on mechanisms of behavior change*. Alcoholics Anonymous, Addiction Research & Theor, 2009. **17**(3): p. 236-259.
57. Kelly, J.F.Y., J. D. , *The role of mutual-help groups in extending the framework of treatment*. Alcohol research & health : the journal of the National Institute on Alcohol Abuse and Alcoholism, 2011. **33**(4): p. 350-355.
58. Morgenstern, J., Labouvie, E., McCrady, B. S., Kahler, C. W., & Frey, R. M., *Affiliation with Alcoholics Anonymous after treatment: A study of its therapeutic effects and mechanisms of action*. Journal of Consulting and Clinical Psychology, 1997. **65**(5): p. 768-777.
59. Florentine, R.H., M.P., *Exploring the Additive Effects of Drug Misuse Treatment and Twelve-Step Involvement: Does Twelve-Step Ideology Matter?* Substance Use & Misuse, 2000. **35**(3): p. 367-397.
60. Humphreys, K., Mankowski, E.S., Moos, R. H., & Finney, J. W, *Do enhanced friendship networks and active coping mediate the effect of self-help groups on substance abuse?* Annals of Behavioral Medicine, 1999. **21**(1): p. 54-60.
61. Kaskutas, L.A., Bond, J., & Humphreys, K., *Social networks as mediators of the effect of Alcoholics Anonymous*. Addiction, 2002. **97**(7): p. 891-900.
62. Kassel, J.D., & Wagner, E. F., *Processes of change in Alcoholics Anonymous: A review of possible mechanisms*. Psychotherapy: Theory, Research, Practice, Training, 1993. **30**(2): p. 222-234.
63. H., M.R., *Theory-based active ingredients of effective treatments for substance use disorders*. Drug and alcohol dependence, 2007. **88**(2-3): p. 109-121.
64. Moisiso, R., Beruchashvili, M., *Questing for Well-Being at Weight Watchers: The Role of the Spiritual-Therapeutic Model in a Support Group*. Journal of Consumer Research, 2010. **36**(5): p. 857-875.
65. Kelly J.F., S.R.L., Greene M.C., Slaymaker V, *Young Adults, Social Networks, and Addiction Recovery: Post Treatment Changes in Social Ties and Their Role as a Mediator of 12-Step Participation*. 9, 2014. **6**.
66. Riessman, F., *The "Helper" Therapy Principle*. Social Work, 1965. **10**(2): p. 27-32.
67. Baumeister, R.F., Leary, M. R., *The need to belong: desire for interpersonal attachments as a fundamental human motivation*. Psychological Bulletin, 1995. **117**(3): p. 497.

### **Emma Barnosky**

Emma Barnosky is a PhD student at UCLA in the Institute of the Environment and Sustainability. She is interested in ecological vulnerabilities and theories of societal change. She is specifically curious about how business, government, and civil society intersect with regards to sustainability, and how to translate knowledge to action between these three sectors. She holds a Bachelor's degree in Romance Languages with a minor in Anthropology from Colorado College, and has experience working with tech startups, nonprofits, and entertainment agencies. She hopes to apply her research and experience to bring together diverse perspectives and facilitate solutions to the world's pressing environmental issues.

### **Magali A. Delmas**

Magali Delmas is a Professor of Management at the UCLA Institute of the Environment and the Anderson School of Management. She is the director of the UCLA Center for Corporate Environmental Performance. Her research interests are primarily in the areas of Business strategy and Corporate Sustainability. Magali Delmas has written more than 80 articles, book chapters and case studies on business and the natural environment. She works on developing effective information strategies to promote conservation behavior and the development of green markets.

### **Marieke Huysentruyt**

Marieke Huysentruyt is Assistant Professor of Strategy at HEC Paris, and academic affiliate at the Stockholm Institute of Transition Economics, Stockholm School of Economics, and ideas42, a non-profit organization that uses insights from behavioral economics and psychology to solve social problems. Her research concerns the effectiveness of organizations at addressing today's major societal challenges, like inequality and global warming. She has studied, among other topics: the effects of personal values, organizational culture and management practices on firm productivity, the role of individual intrinsic and extrinsic motives in influencing the performance of nascent social entrepreneurs (using a field experiment), how empathy affects the success of corporate social initiatives (using field experiments).